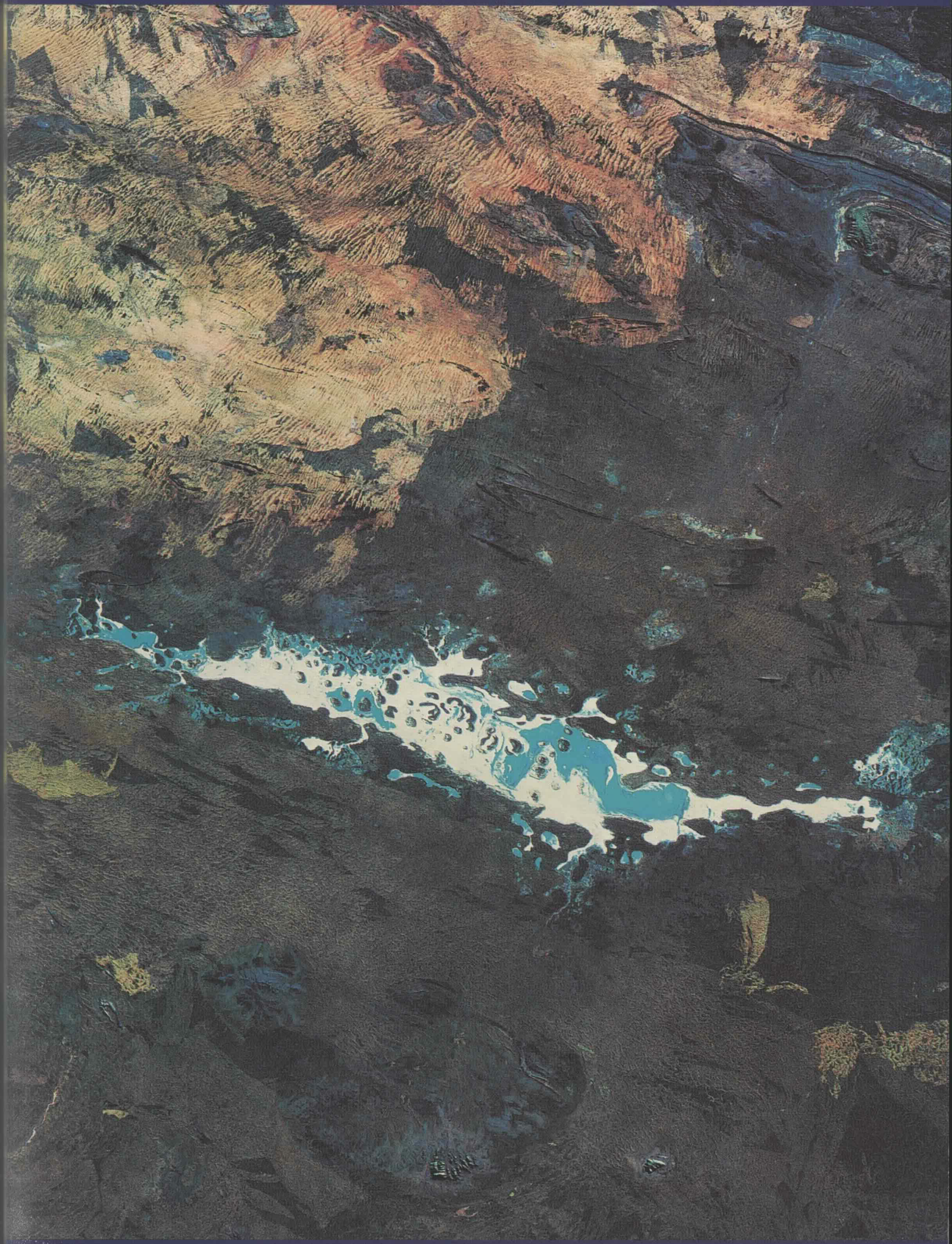
BMR BULLETIN 230: HYDROGEOLOGY AND GROUNDWATER RESOURCES OF THE LAKE AMADEUS AND AYERS ROCK REGION, NORTHERN TERRITORY



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DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

BULLETIN 230

Hydrogeology and groundwater resources of the Lake Amadeus and Ayers Rock region, Northern Territory

by

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Cover: Landsat image showing Lake Amadeus, a groundwater-discharge playa in central Australia. The playa is 120 km long and forms a major segment of the 500-km-long central Australian groundwater-discharge zone, which discharges from a catchment of 90 000 km^2. The blue colour in the image represents gypsum 'fields' in the playa bed. Gypsum precipitates from highly saline brines; volumetric changes during precipitation lead to heaving of the ground and the development of playa bed topography resembling a ploughed field. The two prominent inselbergs, The Olgas and Ayers Rock, 25 km apart, can be seen near the bottom edge of the image. The Kings Canyon area is in the top right-hand corner. The image is a standard false-colour composite Landsat image (path 104, row 77) acquired on 30 June 1983. It was provided by the Australian Centre for Remote Sensing, Australian Surveying and Land Information Group, Department of Administrative Services, Belconnen, ACT.

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FOREWORD

The work described in this Bulletin was undertaken as a pilot study for a national groundwater resources assessment program. The region studied is entirely within the arid zone and therefore may be considered typical of two-thirds of the continent. Future development of arid Australia will depend very much on the availability of groundwater resources, for agricultural and town water supplies, mining, tourism, and Aboriginal settlements. At present the pressures for groundwater resources development in central Australia are not as severe as in other arid parts of the world but we must anticipate an increased level of development and plan accordingly.

The authors have emphasised the occurrence and evolution of brackish and saline waters, and these are an important natural resource in arid Australia, both for water supply and for the potential derivation of industrial minerals.

Computer-assisted cartography has been applied in order to ensure rapid reporting of the results of this project. Hydrogeological map formats have been tested and new ones devised to suit arid zone conditions. I am confident that this project will serve as a model for future groundwater assessment and documentation in the Australian arid zone.

P J Cook.

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CONTENTS

	Page
ABSTRACT	vii
INTRODUCTION	1
METHODOLOGY	1
Computerised map compilation	2
Base-map data	2
Previous BMR work	2
Hydrogeological database	2
Sources of information	2
Construction	2
Use	3
Problems	3
Selection of maps for publication	3
THE HYDROGEOLOGICAL ENVIRONMENT	3
Climate	3
Surface hydrology	4
Physiography	5
Regional geology	5
INTERPRETATION OF HYDROGEOLOGY ON A REGIONAL SCALE	5
Surficial aquifers	5
Isopachs	5
Palaeochannels	5
Hydrogeological interpretation	7
Bedrock aquifers	7
Geological interpretation	7
Hydrogeological interpretation	8
Hydrochemistry and hydrodynamics	9
Groundwater discharge and recharge	9
Hydrochemical evolution	10
Special features of the hydrochemistry	16
Isotope chemistry	16
GROUNDWATER RESOURCES ASSESSMENT OF CONCEPTUALLY KNOWN AREAS	20
Curtin Springs	20
Geology	20
Hydrogeology	21
Groundwater resources	21
Kings Canyon	22
Geology	22
Hydrogeology	23
Groundwater resources	23
Ayers Rock (Uluru)	24
Geology	24
Hydrogeology	24
Groundwater resources	25
EXTRAPOLATION TO CONCEPTUALLY UNKNOWN AREAS	34
Fresh-water resources	34
Brackish and saline groundwaters	34
CONCLUSIONS	35
ACKNOWLEDGEMENTS	35
REFERENCES	36

TABLES

1. Annual rainfall 4
2. Bore yields in Cainozoic aquifers 7
3. Bore yields in bedrock aquifers 9
4. Average chemical composition and types of groundwaters from the Lake Amadeus region 13
5. Ionic ratios for regional groundwaters 14
6. Isotope data for groundwaters, Lake Amadeus–Ayers Rock region 18

FIGURES

1. Location map, and availability of information 1
2. Compilation methodology for the hydrogeological maps 1
3. Annual rainfall at Tempe Downs, 1888–1986 4
4. Tempe Downs, annual rainfall frequency distribution 4
5. The Lake Amadeus–Ayers Rock region in its hydrogeological context 4
6. Bores used for construction of the surficial aquifer maps 6
7. Structure contours of the base of the Cainozoic sediments, Ayers Rock–Mount Conner area 7
8. Bores used for construction of the bedrock aquifer maps 8
9. Hydrogeological cross-section through Lake Amadeus showing dual aquifer system and conceptual model of groundwater flow 10
10. Cross-section of the Lake Amadeus brine pool showing brine density 10
11. Evolutionary trends of major ions with increased salinity in Ayers Rock groundwaters and Lake Amadeus brines 11
12. Major-ion composition of regional groundwaters and playa brines, Lake Amadeus 11
13. Ionic concentrations of calcium, bicarbonate, and sulphate, and the calcium/sulphate molar ratio, as a function of salinity 12
14. Hydrochemical types of groundwater in the Lake Amadeus–Ayers Rock region 15
15. The Mg/Ca molar ratio as a function of salinity in Lake Amadeus groundwaters 16
16. Schematic cross-section showing hydrochemical processes in the regional groundwater flow system 16
17. Hydrochemical parameters and chemical evolution of groundwaters 17
18. Evolution of regional groundwaters and genesis of brine, Lake Amadeus 17
19. Saturation indices for dolomite, calcite, anhydrite, and halite, as a function of groundwater salinity 19
20. Changes in salt composition of brines with increasing density 20
21. Ionic composition of groundwaters, Mereenie oilfield 20
22. Relationship of silica to total-dissolved-solids concentrations in regional groundwaters and Lake Amadeus brines 21
23. Plot of deuterium versus oxygen-18 for Lake Amadeus brines and regional groundwaters 21
24. Gypsum–gypcrete–calcrete association at a small playa near Curtin Springs 22
25. Hydrogeological cross-section through calcrete near Curtin Springs 23
26. Electron-spin-resonance dates obtained for playa gypsum and calcrete 24
27. Groundwater discharge playas near Curtin Springs: Quaternary geology and potentiometry 25
28. Transect at Spring Lake, Curtin Springs, showing geology, potentiometry based on numerical model, and contours of brine density 26
29. The playa–marginal transition zone, Spring Lake, showing potentiometry, zones of evaporative water loss, frequent and infrequent recharge, and contours of brine density 27

Page

30. Schematic diagram showing hydrochemical processes in a groundwater discharge playa, Spring Lake 28
31. Possible model for brine evolution and mineral precipitation sequence 29
32. Hydrograph of piezometer in playa bed, Spring Lake 29
33. Stages in abandonment of playa owing to groundwater head decay 29
34. Block diagram showing aspects of the hydrogeology of the Kings Canyon area 30
35. Hydrochemical zonation in layered Palaeozoic aquifers at Kings Canyon 30
36. Reversed salinity gradient in water bore in Palaeozoic aquifers at Kings Canyon 31
37. Trends in ionic composition of groundwaters related to different salinity gradients in bores, Kings Canyon 31
38. Ayers rock area: tritium and carbon-14 content of groundwaters 32
39. Hydrographs of two observation bores near Ayers Rock showing effects of high 1974 rainfall on groundwater levels 33
40. Yulara town area water supply system 34

COLOUR PLATES (centre pages)

1. Compilation of hydrogeological maps on a computer-aided drafting system
2. Ayers Rock, a large inselberg of resistant Late Proterozoic–Cambrian conglomerate
3. Quaternary sand dunes mantle the landscape near Curtin Springs
4. Vegetation is an important factor in determining groundwater recharge
5. Margin of a groundwater-discharge playa, Spring lake, near Curtin Springs
6. Groundwater-levels and climate parameters are monitored electronically
7. Sand plains near The Olgas, underlain by a shallow aquifer
8. Glauberite Lake, a groundwater-discharge playa near Curtin Springs

Page

APPENDICES

1. Cost of the project 39
2. Intergraph design files 39
3. Pilot study database schema 41
4. Water bores in the Lake Amadeus–Ayers Rock region 45
5. Chemical analyses of groundwater samples, Lake Amadeus–Ayers Rock region 59

MAP-SET (one sheet): Hydrogeology of the Lake Amadeus–Ayers Rock region, NT (in pocket)

ABSTRACT

A hydrogeological map-set of the Lake Amadeus–Ayers Rock region in central Australia has been prepared as a pilot project for a national groundwater resources inventory. The maps in the set were compiled on a computer graphics system at 1:250 000 scale from layers representing topography, bedrock geology, surficial geology, hydrodynamics, hydrochemistry, and water-bore locations. The quantitative information was obtained from a microcomputer database, and the geological and topographic information was digitised from specially revised maps. As the hydrogeological data are sparse it was decided to publish the main maps at 1:500 000 scale. For three areas where more detailed information was available, inset maps at 1:100 000 scale are presented.

The region mapped is arid; annual rainfall is about 250 mm and potential evaporation close to 3000 mm. Groundwater recharge is of the order of 1 mm/year. Important aquifers are surficial Cainozoic sand and calcrete, and bedrock sandstone units including the Palaeozoic Pacoota Sandstone and Mereenie Sandstone. Groundwater varies in quality from 0.4 g/L to more than 200 g/L total dissolved solids. Groundwater converges from the north and south towards a southeast-trending chain of playas, where it discharges by evaporation. Hydrochemical evolution is apparent along groundwater flow paths. Fresher water, generally bicarbonate-rich, occurs close to the hilly recharge areas and in the calcrete. This evolves to highly saline chloride-rich brines in the playas, by processes of solution, precipitation of minerals, and evaporative concentration.

Groundwater supplies have been developed for the Yulara tourist resort, the largest settlement in the area, although the water, derived from Cainozoic sands, is desalinated for use in domestic supplies. For a proposed tourist resort at Kings Canyon, a water supply is being developed from bedrock units, mainly the Pacoota Sandstone. Single bores are scattered through the region, supplying cattle stations and Aboriginal settlements.

In this hydrogeologically complex region, extrapolation from conceptually known areas is difficult. The detailed assessment of groundwater resources will require additional drilling.

INTRODUCTION

Significant gaps in knowledge have been identified in reviews of Australia's groundwater resources. In particular, the collection and interpretation of data for regional-scale groundwater systems and the dissemination of information are considered to be deficient, and a national groundwater resources assessment program has been proposed to remedy this (Jacobson & others, 1983; AGC, 1987a). This program would be based on the publication of hydrogeological maps using computer-assisted cartography.

In 1986, BMR undertook a pilot project to test methodology for the proposed national program. Four regions were selected for study: Ballarat in Victoria (AGC, 1987b); Pooncarie and Deniliquin in New South Wales; and the Lake Amadeus–Ayers Rock region in the Northern Territory. The Lake Amadeus–Ayers Rock region was chosen as representative of an arid region with sparse hydrogeological data, conditions which pertain in two-thirds of the Australian continent. The region is mainly within the Amadeus Basin where BMR has a long-term geoscientific research program under way, and is also an area where the Northern Territory Power & Water Authority is involved in the assessment of groundwater resources. The region chosen comprises the LAKE AMADEUS and AYERS ROCK 1:250 000 sheet areas(Fig. 1).

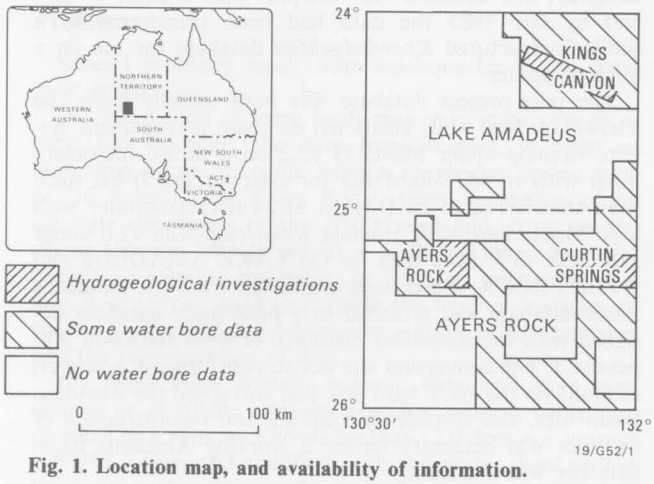


Fig. 1. Location map, and availability of information.

The total population of the region is about 5000, mainly concentrated at the town of Yulara, which is a centre for tourism. Another tourist centre is being developed at Kings Canyon, and there is a producing oil field at Mereenie. There are a number of small Aboriginal settlements in the region and there are large cattle stations at Tempe Downs, Curtin Springs, and Mulga Park.

For this project, G.C. (Geoff) Lau was contracted by BMR to develop the water-bore database, undertake a field data census, and revise the existing geological maps using photogeological interpretation. The work began in February 1986; the field data census was undertaken in March 1986; and preparation of the database and revision of the topographic and geological maps occupied the remainder of 1986. Compilation of the hydrogeological maps on a computer-aided drafting system (Plate 1) began in October 1986 and was completed in May 1987. Coloured penplots were checked, and final corrections were made in November 1987. Scribing of the plates was automated, from digital information, and after cartographic editing, the map-set went to press in June 1988.

The estimated cost of the project (Appendix 1) was $70 000 (excluding publication costs, BMR staff time for hydrogeological research, and NT agencies' staff time for original collection of water-bore data).

METHODOLOGY

An outline of the methodology used for compilation of the maps is shown in Figure 2.

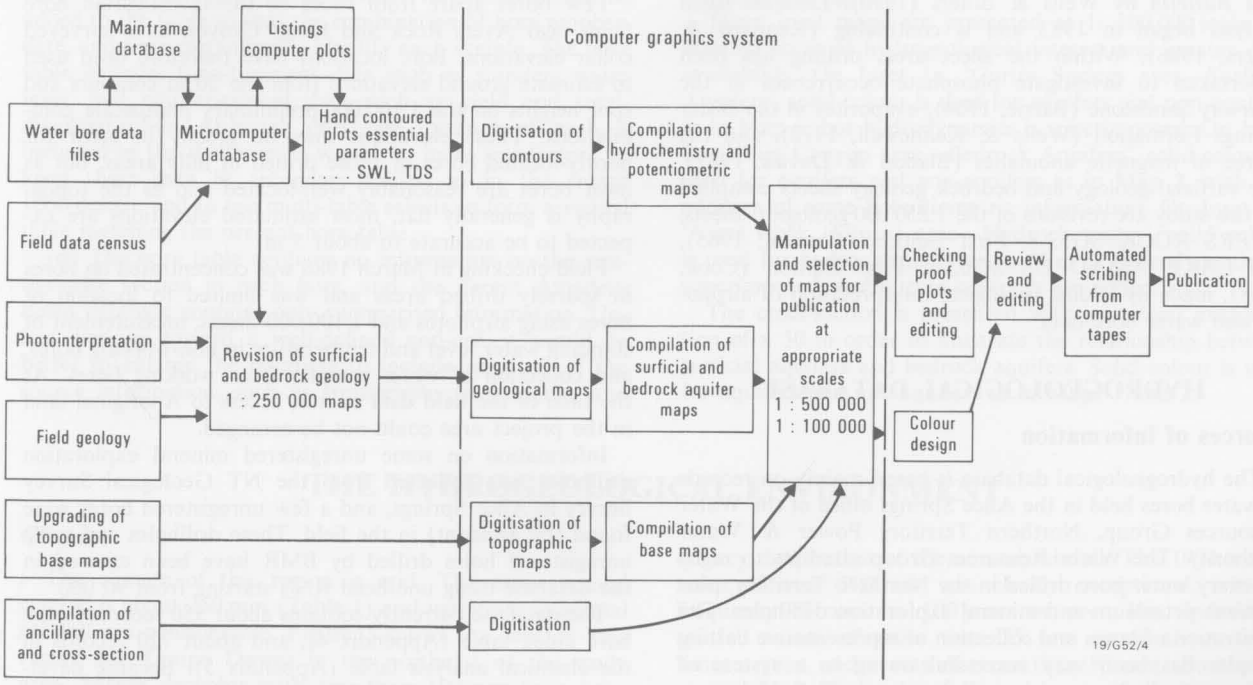


Fig. 2. Compilation methodology for the hydrogeological maps.

Computerised map compilation

All maps were prepared on an InterGraph computer-aided drafting system operated by Cangraphics Pty Ltd, Fyshwick, ACT. The system runs on a Vax 11-785 computer, and an InterGraph workstation at BMR is linked by leased line. Maps were hand-digitised using a separate design file for each section of the study, as shown in Appendix 2. Within the files, each map element was given a separate level to allow selection of any desired combination of elements. Elements such as geological boundaries, which occur in more than one file, have been given the same level in each.

Base-map data

The topographic base was taken from the 1:250 000-scale topographic map sheets AYERS ROCK SG52-8, Edition 1, 1981, and LAKE AMADEUS SG52-4, Edition 1, 1980, published by the Division of National Mapping. New cultural details, such as the Lasseter Highway and the Yulara tourist village, have been added from NatMap 1:100 000 preliminary photoscale compilations, and from airphoto interpretation. The new road to Kings Canyon was taken from QASCO 1:25 000 photogrammetric contour compilations prepared in 1984. To match the 50 m topographic contour interval on AYERS ROCK, 50 m contours on LAKE AMADEUS were generalised by the BMR Cartographic Section from 20 m contours on the 1:100 000 preliminary photoscale compilations. Some additional drainage courses have been photointerpreted, and seismic tracks have been photointerpreted or located by field reconnaissance. Aboriginal place names were taken from Layton (1986). The airphotos used in this study were: RC9 black and white contact prints, nominal scale 1:80 000, for the Lake Amadeus and Ayers Rock 1:250 000 sheets; and colour contact prints, nominal scale 1:50 000, for the Mount Olga, Ayers Rock, and Curtin Springs 1:100 000 Sheets.

Previous BMR work

BMR carried out regional geological mapping of the Amadeus Basin in the period 1960–1970. Progress was reported via *Reports, Records*, and 1:250 000 geological sheets and *Explanatory Notes*, and the project culminated in a *Bulletin* by Wells & others (1970). Detailed basin analysis began in 1983 and is continuing (Kennard & others, 1986). Within the sheet area, drilling has been undertaken to investigate phosphate occurrences in the Stairway Sandstone (Barrie, 1964), evaporites in the Bitter Springs Formation (Wells & Kennewell, 1972), and the source of magnetic anomalies (Bladon & Davies, 1982). The surficial geology and bedrock geology sheets compiled for this study are revisions of the 1:250 000 geological sheets, AYERS ROCK SG52-8, First Edition (Forman, 1965), and LAKE AMADEUS SG52-4, First Edition (Cook, 1968), made by adding geological interpretation of airphotos and water bore data.

HYDROGEOLOGICAL DATABASE

Sources of information

The hydrogeological database is based mainly on records of water bores held in the Alice Springs office of the Water Resources Group, Northern Territory Power & Water Authority. The Water Resources Group attempts to register every water bore drilled in the Northern Territory, plus relevant petroleum and mineral exploration drillholes. The registration of bores and collection of representative cutting samples has been very successful owing to a system of driller accreditation and bore inspection staff. Each bore is allocated a unique Registered Number (RN), and has a bore file in which hardcopy of all available information is kept. The Water Resources Group are working to replace the bore files with a complete archival database, but this system is still at an early stage.

In 1984–85, Keith Warne (consulting geologist, Alice Springs) worked on contract to BMR to extract, from the bore files, information on all bores in the Amadeus Basin. Coding sheets were sent to BMR for entry into an Image 1000 database.

Some additional detail has been taken from various reports on water supply investigations by the Water Resources Group, from BMR's own investigations, from mineral exploration reports, and from field checking.

Construction

In 1985, bore information for the whole Amadeus Basin was entered into an Image 1000 database on the BMR's mainframe computer, then an HP 1000. Although well-designed, this database was complex and difficult to use, and by late 1985 the data had been transferred to a similarly-structured *KnowledgeMan* database for use on a microcomputer.

The pilot-project database was built initially using the *KnowledgeMan* v1.07 relational database management system, running under MS-DOS v2.2 on a Sirius microcomputer with an ACT hard disk for mass storage. It has since been transferred to an Olivetti M-24 microcomputer with a 20 Mbyte hard disk, running *KnowledgeMan* v2.0 under MS-DOS v3.1. Bore data on the LAKE AMADEUS and AYERS ROCK sheets were converted from the Amadeus Basin database and attached to a pilot-study database designed with the simplified relational schema shown in Appendix 3. The conversion was not straightforward, however, as faults on the ACT hard disk had corrupted the Amadeus Basin files, and considerable editing and reconstruction of the files was necessary before a working Amadeus Basin database was available.

Initial editing concentrated on the location of bores. Existing locations were checked against copies of Water Resources' maps and many new locations were added from the 10 000 yard grid to AMG coordinate conversions prepared by the Division of National Mapping. Some locations were updated using Magnavox satellite navigator fixes supplied by the Water Resources Group.

Few bores apart from those in the investigation bore fields near Ayers Rock and Kings Canyon have surveyed collar elevations. Bore locations have therefore been used to estimate ground elevations from the 20 m contours and spot heights on the 1:100 000 preliminary photoscale compilations. These elevations may be grossly in error for poorly-located bores or those drilled in hilly areas, but as most bores are reasonably well-located and as the topography is generally flat, most estimated elevations are expected to be accurate to about 5 m.

Field checking in March 1986 was concentrated on bores in sparsely drilled areas and was limited to location of bores using airphotos and 1:100 000 sheets, measurement of standing water level and temperature in non-working bores, and collection of water samples from working bores. At the time of the field data census, access to Aboriginal land in the project area could not be arranged.

Information on some unregistered mineral exploration drillholes was collected from the NT Geological Survey library in Alice Springs, and a few unregistered bores were found (by accident) in the field. These drillholes and some unregistered holes drilled by BMR have been entered in the database using unofficial RN's starting from 90 000.

The database currently contains about 550 records in the bore index table (Appendix 4), and about 720 records in the chemical analysis table (Appendix 5). Because development and mineral exploration in the study area are limited to the northeastern, eastern, and southern margins

and the Ayers Rock–Olgas area, the bores are unevenly distributed (Fig. 1), and 35% of the study area is more than 20 km from a bore.

Use

It was hoped to transfer the database to an Intergraph database which could be integrated with the digitised maps. However, BMR had not developed expertise with Intergraph databases before the compilation was complete, and only small parts of the pilot-study database were transferred for preparation of working plots of bore location and water chemistry.

The main uses of the *KnowledgeMan* database have been the production of sorted listings of bore data, selection or grouping of related records, calculation of hydrochemical parameters, and simple plotting on a Roland DXY 880 A3-sized plotter.

Problems

Several problems result from inadequacies in the database design.

(a) The values of some fields may vary greatly in accuracy. For example, the bore location may, in order of increasing accuracy, come from a rough description such as '10 miles SE of Ayers Rock', from conversion of an accurate coordinate in the 10 000 yard grid, from an airphoto location transferred to a 1:100 000 map, from the Magnavox satellite navigator, or from an instrument survey. A qualifying field to indicate the level of accuracy of such a field would aid subsequent editing of the database, and the interpretation of data.

(b) Most fields contain numeric data and have been defined as numbers. The absence of a value is badly represented as a zero, as *KnowledgeMan* v2.0 does not support a NULL value, and qualifiers such as 'greater than' or 'less than' are not represented at all. In retrospect, it might have been better to define all fields as character strings, and to use the type conversion functions provided in the data manipulation language where numeric analysis was necessary.

(c) The chemistry table is not normalised since there can be sequential analyses of samples taken from one bore on one date during pumping tests. A time field should be added to the table so that the combination of bore number, date, and time can uniquely identify each sample. The bore table includes time-transient data such as standing water level, and aquifer-related data such as yield and total-dissolved-solids. Although only one instance of each is included in the database, it would be more satisfactory to keep these data in secondary tables, as in the Image 1000 design, and to use multi-table selects to form a virtual table matching the present bore table.

(d) The bore table contains no information on the stratigraphic section in each bore, and the parent Amadeus Basin database contains only summarised information. Unless working toward a well-defined end-use, it would be better to enlarge the database to include as much of the source information, such as stratigraphy, as possible, and to delay summarising the information until the report-generation stage.

SELECTION OF MAPS FOR PUBLICATION

Information was compiled at 1:250 000 scale but, in order to maximise the information shown on the published map and preserve cartographic clarity, a decision was made to publish a 1:500 000-scale triptych or map-set comprising the **surficial aquifers map (Map 1), bedrock aquifers map (Map 2)**, and **hydrochemistry & hydrodynamics map (Map 3).**

Two styles of hydrogeological map are presently in vogue in Australia (Jacobson & others, 1987): maps following the UNESCO international legend in which solid colour is used for aquifer type, i.e. porous or fissured; and maps using a colour matrix for salinity and bore yield. Neither of these styles was considered appropriate for the Lake Amadeus–Ayers Rock region, which is one of complex geology and sparse hydrogeological data. Use of the international legend for mapping this region is precluded by lack of knowledge of aquifer characteristics. Furthermore, most of the known aquifers have both porous and fissured characteristics, making classification of aquifer type difficult.

Use of the salinity/yield matrix is also precluded by lack of information regarding these parameters; groundwater salinity is known in general terms over 75 percent of the region but very few bores have been tested for yield, and some units have not been drilled at all.

The compromise adopted—the triptych—was to use solid colour on Map 1, 'Surficial Aquifers', to distinguish aquifers and non-aquifers, and to subdivide the aquifers on the basis of likely bore yield. On Map 2, 'Bedrock Aquifers', solid colour is again used to distinguish aquifers and non-aquifers, with a subdivision on the basis of likely bore yield, and a further subdivision on the basis of aquifer type. An extra category was introduced for untested units. For the compilation of both these maps, the database was manipulated to derive typical bore yields for all units, and the units were then grouped in terms of aquifer potential. On Map 3, 'Hydrochemistry & Hydrodynamics', solid colour has been used for hydrochemistry defined in terms of total-dissolved-solids content and major anions. Hydrodynamics has been shown in violet symbols similar to those of the international legend.

Three inset maps are presented at 1: 100 000 scale for selected areas of hydrogeological interest and greater data availability. On Inset 1a, 'Curtin Springs area—Surficial Aquifers', solid colour is used for aquifers and non-aquifers as in Map 1, but hydrodynamics is superimposed. On Inset 2a, 'Kings Canyon area—Bedrock Aquifers', solid colour is used for aquifers and non-aquifers as in Map 2, with the addition of some potentiometric information. On Inset 3a, 'Ayers Rock (Uluru) area—Hydrochemistry', solid colour is used for hydrochemistry as in Map 3, hydrodynamics is superimposed, and nitrate contours are added.

The cross-section is presented with a vertical exaggeration of x 50 in order to illustrate the relationship between surficial aquifers and bedrock aquifers. Solid colour is used for aquifers and non-aquifers as in Maps 1 and 2.

THE HYDROGEOLOGICAL ENVIRONMENT

Climate

The climate of this region is arid. The mean annual rainfall is about 250 mm (Table 1) and variations in annual rainfall are considerable. Figure 3 shows the century-long record for Tempe Downs in the northeast of the study area. Severe droughts with less than 100 mm have been recorded in nine separate years. Figure 4 shows the frequency distribution of the annual rainfall. The 1974 maximum of over 900 mm was clearly exceptional, with a frequency of once in 100 years or even less. Individual rainfall events of more than 25 mm occur about three times a year, and events of more than 50 mm about once a year. Most of the rain falls in summer, from November to March.

TABLE 1. ANNUAL RAINFALL

Station	*Timespan*	*No. of years*	*Maximum (mm)*	*Minimum (mm)*	*Mean (mm)*
Ayers Rock	1964–83	20	936	84	333
Curtin Springs	1953–85	33	813	49	226
Tempe Downs	1888–1985	98	979	41	258

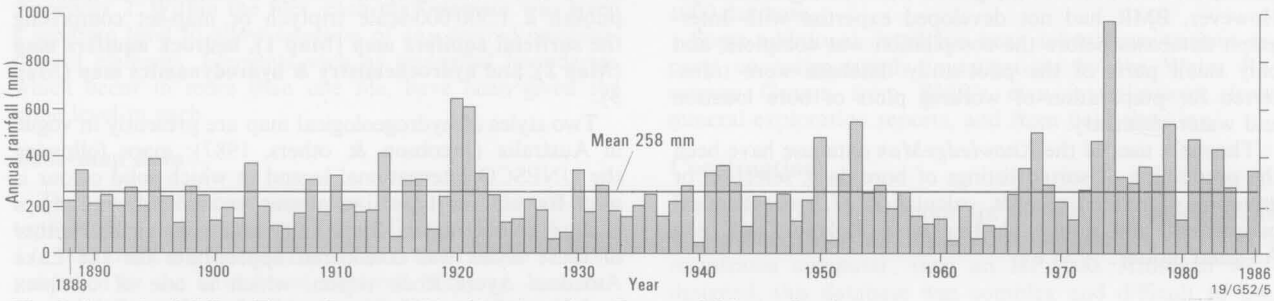


Fig. 3. Annual rainfall at Tempe Downs, 1888–1986 (data from Bureau of Meteorology).

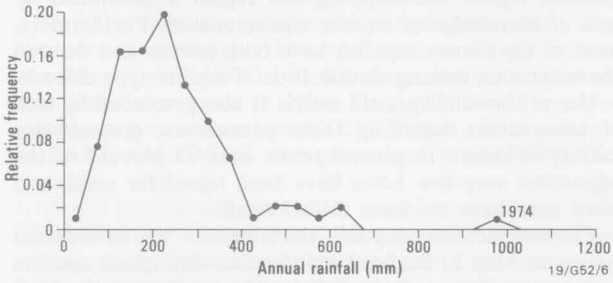


Fig. 4. Tempe Downs: annual rainfall frequency distribution.

The mean monthly maximum temperature ranges from 33° C in January to 20° C in July. The mean monthly minimum ranges from 21° C in January to 4° C in July. Annual pan evaporation is about 2950 mm, based on 13 years' records at Alice Springs, the nearest long-term recording station.

Surface hydrology

There are no river-gauging stations in the study area. Creeks in the George Gill Range to the north and Musgrave Range to the south (Fig. 5) flow after heavy rain.

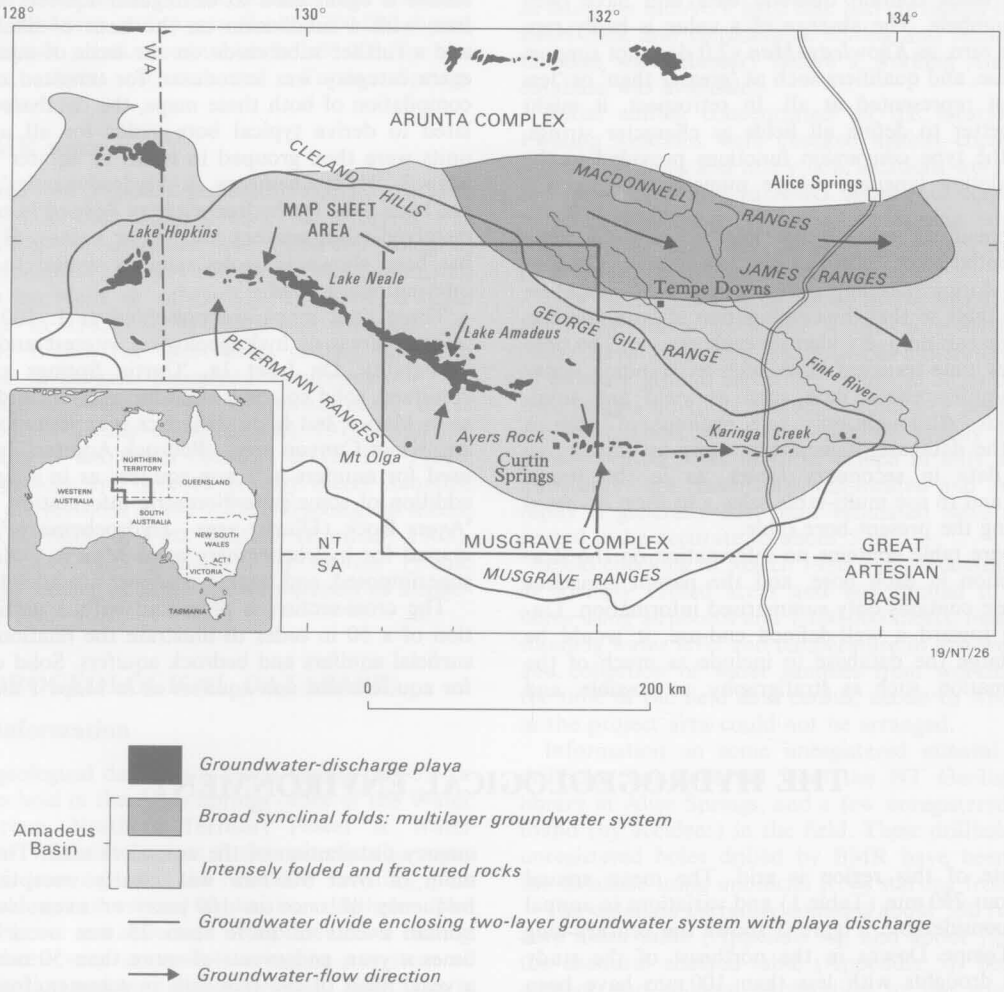


Fig. 5. The Lake Amadeus–Ayers Rock region in its hydrogeological context.

All of these creeks flood out in sand dunes and none reach the playa chain.

Observations of the largest playa, Lake Amadeus, are that about 5 percent of the playa bed is covered with water after a 25 mm rainfall event, and about 10 percent after a 50 mm event. This water evaporates in a few days. Following a 100 mm event, surface water persists in this and other playas for several weeks.

There are permanent pools at the George Gill Range and Ayers Rock as well as a few 'native wells' in calcrete. In prehistoric times, the Aboriginal people obtained water from these widely spaced pools, and their traditional life was based on travelling between the pools and wells (Layton, 1986).

Physiography

The focal point of this region is the chain of playas that extends across its centre (cover photograph). The playas are a segment of a linear system 500 km long extending from Lake Hopkins in western Australia through the mapsheet area to the Finke River in the east (Fig. 5). The chain of playas is the physiographic expression of the central Australian groundwater discharge zone (Jacobson & others, 1988).

The catchment area for the playa chain extends over 90 000 km^2. The catchment is bounded on the north by the Cleland Hills and George Gill Range with a maximum elevation of 900 m. It is bounded on the south by the Petermann and Musgrave Ranges, with a maximum elevation of 1300 m. Between these bounding ranges and the playa chain, low bedrock hills protrude through Cainozoic cover, which generally has a veneer of aeolian sand dunes. The bedrock hills include the distinctive large inselbergs of The Olgas (Katatjuta), 1066 m (Plate 7); Ayers Rock (Uluru), 863 m (Plate 2); and Mount Conner (Atila), 859 m (Plate 3). These three features are remnants of hard rock rising above the general erosion surface (Ollier & Tuddenham, 1961).

Regional geology

Most of the mapsheet area is underlain by Proterozoic and Palaeozoic rocks of the Amadeus Basin sequence, which have been folded and faulted in several orogenies. Structural trends are NW–SE, and the playa chain is probably underlain by an anticlinorium in which upthrust evaporites may have dissolved to form a depression (Wells, 1980). In the northeast, these rocks form anticlines and synclines, including the Mereenie anticline which contains a producing oil field. In this folded belt the regional direction of groundwater flow is west–east along synclinal axes (Lloyd & Jacobson, 1987).

Quaternary sand dunes cover a large part of the surface of the depression (Plate 3) and are up to 30 m high. The dunes are stable and vegetated, and overlie a Cainozoic sequence, up to 100 m thick, of sand, clay, gravel, and calcrete with minor lignite. The base of this sequence at Ayers Rock has been dated as mid Paleocene (Twidale & Harris, 1977). The Cainozoic sediments infill a major palaeodrainage system which drained southeast to the vicinity of Lake Eyre, in early Tertiary time (possibly beginning in the Late Cretaceous).

The southern margin of the mapsheet area is underlain by Precambrian granite and metamorphic rocks, of the Musgrave–Mann Complex. The Cainozoic sediments cover part of this complex as well as the southern margin of the Amadeus Basin.

INTERPRETATION OF HYDROGEOLOGY ON A REGIONAL SCALE

SURFICIAL AQUIFERS

The surficial aquifers of the region, contained in Quaternary and Tertiary units, are shown on Map 1. The bores used for construction of the surficial geological map are shown in Figure 6, and the surficial geology units are as mapped by Cook (1968) and Forman (1965), with additional photointerpretation. Quaternary aeolian sand dunes blanket much of the area. Quaternary calcrete, of groundwater origin, crops out near Curtin Springs (Plate 2) and in the Yulara Creek–Bobbies Well area. The groundwater-discharge playas have a characteristic association of playa-bed gypsum, bordering gypsum dunes, and thin gypcrete crusts (Plate 5). Beneath these Quaternary deposits, Tertiary sand and sandstone form important aquifers.

Isopachs

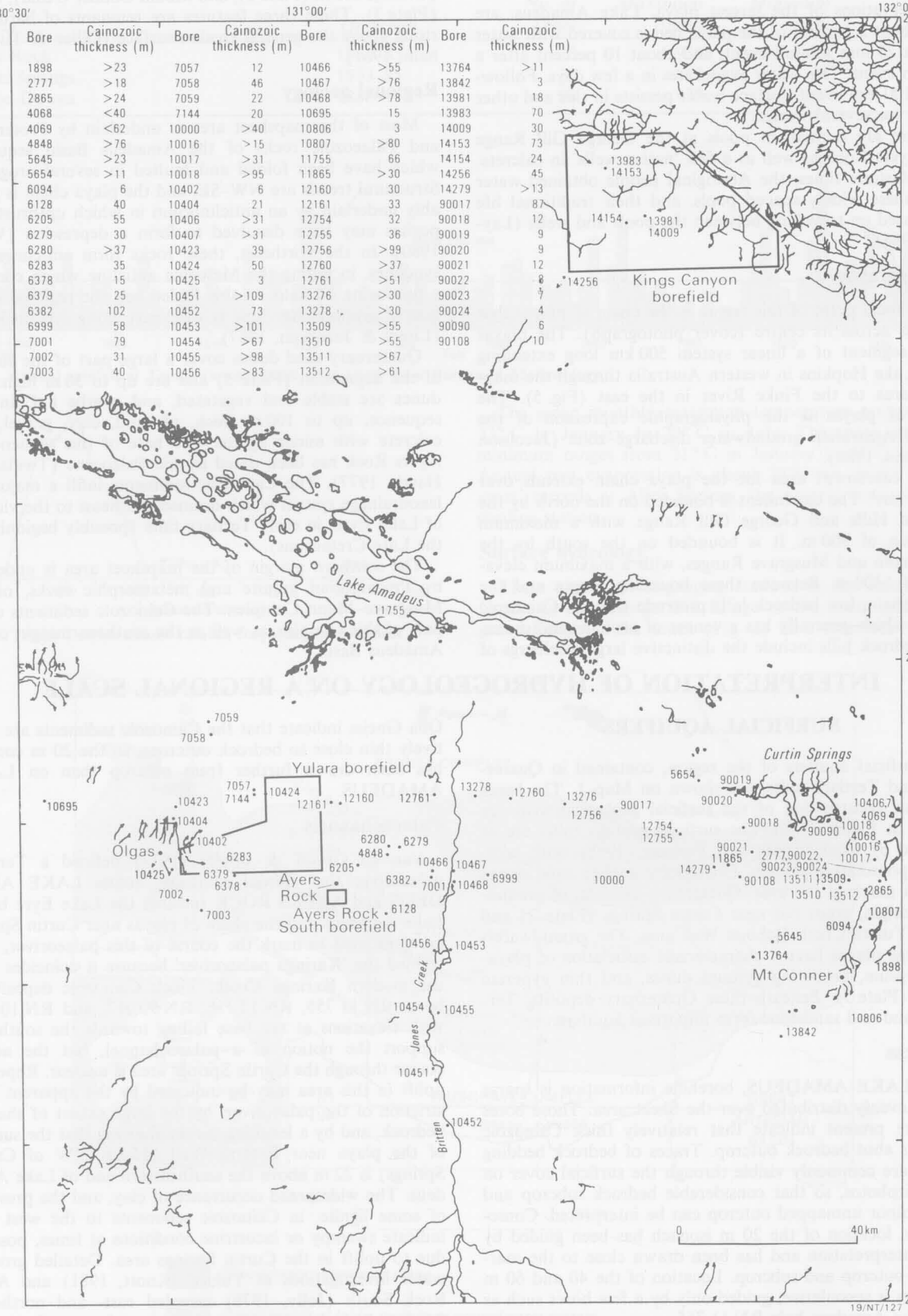
On LAKE AMADEUS, borehole information is sparse and unevenly distributed over the Sheet area. Those bores that are present indicate that relatively thick Cainozoic deposits abut bedrock outcrop. Traces of bedrock bedding trends are commonly visible through the surficial cover on RC9 airphotos, so that considerable bedrock subcrop and some minor unmapped outcrop can be interpreted. Consequently, location of the 20 m isopach has been guided by photointerpretation and has been drawn close to the margins of outcrop and subcrop. Location of the 40 and 60 m contours is speculative, guided only by a few bores such as the Lake Amadeus hole RN 11 755.

On AYERS ROCK, almost no bedrock subcrop can be photointerpreted, but information on approximately 300 bores is available and is better distributed across the Sheet area. For this sheet, structure contours on the basal unconformity were drawn to outline the inferred palaeodrainage pattern (Fig. 7), and isopachs were drawn subsequently. Bore data in the western Olgas area and on the Olia Gneiss indicate that the Cainozoic sediments are relatively thin close to bedrock outcrops, so the 20 m contour has been drawn further from outcrop than on LAKE AMADEUS.

Palaeochannels

Van de Graaff & others (1977) defined a Tertiary palaeoriver that flowed southeast across LAKE AMADEUS and AYERS ROCK towards the Lake Eyre basin. Lake Amadeus and the chain of playas near Curtin Springs are presumed to mark the course of this palaeoriver, here termed the 'Karinga palaeoriver' because it coincides with the modern Karinga Creek. Thick Cainozoic deposits in bores RN 11 755, RN 12 756, RN 90 017, and RN 10 018, with elevations at the base falling towards the southeast, support the notion of a palaeochannel, but the actual course through the Curtin Springs area is unclear. Repeated uplift in this area may be indicated by the apparent constriction of the palaeoriver, by the large extent of shallow bedrock, and by a levelling survey showing that the surface of the playa near Pararra Well (15 km NW of Curtin Springs) is 22 m above the southeastern end of Lake Amadeus. The widespread occurrence of clay, and the presence of some lignite, in Cainozoic sediments to the west also indicate swampy or lacustrine conditions at times, possibly due to uplift in the Curtin Springs area. Detailed groundwater investigations at Yulara (Knott, 1981) and Ayers Rock South (Jolly, 1979) revealed east- and northeast-flowing channels in the unconformity surface, preferentially developed on Pinyinna beds bedrock.

Several of the bores drilled by Macqueen (1972) along Britten Jones Creek show that this area is underlain by thick, dominantly clayey alluvium, and a north-trending palaeotributary has been inferred. No bores have been drilled east or west of Britten Jones Creek, and no information is available for most of the bores between Mulga



Bore	Cainozoic thickness (m)	Bore	Cainozoic thickness (m)	Bore	Cainozoic thickness (m)	Bore	Cainozoic thickness (m)
1898	>23	7057	12	10466	>55	13764	>11
2777	>18	7058	46	10467	>76	13842	3
2865	>24	7059	22	10468	>78	13981	18
4068	<40	7144	20	10695	15	13983	70
4069	<62	10000	>40	10806	3	14009	30
4848	>76	10016	>15	10807	>80	14153	73
5645	>23	10017	>31	11755	66	14154	24
5654	>11	10018	>95	11865	>30	14256	45
6094	6	10402	6	12160	30	14279	>13
6128	40	10404	21	12161	33	90017	87
6205	55	10406	>31	12754	32	90018	12
6279	30	10407	>31	12755	36	90019	9
6280	>37	10423	39	12756	>99	90020	9
6283	35	10424	50	12760	>37	90021	12
6378	15	10425	3	12761	>51	90022	8
6379	25	10451	>109	13276	>30	90023	7
6382	102	10452	73	13278	>30	90024	4
6999	58	10453	>101	13509	>55	90090	6
7001	79	10454	>67	13510	>55	90108	10
7002	31	10455	>98	13511	>67		
7003	40	10456	>83	13512	>61		

Fig. 6. Bores used for construction of the surficial aquifer maps (including information from Jolly, 1979, and Knott, 1981).

Park Station and Mount Conner. The mapped extension of Inkanunna Creek, and the palaeotributary west of Mount Conner are based on the assumption that in wetter climates there must have been some surface drainage north from the Musgrave Ranges. Continuous subcrop has been photointerpreted between the strike ridges of Winnall beds at GT1785 and GT2184, so the isopachs have been drawn to show the inferred course of the ancestral Kings Creek around the end of the strike ridge at GT3977.

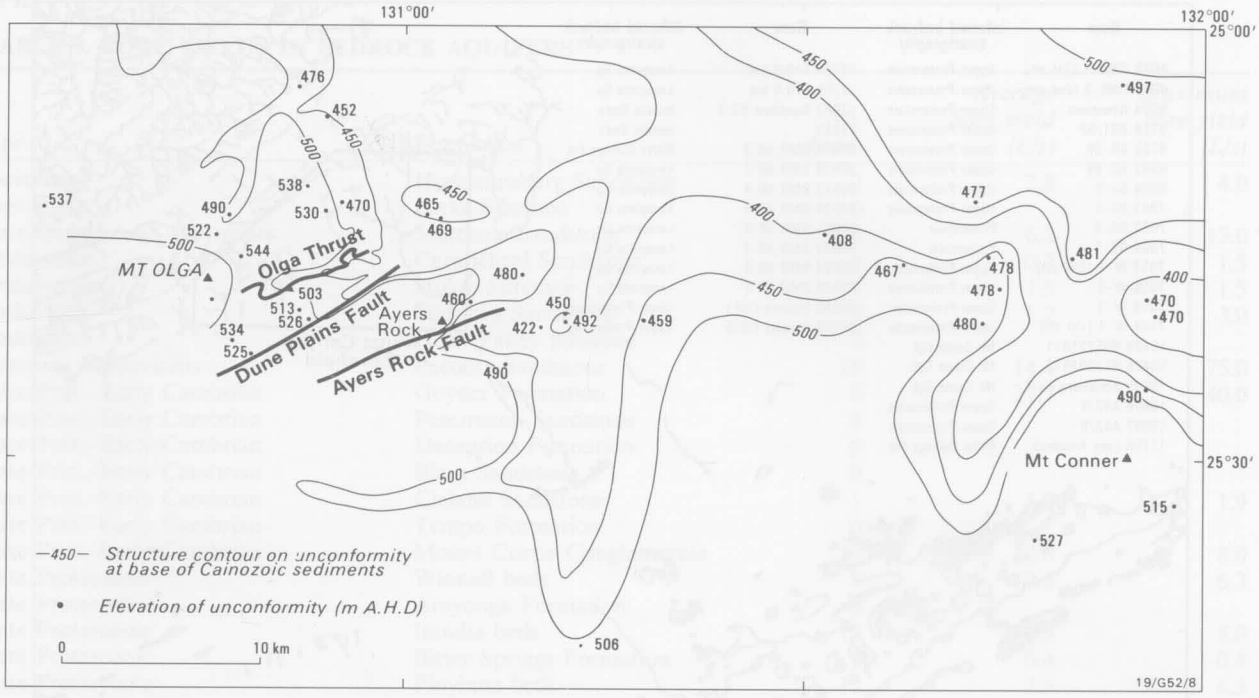


Fig. 7. Structure contours of the base of the Cainozoic sediments, Ayers Rock–Mount Conner area (including information from Jolly, 1979; Knott, 1981; and selected bores).

Hydrogeological interpretation

An analysis of bore yields in the Cainozoic aquifers is shown in Table 2. Porous units described on bore logs as sand, sand and gravel, sandstone, and sandy siltstone have been grouped on Map 1 and described as 'low–high yielding' with the potential for obtaining bore yields greater than 5 L/s. Calcrete aquifers are described as 'low-yielding'. Non-aquifers including thin and low-permeability units are grouped separately. In general, areas with less than 20 m of Cainozoic have been mapped as non-aquifers.

BEDROCK AQUIFERS

The bedrock aquifers of the region, contained in Proterozoic and Palaeozoic units, are shown on Map 2. The bores used for construction of the bedrock geological map are shown in Figure 8.

Geological interpretation

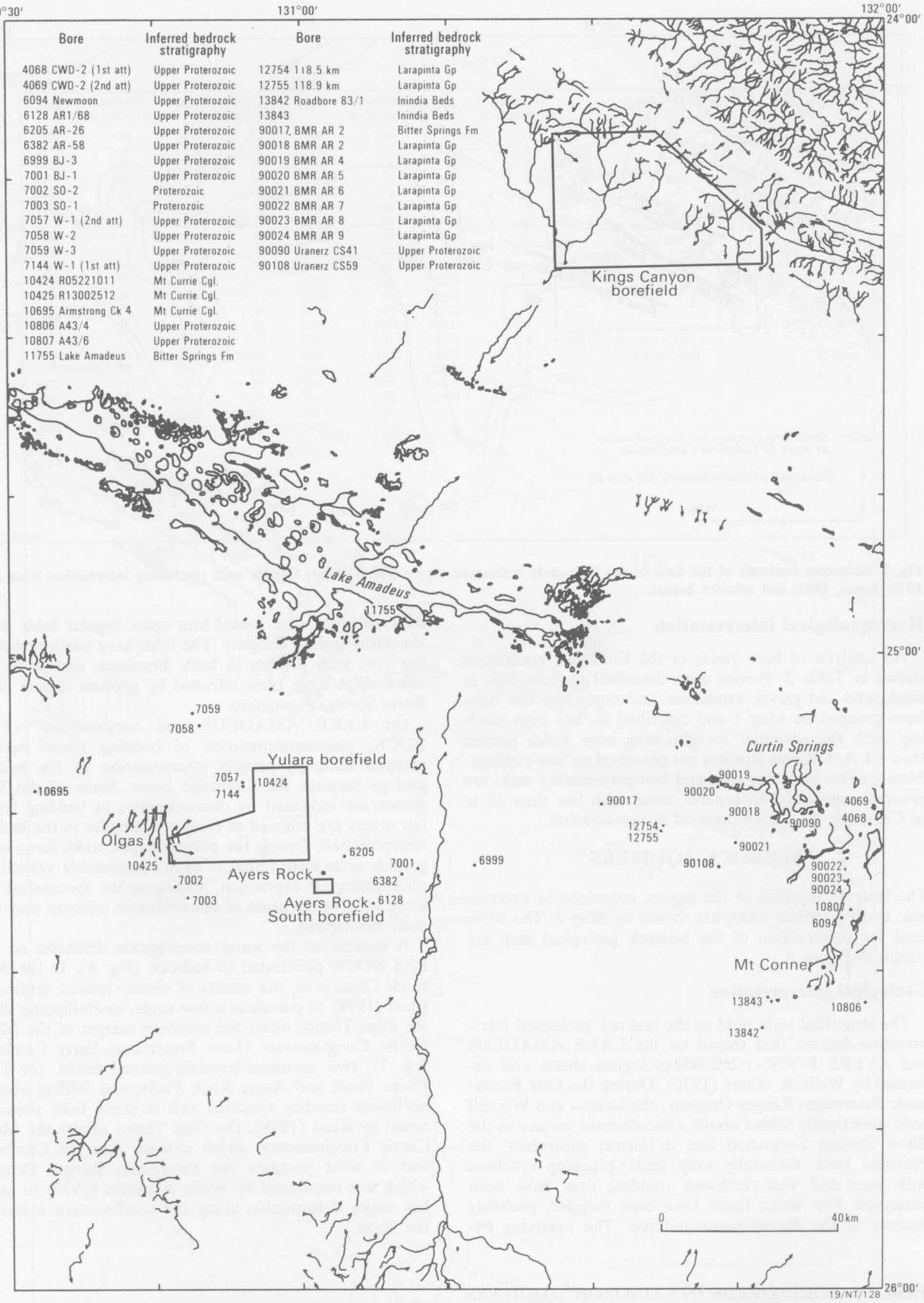
The structural style used in the bedrock geological interpretation follows that shown on the LAKE AMADEUS and AYERS ROCK 1:250 000 geological sheets and described by Wells & others (1970). During the Late Proterozoic Petermann Ranges Orogeny, the Inindia and Winnall beds were tightly folded above a decollement surface in the Bitter Springs Formation and its lateral equivalent, the Pinyinna beds. Generally only gently-plunging synclines with west and west-northwest trending axes have been preserved. Few strike faults have been mapped, probably because of the discontinuous outcrop. The overlying Palaeozoic units were folded into open, regular folds during the Alice Springs Orogeny. The folds have northwest-trending axes with plunges in both directions, and some anticlinal cores have been intruded by gypsum diapirs of the Bitter Springs Formation.

On LAKE AMADEUS and northeastern AYERS ROCK, photointerpretation of bedding traces between mapped outcrops permits interpretation of the bedrock geology beneath the Cainozoic cover. Some of the faults shown are indicated by discontinuities in bedding trends, but others are inferred to resolve anomalies in the bedrock interpretation. During the photointerpretation, some stratigraphic units were found to have considerable variation in photogeological expression, leading to the speculation that some units in the areas of discontinuous outcrop may have been mismapped.

A number of the water investigation drillholes on AYERS ROCK penetrated to bedrock (Fig. 8). In the Ayers Rock–Olgas area, the results of closely spaced drilling led Read (1978) to postulate: a low angle, south-dipping thrust, the Olga Thrust, along the southern margin of the Mount Currie Conglomerate (Late Proterozoic–Early Cambrian; Fig. 7); two northeast-trending normal faults, the Dune Plains Fault and Ayers Rock Fault; and folding about a northwest-trending synclinal axis in these fault slices. As noted by Read (1978), the Olga Thrust offsets the Mount Currie Conglomerate, which extends into the Cambrian, and so must postdate the Petermann Ranges Orogeny, which was considered by Wells & others (1970) to be the last major deformation along the southwestern margin of the Basin.

TABLE 2. BORE YIELDS IN CAINOZOIC AQUIFERS

Age	*Lithology*	*No. of bores*	*Average bore yield (L/s)*	*Maximum bore yield (L/s)*
Quaternary	Calcrete	25	1.5	3.0
Quaternary–Tertiary	Sand and gravel	52	3.6	25.0
Tertiary	Sandstone	42	3.6	23.0
Tertiary	Sandy siltstone	11	4.3	12.6



Bore	Inferred bedrock stratigraphy	Bore	Inferred bedrock stratigraphy
4068 CWD-2 (1st att)	Upper Proterozoic	12754 118.5 km	Larapinta Gp
4069 CWD-2 (2nd att)	Upper Proterozoic	12755 118.9 km	Larapinta Gp
6094 Newmoon	Upper Proterozoic	13842 Roadbore 83/1	Inindia Beds
6128 AR1/68	Upper Proterozoic	13843	Inindia Beds
6205 AR-26	Upper Proterozoic	90017 BMR AR 2	Bitter Springs Fm
6382 AR-58	Upper Proterozoic	90018 BMR AR 2	Larapinta Gp
6999 BJ-3	Upper Proterozoic	90019 BMR AR 4	Larapinta Gp
7001 BJ-1	Upper Proterozoic	90020 BMR AR 5	Larapinta Gp
7002 SO-2	Proterozoic	90021 BMR AR 6	Larapinta Gp
7003 SO-1	Proterozoic	90022 BMR AR 7	Larapinta Gp
7057 W-1 (2nd att)	Upper Proterozoic	90023 BMR AR 8	Larapinta Gp
7058 W-2	Upper Proterozoic	90024 BMR AR 9	Larapinta Gp
7059 W-3	Upper Proterozoic	90090 Uranerz CS41	Upper Proterozoic
7144 W-1 (1st att)	Upper Proterozoic	90108 Uranerz CS59	Upper Proterozoic
10424 R05221011	Mt Currie Cgl.		
10425 R13002512	Mt Currie Cgl.		
10695 Armstrong Ck 4	Mt Currie Cgl.		
10806 A43/4	Upper Proterozoic		
10807 A43/6	Upper Proterozoic		
11755 Lake Amadeus	Bitter Springs Fm		

Fig. 8. Bores used for construction of the bedrock aquifer maps (including information from Jolly, 1979; Knott, 1981; McDonald & others, 1986).

Hydrogeological interpretation

Units on Map 2 are coloured by aquifer yield. The aquifers have been classified by grouping database records by stratigraphy, and assessing the range of bore yields reported (Table 3). The Pacoota Sandstone (Late Cambrian–Early Ordovician) and Mereenie Sandstone (Late Ordovician–Early Devonian) have been described as 'high-yielding', with the potential for bore yields greater than 5 L/s. These formations have both porous and fissured characteristics. Several other sandstone and conglomerate units with fissured and porous characteristics are described as 'low yielding': the Hermannsburg Sandstone (Late Devonian), Carmichael Sandstone (Ordovician), Stairway Sand-

TABLE 3. BORE YIELDS IN BEDROCK AQUIFERS

Age	*Formation*	*No. bores*	*Average bore yield (L/s)*	*Maximum bore yield (L/s)*
Devonian	Hermannsburg Sandstone	2	2.8	4.0
Devonian	Parke Siltstone	0		
Late Ordovician—Devonian	Mereenie Sandstone	6	6.2	13.0
Ordovician	Carmichael Sandstone	6	0.7	1.5
Ordovician	Stokes Siltstone	1	1.5	1.5
Ordovician	Stairway Sandstone	9	1.2	3.0
Ordovician	Horn Valley Siltstone	0		
Cambro—Ordovician	Pacoota Sandstone	18	14.4	75.0
Late Prot.–Early Cambrian	Goyder Formation	2	27.7	40.0
Late Prot.–Early Cambrian	Petermann Sandstone	0		
Late Prot.–Early Cambrian	Deception Formation	0		
Late Prot.–Early Cambrian	Illara Sandstone	0		
Late Prot.–Early Cambrian	Cleland Sandstone	1	1.9	1.9
Late Prot.–Early Cambrian	Tempe Formation	0		
Late Prot.–Early Cambrian	Mount Currie Conglomerate	11	2.0	8.0
Late Proterozoic	Winnall beds	7	2.6	6.3
Late Proterozoic	Areyonga Formation	0		
Late Proterozoic	Inindia beds	15	1.9	5.0
Late Proterozoic	Bitter Springs Formation	1	0.4	0.4
Late Proterozoic	Pinyinna beds	12	2.5	6.3
Late Proterozoic	Dean Quartzite	1	3.0	3.0
Late Proterozoic	Olia Gneiss	10	1.0	2.5

stone (Ordovician), Mount Currie Conglomerate, Winnall beds, and Inindia beds. These units typically have bore yields in the range 1–3 L/s. Several units with fissured aquifer characteristics have been grouped as 'low-yielding': the Late Proterozoic Bitter Springs Formation, Pinyinna beds, and Dean Quartzite, and the Early Proterozoic Olia Gneiss.

The subsurface geological interpretation in areas of scattered outcrop or non-outcrop was to 'group' level: the Winnall and Inindia beds were taken together, and the Mereenie Sandstone was grouped with the Pertnjara Group. The subsequent decision to colour the map in terms of possible bore yield has made this interpretation inadequate, as each 'group' is a composite of units with different aquifer characteristics. On Map 2, only areas of outcrop and areas in which the subsurface interpretation is considered reliable are coloured by yield. Other areas are coloured as 'yield untested'.

HYDROCHEMISTRY AND HYDRODYNAMICS

The hydrochemistry and hydrodynamics of the region are shown on Map 3.

Information for both surficial and bedrock aquifers has been included on this map because data are inadequate to consider these aquifer types separately. In general, the information shown in the central part of the map relates to surficial aquifers, while information at the northern and southern ends relates to bedrock aquifers.

The hydrochemistry of the region is shown in terms of salinity expressed as total dissolved solids and major anionic components. The freshest groundwater sampled in this region contains about 400 mg/L total dissolved solids. The salinity categories of 1500, 3000, 14 000, and 100 000 mg/L relate to possible uses of the water. Thus, 1500 mg/L is the maximum desirable limit for drinking water; water of 1500–3000 mg/L may be used for irrigation of certain crops, and is suitable for livestock; 14 000 mg/L is the limit for livestock; and 100 000 mg/L is a general limit for industrial use. More saline water may be used for ore processing or for brine production. The major anionic component was determined from the hydrochemistry database (Appendix 5). Analysis of the database indicated that nearly all groundwaters of less than 1500 mg/L are bicarbonate–chloride waters; groundwaters between 1500 and 14 000 mg/L are chloride–sulphate waters; and more saline groundwaters are invariably chloride waters.

The hydrodynamics is shown with violet symbols on the map. Potentiometric contours are based on available water-level and topographic survey information. In general, groundwater flows towards the central chain of playas, which is part of the central Australian groundwater discharge zone.

The radiometric ages of groundwater in certain bores are also shown with a violet symbol. Groundwater ages are based on carbon-14 dating.

Groundwater temperatures are shown in black. The temperature at the water-table in sand and calcrete aquifers is a constant 26°C. Temperatures of up to 31°C have been recorded for aquifers at Kings Canyon at depths of 200–300 m. Temperatures in Mereenie oil-field waters are about 60°C at 1200 m depth.

Groundwater discharge and recharge

The largest playa in the discharge zone, Lake Amadeus, has been investigated by BMR and the Australian National University (Jacobson, 1988; Chen & Bowler, 1986). Groundwater flow to Lake Amadeus has been modelled as occurring in a two-layer aquifer system (Fig. 9) with recharge on the flanks of the valley and discharge in the playa. Sediments beneath the lake bed are saturated with brine that contains about 250 000 mg/L total dissolved solids, and is sodium-magnesium chloride rich. Figure 10 is a cross-section of the brine pool: 'fresher' groundwater overlies highly saline brine at the playa margins.

The playa bed is generally dry and contains areas of heaved gypsum ground with flatter halite-encrusted zones that are occasionally flooded. Gypsum is actively precipitating in the capillary zone above the water-table, which is generally at a depth of 0.30–0.50 m. In Lake Amadeus and other playas in the central Australian groundwater discharge zone, the total mass of salt stored is estimated as about 6000 million tonnes; this amount has apparently accumulated in about 12 000 years.

Preliminary water-balance calculations for a small playa, Spring Lake, near Curtin Springs, indicate that the evapo-

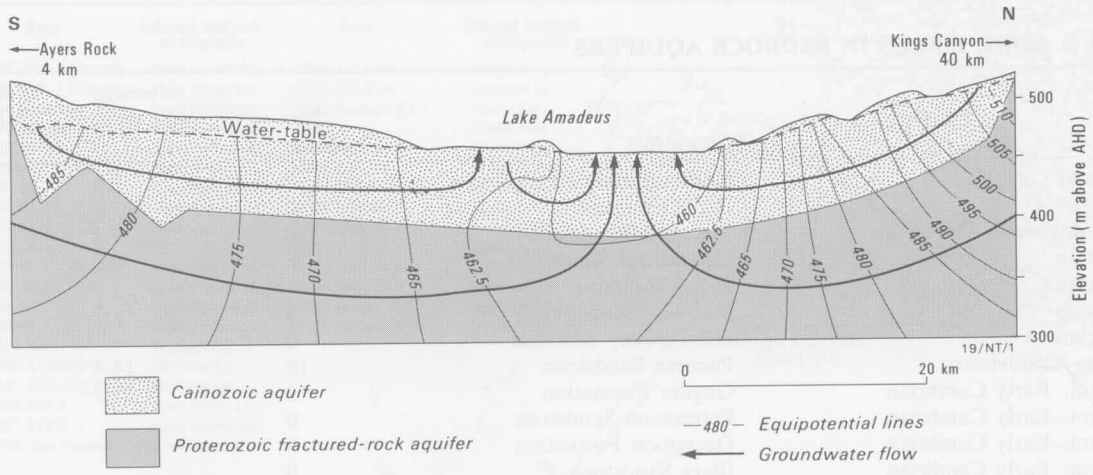


Fig. 9. Hydrogeological cross-section through Lake Amadeus showing dual aquifer system and conceptual model of groundwater flow.

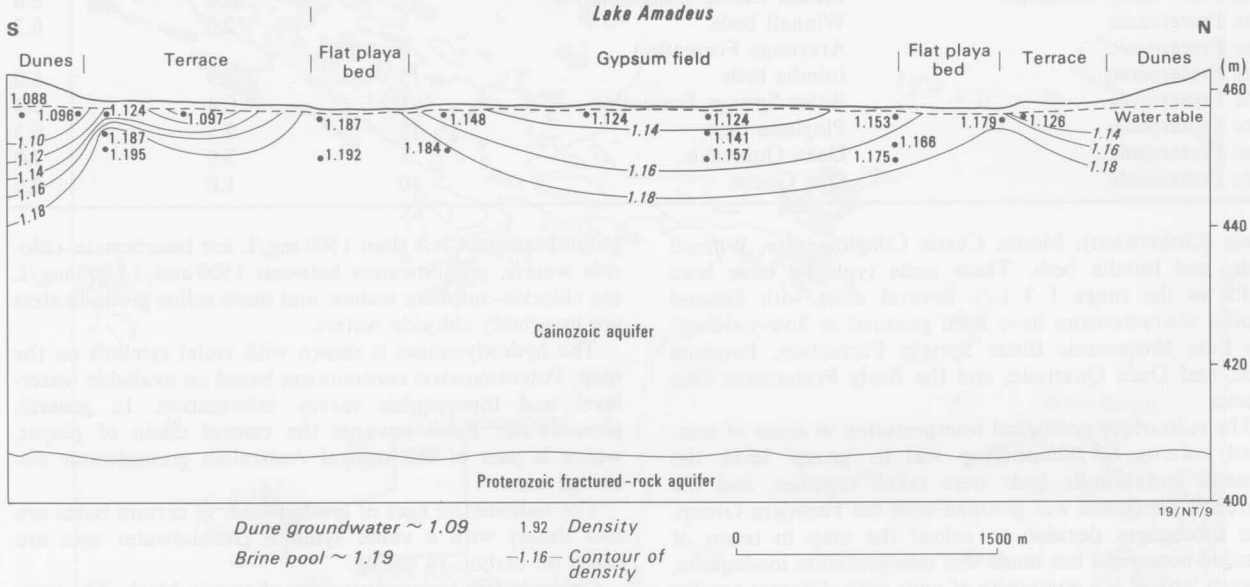


Fig. 10. Cross-section of the Lake Amadeus brine pool, showing brine density.

rative discharge is about 275 mm/year. Of this, 225 mm can be accounted for by the direct infiltration of rainfall on the playa bed and 50 mm is derived from groundwater inflow (Jacobson & Jankowski, 1989).

Over the whole playa chain, the groundwater component of evaporative discharge can be balanced against groundwater recharge, assuming steady-state conditions. Thus, water budget calculations show that groundwater recharge in the catchment of 90 000 km^2 is approximately 1 mm/year, which is only 0.4 percent of the incident rainfall.

Evidence for modern groundwater recharge is afforded by the occurrence of relatively fresh groundwaters (1000 to 1500 mg/L) close to rock outcrops and in calcrete aquifers. These groundwaters typically have low but positive tritium contents. The mechanisms for recharge are complex and include: infiltration through rock fractures in hills flanking the basin; occasional river flooding with infiltration through sandy river beds; and direct infiltration in areas of thin sand dune cover, and, more importantly, in areas of calcrete outcrop. The latter mechanism is probably the most significant in modern times (Jacobson & others, in press).

The low proportion of recharge to incident rainfall is probably due to the extreme efficiency of the Australian arid zone flora in capturing nearly all the incident rainfall for transpiration (Plate 4).

Hydrochemical evolution

The hydrochemical evolution of regional groundwaters and playa brines is illustrated in Figure 11, which shows the major ion content for a wide range of salinities. Salinity increases gradually along groundwater flow paths and then markedly with evaporative concentration in the playas of the discharge zone. Concentrations of individual ions are affected by complex processes of dissolution and precipitation of minerals (Jankowski & Jacobson, in press).

The recharge waters, with up to 1500 mg/L total dissolved solids, are typically bicarbonate–chloride waters, with sodium and calcium the dominant cations. This is illustrated on the trilinear plot showing major ion compositions (Fig. 12). Bicarbonate is removed from solution at relatively low concentrations in the groundwater system, owing to the precipitation of calcite to form calcrete deposits. In the concentration range 1500–15 000 mg/L total dissolved solids, the groundwaters are typically chloride–sulphate waters, with sodium the dominant cation. At concentrations greater than 100 000 mg/L total dissolved solids, gypsum precipitates out from playa brines. This results in a loss of calcium from solution, and some loss of sulphate; sodium, potassium, and magnesium become concentrated in the residual chloride brine. In some playas, glauberite (sodium–calcium sulphate) is precipitating and halite occurs as crusts up to several centimetres thick.

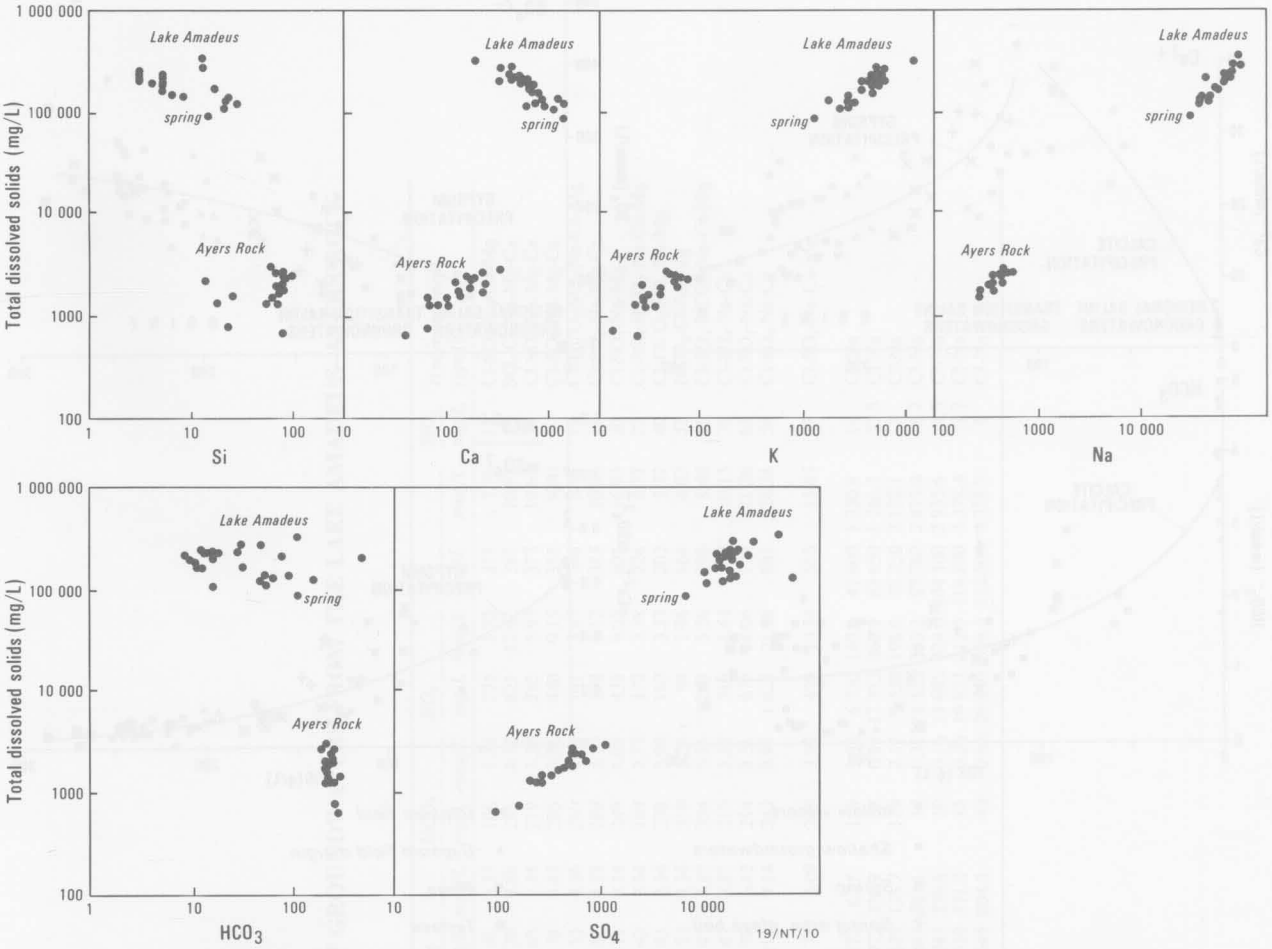


Fig. 11. Evolutionary trends of major ions with increased salinity in Ayers Rock groundwaters and Lake Amadeus brines.

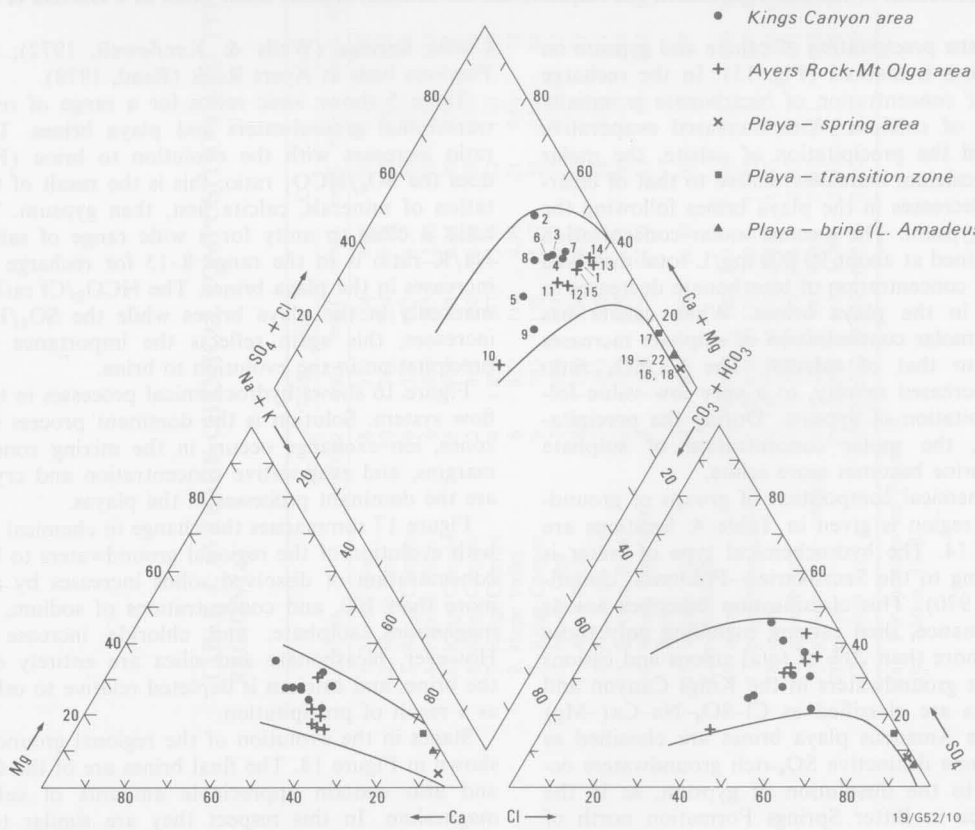


Fig. 12. Major-ion composition of regional groundwaters and playa brines, Lake Amadeus (trilinear plot, in percent milliequivalents). For sample locations, see Table 4 and Figure 14.

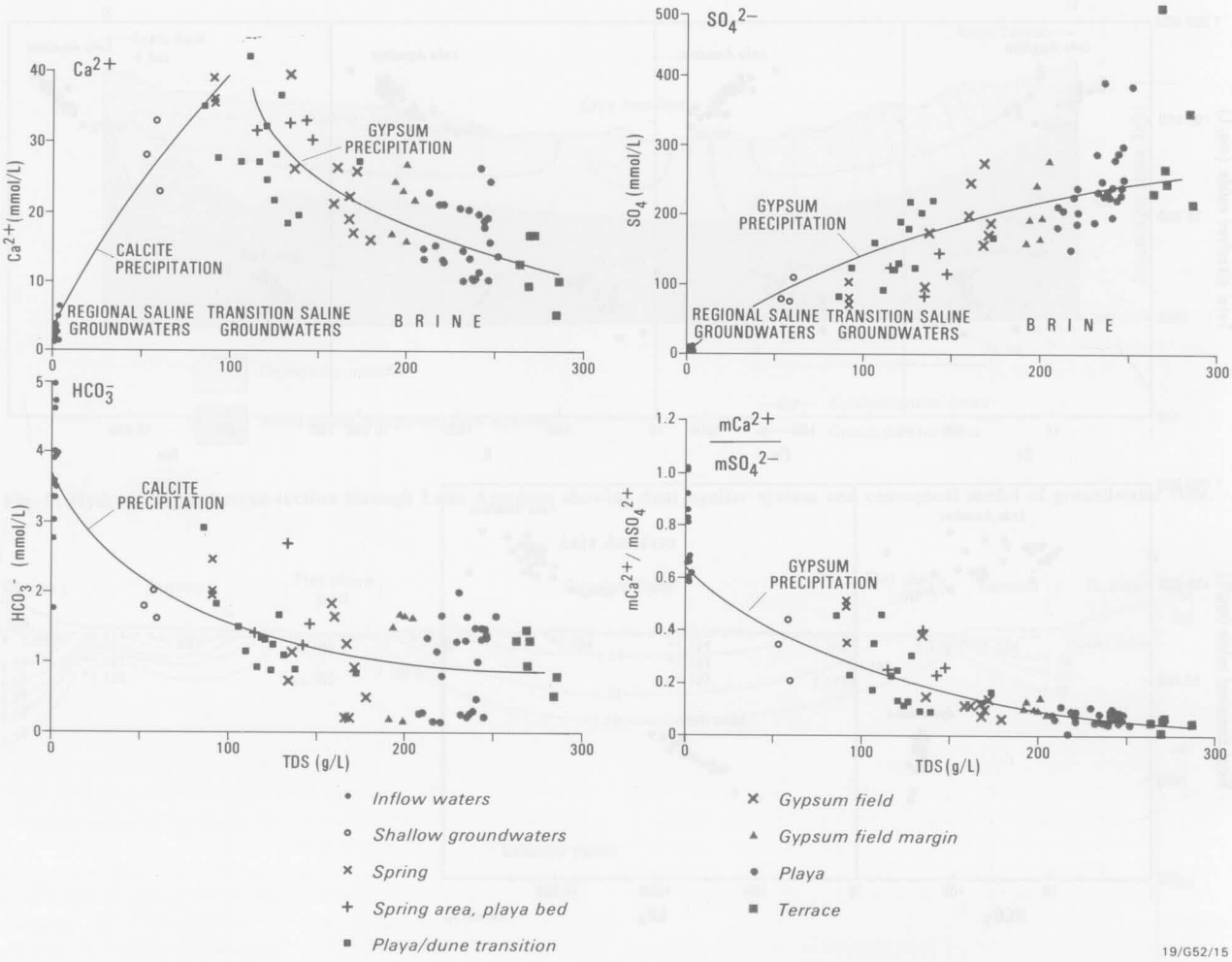


Fig. 13. Ionic concentrations of calcium, bicarbonate, and sulphate, and the calcium/sulphate molar ratio, as a function of salinity.

The effects of the precipitation of calcite and gypsum on ionic concentrations is marked (Fig. 13). In the recharge waters, the molar concentration of bicarbonate is initially higher than that of calcium. With increased evaporative concentration and the precipitation of calcite, the molar concentration of calcium increases relative to that of bicarbonate. It then decreases in the playa brines following the precipitation of gypsum. The greatest molar concentration of calcium is attained at about 90 000 mg/L total dissolved solids. The molar concentration of bicarbonate decreases to very low levels in the playa brines. When calcite has precipitated, the molar concentration of sulphate increases rapidly relative to that of calcium. The Ca/SO_4 ratio decreases with increased salinity, to a very low value following the precipitation of gypsum. During the precipitation of gypsum, the molar concentration of sulphate increases as the brine becomes more saline.

The average chemical composition of groups of groundwaters from the region is given in Table 4; locations are shown in Figure 14. The hydrochemical type of water is described according to the Szczukariew–Priklonski classification (Alekin, 1970). This classification describes anions in order of dominance, then cations, including only those which comprise more than 20% of total anions and cations respectively. Most groundwaters in the Kings Canyon and Ayers Rock areas are classified as Cl–SO_4–Na–Ca(–Mg) waters. The Lake Amadeus playa brines are classified as Cl–Na waters. Some distinctive SO_4-rich groundwaters occur locally, due to the dissolution of gypsum, as in the gypsum karst area in Bitter Springs Formation north of Curtin Springs (Wells & Kennewell, 1972); and in the Pinyinna beds at Ayers Rock (Read, 1978).

Table 5 shows ionic ratios for a range of recharge and transitional groundwaters and playa brines. The Mg/Ca ratio increases with the evolution to brine (Fig. 15), as does the SO_4/HCO_3 ratio; this is the result of the precipitation of minerals, calcite first, then gypsum. The Na/Cl ratio is close to unity for a wide range of salinities. The Na/K ratio is in the range 8–15 for recharge waters but increases in the playa brines. The HCO_3/Cl ratio decreases markedly in the playa brines while the SO_4/HCO_3 ratio increases; this again reflects the importance of mineral precipitation in the evolution to brine.

Figure 16 shows hydrochemical processes in the regional flow system. Solution is the dominant process in recharge zones, ion exchange occurs in the mixing zones at playa margins, and evaporative concentration and crystallisation are the dominant processes in the playas.

Figure 17 summarises the change in chemical parameters with evolution of the regional groundwaters to brines. The concentration of dissolved solids increases by a factor of more than 100, and concentrations of sodium, potassium, magnesium, sulphate, and chloride increase markedly. However, bicarbonate and silica are entirely depleted in the brine, and calcium is depleted relative to other cations, as a result of precipitation.

Stages in the evolution of the regional groundwaters are shown in Figure 18. The final brines are of the Cl–Na type and also contain appreciable amounts of sulphate and magnesium. In this respect they are similar to those of many other Australian playas.

TABLE 4. AVERAGE CHEMICAL COMPOSITION AND TYPES OF GROUNDWATERS FROM THE LAKE AMADEUS–AYERS ROCK REGION (a)

Location	No. of analyses	TDS mg/L	Na mg/L	Na meq/L	K mg/L	K meq/L	Ca mg/L	Ca meq/L	Mg mg/L	Mg meq/L	HCO_3 mg/L	HCO_3 meq/L	SO_4 mg/L	SO_4 meq/L	Cl mg/L	Cl meq/L	SiO_2 mg/L	Hydrochemical type(b)
1. Morris Pass	8	979	184	8.00	28	0.72	69	3.44	41	3.37	106	1.74	275	5.72	375	7.76	11	Cl-SO_4-Na-Ca-Mg
2. Morris Pass	10	1 741	224	9.74	32	0.82	151	7.53	120	9.88	288	4.72	.621	12.92	387	10.91	13	SO_4-Cl-Na-Mg-Ca
3. Kings Canyon	16	1 252	197	8.57	34	0.87	96	4.79	65	5.35	219	3.59	285	5.93	377	10.63	24	Cl-SO_4-Na-Mg-Ca
4. Parana Hill	6	1 466	285	12.40	47	1.20	123	6.14	78	6.42	205	3.36	440	9.15	351	9.90	—	Cl-SO_4-Na-Mg-Ca
5. Kings Canyon	5	964	148	6.44	30	0.77	81	4.04	53	4.36	280	4.59	191	3.97	246	6.94	19	Cl-HCO_3-SO_4-Na-Ca-Mg
6. Kings Canyon	2	915	160	6.96	29	0.74	76	3.79	52	4.28	189	3.10	198	4.12	385	10.86	15	Cl-SO_4-Na-Mg-Ca
7. Kings Canyon	4	1 835	307	13.35	52	1.33	107	5.34	111	9.14	249	4.08	435	9.05	601	16.95	30	Cl-SO_4-Na-Mg
8. Hope Valley	6	827	114	4.96	21	0.54	73	3.64	43	3.54	169	2.77	172	3.58	226	6.37	22	Cl-SO_4-HCO_3-Na-Ca-Mg
9. Kings Canyon	6	785	135	5.87	35	0.90	44	2.20	43	3.54	238	3.90	160	3.33	203	5.72	40	Cl-HCO_3-SO_4-Na-Mg
10. Mount Olga	7	864	151	6.57	15	0.38	52	2.59	53	4.36	319	5.23	94	1.96	164	4.62	53	HCO_3-Cl-Na-Mg
11. Ayers Rock	18	1 160	204	8.87	28	0.72	91	4.54	47	3.87	204	3.35	253	5.26	298	8.40	15	Cl-SO_4-HCO_3-Na-Ca-Mg
12. NE Ayers Rock	7	1 393	248	10.79	38	0.97	111	5.54	47	3.87	215	3.53	319	6.64	360	10.15	76	Cl-SO_4-Na-Ca
13. E Ayers Rock	12	2 527	499	21.71	56	1.43	195	9.73	78	6.42	214	3.51	676	14.06	754	21.26	63	Cl-SO_4-Na-Ca
14. Mount Olga–Ayers Rock	5	3 344	628	27.32	63	1.61	263	13.12	111	9.14	242	3.97	1 023	21.28	861	24.28	54	Cl-SO_4-Na-Ca
15. Yulara	94	1 966	379	16.49	51	1.30	137	6.84	74	6.09	239	3.92	499	10.38	555	15.65	49	Cl-SO_4-Na-Ca-Mg
Lake Amadeus																		
16. spring	5	90 900	31 350	1 363.7	695	17.8	420	70.9	772	63.5	119	1.95	6 730	140.0	47 900	1 350.8	14	Cl-Na
17. playa/dune transition	11	128 450	40 235	1 750.2	1 385	35.4	867	43.3	3 972	326.9	58	0.95	17 352	360.9	62 650	1 766.7	22.5	Cl-Na
18. spring	4	140 750	48 250	2 098.9	1 145	29.3	1 255	62.6	1 625	133.7	129	2.12	9 550	198.6	75 250	2 122.1	7	Cl-Na
19. gypsum field	9	172 367	57 170	2 486.9	2 287	58.5	691	34.5	3 683	303.1	19	0.31	18 520	385.2	87 767	2 475.0	8.7	Cl-Na
20. gypsum field—margin	6	196 200	67 360	2 930.2	2 585	66.1	648	32.3	3 045	250.6	10	0.16	15 605	324.6	104 100	2 935.6	4.5	Cl-Na
21. playa	26	228 254	77 318	3 363.3	2 593	66.3	479	23.9	4 510	371.2	16	0.26	19 832	412.5	119 800	3 378.4	3.7	Cl-Na
22. terrace	6	287 250	89 650	3 899.8	3 035	77.6	360	18.0	7 345	604.5	40	0.66	26 850	558.5	153 500	4 328.7	6	Cl-Na

(a) For locations see Figure 14.
(b) Alekin, 1970.

TABLE 5. IONIC RATIOS FOR REGIONAL GROUNDWATERS, LAKE AMADEUS–AYERS ROCK REGION(*a*)

Location	$\frac{Mg}{Ca}$	$\frac{Na}{Cl}$	$\frac{Na}{K}$	$\frac{Ca+Mg}{Na+K}$	$\frac{HCO_3 .100}{Cl}$	$\frac{SO_4}{Cl}$	$\frac{SO_4}{HCO_3}$	$\frac{Ca}{SO_4+HCO_3}$	$\frac{Na+K}{Cl}$	$\frac{HCO_3+SO_4}{Ca+Mg}$
1. Morris Pass	0.98	1.03	11.11	0.78	22.42	73.71	3.29	0.46	1.12	1.10
2. Morris Pass	1.31	0.89	11.88	1.65	43.26	118.42	2.74	0.43	0.97	1.01
3. Kings Canyon	1.12	0.81	9.85	1.07	33.80	55.79	1.65	0.50	0.89	0.94
4. Parana Hill	1.05	1.25	10.33	0.92	33.94	92.42	2.72	0.49	1.37	1.00
5. Kings Canyon	1.08	0.93	8.36	1.17	66.14	57.20	0.86	0.47	1.04	1.02
6. Kings Canyon	1.13	0.64	9.41	1.05	28.54	37.94	1.33	0.52	0.71	0.89
7. Kings Canyon	1.71	0.79	10.04	0.99	24.07	53.39	2.22	0.41	0.87	0.91
8. Hope Valley	0.97	0.78	9.19	1.31	43.49	56.20	1.29	0.57	0.86	0.88
9. Kings Canyon	1.61	1.03	6.52	0.85	68.18	58.22	0.85	0.30	1.18	1.26
10. Mount Olga	1.68	1.42	17.29	1.00	113.20	42.42	0.37	0.36	1.50	1.03
11. Ayers Rock	0.85	1.06	12.32	0.88	39.88	62.62	1.57	0.53	1.14	1.02
12. NE Ayers Rock	0.70	1.06	11.12	0.44	34.78	65.42	1.88	0.54	2.10	1.08
13. E Ayers Rock	0.66	1.02	15.18	0.70	16.51	66.13	4.01	0.55	1.09	1.09
14. Mount Olga–Ayers Rock	0.70	1.13	16.97	0.77	16.35	87.64	5.36	0.52	1.19	1.13
15. Yulara	0.89	1.05	12.68	0.73	25.05	66.33	2.65	0.48	1.14	1.11
Lake Amadeus										
16. spring	0.89	1.01	76.61	0.097	0.144	10.36	71.79	0.50	1.02	1.06
17. playa/dune transition	7.55	0.99	49.44	0.21	0.054	20.43	379.89	0.12	1.01	0.98
18. spring	2.14	0.99	71.63	0.092	0.100	9.36	93.68	0.31	1.00	1.02
19. gypsum field	8.78	1.00	42.51	0.13	0.013	15.56	1 242.58	0.09	1.03	1.14
20. gypsum field–margin	7.76	1.00	44.33	0.094	0.005	11.06	2 028.75	0.10	1.02	1.15
21. playa	15.53	1.00	50.75	0.12	0.008	12.21	1 586.54	0.06	1.02	1.04
22. terrace	33.58	0.90	50.26	0.16	0.015	12.90	846.21	0.03	0.92	0.90

(*a*) For locations see Figure 14. Ionic ratios represent the average for groups of waters from these locations.

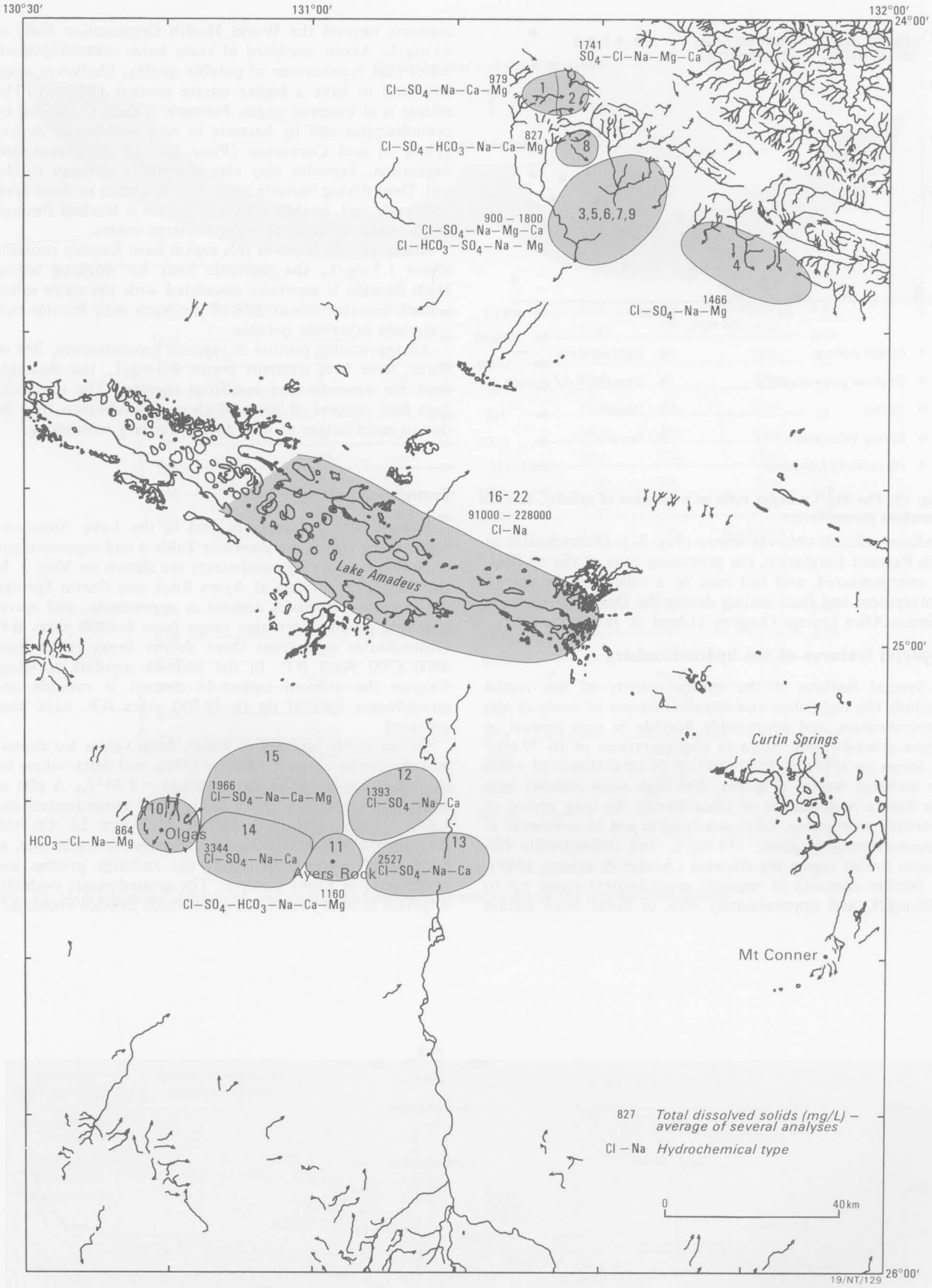


Fig. 14. Hydrochemical types of groundwater in the Lake Amadeus–Ayers Rock region. Types are based on major ionic components according to the Szczukariew–Priklonski classification (Alekin, 1970). The numbers refer to localities listed in Tables 4 and 5.

Modelling of the physical chemistry of the groundwaters (Jankowski & Jacobson, in press) shows that the playa brines are saturated with respect to calcite, dolomite, and gypsum, and are almost saturated with respect to halite (Fig. 19).

Figure 20 shows the theoretical salt composition of the regional groundwaters. The final playa brines consist mainly of NaCl and $MgSO_4$.

Deep formation waters in the Mereenie oil field contain from 60 000 to 240 000 mg/L total dissolved solids, and are

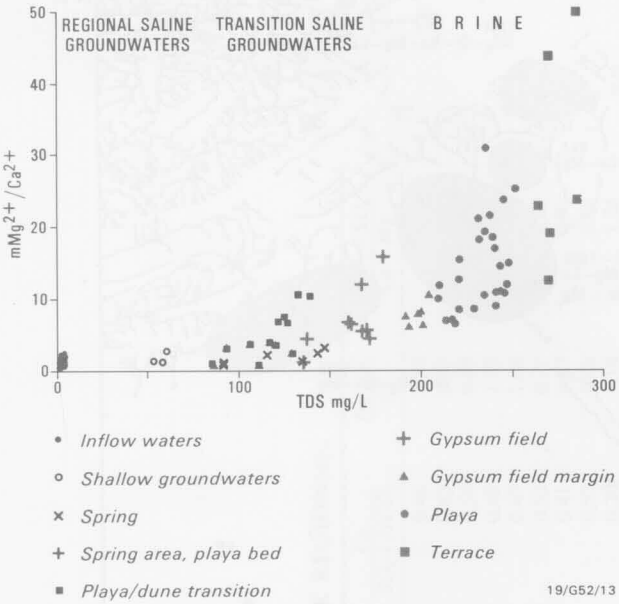


Fig. 15. The Mg/Ca molar ratio as a function of salinity, in Lake Amadeus groundwaters.

sodium–calcium chloride brines (Fig. 21). Groundwater in the Pacoota Formation, the producing zone of the oil field, is overpressured, and this may be a relict feature due to entrapment and fault sealing during the Devonian–Carboniferous Alice Springs Orogeny (Lloyd & Jacobson, 1987).

Special features of the hydrochemistry

Special features of the hydrochemistry of this region include the high silica and nitrate contents of many of the groundwaters, and appreciable fluoride or iron content in some groundwaters. Silica in concentrations of 10–75 mg/L forms an appreciable proportion of total dissolved solids in recharge waters (Fig. 22). The high silica content may be due to mobilisation of silica during the long period of Tertiary weathering. Silica precipitates out in sediments at concentrations of about 115 mg/L, and consequently calcretes in this region are siliceous (Arakel & others, 1989).

Nitrate contents of regional groundwaters range up to 300 mg/L and approximately 45% of bores have nitrate contents beyond the World Health Organisation limit of 45 mg/L. About one-third of these bores contain groundwater that is otherwise of potable quality. Shallower aquifers tend to have a higher nitrate content (Plate 7). The nitrate is of biogenic origin. Nitrogen is fixed in the soil by cyanobacteria and by bacteria in root nodules of *Acacia* (Plate 5) and *Casuarina* (Plate 6) and other arid-zone vegetation. Termites may also contribute nitrogen to the soil. Denitrifying bacteria appear to be absent in these arid-zone soils and, in their absence, nitrate is leached through to the water-table by episodic recharge events.

About 40% of bores in this region have fluoride contents above 1.5 mg/L, the desirable limit for drinking water. High fluoride is generally associated with the more saline waters; however, about 30% of the bores with fluoride-rich water are otherwise potable.

An appreciable portion of regional groundwaters, 70% of bores, have iron contents above 0.3 mg/L, the desirable limit for domestic and industrial supplies. The unusually high iron content of some of these groundwaters may be due to mobilisation of iron during Tertiary weathering.

Isotope chemistry

Isotope data for groundwaters in the Lake Amadeus–Ayers Rock region are shown in Table 6 and representative radiometric ages of groundwaters are shown on Map 3. In the Cainozoic aquifers at Ayers Rock and Curtin Springs, the modern carbon-14 content is appreciable, and corresponding groundwater ages range from 0–1300 years B.P. Groundwater ages from three deeper bores range from 4400–8700 years B.P. In the bedrock aquifers at Kings Canyon the modern carbon-14 content is variable and groundwater ages of up to 32 500 years B.P. have been obtained.

Of the stable isotopes of water, delta values for deuterium are in the range −44 to −55 ‰ and delta values for oxygen-18 are in the range −5.50 to −8.50 ‰. A plot of deuterium versus oxygen-18 for regional groundwaters and Lake Amadeus brines is shown in Figure 23. On this diagram the values plot below the meteoric water line, as a result of evaporation during the recharge process and enrichment in heavy isotopes. The groundwaters evidently originate in heavy rainfall events which provide recharge.

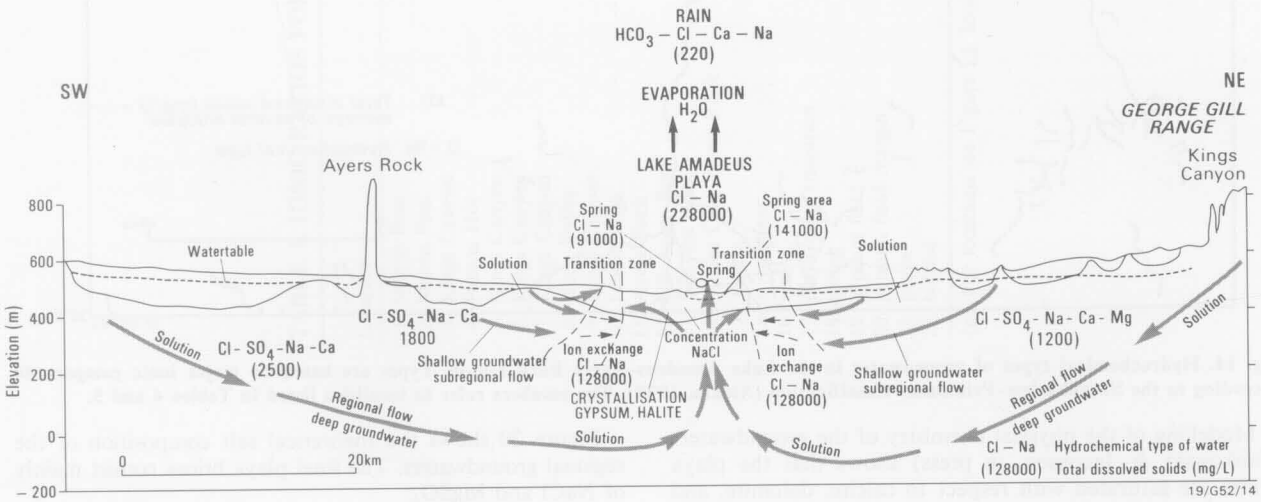


Fig. 16. Schematic cross-section showing hydrochemical processes in the regional groundwater flow system.

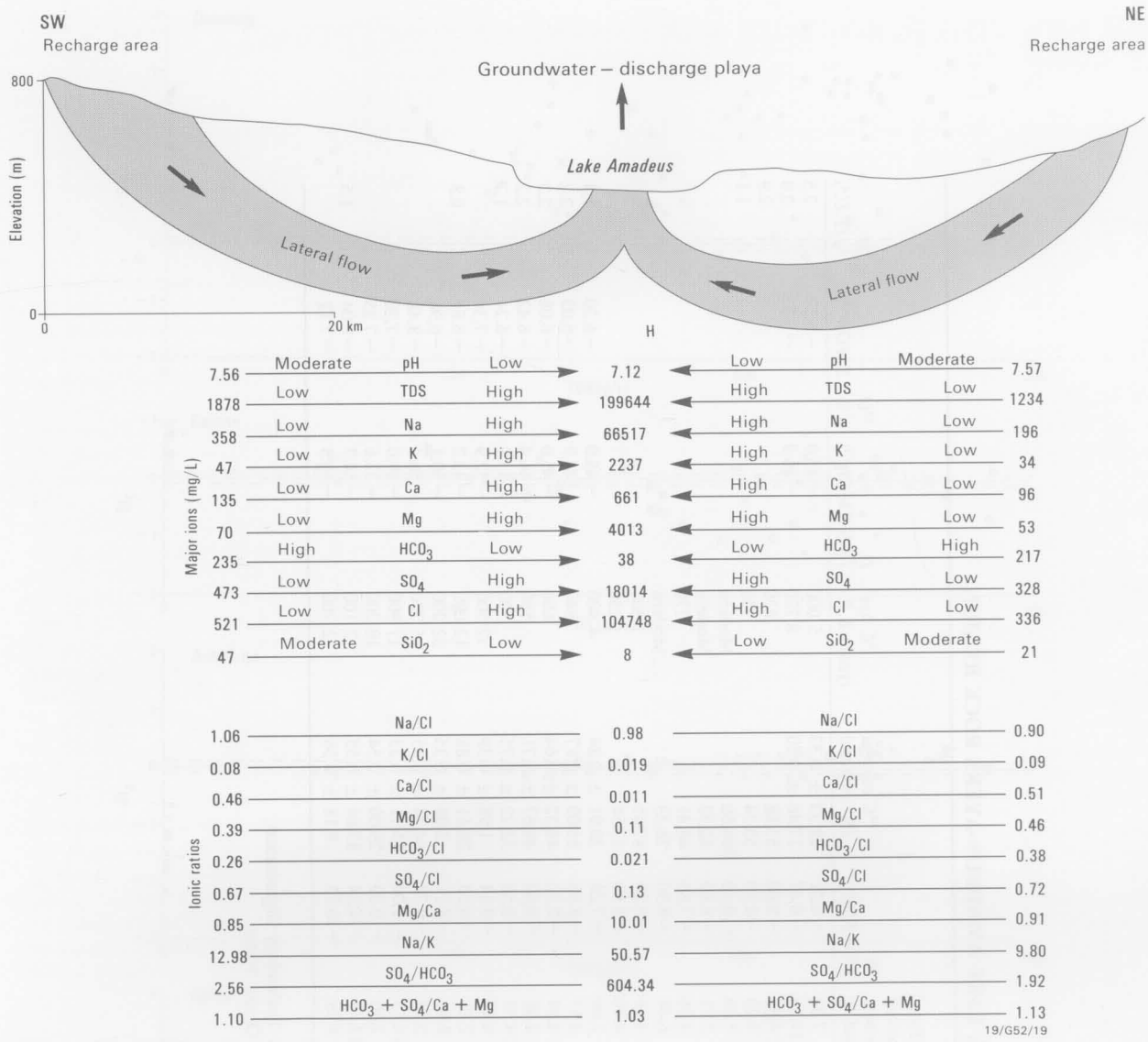


Fig. 17. Hydrochemical parameters, and chemical evolution of groundwaters in the regional flow system.

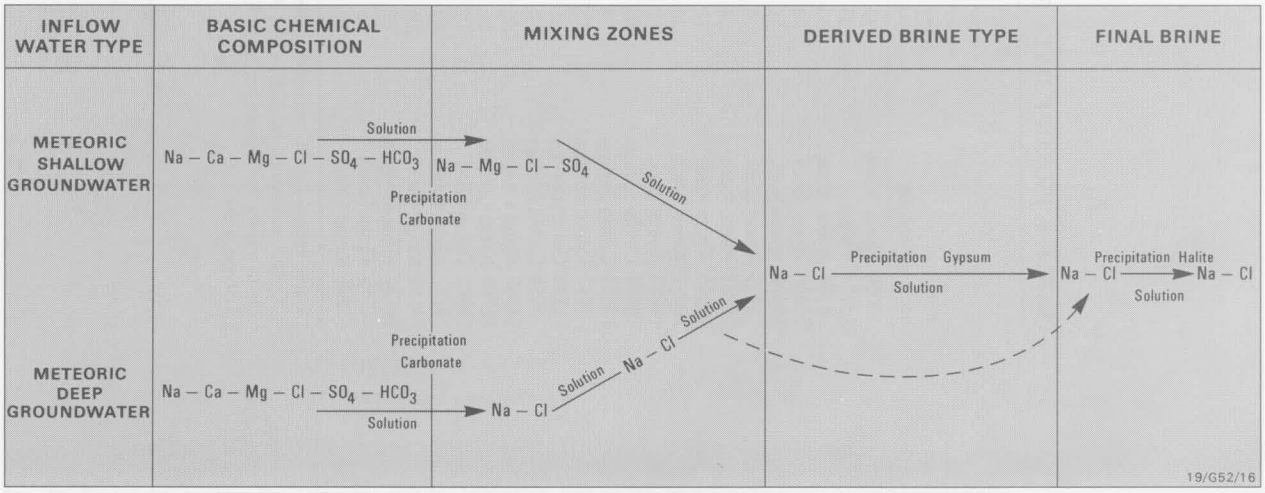


Fig. 18. Evolution of regional groundwaters and genesis of brine, Lake Amadeus.

TABLE 6. ISOTOPE DATA FOR GROUNDWATERS, LAKE AMADEUS–AYERS ROCK REGION

Bore no.	Location	Depth below water table (m)	Aquifer	Total dissolved carbonate (mmol/L)	^{13}C (‰ PDB[1])	^{14}C content (% modern)	^{14}C age[2] (years B.P.)	D (‰ SMOW[3])	^{18}O (‰ SMOW[3])	^{3}H (T.U.[4])
12058	Ayers Rock	32	Sand	7.32	−8.21	28.33 ± 0.33	5 000	−45.0	−5.57	2.5
13363	Yulara	23	"	17.26	−8.47	17.48 ± 0.50	8 720	−46.9	−5.73	2.0
6319	Ayers Rock	33	"	4.95	−8.60	53.88	830			2.9
10689	Ayers Rock	34	"	5.23	−8.10	53.34	770			1.1
10692	Ayers Rock	26	"	5.46	−10.10	104.60	Modern			
2271	Ayers Rock	8	"	5.91	−8.80	62.32	Modern			
10383	Ayers Rock	24	"	4.26	−7.80	48.41	770			
10386	Ayers Rock	19	"	6.48	−8.90	76.33	Modern			
10491	Ayers Rock	29	"	4.08	−8.20	47.45	1 300			
10667	Ayers Rock	31	"	4.80	−8.60	53.54	1 250			
10808	Curtin Springs	50	Calcrete	2.00	−7.20	30.91 ± 0.84	4 400	−45.0	−6.20	1.4
13627	Curtin Springs	7	"	4.67	−8.60	55.09 ± 0.87	840	−44.9	−6.03	2.2
1815	Curtin Springs	17	"	4.89	−7.70	48.32 ± 0.64	660	−45.0	−6.08	2.3
11790	Curtin Springs	5	"	4.86	−8.60	48.67 ± 0.71	580	−46.4	−6.42	2.2
5654	Curtin Springs	4	"	4.53	−8.50	52.22 ± 0.75	300	−45.9	−6.24	1.3
14369	Kings Canyon	168	Pacoota	4.49	−9.54	1.98 ± 0.39	32 500	−52.9	−7.34	
13980	Kings Canyon	16	Carmichael	2.29	−14.55	28.61 ± 0.88	12 000	−43.2	−6.67	0.8
13983	Ochre Hills	7	Stairway	8.65	−8.11	3.08 ± 0.35	32 200	−50.1	−6.98	
14152	Kings Canyon	47	Pacoota	5.99	−9.78	64.24 ± 0.65	5 700	−56.4	−8.48	
14154	Kings Creek	10	Goyder	10.13	−11.04	15.11 ± 0.23	17 900	−49.0	−7.20	
14824	Kings Canyon	29	Pacoota	2.40	− 9.89	29.00 ± 0.54	10 300	−53.6	−7.35	
14256	Kings Creek	16	Pacoota	13.76	−14.24	83.66 ± 0.55	2 100	−54.7	−8.04	1.5
13299	Kings Creek	24	Pacoota	4.29	−10.53	8.18 ± 0.56	22 700	−49.8	−7.12	

[1] Delta values for ^{13}C referred to Peedee Belemnite standard.
[2] ^{14}C determinations by G.E. Calf, Australian Nuclear Science & Technology Organisation.
[3] Delta values for deuterium and ^{18}O referred to Standard Mean Ocean Water.
[4] Tritium units.

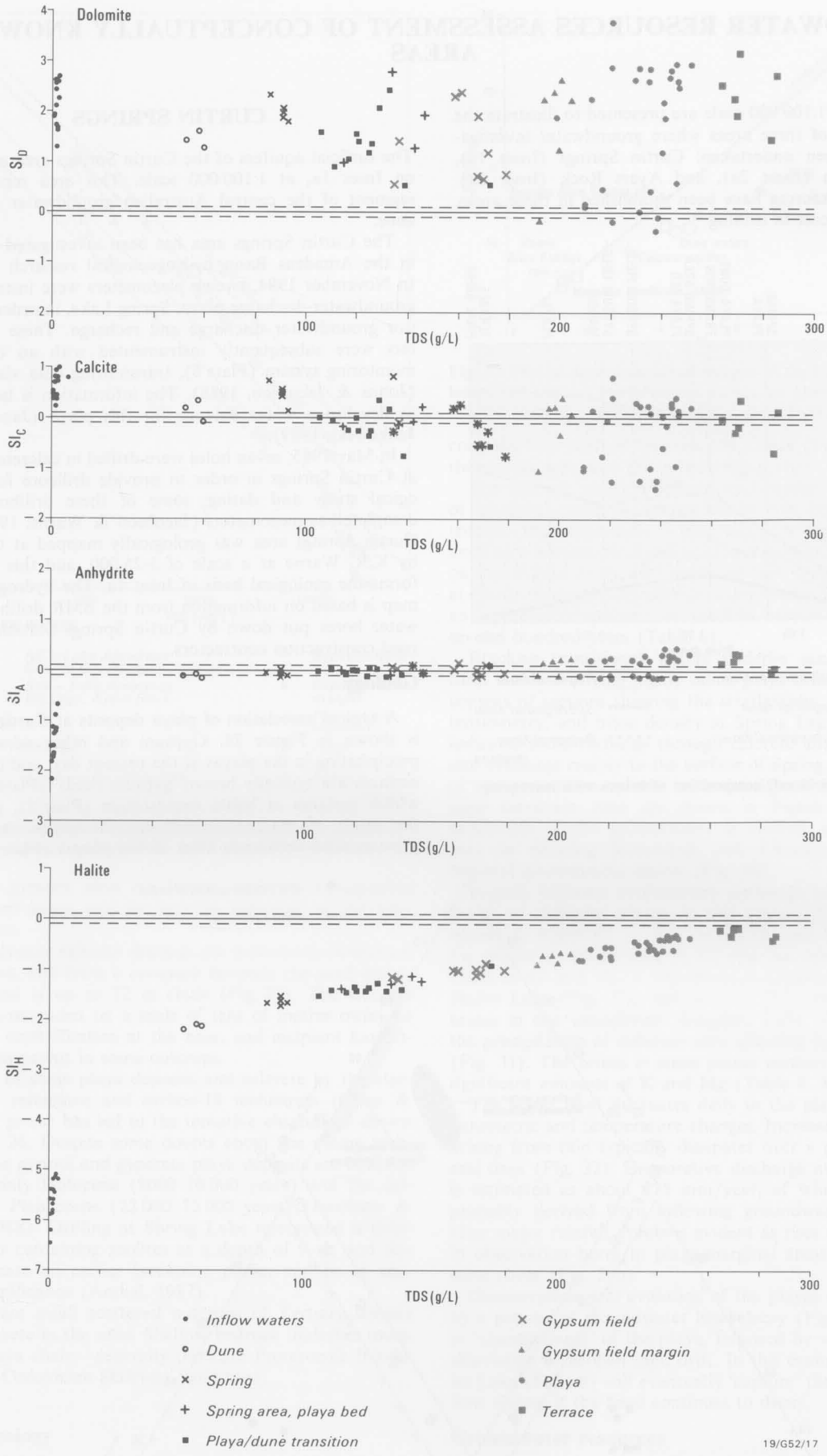


Fig. 19. Saturation indices for dolomite, calcite, anhydrite, and halite, as a function of groundwater salinity.

GROUNDWATER RESOURCES ASSESSMENT OF CONCEPTUALLY KNOWN AREAS

Inset maps at 1:100 000 scale are presented to illustrate the hydrogeology of three areas where groundwater investigations have been undertaken: Curtin Springs (Inset 1a), Kings Canyon (Inset 2a), and Ayers Rock (Inset 3a). Freshwater resources have been established in these areas, but at a high cost in drilling.

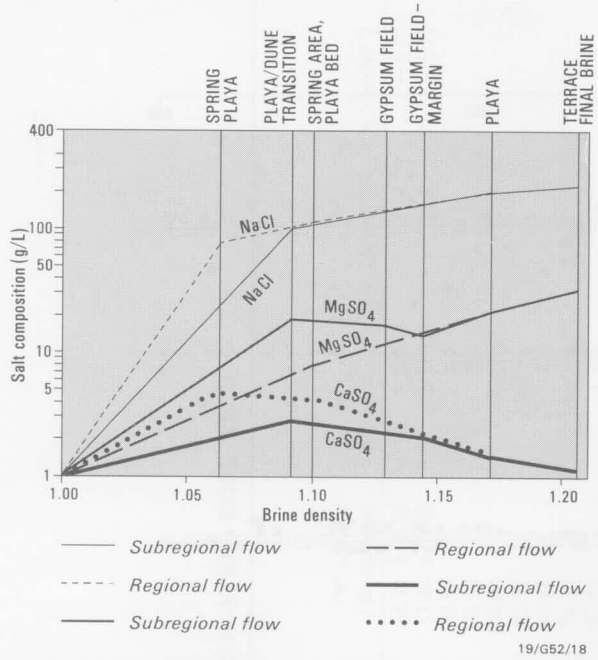


Fig. 20. Changes in salt composition of brines with increasing density.

CURTIN SPRINGS

The surficial aquifers of the Curtin Springs area are shown on Inset 1a, at 1:100 000 scale. This area represents a segment of the central Australian groundwater discharge zone.

The Curtin Springs area has been investigated by BMR in the Amadeus Basin hydrogeological research program. In November 1984, twelve piezometers were installed at a groundwater-discharge playa, Spring Lake, in order to monitor groundwater discharge and recharge. These piezometers were subsequently instrumented with an electronic monitoring system (Plate 6), transmitting data via satellite (Johns & Jacobson, 1988). The information is being used to develop a water balance for this playa (Jacobson & Jankowski, 1989).

In May 1985, seven holes were drilled in calcrete aquifers at Curtin Springs in order to provide drillcore for petrological study and dating; some of these drillholes were completed as piezometers (Jacobson & Warne, 1986). The Curtin Springs area was geologically mapped at that time by K.R. Warne at a scale of 1:25 000, and this mapping forms the geological basis of Inset 1a. The hydrogeological map is based on information from the BMR drillholes, and water bores put down by Curtin Springs Station and by road construction contractors.

Geology

A typical association of playa deposits at Curtin Springs is shown in Figure 24. Gypsum and other minerals are precipitating in the playas at the present day, and the playa surfaces are typically brown 'gypsum fields' (Plate 5) with whiter surfaces of halite encrustation (Plate 8), generally the result of seasonal inundation. A narrow terrace of gypsum sand surrounds most of the playas (Plate 5), and

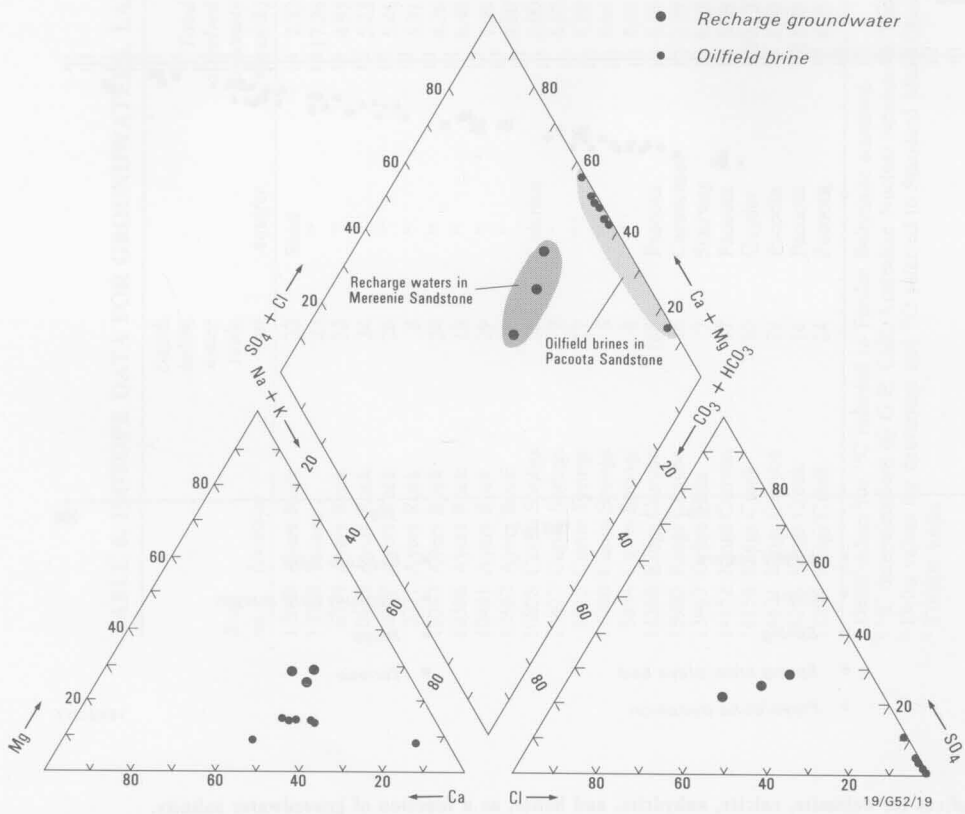


Fig. 21. Ionic composition of groundwaters, Mereenie oilfield (trilinear plot in percent milliequivalents).

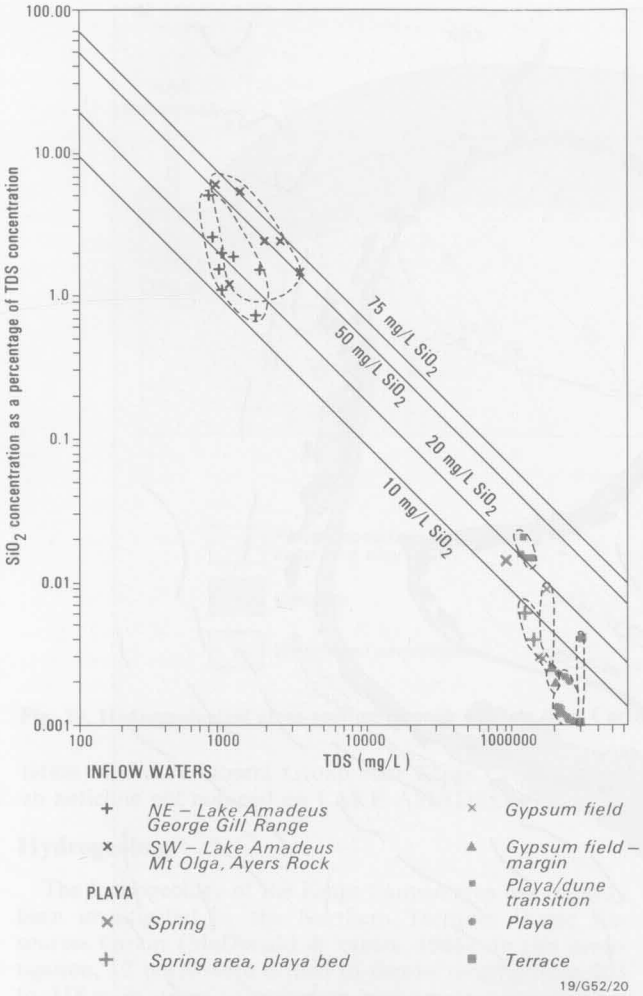


Fig. 22. Relationship of silica to total-dissolved-solids concentrations in regional groundwaters and Lake Amadeus brines.

in places gypsum sand has blown onto the surrounding quartz sand dunes, and has become indurated as thin gypcrete crusts.

Groundwater calcrete deposits are extensively developed in this area, and form a carapace between the sand dunes; the calcrete is up to 12 m thick (Fig. 25). The calcrete surface is mounded on a scale of tens of metres owing to continual crystallisation at the base, and incipient karstification is apparent in some outcrops.

Dating of some playa deposits and calcrete by the electron spin resonance and carbon-14 techniques (Chen & others, in press) has led to the tentative chronology shown in Figure 26. Despite some doubts about the dating techniques, the gypsite and gypcrete playa deposits are believed to be mainly Holocene (8000–16 000 years) and the calcrete late Pleistocene (22 000–75 000 years) (Jacobson & others, 1988). Drilling at Spring Lake intersected a dolomite layer containing zeolites at a depth of 9 m, and this may indicate an earlier lacustrine phase, and be of economic significance (Arakel, 1987).

There are small scattered outcrops of Tertiary silcrete and ferricrete in the area. Shallow bedrock underlies much of the playa chain—generally the Late Proterozoic Inindia beds and Ordovician Stairway Sandstone.

Hydrogeology

In a broad sense, groundwater flows from the flanks of the valley towards the playa chain. Playa bed levels decline eastwards and there is a component of groundwater flow in that direction. Within the playa chain there is a more

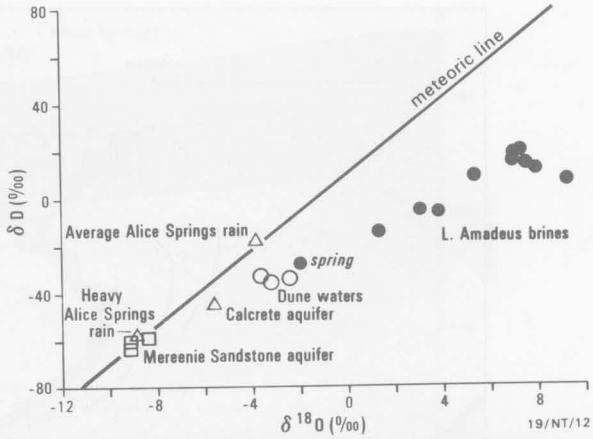


Fig. 23. Plot of deuterium versus oxygen-18 for Lake Amadeus brines and regional groundwaters. Values for Alice Springs rainfall and Mereenie Sandstone aquifer derived from Calf (1978).

complex flow pattern between the playas (Fig. 27), which themselves represent groundwater 'outcrops'.

The calcrete aquifers contain fresh water, and evidence of 'modern' recharge is afforded by low but measurable tritium. The water table is generally at a depth of 4–6 m, and there is evidence of chemical zoning, with fresher water on top. Figure 25 shows a modelled flow system in calcrete at Curtin Springs. Radiometric dating of these waters shows an appreciable amount of modern carbon and ages of several hundred years (Table 6).

Brackish transitional waters underlie sand dunes and form lenses overlying highly saline playa brines. Figure 28 consists of sections showing the stratigraphy, modelled potentiometry, and brine density at Spring Lake. The model indicates some recharge through calcrete and sand dunes, and discharge mainly to the surface of Spring Lake. Details of the potentiometry and brine density of the playa-marginal transition zone are shown in Figure 29. Upward movement of the groundwater is evident, although salts may be diffusing downwards and refluxing beneath the regional groundwater system (Fig. 30).

Slightly different evolutionary pathways are evident for brines in different playas in this region. Thus, recharge waters in which $Cl > SO_4 > HCO_3$ and $Na > Mg > Ca$ evolve to predominantly Cl and Na brines in Spring Lake; to Cl and $Na > Mg$ brines in Glauberite Lake and Halite Lake (Fig. 27); and to $Cl > SO_4$ and $Na > Mg$ brines in the 'abandoned' Samphire Lake. This is due to the precipitation of different salts affecting brine chemistry (Fig. 31). The brines in some playas contain economically significant amounts of K and Mg (Table 4; Appendix 5).

The water level fluctuates daily in the playas, owing to barometric and temperature changes. Increased water level arising from rain typically dissipates over a period of several days (Fig. 32). Evaporative discharge at Spring Lake is estimated as about 275 mm/year, of which 50 mm is probably derived from inflowing groundwater. Recharge after major rainfall events is evident as rises in water level in observation bores in playa-marginal areas of thin sand dune cover (Fig. 29b).

Geomorphological evolution of the playas appears to be by a process of groundwater head decay (Fig. 33), leading to 'abandonment' of the playa, followed by vegetation and alluviation or aeolian sand drift. In this example, Glauberite Lake (Plate 8) will eventually 'capture' the groundwater flow system if the head continues to decay.

Groundwater resources

Appreciable fresh-water resources are held in the calcrete, although nitrate levels are high for domestic use. Bores developed to date have been low-yielding and this is appropriate in view of the likelihood of saline water occur-

Fig. 24. Gypsum–gypcrete–calcrete association at a small playa near Curtin Springs. Based on mapping by K.R. Warne, Alice Springs.

ring at depth beneath the fresh water. Larger-scale development would require a widespread wellfield. Brackish and saline groundwaters are available for various purposes, including the proposed use of solar ponds for power generation. Playa brines could potentially be farmed for K and Mg minerals. In the north of Curtin Springs Station, recent investigations by the Water Resources Group have proved fresh water in outcropping Mereenie Sandstone and Carmichael Sandstone.

KINGS CANYON

The bedrock aquifers of the Kings Canyon area are shown on Inset 2a, at 1:100 000 scale.

Geology

Outcrop in the proposed Kings Canyon National Park has been geologically mapped at 1:25 000 scale by Leon Bagas of the Northern Territory Geological Survey (Bagas, 1988). Inset 2a is a sub-area selected to show the fissured intake beds of the Mereenie Sandstone and the areas of Pacoota Sandstone drilled for water supply investigations by the Water Resources Division. It is based on Bagas's mapping, with some additional photointerpretation in the northeastern and southwestern corners.

To conform with the aquifer yield colouring scheme of Map 2, subsurface boundaries have been interpreted from the structural patterns shown by the outcrop mapping, guided by available bore data (Bagas, 1986). Photointerpre-

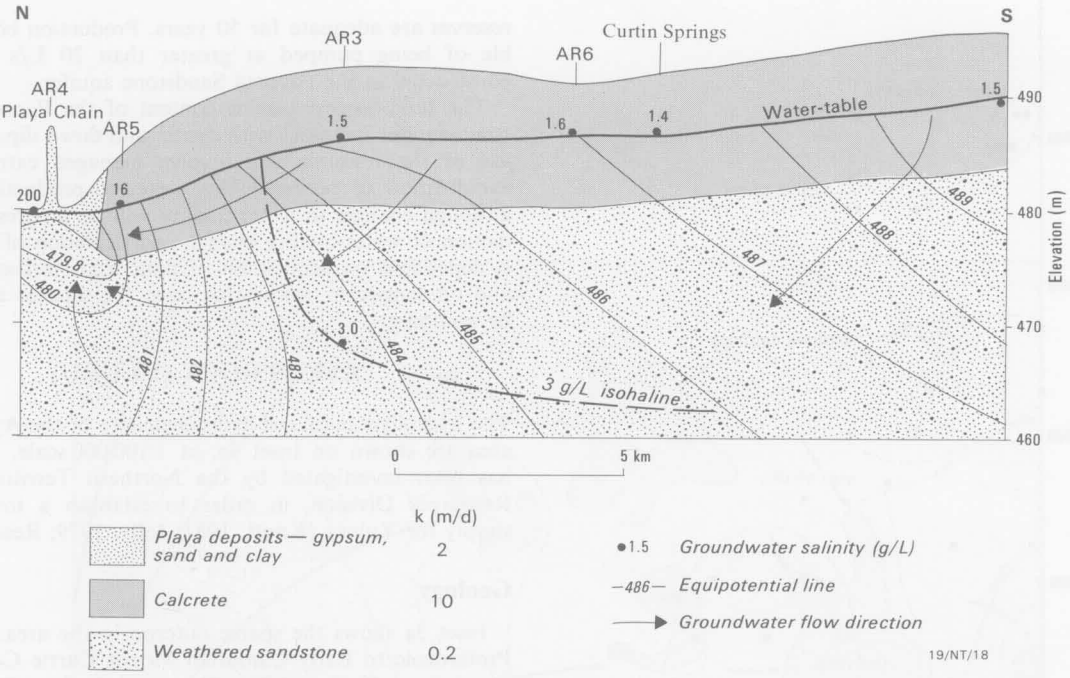


Fig. 25. Hydrogeological cross-section through calcrete near Curtin Springs.

tation of the Pertaoorta Group near Kings Creek showed an anticline not mapped on LAKE AMADEUS.

Hydrogeology

The hydrogeology of the Kings Canyon area has recently been investigated by the Northern Territory Water Resources Group (McDonald & others, 1986). In this investigation, 12 bores were drilled to depths ranging from 203 to 318 m in order to prove up groundwater supplies for tourist resort development. Information is also available from a number of stock and domestic water supply bores.

Figure 34 illustrates aspects of the hydrogeology of the Kings Canyon area. Long tabular aquifers are developed along strike in the weathered zone of the Carmichael Sandstone, Stairway Sandstone, Pacoota Sandstone, and Goyder Sandstone. The sequence contains several siltstone aquicludes. The Cleland Sandstone, which occurs to the south, is also a potential aquifer. The Mereenie Sandstone, which elsewhere in the Amadeus Basin is a highly productive aquifer, at Kings Canyon forms the elevated plateau of the George Gill Range and is inaccessible.

Open joints in the Mereenie Sandstone are visibly the source of recharge, and overflow of these recharge waters is manifest in springs at the foot of the George Gill Range, such as Kathleen Springs, and in a line of vegetation at the Mereenie Sandstone–Carmichael Sandstone contact.

The Pacoota Sandstone is the most productive aquifer in the Kings Canyon area. Airlifted yields of up to 40 L/s were obtained during the investigation, with low-salinity waters (500–1000 mg/L total dissolved solids) occurring in the outcrop areas. The transmissivity of the Pacoota Sandstone is estimated as approximately 2000 m^2/day over a formation thickness of 280 m (transmissivity (m^2/day) is the capacity of an aquifer to transmit water throughout its entire thickness, and is equal to the hydraulic conductivity (m/day) multiplied by the aquifer thickness (m)). The Goyder Formation is also transmissive and high-yielding, and appears to be hydraulically continuous with the Pacoota Sandstone.

Hydrochemical zonation is apparent in many bores, with salinity increasing down dip in particular formations. Figure 35 shows a hydrochemical cross-section at Kings Canyon with salinity increasing down-dip in the Pacoota Sandstone over 300 m. Fresh water in the Pacoota Sandstone (RN 14 369) is apparently adjacent to brackish water in the Goyder Formation (RN 14 370) which is less permeable and therefore less amenable to recharge. In this section, a sample from a depth of 250–300 m in bore RN 14 369 yielded 2% of modern carbon-14, indicating a groundwater age of about 32 000 years.

Reversed salinity gradients are also common in bores in this region. Figure 36 shows a salinity profile down a bore (RN 14 415) which intersects Stairway Sandstone, Horn Valley Siltstone, and Pacoota Sandstone. Salinity is highest in the Stairway Sandstone near the water table, probably reflecting evaporative concentration in near-surface conditions and poor recharge characteristics in that unit. The underlying Pacoota Sandstone contains fresh water. Trends in ionic composition of groundwaters in bores that have salinity gradients are illustrated in Figure 37.

The potentiometric surface on the Pacoota–Goyder aquifers is remarkably flat. Measured potentiometric levels along a strike length of 25 km average 533.4 m AHD (Australian Height Datum) and vary by no more than 0.4 m, which is within the range of measurement accuracy and diurnal fluctuation. There is no apparent hydraulic gradient.

A stepped series of potentiometric levels is apparent in the stratigraphically overlying aquifers. In the Stairway Sandstone, the potentiometric level is approximately 592 m, and in the Carmichael Sandstone approximately 618 m.

On a basin-wide scale the groundwater flow in the folded Amadeus Basin sedimentary rocks is northwest to southeast along synclinal axes. The absence of a flow gradient over a large area at Kings Canyon implies fossil head decay and the virtual absence of modern recharge in an area of high permeability. The presence of better-quality water close to rock outcrops suggests that recharge water is rapidly dissipated owing to the high permeability. To the southwest it is likely that the Goyder Formation is in hydraulic continuity with the underlying Cleland Sandstone and potentiometric levels decline generally southwards towards the discharge zone at Lake Amadeus.

Groundwater resources

The most important water-bearing unit in the Kings Canyon area is the Pacoota Sandstone, which forms a strip

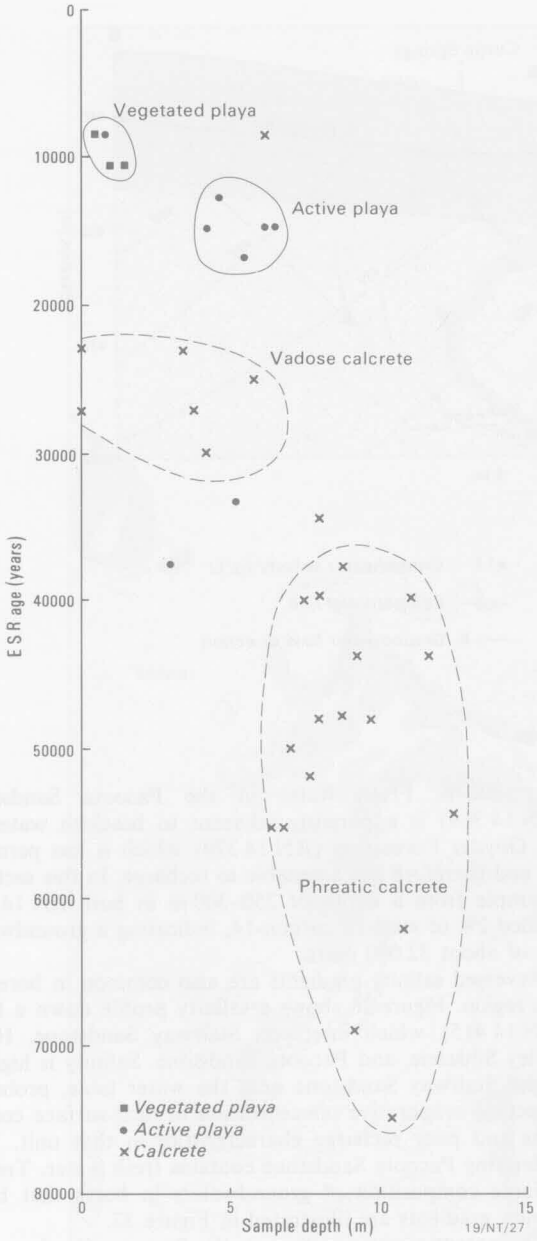


Fig. 26. Electron-spin-resonance dates obtained from playa-gypsum and calcrete. Dating by Chen Yijian, Institute of Geology, Beijing.

aquifer extending for at least 20 km. Continuity of potentiometric surface elevation suggests that the aquifer extends to the underlying Goyder Formation.

Minor supplies of groundwater may be obtained from aquifers in other formations. Useful bores have been drilled in the Carmichael Sandstone, and smaller but still usable supplies have been struck in the Stairway Sandstone. The Cleland Sandstone is a potential aquifer, as yet untested.

The Pacoota Sandstone aquifer contains an appreciable volume of stored water of quality meeting current Department of Health guidelines for drinking water. At least 100 million m^3 is estimated to be held in storage (McDonald & others, 1986). Water requirements for the proposed resort at Kings Canyon will be met from this source.

The groundwater resources at Kings Canyon must be considered non-renewable until sufficient monitoring data are available to quantify aquifer recharge and throughflow. However, this is not an obstacle to managed development given the available stored volume. A preliminary estimate of the extractable volume of water having quality less than 1000 mg/L TDS is 50 million m^3 per 10 km strip of aquifer. Thus, for an annual extraction of one million m^3, reserves are adequate for 50 years. Production bores capable of being pumped at greater than 20 L/s could be constructed in the Pacoota Sandstone aquifer.

The total-dissolved-solids content of the Pacoota Sandstone aquifer increases with depth, and down dip. Effective use of the resource will involve managed extraction to avoid inflow of poorer-quality water to production zones, although changes in water quality will be progressive. Prediction of water-quality change and depletion of resources is dependent on acquisition of data from further drilling, and on long-term monitoring once the aquifer is stressed by pumping.

AYERS ROCK (ULURU)

The hydrodynamics and hydrochemistry of the Ayers Rock area are shown on Inset 3a, at 1:100 000 scale. This area has been investigated by the Northern Territory Water Resources Division, in order to establish a town water supply for Yulara (Knott, 1981; Jolly, 1979; Read, 1978).

Geology

Inset 3a shows the sparse outcrop in the area: the Late Proterozoic to Early Cambrian Mount Currie Conglomerate at Ayers Rock and The Olgas, and the Late Proterozoic Winnall and Inindia beds at The Sedimentaries (Fig. 38). The oldest rocks in the area are the Early Proterozoic Olia Gneiss and the Late Proterozoic Dean Quartzite and Bitter Springs Formation.

Map 2 shows the inferred regional geology, based on interpretative work by Knott (1981) and Read (1978). The three main structural features of the area are: a low-angle thrust fault south of The Olgas (the Olga Thrust); two NE–SW faults preserving the arkose facies of the Mount Currie Conglomerate (Dune Plains Fault and Ayers Rock Fault); and a NW–SE trending syncline (Ayers Rock Syncline).

Erosion since the Tertiary has produced the sand areas that are widespread in this area. Aeolian deposits occur either as gently sloping sand plains (Plate 7) with occasional calcrete outcrops, or as a system of irregular, reticulate or parallel dunes with stable flanks and enclosed swales containing alluvium, calcrete, and gypsite. Beneath the sand are Cainozoic sediments up to 100 m thick (shown in error on the cross-section as Quaternary) comprising sand, clay, and some calcrete and lignite.

Hydrogeology

The main aquifers are sand layers in the Cainozoic sequence; some silty sand lenses are also water-bearing. Fractured-bedrock aquifers occur in dolomite, chert, and sandstone.

Most bores in the Cainozoic aquifers have been tested at about 3 L/s; some give much higher yields. Transmissivity ranges from 30 to 400 m^2/day in this sequence, according to pump test results (Knott, 1981). Bores in bedrock aquifers have yielded up to 5 L/s from depths of about 100 m; transmissivity is less than 100 m^2/day.

Groundwater flow is generally to the northeast (Inset 3a), with a local reversal south of Ayers Rock, where flow is to the south.

Groundwater salinity is less than 1500 mg/L close to Ayers Rock and The Olgas, and north of Yulara. Elsewhere it is within the range 1500–5000 mg/L. Most of the waters are bicarbonate–chloride although some are sulphate-dominant.

High nitrate concentrations are ubiquitous in groundwaters in this area and range up to 200 mg/L. The nitrate is associated with the Cainozoic aquifers and is biogenic. Bores that have been pumped and sampled repeatedly show a decrease in nitrate content.

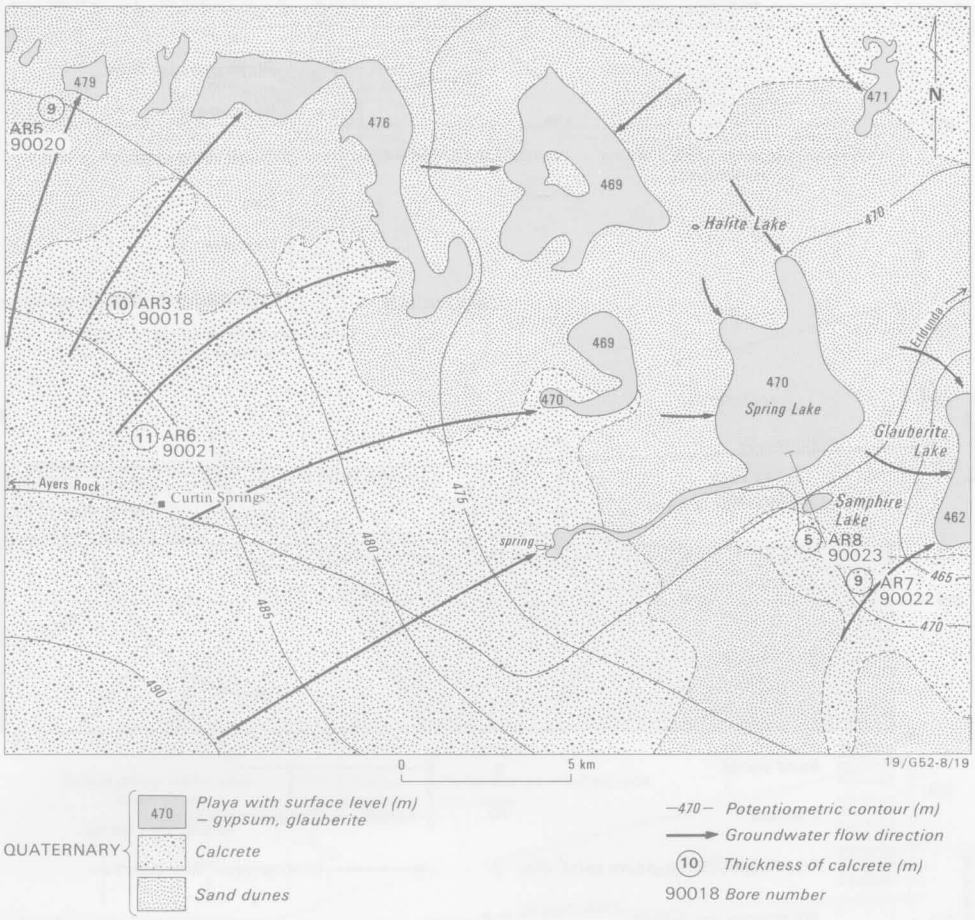


Fig. 27. Groundwater discharge playas near Curtin Springs: Quaternary geology and potentiometry.

High fluoride values, greater than 1.5 mg/L, occur in part of the area, and are associated with the more saline groundwaters. The fluoride may be derived from recharge waters emanating from the Olia Gneiss (Knott, 1981). High iron contents were recorded in some bores on initial testing but did not persist after pumping for some time.

Age determinations on Ayers Rock groundwaters using the carbon-14 technique indicate a range from modern to 1300 years old (Table 6). Most bores show a low level of tritium, indicating a component of modern groundwater recharge (Fig. 38; Plate 5). Recharge following unusually heavy rainfall is also evident from the hydrographs of some observation bores (Fig. 39).

Groundwater resources

The Yulara town water usage is about 300 000 m^3/year and is presently supplied from the New Wellfield (Fig. 40) which consists of bores RN 13 363 and 13 365. The Old Wellfield, consisting of bores RN 10 490 and 12 058, about 7 km to the southwest, was pumped in 1983–4 and is now only on standby. The combined capacity of the two wellfields is about 800 000 m^3/year. Additional resources are available south of Ayers Rock where bores formerly supplied a tourist resort (Jolly, 1979).

The Yulara supply is desalinated using the electrodialysis process to reduce salinity from about 1800 to about 450 mg/L. The untreated bore water is used for some irrigation and other purposes. Effluent brine from the desalination plant is disposed of in sand dunes northwest of the town. Waste water from the town is treated and used for irrigating a plantation of trees. In the long term there may be some concern about the effects of brine effluent, waste water, and landfill on groundwater quality if the wellfield is further extended.

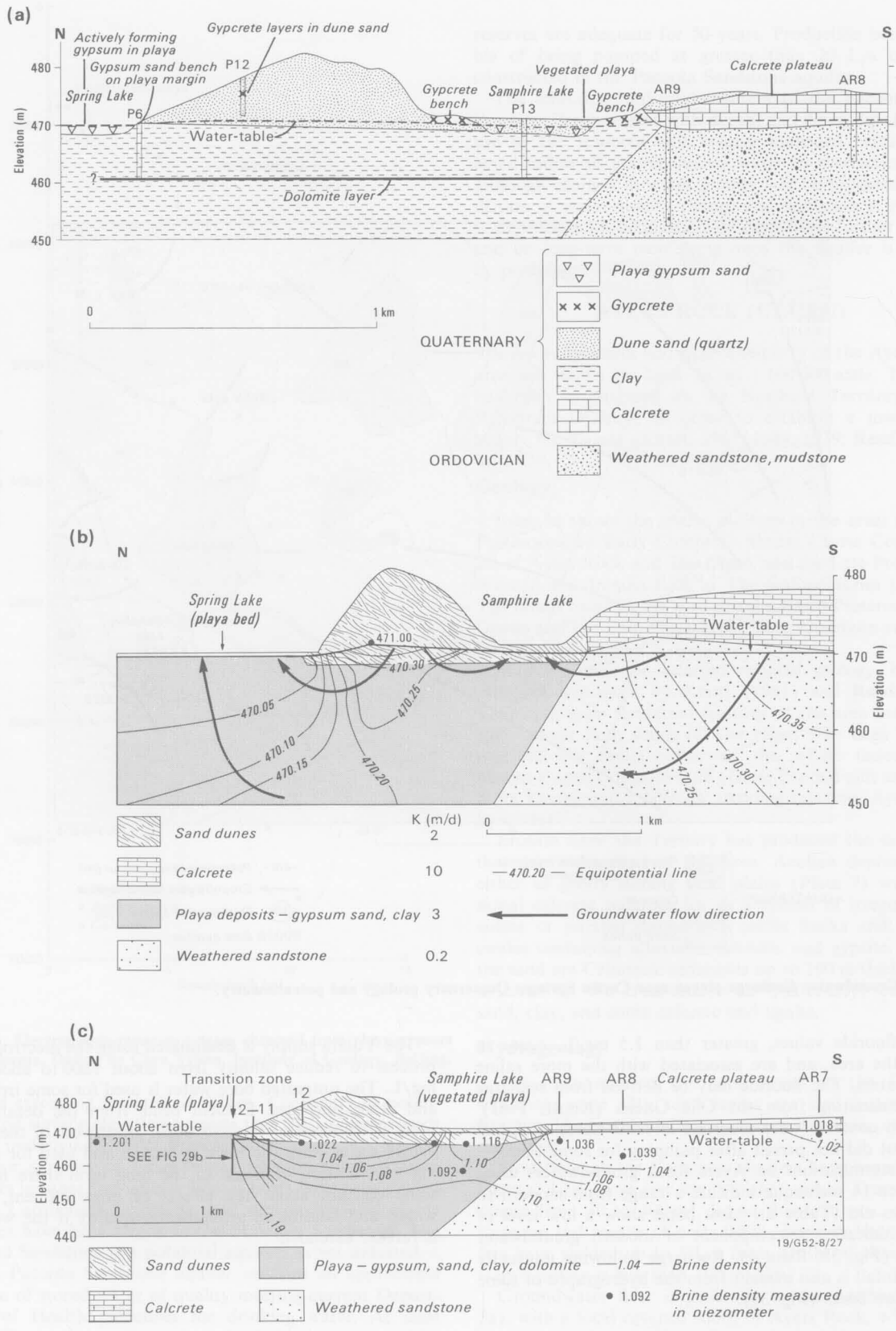


Fig. 28. Transect at Spring Lake, Curtin Springs, showing: (A) geology; (B)potentiometry, based on numerical model; (C) contours of brine density.

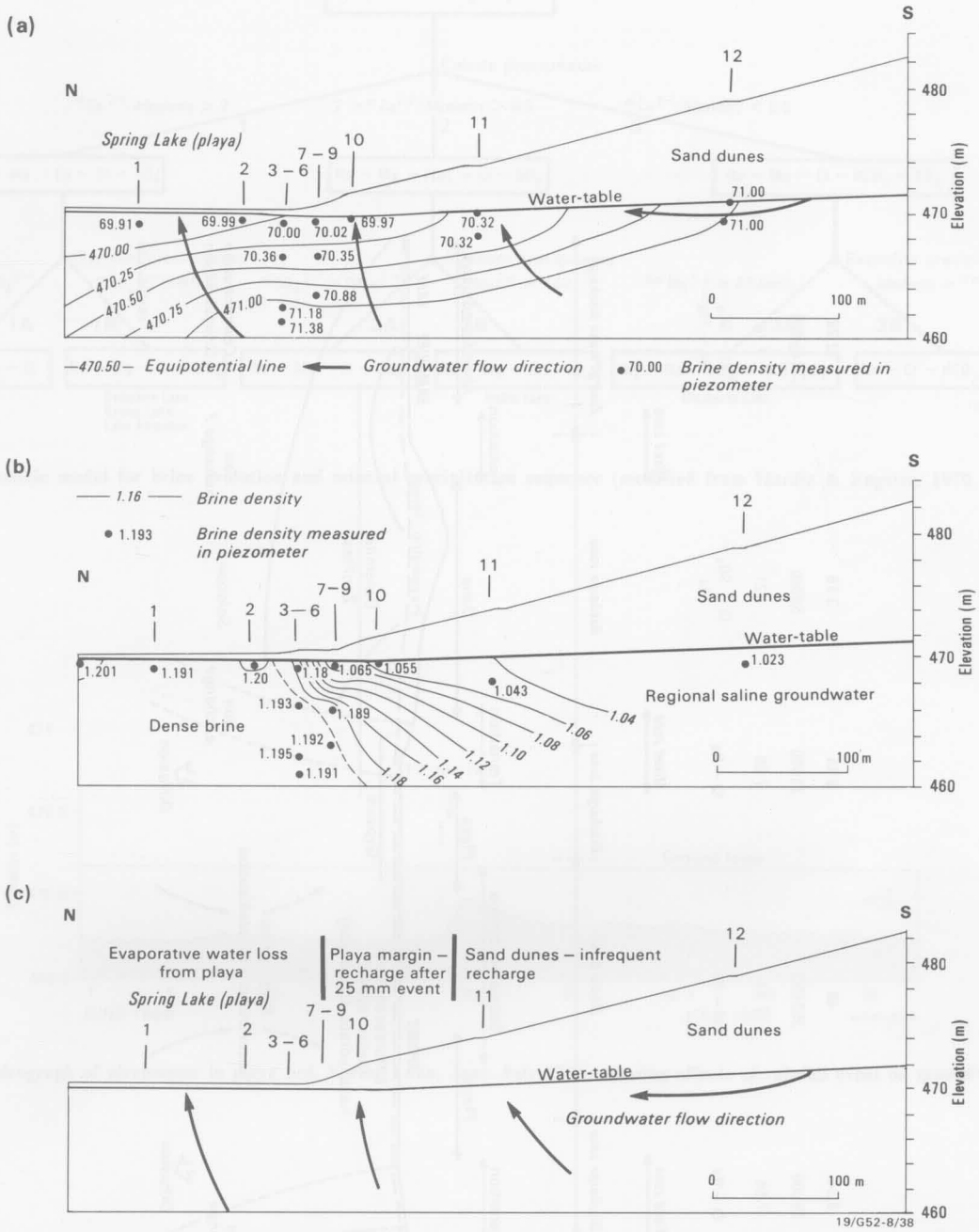


Fig. 29. The playa-marginal transition zone, Spring Lake, showing: (A) potentiometry, based on measurements reduced to standard reference density, 1.03; (B) contours of brine density; (C) zones of evaporative water loss, and frequent and infrequent recharge.

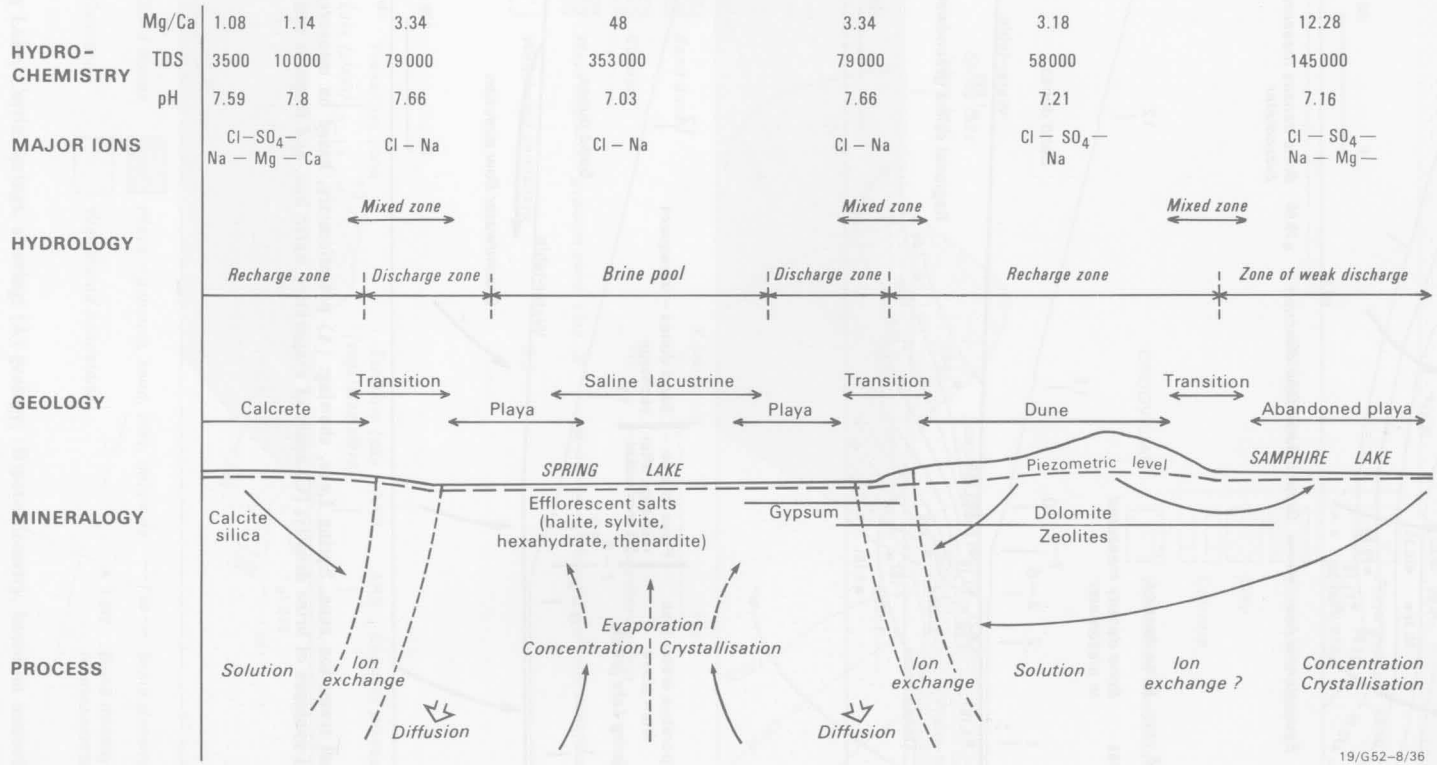


Fig. 30. Schematic diagram showing hydrochemical processes in a groundwater-discharge playa, Spring Lake, Curtin Springs.

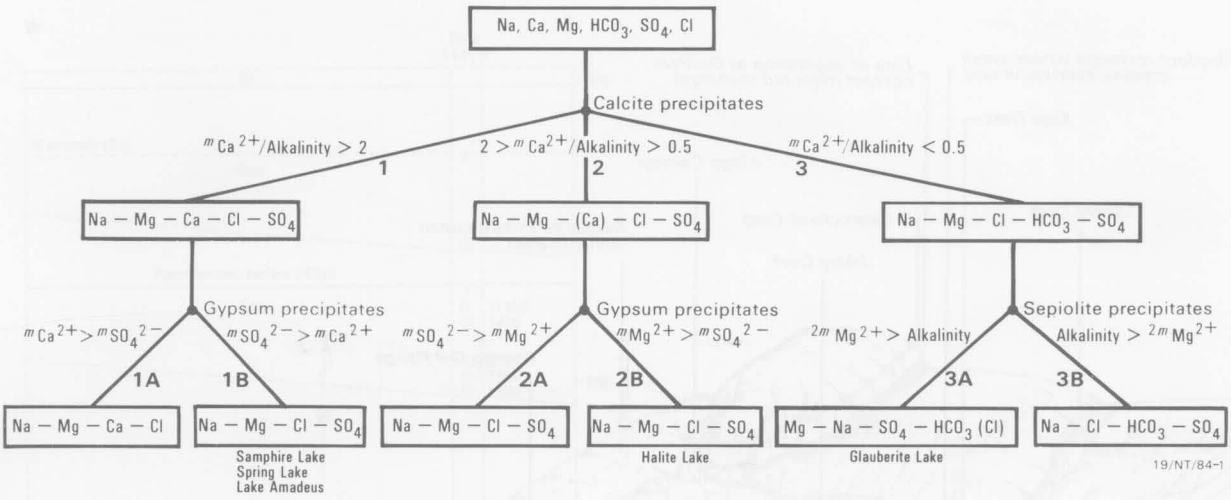


Fig. 31. Possible model for brine evolution and mineral precipitation sequence (modified from Hardie & Eugster, 1970, and Drever, 1982).

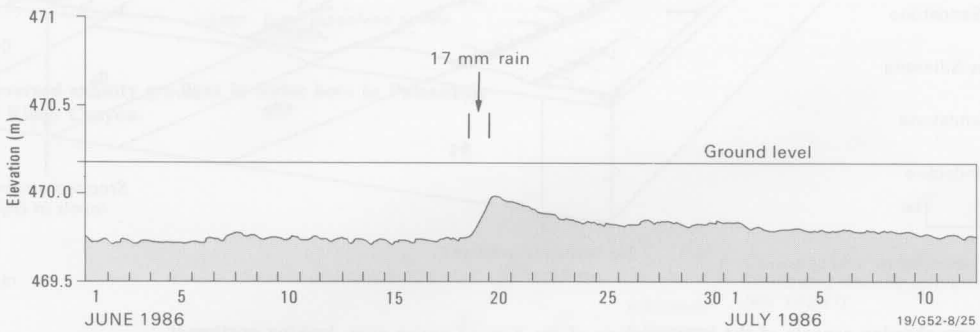


Fig. 32. Hydrograph of piezometer in playa bed, Spring Lake, June–July 1986, showing effects of rainfall event on groundwater level.

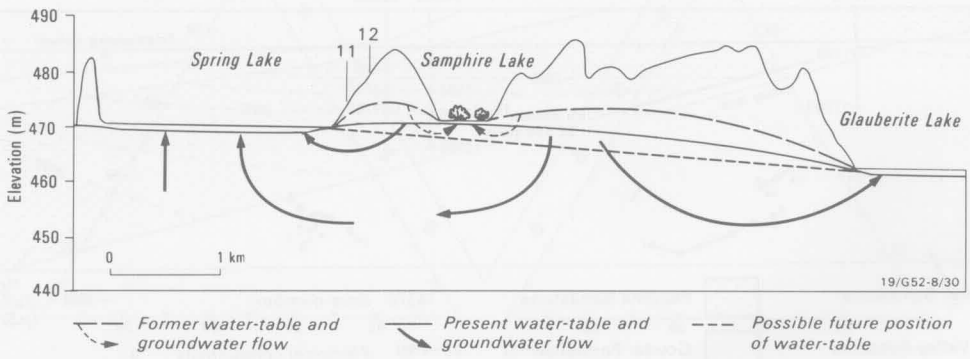


Fig. 33. Stages in abandonment of playa owing to groundwater head decay. Samphire Lake is now revegetated, with weak groundwater discharge. Glauberite Lake will eventually 'capture' the groundwater flow if the head continues to decay.

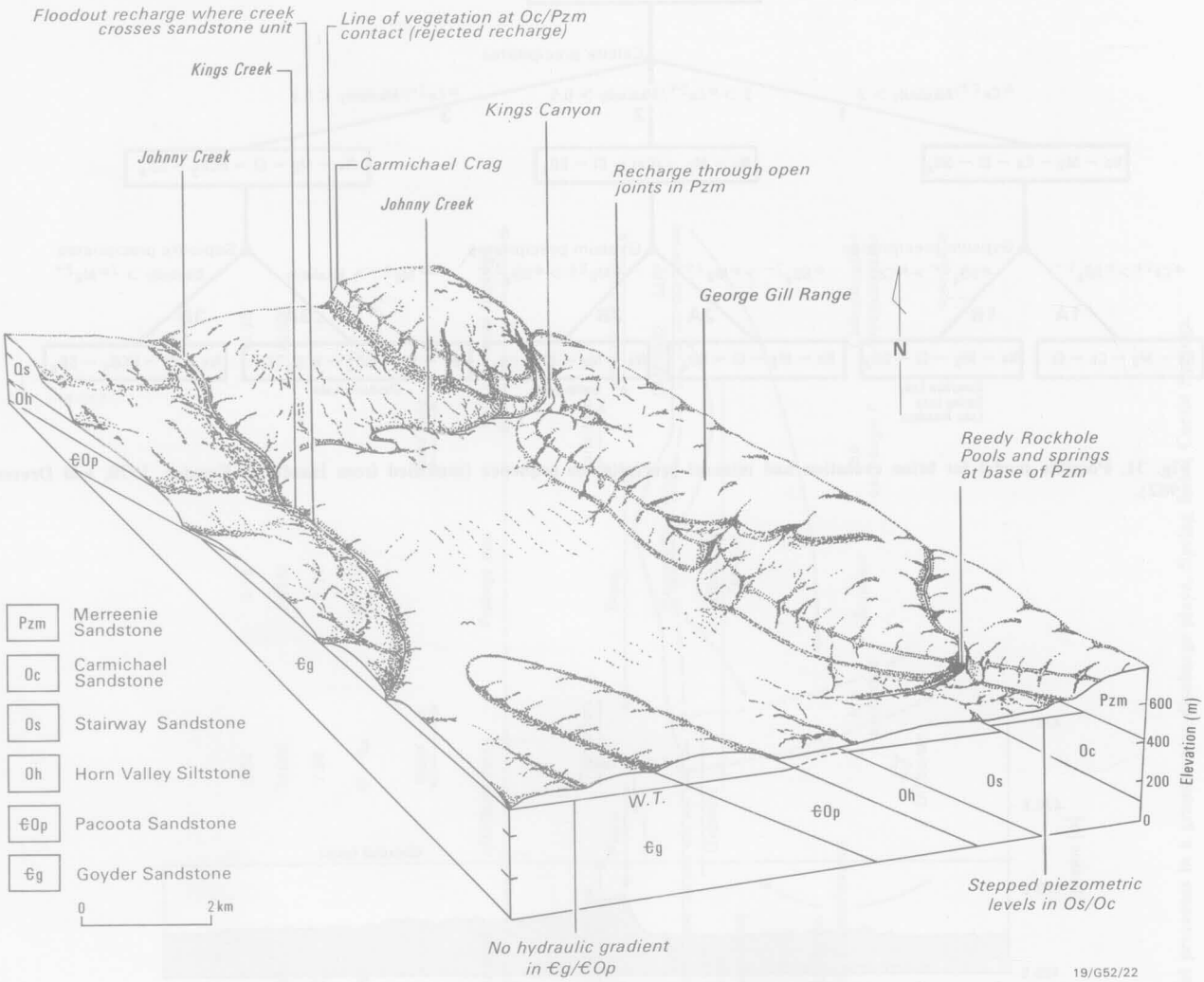


Fig. 34. Block diagram showing aspects of the hydrogeology of the Kings Canyon area, looking northwest.

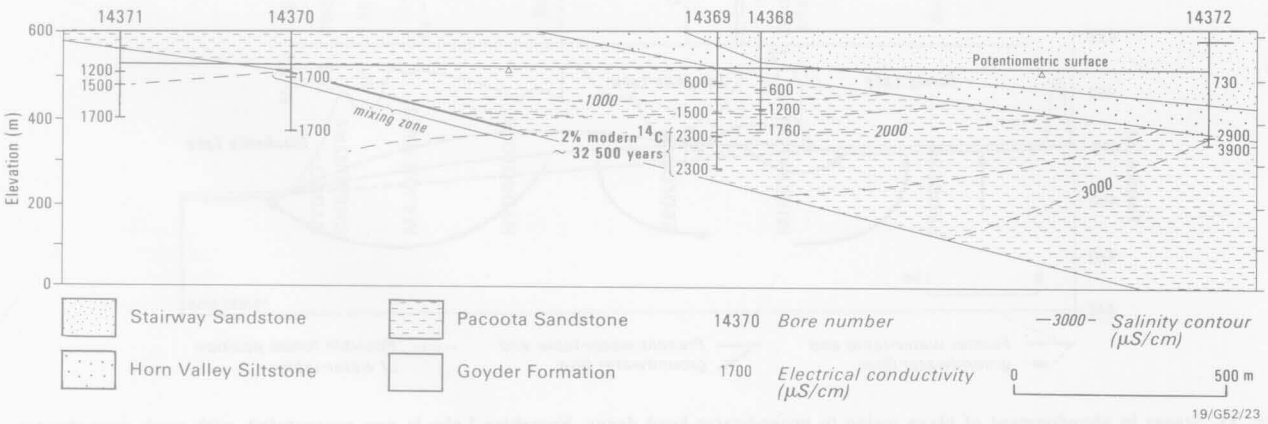


Fig. 35. Hydrochemical zonation in layered Palaeozoic aquifers at Kings Canyon.

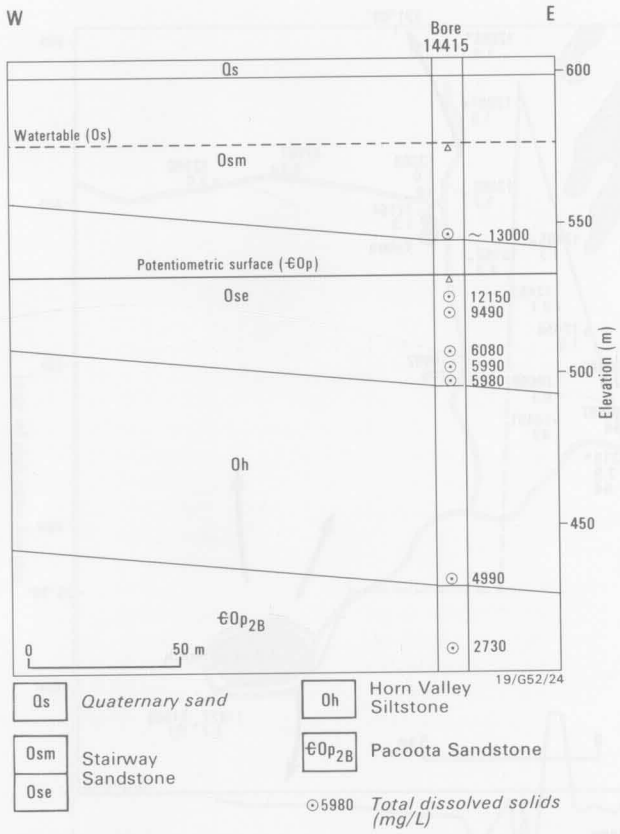


Fig. 36. Reversed salinity gradient in water bore in Palaeozoic aquifers at Kings Canyon.

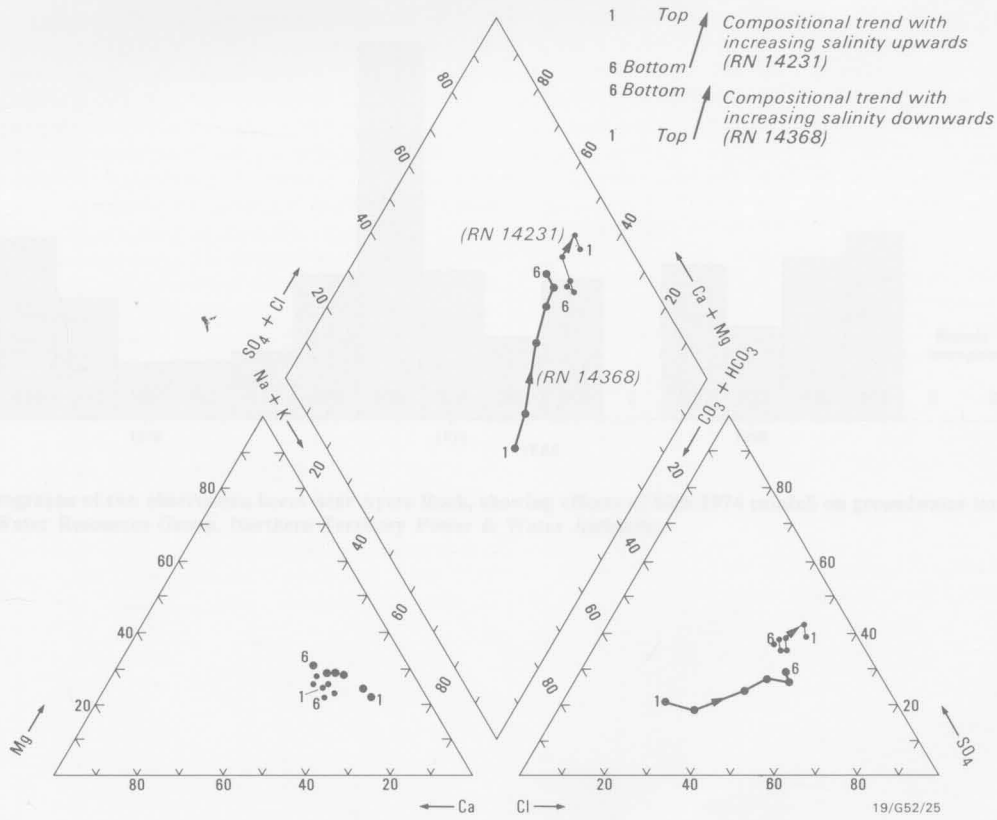


Fig. 37. Trends in ionic composition of groundwater, related to different salinity gradients in bores, Kings Canyon.

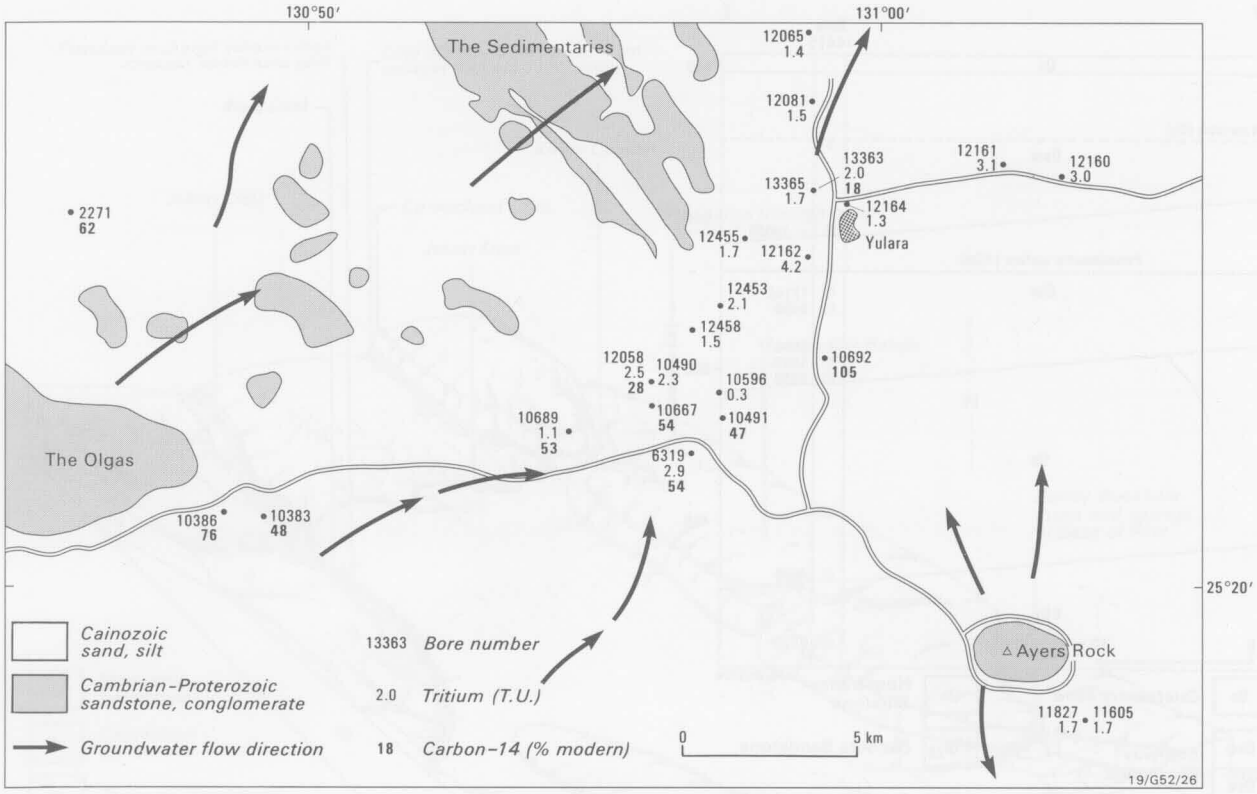


Fig. 38. Ayers Rock area: tritium and carbon-14 content of groundwaters.

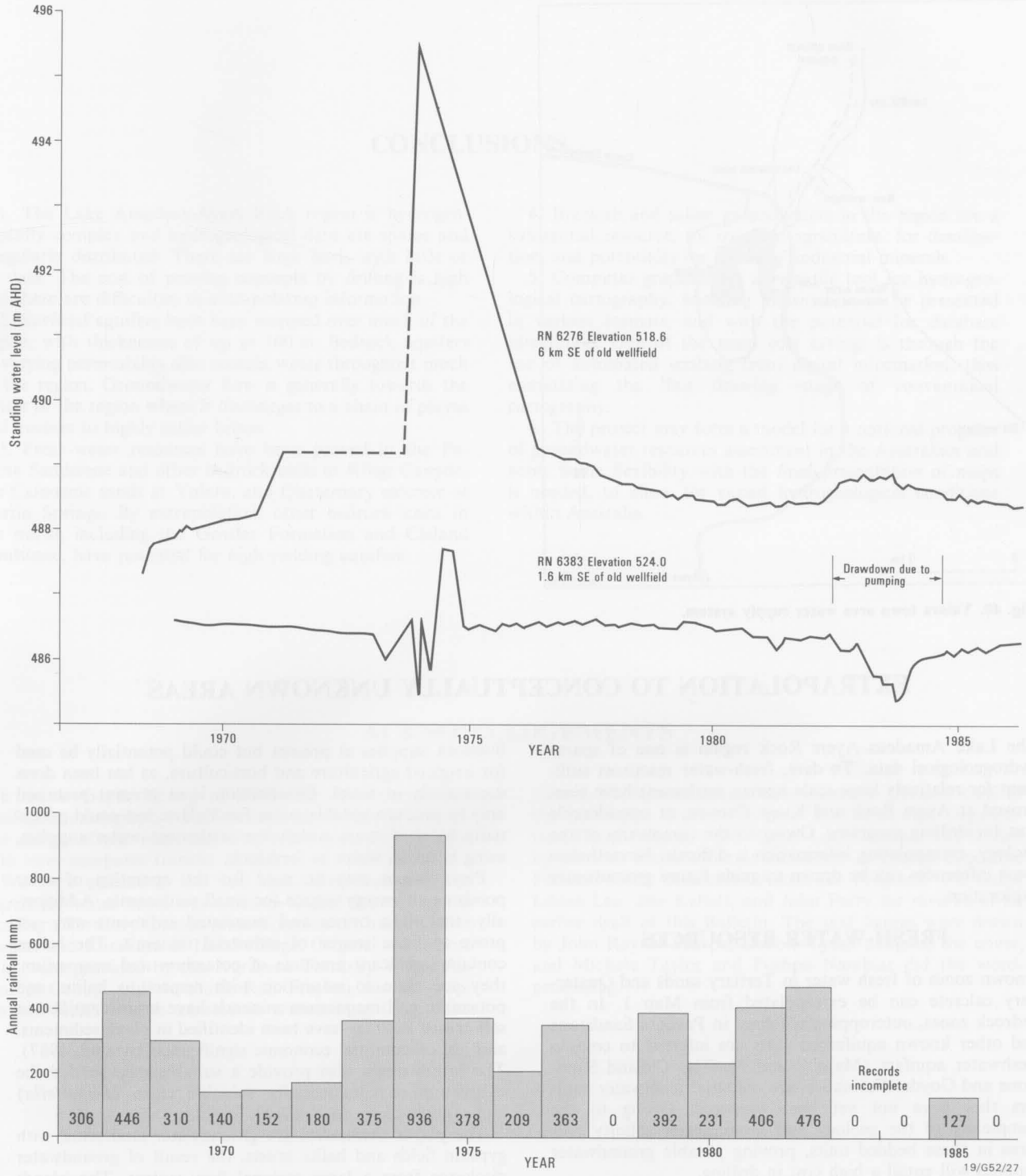


Fig. 39. Hydrographs of two observation bores near Ayers Rock, showing effects of high 1974 rainfall on groundwater levels. Information supplied by Water Resources Group, Northern Territory Power & Water Authority.

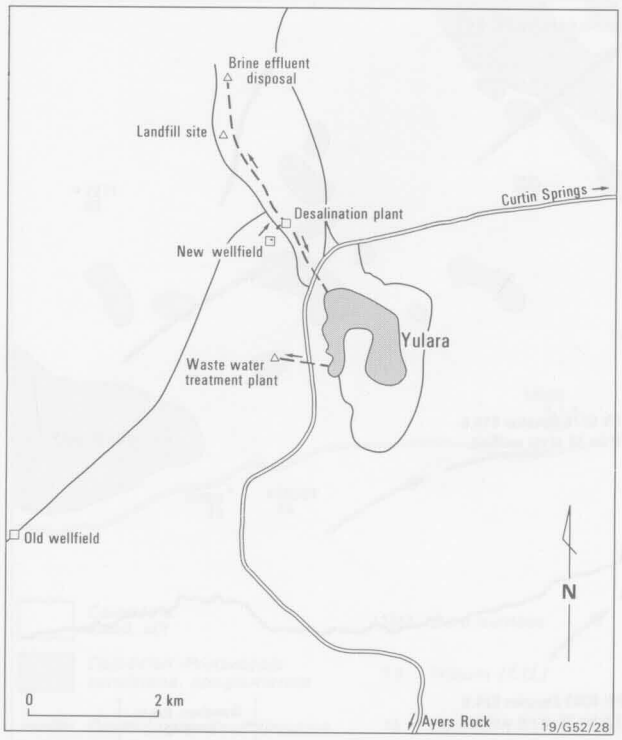


Fig. 40. Yulara town area water supply system.

EXTRAPOLATION TO CONCEPTUALLY UNKNOWN AREAS

The Lake Amadeus–Ayers Rock region is one of sparse hydrogeological data. To date, fresh-water resources sufficient for relatively large-scale human settlement have been proved at Ayers Rock and Kings Canyon, at considerable cost for drilling programs. Owing to the complexity of the geology, extrapolating information is difficult. Nevertheless some inferences can be drawn to guide future groundwater exploration.

FRESH-WATER RESOURCES

Known zones of fresh water in Tertiary sands and Quaternary calcrete can be extrapolated from Map 1. In the bedrock zones, outcropping synclines in Pacoota Sandstone and other known aquiferous units are inferred to contain freshwater aquifers (Maps 2 and 3). The Cleland Sandstone and Goyder Formation are potential freshwater aquifers that have not yet been explored. Owing to the complexity of the geology and groundwater salinity patterns in these bedded units, proving potable groundwater supplies will entail a high cost in drilling.

BRACKISH AND SALINE GROUNDWATERS

Very large resources of brackish and saline groundwater are available in this region. Brackish water is used only for livestock supplies at present but could potentially be used for irrigated agriculture and horticulture, as has been done successfully in Israel. Desalination is at present practised only to produce potable water for Yulara, but could potentially be used more widely for settlement water supplies, using brackish water as feedstock.

Playa brines may be used for the operation of solar ponds as an energy source for small settlements. Additionally, the playa brines and associated sediments may yet prove to be a source of industrial minerals. The brines contain significant amounts of potassium and magnesium; they are close to saturation with respect to halite, and potassium and magnesium minerals have been identified in salt crusts. Zeolites have been identified in playa sediments, and are of potential economic significance (Arakel, 1987). The brines might also provide a suitable medium for the cultivation of commercially valuable algae (*Dunaliella*) and cyanobacteria (*Spirulina*).

The playas themselves are groundwater landforms, with gypsum fields and halite crusts, the result of groundwater discharge from a large regional flow system. The islands within them, and their marginal dunes, are a relict of environmental change since the Pleistocene. The playas, called *pantu* in Pitjantjatjara, are thus uniquely Australian landforms, and have considerable intrinsic ecological, wilderness, and aesthetic value.

CONCLUSIONS

1. The Lake Amadeus-Ayers Rock region is hydrogeologically complex and hydrogeological data are sparse and irregularly distributed. There are large parts with little or no data. The cost of proving concepts by drilling is high and there are difficulties in extrapolating information.

2. Surficial aquifers have been mapped over much of the region, with thicknesses of up to 100 m. Bedrock aquifers of varying permeability also contain water throughout much of the region. Groundwater flow is generally towards the centre of the region where it discharges to a chain of playas and evolves to highly saline brines.

3. Fresh-water resources have been proved in the Pacoota Sandstone and other bedrock units at Kings Canyon, the Cainozoic sands at Yulara, and Quaternary calcrete at Curtin Springs. By extrapolation, other bedrock units in the north, including the Goyder Formation and Cleland Sandstone, have potential for high-yielding aquifers.

4. Brackish and saline groundwaters in the region are a substantial resource, for irrigated agriculture, for desalination, and potentially for 'farming' industrial minerals.

5. Computer graphics are a versatile tool for hydrogeological cartography, enabling information to be presented in various formats, and with the potential for database integration. One of the main cost savings is through the use of automated scribing from digital information, thus eliminating the 'fair drawing' stage of conventional cartography.

6. The project may form a model for a national program of groundwater resources assessment in the Australian arid zone. Some flexibility with the final presentation of maps is needed, to allow for varied hydrogeological conditions within Australia.

ACKNOWLEDGEMENTS

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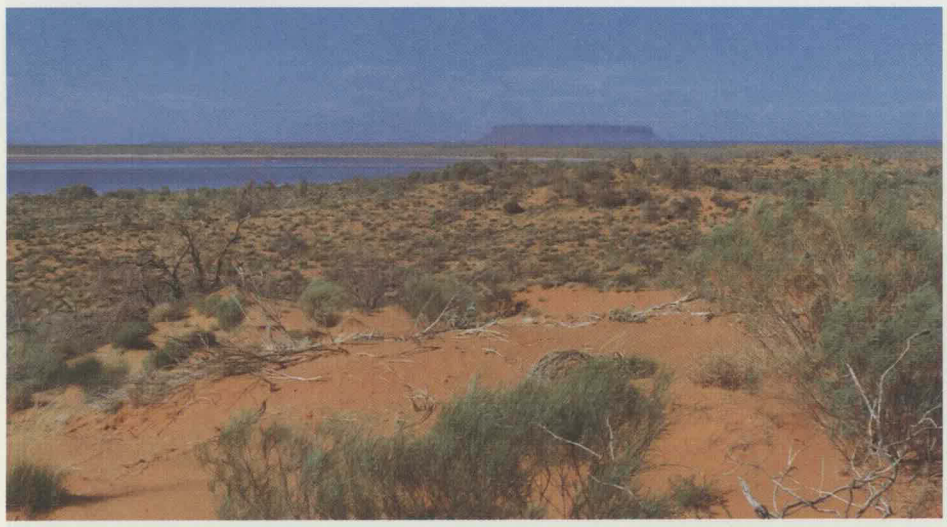
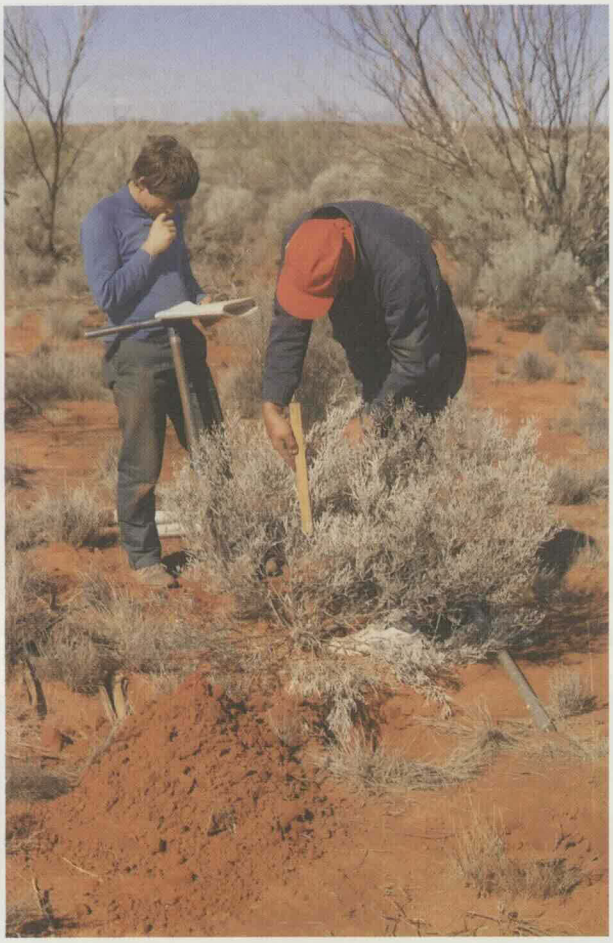
Pl. 1. Compilation of hydrogeological maps on a computer-aided drafting system.

Pl. 2. Ayers Rock, a large inselberg of resistant Late Proterozoic–Cambrian conglomerate, rising 350 m above the Quaternary sand plain.



Pl. 3. Quaternary sand dunes mantle the landscape near Curtin Springs. In the middle distance is the groundwater-discharge playa known as Spring Lake. Mount Conner in the background is a large inselberg of resistant Proterozoic sandstone.



Pl. 4. Vegetation is an important factor in determining groundwater recharge in the Australian arid zone. The mulga trees (*Acacia aneura*) channel available rainwater into stem flow, facilitating the entry of water into the ground and its use for transpiration.

Pl. 5. Margin of a groundwater-discharge playa, Spring Lake, near Curtin Springs. Heaved gypsum ground forms the playa bed, the playa margin has been colonised by samphire, and windblown gypsum sand forms crusts on the dunal margin.

Pl. 6. Groundwater levels and climatic parameters are measured electronically and data transmitted by satellite, in remote parts of central Australia.

Pl. 7. Sand plains near The Olgas, underlain by a shallow aquifer containing about 2000 mg/L total dissolved solids. These groundwaters have high nitrate contents (50–200 mg/L) due to biological fixation in the soil and episodic groundwater recharge. *Spinifex* grasses and *Casuarina* trees are pictured.

Pl. 8. Glauberite Lake, a groundwater-discharge playa near Curtin Springs. Beneath the halite crust are deposits of glauberite (sodium–calcium sulphate) precipitated from playa brine.

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APPENDIX 1. PROJECT COSTS

The cost of the project, in 1986 dollars, is estimated to have been as follows:

	$
—BMR shallow drilling in discharge zone and calcrete	15 000
—Contract for field data census and construction of database	15 000
—Contract for photointerpretation and revision of geological maps	10 000
—BMR field travel	5 000
—Computer-assisted cartography —hire of computer time	10 000
—BMR staff time for compilation: hydrogeologist and cartographer	15 000
Total	70 000

Uncosted items were: BMR staff time for hydrogeological research (the region is part of a basin research program); original collection of water bore data by Northern Territory agencies (this is a normal function); and publication costs.

APPENDIX 2. INTERGRAPH DESIGN FILES

Topographic base

1 Australian Map Grid and border
2 Spot height
3 State border
4 Town name, latitude & longitude
5 Mountain name
6 Lake name
7 Road name
10 Bore symbol
11 River lettering
12 AMG grid value
13 Park/reserve boundary
20 River symbol
21 Creek symbol
22 Lake symbol
23 Swamp symbol
27 Stream and arrowhead
30 Topographic contour
39 Bore number
40 Major road
41 Minor road
42 Town
43 Track
63 Registration

Surficial geology

28 Isopach on surficial units
29 Isopach value
45 Geological boundary, position accurate
46 Geological boundary, position approximate
47 Geological boundary, inferred
48 Fault
49 Fault, position approximate
54 Stratigraphic letter symbol
63 Registration

Bedrock geology

45 Geological boundary, position accurate
46 Geological boundary, position approximate
47 Geological boundary, inferred
48 Fault
49 Fault, position approximate
50 Trend-line
51 Joint pattern
52 Dyke
53 Sheared zone
54 Stratigraphic letter symbol
55 Strike and dip of bedding
56 Strike and dip of foliation
57 Anticline symbol
58 Syncline symbol
59 Fold axis
60 Fold axis, position approximate
61 Fold axis, inferred
63 Registration

Hydrochemistry

14 Spring
15 Groundwater divide
16 Potentiometric contour, surficial aquifer
17 Potentiometric contour, bedrock aquifer
18 Direction of groundwater flow, shaft
19 Direction of groundwater flow, arrowhead
31 1500 mg/L TDS contour
32 3000 mg/L TDS contour
33 14 000 mg/L TDS contour
34 100 000 mg/L TDS contour
37 Potentiometric contour value
63 Registration

Page 40 is blank.

APPENDIX 3. PILOT STUDY DATABASE SCHEMA

CHEM TABLE (Chemical analyses of water)

Field	Type	Max. Size	Knowledgeman Picture	Explanation
WELL	Number		"ddddd"	Official or unofficial Registered Number
AQUIDS	String	4 chars		
SAMDT	String	8 chars		Date of sample collection in dd/mm/yy format
SAMBY	String	10 chars		Name of sample collector
SAMDP	Number		"ddd.d"	Depth of sample in metres below ground level
SRFTP	Number		"dd.d"	Temperature in degrees Celsius
PHFLD	Number		"dd.dd"	Field pH
CONFD	Number		"ddddd"	Field conductivity in millimhos/cm
PHLAB	Number		"dd.dd"	Laboratory pH
CONLB	Number		"ddddd"	Laboratory conductivity in millimhos/cm
TDS	Number		"dddddd"	Total dissolved solids in milligrams/litre
TOALK	Number		"dddddd"	Total alkalinity
TOHRD	Number		"dddddd"	Total hardness
NAION	Number		"dddddd"	Na^{+} in milligrams/litre
KION	Number		"dddddd"	K^{+} in milligrams/litre
CAION	Number		"dddddd"	Ca^{++} in milligrams/litre
MGION	Number		"dddddd"	Mg^{++} in milligrams/litre
CLION	Number		"dddddd"	Cl^{-} in milligrams/litre
FION	Number		"dddddd"	F^{-} in milligrams/litre
SO4ION	Number		"dddddd"	SO_4^{--} in milligrams/litre
CO3ION	Number		"dddddd"	CO_3^{--} in milligrams/litre
HCO3ION	Number		"dddddd"	HCO_3^{-} in milligrams/litre
NO3ION	Number		"dddddd"	NO_3 in milligrams/litre
SIO2ION	Number		"ddd.d"	SiO_2 in milligrams/litre
BORON	Number		"ddd.d"	B^{-} in milligrams/litre
TOTFE	Number		"ddd.d"	Total iron in milligrams/litre

ALMST TABLE (Amadeus Well Master; bore details)

Field	Type	Max. Size	Knowledgeman Picture	Explanation
WELL	Number		"ddddd"	Official or unofficial Registered Number
MAPSHEET	String	4 chars	"uuuu"	Number of the 1:000 000 topographic map sheet
MAPNAME	String	16 chars	"16%u"	Name of the 1:250 000 topographic map sheet
WELLNAME	String	8 chars	"dd.dd.dd"	Latitude in degrees, minutes, and seconds
LONGITUD(e)	String	9 chars	"ddd.dd.dd"	Longitude in degrees, minutes and seconds
EASTING	Number		"dddddddmE"	AMG easting in metres
NORTHING	Number		"ddddddddmE"	AMG northing in metres
ELEVATIO(n)	Number		"dddd.dm"	Ground level at collar in metres above AHD
DEPTH	Number		"dddd.dm"	Total depth in metres below ground level
STATUS	String	10 chars	"10%u"	Whether abandoned, capped, or operating
EQUIPMEN(t)	String	20 chars	"20%u"	How equipped (eg pump + engine + tank)
FORMATIO(n)	String	15 chars	"15%u"	Stratigraphic names of aquifers
LITHOLOG(y)	String	15 chars	"15%u"	Abbreviated lithology of aquifers
AQDEPTH	Number		"ddd.dm"	Depth to aquifer top in metres below ground level
SWL	Number		"ddd.dm"	Standing water level in metres below ground level
YIELD	Number		"ddd.dd L/S"	Aquifer yield in litres/second
TRANSMIS(sivity)	Number		"ddd.d M2/D"	Transmissivity in square metres/day
TDS	Number		"dddddd mg/L"	Total dissolved solids in milligrams/litre

ALMST Key field is well
CHEM Composite key is well - samdt - samtp fields
Almst.well = chem. well

Page 44 is blank.

APPENDIX 4. LIST OF WATER BORES IN THE LAKE AMADEUS–AYERS ROCK REGION

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME	AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
1017	5246	AYERSROCK	KARREE-2 MULGAPK	776442	7138924	595.0	32.9	ABANDONED								
1020	5246	AYERSROCK	KARREE-2-2ATTMULGAPK	777194	7140240	593.0	35.1									
1022	5247	AYERSROCK	NO-1 CTSP	783884	7226331	510.0	120.8	ABANDONED	(SALT)							
1023	5247	AYERSROCK	NO-2 CTSP	776769	7221587	498.0	51.4	ABANDONED								
1024	5248	LAKEAMADEUS	ININDIA BORE CTSP	787130	7236330	519.4	103.6	ABANDONED	(SALT)	CZ/MEREENIE	CALCR/SANDST		42.5			7000
1025	5247	AYERSROCK	NO-4 CTSP	772300	7213200	495.0	175.3	ABANDONED					96.0			
1154	5147	AYERSROCK	77/9 AYERSRK	702765	7193646	522.1	19.0	CAPPED								
1898	5247	AYERSROCK	AMERYBORE CTSP	799700	7180600	512.0	22.9	ABANDONED		CZ	SAND	8.2	2.4	0.32		
1976	5147	AYERSROCK	BMR-10 AYERSRK	705901	7190701	517.0	121.9			CZ	LIMESTONE	49.7	18.3	0.04		
2002	5047	AYERSROCK		673800	7204400	580.0					LST/GRAVEL	24.4	20.1	0.25		
2007	5147	AYERSROCK	WINDMILLBORE AYERSRK	706378	7194073	519.1	76.2	OPERATING			SAND	49.7	31.4	0.75		1577
2009	5147	AYERSROCK	TUITS AYERSRK	701258	7196080	522.0	56.2						16.8	0.05		
2010	5147	AYERSROCK	TUITSBORE AYERSRK	704014	7196954	515.0	35.7	CAPPED		CZ	SANDSTONE		17.4	0.10		1295
2056	5247	AYERSROCK	PARRARAWELL CTSP	767650	7211530	491.0	2.8	ABANDONED		CZ	CALCRETE		2.2			1380
2057	5247	AYERSROCK	SPRINGWELL CTSP	787590	7195680	486.0	3.1	UNKNOWN		CZ	CALCRETE		2.2			5500
2058	5247	AYERSROCK	MALLEEWELL CTSP	783340	7203370	480.0	2.4	ABANDONED		CZ	ALLUVIUM		1.4			10280
2059	5246	AYERSROCK	MTCONNORWELL CTSP	786590	7171680	520.0	6.1	ABANDONED		CZ	CALCRETE		3.1	1.40		1810
2060	5247	AYERSROCK	AMERYWELL CTSP	799700	7180600	500.0	5.7	ABANDONED		CZ	CALCRETE		3.7			6583
2133	5246	AYERSROCK	NO-1BORE MULGAPK	773800	7130700	630.0	27.4	OPERATING	WINDMILL+DAM				16.7	1.38		990
2134	5246	AYERSROCK	NO-2BORE MULGAPK	767800	7132300	624.0	30.5	OPERATING	WINDMILL+TANK				18.3	0.90		
2135	5246	AYERSROCK	NO-3BORE MULGAPK	773700	7151500	562.0	29.0	OPERATING	WINDMILL+TANK				18.3	1.75		2680
2136	5246	AYERSROCK	NO-4STATION MULGAPK	767100	7132000	625.0	32.0	OPERATING	WINDMILL+TANK							
2137	5246	AYERSROCK	NO-5BORE MULGAPK	756500	7132300	628.0	24.4	OPERATING	WINDMILL+DAM					1.75		1240
2138	5246	AYERSROCK	NO-6BORE MULGAPK	766150	7141850	595.0	15.2	OPERATING	WINDMILL+DAM		CLAY		9.1	1.56		2750
2271	5047	AYERSROCK	RB1 AYERSRK	677850	7207450	533.0	50.3				LIMESTONE	25.0	8.4			900
2272	5047	AYERSROCK	RB2 AYERSRK	678100	7208300	530.0										720
2365	5247	AYERSROCK	GARDENWELL CTSP	777500	7197000	490.0	3.9	ABANDONED		CZ			3.7	1.13		2840
2777	5247	AYERSROCK	WIREYARDBORE CTSP	798500	7195000	475.0	18.3	ABANDONED	(SALT)		LIMESTONE+CLAY					
2865	5247	AYERSROCK	SALTBORE CTSP	798216	7193360	476.0	24.4	ABANDONED		CZ	CALCRETE		9.1			41062
2866	5247	AYERSROCK	HOUSEBORE CTSP	777500	7197000	490.0	16.0	ABANDONED		CZ	CALCRETE		6.4	1.80		5450
2867	5247	AYERSROCK	STOCKYARD CTSP	777462	7197215	490.0	10.7	ABANDONED		CZ	CALCRETE		5.5	2.00		4510
3328	5247	AYERSROCK	MTCONNORBORE CTSP	797798	7183758	495.0	6.5	(SALT)		CZ			5.0	1.40		
3498	5247	AYERSROCK	CTSP	793322	7224500		106.7	ABANDONED						0.75		
3501	5247	AYERSROCK	STOCKWELL CTSP	777500	7197000	490.0	4.9	ABANDONED			CALCRETE		4.6	3.00		1531
3521	5146	AYERSROCK	WESTDUD MULGAPK	743300	7146400	620.0	29.0	ABANDONED		OLIA?	GRANITE					609
3522	5246	AYERSROCK	EASTDUD MULGAPK	751000	7142800	598.0	62.5	ABANDONED		OLIA	LATERITIC SAND		12.2			623
3523	5146	AYERSROCK	CENTRALDUD MULGAPK	750000	7143600	610.0	27.4	ABANDONED	(DRYHOLE)							
4068	5247	AYERSROCK	NO1TRYCWD-2 CTSP	800127	7201841	477.0	39.6	ABANDONED	(SALT)		SILTSTONE		10.1	0.06		
4069	5247	AYERSROCK	NO2TRYCWD CTSP	801126	7204389	477.0	61.6	ABANDONED			SILTSTONE		10.1	0.33		
4169	5149	LAKEAMADEUS	JOHNNYCREEK-1 TEMPE	752617	7327200	670.0	8.2	ABANDONED		QA	SAND+GRAVEL					
4170	5149	LAKEAMADEUS	JOHNNYCREEK-2 TEMPE	752342	7327200	670.0	9.5	ABANDONED		QA	SAND+GRAVEL					
4198	5249	LAKEAMADEUS	A60/2 TEMPE	800524	7306978	597.0	67.1			MEREENIE	SANDSTONE	64.0	42.7	1.25		
4206	5246	AYERSROCK	NO-9BORE MULGAPK	780200	7125500	632.0	21.3	OPERATING	CASING+PUMP+TANK					0.50		6310

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME	AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
4207	5246	AYERSROCK	OLDHOMESTEAD MULGAPK	765500	7137000	610.0		ABANDONED		CZ/OLIA	CALCR/GNEISS		8.0			2524
4208	5147	AYERSROCK	BMR-12BORE AYERSRK	707600	7194300	522.0	39.6	ABANDONED					24.3			
4209	5146	AYERSROCK	NO-10BORE MULGAPK	743600	7125500	650.0	27.4	OPERATING	WINDMILL	OLIA	PEGMATITE		22.9	1.50		3510
4210	5246	AYERSROCK	NO-7BORE MULGAPK	796600	7141700	570.0		OPERATING	WINDMILL+DAM							2020
4212	5246	AYERSROCK	NO-11BORE MULGAPK	751400	7142000	600.0	17.1	OPERATING	WINDMILL+DAM					1.90		
4213	5246	AYERSROCK	NO12-BORE MULGAPK	775626	7139440	595.0		OPERATING	WINDMILL+TANK			22.2		1.11		
4214	5246	AYERSROCK	MULGAPK	800676	7156170	542.0	31.7		CASING+TANK			24.3				370
4215	5246	AYERSROCK	NO-8BORE MULGAPK	780318	7162243	535.0		ABANDONED	WINDMILL				9.8			6720
4216	5246	AYERSROCK	NO-16BORE MULGAPK	799759	7125987	593.0	30.5	OPERATING	WINDMILL+TANK				24.6			4620
4238	5149	LAKEAMADEUS	JOHNNYCREEK-3 TEMPE	750740	7325168	645.0	97.5			STAIRWAY	SANDSTONE	88.4	55.2	0.58		5350
4412	5249	LAKEAMADEUS	A60/3-1ATT TEMPE	777095	7313100	750.0	106.7	ABANDONED	(DRYHOLE)							
4413	5249	LAKEAMADEUS	A60/3-2ATT TEMPE	777095	7312896	750.0	97.5	CAPPED	CASING+CAP (DRYHOLE)				3.1			
4620	5249	LAKEAMADEUS	EAST MEREENIE-2 H/BF	769005	7338996	778.0	152.4	CAPPED		MEREENIE	SANDSTONE	141.9	125.0			846
4848	5147	AYERSROCK	AR-1 AYERSRK	713450	7190050	521.2	76.2	CAPPED		CZ	SAND+GRAVEL	57.9	27.4	0.45		
4849	5147	AYERSROCK	AR-2 AYERSRK	718550	7194500	524.0	76.2	ABANDONED		CZ	SANDYCLAY	36.6	30.1	0.40		
4850	5147	AYERSROCK	AR-3 AYERSRK	704014	7196954	522.0	21.6	ABANDONED	(DRYHOLE)							
4851	5147	AYERSROCK	AR-4 AYERSRK	705789	7193270	524.0	85.3	ABANDONED		CZ	SAND+GRAVEL	70.1	27.4	1.50	40.0	971
4866	5249	LAKEAMADEUS	EASTJOHNNYCREEK-1	757092	7327913	735.0	71.9			STAIRWAY	SANDSTONE		25.9	0.25		
4868	5249	LAKEAMADEUS	OCHREHILL-2 TEMPE	769200	7324100	750.0	106.9	ABANDONED	(DRYHOLE)	MEREENIE						
4869	5249	LAKEAMADEUS	OCHREHILL-2 TEMPE	768015	7324097	800.0	128.0	ABANDONED	(DRYHOLE)	MEREENIE						
5220	5249	LAKEAMADEUS	EAST-MEREENIE-3	757656	7341811	775.0	951.3	CAPPED		MER/STWAY/PAC						
5407	5247	AYERSROCK	A43/4 CTSP	792824	7224506	500.0	106.1	ABANDONED	(SALT)	PROTEROZOIC	SANDSTONE	65.6	14.6	1.00		21820
5644	5248	LAKEAMADEUS	A43/2 CTSP	794238	7239766	570.0	121.4	ABANDONED		STAIRWAY	QUARTZITE		83.4	0.06		
5645	5247	AYERSROCK	HALFWAYBORE CTSP	779500	7183500	509.0	22.9	ABANDONED	(DRYHOLE)							
5646	5247	AYERSROCK	HOMESTEAD-5 CTSP	777550	7197155	490.0	39.6	OPERATING	PUMP+MOTOR	CZ	CALCRETE	7.6	4.6	0.20		1485
5647	5247	AYERSROCK	HOMESTEAD-6 CTSP	777550	7197155	490.0	18.3	ABANDONED		CZ	CALCRETE	7.9	4.6	0.32		4734
5654	5247	AYERSROCK	NEWPARRARRA CTSP	767650	7211530	491.0	10.7	OPERATING	PUMP+ENGINE+TANK	CZ	CALCRETE		3.7	1.80		1310
6094	5247	AYERSROCK	NEWMOON	795000	7185420	496.0	19.8	ABANDONED		CZ	CALCRETE	13.7	13.7	2.25		
6128	5147	AYERSROCK	AR1/68 AYERSRK	713800	7189900	530.0	85.3	ABANDONED		CZ	SANDY SILTST		32.3	0.60		3889
6129	5147	AYERSROCK	AR-3 AYERSRK	705116	7193662	521.8	106.7	CAPPED		CZ	SAND+GRAVEL		24.0			628
6130	5147	AYERSROCK	AR-4/ AYERSRK	705247	7193127	521.9	182.9	CAPPED		CZ	SANDSTONE		25.6	1.25		913
6131	5147	AYERSROCK	AR-6 AYERSRK	706594	7193375	519.3	152.4	CAPPED		CZ	CLAY+GRAVEL		24.7			1548
6132	5147	AYERSROCK	AR-7 AYERSRK	707400	7194550	520.0	524.1			CZ	SAND+GRAVEL		25.3	2.50		3200
6133	5147	AYERSROCK	AR-8 AYERSRK	705344	7192726	520.5	140.5	CAPPED		CZ	SAND+GRAVEL		28.0			689
6134	5147	AYERSROCK	AR-10 AYERSRK	705846	7193262	524.0	94.3	CAPPED								1080
6135	5147	AYERSROCK	AR-11 AYERSRK	706157	7193328	542.1	170.7	CAPPED		CZ	SAND+GRAVEL		26.1			540
6184	5147	AYERSROCK	AR2/68 AYERSRK	718400	7194800	524.0	155.5	CAPPED		CZ	SANDSTONE		29.3			2014
6202	5147	AYERSROCK	AR-23 AYERSRK	717900	7194600	524.0	44.8	ABANDONED		CZ	SANDSTONE		31.4			
6203	5147	AYERSROCK	AR-24 AYERSRK	718950	7194600	524.0	42.7	CAPPED		CZ	SANDSTONE		30.5	0.60		2882
6204	5147	AYERSROCK	AR-25 AYERSRK	718600	7194100	524.0	45.1			CZ	SAND		31.3			
6205	5147	AYERSROCK	AR-26 AYERSRK	708800	7197650	515.0	76.8	ABANDONED		CZ	SANDY SILTST		26.4			
6262	5147	AYERSROCK	AR-5 AYERSRK	706001	7193295	520.7	103.6	CAPPED		CZ	SANDY SILTST		29.6			1320
6263	5147	AYERSROCK	AR-9 AYERSRK	707300	7195200	521.0	24.4	CAPPED	(SEEP ONLY)	CZ/MT CURRIE@6	CALCR/SST+CLST					

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME		AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
6264	5247	AYERSROCK	AR-12	AYERSRK	705998	7193302	520.3	61.0	CAPPED		CZ	SANDY SILTST		24.4			684
6265	5247	AYERSROCK	AR-13	AYERSRK	705990	7193315	524.0	61.0	CAPPED					25.2			740
6266	5147	AYERSROCK	AR-14	AYERSRK	718550	7194500	524.0	42.7	CAPPED					29.9			
6267	5147	AYERSROCK	AR-15	AYERSRK	705840	7193275	524.0	45.7	CAPPED					25.2			638
6268	5147	AYERSROCK	AR-16	AYERSRK	705834	7193289	520.5	45.7	CAPPED					23.3			598
6269	5047	AYERSROCK	AR-21	AYERSRK	694220	7201224	519.5	73.2	CAPPED		CZ	SANDSTONE		33.0	3.80		2819
6270	5147	AYERSROCK	AR-22	AYERSRK	718550	7194500	524.0	61.0	CAPPED		CZ	CLAYEY SAND		29.9			2700
6271	5147	AYERSROCK	AR-27	AYERSRK	705750	7192571	524.8	61.6	CAPPED		CZ	SILTY CLAY		28.7	1.25		866
6272	5147	AYERSROCK	AR-28	AYERSRK	705752	7192555	524.7	74.5	CAPPED		CZ	SANDSTONE		29.0	0.75		
6273	5147	AYERSROCK	AR-29	AYERSRK	705742	7192541	524.0	101.9	CAPPED		CZ	SANDY SILTST		28.6	12.60	20.0	2507
6274	5147	AYERSROCK	AR-30	AYERSRK	702100	7196500	519.0	12.2	ABANDONED		CZ/OLIA@7.6	SAND/GNEISS		5.8	0.25		804
6275	5047	AYERSROCK	AR-31	AYERSRK	696853	7205239	510.0	42.1	CAPPED		CZ/WINNALL@27.4	SILT+SAND/SST		29.6	0.25		1164
6276	5047	AYERSROCK	AR-32	AYERSRK	699066	7199558	518.6	84.4	CAPPED		MT CURRIE	CONGLOMERATE		31.7			5700
6277	5047	AYERSROCK	AR-33	AYERSRK	700357	7197008	522.0	4.3	ABANDONED	(DRYHOLE)							
6278	5047	AYERSROCK	AR-34	AYERSRK	699305	7201908	514.2	67.1	CAPPED		CZ	SANDSTONE		30.5	0.12		3800
6279	5147	AYERSROCK	AR-35	AYERSRK	715967	7201351	510.0	39.0	CAPPED		CZ	SANDSTONE		24.4	0.14		1928
6280	5147	AYERSROCK	AR-36	AYERSRK	714139	7201378	512.0	36.6	ABANDONED		CZ	SANDSTONE	30.5	24.4			1939
6281	5047	AYERSROCK	AR-37	AYERSRK	696926	7200007	518.1	63.7	ABANDONED	(DRYHOLE?)							
6282	5047	AYERSROCK	AR-38	AYERSRK	691925	7200591	526.7	40.8	ABANDONED	(DRYHOLE)							6510
6283	5047	AYERSROCK	AR-39	AYERSRK	685774	7199299	538.2	47.2	CAPPED		CZ	SANDSTONE		37.0	0.10		
6284	5147	AYERSROCK	AR-40	AYERSRK	705755	7192525	525.0	48.8	CAPPED		CZ	SANDSTONE		30.4			
6285	5147	AYERSROCK	AR-41	AYERSRK	706742	7192201	527.7	48.8	CAPPED		CZ	SANDY SILTST		33.8			1100
6286	5047	AYERSROCK	AR-42	AYERSRK	696769	7200126	518.1	59.7	CAPPED		MT CURRIE	CLAY		32.8			
6287	5047	AYERSROCK	AR-43	AYERSRK	696598	7201977	514.5	42.7	CAPPED		CZ	SANDSTONE		30.1			
6288	5047	AYERSROCK	AR-44	AYERSRK	695825	7201167	517.5	54.9	CAPPED		CZ	SILTSTONE		30.9			
6297	5047	AYERSROCK	AR-45	AYERSRK	694960	7201348	518.6	103.6	CAPPED		CZ	SANDSTONE		32.2	3.10		
6316	5047	AYERSROCK	AR-46	AYERSRK	695837	7201158	517.5	115.2	CAPPED		CZ	SANDY SILTST		32.0	3.10		5000
6317	5047	AYERSROCK	AR-47	AYERSRK	693346	7200978	520.9	118.9	CAPPED		CZ	SANDSTONE		34.2	2.50		2416
6318	5047	AYERSROCK	AR-48	AYERSRK	694250	7201223	519.3	79.3	ABANDONED		CZ	SANDSTONE			1.65		2820
6319	5047	AYERSROCK	AR-49	AYERSRK	694277	7201201	519.2	76.8	CAPPED	DAM	CZ	SANDSTONE		32.7	10.00	375.0	2820
6377	5047	AYERSROCK	AR-50	AYERSRK	633873	7199000	545.0	51.8	ABANDONED		CZ	SANDY SILTST	45.7				
6378	5047	AYERSROCK	AR-54	AYERSRK	688812	7195729	541.3	121.9	CAPPED		ININDIA	SILTSTONE		16.5	0.10		
6379	5047	AYERSROCK	AR-55	AYERSRK	687665	7197017	538.5	109.7	CAPPED		ININDIA	SILTSTONE		25.6			1900
6380	5147	AYERSROCK	AR-56	AYERSRK	706009	7193281	524.0	93.0	CAPPED		ININDIA	SILTSTONE		31.2	3.00	20.0	1718
6381	5147	AYERSROCK	AR-57	AYERSRK	707850	7194700	520.0	17.7	ABANDONED	(DRYHOLE)		DOLOMITE					
6382	5147	AYERSROCK	AR-58	AYERSRK	718550	7194500	524.0	124.6	ABANDONED		CZ	SAND	56.7	29.7	1.25		6800
6383	5047	AYERSROCK	AR-V61	AYERSRK	695203	7201567	517.1	74.1	CAPPED		WINNALL	SANDSTONE		31.0	6.30	50.0	3540
6384	5047	AYERSROCK	AR-V62	AYERSRK	691999	7196691	515.0	57.9	ABANDONED		MT CURRIE	SANDSTONE		29.0			
6385	5147	AYERSROCK	AR-V64	AYERSRK	707700	7194700	520.0	68.9	UNUSED		ININDIA	SAND+CLAY			1.25		1380
6406	5047	AYERSROCK	ARV-59	AYERSRK	695865	7199774	520.6	76.2	ABANDONED		ININDIA	QUARTZITE	70.1	51.8	0.10		
6425	5047	AYERSROCK	ARV-60	AYERSRK	695386	7200821	518.3	76.2	CAPPED		ININDIA	SANDSTONE	61.0	33.2	2.25		3046
6999	5147	AYERSROCK	BJ-3	AYERSRK	731300	7195600	517.0	167.9	CAPPED		CZ	SILTSTONE	24.0	28.1	1.65		1481
7000	5147	AYERSROCK	BJ-2	AYERSRK	724116	7195744	518.0	167.9	CAPPED		CZ	SANDSTONE	27.0	26.4	4.80		1640

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7001	5147	AYERSROCK	BJ-1	AYERSRK	721500	7195500	519.0	79.3	CAPPED		WINNALL	QUARTZITE	33.0	25.0	2.50		2960
7002	5047	AYERSROCK	SO-2	AYERSRK	679200	7193200	565.0	167.9	CAPPED		CZ	SANDY SILTST	12.2	12.5	0.75		3087
7003	5047	AYERSROCK	SO-1	AYERSRK	681300	7191500	565.0	167.9	CAPPED		OLIA	SCHIST		13.7	0.25		1280
7056	5147	AYERSROCK	AR-65	AYERSRK	705786	7192655	525.0	75.9	CAPPED		CZ	SILTSTONE		28.0	1.50	60.0	720
7057	5047	AYERSROCK	W-1 (2ND ATT)	AYERSRK	691435	7211171	550.0	35.4	ABANDONED	(DRYHOLE)		SANDSTONE					
7058	5047	AYERSROCK	W-2	AYERSRK	684300	7221800	498.0	58.5	ABANDONED		WINNALL	SANDSTONE			1.25		14500
7059	5047	AYERSROCK	W-3	AYERSRK	683200	7224200	498.0	40.5	CAPPED		WINNALL	SANDSTONE		18.8	2.50		2530
7143	5047	AYERSROCK	NO-1	AYERSRK	678100	7213400	520.0	16.8	ABANDONED	(DRYHOLE)							
7144	5047	AYERSROCK	W-1(1STATT)	AYERSRK	691421	7210857	550.0	35.1	ABANDONED	(DRYHOLE)	WINNALL	SANDSTONE					
7145	5147	AYERSROCK	AR-65	AYERSRK	705796	7192683	525.0	85.3	CAPPED		ININDIA	SILTSTONE		27.7	1.25		
7467																	
7483	5248	LAKEAMADEUS	BMR LKAMADEUS 3B		791800	7256400	535.0	305.9	CAPPED		BITTERSPRINGS	GYPSUM		36.6	0.40		6200
10000	5247	AYERSROCK	SITE-D	AYERSRK	755075	7196201	506.0	39.6	ABANDONED		CZ	SAND+GRAVEL	32.0	16.8	3.00		2420
10001	5147	AYERSROCK	SITE-E/1	AYERSRK	731300	7195600	517.0	39.3	ABANDONED		CZ	SAND+CLAY	35.1	21.3	0.52		
10002	5147	AYERSROCK	SITE-E/2	AYERSRK	731300	7195600	517.0	39.6	CAPPED		CZ	SANDSTONE	34.0	24.4	0.90		1370
10016	5247	AYERSROCK	SITE B-2ATT	CTSP	799048	7200027	478.0	14.8	ABANDONED	(DRYHOLE)							
10017	5247	AYERSROCK	SITE-B-3ATT	CTSP	797500	7197000	484.0	30.5	ABANDONED					9.1			
10018	5247	AYERSROCK	SITE-B-4ATT	CTSP	800648	7203023	477.0	95.4	ABANDONED	(DRYHOLE)							
10019	5247	AYERSROCK	SITE-C	CTSP	777500	7197000	490.0	12.8	UNUSED					3.2			1400
10020	5247	AYERSROCK	SITE-B-1ATT	CTSP	796663	7196586	484.0	10.7	ABANDONED	(DRYHOLE)							
10383	5047	AYERSROCK	R09308502		683200	7199100	546.0	95.0	ABANDONED					24.1	0.40		560
10384	5047	AYERSROCK	R09309503		684700	7199000	543.0	64.0	ABANDONED					29.6	1.00		660
10385	5047	AYERSROCK	R09310504		685800	7198900	542.0	104.0	ABANDONED					44.5	5.80		3000
10386	5047	AYERSROCK	R09307505		682100	7199200	547.0	90.0	ABANDONED					18.6	0.20		610
10387	5247	AYERSROCK	HOMESTEAD-7	CTSP	777500	7197000	490.0	9.1	UNUSED		CZ	CALCRETE	5.5	4.3	0.72		4960
10402	5047	AYERSROCK	R05207006	AYERSRK	680342	7203705	550.0	65.0	ABANDONED	(SEEP ONLY)	MT CURRIE	CONGLOMERATE		15.0			1130
10403	5047	AYERSROCK	R05209507	AYERSRK	682650	7205200	543.0	61.0	ABANDONED		MT CURRIE	CONGLOMERATE	49.0		0.06		3630
10404	5047	AYERSROCK	R01806008	AYERSRK	677200	7206800	543.0	80.0	ABANDONED		CZ	CONGLOMERATE	12.0	8.0	0.06		890
10406	5247	AYERSROCK	B111-SITE1-1ATT	CTSP	801791	7206026	476.0	30.8	ABANDONED	(SEEP ONLY)	CZ	CLAYSTONE					
10407	5247	AYERSROCK	B111-SITEC/2	ANGAS	801158	7206584	476.0	30.5	ABANDONED	(SEEP ONLY)							
10408	5047	AYERSROCK	ARV-63	AYERSRK	695213	7201571	517.1	88.1	CAPPED		CZ	SANDSTONE		31.2	1.00		
10409	5246	AYERSROCK	NO-14BORE	MULGAPK	793327	7160308	537.0	24.4						19.8	1.25		
10410	5146	AYERSROCK	NO-11BORE	MULGAPK	739633	7148770	598.0	24.4	OPENHOLE					19.8	1.25		
10411	5246	AYERSROCK	---DUD	MULGAPK	778723	7132531	616.0	32.9	ABANDONED	(DRYHOLE)							
10412	5246	AYERSROCK	---DUD	MULGAPK	781318	7134687	611.0	24.4	ABANDONED	(DRYHOLE)							
10413	5246	AYERSROCK	---DUD	MULGAPK	783055	7134569	608.0	29.0	ABANDONED	(DRYHOLE)							
10414	5146	AYERSROCK	---DUD	MULGAPK	743300	7123900	651.0	30.5	ABANDONED	(DRYHOLE)							
10415	5146	AYERSROCK	---DUD	MULGAPK	745000	7125100	652.0	30.5	ABANDONED	(DRYHOLE)							
10416	5146	AYERSROCK	---DUD	MULGAPK	737866	7128854	645.0	30.5	ABANDONED	(DRYHOLE)							
10417	5246	AYERSROCK	---DUD	MULGAPK	770600	7137800	599.0	24.4	ABANDONED	(DRYHOLE)							
10418	5246	AYERSROCK	---DUD	MULGAPK	766400	7136450	610.0	27.4	ABANDONED	(DRYHOLE)							
10419	5246	AYERSROCK	NO-1DUD	MULGAPK	767800	7132300	624.0	32.6	ABANDONED	(DRYHOLE)							
10420	5246	AYERSROCK	---DUD	MULGAPK	767800	7132300	624.0	10.7	ABANDONED	(DRYHOLE)							

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10422	5047	AYERSROCK	R01807509	AYERSRK	677600	7207600	535.0	104.0	ABANDONED		MT CURRIE	CONGLOMERATE		13.3	0.10		720
10423	5047	AYERSROCK	R01809510	AYERSRK	678800	7209200	529.0	76.0	ABANDONED		CZ	SANDSTONE	11.0	21.4	0.40		850
10424	5047	AYERSROCK	R05521011	AYERSRK	693251	7210831	520.0	53.5	CAPPED	(DRYHOLE)		SST+CONGL					
10425	5047	AYERSROCK	R13002512	AYERSRK	676700	7198300	580.0	14.8	ABANDONED		MT CURRIE	CONGLOMERATE		7.9			950
10426	5047	AYERSROCK	R13002513	AYERSRK	676700	7198300	580.0	5.5	ABANDONED	(DRYHOLE)							
10427	5047	AYERSROCK	R13002514	AYERSRK	676700	7198300	580.0	8.0	ABANDONED	(DRYHOLE)							
10428	5047	AYERSROCK	R13002515	AYERSRK	676700	7198300	580.0	5.0	ABANDONED	(DRYHOLE)							
10429	5047	AYERSROCK	R13002516	AYERSRK	676700	7198300	580.0	6.5	ABANDONED	(DRYHOLE)							
10431	5147	AYERSROCK	AR51	AYERSRK	710200	7191700	528.0	123.6		(DRYHOLE?)		SILTST+QTZITE					
10432	5147	AYERSROCK	AR52	AYERSRK	716700	7192100	528.0	94.5				CONGLOMERATE					
10433	5147	AYERSROCK	AR53	AYERSRK	717050	7193200	510.0	75.9	ABANDONED		PINYINNA?	SST+DOLOM					
10451	5146	AYERSROCK	10N2100W19	BRITTJCK	720750	7162900	561.0	109.0	ABANDONED		CZ	CLAY, MNR SAND		32.0	2.50		1440
10452	5146	AYERSROCK	00N0000W21	BRITTJCK	722800	7153150	579.0	74.0	ABANDONED		CZ/DEAN	CLAY/QZITE @73	73.0	31.0	3.00		2460
10453	5147	AYERSROCK	30N1000E22	BRITTJCK	724200	7183500	540.0	101.0	ABANDONED		CZ	SAND		32.0	1.50		1800
10454	5146	AYERSROCK	20N3000W17	BRITTJCK	720400	7172700	549.0	67.0	ABANDONED		CZ	SND+GVL IN CLAY	67.0	29.0	2.90		2170
10455	5146	AYERSROCK	20N1500W18	BRITTJCK	721850	7172600	550.0	98.0	ABANDONED	(SEEP ONLY)	CZ	CLAY		29.0			2800
10456	5147	AYERSROCK	30N1800W20	BRITTJCK	721300	7183500	541.0	83.0	ABANDONED	(SEEP ONLY)	CZ	CLAY					
10457	5147	AYERSROCK	43N5500W24	AYERSRK	718300	7195700	521.0	94.4	ABANDONED	(SEEP ONLY)	CZ	SAND+GRAVEL					
10463	5047	AYERSROCK	G392856-23	AYERSRK	694193	7202120	517.5	90.0	CAPPED		CZ	SAND+CLAY	43.0	31.0	6.30	600.0	1800
10464	5047	AYERSROCK	G394858-26	AYERSRK	695157	7203152	512.9	79.0	ABANDONED		CZ	SANDSTONE		28.0			1310
10465	5047	AYERSROCK	G392859-29	AYERSRK	694137	7204323	516.4	84.0	ABANDONED		PINYINNA	PHYLLITE		28.0	6.30	2.0	1480
10466	5147	AYERSROCK	45N2200W 27	P/MANN	721500	7197000	518.0	55.2			CZ?	SAND	45.0	27.1	3.03		2400
10467	5147	AYERSROCK	44N1200E 28	P/MANN	725200	7197000	490.0	76.0			CZ?	?CONGLOMERATE	55.0		0.38		1460
10468	5147	AYERSROCK	42N0800E-30	AYERSRK	725000	7195200	519.0	47.7	ABANDONED		CZ	GRAVEL+SAND	42.0	26.6	3.00		1790
10484	5047	AYERSROCK	G391848-31	AYERSRK	692903	7203306	519.0	85.0	ABANDONED		CZ	GRAVEL+SAND	30.0	31.0			
10485	5047	AYERSROCK	G391856-32	AYERSRK	693006	7202020	519.9	78.0	ABANDONED		CZ	SANDSTONE	33.0	33.4	7.52	600.0	1640
10486	5047	AYERSROCK	G392854-33	AYERSRK	694093	7199740	520.8	85.0	ABANDONED		CZ	SANDSTONE	60.0	34.0	2.50	14.0	4340
10487	5047	AYERSROCK	G389855-34	AYERSRK	691384	7200825	526.0	90.0	ABANDONED		CZ	SANDSTONE	36.0	38.0			
10488	5047	AYERSROCK	G393858-35	AYERSRK	695211	7203727	514.6	72.0	ABANDONED		PINYINNA	DOLOMITE		29.0	0.25		1560
10489	5047	AYERSROCK	G392858-36	AYERSRK	694194	7203174	516.3	66.0	ABANDONED		CZ	SANDSTONE		29.0			
10490	5047	AYERSROCK	G-37	AYERSRK	694172	7203149	516.5	66.0	OPERATING	ENGINE+PUMP (YULARA)	CZ	SANDSTONE	45.0	30.4	23.00	370.0	1450
10491	5047	AYERSROCK	G-38	AYERSRK	696234	7201988	513.8	81.0	CAPPED		CZ	SANDSTONE	63.0	29.0	12.50	400.0	1750
10492	5047	AYERSROCK	G-39	AYERSRK	697557	7202768	512.2	91.0	ABANDONED		CZ	SANDSTONE	33.0	28.0	0.25		2020
10493	5047	AYERSROCK	G-40	AYERSRK	692487	7199915	525.0	66.0	ABANDONED		CZ	SANDY SILTST	27.0	38.0	0.50		3120
10494	5047	AYERSROCK	G-41	AYERSRK	698189	7201712	514.3	61.0	OPENHOLE		CZ	SANDSTONE	45.0	30.0	4.55		3560
10495	5147	AYERSROCK	NO4REPL	AYERSRK	704879	7193283	512.2	73.0	CAPPED		CZ	SANDSTONE	66.0	30.2	3.80		810
10596	5047	AYERSROCK	G394857-42	AYERSRK	696181	7202654	513.5	91.0	ABANDONED		PINYINNA	CALC SILTST		27.5	3.08		2360
10597	5047	AYERSROCK	G-43	AYERSRK	696482	7201528	515.1	102.0	ABANDONED		CZ	CLAYSTONE			2.30		2140
10598	5047	AYERSROCK	G-44	AYERSRK	696376	7200736	518.2	100.0	ABANDONED		CZ	SANDSTONE	45.0		3.00		3590
10619	5047	AYERSROCK	G392858-45	AYERSRK	693881	7204141	516.7	90.0	ABANDONED		CZ	CHERT	66.0	30.1	6.00		2580
10620	5047	AYERSROCK	G391860-46	AYERSRK	693424	7204578	517.8	67.0	ABANDONED	(DRYHOLE)							
10621	5047	AYERSROCK	G391860-47	AYERSRK	693090	7204323	518.4	97.0	ABANDONED		MT CURRIE	CONGLOMERATE		24.8	0.13		940
10661	5047	AYERSROCK	G391860-48	AYERSRK	693676	7204728	517.3	83.5	CAPPED		MT CURRIE	CONGLOMERATE		21.3	1.01		2050

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME		AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
10662	5047	AYERSROCK	G392858-49	AYERSRK	693567	7203902	517.3	116.0	ABANDONED		PINYINNA	SANDSTONE		29.8	2.50		540
10666	5047	AYERSROCK	G391857-50	AYERSRK	692946	7202623	520.0	93.0	ABANDONED		CZ	SANDSTONE	42.0	33.2	2.00		1690
10667	5047	AYERSROCK	G392857-51	AYERSRK	694311	7202472	516.6	122.0	CAPPED		CZ	SANDSTONE	36.0	31.2	5.00		1620
10668	5047	AYERSROCK	G392855-52	AYERSRK	694223	7201679	519.7	108.0	CAPPED		CZ	SANDSTONE	36.0	33.4	5.00		2090
10688	5047	AYERSROCK	G-53	AYERSRK	694280	7200369	520.6	96.0	ABANDONED		CZ	?GRAVEL		33.2			5500
10689	5047	AYERSROCK	G-54	AYERSRK	691962	7201586	522.1	108.0	CAPPED		CZ	SANDSTONE	48.0	34.2	3.40		1740
10690	5047	AYERSROCK	G-55	AYERSRK	689493	7201117	530.0	64.0	ABANDONED	(DRYHOLE)	CZ						
10691	5047	AYERSROCK	G-56	AYERSRK	700606	7200653	516.6	121.0	ABANDONED		CZ	CLAY+SANDST	72.0	32.2	3.50		5390
10692	5047	AYERSROCK	G-57	AYERSRK	699125	7203683	509.0	108.0	CAPPED		CZ	SANDY SILTST	36.0	26.3	8.00		2430
10693	5047	AYERSROCK	G-58	AYERSRK	695327	7202407	516.5	108.0	CAPPED		CZ	GRAVEL+SAND	54.0	30.2	5.50		1690
10694	5047	AYERSROCK	G-59	AYERSRK	697520	7204119	510.2	42.0	CAPPED		CZ	SANDSTONE	36.0	30.2	4.50		1770
10695	5047	AYERSROCK	ARMSTRONGCK4	AYERSRK	655142	7210496	552.0	24.0	CAPPED		MT CURRIE	CONGLOMERATE		10.1	8.00		910
10806	5246	AYERSROCK	A43/4	CTSP	798513	7170478	518.0	66.4	ABANDONED	(DRYHOLE)	PROTEROZOIC	SILTSTONE	39.0				
10807	5247	AYERSROCK	A43/6	CTSP	796382	7186982	490.0	80.0	ABANDONED	(SEEP ONLY)	CZ	CLAY	76.0		0.13		
10921	5047	AYERSROCK	G-60	AYERSRK	698935	7202809	514.2	115.0	ABANDONED								
11539	5147	AYERSROCK	77/1	AYERSRK	704627	7193505	521.3	116.8	CAPPED		CZ	SANDSTONE		25.9	0.60		440
11540	5147	AYERSROCK	77/2	AYERSRK	703494	7193582	520.8	77.0	CAPPED		PINYINNA	ARKOSE+SILTST		11.2	2.00		580
11541	5147	AYERSROCK	77/3	AYERSRK	703508	7192467	524.5	107.8			CZ	SANDSTONE	66.0	28.2	5.00		1570
11542	5147	AYERSROCK	77/4	AYERSRK	704468	7192515	527.1	82.0	CAPPED		CZ	SILTSTONE	64.0	31.0			1120
11543	5147	AYERSROCK	77/5	AYERSRK	702452	7192367	527.0	35.0	ABANDONED	(DRYHOLE)							
11544	5147	AYERSROCK	77/6	AYERSRK	702493	7193054	530.3	3.0	ABANDONED	(DRYHOLE)							
11545	5147	AYERSROCK	77/7	AYERSRK	703038	7193233	522.2	48.3	OPERATING	ENG+PUMP (NATPK OFF)	PINYINNA	SANDSTONE	47.0	23.8	3.00		690
11546	5147	AYERSROCK	77/8	AYERSRK	704288	7193941	522.5	34.0	ABANDONED	(DRYHOLE)							
11547	5147	AYERSROCK	77/9	AYERSRK	702800	7193560	520.0	19.0	ABANDONED		CZ/MTCURRIE	?/?96					
11548	5147	AYERSROCK	77/10	AYERSRK	702929	7194021	519.8	4.0	ABANDONED	(DRYHOLE)							
11549	5147	AYERSROCK	77/11	AYERSRK	703094	7194298	519.2	5.3	ABANDONED	(DRYHOLE)							
11550	5147	AYERSROCK	77/12	AYERSRK	703289	7194452	519.1	8.1	CAPPED		CZ	SANDSTONE		5.4			670
11551	5147	AYERSROCK	77/13	AYERSRK	703524	7193420	521.4	59.3	CAPPED		PINYINNA	LIMESTONE	45.0	22.7	4.03	30.0	700
11573	5147	AYERSROCK	77/14	AYERSRK	703417	7193569	520.9	77.6	CAPPED					15.2			700
11574	5147	AYERSROCK	77/15	AYERSRK	703114	7193045	523.1	77.3	CAPPED		PINYINNA	LIMESTONE	51.0	21.6	2.00	55.0	660
11576	5147	AYERSROCK	77/16	AYERSRK	704044	7192984	522.4	83.3	CAPPED		CZ	SANDSTONE	27.0	25.8	2.00		730
11577	5147	AYERSROCK	77/17	AYERSRK	705845	7193539	519.9	148.4	CAPPED		CZ	SAND	81.0	25.3	4.00		1490
11578	5147	AYERSROCK	77/18	AYERSRK	703544	7193438	521.3		CAPPED		PINYINNA	SANDSTONE	42.0	20.6	1.00	25.0	680
11579	5147	AYERSROCK	77/19	AYERSRK	703047	7193213	522.2	61.2	CAPPED	(OBSBORE)	PINYINNA	SILTSTONE	42.0	21.1	3.00	45.0	690
11582	5046	AYERSROCK	KULPITJATA-1	P/MANN	694505	7146345	660.0	78.0			OLIA	GNEISS	30.0		0.40		
11583	5146	AYERSROCK	KULPITJATA-2	P/MANN	702073	7145900	638.0	65.6		(SEEP ONLY)			35.6				
11584	5146	AYERSROCK	KULPITJATA-3	P/MANN	702252	7145600	635.0	74.6		(SEEP ONLY)			51.0				
11585	5046	AYERSROCK	KULPITJATA-4	P/MANN	692738	7144452	700.0	59.6			OLIA?	GNEISS	55.0		3.00		
11605	5147	AYERSROCK	PRODUCTION-5	AYERSRK	705769	7192525	525.0	52.0	CAPPED		CZ	SANDSTONE	33.0	31.3	4.00	90.0	540
11753	5248	LAKEAMADEUS	BMRPHOSPHATE-4	CTSP	793870	7239589	560.0	103.3	ABANDONED		STOKES/STAIRWAY	SANDSTONE		61.8			2082
11754	5249	LAKEAMADEUS	BMR-AP-1	TEMPE	773870	7314498	670.0	280.0	ABANDONED		STAIRWAY			30.5			
11755	5148	LAKEAMADEUS	LAKEAMADEUS 1,1A		718470	7241080	460.0	121.9	ABANDONED	(EXPLORATION DDH)	CZ/BITTERSPRNGS	DOLOMITE		18.3			183755
11778	5147	AYERSROCK	PRODUCTION-6	AYERSRK	705794	7192595	525.0	113.9	PRODUCTION	ENGINE+PUMP	CZ	SILTSTONE	110.0	30.5	10.00		3120

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11789	5246	AYERSROCK	GC-1/78	MULGAPK	767100	7132000	625.0	49.0			OLIA?	GRANITE		29.0	1.77		1450
11790	5247	AYERSROCK	GC1/78	CTSP	777500	7197000	490.0	15.0	OPERATING	ENGINE+PUMP	CZ	CALCRETE		3.0	2.27		2500
11791	5247	AYERSROCK	A 43/9	CTSP	790000	7181300	550.0	72.0	ABANDONED	(SALT)	ININDIA	SANDSTONE	43.0	38.0	0.53		
11827	5147	AYERSROCK	PRODUCTION-7	AYERSRK	705749	7193870	523.0	78.1		ENGINE+PUMP	CZ	SAND	73.0	25.6	4.00		830
11865	5247	AYERSROCK	A43/7	CTSP	777500	7197000	490.0	30.0	ABANDONED		CZ	CALCRETE	4.0	2.5	0.57		5470
12058	5047	AYERSROCK	PRODUCTION-2	AYERSRK	694200	7202900	516.4	67.6	OPERATING	ENGINE+PUMP (YULARA)	CZ	SAND	46.6	32.3	7.20	393.0	1468
12059	5047	AYERSROCK		AYERSRK	699800	7204500	510.6	48.0	ABANDONED		CZ	SAND	36.0	28.4	3.00		2400
12060	5047	AYERSROCK		AYERSRK	700200	7206400	506.9	42.0	ABANDONED		CZ	SAND	37.4	28.6	8.00		2715
12061	5047	AYERSROCK		AYERSRK	699600	7208300	500.6	60.0	ABANDONED		CZ	SAND	57.0	11.4	11.00		2597
12062	5047	AYERSROCK		AYERSRK	699200	7205000	503.4	54.0	ABANDONED		CZ	SAND	40.5		2.00		2715
12063	5047	AYERSROCK	2S		699000	7206900	550.6	48.0	CAPPED		CZ	SAND	37.0	22.2	9.00		1990
12064	5047	AYERSROCK	2NEAST	AYERSRK	699600	7210200	496.8	49.5	ABANDONED		CZ	SAND	38.0	15.3	2.00		2650
12065	5047	AYERSROCK	5N	AYERSRK	698700	7212900	492.5	42.0	CAPPED		CZ	SAND	37.4	12.3	3.50	65.0	2550
12066	5047	AYERSROCK	2SW	AYERSRK	697900	7208300	501.3	48.0	CAPPED		CZ	SAND	37.0	20.2	3.50	111.0	1580
12067	5047	AYERSROCK		AYERSRK	697700	7206600	502.7	49.5	ABANDONED		CZ	SAND	36.0	21.2	1.00		1476
12068	5047	AYERSROCK		AYERSRK	700600	7208500	498.6	37.5	ABANDONED		CZ	SAND	30.0	19.0	2.00		2941
12069	5047	AYERSROCK	2E	AYERSRK	701400	7208700	497.9	36.0	CAPPED	(OBSBORE)	CZ	SAND	34.0	17.3	2.00		3260
12070	5147	AYERSROCK		AYERSRK	702300	7208800	501.3	36.0	ABANDONED		CZ	SAND	36.0	21.1	1.00		2870
12071	5047	AYERSROCK		AYERSRK	699500	7209300	499.8	40.0	ABANDONED		CZ	SAND	31.5	18.7	5.00		2750
12072	5047	AYERSROCK	1SW	AYERSRK	698900	7208400	505.4	49.5	CAPPED		CZ	SAND	43.5	23.6	4.60	55.0	2050
12073	5047	AYERSROCK		AYERSRK	698000	7209500	498.7	49.5	ABANDONED		CZ	SAND	36.5	17.4	1.00		2120
12074	5047	AYERSROCK		AYERSRK	697800	7211100	495.7	39.0	ABANDONED		CZ	SAND	33.5	14.8	1.00		2520
12075	5047	AYERSROCK		AYERSRK	696900	7211800	492.8	54.0	ABANDONED		CZ	SAND	30.5	12.9	0.50		1530
12076	5047	AYERSROCK		AYERSRK	697800	7212300	493.1	37.5	ABANDONED		CZ	SAND	27.0	12.6	3.00		2110
12077	5047	AYERSROCK		AYERSRK	697500	7208400	500.3	48.0	ABANDONED		CZ	SAND	32.0	18.9	0.50		1560
12078	5047	AYERSROCK		AYERSRK	697100	7208400	500.8	53.0	ABANDONED		CZ	SAND	43.0	19.7	0.25		1350
12079	5047	AYERSROCK		AYERSRK	696900	7207000	503.3	45.9	ABANDONED		CZ	SAND	43.0	23.9	0.25		1440
12080	5047	AYERSROCK	5SW	AYERSRK	697400	7206400	506.5	48.0	CAPPED		CZ	SAND	28.0	24.2	0.25		1450
12081	5047	AYERSROCK	3NNW	AYERSRK	698800	7211000	495.4	88.9	CAPPED		CZ	SAND	76.3	14.6	3.00		2580
12082	5047	AYERSROCK	1SE	AYERSRK	699500	7211200	495.4	53.0	ABANDONED		CZ	SAND	18.0		1.00		3340
12083	5047	AYERSROCK	1SE	AYERSRK	700200	7207300	503.7	84.4	CAPPED		CZ	SAND	61.7	22.4	1.75		3720
12159	5047	AYERSROCK	2.5W	AYERSRK	697300	7208400	500.6	101.0	CAPPED	(OBSBORE)	CZ	SAND	32.0	19.9	0.25		1370
12160	5147	AYERSROCK	7E	AYERSRK	705850	7208800	498.6	38.0	CAPPED		CZ/PALAEOZOIC?	SAND/SST @30M	22.0	16.9	4.00	132.0	2830
12161	5147	AYERSROCK	5E	AYERSRK	704300	7209200	498.2	38.0	CAPPED		CZ/PALAEOZOIC?	CLAY/SILTST @35	30.5	17.0	4.00		1890
12162	5047	AYERSROCK	3SSW	AYERSRK	698700	7206500	505.9	53.0	CAPPED		CZ	SAND	42.0	23.2	3.54	90.0	1550
12163	5047	AYERSROCK	3NREPLACEMNT	AYERSRK	699500	7211200	495.4	63.0	CAPPED	(OBSBORE)	CZ	SAND	23.0	14.2	1.75		3160
12164	5047	AYERSROCK	2NWEST	AYERSRK	699600	7208200	501.0	43.0	CAPPED		CZ	SAND	35.0	20.0	3.52	111.0	2700
12447	5047	AYERSROCK	L	AYERSRK	698700	7212900	445.0	39.0	CAPPED		CZ	SILTSTONE	39.0	13.1	4.00		2695
12448	5047	AYERSROCK		AYERSRK	698700	7212900	495.0	44.0	CAPPED		CZ	CLAY	39.0	13.3	4.00		2760
12449	5047	AYERSROCK	SITE-A	AYERSRK	693900	7204200	516.7	122.6	CAPPED	(OBSBORE)	PINYINNA	DOLOMITE	116.0	29.4	2.00		1395
12450	5047	AYERSROCK	SITE-B	AYERSRK	694600	7204700	514.9	121.6	ABANDONED				24.0	22.4			
12451	5047	AYERSROCK	SITE-G	AYERSRK	695300	7204600	513.5	121.6	ABANDONED					27.6			
12452	5047	AYERSROCK		AYERSRK	695400	7204400	513.4	140.9	CAPPED	(OBSBORE)	CZ	SAND	57.0	28.5	9.75		1447

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12453	5047	AYERSROCK	SITE-E AYERSRK	696200	7205100	510.8	103.3		ENGINE+PUMP	ININDIA	SANDSTONE	86.0	30.0	3.25	20.0	1240
12454	5047	AYERSROCK	SITE-D AYERSRK	696400	7205800	508.8	112.4	CAPPED		ININDIA	SANDSTONE	71.0	27.0	1.00		1460
12455	5047	AYERSROCK	12079SITE AYERSRK	696900	7207000	503.3	144.5		ENGINE+PUMP	ININDIA	FRACT SILTST	50.0	25.2	4.79	45.0	1479
12456	5047	AYERSROCK	RN12079SITE AYERSRK	696900	7207000	503.3	135.3	CAPPED		ININDIA	FRACT SILTST	43.0	24.8	1.00		1440
12457	5047	AYERSROCK	12452SITE AYERSRK	695400	7204400	513.4	126.0		ENGINE+PUMP	ININDIA	CHERT	112.0	29.1	2.70	84.0	1750
12458	5047	AYERSROCK	AYERSRK	695400	7204400	513.4	59.5		ENGINE+PUMP	CZ	SAND	56.6	29.1	7.50	140.0	1380
12459	5047	AYERSROCK	12453 SITE AYERSRK	696200	7205100	510.8	85.6	CAPPED		MT CURRIE	BASE OF CONGL	84.0	29.4	3.00		1320
12460	5047	AYERSROCK	AYERSRK	693900	7204200	516.7	113.1	CAPPED		PINYINNA	DOLOMITE		29.8	1.00	25.0	1305
12754	5247	AYERSROCK	118.5 KM LASSETERHWY	764600	7202000	490.0	32.0	CAPPED?				14.0	6.6	1.25		990
12755	5247	AYERSROCK	118.9 KM LASSETERHWY	764300	7202300	490.0	36.0	CAPPED?				24.3	6.7	3.00		960
12756	5147	AYERSROCK	134 KM LASSETERHWY	750650	7207500	498.0	99.0	CAPPED?		CZ	SDYCLAY/GRAVEL	14.0	9.0	1.00		2220
12757	5147	AYERSROCK	134.5 KM LASSETERHWY	750650	7207200	498.0	21.0	CAPPED?		CZ		14.0	11.0	3.00		2260
12758	5147	AYERSROCK	134.8 KM LASSETERHWY	750150	7207350	498.0	27.0	CAPPED?		CZ		14.0	9.0	5.00		2030
12759	5147	AYERSROCK	149 KM LASSETERHWY	736100	7209250	499.0	33.0	CAPPED	DAM	CZ		20.0	15.0	4.50		1400
12760	5147	AYERSROCK	149.25KM LASSETERHWY	735850	7209250	499.0	37.0	CAPPED?	DAM	CZ?	CALCR+CLAY	21.0	15.1	3.00		1460
12761	5147	AYERSROCK	162.4 KM LASSETERHWY	723050	7208400	502.0	52.0	CAPPED?		CZ	CLAYEYSAND	21.0	17.8	2.25		1390
12762	5147	AYERSROCK	162.9 KM LASSETERHWY	722500	7208250	502.0	37.0	CAPPED?		CZ?		21.0	17.3	6.00		1590
12854	5246	AYERSROCK	NO-1REPL MULGAPK	773572	7130688	630.0	36.0			OLIA?	GRANITE		21.5	1.01		1180
12855	5146	AYERSROCK	NO-10REPL MULGAPK	743600	7125500	650.0	29.0			OLIA?	QZ+GRANITE	14.0	14.0	1.14		3050
12856	5246	AYERSROCK	A122/5 MULGAPK	798900	7126644	593.0	37.0				GRANITE	24.0		2.27		3680
12857	5246	AYERSROCK	NO-9 MULGAPK	779989	7125557	632.0	53.0			OLIA	SCHIST		14.5	1.63		5480
12971	5146	AYERSROCK	1/80 ARMATA	728100	7130500	621.0	40.0	ABANDONED	(DRYHOLE)	OLIA	GRANITE					
12972	5146	AYERSROCK	ALPARA-1 ARMATA	718000	7139419	621.0	18.0			OLIA	GRANITE	15.0	8.0	2.52		
12981	5146	AYERSROCK	ALPARA-2 ARMATA	723500	7138866	608.0	23.0			OLIA	GRANITE	16.0	14.0	0.94		
13041	5249	LAKEAMADEUS	WESTWALKER TEMPE	795269	7323341	598.0	121.0			MEREENIE	SANDSTONE		21.0	4.50		1750
13194	5249	LAKEAMADEUS	KCR-81/2 TEMPE	800692	7293249	640.0	150.0	ABANDONED	(DRYHOLE)	STAIRWAY						
13276	5147	AYERSROCK	140 KM-A LASSETERHWY	744200	7208100	498.0	30.0			CZ?	CLAY	15.0	15.0	2.27		1240
13277	5147	AYERSROCK	140 KM-B LASSETERHWY	744200	7208100	498.0	30.0	CAPPED	DAM	CZ	SAND+CLAY	15.0	10.3	3.79		1270
13278	5147	AYERSROCK	154 KM LASSETERHWY	728850	7209800	504.0	30.0	CAPPED		CZ	CALCRETE	24.0	17.2	2.52		
13279	5147	AYERSROCK	154 KM-B LASSETERHWY	728850	7209800	504.0	30.0	CAPPED?			LIMESTONE	21.0	18.0	3.79		1400
13299	5249	LAKEAMADEUS	A146/1 TEMPE	788000	7295400	620.0	91.0	OPERATING	ENGINE+PUMP	PACOOTA	SANDSTONE	70.0	46.0	1.51		5150
13363	5246	AYERSROCK	PRODUCTION 1 YULARA	698603	7208237		66.0	OPERATING	ELECTRIC PUMP	CZ	SAND/CALCR/CLAY	41.0	22.7	25.00	350.0	2150
13365	5246	AYERSROCK	PRODUCTION 2 YULARA	698625	7208237		66.5	OPERATING	ELECTRIC PUMP	CZ	SAND/CALCR/CLAY	41.0	23.0	25.00	500.0	2150
13400	5249	LAKEAMADEUS	SALT KINGSCYN	788440	7297830	606.5	41.2	ABANDONED		CARMICHAEL	SANDSTONE	28.9	4.5			38100
13417	5249	LAKEAMADEUS	EASTMEREENIE-6 H/BF	772240	7334833	695.0		CAPPED		MEREENIE	SANDSTONE	690.5		13.00		760
13509	5247	AYERSROCK	PMANNRD-82/6 AYERSRK	793929	7194247	477.9	49.0	ABANDONED	(DRYHOLE)							
13510	5247	AYERSROCK	ROADBORE83/2 CTSP	788570	7192360	485.0	55.0	ABANDONED					7.0	0.40		
13511	5247	AYERSROCK	PETERMANNRD82/8 CTSP	787700	7192800	485.0	67.0	ABANDONED		CZ	CALCRETE	12.0	7.4	0.50		
13512	5247	AYERSROCK	PETERMANNRD82/9 CTSP	791250	7192450	482.9	61.0	ABANDONED		CZ	CALCRETE	9.2	6.2	0.60		14000
13554	5246	AYERSROCK	NO-5DUPL MULGAPK	756500	7132300	628.0	55.0			OLIA?	GRANITE		6.0	1.30		7330
13555	5246	AYERSROCK	A122/6 MULGAPK	788951	7127113	615.0	91.0	ABANDONED	(SEEP ONLY)	OLIA	GRANITE		67.0			3990
13627	5247	AYERSROCK	NEWAMERY CTSP	799910	7180780	498.0	30.0	OPERATING	PUMPJACK+ENGINE	CZ	CALCRETE	10.0	7.0	1.20		2200
13661	5149	LAKEAMADEUS	TEMPEVALE-1 H/BF	732147	7339475	708.0	140.0	CAPPED		STOKES		43.0	40.0	1.50		

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME	AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
13764	5247	AYERSROCK	WYNDOW CTSP	778260	7189770	496.0	10.9	UNUSED		CZ	CALCRETE		3.9			1600
13842	5246	AYERSROCK	ROADBORE83/1 MULGAPK	780450	7166550	530.0	100.0	CAPPED	DAM	ININDIA	SANDSTONE		12.3	0.90		2040
13843	5246	AYERSROCK	ROADBORE CTSP	781770	7171810	525.0	55.0	CAPPED	DAM	ININDIA	SANDSTONE		12.3	5.00		3230
13861	5249	LAKEAMADEUS	EAST MEREENIE-2	769028	7337349	725.0	213.0	CAPPED		HERMANNSBURG	SANDSTONE	186.0	61.0	4.00		920
13862	5249	LAKEAMADEUS	H/BF	756573	7342833	752.0	183.0	ABANDONED	(DRYHOLE)							
13864	5249	LAKEAMADEUS	H/BF	757000	7341500	785.0	280.0	CAPPED		HERMANNSBURG	SANDSTONE	210.0	183.0	1.60		410
13872	5249	LAKEAMADEUS	A146/4 KINGSCRK	785422	7297084	612.0	57.0	OPERATING	PUMP	STAIRWAY	SANDSTONE	52.0	33.0	2.50		2447
13979	5249	LAKEAMADEUS	BAGOTSP84/1 TEMPE	784416	7299892	623.1	103.0	CAPPED		QA/CARMICHAEL	SANDSTONE	24.0	13.8	1.00		940
13980	5249	LAKEAMADEUS	REEDYROCKHOLE KNGSCN	764040	7309940	636.9	61.0	OPERATING	ENGINE+PUMP	QA/CARMICHAEL	SANDSTONE	36.0	19.6	1.00		400
13981	5249	LAKEAMADEUS	TEMPESTOCK TEMPE	760050	7308830	619.4	139.0	CAPPED		PACOOTA	SANDSTONE	109.0	86.2	3.00		780
13982	5249	LAKEAMADEUS	RANGERS-84/1 KINGSCN	759290	7311020	619.0	152.0	ABANDONED		STAIRWAY	SANDSTONE	118.0	72.4	0.50		676
13983	5149	LAKEAMADEUS	ULPANYALI	754000	7317940	620.3	109.0	OPERATING	PUMP	STAIRWAY	SANDSTONE	94.0	86.7	1.50		1360
13984	5249	LAKEAMADEUS	K/CANYON84/1 TEMPE	760182	7314930	616.4	150.0	ABANDONED		CARMICHAEL	SANDSTONE	32.0	26.2	0.30		1070
14009	5249	LAKEAMADEUS	WOOPATA 84/2 TEMPE	760030	7308870	619.1	122.0	CAPPED		PACOOTA	SANDSTONE	104.0	86.1	2.00		560
14010	5249	LAKEAMADEUS	RANGERS84/2 TEMPE	758358	7310990	615.0	128.0	ABANDONED		PACOOTA	SANDSTONE	122.5	85.3	1.80		460
14130	5247	AYERSROCK	CONMAN 1 (MID) CTSP	774960	7203180	492.4	19.5	UNUSED		CZ	CALCRETE		4.0	1.25		1360
14131	5247	AYERSROCK	CONMAN 2 (STH) CTSP	774960	7203180	492.6	19.5	UNUSED		CZ	CALCRETE		4.0	1.25		
14132	5247	AYERSROCK	CTSP	770700	7217000	495.0	12.0	ABANDONED	(DRYHOLE)							
14133	5247	AYERSROCK	AMERYSTANDBY CTSP	799912	7180780	498.0	30.0	UNUSED		CZ	CALCRETE		9.0	1.25		
14152	5249	LAKEAMADEUS	OBSBORE KINGS CANYON	758340	7311000	609.1	126.0	CAPPED		PACOOTA	SANDSTONE	123.0	75.9	6.00		460
14153	5149	LAKEAMADEUS	OCHREHILL84/2 TEMPE	753930	7317860	619.3	115.7	CAPPED		STAIRWAY	SANDSTONE	105.0	85.6	3.00		1350
14154	5249	LAKEAMADEUS	LEASEBACK TEMPE	757920	7308070	602.1	91.0	OPERATING	WINDMILL	CLELAND?	SANDSTONE	79.0	69.1	1.10		1000
14155	5249	LAKEAMADEUS	K/CANYON84/2 TEMPE	760127	7315025	618.4	64.0	CAPPED		CARMICHAEL	SANDSTONE	15.2	10.8	0.80		980
14156	5249	LAKEAMADEUS	K/CANYON84/3 TEMPE	760170	7315000	618.1	91.0	CAPPED		CARMICHAEL	SANDSTONE	39.0	14.9	0.44		890
14157	5249	LAKEAMADEUS	BAGOTSP84/2 TEMPE	784386	7299966	626.1	36.6	CAPPED		CARMICHAEL	SANDSTONE	26.0	12.9	0.50		470
14158	5249	LAKEAMADEUS	REEDYR/H84/2 TEMPE	763840	7309520	630.4	41.5	CAPPED		CARMICHAEL	SANDSTONE	35.5	26.1	1.50		450
14231	5249	LAKEAMADEUS	A60/14 TEMPE	794761	7294170	627.0	200.0	CAPPED	(OBSBORE)	PACOOTA	SILTST/SANDST	180.0	108.7	4.00		1100
14253	5249	LAKEAMADEUS	TEMPE	796000	7294600	660.0	111.0	ABANDONED	(DRYHOLE)							
14254	5249	LAKEAMADEUS	TEMPE	792500	7287800		117.0					109.0	68.0	1.25		1090
14255	5249	LAKEAMADEUS	KINGSCK	744700	7297900	562.0	30.0	ABANDONED	(DRYHOLE)		SANDYCLAY					
14256	5149	LAKEAMADEUS	A146/3 KINGSCK	746600	7299000	568.1	57.0	OPERATING	ENGINE+PUMP	PACOOTA	SANDSTONE	48.0	32.0	1.00		930
14257	5149	LAKEAMADEUS	KINGS CREEK	743907	7314982	614.0	112.0				SANDSTONE	105.0	81.2	1.90		
14279	5247	AYERSROCK	TOMS CTSP	769360	7198670	493.7	12.5	UNUSED		CZ	CALCRETE		6.0	3.00		850
14368	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	758120	7311300	607.3	226.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE		73.8	20.00		930
14369	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	758140	7311200	606.7	317.8	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE		73.3	75.00		1460
14370	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	757560	7310300	603.4	318.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE		70.0	40.00		
14371	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	757270	7310000	602.6	200.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE	105.0	69.4	15.00		1000
14372	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	759500	7311080	612.7	275.0	CAPPED	(OBSBORE)	STWAY/HORNV/PAC	SANDSTONE		64.3	18.00		2000
14373	5149	LAKEAMADEUS	6/85 OBS KINGSCYN	751680	7315900	644.7	307.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE		109.8	37.00		850
14374	5149	LAKEAMADEUS	7/85 KINGSCYN	750300	7316200	656.7	198.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE	140.0	122.9	1.00		1000
14413	5049	LAKEAMADEUS	OBS BORE KINGS CNYON	746630	7327950	662.7	299.0	CAPPED	(OBSBORE)	PACOOTA	SANDSTONE		129.5	25.00		1000
14414	5049	LAKEAMADEUS	OBS BORE KINGS CNYON	748550	7328500	649.7	239.0	CAPPED	(OBSBORE)	PACOOTA	SST-SLTST-LST		65.1	18.00		
14415	5049	LAKEAMADEUS	OBS BORE KINGS CNYON	755560	7315900	604.1	203.0	CAPPED	(OBSBORE)	PACOOTA	SST-SLTST-SST	60.0	69.0			

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14483	5249	LAKEAMADEUS	MCMAHONS BORE KGSCYN	772960	7300740	655.3	166.0	CAPPED		PACOOTA	SANDSTONE	158.0	123.1	3.00		930
14824	5249	LAKEAMADEUS	OBS BORE KINGS CNYON	772962	7300715	650.0	221.0	CAPPED		PACOOTA	SANDSTONE	130.0	101.2	8.00		500
14920	5247	AYERSROCK	A43/10	787063	7228828	535.0	80.0				SANDSTONE	72.0	47.6	3.00		
14921	5248	LAKEAMADEUS	A43/14 CTSP	780045	7241964	530.0	57.0				SANDSTONE	48.0	41.0	2.00		
14922	5247	AYERSROCK	A43/11	792092	7225282	515.0	50.0				SANDSTONE	47.0		1.00		
14923	5247	AYERSROCK	A43/12	796060	7222757	520.0	50.0				SANDSTONE	49.0		4.00		
14924	5248	LAKEAMADEUS	A43/17 CTSP	794500	7238000	560.0	87.0				SANDSTONE	73.0	60.0	2.00		
14925	5248	LAKEAMADEUS	A43/13 CTSP	798530	7240660	550.0	87.0				SANDSTONE	80.0	59.0	2.00		
90001	5247	AYERSROCK	BMR SPRINGLAKE P1	795580	7198640	470.1	0.7	PIEZOMETER		CZ	GYPS SAND/CLAY		0.2			287000
90001	5247	AYERSROCK	BMR SPRINGLAKE P1	795580	7198640	470.1	0.7	PIEZOMETER					0.2			287000
90001	5247	AYERSROCK	BMR SPRINGLAKE P1	795580	7198640	470.1		PIEZOMETER					0.2			287000
90002	5247	AYERSROCK	BMR SPRINGLAKE P2	795580	7198640	470.1		PIEZOMETER		CZ	GYPS SAND/CLAY		0.2			
90003	5247	AYERSROCK	BMR SPRINGLAKE P3	795580	7198640	470.2	0.7	PIEZOMETER		CZ	GYPS SAND/CLAY		0.2			
90004	5247	AYERSROCK	BMR SPRINGLAKE P4	795580	7198640	470.2	3.6	PIEZOMETER		CZ	GYPS SAND/CLAY		0.3			
90005	5247	AYERSROCK	BMR SPRINGLAKE P5	795580	7198640	470.2	8.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.3			
90006	5247	AYERSROCK	BMR SPRINGLAKE P6	795580	7198640	470.2	9.7	PIEZOMETER		CZ	GYPS SAND/CLAY		0.3			
90007	5247	AYERSROCK	BMR SPRINGLAKE P7	795580	7198640	470.4	0.7	PIEZOMETER		CZ	GYPS SAND/CLAY		0.4			
90008	5247	AYERSROCK	BMR SPRINGLAKE P8	795580	7198640	470.4	3.9	PIEZOMETER		CZ	GYPS SAND/CLAY		0.6			
90009	5247	AYERSROCK	BMR SPRINGLAKE P9	795580	7198640	470.4	7.2	PIEZOMETER		CZ	GYPS SAND/CLAY		0.6			
90010	5247	AYERSROCK	BMR SPRINGLAKE P10	795400	7198200	471.7	1.9	PIEZOMETER		CZ	SAND		1.7			
90011	5247	AYERSROCK	BMR SPRINGLAKE P11	795650	7198170	473.9	5.7	PIEZOMETER		CZ	SAND		3.6			57000
90012	5247	AYERSROCK	BMR SPRINGLAKE P12	795720	7197850	479.0	9.3	PIEZOMETER		CZ	SAND		8.0			35000
90013	5247	AYERSROCK	BMR SPRINGLAKE P13	795830	7197280	471.7	1.6	PIEZOMETER		CZ	SAND		1.6			154000
90014	5247	AYERSROCK	BMR SPRINGLAKE P14	795870	7197730	471.1	1.7	PIEZOMETER		CZ	GYPS SAND/CLAY		0.8			130000
90015	5247	AYERSROCK	BMR SPRINGLAKE P15	795870	7197130	471.1	9.5	PIEZOMETER		CZ	GYPS SAND/CLAY		9.0			130000
90016	5247	AYERSROCK	BMR AYERS ROCK 1	754000	7206350	495.0	158.0	ABANDONED	(GEOPHYSICAL DDH)	CZ/BITTERSPRING	CLAY+SND/BAS@87					
90017	5247	AYERSROCK	BMR AYERS ROCK 2	754000	7206350	495.0	158.0	ABANDONED	(GEOPHYSICAL DDH)	CZ/BITTERSPRING	SND+CLAY/BAS@87					
90018	5247	AYERSROCK	BMR AYERS ROCK 3	774960	7203180	490.0	17.9	ABANDONED		CZ/ORDOVICIAN	CALCR/SST @11.8		6.5			1500
90019	5247	AYERSROCK	BMR AYERS ROCK 4	773500	7210000	487.5	10.0	PIEZOMETER		CZ/PALAEOZOIC	GYPCR/SST @ 9M		7.2			15600
90020	5247	AYERSROCK	BMR AYERS ROCK 5	773900	7208800	486.0	16.5	PIEZOMETER		CZ/PALAEOZOIC	CALCR/SST @ 9M		4.9			1400
90021	5247	AYERSROCK	BMR AYERS ROCK 6	776460	7198900	490.6	16.5	CAPPED		CZ/ORDOVICIAN	CALCR/SST @11.8		4.2			1100
90022	5247	AYERSROCK	BMR AYERS ROCK 7	796260	7195000	478.2	11.5	PIEZOMETER		CZ/PALAEOZOIC	CALCR/SLTST@8.3		7.3			22800
90023	5247	AYERSROCK	BMR AYERS ROCK 8	795700	7195200	476.6	21.3	PIEZOMETER		CZ/PALAEOZOIC?	CALCR/CLYST@6.5		6.4			53600
90024	5247	AYERSROCK	BMR AYERS ROCK 9	795300	7196900	474.8	9.9	PIEZOMETER		CZ/PALAEOZOIC	CALCR/MUDST@3.9		4.6			48000
90025	5148	LAKEAMADEUS	BMR LKAMADEUS P1	719100	7241400	496.0	2.0	PIEZOMETER		CZ	GYPS SAND/CLAY		1.5			116900
90026	5148	LAKEAMADEUS	BMR LKAMADEUS P2	720600	7243000	457.7	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.7			
90027	5148	LAKEAMADEUS	BMR LKAMADEUS P3	720600	7243000	457.7	5.0	PIEZOMETER		CZ	GYPS SAND/CLAY		3.5			
90028	5148	LAKEAMADEUS	BMR LKAMADEUS P4	720600	7243000	457.7	14.0	PIEZOMETER		CZ	GYPS SAND/CLAY		3.0			
90029	5148	LAKEAMADEUS	BMR LKAMADEUS P5	708300	7244400	458.1	2.0	PIEZOMETER		CZ	SAND		1.1			125400
90030	5148	LAKEAMADEUS	BMR LKAMADEUS P6	708300	7244550	459.1	2.5	PIEZOMETER		CZ	SAND		2.0			138900
90031	5148	LAKEAMADEUS	BMR LKAMADEUS P7	708350	7244700	458.5	2.0	PIEZOMETER		CZ	GYPS SAND/CLAY		1.5			179400
90032	5148	LAKEAMADEUS	BMR LKAMADEUS P8	708350	7244700	458.5	3.5	PIEZOMETER		CZ	GYPS SAND/CLAY		1.6			285000
90033	5148	LAKEAMADEUS	BMR LKAMADEUS P9	708350	7244700	458.5	7.0	PIEZOMETER		CZ	GYPS SAND/CLAY		1.7			

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90034	5148	LAKEAMADEUS	BMR LKAMADEUS P10	708400	7245400	457.3	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.6			
90035	5148	LAKEAMADEUS	BMR LKAMADEUS P11	708400	7245400	457.3	9.0	PIEZOMETER		CZ	GYPS SAND/CLAY		7.1			
90036	5148	LAKEAMADEUS	BMR LKAMADEUS P12	708900	7245900	457.4	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.4			
90037	5148	LAKEAMADEUS	BMR LKAMADEUS P13	708900	7245900	457.4	6.5	PIEZOMETER		CZ	GYPS SAND/CLAY		3.6			
90038	5148	LAKEAMADEUS	BMR LKAMADEUS P14	710150	7247100	457.5	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.4			
90039	5148	LAKEAMADEUS	BMR LKAMADEUS P15	710150	7247100	457.5	3.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.5			
90040	5148	LAKEAMADEUS	BMR LKAMADEUS P16	710150	7247100	457.5	7.5	PIEZOMETER		CZ	GYPS SAND/CLAY		5.9			289500
90041	5148	LAKEAMADEUS	BMR LKAMADEUS P17	711250	7248200	457.5	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.6			
90042	5148	LAKEAMADEUS	BMR LKAMADEUS P18	711250	7248200	457.4	4.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.6			
90043	5148	LAKEAMADEUS	BMR LKAMADEUS P19	711250	7248200	457.5	7.5	PIEZOMETER		CZ	GYPS SAND/CLAY		4.1			
90044	5148	LAKEAMADEUS	BMR LKAMADEUS P20	711450	7248400	457.2	1.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.1			
90045	5148	LAKEAMADEUS	BMR LKAMADEUS P21	711450	7248400	457.1	5.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.5			221500
90046	5148	LAKEAMADEUS	BMR LKAMADEUS P22	711450	7248400	457.1	9.0	PIEZOMETER		CZ	GYPS SAND/CLAY		0.4			
90047	5148	LAKEAMADEUS	BMR LKAMADEUS P23	701250	7238350	463.7	8.0	PIEZOMETER		CZ	GYPS SAND/CLAY		1.6			220000
90048	5148	LAKEAMADEUS	BMR LKAMADEUS P24	701250	7238350	463.7	2.0	PIEZOMETER		CZ	GYPS SAND/CLAY		1.0			
90050	5247	AYERSROCK	URANERZ CS1	783340	7203360	480.0	14.0	ABANDONED		CZ	CLAY/GRAVEL		4.3			17750
90051	5247	AYERSROCK	URANERZ CS2	783750	7203900	484.0	11.0	ABANDONED		CZ	CLAY					25050
90052	5247	AYERSROCK	URANERZ CS3	783850	7203900	485.0	15.0	ABANDONED		CZ	CLAY		3.5			
90053	5247	AYERSROCK	URANERZ CS4	784480	7204320	486.0	15.0	ABANDONED		CZ	GYPS CLAY		1.0			239800
90054	5247	AYERSROCK	URANERZ CS5	782530	7202820	490.0	15.0	ABANDONED		CZ	CALCR/GYPS CLAY		4.5			46300
90055	5247	AYERSROCK	URANERZ CS6	782230	7202340	489.0	7.0	ABANDONED		CZ	CALCR+GYPS					
90056	5247	AYERSROCK	URANERZ CS7	781980	7201920	487.0		ABANDONED								
90057	5247	AYERSROCK	URANERZ CS8	781800	7201470	487.0	10.0	ABANDONED		CZ	CALCR+DOLOCR					
90058	5247	AYERSROCK	URANERZ CS9	781480	7201020	490.0	5.0	ABANDONED		CZ	DOLOM CALCR					
90059	5247	AYERSROCK	URANERZ CS10	781000	7200540	491.0		ABANDONED								
90060	5247	AYERSROCK	URANERZ CS11	784020	7203550	477.0	15.0	ABANDONED		CZ	GYPS CLAY		1.0			61540
90061	5247	AYERSROCK	URANERZ CS12	783620	7204270	485.0	15.0	ABANDONED		CZ	GYPS CLAY		0.5			111140
90064	5247	AYERSROCK	URANERZ CS15	783560	7202750	484.0	15.0	ABANDONED		CZ	CALCR/GYPS CLAY		4.0			41950
90065	5247	AYERSROCK	URANERZ CS16	782400	7203470	487.0	15.0	ABANDONED		CZ	CALCR/CLAY/GVL		6.0			35160
90066	5247	AYERSROCK	URANERZ CS17	782650	7202050	488.0	11.0	ABANDONED		CZ	SAND/CALCR					
90067	5247	AYERSROCK	URANERZ CS18	781920	7202820	488.0	17.0	ABANDONED		CZ	CALCR/GYPS CLAY		4.5			9900
90068	5247	AYERSROCK	URANERZ CS19	782310	7201600	490.0	5.0	ABANDONED		CZ	DOLOM CALCR					
90069	5247	AYERSROCK	URANERZ CS20	781550	7202280	488.0	6.0	ABANDONED		CZ	DOLOM CALCR					
90070	5247	AYERSROCK	URANERZ CS21	792460	7199530	486.0	13.0	ABANDONED		CZ	CALC SAND		11.0			45600
90071	5247	AYERSROCK	URANERZ CS22	791560	7199490	481.0	11.0	ABANDONED		CZ	GYPS+CALC CLAY		10.0			
90072	5247	AYERSROCK	URANERZ CS23	790590	7199490	485.0	11.0	ABANDONED		CZ	CALC SAND					
90073	5247	AYERSROCK	URANERZ CS24	789580	7199490	481.0	11.0	ABANDONED		CZ	GYPS CLAY					
90074	5247	AYERSROCK	URANERZ CS25	788550	7199490	474.0	7.0	ABANDONED		CZ	GYPS CLAY		3.0			28100
90075	5247	AYERSROCK	URANERZ CS26	787480	7199490	476.0	4.0	ABANDONED		CZ	GYPS CLAY		2.0			65600
90076	5247	AYERSROCK	URANERZ CS27	787330	7199460	481.0	11.0	ABANDONED		CZ	CALCR/GYPS CLAY		9.0			46400
90077	5247	AYERSROCK	URANERZ CS28	786350	7199460	481.0	8.0	ABANDONED		CZ	SILIF CALCR					
90078	5247	AYERSROCK	URANERZ CS29	785660	7199460	487.0	8.0	ABANDONED		CZ	CALCR					
90079	5247	AYERSROCK	URANERZ CS30	784700	7199460	488.0	6.0	ABANDONED		CZ	CALCR					

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME	AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
90080	5247	AYERSROCK	URANERZ CS31	783740	7199460	488.0	8.0	ABANDONED		CZ	SILIF CALCR					
90081	5247	AYERSROCK	URANERZ CS32	782780	7199460	486.0	4.0	ABANDONED		CZ	CALCR					
90082	5247	AYERSROCK	URANERZ CS33	781750	7199460	490.0		ABANDONED		CZ	CALCR					
90083	5247	AYERSROCK	URANERZ CS34	780790	7199430	490.0	3.0	ABANDONED		CZ	CALCR					
90084	5247	AYERSROCK	URANERZ CS35	789850	7199430	490.0	1.0	ABANDONED		CZ	CALCR					
90085	5247	AYERSROCK	URANERZ CS36	768530	7199400	490.0	2.0	ABANDONED		CZ	CALCR					
90086	5247	AYERSROCK	URANERZ CS37	769560	7199400	490.0	2.0	ABANDONED		CZ	CALCR					
90087	5247	AYERSROCK	URANERZ CS38	770600	7199400	492.0	2.0	ABANDONED		CZ	CALCR					
90088	5247	AYERSROCK	URANERZ CS39	771600	7199400	492.0	4.0	ABANDONED		CZ	CALCR					
90089	5247	AYERSROCK	URANERZ CS40	785660	7203240	483.0	12.0	ABANDONED		CZ	GYPS CLAY		4.3			61700
90090	5247	AYERSROCK	URANERZ CS41	785660	7202340	487.0	12.0	ABANDONED		CZ/PALAEOZOIC	CALCR/SILST @6M		8.0			28400
90091	5247	AYERSROCK	URANERZ CS42	785660	7201370	485.0	11.0	ABANDONED		CZ	CLAY		4.5			38400
90092	5247	AYERSROCK	URANERZ CS43	785660	7200350	482.0	13.0	ABANDONED		CZ	SILIF CLAY		4.0			38700
90093	5247	AYERSROCK	URANERZ CS44	783620	7201380	485.0	12.0	ABANDONED		CZ	GYPS CLAY		3.5			5110
90094	5247	AYERSROCK	URANERZ CS45	783590	7202210	490.0	13.0	ABANDONED		CZ	GYPS CLAY		2.5			59000
90095	5247	AYERSROCK	URANERZ CS46	781410	7207970	485.0	11.0	ABANDONED		CZ	CALCR/GYPS CLAY		6.3			21600
90096	5247	AYERSROCK	URANERZ CS47	781410	7207070	489.0	7.0	ABANDONED		CZ	CLAY		2.6			55300
90097	5247	AYERSROCK	URANERZ CS48	78144	7205890	489.0	15.0	ABANDONED		CZ	CALCR/CLAY		8.8			2160
90098	5247	AYERSROCK	URANERZ CS49	779770	7207900	485.0	11.0	ABANDONED		CZ	GYPS CLAY		4.5			39800
90099	5247	AYERSROCK	URANERZ CS50	779770	7206950	489.0	7.0	ABANDONED		CZ	SILIF CALCR					
90100	5247	AYERSROCK	URANERZ CS51	779770	7205800	489.0	4.0	ABANDONED		CZ	SILIF CALCR					
90101	5247	AYERSROCK	URANERZ CS52	774420	7211540	481.0	2.0	ABANDONED		CZ	SILIF CALCR					
90102	5247	AYERSROCK	URANERZ CS53	773750	7210670	479.0	7.0	ABANDONED		CZ	GYPS CLAYR		3.0			41700
90103	5247	AYERSROCK	URANERZ CS54	773560	7199840	479.0	4.0	ABANDONED		CZ	SILIF GYPS CLAY		2.1			43500
90104	5247	AYERSROCK	URANERZ CS55	774040	7198720	484.0	12.0	ABANDONED		CZ	CALCR/SAND/CLAY		4.0			23900
90105	5247	AYERSROCK	URANERZ CS56	773850	7197500	489.0	17.0	ABANDONED		CZ	CALCR/CBNS CLAY		5.8			42100
90106	5247	AYERSROCK	URANERZ CS57	774170	7196540	490.0	9.0	ABANDONED		CZ	CALCR		3.0			
90107	5247	AYERSROCK	URANERZ CS58	774130	7195510	490.0	7.0	ABANDONED		CZ	CALCR		3.0			
90108	5247	AYERSROCK	URANERZ CS59	774200	7194520	490.0	17.0	ABANDONED		CZ/PALAEOZOIC	CALCR/CLAY @10M					
90120	5247	AYERSROCK	ROADBORE CTSP	795750	7194850	478.0		ABANDONED		CZ	CALCRETE		7.2			
90122	5247	AYERSROCK	HORIZON 13/15 CTSP	785500	7227100	510.0		UNUSED	(SALT)	PERTNJARA?	MUDSTONE		42.2			
90123	5247	AYERSROCK	HORIZON E-W CTSP	776500	7198830	490.0				CZ						1550
90124	5047	AYERSROCK	R04321501	690500	7214450	500.0	101.0	ABANDONED		WINNALL	SANDSTONE					
90133	5148	LAKEAMADEUS	BMR LKAMADEUS 12/3	721500	7243800	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					209400
90134	5148	LAKEAMADEUS	BMR LKAMADEUS 12/4	721200	7243500	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					236000
90135	5148	LAKEAMADEUS	BMR LKAMADEUS 12/5	720900	7243250	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					238200
90136	5148	LAKEAMADEUS	BMR LKAMADEUS 12/6	720600	7242950	457.7	0.3	SAMPLE PT		CZ	GYPS SAND					231900
90137	5148	LAKEAMADEUS	BMR LKAMADEUS 12/7	720100	7242500	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					209700
90139	5148	LAKEAMADEUS	BMR LKAMADEUS 12/9	719750	7242150	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					134500
90140	5148	LAKEAMADEUS	BMR LKAMADEUS 12/10	719750	7242150	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					90900
90141	5148	LAKEAMADEUS	BMR LKAMADEUS 12/6W	720600	7242950	457.7	0.3	SAMPLE PT		CZ	GYPS SAND					147000
90153	5148	LAKEAMADEUS	BMR LKAMADEUS 13/3	719100	7241600	459.0	0.3	SAMPLE PT		CZ	GYPS SAND					221200
90157	5148	LAKEAMADEUS	BMR LKAMADEUS 13/1	719550	7241950	459.0	0.3	SAMPLE PT		CZ	GYPS SAND					90900

WELL NUMBER	1:100000 SHEET NUMBER	1:250000 SHEET NAME	WELL NAME	AUSTRALIAN MAP GRID EASTING	NORTHING	GROUND ELEVATION	DEPTH	STATUS	EQUIPMENT	AQUIFER STRATIGRAPHY	AQUIFER LITHOLOGY	AQUIFER DEPTH	STANDING WATER LEVEL	AQUIFER YIELD	AQUIFER TRANS-MISSIVITY	TDS
90161	5148	LAKEAMADEUS	BMR LKAMADEUS 14/1	711550	7248300	457.0	0.3	SAMPLE PT		CZ	GYPS SAND					192000
90163	5148	LAKEAMADEUS	BMR LKAMADEUS 14/3	711750	7248500	457.0	0.3	SAMPLE PT		CZ	GYPS SAND					240800
90171	5148	LAKEAMADEUS	BMR LKAMADEUS 15/1	708600	7245500	457.0	0.3	SAMPLE PT		CZ	GYPS SAND					246000
90172	5148	LAKEAMADEUS	BMR LKAMADEUS 15/2	708800	7245500	457.0	0.3	SAMPLE PT		CZ	GYPS SAND					200400
90173	5148	LAKEAMADEUS	BMR LKAMADEUS 15/3	709700	7246500	457.0	0.3	SAMPLE PT		CZ	GYPS SAND					169800
90174	5148	LAKEAMADEUS	BMR LKAMADEUS 15/4	710350	7247100	457.5	0.3	SAMPLE PT		CZ	GYPS SAND					167900
90181	5148	LAKEAMADEUS	BMR LKAMADEUS 19/1	708000	7244750	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					132600
90191	5148	LAKEAMADEUS	BMR LKAMADEUS 20/1	708000	7244750	458.0	0.3	SAMPLE PT		CZ	GYPS SAND					217200
90201	5148	LAKEAMADEUS	YULARA CK SPRING	706400	7242600	459.0	0.3	SAMPLE PT		SURFACE WATER						343000
90205	5247	AYERSROCK	BMR SPRINGLK BRINE	795580	7198640	470.0	0.3	SAMPLE PT		CZ	GYPS SAND					231000
90206	5247	AYERSROCK	BMR SPRINGLKBRINE 41	793500	7200450	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					461000
90207	5247	AYERSROCK	BMR SPRINGLKBRINE 42	793850	7200350	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					461000
90208	5247	AYERSROCK	BMR SPRINGLKBRINE 43	794250	7200300	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					523000
90209	5247	AYERSROCK	BMR SPRINGLKBRINE 44	795200	7202150	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					365000
90210	5247	AYERSROCK	BMR SPRINGLKBRINE 45	796850	7199750	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					265000
90211	5247	AYERSROCK	BMR SPRINGLKBRINE 46	796250	7199850	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					271000
90212	5247	AYERSROCK	BMR SPRINGLKBRINE 48	795000	7200100	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					377000
90214	5247	AYERSROCK	BMR SPRINGLKBRINE 49	794200	7198200	479.0	0.3	SAMPLE PT		CZ	GYPS SAND					358000
90215	5247	AYERSROCK	BMR SPRINGLKBRINE RC	795580	7198640	470.4	0.3	SAMPLE PT		CZ	GYPS SAND					468000
90216	5247	AYERSROCK	CURTIN SPRINGS RAIN	777500	7197000	490.0		SAMPLE PT		RAINWATER						455
90217	5247	AYERSROCK	SPRING CREEK	793800	7197650	480.0	0.3	SAMPLE PT		SURFACE WATER						264000
90218	5247	AYERSROCK	SPRING WATER CTSP	787700	7196000	482.0	0.3	SAMPLE PT		SURFACE WATER						9740
90219	5247	AYERSROCK	HALITE LAKE	792500	7205300	478.0	0.3	SAMPLE PT		CZ	GYPS SAND					315000
90230	5247	AYERSROCK	CONMAN 3 (NTH) CTSP	774960	7203180	493.0	22.0	ABANDONED		CZ	CALCRETE		6.3			
90231	5249	LAKEAMADUES	REEDY ROCKHOLE				0.5	SPRING		MEREENIE						200
90232	5247	AYERSROCK	GLAUBERITE LAKE			462.0	0.5	SAMPLEPT		CZ	SAND/CLAY					361200
90233		AYERSROCK	MAGGIE SPRING													
90234		AYERSROCK	OLGA CREEK													
90235		AYERSROCK	BRINE EFFLUENT YULAR													
90236		AYERSROCK	RAINWATER													
90236		AYERSROCK	AYERS ROCK RAINWATER													
90237		AYERSROCK	WATER TREATMENT YULA													
90238		LAKE AMADEUS	MEREENIE OILFIELD													
90239		LAKE AMADEUS	KINGS CANYON POOL													
90240		LAKE AMADEUS	KINGS CREEK													
90241		LAKE AMADEUS	EASTMEREENIE 12 WBOR					OPERATING								
90242		LAKE AMADEUS	EAST MEREENIE 3 WBOR					OPERATING								

APPENDIX 5. LIST OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES, LAKE AMADEUS–AYERS ROCK REGION

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
1024	15/07/57	OWNER	0.0							7475			1600	37	94	530	3145	4.0	1735		251	79	22.0			
1024	27/07/61	OWNER	0.0					7.30		7185			1625	36	273	452	3010	3.0	1748		23	5				
1024	27/07/61	OWNER	0.0					7.70		6512			1450	35	238	426	2725	3.0	1509		121	5				
1898	13/07/61	OWNER	0.0					7.10		10821		2720	2600	188	648	268	3520	3.0	3294		292	8				
2007	03/08/60	BMR	0.0	TS				7.20		1509			260	24	119	55	395	1.0	361		277	14				
2007	08/02/61	BMR	0.0	TS				7.20		1479		560	330	22	131	57	450	2.0	23		57	7				
2007	24/03/61	BMR	0.0	TS						1773		586	325	22		59	480	2.0	449		277	3				
2007	26/08/61		0.0	TS				7.40		1686		570	325	22	137	55	433	2.0	415		285	11				
2007	16/09/62	BMR	0.0	TS				7.30		1577		532	300	23	126	53	390	2.0	377		293	13				
2007	24/11/64	BMR	0.0	TS				7.90		832		286	132	20	62	32	155	1.0	135		295					
2010	24/11/64	BMR	0.0	TS				7.60		1295		416	238	23	91	46	255	2.0	258			12				
2056	31/05/61	OWNER	0.0					7.80		1538		368	330	46	76		375	2.0	293		273	99				
2056	08/12/67	WATER	0.0					7.45	4320	3369	1010	660	700	140	170	75	590	1.0	265		616	70	105.0			0.1
2056	11/08/70	WATER	0.0					7.40	2090	1450	238	366	298	42	87	36	326	2.0	287		290	118	68.0			0.1
2056	14/07/72	WATER	0.0					7.90	2130	1380	233	372	293	47	88	37	334	2.0	255		284	139	38.0			0.1
2057	28/07/61		0.0					7.20		4955		1086	1200	120	188	150	1620	3.0	1126		408	140				
2057	08/12/67	WATER	0.0					7.75	6600	5359	388	1260	1400	120	350	150	1800	4.0	750		233	213	95.0			0.3
2057	11/84	BMR	0.0	CALCR				7.80	16000	10500			3000	270	280	285	3680	4.0	2700		282	300	97.0	4.9		0.1
2058	05/07/72	WATER	0.0					8.60	14600	10280	155	1959	2670	330	234	340	3267	4.0	2225	30	128	600	25.0			0.2
2058	05/85	BMR	0.0	ALLUV				8.30	25600	20000			5200	520	240	560	7200	3.0	4200		735	220	55.0	7.9		
2059	11/08/70	WATER	0.0					7.50	3550	2210	326	212	630	137	29	34	792	3.0	236		398	125	56.0			0.2
2059	04/07/72	WATER	0.0					9.40	3070	1810	273	168	517	128	21	28	635	3.0	155	105	119	108	76.0			0.1
2060	23/02/61	WATER	0.0					7.40		6583		2374	1200	76	718		1720	2.0	2194		529					
2138	05/85	BMR	0.0					8.00	3600	2250			500	100	40	70	682	5.0	300		339	130	70.0	1.7	6.0	
2271	17/05/74	?WRD	36.0					7.70	1590	900	276	516	130	11	72	82	288	1.0	88		336	71	31.0			1.1
2271	07/06/72	?WRD	55.0					7.90	1700	940	237	534	135	11	74	85	298	1.0	100		289	108	22.0			19.0
2272	17/05/72	?WRD	50.6					7.70	1160	720	268	361	100	16	46	60	123	1.0	63		326	104	45.0			0.8
2365	07/12/60	OWNER	0.0					7.35		2805		594	655	78	226	74	755		570		375	72				
2365	31/05/61	OWNER	0.0					7.70		2841		672	660	81	136	81	830		574		395	121				
2365	12/12/67	OWNER	0.0					8.00	4400	3007	274		775	83	195	90	960	3.0	370		163	213				
2365	10/04/76	WATER	0.0					7.20	11820	7970	437	1644	2130	193	285	227	2744	6.0	1980		533	315	83.0			0.1
2866	28/07/61	OWNER	0.0					7.70		2724		632	625	74	115	84	783	3.0	555		377	108				
2866	08/12/61	WATER	0.0					8.00		4066		774	1040	118	144	101	1345	4.0	780		476	58				
2866	09/05/65	WATER	0.0					7.90				740	1040	120	134	98	1160	4.0	908		445	148				
2866	10/04/76	WATER	0.0					7.30	7140	5450	390	995	1470	139	170	139	1668	5.0	1400		475	215	88.0			0.1
2867	08/12/61	WATER	0.0					7.80		3764		696			123	94	1075		897		499					
2867	11/12/67	WATER	0.0					7.65	7560	5470	308	1130	1400	160	195	150	1500	3.0	1480		188	165	75.0			
2867	05/07/72	WATER	0.0					8.00	6820	4150	285	832	1170	142	154	109	1418	4.0	1100		348	211	85.0			0.1
3501	07/12/60	OWNER	0.0					7.60		1531		346	345	48	70	42	360	1.0	292		290	83				
3521	01/06/61	WATER	0.0	GRNT				7.70				268	70	5	57	30	84	1.0	33		314	15				
3522	01/06/61	WATER	0.0	TA				7.80		623	56	186	106	11	31	26	78	2.0	44		295	30				
4206			0.0							5045		350	1585	66	27	69	1670	5.0	809		814	55				
4206	10/08/70	WATER	0.0					8.20	9520	6310	849		2160	102	43	91	2260	8.0	1230		1040	22	103.0			0.1
4207	31/05/61	WATER	0.0					7.80		2524		350	355	61	126	80	650	4.0	144		504					

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	ANIONS Na	K	Ca	Mg	Cl	F	CATIONS SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
4209	09/05/61	BMR-WATER	0.0					7.80		3524		564	990	41	139	53	1165	3.0	643		470	20				
4210	31/05/61	BMR-WATER	0.0					7.70		2022		308	550	43	51	44	650	5.0	268		331	80				
4214		UNKNOWN	0.0					7.80	610	370	251		31	9	48	32	38	1.0	44		277	1	12.0			0.7
4215		UNKNOWN	0.0							6721		1328	1825	55	263	260	2510	1.0	1294		349					
4216	06/11/61	BMR-WATER	0.0					7.40		6652					286	321	2560		1165		395					
4216	10/08/70	WATER	0.0					7.70	6760	4620	217	1212	1130	46	163	196	1900	2.0	940		264	23	60.0			2.7
4238			0.0					7.90		5350		2184			286	358	1425	0.8	1525		294					
4238	15/02/65		0.0					8.20		1800		568			93	81	495		370		238					
4620	02/11/64	WATER-MINE	0.0	DS				8.00		846		344	128	27	43	8	230	1.0	161		180	68				
4851	24/04/70	WATER	55.2	TS						1100																
4851	26/04/70	WATER	55.2	TS				8.60		971		282	190	16	56	35	210	1.0	174		287	2				
4851	23/11/70	WATER	55.2	TS				8.70		859		286	144	18	92	13	140	1.0	168		278	5				
4866	24/05/65		0.0					7.60		1155		470	156	37	119	42	270		354		177					
5407	13/05/66	OWNER	19.5							11850																
5407	12/11/66	OWNER	45.7					7.43	25850	19644	286	4650	4050	75	460	840	8600	2.0	1275		174	30		1.0		0.8
5407	12/11/66	OWNER	70.1					7.56	27200	21820	258	5000	4650	91	675	795	9850	3.0	1575		157	51				
5646	12/12/67	WATER	39.6					7.45	2210	1485	240	370	250	47	75	40	340	1.0	270		146	115	70.0			1.8
5647	05/05/72	WATER	0.0					8.30	9680	6630	413	1423	1670	476	251	194	2139	5.0	1590		503	270	73.0			3.2
5647	12/12/67	WATER	4.6					7.65	7030	4734	334	980	1100	120	210	130	1470	3.0	1040		204	185	80.0			
5654	09/84	BMR	0.0	CALCR						1310			263	32	98	29	377		281		176		70.0	2.0		
5654	11/85	BMR	0.0					7.70	1800	1436			330	48	130	40	325	3.0	360		290	138			0.1	
5737	11/85	BMR	0.0					8.20	1350	1060			160	33	110	70	125	2.0	245		283	8			1.4	
6128	15/03/68	WATER	0.0	TS				7.75	5500	3803	210	900	1000	71	300	110	1260	3.0	1050		128	41	18.0			1.2
6128	16/03/68	WATER	0.0	TS				7.00	5430	3889	228	1025	900	76	280	120	1190	2.0	980		139	43	21.0			0.3
6129	04/04/68	WATER	0.0	TS				7.45		3420	40	1245	725	30	400	115	930	1.0	753		24		13.0			2.0
6129	08/04/68	WATER	0.0	TS					1740	1010		318	230	21	85	40	284	1.0	260		24		15.0			4.1
6129	22/05/68	WATER	0.0	TS				7.75	6450	1093	40	460	245	22	90	35	310	1.0	245		24	11	4.0			2.8
6129	27/11/68	WATER	0.0	TS				8.30	7530	628	78	246	63	19	60	23	50	1.0	16		396					
6129	26/09/68	WATER	61.0	TS				7.60		593	40	229	65	17	58	21	53	1.0	40		334	4				
6130	68		0.0	TS				7.65	1150	760	52	320	130	21	50	31	130	1.0	142		32	1	1.0			0.4
6130	06/68	WATER	0.0	TS				6.95	700	499	48	260	39	17	65	20	68		29		29	1	73.0			2.7
6130	07/68	WATER	0.0	TS				7.00	1150	732	50	345	130	23	70	28	135	2.0	120		31	1	14.0			1.4
6130	27/11/68	WATER	0.0	TS				8.30	689	540		248	43	17	59	24	50	1.0	17		302	27				
6130	27/11/68	WATER	0.0	TS				8.50	689	913		271	176	15	51	35	180		179	1	266	4				
6131	17/06/68	WATER	0.0	TS				7.85	2400	1548	176	545	310	28	166	62	450	1.0	368		107	1	13.0			1.0
6131	17/11/68	WATER	0.0	TS				8.70	1006	674		206	110	25	42	24	100	9.0	1	1	224	45				
6131	17/06/68	WATER	91.4	TS				7.10	2470	1588	204	520	325	30	172	62	410	1.0	368		124	1	13.0			3.7
6132	01/04/68	WATER	0.0	TS				7.55	4370	3442		1305	750	31	350	115	965	1.0	731		18		11.0			
6132	27/11/68	WATER	0.0	TS				8.40	821	660	23	204	110	18	20	38	110	1.0	76		277	10				
6132	04/01/69	WATER	0.0	TS						2900									794							
6133	26/09/68	WATER	0.0	TS				8.50	803	689	20	220	100	27	46	26	75		121	1	293					
6133	12/68	WATER	0.0	TS				7.90	821	638	20	214	88	27	24	38	85	1.0	47		293	35				
6134	11/04/68	WATER	0.0	TS				7.85	2240	1404	48	505	290	27	115	55	375	1.0	397		48		8.0			
6134	11/04/68	WATER	0.0	TS				7.55		1327	44	475	290	27	70	55	380	1.0	384		44		10.0			1.7

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS					CATIONS						
6134	27/11/68	WATER	0.0	TS					1810	1077		284	245	27	40	45	3550	1.0	275		86	3				
6135	27/11/68	WATER	0.0	TS				8.10	750	540		250	44	22	51	30	70	1.0	17		230	75				
6184	08/04/68	WATER	0.0	TS				7.65	2860	2014	40	420	455	52	110	45	560	2.0	512	2	27	52				
6203	26/09/68	WATER	0.0	TS				7.40	4319	2882			655	68	178	88	960	2.0	651		265	15				
6262	06/68	WATER	0.0	TS				7.42	2000	1320	34	455	260	25	115	47	370	1.0	324		21	1	6.0			0.4
6262	27/11/68	WATER	0.0	TS					2550	1800						478										
6264	27/11/68	WATER	0.0	TS				7.90	8920	684		220	110	25	28	36	115	1.0	101		258	10				
6265	27/11/68	WATER	0.0					8.00	1042	744		254	124	27	40	38	140	1.0	34		298	42				
6267	27/11/68	WATER	0.0	TS				7.80	8650	638		272	62	26	57	32	80	1.0	71		284	25				
6268	27/11/68	WATER	0.0	TS				7.90	939	598		268	54	23	56	31	80	1.0	24		249	80				
6269	19/09/68	WATER	0.0	TS				7.70	4228	2712		750	601	67	167	81	900	2.0	627		242	25				
6269	25/09/68	WATER	0.0	TS				7.90		2779		928	546	54	197	106	730	1.0	999		146					
6269	01/10/68	WATER	0.0	TS				7.50		2794		1052	500	50	245	107	705		925	1	241	20				
6269	01/10/68	WATER	0.0	TS				8.00		2948		908	630	27	217	89	750	1.0	988		240	2				
6269	02/10/68	WATER	0.0	TS				7.50		2833		1054	500	50	246	106	703	1.0	969		248	20				
6269	03/10/68	WATER	0.0	TS				7.60		2819		1039	500	50	240	107	703	1.0	96		241	15				
6269	12/08/68	WATER	42.7	TS				7.35	4300	3073	202	1190	575	62	286	118	880	1.0	915		123	24	31.0			0.5
6270	09/09/68	WATER	0.0	TS				7.70	4198	2700		732	610	67	163	79	880	2.0	623		248	28				
6270	19/09/68	WATER	0.0	TS				7.70	4228	2712		750	601	67	167	81	900	2.0	627		242	25				
6270	19/09/68	WATER	0.0	TS				7.80	4206	2747		727	610	72	163	78	910	2.0	634		250	28				
6270	19/09/68	WATER	0.0	TS				7.80	4371	2889		796	640	67	182	84	940	2.0	705		248	21				
6271	24/08/68	WATER	0.0	TS				8.30		608	59	164	100	24	35	19	78	1.0	51		272	28				
6271	27/11/68	WATER	0.0	TS				8.10	1448	866		348	120	48	67	44	275	1.0	42		170	99				
6273	16/09/68	WATER	0.0	TS				7.80	966	821	89	214	136	24	62	15	65	1.0	149		366	3				
6273	17/09/68	WATER	0.0	TS				7.90		1972		652	380	28	145	71	475	1.0	546		326					
6273	18/09/68	WATER	0.0	TS				8.20		691	79	160	130	35	35	18	90	1.0	78		292	24				
6273	19/09/68	WATER	0.0	TS				7.70		1914		684	350	26	166	65	450	1.0	526		320	10				
6273	24/09/68	WATER	0.0	TS				8.50		869	34	246	153	23	59	24	125	1.0	142	2	303	24				
6273	25/09/68	WATER	0.0	TS				7.70		2049		758	415	27	150	69	510	1.0	567		310					
6273	22/10/68	WATER	0.0	TS				7.90	1509	995		304	176	26	62	36	195	1.0	214		283	2				
6273	01/12/76	WATER	0.0	TS				7.70	3260	2234	233	853	378	29	228	69	554	1.0	640		284	16	45.0			0.1
6273	22/07/77	WATER	0.0	TS				7.60	3650	2507			433	39	244	85	1098	1.0	725		268	15	40.0			0.1
6274	11/09/68	WATER	0.0	ES				8.20	1237	700		244	135	3	46	32	170		85		209	56				
6274	25/09/68	WATER	12.1	ES				8.40	1174	804		280	120	30	59	32	140	1.0	165		201	56				
6274	11/09/68	WATER	55.1	ES				8.20		730		257	100	41	49	33	150	2.0	88		203	64				
6275	25/09/68	WATER	0.0	PS				7.60		1164		360	210	34	74	43	305	1.0	195		179	126				
6276	25/09/68	WATER	0.0	ES						5700									2							
6278	25/09/68	WATER	0.0	TS						3800																
6279	26/09/68	WATER	0.0	TS				8.20	3077	1928		450	450	42	96	51	515	2.0	440		318	14				
6280	26/09/68	WATER	0.0	TS				8.20		1939		282	510	43	59	33	463	3.0	461		303	64				
6282	06/05/69	WATER	0.0	TS				7.70	7500	6080	206	2200	1213	79	636	170	1600	3.0	2155		251	1	36.0			5.7
6282	07/05/69	WATER	0.0	PS				7.70	7000	6510	202	2120	1125	81	546	153	1500	4.0	1930		246	4	45.0			
6285	27/11/68	WATER	0.0	TS				8.40	1665	1100		282	225	32	28	52	230	1.0	216		314	2				
6316	68	WATER	0.0	TS					6160		5000															

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	ANIONS Ca	Mg	Cl	F	CATIONS SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
6316	18/10/68	WATER	0.0	TS						5200																
6317	24/10/68	WATER	0.0	TS				7.80	3565	2416		776	480	54	171	85	650	1.0	766		181	28				
6317	26/10/68	WATER	0.0	TS				8.00	3990	2820		1064	480	54	249	108	715	1.0	990		178	45				
6319	68	WATER	0.0	TS				7.50		2794		1052	500	50	245	107	705	1.0	925		241	20			4.0	
6319	06/05/74	WATER	0.0	TS				7.40	4080	2874	200	966	526	67	216	104	760	2.0	870		244	25	60.0			0.4
6319	08/05/74	WATER	0.0	TS	26.6			7.40	3930	2915	201	973	534	67	212		770	2.0	890		245	26	63.0			0.6
6319	05/85	BMR	0.0	SAND	26.0			7.60	3750	2750			500	55	220	105	767	1.0	890		251	15	65.0	0.4		
6319	11/02/71	WATER	26.9	TS				6.50	3560	2440	58	738	510	7	146	91	758	1.0	770		71	2	16.0			11.3
6379	04/11/69	WATER	0.0	PS						1900									489							
6380	26/04/69	WATER	0.0	PS				7.50	2500	1610	258	600	355	28	132	65	435	1.0	402		315	1	17.0			3.7
6380	27/04/69	WATER	0.0	PS				7.90	2500	1640	252	610	355	28	145	63	450	1.0	430		307	1	14.0			
6380	27/04/69	WATER	0.0	PS				7.30	2500	1650	258	610	375	28	144	69	440	1.0	399		315	1				
6380	28/04/69	WATER	0.0	PS				7.50	2500	1640	260	625	340	28	143	65	445	1.0			317	1	14.0			
6380	28/04/69	WATER	0.0	PS				7.90		1757		608	322	27	137	64	422	1.0	453		328	3				
6380	24/06/69	WATER	0.0	PS				8.00		1795		620	330	24	145	63	425	1.0	450		350	7				
6380	24/06/69	WATER	0.0	PS				8.10		1744		610	320	25	140	63	420	1.0	450		324	1				
6382	04/09/72	WATER	0.0	TS				7.10	6800	5930	172	2117	1120	81	581	166	1710	3.0	2100		210	3	28.0			1.4
6383	01/05/69	WATER	0.0	PS				7.50	3800	2700	190	970	495	61	228	107	730	1.0	770		232	30	66.0	1.0		0.1
6383	01/05/69	WATER	0.0	PS						3000																
6383	02/05/69	WATER	0.0	PS				7.60	3800	2750	190	940	500	58	228	100	740	1.0	785		232	28	63.0			0.1
6383	03/05/69	WATER	0.0	PS				7.65	3800		188		612	60	204	98	750	2.0	820		229	30	63.0			0.1
6383	25/08/72	WATER	0.0	PS		8.20		7.30	3540	2640	184	913	491	59	198	102	708	2.0	808		224	31	62.0			1.1
6385	25/09/76	WATER	0.0	PS				7.20	2020	1416	217	452	260	19	112	42	363	1.0	333		264	7	15.0			0.1
6425	05/02/69	WATER	0.0	PS				7.90	3600	2750	130	848	495	57	176	100	715	2.0	710		159	34	15.0			4.3
6425	24/06/69	WATER	0.0	PS				8.40		3046		966	600	70	281	64	905	1.0	855	1	238	22				
6425	11/02/71	WATER	0.0	PS				7.70	4500	3100	202	945	670	95	178	122	941	2.0	990		246	25	57.0			0.7
6999	23/02/70	WATER	30.5	TS				7.80	1980		148	515					390				181					
6999	23/02/70	WATER	48.8	TS				7.10	1980		156	510					375				190					
6999	26/02/70	WATER	91.4	TS				6.90	2350		148	590					500				181					
7000	21/03/70	WATER	30.5	TS				6.50	2400	1640	150	560	300	46	126	58	510	1.0	365		183	38	60.0			20.7
7000	70	WATER	48.8	TS				6.30	2700	1940	142	700	317	48	160	69	630	1.0	389		173	23	62.0			0.4
7000	21/03/70	WATER	91.4	TS				6.60	2800	2010	134	700	345	48	177	72	660	1.0	420		163	27	75.0			
7001	06/02/70	WATER	79.3	PS				6.60	3900	2960	162	1100	470	62	275	982	730	4.0	1045		198	16	35.0			
7002	11/03/70	WATER	79.3	TS				8.10	4900		299	700					1220				364					
7002	14/03/70	WATER	167.6	TS				8.00	4700		320	740					1120				390					
7003	06/03/70	WATER	94.5	PS				8.10	4200		249	580					1000				303					
7056	29/07/70	WATER	45.7	TS				7.80	1070	720	204	207	144	33	35	29	145	1.0	138		249	4	64.0			
7058	24/04/70	WATER	48.8	PS				7.60	17680		288						5500				351					
7058	24/04/70	WATER	48.8	PS						15000																
7058	24/04/70	WATER	58.5	PS				7.60	17680		249						5560				303					
7058	29/04/70	WATER	58.5	PS						14500																
7059	25/04/70	WATER	24.4	PS				7.60	3820	2530	268	647	572	75	93	101	825	2.0	558		327	12	67.0			4.0
7059	25/07/70	WATER	41.8	PS				8.10	4560	3300	244	819	705	79	106	135	1060	3.0	680		298	9	34.0			1.2
7483	05/12/70	WATER-BMR	71.9					6.50	7810	6200	76	2530	935	95	733	169	1520	2.0	2360		93	71	28.0			3.6

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS					CATIONS						
7483	05/12/70	WATER-BMR	90.5					6.60	8690	6920	90	2760	1120	92	721	233	1820	4.0	2620		110	7	33.0			0.3
10000	24/01/71	WATER	36.6	TS				7.50	3590	2420	154	649	560	48	140	73	708	2.0	720		188	104	71.0			3.6
10002	23/01/71	COMPANY	39.6	TS				7.50	2100	1370	140	469	250	34	112	46	354	2.0	375		171	51	61.0			8.6
10015	28/01/71	COMPANY	64.9	TS					4930	3500	246	1403	650	64	269	178	1242	2.0	800		300	66	30.0			
10015	30/04/83	COMPANY	64.9	TS				6.80	5400	3400	138	1337	688	114	220	192	1290	2.0	860		168	11	14.0			0.3
10019	20/10/72	WATER	0.0					8.00	2290	1450	229	390	312	49	84	44	355	2.0	310		279	130	88.0			0.8
10019	20/04/83	WATER	0.0				2400	7.50	1830	1460	235	366	320	65	76	43	360	2.0	310		286	99	66.0			1.0
10019	22/01/71	WATER	6.1					7.70	2250	1390	210	297	339	50	58	37	355	2.0	300		256	119	69.0			1.1
10019	22/01/83	COMPANY	6.1	TS				7.70	2250	1390	210	297	339	50	58	37	355	2.0	300		256	119	69.0			1.1
10387	05/07/72	WATER	0.0					8.00	7470	4960	320	938	1280	142	152	136	1581	4.0	1080		390	297	82.0			0.1
10402	14/07/72	WATER	0.0	ES				7.30	1740	1130	203	529	157	9	74	84	228	0.6	240		248	134	36.0			7.9
10403	13/07/72	WATER	0.0	ES				7.10	5730	3630	142	1646	610	40	235	258	1580	1.0	520		173	187	25.0			21.8
10404	18/07/72	WATER	80.0	TS				8.10	1460	890	276	263	214	7	33	44	161	1.0	80		337	83	38.0			7.1
10406	15/06/72	WATER	0.0						90310		126	15300					40270				154					
10406	15/06/72	WATER	0.0	TA				7.00			126	15300			40270						154					
10422	24/07/72	WATER	52.0	ES				7.60	1440	720	318	296	135	10	48	43	87	1.0	88		388	85	39.0			0.8
10423	03/08/72	WATER	76.0	TS				7.70	1310	820	252	290	154	18	44	44	151	1.0	102		307	94	94.0			0.7
10425	09/08/72	WATER	14.0	ES					1410	950	300	415	150	12	65	59	162	1.0	62		366	200	54.0			6.8
10463	18/09/72	WATER	0.0		26.0			8.10	2640	1700	80	578	814	47	110	74	494	1.0	465		98	6	75.0			0.3
10463	18/09/72	WATER	0.0	TS	26.0			8.20	2750	1800	98	606	334	52	116	77	512	1.0	490		119	5	71.0			0.4
10463	18/09/72	WATER	0.0	TS				7.10	2600	1880	182	680	328	49	78	144	523	1.0	455		222	57	72.0			0.5
10463	22/09/72	WATER	81.0	TS				7.70	3580	1870	177	668	302	45	144	75	475	1.0	440		216	60	67.0			1.3
10464	19/09/72	WATER	27.0	TS				7.30	3550	2860	464	1108	462	50	315	78	665	3.0	985		200	14	8.0			27.2
10465	12/10/72	WATER	0.0	PM	27.0			7.40	2560	1710	240	634	324	41	114	85	518	1.0	305		293	122	31.0			1.1
10465	12/10/72	WATER	0.0	PM	27.0			7.40	2580	1670	281	625	324	35	114	83	542	1.0	285		342	75	23.0			5.6
10465	28/09/72	WATER	36.0	PM				7.60	2740	2940	164	669	330	49	120	90	527	1.0	335		200	424				
10465	28/09/72	WATER	74.0	PM				7.80	2320	1480	300	600	296	31	100	85	551	1.0	210		366	2	11.0			0.9
10466	15/09/72	WATER	33.5	TS				7.80	3470	2310	134	764		61	165	86	790	1.0	462		163	40	105.0			1.7
10466	18/09/72	WATER	48.0	TS				8.00	3770	2300	153	848	405	58	190	91	830	1.0	460		187	25	93.0			1.4
10466	21/09/72	WATER	54.0	TS				8.00	3650	2360	164	827	411	58	185	89	820	1.0	476	47	200	1	106.0			1.7
10467	30/09/72	WATER	0.0	TS	27.0			7.30	3270	2490	172	903	423	66	220	86	789	1.0	595		210	2	67.0			0.4
10467	30/09/72	WATER	0.0	TS	27.0			6.90	3350	2480	230	934	437	65	226	90	798	1.0	580		281	1	65.0			4.5
10467	30/09/72	WATER	0.0	TS	27.0			7.20	3350		183	900					798				223					
10467	25/09/72	WATER	36.0	TS				7.70	2310	1600	165	625	276	40	448	62	474	1.0	408		201	32				
10468	06/10/72	WATER	0.0	TS	26.0			7.00	2590	1830	200	686	295	46	161	69	561	1.0	405		244	11	73.0			0.8
10468	06/10/72	WATER	0.0		26.0			7.10	2540	1790	172	672	297	46	157	68	570	1.0	415		210	17				
10468	30/09/72	WATER	40.6	TS	26.0			7.70	2780	1810	150	752	287	50	173	78	581	1.0	430		193	26	86.0	86.0		8.1
10483	20/09/72	WATER	0.0	PS				7.40	1950	1350	194	510	27	38	59	107	337	1.0	264		236	101	62.0			0.2
10483	20/09/72	WATER	0.0	PS	26.0			7.40	1950	1360	194	507	227	37	59	106	342	1.0	266		236	102	106.0			0.2
10483	20/09/72	WATER	0.0	PS	26.0			7.30	1950	1360	194	507	227	38	59	106	337	1.0	272		236	101	62.0			0.3
10483	30/09/72	WATER	0.0	PS	27.0			7.40	205	1420	200	55	237	43	120	61	380	1.0	330		244	8	58.0			
10483	02/10/72	WATER	0.0	PS	27.0				2010		200	555					371				244					
10483	02/10/72	WATER	0.0	PS	27.0				2030		198	550					371				241					
10483	02/10/72	WATER	0.0	PS	27.0			7.50	2030	1420	200	542	237	42	120	59	371	1.0	325		241	8	58.0			

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	ANIONS Ca	Mg	Cl	F	CATIONS SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
10483	12/09/72	WATER	27.0	PS				7.90	1900	1360	188	502	221	39	104	59	333	1.0	252		229	105	62.0			0.2
10483	27/09/72	WATER	74.0	PS	26.0			7.80	1870	1460	196	557	236	38	118	64	361	1.0	310		239	79	58.0			0.5
10485	18/10/72	WATER	0.0	TS	26.0	8.40		7.50	2270	1640	183	610	265	39	129	70	437	1.0	370		223	75	73.0			0.1
10485	18/10/72	WATER	0.0	TS	26.0			7.60	2280	1630	185	594	272	40	128	67	437	1.0	375		226	66	73.0			0.3
10485	12/10/72	WATER	39.0	TS				7.70	2340	1680	183	615	275	45	128	72	447	1.0	385		223	76	69.0			3.1
10485	12/10/72	WATER	50.0	TS				7.90	2340	1700	183	639	275	44	136	73	447	2.0	398		223	80	67.0			0.5
10485	12/10/72	WATER	50.0	TS	27.0				2340	1650	185	625	271	43	182	72	428	1.0	380		226	78	71.0			2.1
10486	18/10/72	WATER	64.0	TS	27.0			7.70	4810	3560	270	682	920	117	115	106	1254	2.0	730		329	92	62.0			1.3
10486	18/10/72	WATER	78.0	TS	27.0			7.60	5630	4340	270	911	1130	126	148	132	1520	3.0	960		329	22	49.0			3.7
10488	25/10/72	WATER	72.0	PM				7.50	2310	1530	188	584	290	33	117	71	485	2.0	353		229	14	33.0			0.2
10488	25/10/72	WATER	72.0	PM				7.40	2350	1560	190	583	290	33	120	69	475	1.0	365		232	12	32.0			0.1
10490	10/11/72	WATER	0.0	TS	26.0			7.40	2090	1400	193	526	235	36	107	63	359	1.0	295		235	100	62.0			0.2
10490	14/11/72	WATER	0.0	TS	26.0			7.60	2100	1460	193	538	237	36	111	63	349	1.0	285		235	114	61.0			0.1
10490	15/11/72	WATER	0.0	TS	26.0	8.40		7.50	2100	1370	195	532	235	36	111	62	364	1.0	285		238	94	59.0			0.1
10490	15/08/80	WATER	0.0	TS				7.20	2170	1390	194	521	226	38	110	60	362	1.0	280		236	96	73.0			0.1
10490	24/09/80	WATER	0.0					7.30	2430	1320	189	542	225	39	110	65	307	1.0	337		231	99	71.0			0.1
10490	11/12/80	WATER	0.0	TS	25.0			7.20	2520	1420	195	525	222	35	110	61	348	1.0	285		238	98	67.0			0.1
10490	14/01/81	WATER	0.0	TS				7.40	2110	1360	190	511	233	35	106	60	354	1.0	275		232	96	69.0			0.1
10490	24/04/82	WATER	0.0	TS	26.0			7.30	2280	1510	185	540	255	44	120	65	395	1.0	310		225	86	60.0			0.1
10490	09/07/82	WATER	0.0	TS	26.0			6.90	2150	1700	194	518	370	47	112	58	370	1.0	498		237	98				0.3
10490	30/09/82	WATER	0.0	TS				7.30	2350	1510	189	557	262	58	118	64	380	1.0	345		231	81	61.0			0.1
10490	16/03/83	WATER	0.0	TS				7.50	2280	1540	186	570	256	48	119	66	390	1.0	335		227	81	66.0			0.1
10490	02/09/83	WATER	0.0	TS				7.80	2080	1450	189	534	229	37	112	62	350	1.0	296		229	92	57.0			0.1
10490	05/85	BMR	0.0	SAND	26.0			7.30	2100	1500			225	28	102	60	395	1.0	280		228	39	60.0	0.3	2.0	
10491	20/11/72	WATER	0.0	TS	27.0			7.30	2690	1900	183	536	365	48	111	63	495	1.0	430		223	71	72.0			0.2
10491	21/11/72	WATER	0.0	TS	27.0	8.40		7.30	2660	1820	185	549	356	48	111	66	500	2.0	420		226	68	69.0			0.2
10491	05/05/74	WATER	38.0	TS	26.3			7.50	2670	1750	182	542	350	12		120	485	1.0	415		222	61	69.0			1.2
10491	08/11/72	WATER	42.0	TS				7.80	4220	1580	172	521	313	48	110	60	447	2.0	370		210	78	68.0			1.4
10491	08/11/72	WATER	60.0	TS				7.90	2480	1720	188	521	322	47	110	60	461	1.0	390		229	76	66.0			0.5
10491	08/11/72	WATER	72.0	TS				7.70	2740	1910	180	521	372	47	105	63	500	1.0	445		220	75	69.0			0.3
10492	10/11/72	WATER	36.0	TS				7.60	2960	2020	180	645	390	57	133	76	582	2.0	515		220	61	60.0			5.9
10493	16/11/72	WATER	0.0	TS				7.40	4580	3120	226	966	628	76	196	116	834	2.0	990		275	1	52.0			0.2
10493	22/11/72	WATER	66.0	TS				7.10	4400	3010	210	1054	580	72	228	118	795	2.0	990		256	19	47.0			0.3
10494	27/11/72	WATER	0.0	TS				7.50	5560	3560	228	845	860	118	138	122	1213	2.0	860		278	52	39.0			6.3
10494	27/11/72	WATER	43.0	TS				7.60	4529	2900	233	629	740	102	104	90	907	2.0	700		284	67	68.0			1.4
10494	27/11/72	WATER	61.0	TS				7.50	5200	3320	228	754	820	114	126	107	1217	2.0	780		278	60	24.0			8.4
10495	01/09/83	WATER	0.0	TS	20.0			7.80	1300	810	216	294	165	18	67	31	187	1.0	180		263	9	19.0			0.1
10495	25/01/73	WATER	66.0	TS				7.60	1290	810	239	271	184	17	59	30	182	1.0	168		291	1	25.0			2.0
10495	25/01/73	WATER	66.0	TS				7.50	1260	820	244	269	190	17	63	27	196	2.0	170		298	2	26.0			2.0
10495	25/01/73	WATER	66.0	TS	26.0			7.70	1790	1150	195	408	204	35	96	41	302	2.0	262		238	2	35.0			68.0
10495	26/01/73	WATER	66.0	TS				7.60	1300	820	237	260	184	17	58	28	187	2.0	184		290	2	24.0			0.5
10495	26/01/73	WATER	66.0	TS				7.60	1270	800	241	260	180	17	58	28	178	1.0	166		294	2	25.0			7.2
10495	26/01/73	WATER	66.0	TS				7.70	1280	800	240	260	184	17	58	28	178	2.0	165		293	1	26.0			1.6
10495	27/01/73	WATER	66.0	TS				7.50	1260	800	235	265	176	16	60	28	178	1.0	171		287	2	24.0			0.3

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS				CATIONS							
10495	27/01/73	WATER	66.0	TS				7.50	1290	810	242	260	180	17	58	28	178	1.0	169		295	1	24.0			7.6
10495	27/01/73	WATER	66.0	TS				7.60	1280	810	237	260	187	17	58	28	178	2.0	179		290	2	24.0			2.2
10596	05/85	BMR	0.0	SAND	26.0			7.50	3000	2150			350	27	230	84	578	1.0	720		246	2	13.0	0.1	3.0	
10596	27/04/73	WATER	71.0	PM				7.60	3270	2360	222	927	372	35	233	84	570	1.0	720		271	1	65.0			3.6
10596	11/04/73	WATER	73.0	PM				7.60	3190	2200	210	862		375	207	84	575	1.0	690		256	1	11.0			8.9
10596	11/04/73	WATER	91.0	PM				7.60	3340	2360	203	938	385	36	234	86	599		706		247	1	10.0			0.4
10597	28/06/73	WATER	62.0	TS				7.70	4420	2740	415	501	770	61	92	66	799	2.0	680		506	5	6.0			1.0
10597	14/04/73	WATER	66.0	TS				7.80	3050	2140	185	740	377	49	160	83	570	1.0	583		226	30	54.0			5.6
10598	09/05/73	WATER	0.0	TS				7.50	5330	3590	240	859	770	114	153	116	1093	2.0	820		293	45	30.0			1.0
10598	17/04/73	WATER	60.0	TS				7.60	5190	3360	233	854	740	114	151	116	1074	2.0	810		284	43	65.0			1.4
10619	15/05/73	WATER	0.0	TS				7.60	2310	1410	219	441	297	25	94	51	466	1.0	240		267	1	13.0			0.6
10619	01/05/73	WATER	64.1	TS	26.0			7.60	2400	1410	222	435	327	23	94	48	496	1.0	243		271	4	13.0			0.5
10619	15/05/73	WATER	64.1	TS				7.40	2300	1370	217	443	297	25	95	51	469	1.0	220		265	1	13.0			0.1
10619	15/05/73	WATER	64.1	TS				7.50	2300	1410	220	443	306	24	92	52	470	1.0	215		268	1	14.0			0.1
10619	30/05/73	WATER	64.1	TS	26.0			7.40	2300	1390	220	438	297	26	93	51	467	1.0	241		268	1	13.0			0.8
10619	30/05/73	WATER	64.1	TS	26.0			7.40	2300		220	450					480				268					
10619	31/05/73	WATER	64.1	TS	26.0			7.50	2310	1370	225	434	314	23	93	49	483	1.0	230		274	2	13.0			0.2
10619	01/06/73	WATER	64.1	TS	26.0			7.40	2380		220	440					489				268					
10619	01/06/73	WATER	64.1	TS	26.0			7.60	2400	1410	222	435	327	37	94	48	496	1.0	243		271	4	13.0			0.5
10619	10/05/73	WATER	73.0	TS				8.10	2310	1390	222	444	292	26	93	52	466	1.0	240		271	1	13.0			1.4
10619	04/05/73	WATER	78.0	TS				7.60	3360	2580	328	478	570	30	96	58	734	3.0	260		400	1	413.0			1.4
10621	18/05/73	WATER	97.0	ES				8.20	1610	930	224	215	250	15	43	26	298	1.0	128		273	1	27.0			8.4
10661	04/06/73		0.0	ES				7.20	3110	2050	186	604	410	49	104	84	578	2.0	380		227	200	54.0			3.1
10662	29/06/73	WATER	0.0	TS				7.40	3940	2440	192	832	500	28	190	87	883	2.0	480		234	1	11.0			16.0
10662	09/05/73	WATER	36.5	PM				7.20	1000	540	309	145	138	21	30	17	117	1.0	17		377	13	24.0			1.6
10662	29/05/73	WATER	66.0	TS				7.90	3330	2020	197	749	422	32	162	84	710	2.0	470		241	4	11.0			2.8
10666	09/08/73	WATER	36.0	TS				7.80	2480	1690	180	584	311	47	132	62	485	2.0	415		220	78	72.0			4.1
10666	05/06/73	WATER	45.0	TS				7.50	1420	970	176	325	161	29	61	42	210	2.0	146		214	117	41.0			5.6
10666	05/06/73	WATER	45.0	TS				7.20	1420	940	187	327	162	31	62	42	207	4.0	160		228	111	41.0			0.3
10667	25/06/73	WATER	0.0	TSED	26.0			6.90	2350	1830	180	648	295	44	44136	75	461	1.0	440		220	74	71.0			0.1
10667	28/06/73	WATER	0.0	TSED	26.0			7.10	2280	1770	176	630	295	47	134	72	461	1.0	425		215	75	70.0			0.1
10667	17/07/73	WATER	0.0	TSED	26.0			7.00	2640	1700	186	639	310	50	136	73	466	2.0	430		227	64				
10667	05/05/73	WATER	42.0	TSED				7.50	2440	1620	181	579	292	42	120	68	456	1.0	395		221	45	58.0			1.5
10667	14/06/73	WATER	42.0	TS				7.30	2610	1820	162	607	307	46	128	70	470	1.0	455		198	78	57.0			0.5
10668	73	WATER	0.0	TS	26.0			8.10	3200		180	805					662				220					
10668	18/07/73	WATER	0.0	TS	26.0			7.00	3210	2270	173	787	366	51	172	87	557	3.0	615		211	50	65.0			0.4
10668	19/07/73	WATER	0.0	TS	26.0			7.50	5430	3490	240	886	830	117	156	121	1190	2.0	850		293	56	66.0			0.1
10668	19/07/73	WATER	0.0	TS	26.0			7.60	5430	3460	252	873	830	119	154	119	1190	2.0	870		307	50	63.0			1.5
10668	09/05/73	WATER	50.0	TS				6.90	3080	2090	176	745	360	54	170	78	553	1.0	610		214	45	66.0			0.1
10668	26/06/73	WATER	76.0	TS				7.10	3410	2370	157	857	413	56	192	92	625	1.0	740		192	49	48.0			
10688	30/06/73	WATER	73.0	TS				7.20	6950	5730	137	2299	900	70	665	155	1340	2.0	2160		167	1	15.0			0.7
10688	14/08/73	WATER	75.0	TS				7.30	7110	5500	154	2078	928	63	585	149	1294	6.0	2180		188	1	21.0			0.3
10689	17/08/73	WATER	0.0	TS				7.20	2700	1910	185	656	325	40	136	77	510	10.0	500		226	225	73.0			0.2
10689	28/08/73	WATER	0.0	TS				7.00	2620	1800	199	678	305	39	148	75	500	4.0	483		242	38	73.0			0.1

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
10689	05/85	BMR	0.0	SAND	26.0			7.60	2450	1750			270	30	132	70	481	1.0	400		218	22	70.0	0.3		
10689	74	WATER	50.0	TS	27.0			7.30	2700	1740	217	664	296	42	146	73	490	1.0	450		265	22	66.0		2.0	8.5
10689	04/07/73	WATER	54.0	TS				7.70	2600	1800	176	672	295	40	144	76	500	1.0	440		214	66	73.0			0.1
10691	09/73	WATER	0.0	TS	26.0			7.40	6620	5390	183	2480	700	43	721	165	1215	3.0	2060		223	1	14.0			1.8
10691	31/07/73	WATER	71.8	TS	26.0			7.20	6760	5320	190	2493	720	47	723	167	1242	2.0	2040		232	3	13.0			0.4
10691	01/08/73	WATER	71.8	TS				7.80	6560	5380	174	2524	675	47	729	171	1235	3.0	2090		212	1	13.0			0.1
10692	03/09/73	WATER	0.0	TS	26.0			7.80	3810		226	650					745				275					
10692	04/09/73	WATER	0.0	TS	26.0			7.60	3730	2470	217	640	558	76	120	85	745	2.0	660		265	53	70.0			0.1
10692			26.0										560	60	4	62	830	4.0	400		182		2.3	0.6	5.0	0.1
10692	03/08/73	WATER	36.0	TS					3710	2430	217	217	552	75	116	83	725	2.0	660		265	56	69.0			3.2
10692	31/08/73	WATER	36.0	TS				7.60	3710	2450	220	618	590	76	116	80	728	2.0	620		268	63	68.0			
10692	05/05/74	WATER	38.0	TS	27.0	7.60		7.50	3760	2430	262	632	560	82	120	81							66.0			0.1
10692			60.0										605	66	12	67	800		450		184		9.3	0.7	4.5	2.0
10692	06/08/73	WATER	60.0	TS				7.40	4120	2720	2720	699	616	84	132	90	834		2		293	65	67.0			1.6
10692	03/08/73	WATER	63.0	TS				7.20	4180	2720	240	710	610	84	130	94	823	2.0	700		293	59	73.0			
10693	07/09/73	WATER	0.0	TS	26.0			7.30	2430	1650	180	590	276	40	126	67	447	1.0	365		219	77	69.0			0.1
10693	07/09/73	WATER	0.0	TS	26.0			7.30	2440	1680	182	590	285	43	126	67	456	1.0	365		222	78	69.0			0.1
10694	09/08/73	WATER	36.0	TS				7.80	2480	1770	180	588	298	45	132	63	456	2.0	415		220	71	73.0			0.3
10695	06/09/73	WATER	0.0	ES	26.0			7.00	1260	830	183	225	168	33	44	28	155	2.0	156		223	86	68.0			0.1
10695	15/11/79	WATER	0.0	ES				7.60	1290	1010	180	274	170	31	53	34	163	2.0	160		220	118	76.0			4.1
11539	26/03/77	WATER	55.0	TS				7.70	680	440	215	177	83	16	46	15	69	2.0	64		262	7	19.0			2.1
11539	26/03/77	WATER	65.0	TS				7.30	950	610	226	254	34	44	35	74		6.0		28	95	65		49.0		
11540	28/03/77	WATER	21.0	PM				7.70		580	195	224	74	33	42	29	74	2.0	52		238	60	85.0			9.1
11540	01/04/77	WATER	52.0	PM				7.20	1000	590	200	219	77	34	40	29	74	2.0	52		244	60	81.0			10.0
11540	16/04/77	WATER	60.0	PM				7.40	1100	710	250	279	37	46	40	76	2	10.0		31	65	60				1.7
11540	18/04/77	WATER	65.0	PM				7.30	950	610	226	254	77	34	44	35	74	1.0	64		275	95	65.0			49.0
11541	02/04/77	WATER	66.7	TS				7.80	2560	1570	363	533	345	43	90	75	451	3.0	375		442	2	11.0			2.3
11541	05/04/77	WATER	83.0	TS				7.70	2020	1200	233	292	285	46	48	42	294		288		34	64	85.0			
11542	14/04/77	WATER	76.0	TS				7.70	1580	1120	210	370	228	7	74	45	255	2.0	280		256	43	18.0			2.4
11545	20/04/77	WATER	48.0	PM				8.00	1030	740	250	203	154	40	32	30	104	2.0	158		305	30	45.0			5.0
11545	09/06/77	WATER	48.0	PM	27.0			7.50	1080	660	255	237	130	42	37	36	103	2.0	152		311	17	49.0			0.8
11545	12/06/77	WATER	48.0	PM	27.0			7.60	1100	680	253	228	132	41	38	33	92	2.0	148		308	24	46.0			1.1
11545	20/04/77	WATER	52.1	PM				7.60	1120	660	267	244	135	42	40	35	103	2.0	162		326	18	46.0			0.7
11545	20/04/77	WATER	54.0	PM				8.20	1120	710	250	246	130	38	36	38	98	1.0	158		305	17	45.0			4.4
11547	28/04/77	WATER	19.0	ES				7.40	1140	710	240	132	161	31	30	14	88	1.0	88		293	93	63.0			3.9
11550	28/04/77	WATER	8.5	TS				7.50	1080	670	255	221	110	38	54	21	82	2.0	72		311	78	85.0			
11551	30/04/77	WATER	42.0	PM				7.30	1000	600	200	231	83	29	43	30	69	2.0	70		244	50	60.0			9.7
11551	29/04/77	WATER	47.0	PM				6.80	1120	700	178	214	113	34	38	29	94	2.0	65		217	151	59.0			6.5
11551	29/04/77	WATER	59.0	PM				7.40	960	610	205	224	83	29	42	29	64	2.0	65		250	95	60.0			0.5
11551	30/04/77	WATER	59.0	PM					920	580	215	229	88	31	44	29	69	2.0	67		262	95	62.0			8.6
11573	02/05/77	WATER	72.0					7.50	1190	700	240	266	110	34	44	38	88	2.0	86		293	119	35.0			5.6
11574	03/05/77	WATER	53.0	PM				7.90	1160	660	2530	248	123	32	50	30	84	2.0	164		308	1	27.0			3.8
11574	03/05/77	WATER	77.3	PM				7.90	1140	650	230	224	127	30	42	29	92	2.0	170		281	2	24.0			8.6
11576	11/05/77	WATER	54.0	TS				7.60	1310	730	226	332	113	31	64	42	147	2.0	148	3	275	47	17.0			3.8

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS				CATIONS							
11576	11/05/77	WATER	84.0	TS				7.80	1210	600	190	297	107	27	58	37	139	3.0	232	3	12					
11577	12/05/77	WATER	68.0	TS				7.20	1280	720	212	2912	126	19	72	27	157	1.0	146		259	22	37.0			
11577	12/05/77	WATER	84.0	TS				7.60	2610	1490	228	516	300	26	128	48	387	2.0	430		278	1	13.0			
11578	16/05/77	WATER	49.0	PM				7.70	1050	680	230	212	104	32	34	31	138	1.0	52		281	142	62.0			1.5
11578	17/05/77	WATER	60.0	PM				7.60	960	590	208	221	83	27	44	27	67	2.0	65		253	92	62.0			0.1
11579	18/05/77	WATER	61.0	PM				7.60	1190	690	260	217	144	36	36	31	87	2.0	166		317	9	42.0			4.4
11605	18/05/77	WATER	0.0	TS	25.0			7.80	1110	760	223	231	140	31	45	29	127	1.0	135		272	45	67.0			0.1
11605	18/05/77	WATER	0.0	TS						740								1.0				40				
11605	31/08/77	WATER	0.0	TS				7.80	950	640	235	184	120	28	36	23	84	1.0	97		287	41	80.0			0.1
11605	14/10/77	WATER	0.0	TS				7.50	990	650	230	201	123	31	39	25	91	1.0	104		281	43	80.0			0.3
11605	14/10/77	WATER	0.0	TS				8.10	880	620	260	165	117	30	30	22	69	1.0	54		317	57	78.0			0.8
11605	25/11/77	WATER	0.0	TS				7.40	1000	670	230	203	131	38	40	25	98	1.0	120		281	44	83.0			0.3
11605	05/01/78	WATER	0.0	TS				7.70	1020	680	240	210	125	31	41	26	101	1.0	112		293	38	66.0			
11605	24/01/78	WATER	0.0	TS				7.60	1020	690	235	203	130	20	40	25	101	1.0	112		287	40	82.0			0.2
11605	24/01/78	WATER	0.0	TS				7.70	1020	238	205						113				290					
11605	17/02/78	WATER	0.0	TS				7.00	1020	700	235	205					100				287					
11605	05/05/78	WATER	0.0	TS						740								1.0				40				
11605	25/07/78	WATER	0.0	TS				7.40	1090		226	225						1.0				42				0.2
11605	22/09/78	WATER	0.0	RS				7.30	1190		226	215					120				275	43				
11605	17/01/79	WATER	0.0	TS				7.50	1000	653	225	195	130	31	40	25	98	1.0	116		275	43	72.0			0.8
11605	14/08/80	WATER	0.0	TS				7.40	1020	660	234	198	126	28	40	24	98	1.0	102		285	47	83.0			0.5
11605	27/11/81	WATER	0.0	TS				7.60	2730	1820	262	750	268	63	141	94	520	1.0	358		320	31	75.0			1.1
11605	17/08/82	WATER	0.0	TS				7.20	1230	790	225	258	145	39	54	30	140	1.0	144		274	42	74.0			0.2
11605	08/12/83	WATER	0.0	TS	31.0			7.80	1000	650	295	187	132	33	27	29							58.0			0.1
11605	08/12/83	WATER	0.0	TS	31.0			7.80	1110	760	223	231	140	31	45	29	127	1.0	135		272	45	67.0			0.1
11605	05/85	BMR	0.0	SAND	26.0			7.80	990	680			120	24	40	25	109	1.0	98		280	20	75.0	0.4	1.0	
11753	07/11/63	BMR	0.0					7.80		2082		612			113		655		315	31	231					
11778	17/03/78	WATER	0.0	TS	27.0			7.80	4450	3220	213	1295	560	32	357	98	911	1.0	1030		268	2	15.0			0.9
11778	06/10/78	WATER	0.0	TS				7.50	4590	3125	185	1339	536	35	345	116	941	1.0	947		226	1	14.0			1.8
11778	07/12/78	WATER	0.0	TS				7.20	4730	3280	215	1381	570	34	367	113	969	1.0	1047		262	1	14.0			1.2
11778	16/01/80	WATER	0.0	TS				7.40	4670	3227	220	1267	594	30	341	101	931	1.0	1000		268	1	15.0			1.7
11778	14/08/80	WATER	0.0	TS				7.80	3030	1690	225	672	299	26	172	59	465	1.0	500		274	16	34.0			1.0
11778	02/03/82	WATER	0.0	TS				7.10	4580	3120	214	1250	528	35	341	100	855	1.0	995		261	1	13.0			2.0
11778	15/02/78	WATER	60.0	TS				7.30	960	600	145	142	137	23	34	14	104	1.0	130		177	37	40.0			4.3
11778	17/02/78	WATER	113.0	TS				7.30	3530	3170	145	1731	230	38	584	66	198	1.0	1720		177	42	62.0			3.6
11778	18/02/78	WATER	113.0	TS				7.60	4680	3420	190	1273	562	38	345	100	911	1.0	1040		232	1	14.0			8.9
11789	28/02/78	WATER	42.0					7.20	2180	1450	283	390	285	57	74	50	361	3.0	170		345	154	58.0			4.7
11790	25/02/78	WATER	15.0								250	599	730	81	110	79	760	3.0	890		305	131	75.0			3.1
11827	28/02/79	WATER	0.0	TS				7.70	1357	780	230	310	176	16	80	30	188	1.0	176		281	5	22.0			0.1
11827	18/07/79	WATER	0.0	TS				7.50	1280	770	217	295	170	17	67	31	193	1.0	176		265	5	22.0			0.1
11827	01/11/79	WATER	0.0	TS				7.50	1420	780	221	284	170	17	66	29	191	1.0	174		269	6	22.0			0.6
11827	16/01/80	WATER	0.0	TS				7.10	1346	880	216	286	165	16	65	30	186	1.0	178		263	5	22.0			0.2
11827	05/03/80	WATER	0.0	TS				7.30	1590	799	224	284	168	19	66	29	167	1.0	180		273	6	21.0			1.6
11827	14/08/80	WATER	0.0	TS				7.40	1490	770	220	284	160	16	66	29	188	1.0	180		268	7	20.0			0.1

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
11827	07/10/81	WATER	0.0	TS				7.60	1440	780	230	281	169	19	65	30	190	1.0	176		281	8	21.0			0.1
11827	27/11/81	WATER	0.0	TS				7.50	1310	830	217	280	167	18	53	30	185	1.0	180		265	9	21.0			0.5
11827	05/85	BMR	0.0	SAND	28.0			7.70	1190	800			150	14	65	31	182	1.0	165		267	4	23.0	0.2	1.0	
11827	22/10/78	WATER	60.2	TS				7.30	1290	890	215	319	186	19	72	34	213	1.0	199		262	5	24.0			0.1
11865	24/02/78	DRILLER	0.0					8.00	7830	5470	312	895	1410	148	148	128	1535	4.0	1480		381	184	54.0			6.6
12058	15/08/80	WATER	0.0	TS				6.90	2290	1445	196	552	247	39	116	64	383	1.0	320		239	87	78.0			0.1
12058	25/09/80	WATER	0.0	TS				7.50	2640	1480	188	528	257	39	108	63	393	1.0	289		229	89	72.0			0.1
12058	02/01/81	WATER	0.0	TS				7.30	2680	1420	192	552	251	35	116	64	388	1.0	335		234	86	68.0			0.2
12058	14/01/81	WATER	0.0	TS				7.30	2240	1480	190	533	250	37	110	63	388	1.0	310		232	87	72.0			0.2
12058	24/04/82	WATER	0.0	TS				7.10	2110	1340	185	510	230	42	109	59	345	1.0	285		225	96	63.0			0.1
12058	30/09/82	WATER	0.0	TS				7.30	2180	1420	190	684	236	53	111	99	340	1.0	310		232	93	58.0			0.1
12058	16/03/83	WATER	0.0	TS				7.30	2100	1390	194	551	232	47	117	63	340	1.0	290		236	95	65.0			0.2
12058	31/08/83	WATER	0.0	TS	26.0			7.80	2260	1530	185	580	257	41	122	67	390	1.0	340		226	83	52.0			0.1
12058	05/85	BMR	0.0	SAND	26.0	7.41		7.50	2000	1350			190	30	105	60	348	1.0	270		235	40	65.0	0.4	2.0	
12058	01/11/86	BMR	0.0					8.00	2200	1520	210	567	220	30	120	65	342		310		256	97	70.0			
12058	17/03/79	WATER	45.8	TS				7.40	2260	1457	180	540	246	43	114	65	396		323		220	89	70.0			0.3
12058	27/03/79	WATER	67.0	TS				7.60	2280	1474	180	540	250	14	118	62	406	1.0	330		220	89	64.0			8.4
12059	05/03/79	WATER	48.0	PM				7.60	3710	2395	205	640	538	79	126	76	713	2.0	610		250	57				5.5
12060	05/03/79	WATER	42.0	TS				7.40	4210	2715	215	690	628	88	134	85	812	2.0	660		262	62				2.4
12061	06/03/79	WATER	60.0	PS					3980	2597	185	760	554	79	169	88	792	2.0	730		226	54	68.0			3.8
12062	08/03/79	WATER	50.0	TS				7.30	3750	2715	212	660	586	90	120	90					259					
12062	08/03/79	WATER	50.0	TS				7.40	2430			703	552	82	140	86	706				268					
12063	09/03/79	WATER	48.0	TS				7.60	3180	2040	200	610	430	50	128	71	589	2.0	558		244	67	7.0			13.3
12064	10/03/79	WATER	48.0	TS				7.90	3180	2040	200	747	430	50	128	71	589	2.0	558		244	67	71.0			7.1
12064	16/03/79	WATER	48.0	TS				8.70	4240	2650	205	760	592	80	148	95	832	2.0	710	1	238	64				
12065	14/12/79	WATER	0.0	TS				7.40	4000	2540	206	787	530	85	167	90	755	2.0	630		251	64	85.0			0.3
12065	05/85	BMR	0.0	SAND	25.0			7.50	3000	2150			440	60	120	75	665	1.0	500		219	35	75.0	0.6	4.0	
12065	16/05/79	WATER	29.5	TS	26.0			7.30	2657	1259	200	731	550	86	148	88	764	2.0	638		244	65	72.0			0.3
12065	10/03/79	WATER	42.0	TS	26.0			7.80	4010	2587	185	730	570	85	148	90	842	2.0	625		226	24	90.0			33.4
12066	10/05/79	WATER	37.4	TS	26.0			7.30	2470	1580	165	430	275	22	118	33	280	1.0	365		201	104	72.0			0.1
12066	12/03/79	WATER	48.0	TS				7.70	2430	1546	140	520	280	58	116	58	431	2.0	383		171	100	71.0			3.4
12067	12/03/79	WATER	42.0	TS				7.80	2290	1476	145	490	260	56	100	57	406	2.0	310		177	122				
12068	13/03/79	WATER	36.0	TS				7.40	4560	2941	200	740	715	96	146	87	941	2.0	727		244	66	83.0			
12069	14/03/79	WATER	36.0	TS				7.30	5060	3260	226	789	750	114	150	101	1069	2.0	825		275	69				
12070	14/03/79	WATER	36.0	TS				7.80	4360	2870	226	663	648	102	144	74	792	2.0	805		275	78	78.0			0.4
12071	15/03/79	WATER	36.0	TS				7.60	4240	2750	205	720	610	88	142	89	851	2.0	688		250	64	72.0			3.8
12072	12/05/79	WATER	41.0	TS				7.00	3180	2050	190	636	410	63	138	71	554	1.0	515		232	104	71.0			0.1
12072	20/03/79	WATER	48.0	TS				7.50	3150	2110	190	682	410	63	140	80	584	1.0	515		232	72	68.0			16.8
12073	22/03/79	WATER	48.0	TS				7.70	2980	2120	170	733	346	60	172	74	510	2.0	575		207	82	66.0			0.8
12074	22/03/79	WATER	39.0	TS				7.60	3580	2520	161	998	393	63	253	89	608	2.0	850		196	65	63.0			
12075	22/03/79	WATER	54.0	TS				7.50	2400	1530	176	468	307	80	102	52	407	2.0	395		215	65				
12076	24/03/79	WATER	36.0	TS				7.90	3240	2110	176	698	410	68	148	80	598	2.0	580		214	75	74.0			18.6
12077	26/03/79	WATER	48.0	TS				7.30	2350	1560	140	519	278	55	112	58	431	1.0	298		171	150	68.0			
12078	27/03/79	WATER	38.0	TS				7.20	2110	1350	112	429	245	40	81	41	363	1.0	250		137	187	74.0			5.4

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
12079	28/03/79	WATER	48.0	TS				7.50	2310	1440	147	504	247	52	100	62	412	2.0	195		179	186	52.0			3.7
12080	29/03/79	WATER	48.0	TS		7.30		7.50	2200	1450	150	471	255	51	98	55	377	2.0	295		183	131	69.0			4.5
12081	14/12/79	WATER	0.0	TS				7.50	3760	2520	195	847	477	79	188	92	711	2.0	665		238	59	84.0			0.3
12081	05/85	BMR	0.0	SAND	26.0			7.70	3350	2400			440	55	175	90	697	1.0	660		244	28	80.0	0.4	4.0	
12081	31/03/79	WATER	93.0	TS				7.90	2770	2580	179	784	480	75	166	90	725	2.0	670		218	62	70.0			1.2
12082	02/04/79	WATER	48.0	PS				7.70	4990	3340	178	1075	650	85	248	111	941		1000		217	47	40.0			2.0
12083	05/04/79	WATER	80.0	PS				8.10	5620	3720	202	1202	774	104	269	129	1117	2.0	1150		246	60	53.0			5.8
12159			0.0										290	38		1	370	1.0	140		310	104	81.0	0.2	1.9	0.1
12159	09/04/79	WATER	50.0	TS				7.90	2330	1370	128	506	270	43	104	60	416	2.0	315		156	133	31.0			5.2
12160	05/85	BMR	0.0	SAND	26.0			7.80	3900	2750			570	51	180	82	991	1.0	560		203	35	75.0	0.3	4.0	
12160	08/03/86	BMR	16.9		27.2																					
12160	19/05/79	WATER	30.4	TS	26.0			7.40	4530	2830	160	829	616	75	184	90	990	2.0	605		195	68	77.0			0.1
12160	20/04/79	WATER	38.0	TS				7.30	4600	2840	176	827	616	74	188	87	1029	1.0	623		214	65	76.0			6.9
12160	17/04/85	WRD	38.0					7.60	4330	2830	164	812	604	55	182	87	970	1.0	597		200	64	83.0			0.6
12160	03/05/85	?WRD	38.0					7.60	4330	2830	164	812	604	55	182	87	970	1.0	597		200	64	83.0			0.6
12161	05/85	BMR	0.0	SAND	26.0			8.00	2550	1850			360	40	130	50	514	1.0	450		215	36	75.0	0.3	2.0	
12161	08/03/86	BMR	17.0		27.2																					
12161	21/04/79	WATER	38.0	TS				8.10	2950	1890	182	598	389	55	144	58	533	2.0	498		220	70	77.0			1.4
12162	05/85	BMR	0.0	SAND	26.0			7.80	3500	2550			430	62	155	105	741	2.0	580		243	55	90.0	0.8	5.0	
12162	07/05/79	WATER	44.0	PS				7.40	2430	1550	180	548	275	53	116	63	406	1.0	348		220	92	76.0			0.9
12162	21/04/79	WATER	53.0	PS				7.60	3870	1570	179	518	280	53	112	58	417	1.0	343		218	92	77.0			2.2
12163	16/05/79	WATER	63.0	PS				8.30	4840	3160	180	1082	632	81	244	115	940	2.0	935		220	42	48.0			
12164	12/01/79	WATER	0.0	TS						2755								2.0				60				
12164	19/07/79	WATER	0.0	TS				7.40	3690	2670	226	704	610	82	144	84	813	2.0	690		275	63	77.0			0.2
12164	27/09/79	WATER	0.0	TS				7.40	4100	2800	229	731	645	78	148	88	780	2.0	682		279	65	80.0			0.2
12164	14/12/79	WATER	0.0	TS				7.50	4120	2650	222	776	584	87	161	91	794	2.0	685		271	60				
12164	18/03/81	WATER	0.0	TS				7.40	4530	2590	217	745	580	82	152	89	800	2.0	710		265	61	80.0			0.3
12164	05/85	BMR	0.0		26.0			7.80	3400	2500			380	75	185	122	776	1.0	610		241	28	75.0	0.3	4.0	
12164	05/05/79	WATER	30.0	TS	26.0			7.40	4240	2700	222	725	610	88	144	88	812	2.0	675		271	60	73.0			
12164	26/04/79	WATER	43.0					7.60	4250	2690	224	710	610	83	141	87	833	2.0	705		273	60	75.0			5.9
12447	23/02/80	WATER	39.0	TS				7.50	4960	2695	208	769	546	80	160	90	788	2.0	705		253	64	74.0			0.7
12448	25/02/80	WATER	39.0	TS			3700	7.60	5070	2760	194	779	588	80	164	90	804	1.0	725		236	63	74.0			
12449	04/03/80	WATER	125.0	PM				7.90	2830	1395	272	429	316	25	83	54	461		235		332	1	13.0			17.9
12452	08/03/80	WATER	44.0	TS				7.10	1630	941	165	275	161	38	52	35	172	2.0	128		201	148	131.0			
12452	08/03/80	WATER	57.5	TS				7.60	2750	1447	226	508	280	36	100	63	416	1.0	318		275	46	27.0			5.8
12453	05/85	BMR	0.0	SAND	26.0			7.90	1850	1350			175	36	80	65	334	1.0	210		221	60	55.0	0.5	3.0	
12453	07/05/80	WATER	86.0	PS	25.0			7.40	2440	1240	190	481	208	44	84	66	334	1.0	235		232	99	62.0			0.2
12453	19/03/80	WATER	100.0	PS				7.70	2390	1280	188	487	212	47	80	70	356	1.0	193		229	117	56.0			1.3
12454	21/03/80	WATER	113.0	PS				8.00	2810	1460	189	505	272	44	84	72	475	1.0	263		231	24	27.0			1.2
12455			0.0										300	29	8	82	480	1.0	230		199	20	3.7	0.5	2.3	0.1
12455	05/85	BMR	0.0	SAND	26.0	7.17		7.80	2250	1550			260	28	65	110	453	1.0	340		291	14	25.0	0.4	3.0	
12455	22/03/80	WATER	50.0	TS				7.50	2750	1540	153	528	250	50	108	63	416	2.0	260		186	148	66.0			4.0
12455	22/03/80	WATER	71.0	TS				7.80	2720	1480	150	547	246	48	104	70	386	2.0	315		178	134	66.0			
12455	24/04/80	WATER	100.0	PM	26.0			7.50	2870	1479	196	574	257	39	90	85	417	1.0	325		239	88	56.0			0.3

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
12455	24/03/80	WATER	112.0	PM				7.80	2800	1540	164	554	244	47	84	84	412	1.0	265		200	127	57.0			5.1
12455	24/03/80	WATER	144.0	PM				7.80	3110	1660	217	650	278	44	96	100	461	1.0	341		265	81	45.0			0.3
12456	26/03/80	WATER	43.7	TS		7.35	2100	7.80	2800	1530	157	543	253	49	104	69	406	1.0	305		192	132	68.0			1.1
12456	22/05/80	WATER	94.1	TS			2100	7.70	2670	1440	161	570	235	40	100	78	407	2.0	280		196	126	59.0			1.9
12457	14/04/80	WATER	4.5	TS				7.60	3200	1830	199	715	323	25	176	67	431	2.0	620		243	1	15.0			1.2
12457	15/03/83	WATER	58.0	TS	26.0			7.70	2650	1750	214	646	338	36	160	60	422	1.0	585		261	1	11.0			0.9
12457	23/05/80	WATER	99.0	TS	28.0		2600	7.30	3290	1750	220	696	330	27	170	66	431	1.0	630		268	1	17.0			0.4
12458	05/85	BMR	0.0	SAND	26.0			8.00	2100	1350			270	23	70	55	433	1.0	235		258	14	18.0	0.5	2.0	
12458	16/05/80	WATER	58.0	TS				7.50	2830	1380	237	510	279	31	104	61	421	1.0	280		289	37	27.0			0.1
12459	22/04/80	WATER	54.0	ES			2000	7.30	2420	1320	200	496	246	40	82	71	363	1.0	245		244	110	58.0			6.4
12460	28/05/80	WATER	94.0	PM	27.0			7.50	2730	1350	259	496	280	26	100	60	456	1.0	223		316	2	12.0			1.1
12754	14/07/80	?WRD	24.3					7.20	1590	990	212	349	175	36	84	34	230	1.0	152		259	118	73.0			
12755	08/03/86	BMR	6.7		26.7																					
12755	13/07/80	?WRD	24.3					7.70	1490	960	194	311	166	35	72	32	197	2.0	156		236	118	77.0			3.3
12756	25/08/80	?WRD	17.0					7.30	3450	2220	193	619	477	47	139	66	604	2.0	630		235	77	84.0			4.0
12757	25/08/80	?WRD	21.0					7.20	3400	2260	205	630	463	52	147	64	588	1.0	630		250	55	68.0			
12758	25/08/80	?WRD	20.0					7.60	3150	2030	162	592	430	44	140	59	564	2.0	560		197	73	77.0			
12759	08/03/86	BMR	15.0		26.8																					
12759	22/09/80	?WRD	30.0					7.50	1910	1400	165	488	239	32	118	47	345	1.0	312		201	80	82.0			4.0
12760	09/07/80	?WRD	37.0					7.50	2170	1460	163	525	263	33	128	50	378	1.0	363		199	83	84.0			1.0
12761	22/09/80	?WRD	52.0					7.60	2090	1390	167	467	251	44	108	50	391	1.0	313		204	62	69.0			1.0
12762	22/09/80	?WRD	37.0					7.20	2360	1590	170	554	283	51	126	58	475	1.0	343		207	61	83.0			1.0
12854	21/08/80	WATER	28.0					7.50	2200	1180	244	336	267	28	64	43	335	2.0	170		298	119	64.0			8.2
12855	21/08/80	WATER	15.0	QTZ				8.00	5560	3050	350	485	908	50	40	94	1090	2.0	663		427	119	85.0			1.8
12856	22/08/80	WATER	29.0	GRNT				7.60	6520	3680	194	971	902	41	139	152	1485	2.0	781		237	22	74.0			1.7
12857	21/08/80	WATER	44.0	PM				7.60		5480	445	1177	1525	99	182	176	2410	2.0	700		543	91	62.0			2.5
13041	01/03/82	CONTRACTOR	0.0	DLS				7.40	2430	1720	258	914	212	19	164	123	256	1.0	743		315	3	8.0			0.8
13041	23/03/82	CONTRACTOR	0.0	DLS				7.70	2360	1750	240	850	223	23	160	110	260	1.0	710		295	2	22.0			0.3
13276	23/09/81	DRILLER	0.0					7.50	1900	1240	263	389	217	32	97	37	250	1.0	292		321	88	69.0			10.4
13277	24/09/81	DRILLER	0.0					7.50	2120	1270	150	405	236	34	104	38	300	1.0	320		183	70	70.0			3.4
13277	24/09/81	WATER	0.0					7.50	2120	1270	150	405	236	34	104	38	300	1.0	320		183	70				
13277	08/03/86	BMR	10.3		26.6																					
13278	25/09/81	WATER	0.0					7.20	2280		190	442					360				232					
13279	26/09/81	WATER	0.0					7.60	2280	1400	156	420	250	39	97	46	380	1.0	290		192	76	74.0			1.5
13299	21/04/81	WATER	0.0				5260	7.40	5090	3290	120	1002	686	83	136	171	1230	2.0	650		146	1	9.0			
13299	04/12/81	CONTRACTOR	0.0	EOPS			5260	7.40	5090	3290	120	1002	686	83	136	171	1230	2.0	650		146	1	9.0			
13299	01/84	CONTRACTOR	0.0	EOPS	27.5	6.68		7.10	5150	3310	133	1029	678	71	128	173	1300	1.0	772	2	162	1	9.0			0.1
13299	01/84	WATER	0.0	EOPS	27.5	6.68	5260	7.10	5150	3310	133	1029	678	71	128	173	1300	1.0	772	2	162	1	9.0			0.1
13299	11/85	BMR	0.0					7.60	3250	2828			620	78	170	160	990	2.0	450		189				3.2	
13299	01/11/86	BMR	0.0					7.50	5000	3160	157	1045	550	70	150	163	1150		615		192		11.0			
13363			0.0										470	40	350	106	680		1230		220	43	63.0		3.0	
13363	05/85	BMR	0.0	SAND	28.0	7.93		7.80	3900	3000			460	45	335	105	712	1.0	1150		224	20	60.0	0.1	3.0	
13363	01/11/86	BMR	0.0					7.70	4100	2960	193	1348	374	35	375	100	658		1050		235	46	63.0			
13365	05/85	BMR	0.0	SAND	27.2	7.52		7.40	2750	2000			330	40	160	70	522	1.0	530		229	35	70.0	0.3	3.0	

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS					CATIONS						
13389	21/01/82		0.0					6.80	1310		117	310	126	40	57	42	245	0.6	149		143		16.0			0.3
13400	11/81	OWNER	0.0					6.90			75	8600					13000									
13400	11/81		0.0					6.90	38100		75	8600					13000				92					
13417	03/82	CONTRACTOR	690.5	DS				6.90	1260	760	150	345	121	26	68	39	195	1.0	182		182	1	16.0			3.1
13510	11/06/82	WATER	0.0						55200																	
13511	13/06/82	WATER	12.0					6.90	59500		104	11800					23500				127					
13512	13/06/82	WATER	0.0					7.30	21100		260	3840					5700				317					
13553	27/11/82		0.0				1670	7.40	1910	1190	155	485	208	47	84	67	360	1.6	283		189	1	9.0			0.3
13554	01/12/82	WATER	55.0	GRNT				8.10		7330	591	994	2270	205	96	184	2840	5.0	1330		720	18	67.0			1.4
13555	02/12/82	WATER	91.0	GRNT				7.10	5960	3900	181	784	995	126	194	73	1270	5.0	1060		221	52	14.0			
13627	13/12/82	WATER	0.0					7.30	3560	2200	235	731	422	93	140	93	630	2.0	500		287	143	64.0			0.6
13627	09/84	BMR	0.0	CALCR	26.7			7.46	3400	1490			425	63	140	103	703	2.0	430		269	210	70.0	1.0	8.8	
13764	09/84	BMR	0.0	CALCR				8.00	2700	1635			260	48	49	49	475	1.0	51		191	120	0.1			0.2
13764	11/03/86	BMR	3.9		28.2																					
13842	26/08/83	WATER	100.0	PS				7.70	3380	2040	195	594	438	45	121	71	650	1.0	337		238	105	49.0			
13843	09/84	BMR	0.0					8.90	3500	2010			620	32	4	33	688	1.0	420	21	171	9	5.5	0.8		
13843	27/08/83	WATER	73.0	PS				7.70	5330	3230	361	832	870	52	131	123	1062	1.0	814		440	5	17.0			
13861	07/02/84	CONTRACTOR	213.0	DCS				7.40	920	614	89	261	82	18	65	24	105		192		108	10	10.0			0.1
13864	11/02/84	CONTRACTOR	280.0	DCS				7.20	635	414	83	122	78	16	19	18	100	1.0	67		101	9	6.0			0.1
13864	11/02/84		280.0					7.20	635	414	83	122	78	16	19	18	100	0.9	67		101	9	6.0			
13872	08/02/83		0.0				3360	7.40	3500	2447	331	641	511	44	104	93	810	1.0	421		404	10	49.0			0.1
13872	26/08/83	CONTRACTOR	57.0		27.0			7.70	3420	2120	315	643	504	57	103	94	690	1.0	421		384	11	57.0			
13979	29/02/84	CONTRACTOR	103.0	OS				7.30	1650	940		241	221	47	34	38	330	1.0	205		121	4	13.0			0.3
13980	11/85	BMR	0.0					8.30	400	270			55	20	27	18	120	1.0	35		131				0.6	
13980	01/11/86	BMR	0.0					7.30	550	390	79	133	50	20	22	19	89		44		96	11	22.0			
13980	17/05/84	WATER	39.0	OS	28.0	6.65		6.50	580	330	76	128	55	17	23	17	90	1.0	47		92	11	23.0			0.2
13980	11/04/84	CONTRACTOR	61.0	OS				7.50	610	398	77	125	60	18	22	17	110	1.0	49		94	13	15.0			0.1
13981	22/05/84	WATER	128.4	OS	20.0		1100	6.90	1020	610	208	222	114	40	31	35	120	1.0	101		254	11	48.0			0.1
13981	06/03/84	CONTRACTOR	139.0	OS				7.50	1070	782	212	198	130	47	30	30	140	1.0	108		258	10	28.0			0.1
13982	08/03/84	CONTRACTOR	152.0	OS				8.40	980	676	161	174	116	43	32	23	140	1.0	114		196	1	6.0			0.1
13983	01/11/86	BMR	0.0					7.50	2000	1280	213	690	155	18	128	90	362		330		259		16.0			
13983	28/05/84	WATER	96.0	OS	31.0		2500	6.50	2120	1360	198	710	161	23	120	100	350	1.0	370		241	1	21.0			0.3
13983	11/03/84	CONTRACTOR	109.0	OS	28.6	6.25		7.50	2140	1420	166	678	171	36	125	89	380	1.0	393		202	2	11.0			0.1
13984	12/03/84	CONTRACTOR	150.0	OS				7.40	1770	1070	171	453	164	46	58	75	330	1.0	237		208	6	9.0			0.1
14009	20/10/84	WATER	106.0	EOP	31.0		930	7.10	900	560	203	175	106	31	27	26	110	1.0	91		248	10	43.0			0.2
14010	31/08/84	CONTRACTOR	128.0	EOP				7.60	700	460	199	131	85	28	21	19	68	1.0	60		243	13	57.0			
14130	09/84	BMR	0.0	CALCR	25.5	7.23		7.50	2450	1510			280	38	95	50	394	2.0	200		319	142	77.0	0.7	9.0	
14152	01/11/86	BMR	0.0					7.80	700	425	202	112	85	35	17	17	51		47		246	12	64.0			
14152	12/10/84	WATER	112.0		32.0		660	7.70	700	460	220	147	79	27	29	18	55	1.2	54		268	14	64.0			1.5
14153	06/09/84	CONTRACTOR	115.0	OS				7.70	2180	1350	181	681	176	31	128	88	390	1.0	380		220	1	15.0			1.2
14154	01/11/86	BMR	0.0					7.80	1700	1010	345	460	165	35	87	59	217		210		421		15.0			
14154	08/09/84	CONTRACTOR	91.0	ES	28.5	6.60		7.90	1690	1000	221	361	190	46	56	54	275	2.0	245		270	1	14.0			
14155	09/09/84	CONTRACTOR	64.0	OS				8.10	1570	980	189	436	136	30	58	71	280	1.0	202		230	9	13.0			
14156	10/09/84	CONTRACTOR	91.0	OS				8.10	1440	890	176	372	127	32	55	57	250	1.0	180		215	8	14.0			

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
14157	31/10/84	WATER	27.0	OS	29.0		840	6.70	830	470	113	176	93	12	26	27	145	1.0	83		137	8	25.0			
14158	18/10/84	WATER	29.6	OS	29.0		830	6.90	770	450	136	157	84	20	25	23	110	1.0	72		166	4	46.0			0.9
14158	12/09/84	CONTRACTOR	41.5	OS				7.70	810	470	143	168	89	24	26	25	124	1.0	78		174	5	39.0			
14231	11/85	BMR	126.0					7.45	2600	2070			420	53	180	110	580		635		248	4			3.6	
14231	11/85	BMR	158.0					7.60	2500	1980			380	56	170	120	325		645		164	1			2.9	
14231	11/85	BMR	172.0					7.65	1750	1470			260	46	130	80	345	3.0	420		231				2.1	
14231	11/85	BMR	190.0					7.60	1450	1150			230	43	90	60	305		320		203	1			2.1	
14231	11/85	BMR	195.0					7.65	1350	1050			210	41	80	50	275	2.0	285		192				1.4	
14233	21/02/85		120.0					7.30	320	210	40	67	35	7	12	9	56	0.3	28		49	9	18.0			
14252	11/85	BMR	0.0					8.10	1870	1500			295	46	135	90	400		440		287	5			1.9	
14256	17/05/85	WATER	0.0	EOP	27.5	6.98		7.80	1620	930	458	403	163	79	58	63	155	1.2	159		558	30	14.0	4.9		0.1
14256	01/11/86	BMR	0.0					8.10	1750	1050	575	533	140	84	95	72	125		143		702	30	29.0			
14256	17/05/85		57.0					7.80	1620	930	458	403	163	79	58	63	155	1.2	159		558	30	14.0			
14279	09/84	BMR	0.0	CALCR				6.90	1700	850			260	40	16	20	304	1.0	12		267	120	4.5	0.4		
14362	13/09/85		120.0		31.0		600	7.40	1570	930	205	339	168	18	58	50	250	0.9	197		250	7	38.0			0.4
14368	02/10/85	WRD	120.0					7.40	1570	930	205	339	168	18	58	50	250	1.0	197		250	7	38.0			0.4
14368	24/04/85		142.3				500	7.60	670	390	180	117	78	28	17	18	60	1.1	64		220	10	37.0			
14368	24/04/85		160.0				600	8.40	780	470	185	145	95	29	22	22	88	1.0	72	3	220	11	52.0			6.6
14368	24/04/85		190.3				1100	8.20	1220	740	203	250	129	35	36	39	170	1.0	148		247	9	46.0			7.8
14368	24/04/85		202.7				1400	8.10	1590	960	205	363	168	38	53	56	250	0.9	208		250	7	40.0			6.2
14368	26/04/85		221.0				1400	8.20	1740	1060	203	420	189	38	68	61	330	0.8	226		247	6	35.0			1.5
14368	03/05/85		225.0				1400	7.70	1760	1090	203	421	150	39	70	60	320	0.7	245		247	6	33.0			0.6
14369	01/11/86	BMR	0.0					7.80	2400	1660	197	668	214	29	126	86	459		354		240		16.0			
14369	02/10/85	WRD	120.0		31.5	7.09		7.50	2400	1460	181	605	234	33	124	72	441		329		220		17.0			
14369	18/05/85		127.5				500	8.40	600	390	180	109	61	29	17	16	46	1.1	51		220	14	58.0			
14369	20/05/85		160.0				600	8.00	800	500	193	152	78	31	23	23	88	1.1	48		235	11	56.0			2.8
14369	20/05/85		184.0				1050	8.20	1210	740	194	247	114	35	38	37	180	0.9	148		236	8	44.0			
14369	20/05/85		189.0				1400	8.20	1540	940	190	354	137	39	58	51	260	0.8	145		232	6	37.0			3.7
14369	20/05/85		197.0				1800	8.00	1920	1240	193	491	158	38	88	66	370	0.6	274		235	4	27.0			5.2
14369	21/05/85		215.0				1800	7.80	2160	1320	185	559	208	35	112	68	410	0.5	311		226	3	13.0			
14369	27/05/85		239.0				2100	7.50	2330	1460	140	571	244	36	112	71	470	0.3	361		171	1	15.0			
14369	27/05/85		245.0				2100	7.70	2400	1590	170	643	242	34	126	80	490	0.3	353		207	1	16.0			
14369	27/05/85		251.0				2400	7.70	2400	1510	188	634	246	34	124	79	490	0.3	359		229	1	16.0			1.6
14369	29/05/85		256.0				2400	7.50	2290	1450	176	620	234	34	120	78	480	0.3	349		214	1	15.0			
14369	30/05/85		264.0				2700	7.60	2320	1460	176	633	236	34	122	80	480	0.3	339		214	1	16.0			
14369	31/05/85		293.4				2000	7.50	3060	1430	175	660	250	34	128	83	450	0.3	475		217		12.0			
14369	01/06/85		305.6					7.40	2350	1530	172	621	240	36	114	82	460	0.4	340		210		15.0			
14369	01/06/85		311.7					7.40	2340	1510	176	627	242	34	118	81	460	0.3	330		214		14.0			
14369	01/06/85		317.8					7.40	2340	1500	178	593	226	34	106	80	460	0.5	340		217		13.0			
14370	11/06/85		93.9					7.80	1700	1130	228	482	154	37	86	65	280	0.9	232		278	4	30.0			4.9
14370	14/06/85		117.9					8.10	1390	860	281	397	131	30	72	53	200	0.8	152		342	7	19.0			0.6
14370	15/06/85		142.2					7.90	1400	860	262	387	133	30	71	51	210	0.8	154		320	7	19.0			4.5
14370	18/06/85		177.7					7.60	1630	970	212	414	165	27	85	49	240	0.5	202		259	9	16.0			3.8
14370	18/06/85		226.5					7.40	1620	1000	165	424	159	26	89	49	300	0.5	216		201	8	13.0			

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
															ANIONS				CATIONS							
14370	20/06/85		318.0					7.30	1700		158										192					
14371	24/06/85		106.0				1380	7.90	1390	830	160	357	145	27	67	46	250	12.0	169		195	10	19.0			0.9
14371	27/06/85		196.0				1700	7.30	1690	1000	150	450	175	32	85	58	320	0.4	228		183	2	10.0			
14372	02/07/85		99.4					7.30	730	430	144	140	78	32	28	17	105	12.0	60		176	16	45.0			
14372	12/07/85		260.0					7.50	2900	1890	189	743	310	50	112	113	580	10.0	451		231	8	36.0			
14372	16/08/85	WRD	275.2					7.70	3900	2540	249	1005	434	65	146	156	900	1.0	623		304	4	21.0			0.5
14373	23/07/85	WATER	57.5					7.30	1000	660	185	327	65	20	65	40	124	0.7	163		226		9.0			
14373	21/09/85	WATER	146.0		29.0		1460	6.90	1380	830	121	358	128	21	79	39	250	0.6	185		148	8	25.0			3.2
14373	02/10/85	WRD	146.0					6.90	1380	830	121	358	128	21	79	39	250	1.0	185		148	8	25.0			3.2
14373	01/08/85	WATER	154.2					7.10	980	690	105	294	96	16	60	35	170	0.6	172		128	2	29.0			2.6
14373	01/08/85	WATER	178.6					6.80	1030	680	95	256	99	17	53	30	175	0.5	133		116	19	31.0			
14373	08/08/85	WATER	238.5					7.20	1670	1060	187	457	155	28	89	57	320	0.5	187		228	5	18.0			1.9
14373	08/08/85	WATER	244.0					7.00	1650	1040	135	462	140	26	91	57	320	0.5	193		165	6	18.0			1.2
14374	03/09/85	WRD	141.9					7.40	1170	710	103	245	137	15	52	28	225	1.0	131		126	10	10.0			
14413	10/08/85	WRD	161.0					7.70	1080	580	152	296	100	15	50	30	150	1.0	90		185	1	10.0			
14413	07/09/85	WRD	196.0					7.30	1440	900	133	319	166	26	65	38	230	1.0	260		162	1	12.0			
14413	07/09/85	WRD	211.4					7.40	1710	1080	110	384	197	30	78	46	280	1.0	331		135		11.0			
14413	11/09/85	WRD	224.0					7.50	1760	1100	117	372	212	32	73	46	310	1.0	331		143	1	13.0			
14413	11/09/85	WRD	244.0					7.30	1870	1200	95	383	228	34	76	47	350	1.0	353		115	1	10.0			1.1
14413	11/09/85	WRD	253.0					7.20	1730	1060	106	378	200	31	79	44	289	1.0	302		129		13.0			3.0
14413	11/09/85	WRD	255.0					7.10	1690	1010	72	342	199	32	71	40	300	1.0	290		88	2	10.0			
14413	16/09/85	WRD	271.0					7.20	1470	900	60	294	173	27	60	35	290	1.0	240		74	4	10.0			
14414	21/09/85	WATER	98.0					7.40	3100	2118	236	1069	262	37	188	146	460	0.6	838		288	1	9.0			4.0
14414	21/09/85	WATER	102.0				3050	7.10	3080	2140	229	1102	270	32	165	168	510	0.6	874		279	1	9.0			
14414	24/09/85	WATER	111.0				3020	7.50	3080	2180	238	1064	268	32	186	146	450	0.8	808		290	1	12.0			2.8
14414	11/85	BMR	131.0					8.10	1800	1520			220	35	150	130	330		630		276				2.2	
14414	24/09/85	WATER	143.0				2240	7.20	2280	1520	190	748	205	28	135	100	330	0.7	520		232	1	13.0			
14414	24/09/85	WATER	180.0				2230	7.30	2330	1560	193	740	200	30	132	100	340	0.7	530		235	1	12.0			
14414	25/09/85	WATER	191.0				2220	7.60	2270	1460	265	696	202	33	134	88	290	0.4	452		323	1	14.0			4.3
14414	25/09/85	WATER	203.0					7.40	2240	1440	254	727	202	30	133	96	351	0.4	448		310	1	13.0			3.1
14414	04/10/85	WATER	211.0				2500	7.60	2590	1690	253	837	212	30	148	114	380	0.6	576		309	1	14.0			1.4
14414	11/85	BMR	211.0					7.90	2000	1690			230	36	130	170	380		660		254				2.2	
14414	05/10/85	WATER	229.0				2360	7.60	2460	1780	257	836	206	32	144	116	370	0.7	574		313	1	14.0			6.1
14414	11/85	BMR	229.0					7.95	1850	1590			220	35	160	130	330		610		254				1.8	
14414	07/10/85	WATER	239.0				2510	7.70	2580	1520	251	858	221	31	140	124	390	1.0	590		306	1	14.0			0.4
14414	11/85	BMR	239.0					7.95	1950	1710			230	35	170	140	335		630		282				2.0	
14415	11/85	BMR	79.0					8.10	12500	12150			2390	195	560	830	4000		3450		276				21.0	
14415	11/85	BMR	84.0					8.20	10200	9490			1880	162	450	660	3205		2720		220				17.0	
14415	11/85	BMR	97.0					8.20	6900	6080			1240	117	240	420	2155				127				12.0	
14415	11/85	BMR	102.0					7.65	6700	5990			1200	112	300	400	1935		1550		261				11.0	
14415	11/85	BMR	106.0					7.65	6800	5980			1190	113	300	390	1920		1980		279				14.0	
14415	11/85	BMR	172.0					7.70	5800	4990			960	95	290	320					268					
14415	11/85	BMR	195.0					7.55	3200	2730			460	51	240	180	842		490		276				3.1	
14483	18/10/85	WATER	0.0				1550	7.10	1510	830	118	369	146	27	64	51	270	0.5	193		144	7	16.0			0.3

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	ANIONS Na	K	Ca	Mg	Cl	F	CATIONS SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
14483	11/85	BMR	0.0					7.75	1150	910			150	32	80	50	255	1.0	215		165	7			1.3	
14483	06/06/85	WATER	166.0		28.0			7.30	1690	1030	135	433	170	30	78	58	320	1.0	235		165	6	11.0			
14663	20/12/85	?WRD	73.3					6.40	2250	1360	8	12	253	40	60	58	10	2.0	256			55	37.0			
14824	01/11/86	BMR	0.0					7.60	800	490	107	176	83	20	26	27	126		93		131		29.0			
14920	15/12/86	DRILLER?	80.0				10100	7.60	11710	7010	164	2044	1704	48	401	254	3370	0.9	1016		199	87	25.0			
14921	16/12/86	DRILLER?	57.0					7.40	1580	930	92	294	182	27	52	40	302	0.9	164		112	35	43.0			5.6
14922	17/12/86	DRILLER?	50.0				19800	7.70	19800		183	6750					6830				224					
14923	17/12/86	DRILLER?	50.0					7.50	60000		232	7000					15600				283					
14924	20/12/86	DRILLER?	87.0					7.90	8820	4540	173	1477	943	62	176	253	1635	1.4	1029		211	27	11.0			
14925	21/12/86	DRILLER?	87.0					7.70	8350	4370	195	1428	887	41	184	236	1485	1.2	1035		237	30	9.0			8.0
14928	03/02/87	DRILLER?	68.0					7.50	5130	3060	220	970	670	65	200	120	1070	1.1	600		270	60	10.0			0.4
14930	06/02/87	DRILLER?	72.0					7.40	5580	3210	140	870	770	30	160	120	1310	1.0	480		170	130	15.0			
14931	07/02/87	DRILLER?	0.0					7.60	10390	6860	190	2250	1330	70	420	300	2670	0.5	1120		230	390	20.0			
14932	13/02/87	DRILLER?	50.0					7.50	30500		220	6200					10430				270					
14933	14/02/87	DRILLER?	64.0					7.70	24400		180	4550					8150				220					
14934	14/02/87	DRILLER?	57.0					7.80	18180		170	3100					5530				210					
14935	14/02/87	DRILLER?	10.0					7.80	2410	1540	240	420	310	40	100	40	380	1.4	270		290	110	80.0			
14937	16/02/87	DRILLER?	27.0					7.70	2360	1520	250	360	320	50	75	40	350	1.5	300		300	110	75.0			8.2
14938	16/02/87	DRILLER?	20.0					7.80	2640	1580	170	400	320	50	80	50	440	1.6	280		210	120	80.0			2.5
14939	17/02/87	DRILLER?	18.0					7.80	1660	1110	200	340	200	40	75	35	240	1.4	180		250	110	85.0			2.1
14960	11/05/87	DRILLER?	45.5		26.0		2000	8.00	1800	1150	289	230	288	35	46	28	221	1.7	235		352	57	78.0			4.0
14961	12/05/87	DRILLER?	54.5		24.0			8.20	1400	905	316	166	230	30	32	21	147	1.8	128		385	50	77.0			6.0
90003	11/84	BMR	0.0	PLAYA	31.0	7.12		6.60	215000	296000			91600	4700	440	8450	144000	1.0	27800		43	180	4.4	1.4		0.1
90004	11/84	BMR	0.0	PLAYA		7.13		7.40	210000	307000			88500	4050	340	9100	142000	1.0	32600		53	31	7.1			0.1
90005	11/84	BMR	0.0	PLAYA	26.3	6.78		7.30	210000	308000			86400	3950	340	9650	143000	1.0	34500		84	22	7.2	0.4		0.1
90006	11/84	BMR	0.0	PLAYA				7.00	210000	360000			89600	4300	330	9150	143000	1.0	35300		99	22	7.7	1.0		0.1
90007	11/84	BMR	0.0	PLAYA		7.66		7.50	100000	87800			26000	1450	1090	2300	40400	2.0	10500		131	53	16.0	0.3		0.1
90008	11/84	BMR	0.0	PLAYA		6.96		6.50	215000	329000			91400	4420	380	8900	150000	2.0	29700		31	67	7.6	0.7		0.1
90009	11/84	BMR	0.0	PLAYA		6.93		6.80	215000	361000			85600	4120	340	9400	144000	2.0	31300		57	53	11.0	1.4		0.1
90010	11/11/84	BMR	0.0	SAND		6.74		6.50	75000	60800			17400	790	950	1720	27300		9200		143	56	12.0	0.1	41.0	0.1
90011	11/84	BMR	0.0	SAND	25.3	6.85		6.60	48000	38000			10300	540	1050	1100	160000		6150		225	110	12.0	0.1	27.0	0.1
90012	11/84	BMR	0.0	SAND	26.2	7.12		7.40	88000	76000			20700	1100	890	2760	31600		12600		135	78	28.0	0.1	18.0	0.5
90013	11/84	BMR	0.0	PLAYA	24.6	7.24		7.50	140000	154000			39700	2100	730	5700	64500	5.0	21600		115	220	16.0	16.6		7.7
90015	11/84	BMR	0.0	PLAYA	25.6	7.05		7.10	128000	137000			37000	2100	720	5100	56000	7.0	21900		213	100	14.0	16.6		5.0
90020	05/85	BMR	0.0	CALCR	25.6	7.15		7.50	20500	15600			3850	280	480	450	6160	2.0	2920		331	250	88.0	0.5	22.0	0.2
90021	09/84	BMR	0.0	CALCR				7.10	2650	1660			370	44	80	40	373	2.0	305		355	168	89.0	0.9	2.0	
90021	09/84	BMR	0.0	CALCR		7.20		7.70	2550	1615			350	42	77	39	356	4.0	285		349	120	48.0	0.7	2.0	0.1
90022	05/85	BMR	0.0	CALCR	25.2	6.82		7.50	27500	22800			5600	300	560	900	8980		4800		331	125	59.0	2.7	40.0	0.2
90023	05/85	BMR	0.0	CALCR	26.2	6.73		7.40	55000	53600			14300	480	710	2240	21000		12500		259	90	30.0	0.1	86.0	0.1
90024	05/85	BMR	0.0	CALCR				7.60	52000	48000			13200	590	735	1620	19300	2.0	10200		232	110	45.0	1.9		0.1
90025	09/84	BMR	0.0	PLAYA				7.00		116900			39100	1200	1080	2460	61600		11500		56	2	13.0	0.1	38.0	0.1
90029	09/84	BMR	0.0	PLAYA				7.06		125400			39900	1380	868	3850	62200		17200		54	3	35.0	0.1	80.0	0.1
90030	09/84	BMR	0.0	PLAYA				6.70		138900			41800	1400	782	4880	65300		21200		55	3	22.0	0.2	88.0	2.0
90031	09/84	BMR	0.0	PLAYA				6.87		179400			55900	2050	637	6090	88600		24200		33	8	12.0	0.1	28.0	4.0

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	Na	K	Ca	Mg	Cl	F	SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
													ANIONS						CATIONS							
90032	09/84	BMR	0.0	PLAYA				6.90	185000	285000			85300	3250	320	9640	145000		33000		32	28	12.0	0.9		2.9
90040	09/84	BMR	0.0	PLAYA				7.30	205000	289500			94000	2820	400	5050	162000		20700		49	25				
90045	09/84	BMR	0.0	PLAYA				7.20	175000	221500			70700	2650	520	4000	115000		19500		490	66	5.4	0.9		
90047	09/84	BMR	0.0	PLAYA				7.70	155000	220000			45500	3000	310	6100	71300		29900		81	670	4.7	5.5		
90050	14/09/81	URANERZ	0.0	CZ		7.60				17750				485					4390		395		34.0			
90051	14/09/81	URANERZ	0.0	CZ		7.55				25050				720					5960		695		43.0			
90053	14/09/81	URANERZ	0.0	CZ		6.70				239800				4200					45400		55		7.0			
90054	14/09/81	URANERZ	0.0	CZ		7.30				46300				1400					11400		355		23.0			
90060	14/09/81	URANERZ	0.0	CZ		7.40				61540				1630					16100		355		23.0			
90061	14/09/81	URANERZ	0.0	CZ		7.11				111140				2520					24000		190		14.0			
90064	14/09/81	URANERZ	0.0	CZ		7.43				41950				1050					10600		560		22.0			
90065	14/09/81	URANERZ	0.0	CZ		7.25				35160				960					9290		905		37.0			
90067	14/09/81	URANERZ	0.0	CZ		7.35				9900				260					2350		540		39.0			
90070	27/09/82	URANERZ	0.0	CZ		7.10				45600				490							135		11.0			
90074	27/09/82	URANERZ	0.0	CZ		7.60				28100				830							255		8.0			
90075	27/09/82	URANERZ	0.0	CZ		6.90				65600				1270							112		11.0			
90076	27/09/82	URANERZ	0.0	CZ		6.90				46400				880							68		28.0			
90089	05/11/82	URANERZ	0.0	CZ		6.90				61700				1020							155		17.0			
90090	05/11/82	URANERZ	0.0	CZ		7.20				28400				620							275		25.0			
90091	05/11/82	URANERZ	0.0	CZ		6.20				38400				675							44		36.0			
90092	05/11/82	URANERZ	0.0	CZ		6.90				38700				580							160		11.0			
90093	05/11/82	URANERZ	0.0	CZ		7.20	5330			5110				86							70		13.0			
90094	05/11/82	URANERZ	0.0	CZ		6.90				59000				1270							280		12.0			
90095	05/11/82	URANERZ	0.0	CZ		7.20				21600				440							415		46.0			
90096	05/11/82	URANERZ	0.0	CZ		7.30				55300				1560							410		14.0			
90097	05/11/82	URANERZ	0.0	CZ		7.50	3290			2160				58							430		36.0			
90098	05/11/82	URANERZ	0.0	CZ		7.10				39800				960							210		14.0			
90102	05/11/82	URANERZ	0.0	CZ		7.10				41700				625							54		17.0			
90103	05/11/82	URANERZ	0.0	CZ		7.10				43500				880							265		18.0			
90104	05/11/82	URANERZ	0.0	CZ		7.20				23900				600							745		48.0			
90105	05/11/82	URANERZ	0.0	CZ		7.20				42100				980							700		25.0			
90133	09/84	BMR	0.0	PLAYA				6.85		209400			71790	2040	563	3590	109900		17600		17		5.0	5.8		
90134	09/84	BMR	0.0	PLAYA				6.98		236000			80170	2820	426	4970	122800		21740		14		3.0	0.4		
90135	09/84	BMR	0.0	PLAYA				6.50		238200			80510	2740	405	5310	123800		22230		17		3.0	0.5		
90136	09/84	BMR	0.0	PLAYA				6.75		231900			77460	2660	409	5230	120300		22200		15		3.0	0.5		
90137	09/84	BMR	0.0	PLAYA				6.85		209700			71870	2210	524	3820	108600		20220		17		3.0	0.6		
90139	09/84	BMR	0.0	PLAYA				8.60	135000	134500			47000	920	1310	1050	75800	3.0	7900		164	10	8.0	2.4		
90140	09/84	BMR	0.0	PLAYA				7.30		90900			31350	695	1420	772	47900		6730		111		14.0	2.4		
90141	09/84	BMR	0.0	PLAYA	31.5	7.16		7.10	160000	147000			49500	1370	1200	2200	74700		11200		94	90	5.9	1.3		
90151	09/84	BMR	0.0	PLAYA				6.65		238900			81400	2890	411	1630	124400		21650		19		5.0	0.6		
90153	09/84	BMR	0.0	PLAYA				6.90		221200			74210	2520	527	4910	117300		17970		9		5.0	0.4		
90161	09/84	BMR	0.0	PLAYA				6.95		192000			65820	2440	670	3030	102000		15370		11		5.0	0.2		
90163	09/84	BMR	0.0	PLAYA				7.05		240800			82910	2740	449	4630	128800		18890		30		3.0	0.2		
90171	09/84	BMR	0.0	PLAYA				7.02		246000			82420	2720	406	5840	128900		21710		13		3.0	1.3		

WELL	SAMPLE DATE	SAMPLED BY	SAMPLE DEPTH	AQUIFER	TEMP.	FIELD pH	FIELD COND.	LAB. pH	LAB. COND.	TDS	TOTAL ALK.	TOTAL HARD.	ANIONS Na	K	Ca	Mg	Cl	F	CATIONS SO4	CO3	HCO3	NO3	SiO2	B	Br	TOTAL Fe
90172	09/84	BMR	0.0	PLAYA				7.70		200400			68900	2730	626	3060	106200		15840		10		4.0	0.4		
90173	09/84	BMR	0.0	PLAYA				7.45		169800			58310	2450	683	2450	87400		16270		13		5.0	0.7		
90174	09/84	BMR	0.0	PLAYA				7.40		167900			57300	2360	754	2510	87300		15090		12		5.0	0.2		
90181	09/84	BMR	0.0	PLAYA				7.62		132600			40140	1560	737	4700	61500		19510		67		21.0	0.4		
90191	09/84	BMR	0.0	PLAYA				7.62		217200			77060	2530	612	2680	118000		14440		9		3.0	0.6		
90201	09/84	BMR	0.0	PLAYA				7.50	17500	343000			94100	6100	186	13400	154000		58400		112	240	12.0	5.8		1.8
90205	09/84	BMR	0.0	PLAYA				7.50	145000	231000			70000	3600	550	6100	122000		21100		47	70	5.2	0.7		0.5
90206	11/84	BMR	0.5	PLAYA	31.5	6.88		7.50	210000	461000			95500	5400	300	10800	147000		43000	21	95	31	42.0	1.1		0.1
90206	11/84	BMR	0.5	PLAYA	32.0	6.58		7.10	210000	373000			93400	4650	280	13000	151000		44600	21	45	22	33.0			3.0
90208	11/84	BMR	0.5	PLAYA	32.0	6.76		7.30	210000	523000			104000	6500	230	12100	163000	1.0	48000	21	89	22	8.5	1.5		0.1
90209	11/84	BMR	0.5	PLAYA	31.0	7.01		7.40	215000	365000			93800	5250	380	6650	139000		36000	21	36	22	5.7	1.2		0.1
90210	11/84	BMR	0.5	PLAYA	26.5	6.93		6.80	210000	265000			85000	4500	450	5250	123000		33000	21	21	35	5.1			2.6
90211	11/84	BMR	0.5	PLAYA	27.6	7.10		7.00	205000	271000			86000	4700	400	5150	122000		39700		24	53	5.1	0.7		3.9
90212	11/84	BMR	0.5	PLAYA	31.5		7	7.30	215000	377000			96300	4600	330	9500	149000	1.0	36600		104	22	7.2	2.1		8.2
90214	11/84	BMR	0.5	PLAYA	31.2	6.65		6.90	200000	358000			90000	5500	250	14700	143000	1.0	55000		72	1030	7.7	0.7		5.6
90215	11/84	BMR	0.0	PLAYA				9.60	215000	468000			94000	4100	360	8900	144000		35600	42		22	0.9	0.1		9.0
90215	11/85	BMR	0.0					6.70	167000	353502			145000	4960	320	10500	179000		41160		73	63			250.0	
90216	11/84	BMR	0.0					6.40	340	455			22	6	39	3	33		29		112	1	3.6	0.1		0.1
90217	11/84	BMR	0.0	SURFA				7.30	185000	264000			64300	2000	680	3000	93700	2.0	24500		180	580	15.0	7.5		0.1
90218	11/84	BMR	0.0	CALCR				7.80	16500	9740			2250	180	420	290	3500	4.0	1820		369	290	94.0	3.6		0.1
90219	05/85	BMR	0.0	PLAYA				6.90	200000	315000			90000	7000	255	19000	186000		29000		238		48.0	10.0		
90230			7.0										245	27	90	42	330	3.0	220		310	110	82.0	0.4	1.5	0.1
90230			13.0										235	27	90	40	310	3.0	230		310	120	82.0	0.3	1.7	0.6
90230			20.0										730	45	90	87	1140	2.0	400		310	104	81.0	0.2	1.9	0.1
90231	11/85	BMR	0.0					6.70	150	156			36	15	20	12	90		60		69	9				
90231	24/09/86	BMR	0.0					6.90	375	200	51	84	35	9	14	12	57		31		62	13	17.0		0.1	
90232	11/85	BMR	0.0					6.50	153000	371650			128000	4680	130	16500	145850		52000		89				369.0	
90232	24/09/86	BMR	0.0					6.80	200000	361200	903	48219	107000	3800	39	11700	185550		31700		1102				369.0	
90233	22/07/86		0.0										1				1		1		1	2	0.5			0.1
90234	23/07/86		0.0										6	1		3	12		4		4	26	8.3			0.1
90235	23/07/86		0.0										1160	142	570	270	1910	7.0	2240		415	234	84.0			1.0
90236	22/07/86		0.0																220		4		0.4	0.1	0.1	0.1
90237	25/07/86		0.0										1160	142	560	270	1910	7.0	2240		420	235	84.0	0.1	9.3	0.1
90238	11/85	BMR	0.0					5.45	76000	71210			15230	5	8080	2240	39500		1210		39				455.0	
90239	11/85	BMR	0.0					5.90	50	40			2	2	2	1	4		2		17				0.1	
90240	11/85	BMR	0.0					6.90	280	200			49	15	38	8	48		8		112	9			0.1	
90241	11/85	BMR	0.0					7.80	1000	752			134	30	80	52	275		630		181	6			1.3	
90242	11/85	BMR	0.0					8.10	770	500			100	23	40	36	145	1.0	115		146	7			1.0	

HYDROGEOLOGY OF THE LAKE AMADEUS – AYERS ROCK REGION

NORTHERN TERRITORY

1988

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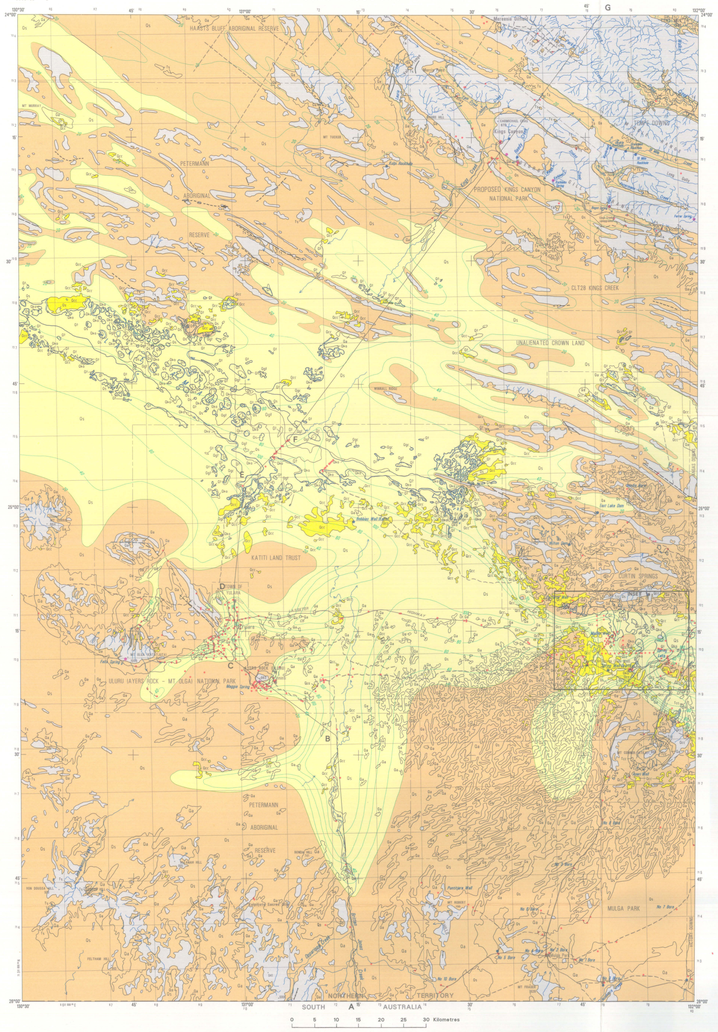
LAKE AMADEUS – AYERS ROCK SURFICIAL AQUIFERS

MAP 1

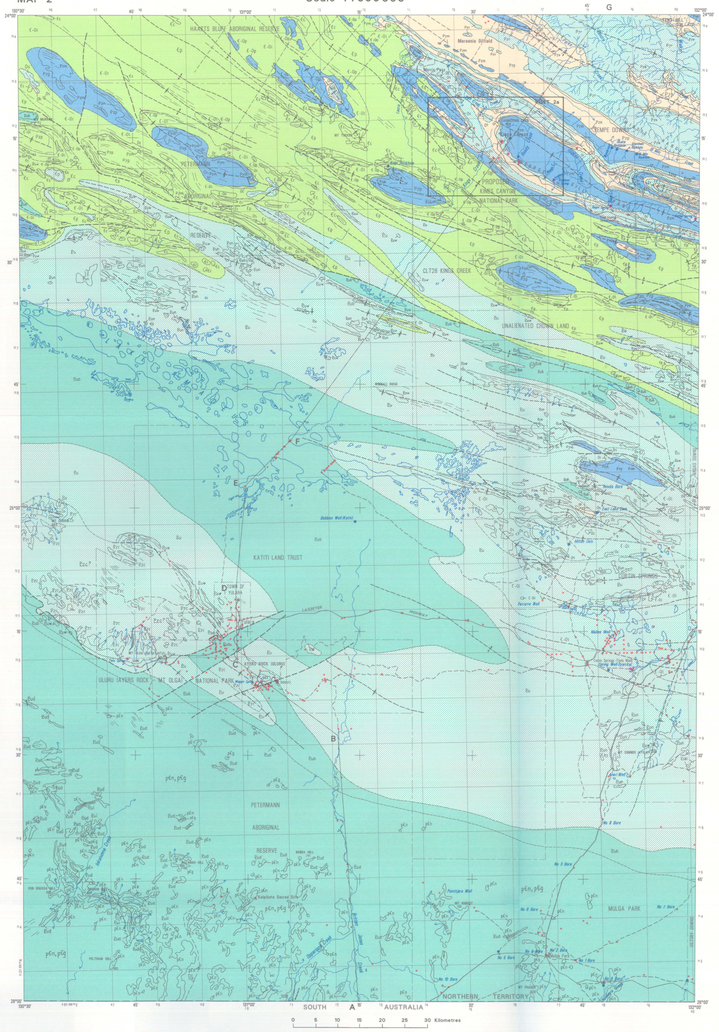
Scale 1 : 500 000



LAKE AMADEUS – AYERS ROCK BEDROCK AQUIFERS

MAP 2

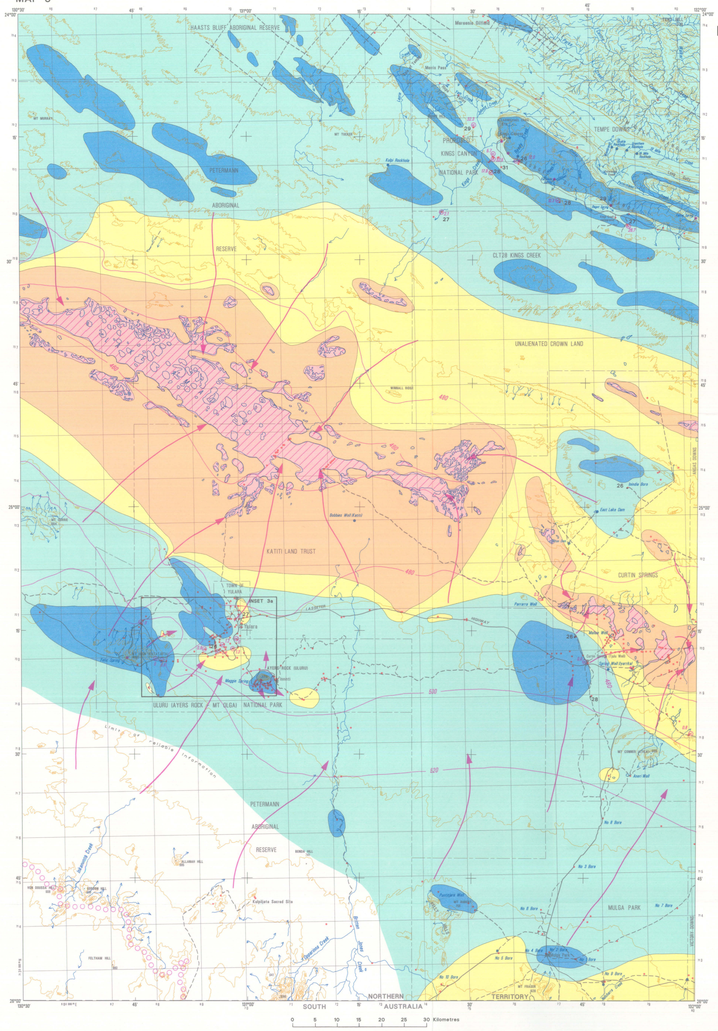
Scale 1 : 500 000



LAKE AMADEUS – AYERS ROCK HYDROCHEMISTRY AND HYDRODYNAMICS

MAP 3

Scale 1 : 500 000



SURFICIAL AQUIFERS

- Low-high yielding bore yields >5 L/s may be obtained in these and underlying Cainozoic units; porous
- Low yielding bore yields typically 0.5-3 L/s; porous and fissured
- Non-aquifer; thin and low-permeability units, including areas where surficial deposits <20m thick
- Bedrock outcrop
- 40 Isopachs, thickness of Cainozoic sediments, in metres

BEDROCK AQUIFERS

- High yielding bore yields >5 L/s may be obtained; porous and fissured
- Low yielding bore yields typically 1-3 L/s; fissured and porous
- Low yielding bore yields typically 1-3 L/s; fissured
- Untested units with potential for low yielding aquifers
- Non-aquifers; low permeability

HYDROCHEMISTRY, generalised for all aquifers

Major ionic group	Total dissolved solids (mg/L)
Bicarbonate-chloride	400-1500
Chloride-sulphate	1500-3000
Chloride-sulphate	3000-14000
Chloride	14000-100000
Chloride	> 100000

- 1500 Salinity contour mg/L (Curtin Springs 1:100 000 only)
- 40 Nitrate mg/L (Ayers Rock 1:100 000 only)

HYDRODYNAMICS

- 480 Potentiometric surface, in metres (surficial aquifers)
- Groundwater flow direction
- Groundwater divide
- Spring
- Groundwater discharge zone
- 545.0 Potentiometric height, in metres (Kings Canyon 1:100 000 only)
- 2 Radiometric age of groundwater, thousands of years
- 26 Groundwater temperature, in degrees Celsius

MANMADE FEATURES

- Bore locality (1:500 000 only)
- 1385 Bore locality with reference number (1:100 000 only)
- Borefield
- Desalination plant
- Liquid waste disposal site
- Pipeline

(Ayers Rock 1:100 000 only)

GEOLOGY

Quaternary

- Qa Alluvial and colluvial sand and silt
- Qc Colluvium, scree
- Qs Fine aeolian sand
- Ql Lacustrine clay, gypsum sand and silty evaporite deposits in groundwater-discharge playas
- Qgc Gypcrete
- Qgf Pressure-ridged evaporites (gypsum flake) in groundwater-discharge playas
- Qes Aeolian gypsum sand (kopi)
- Qcc Knobby and concretionary calcrete, dominantly of groundwater (pedogenic) origin

Tertiary

- Tcl Grey limestone and chert, thin sandstone and siltstone interbeds
- Ts Conglomerate, sandstone, siltstone, minor silcrete

Pre-Tertiary

- Pre-Tertiary strata on surficial geology map

Late Devonian – Late Ordovician to Early Devonian

Pertnunka Group:

- Hermannsburg Sandstone: Dhg Undivided sandstone, pebbly sandstone, siltstone; Dhr Red-brown sandstone, pebbly sandstone, minor siltstone
- Parke Siltstone: Dpk Siltstone, calcareous siltstone, interbeds of limestone and fine silty sandstone
- Meneerie Sandstone: Dpm White ripple-marked and strongly cross-bedded quartz sandstone

Ordovician – Late Cambrian to Early Ordovician

Larapinta Group:

- Carnichael Sandstone: O-Dc Undivided sandstone, siltstone, minor limestone; Oc Red-brown sandstone, with thin recessive siltstone interbeds
- Stokes Siltstone: Os Siltstone, fossiliferous sandy limestone interbeds
- Stairway Sandstone: Ds Sandstone, siltstone, and limestone, all partly phosphatic and fossiliferous; Ds$_1$ Slightly calcareous sandstone with minor silty interbeds; Ds$_2$ Interbedded siltstone and quartz sandstone, pelletal and nodular phosphatic, minor dolomite; Ds$_3$ Quartz sandstone, with minor siltstone interbeds
- Horn Valley Siltstone: Dh Fossiliferous siltstone and limestone, some oolitic ironstone

Late Cambrian to Early Cambrian

- Pacoota Sandstone: Є-Op Fossiliferous sandstone, conglomeratic sandstone; Є-Op$_1$ Quartz sandstone, with minor siltstone interbeds; commonly bioturbated, (Kings Canyon 1:100 000 only); Є-Op$_2$ Quartz sandstone with interbedded siltstone and minor pebbly beds, (Kings Canyon 1:100 000 only)

Late Proterozoic to Early Cambrian

Pertnjirrk Group:

- Gayder Formation: Єg Undivided. Sediments
- Petermann Sandstone: Єp Calcareous sandstone, siltstone, algal limestone and dolomite
- Deception Formation: Єx Red-brown sandstone and silty sandstone
- Diana Sandstone: Єd Red-brown siltstone and shale
- Cleland Sandstone: Єc Red-brown sandstone, minor interbeds of calcareous sandstone and siltstone
- Tempe Formation: Єt Brown silty sandstone, pebbly sandstone
- Mount Currie Conglomerate: Єm Siltstone, sandy dolomite, glauconitic dolomite, limestone, sandstone
- Mount Currie Conglomerate: Єmr Coarse conglomerate, arkose

Late Proterozoic

- Bu Undivided. Sediments
- Winnall Beds: Buw White and brown sandstone, white and green siltstone
- Areyonga Formation: Bua Siltstone and claystone, minor lenses of sandstone
- Inindo Beds: Bun Red-brown, white siltstone, chert, sandstone, pebbly siltstone, thin beds of dolomite
- Bitter Springs Formation: Bub Dolomite, dolomitic limestone, limestone, gypsum, siltstone, sandstone, basalt
- Pinyinna Beds: Bul Grey pyllite, quartz-sericite schist, amphibole schist
- Dean Quartzite: Bud Schistose quartzite

Early Proterozoic

- Dillo Gneiss: pK$_1$ Gneiss, schist, amphibolite, migmatite and granite
- pK$_2$ Granite

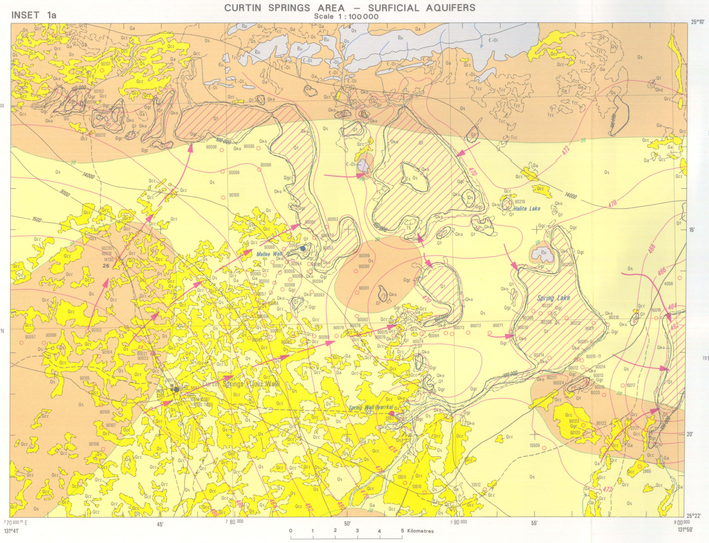
Where location of boundaries, folds and faults is approximate, the line is broken; where inferred, dashed; where concealed, boundaries and folds are dotted, faults are shown by short dashes.

- Strike and dip of strata
- Trend-line
- Joint pattern
- Dyke
- Geological boundary
- Syncline
- Anticline
- Fault
- Bore, well, tank, or waterhole
- Topographic contour, in metres
- Homestead or building
- Built-up area
- Road
- Vehicle track
- Landing ground
- National park or reserve boundary
- Height in metres

(Airphoto interpretation)

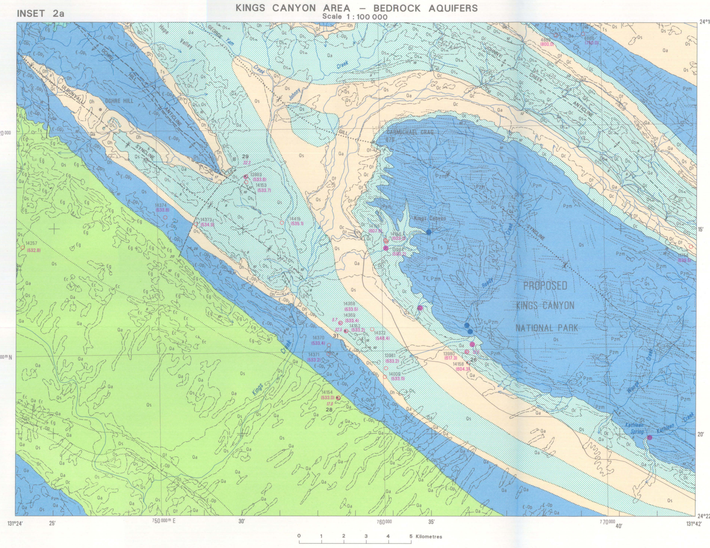
INSET 1a – CURTIN SPRINGS AREA – SURFICIAL AQUIFERS

Scale 1 : 100 000



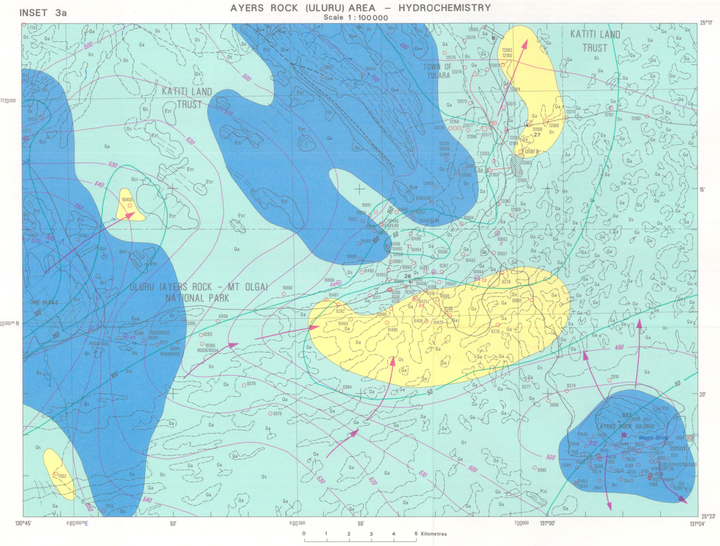
INSET 2a – KINGS CANYON AREA – BEDROCK AQUIFERS

Scale 1 : 100 000



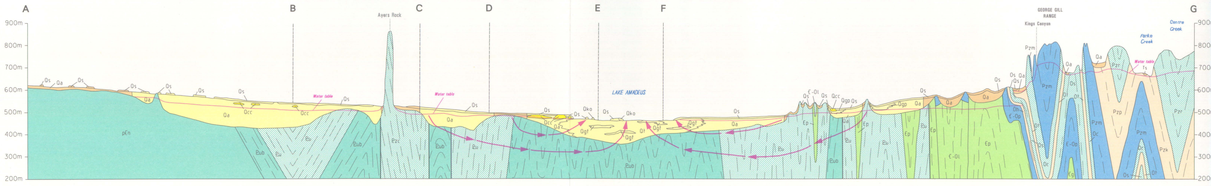
INSET 3a – AYERS ROCK (ULURU) AREA – HYDROCHEMISTRY

Scale 1 : 100 000



Section

Scale V/H = 50



RELIABILITY DIAGRAM

- Hydrogeological investigation
- Some water bore data
- No water bore data

INDEX TO ADJOINING SHEETS

MOUNT WEBB SF 52-9	MOUNT LEBIG SF 52-10	HERMANNSBURG SF 53-13
BLOODS RANGE SG 52-2	ERL NAMUNG SG 52-3	HERBERT SG 53-1
PETERMANN RANGE SG 52-7	ERL DIN DIN SG 52-8	FLEURIEU SG 53-6
NT / SA	WOODROFFE SG 52-12	ALBERGA SG 53-5
MANN SG 52-11		

MAP LOCALITY

UNIVERSAL GRID REFERENCE

TRANSVERSE MERCATOR PROJECTION

GRID ZONE Ddesignation: 53J	TO GIVE A STANDARD REFERENCE ON this SHEET TO NEAREST 100 METRES
100,000 METRE SQUARE IDENTIFICATION	SAMPLE POINT : AYERS ROCK (ULURU)
	1. Read letters identifying 100,000 metre square in which point is located.
	2. Locate this VERTICAL grid line in the top margin, or on the frame, nearest identifying the line written in the top or bottom margin, or on the line itself.
	3. Estimate tenths from grid line to point.
	4. Locate this HORIZONTAL grid line nearest identifying the line written in the left or right margin, or on the line itself.
	5. Estimate tenths from grid line to point.
	SAMPLE REFERENCE : 555945
	5 Easting (Eastern) or any direction 4 Northing (Northern) or any direction

GREY NUMBERED LINES ARE TO BE USED WITHIN INTERVALS OF THE AUSTRALIAN ANS ZONE 53 GRID VALUES ARE SHOWN IN FULL ONLY AT THE SOUTH WEST CORNER OF EACH MAP

HYDROGEOLOGY OF THE LAKE AMADEUS – AYERS ROCK REGION NORTHERN TERRITORY 1988