DEPARTMENT OF
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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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PROGRESS REPORT ON THE GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY 1972-1974

by

M. AUDIBERT*

* B.R.G.M. - AUSTRALIA

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SUMMARY

This report covers the period during which a joint BMR-BRGM team prepared and started the computer - based simulation of the Great Artesian Basin.

Geological and hydrologic data were first collected from Federal and State authorities and then processed either manually or automatically.

Processed data were then used to prepare input and calibration documents, including geological documents (geometry of system) and hydrologic documents (potentiometry).

The first run of the mathematical model was obtained for the initial steady-state, and results appeared very encouraging.

1. INTRODUCTION

The hydrogeological study of the Great Artesian Basin (GAB) commenced in 1971 when a BMR team began collating available geological information. In 1972, a contract was awarded to BRGM Australia to provide staff to assist BMR in the preparation of a hydrodynamic simulation model. This report presents early results of the jointly staffed program. Those taking part in the project were:

from BMR — R. Abell
M.A. Habermehl
G. Seidel

from BRGM — M. Audibert
G. Krebs
P. Ungemach

who all equally participated to the elaboration of the results produced in this report.

The study was planned in four different phases, which in practice overlapped:

Phase 1 - formulation of assumptions on the GAB hydrodynamic system and design of a mathematical simularion model.
Phase 2 - data collection and processing.
Phase 3 - preparation of input documents to the 'model'.
Phase 4 - calibration and simulation.

This report describes achievements to April 1975, i.e. towards the end of the period of contract assistance.

Phase 1 consisted of consultation with BMR geologists involved in mapping the GAB area, and the adaptation of the most suitable existing simulation program to the current situation. It was agreed at the time that, in spite of a lack of data in certain areas, the GAB should be modelled as a multilayered aquifer comprising

- a water-table aquifer
- a first confining layer
- a first confined aquifer corresponding to the Hooray and Adori Sandstones
- a second confining layer

- a second confined aquifer corresponding to the Hutton Sandstone, Evergreen Formation, and Precipice Sandstone
- a third confining layer
- a third confined aquifer corresponding to sandstones of Triassic and Permian age and to limestones of Cambrian age.

The simulation program was consequently selected with the following characteristics*:

hydraulic scheme - HANTUSH multilayered leakage system;
type - one phase, bi-dimensional, steady and non-steady states.

Phase 2 has been partly dealt with in several BMR records (Ungemach & Habermehl, 1973; Seidel, 1973; Krebs, 1973/74).

Phase 4, initially planned to be completed before the writing of this report, has been considerably delayed for various reasons including computing difficulties, and is still in progress.

The present report is intended to concentrate on aspects of the study which have not yet been covered, i.e. parts of phase 2 and phases 3 and 4. Discussions of phase 4 will be primarily concerned with experience gained from the first calibration runs, rather than with actual results.
W.P. Shafron (BMR) drafted the figures, and plates of this report.

2. DATA COLLECTION AND PROCESSING

Two types of data were collected and processed: geological data and hydrologic data. The sources of information for geological data were syntheses, such as State Geological Survey and BMR reports, records and geological maps as well as basic documents such as petroleum exploration well completion reports (held in BMR, Petroleum Exploration Branch), and water-bore gamma-ray logs (held in BMR, Geological Branch). The sources of information for hydrologic data were syntheses prepared by State authorities on parts of the GAB (see for instance Ogilvie 1954) and reports on interstate conferences on artesian water (ICAW), together with basic data collected and held by State Water Authorities concerned with the GAB. These data mainly consist of

* Details on the organization and capabilities of the simulation program are to be found in Ungemach (1975).

pressure and flow measurements made on water-bores.

The geological data were entirely handled in Canberra and were used, firstly, to aid a better understanding of the structure and lithostratigraphy of the GAB and, secondly, in conjunction with hydrologic data, to prepare several hydrogeological documents (section 3).

The basic hydrologic data, because of their quantity, were handled by computer whenever possible. An ADP system was therefore established so that data collection took the form of transferring the original data to coding sheets. The coding sheets were subsequently sent to Canberra and processed. The collection operation took 18 months to complete, and involved two technical assistants.

The following gives the results obtained and, where necessary, the methods used.

2.1. GEOLOGICAL CONTEXT

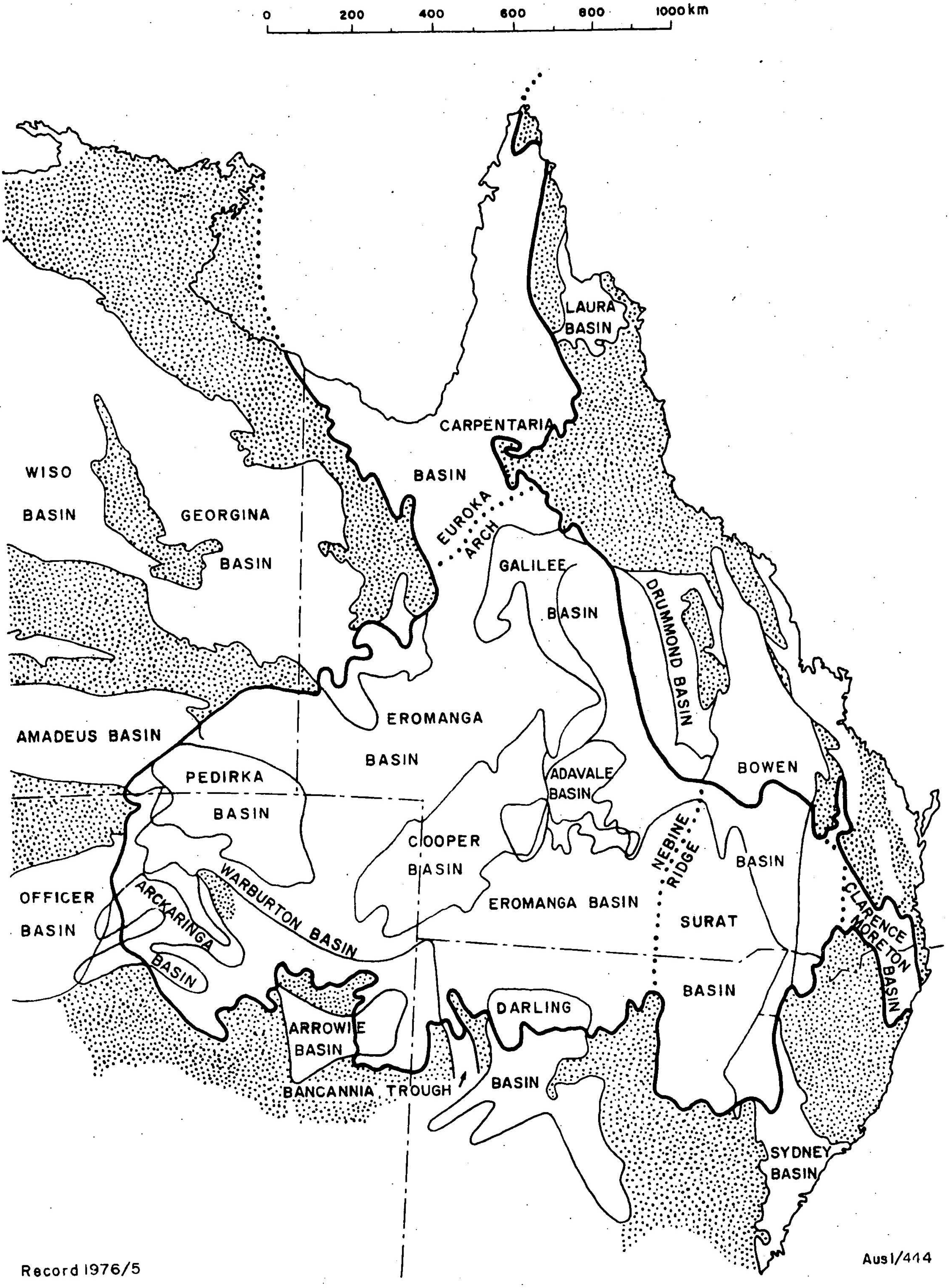
From a hydrological viewpoint the Great Artesian Basin is an entity as a hydraulic continuity exists throughout the constitutent Jurassic and Cretaceous formations. Geologically, however, it is composed of three distinct Jurassic-Cretaceous sedimentary basins which overlie older (Palaeozoic) basins and intertongue over the basement highs which separate them. These three basins are (Fig. 1):

a) The Eromanga Basin which occupies most of the Great Artesian Basin area. Its limits coincide with the GAB limits to the northeast, northwest, west, and south. To the southeast and north it is bounded by two sub-surface ridges, the Nebine Ridge and the Euroka Arch, which separate it from the other two basins.

b) The Surat Basin which constitutes the eastern part of the GAB.

c) The Carpentaria Basin, north of the Euroka Arch, extends northwards under the sea and only the southernmost part of it lies inland. Owing to the lack of hydrologic data, this part of the GAB has not been considered in the present study, and the limit of the simulated reservoir was set at the Euroka Arch natural boundary.

FIG 1-PALAEOZOIC AND MESOZOIC SEDIMENTARY BASINS IN THE GREAT ARTESIAN BASIN AREA



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These three basins formed over a period extending from Early Jurassic to Late Cretaceous times on a planed surface composed of sedimentary rocks of Palaeozoic basins and the metamorphic basement.

2.1.1. STRUCTURE

The Jurassic-Cretaceous sedimentary basins of the GAB unconformably overlie the following older basins (Fig. 1):

Cambrian to Ordovician	GEORGINA	outcropping on edge of GAB
	AMADEUS	"
Devonian to Carboniferous	DRUMMOND	"
	ADAVALE	concealed
	DARLING	outcropping on edge of GAB
Permian to Triassic	PEDIRKA	concealed
	GALILEE	outcropping on edge of GAB
	COOPER	concealed
	BOWEN	outcropping on edge of GAB

The tectonic map of Australia and New Guinea (GSA, 1971) illustrates the relations between the basins. The Georgina and Amadeus Basins are part of the Central Australian Platform Cover and are overlapped by the Eromanga Basin. The Drummond, Adavale, and Darling Basins belong to the transitional domains associated with the North Queensland and the Lachlan Orogenic Domains. As such they form part of the basement of the Trans-Australian Platform Cover, of which the Pedirka, Galilee, Cooper, and Bowen Basins, as well as the Eromanga, Surat, and Carpentaria Basins, are constituents.

Thus the GAB corresponds to that part of the Trans-Australian Platform Cover which is bounded to the west by outcrops of an older platform cover and, to the east and south, by deformed geosynclines which constitute its youngest basement. To the north, the coastline has always been regarded as the GAB geographical limit but its geological as well as hydrological boundary should probably be set at the Highlands Orogenic Domain of New Guinea. For reasons already given, the northern limit of the present study area is the Euroka Arch.

The present GAB structure results directly from its relations with other tectonic units. As part of a platform cover, it has been subjected to mild deformations only, such as broad warping and block-faulting, which are signs of late movements along basement lineaments.

However, a very important movement from our point of view occurred during Late Jurassic to mid-Tertiary times. This resulted in the strong uplift of the northeast margin of the GAB, a lesser uplift of the southwest margin, and the subsequent southwest tilting of the whole area (Sprigg, 1961).

A good appreciation of the extent of deformation of the sediments may be gained from the structural contour maps of the Hooray and Mooga Sandstones (Pl. 1). These two formations are about in the middle of the Jurassic-Cretaceous sequence and therefore provide a good reference surface. The Eromanga and Surat Basins clearly show up on the map, separated by a wide flat area corresponding to the Cunnamulla Shelf. To the north the 200-m contour closes near the Euroka Arch.

A comparison of Figure 1 and Plate 1 demonstrates that, if the general southwest tilting is kept in mind, the deeper parts of the Jurassic-Cretaceous basins correspond to the axes of the Permo-Triassic basins: Pedirka Basin in the southwest, Cooper Basin in the centre with an eastern extension into the Adavale Basin, and to a lesser extent the Galilee and Bowen Basins in the northeast. In spite of the distortion caused by the choice of the contour interval, one must realize that dips exceeding a few degrees are very rare, except in folds associated with basement block faulting.

Faulting is the aspect of the structure that is most important to the hydrologist in that a fault may

a) considerably reduce the transmissivity of an aquifer by simply displacing part of it vertically, leaving only part of the total aquifer thickness available to the water flow;

b) reduce the transmissivity further if the aquifer is sealed off by impermeable material within the fault;

c) divert the flow from one aquifer to another;

d) constitute a privileged path to vertical leakage.

Referring to Plate 1, one can immediately observe two prevailing fault lines. Firstly, the Canaway and Stormhill Faults which run north-south for over 300 km in the central-eastern Eromanga Basin. The maximum displacement at the bottom of the Cretaceous sequence is about 400 m (Senior, in press), that is half the total thickness of the Jurassic sequence. The second group comprises the Cork Fault and Holberton and Weatherby Structures in the northern part of the Eromanga Basin which trend north-northeast; their estimated maximum displacement is 280 m (Senior et al., in press). Apart from these two major groups of features, smaller structures, such as drape folds over basement ridges and basement faults also appear. These minor features are expressed by lineaments in the sedimentary cover.

Many of the springs in the GAB must be attributed to the latter, as for example along the southwest margin of the basin where they provide an easy passage for the escape of water from the confined aquifers.

2.1.2. LITHOSTRATIGRAPHY IN RELATION TO GROUNDWATER

Exploitable groundwater of the GAB is essentially contained in Jurassic and Cretaceous rocks, but some marginal water-bearing beds also occur in the underlying rocks and particularly in the Permo-Triassic basins which represent the first 'layer' of the Trans-Australian Platform Cover.

2.1.2.1. PRE-PERMIAN

At the southeastern extremity of the Georgina Basin (Fig. 1) a Jurassic to Lower Cretaceous permeable sandstone overlies 40 m of strongly karstified limestone. This limestone, which is Cambrian-Ordovician, yielded a very high artesian flow on one occasion.

2.1.2.2. PERMO-TRIASSIC

The Permo-Triassic sequence corresponds to the filling of the 'first generation' basins of the Trans-Australian Platform Cover, namely the Pedirka, Cooper, Galilee, and Bowen Basins.

a) Pedirka Basin

The Crown Point Formation consists of up to 50 m of siltstone, sandstone, tillite and, conglomerate (Wells et al., 1970). It crops out along the western margin of the basin unconformably beneath the Jurassic/Lower Cretaceous De Souza Sandstone. Farther southeast, the Purni Formation, consisting of 80 m of sandstone, siltstone, and carbonaceous shale, overlies the Crown Point Formation. The Crown Point and Purni Formations are regarded as Lower Permian.

No Triassic sediments have been identified in the Pedirka Basin.

Hydrologically, the Crown Point Formation must be considered to be in continuity with the overlying Mesozoic aquifer, at least in that part of the Pedirka Basin where it directly underlies the De Souza Sandstone.

b) Cooper Basin

In South Australia and southwest Queensland the Permo-Triassic sediments are divided into the Merrimelia Formation (400 m of ferruginous sandstone, conglomerate, siltstone, and shale of pre Permian or Early Permian age), the Gidgealpa Group (300 m of interbedded sandstone, siltstone, and shale of Early and Late Permian age), and the Nappamerrie Formation, 220 m of dolomitic siltstone of Triassic age (GSSA, 1969). To the northeast, coal measures and carbonaceous shales replace Permian and Triassic sediments (Senior, in press). None of these formations is of hydrogeological interest.

c) Galilee Basin

Permian and Triassic sediments are dominantly fine-grained in the western part of the Galilee Basin. More important from our point of view are the Triassic facies in the eastern part; three formations have been distinguished - The Rewan Formation (200 m thick, consisting of shale, siltstone, and sandstone), the Clematis Sandstone (up to 170 m of sandstone with interbeds of shale and siltstone and which crops out on the eastern margin of the GAB), and the Moolayember Formation (over 300 m of tan-coloured shale, siltstone, and sandstone). All three formations wedge out westwards, but owing to the thinning of the Moolay member Formation the Clematis Sandstone maintains hydraulic continuity with the overlying Jurassic Precipice Sandstone.

d) Bowen Basin

Hydrogeologically the situation is much the same as in the Galilee

Basin, except that the Wandoan Formation, which overlies the Rewan Formation, becomes a lithological equivalent of the Clematis Sandstone and the Moolayember Formation.

2.1.2.3. JURASSIC-CRETACEOUS

The Jurassic-Cretaceous formations of the Eromanga and Surat Basins are described and discussed in detail in four BMR bulletins (Senior, in press; Senior et al., in press; Mond & Harrison, in press; Exon, in press).

From these sources, the main characteristics of the formations of present interest are presented in Table 1. The probable relations of the formations as differentiated in different parts of the Surat and Eromanga Basins are shown in Plate 2.

2.1.2.4. TERTIARY AND QUATERNARY

The Tertiary sequence in the Eromanga Basin is composed of extensive river deposits of the Glendower Formation (Senior, in press). They occupy large portions of southwest Queensland and extend into South Australia. They consist of quartzose sandstone, sandy conglomerate, and minor siltstone up to 70 m thick, unconformably resting on the Winton Formation. They usually crop out in areas of flat-topped hills where they have been protected from erosion by intense silicification. They contain a perched water-table. The Whitula Formation which consists of interbedded friable quartzose sandstone, siltstone, and mudstone up to 220 m thick, unconformably overlies the Glendower Formation and is conformable below the Quaternary alluvium of the Cooper and Whitula Creeks.

Quaternary sediments cover most of the Basin and consist of thick, fine-grained alluvium in major water-courses (up to 120 m), superficial alluvium, lacustrine deposits, and aeolian sand.

In the Surat Basin, extensive stream sedimentation occurred during Tertiary and Quaternary times after renewed tectonic movements in the north and the east induced the relative sinking of the central part of the basin. The deposits consist of gravel, sand, and mud, and are up to 220 m thick in the Balonne River system (Exon, in press).

TABLE 1 SUMMARY OF JURASSIC AND CRETACEOUS FORMATIONS

Name of Formation	Lithology	Lateral Extent	Stratigraphic position	Thickness (m)	Water transmitting properties	Equivalents
		LOWER CRETACEOUS				
WINTON FORMATION Kw	Very labile sandstone, siltstone, and mudstone	Eromanga Basin Youngest widespread Cretaceous formation	Conformable on Mackunda F., where present, or Toolebuc or Coreena F.	up to 1200 in deepest part of Basin	Numerous sandstone aquifers in lowest part. Confining in middle and upper part.	None
MACKUNDA FORMATION Klm	Labile to very labile sandstone, siltstone, and mudstone, calcareous in part	Eromanga Basin except Eulo Ridge and Cunamulla Shelf. Not distinguished in S. Australia from Winton Formation	Conformable between Allaru M. and Winton F.	up to 150	Contains enough sandstone to be considered an aquifer	None
OODNADDATTA FORMATION Klod	Silty shale dominant, begins and ends with glauconite sandstone	Western Eromanga basin (S. Australia)	Conformable between Bulldog Shale and Winton F.	140 in margins - Up to 600 in deepest part of Basin	Confining bed	Upper part of Coreena F. and Toolebuc F.
GRIMAN CREEK FORMATION Klgg	Thinly interbedded siltstone, fine sandstone, and mudstone	Restricted to central Surat Basin	Conformable on Surat Siltstone	400 max.	Confining bed	Allaru M.
ALLARU MUDSTONE Kla	Thinly bedded blue grey mudstone with interbeds of indurated calcareous siltstone and fine sandstone	Central and N. Eromanga Basin	Conformable between Toolebuc F., where present, or Coreena F. and Mackunda F.	270 in outcrop - diminishes towards Eulo Ridge and Cunamulla Shelf	Confining bed	Griman Creek F. Lower Oodnadatta F.
SURAT SILTSTONE Kls	Thinly interbedded siltstone and mudstone dominant. Sandstone lenses at some levels	N. and central part of Surat Basin	Conformable between Coreena F. and Griman Creek F.	up to 150	Confining bed	Upper Coreena F. and Toolebuc F. of Eromanga Basin
TOOLEBUC FORMATION Klo		Central and N. Eromanga Basin	Conformable between Coreena F. and Allaru M.	75	Confining bed	Upper Surat Siltstone
BULLDOG SHALE Klb	Thinly interbedded siltstone and shale grading up into dark grey shale	W. Eromanga Basin (S. Australia)	Conformable between Cadna-Owie F. and Oodnaddatta F.	up to 450	Confining bed	Doncaster M. and part of Coreena F.
COREENA FORMATION Klc	Interbedded mudstone and siltstone grading into labile and sublabile sandstone	Central and N. Eromanga Basin - Surat Basin	Eromanga Basin: conformable between Toolebuc F. and Doncaster M. or Allaru M. and Doncaster M. Surat basin: Conformable between Surat S. and Doncaster M.	150	Contains minor aquifers. Overall confining bed	Upper Bulldog Shale, Surat Siltstone (upper Coreena F.)
DONCASTER MUDSTONE Kld	Dark blue grey mudstone predominant with fine-grained glauconitic labile sandstone and siltstone	Central and N. Eromanga Basin Surat Basin	Conformable between Cadna-Owie F. (Eromanga Basin) or Bungil F. (Surat Basin) and Coreena F.	Surat Basin: 150 North of Central Eromanga Basin: 220 Cunamulla Shelf: 240	Contains minor aquifers; overall confining bed	Bungil F. (lower Doncaster M.). Lower Bulldog Shale
BUNGIL FORMATION Kly	Mixture of fine lithic sandstone, siltstone and mudstone with calcareous and glauconitic beds	Surat Basin	Conformable between Mooga S. and Doncaster M.	300 in SE	Contains a very poor aquifer; overall confining bed	Cadna-Owie F. Lower Doncaster M. Mooga S.
CADNA-OWIE FORMATION Kco	Fine to medium quartzose sandstone and very fine labile sandstone and siltstone, Top part coarser	Eromanga Basin	Conformable between Hooray S. and Doncaster M. in E. Eromanga Basin, between Algebuckina S. and Bulldog Shale in W. Eromanga Basin	75 constant	Top part is good aquifer	Bungil F.

Name of Formation	Lithology	Lateral Extent	Stratigraphic position	Thickness (m)	Water transmitting properties	Equivalents
			UPPER JURASSIC TO LOWER CRETACEOUS			
ALGEBUCKINA SANDSTONE Jua	Fine to medium quartz sandstone in deeper parts of Basin. Coarser and cleaner on margins	W. Eromanga Basin	Unconformable on basement or conformable on Hutton S. Conformable below Cadna-Owie F.	up to 400	good aquifer	Adori S., Westbourne F., and Hooray S.
RONLOW BEDS Jkr	Cross-bedded quartzose to sublabile sandstone. Some pebbly beds, micaceous siltstone, mudstone	Restricted to a band 30 to 40 km wide and 300 km long subcropping and (mainly) outcropping along NE margin of Eromanga Basin	Unconformable on older sediments and conformable below Doncaster M.		Good aquifer intake beds	Hutton S., Birkhead F., Adori S., Westbourne F., and Hooray S.
HOORAY SANDSTONE JKL	Quartzose to clayey and lithic medium to coarse sandstone	Central, NW and NE Eromanga Basin, NW Surat Basin	Conformable between Westbourne F. and Cadna-Owie F. where present on Doncaster M.	120 in outcrop up to 400 in Eulo Ridge and Cunamulla Shelf areas	Good aquifer	Gubberamunda S., Orallo F., Mooga S. in Surat Basin. Upper part of Ronlow Beds of NE Eromanga Basin. S of W and NW Eromanga Basin
MOOGA SANDSTONE Klmo	Subabile to quartzose sandstone at the base overlain by thinly interbedded fine sublabile calcareous sandstone, siltstone, and mudstone	Surat Basin	Conformable between Orallo F. and Bungil F.	less than 100 in N, E and S of Basin; 200 in central area	Good aquifer	Combines with Gubberamunda S. to form Hooray S. where Orallo F. disappears on flank of Ridge
ORALLO FORMATION Juo	Thin bedd siltstone and mudstone and thick-bedded fine to coarse calcareous lithic sandstone	Surat Basin	Conformable between Gubberamunda S. and Mooga S.	150 in N. of Basin	Poor aquifer	Middle Hooray S. in W. Surat Basin
GUBBERAMUNDA SANDSTONE Jug	Sublabile to labile sandstone, with conglomerate, siltstone, mudstone, and claystone. Coarser in E.	Surat Basin	Conformable between Westbourne F. and Orallo F. in most of Surat Basin, between Pilliga S. and Orallo F. in S.	45 in outcrop. 200 in central Surat Basin	Good aquifer	Grades into lower Hooray S. in W. where Orallo F. disappears.
			MIDDLE TO UPPER JURASSIC (INJUNE CREEK GROUP)			
PILLIGA SANDSTONE Jp	Fine to coarse sandstone. Contains thin beds of conglomerate or breccia. Rare interbeds of shale and siltstone	S. Surat Basin	Conformable between Walloon Coal Measures and Orallo F.	250	Good aquifer	Intertongues and replaces Springbok S. and Westbourne F.
WESTBOURNE FORMATION Juw	Alternating beds of mudstone and lithic sandstone below thinly bedded siltstone and quartzose to sublabile sandstone above	Eromanga and Surat Basin	Conformable between Adori S. and Hooray S. in Eromanga Basin, between Springbok S. and Hooray S. in Surat Basin	250	Partly aquifer	Upper Pilliga S. Part of Algebuckina and Hooray S. part of Ronlow Beds
SPRINGBOK SANDSTONE Js	Lithic fine sandstone, clay matrix important, calcite cement in some beds, interbedded siltstone and mudstone	Surat Basin except S. part	Conformable between Walloon Coal Measures and Westbourne F.	250	Poor aquifer	Adori S. lower Pilliga S.
ADORI SANDSTONE Ja	Fine to medium clayey sublabile to labile sandstone	Eromanga Basin and W. Surat Basin	Conformable between Birkhead F. and Westbourne F.	70	Fair aquifer	Interfingers with Springbok S. across Ridge. Merges into Hooray S. and Algebuckina S. respectively in NW and W Eromanga Basin. Part of Ronlow Beds
WALLOON COAL MEASURES Jw	Fine to medium calcareous labile sandstone with beds of siltstone, mudstone, coal, and limestone	Surat Basin	Conformable between Eurombah F. and Pilliga S.	More than 400 in N. and E. Surat Basin	Confining bed	Birkhead F.

Name of Formation	Lithology	Lateral Extent	Stratigraphic position	Thickness (m)	Water transmitting properties	Equivalents
BIRKHEAD FORMATION Jmb	Carbonaceous, calcareous in part, mudstone, siltstone, and fine labile sandstone	Eromanga and W. Surat Basin	Conformable between Hutton S. and Adori S.	110	Partly aquifer	Walloon Coal Measures. Part of Ronlow Beds
EUROMBAH FORMATION Jme	Thick-bedded fine to coarse clayey labile sandstone and conglomerate and thin-bedded siltstone and mudstone	N. Surat Basin	Conformable between Hutton S. and Walloon Coal Measures	100	Confining bed	None
		LOWER JURASSIC				
HUTTON SANDSTONE Jih	Predominantly quartz sandstone with metamorphic and volcanic rock fragments and felspar-kaolinite and calcite cement common	Surat Basin, central, N. Eromanga Basin. Absent on Cunamulla Shelf	Conformable between Evergreen F. and Eurombah F. in Surat Basin. Unconformable on older sediments or basement in Eromanga Basin	150 in outcrops-250 in subsurface	Good aquifer	Part of Ronlow beds
EVERGREEN FORMATION Jle	Fine to medium sublabile to labile sandstone, siltstone, and mudstone	Surat Basin and NE Eromanga Basin. In places absent on Cunamulla Shelf	Conformable between Precipice and Hutton S.	260	Partly aquifer	None in GAB area
PRECIPICE SANDSTONE Jlp	Quartzose sandstone, with minor lithic grains, feldspar, and muscovite. Clayey matrix	Surat Basin. E. Eromanga Basin. Absent on Cunamulla Shelf	Unconformable over older sediments or basement	150	Good aquifer	None in GAB area

2.2. HYDROLOGIC DATA

2.2.1. TECHNIQUES AND METHODS

Most of the techniques and methods used to collect, check, store, retrieve, and process the hydrologic data are described in four previous BMR Records (Ungemach & Habermehl, 1973; Krebs, 1973, 1974; Seidel, 1973).

The following is a brief outline of their content plus additional comments on processing not described in the Records.

2.2.1.1. DATA CODING SHEETS

The data coding sheets, shown in Figures 2 and 3, can be subdivided into three groups:

- Sheet 4A contains general information on a water-well and indicates the extistence or absence of specific information recorded on other sheets.

- Sheets 4B to 4E, 4G, 4I to 4M are used to code basic unprocessed data (results of measurements).

- Sheets 4F, 4H are to be used after a preparatory treatment.

Basically, the design is adapted to the specific purpose of the GAB study, and applies the concept of a fixed-format system. Coding sheets are subdivided into 80 columns corresponding to the standard computer punch cards so that each line corresponds to one card. During the coding and punching operations, inevitable errors are made. To eliminate these errors as far as possible, checking programs were written to rectify the internal logic of the information contained in each card type (horizontal programming) and the internal logic of the information about a single water-well contained in a set of different card types (vertical program). Errors were printed out and corrected by the replacement of faulty cards.

2.2.1.2. STORAGE AND RETRIEVAL

The storage of data on punch-cards has a double disadvantage: a

FIG 2-CODING SHEETS 4A TO 4F

B M R - G A B Groundwater project — **MASTER SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	WELL NAME	Well Location: Longitude Deg.	Min.	Sec.	Latitude Deg.	Min.	Sec.	Accuracy	Ground Elevation: Feet	O.T. Test	Accuracy	TOTAL DEPTH DRILLED (feet)	DATE COMPL.: Year	Mth.	TYPE AND USE	GEOL. LOG AVAIL.	GEOPH. LOG AVAIL.	Card Availability: Bore casing and screen	Lithostrat.	Aquif. desc.	Discharge data	Well production	Head and temperature	Hydrodyn.	Pump and Flow	Well charact.	T.D.S.	Chem. 1	Chem. 2	D.S.T.-M.C.
4,A																																				
4,A																																				

B M R - G A B Groundwater project — **WELL CASING AND SCREEN SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card cont.	Deepening	Well Number	Records Nº1: Equip diam.	Nature	Material	Depth from	Depth to	Drilling diam.	Method	Cemented from	Cemented to	Corroded		Nº2: Equip. diam.	Nature	Material	Depth from	Depth to	Drilling diam.	Method	Cemented from	Cemented to	Corroded	YEAR COMPLETED	FOLIO NUMBER
4,B																													
4,B																													

B M R - G A B Groundwater project — **LITHOSTRATIGRAPHY SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	1 Depth	1 Lithost.	2 Depth	2 Lithost.	3 Depth	3 Lithost.	4 Depth	4 Lithost.	5 Depth	5 Lithost.	6 Depth	6 Lithost.	7 Depth	7 Lithost.	FOLIO NUMBER
4,C																					
4,C																					

B M R - G A B Groundwater project — **AQUIFER DESCRIPTION SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	No.1: Aquifer Number	Top Depth	Bottom Depth	Lithostr.	Perm.	Depth Tested	Pressure or Depth	Flow Rate When Flowing (100 g.p.d)	No. 2: Aquifer Number	Top Depth	Bottom Depth	Lithostr.	Perm.	Depth Tested	Pressure or Depth	Flow Rate When Flowing (100 g.p.d)	FOLIO NUMBER
4,D																							
4,D																							

B M R - G A B Groundwater project — **WELL DISCHARGE DATA SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card cont.	Deepening	Well Number	MAIN AQUIFER	RELIABILITY	SINGLE WELL	No.1: Date Year	Month	Discharge Rate 10^3 gpd	Reliability	Sign	Dynamic Level Back Pressure	O.I.	Unit	Type of Flow	Outlet	Comments	No.2: Date Year	Month	Discharge Rate 10^3 gpd	Reliability	Sign	Dynamic Level Back Pressure	O.I.	Unit	Type of Flow	Outlet	Comments	No.3: Date Year	Month	Discharge Rate 10^3 gpd	Reliability	Sign	Dynamic Level Back Pressure	O.I.	Unit	Type of Flow	Outlet	Comments	FOLIO NUMBER
4,E																																											
4,E																																											

B M R - G A B Groundwater project — **WELL PRODUCTION SHEET** — G A B - ADP System transfer sheet

CODE	Identification: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	MAIN AQUIFER	RELIABILITY	No.1: Year	Discharge Rate 10^3 gpd	Production Period Month	To Month	Days/W	Hours Per Day	Reliability	Total Yearly Prod. 10^6 g	Type of Flow	No.2: Year	Discharge Rate 10^3 gpd	Production Period Month	To Month	Days/W	Hours Per Day	Reliability	Total Yearly Prod. 10^6 g	Type of Flow	No.3: Year	Discharge Rate 10^3 gpd	Production Period Month	To Month	Days/W	Hours Per Day	Reliability	Total Yearly Prod. 10^6 g	Type of Flow	FOLIO NUMBER
4,F																																				
4,F																																				

card-deck is not easy to manipulate when a great number of cards is involved, and is subject to sorting disarrangement, damage, or even loss. It should therefore be kept as an original and reference data set, whereas processing is best performed on some sort of copy. An existing system which uses a magnetic tape as a permanent file medium was, therefore, adapted to the specific needs of the GAB study. A set of programs allows for retrieval and updating of the information.

2.2.1.3. PROCESSING

Four main factors were investigated using processing programs:

a) the formations tapped by each water-bore

b) the values of hydraulic parameters

c) the head values corresponding to initial steady-state and present-day state

d) the water table heads

a) Formations tapped by each water-bore

The method consisted of comparing hand-prepared structural maps of formations to the elevations of tapped intervals, or, in default, to the total depth of water-bores (program PRCAFO).

b) Values of hydraulic parameters

(i) Horizontal hydraulic conductivity (aquifers).

Hydraulic tests were performed in New South Wales and Queensland. The results of a number of step-draw down tests in Queensland have been interpreted by N. Eden and C. Hazel who used a modified version of the Sternberg Method (Kruseman & De Ridder, 1970).

The equation is written (Hazel, 1973).

$$s = aQ_m + b \sum_{i=1}^{i=m} \log (t - t_i) \Delta Q_i + CQ_m^n$$

FIG 3-CODING SHEETS 4G TO 4M

BMR - GAB Groundwater project **HEAD AND TEMPERATURE SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	RELIABILITY	HEAD AND TEMPERATURE RECORDS No. 1: Date Year	Month	Build-up Sign	Pressure Depth Elevation	O.I.	Unit	Ref. Lev./Ground Surface	Temperature	°C - °F	Reliability	No. 2: Date Year	Month	Build-up Sign	Pressure Depth Elevation	O.I.	Unit	Ref. Lev./Ground Surface	Temperature	°C - °F	Reliability	No. 3: Date Year	Month	Build-up Sign	Pressure Depth Elevation	O.I.	Unit	Ref. Lev./Ground Surface	Temperature	°C - °F	Reliability	FOLIO NUMBER
4,G																																							
4,G																																							

BMR - GAB Groundwater project **HYDRODYNAMICS SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	PERFORATED CASING OR OPEN HOLE: From	To	AQUIFER TAPPED: From	To	RECORDS 1: Type of Test	T value g.p.d./f	S	2: Type of Test	T value g.p.d./f	S	3: Type of Test	T value g.p.d./f	S	COMMENTS	FOLIO NUMBER
4,H																						
4,H																						

BMR - GAB Groundwater project **TEST SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	TYPE OF TEST	FLOW RATE BEFORE TEST STARTS 1000 g.p.d.	PRESSURE BEFORE TEST Feet or p.s.i.	O.I.	Unit	DATE: Year	Month	Day	Hour	Min	RECORDS 1: Time hr.	m	Flow 1000 g.p.d.	Pressure Feet or p.s.i.	O.I.	Unit	2: Time hr.	m	Flow 1000 g.p.d.	Pressure Feet or p.s.i.	O.I.	Unit	3: Time hr.	m	Flow 1000 g.p.d.	Pressure Feet or p.s.i.	O.I.	Unit	Next Type of Test	FOLIO NUMBER
4,I																																							
4,I																																							

BMR - GAB Groundwater project **WELL CHARACTERISTIC CURVE SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250 000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	RELIABILITY	TEST NUMBER	DATE COMPLETED: Year	Month	Day	STARTING HEAD: Build-up Sign	Measurement	RECORDS No. 1: Discharge Rate (1,000 g.p.d.)	Pressure Or Depth	No. 2: Discharge Rate (1,000 g.p.d.)	Pressure Or Depth	No. 3: Discharge Rate (1,000 g.p.d.)	Pressure Or Depth	No. 4: Discharge Rate (1,000 g.p.d.)	Pressure Or Depth	No. 5: Discharge Rate (1,000 g.p.d.)	Pressure Or Depth	UNITS	COMPLETED BY	RELIABILITY	FOLIO NUMBER
4,J																													
4,J																													

BMR - GAB Groundwater project **TOTAL DISSOLVED SOLIDS SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250000 Map Number	Card Cont.	Deepening	Well Number	MAIN AQUIFER	TOTAL DISSOLVED SOLIDS RECORDS 1: Year	Unit	Total Dissolved Solids Measurement	2: Year	Unit	Total Dissolved Solids Measurement	3: Year	Unit	Total Dissolved Solids Measurement	4: Year	Unit	Total Dissolved Solids Measurement	5: Year	Unit	Total Dissolved Solids Measurement	6: Year	Unit	Total Dissolved Solids Measurement	7: Year	Unit	Total Dissolved Solids Measurement	FOLIO NUMBER
4,K																													
4,K																													

BMR - GAB Groundwater project **WATER CHEMISTRY - 1 SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	RELIABILITY	SAMPLING AUTHORITY	RELIABILITY	DATE SAMPLED: Year	Month	Day	DATE ANALYZED: Year	Month	Day	Analyzing Laboratory	FIELD DETERMINATION: Temperature of Resistivity °C or °F	Temperature of Sample °C or °F	pH	Eh	Code	Resistivity ohm/m Conductivity µmhos/cm	LABORATORY DETERMINATION: Code	Resistivity ohm/m Conductivity µmhos/cm	10^n	pH	Total Hardness: Method	10^n	Total Alkalinity ppm: Method	10^n	Total Dissolved Solids ppm: Method	10^n	Free CO_2 ppm	FURTHER INFORMATION AVAILABLE: Hydro-Carbons	Trace Elem.	Pesticides Insecticides	Radioactive	Other	FOLIO NUMBER
4,L																																										
4,L																																										

BMR - GAB Groundwater project **WATER CHEMISTRY - 2 SHEET** GAB - ADP System transfer sheet

CODE	IDENTIFICATION: State	Letter	1:250000 Map Number	Card Cont.	Deepening	Well Number	AQUIFER No.	RELIABILITY	LABORATORY DETERMINATION Anions: Cl^- ppm	10^n	SO_4^{2-} ppm	10^n	HCO_3^- ppm	10^n	CO_3^{2-} ppm	10^n	NO_3^- ppm	10^n	PO_4^{3-} ppm	10^n	F^- ppm	O.I.	Br^- ppm	O.I.	Cations: Ca^{2+} ppm	10^n	Mg^{2+} ppm	10^n	Na^+ ppm	10^n	K^+ ppm	10^n	Fe^{2+} ppm	O.I.	Mn^{2+} ppm	O.I.	Si^{4+} ppm	O.I.	Hydrocar-bons: CH_4 ppm	Other	DATE SAMPLED: Year	Month	Day	DATE ANALYZED: Year	Month	Day	FOLIO NUMBER
4,M																																																				
4,M																																																				

where s : drawdown

a : $b \log_{10} \dfrac{2.25\ T}{r^2\ S}$

b : $\dfrac{2.3}{4 \pi T}$

T : transmissivity

r : effective radius of the well

S : storage coefficient

Q_m : discharge at step m

t : time after the start of the first step

n : a constant (usually 2)

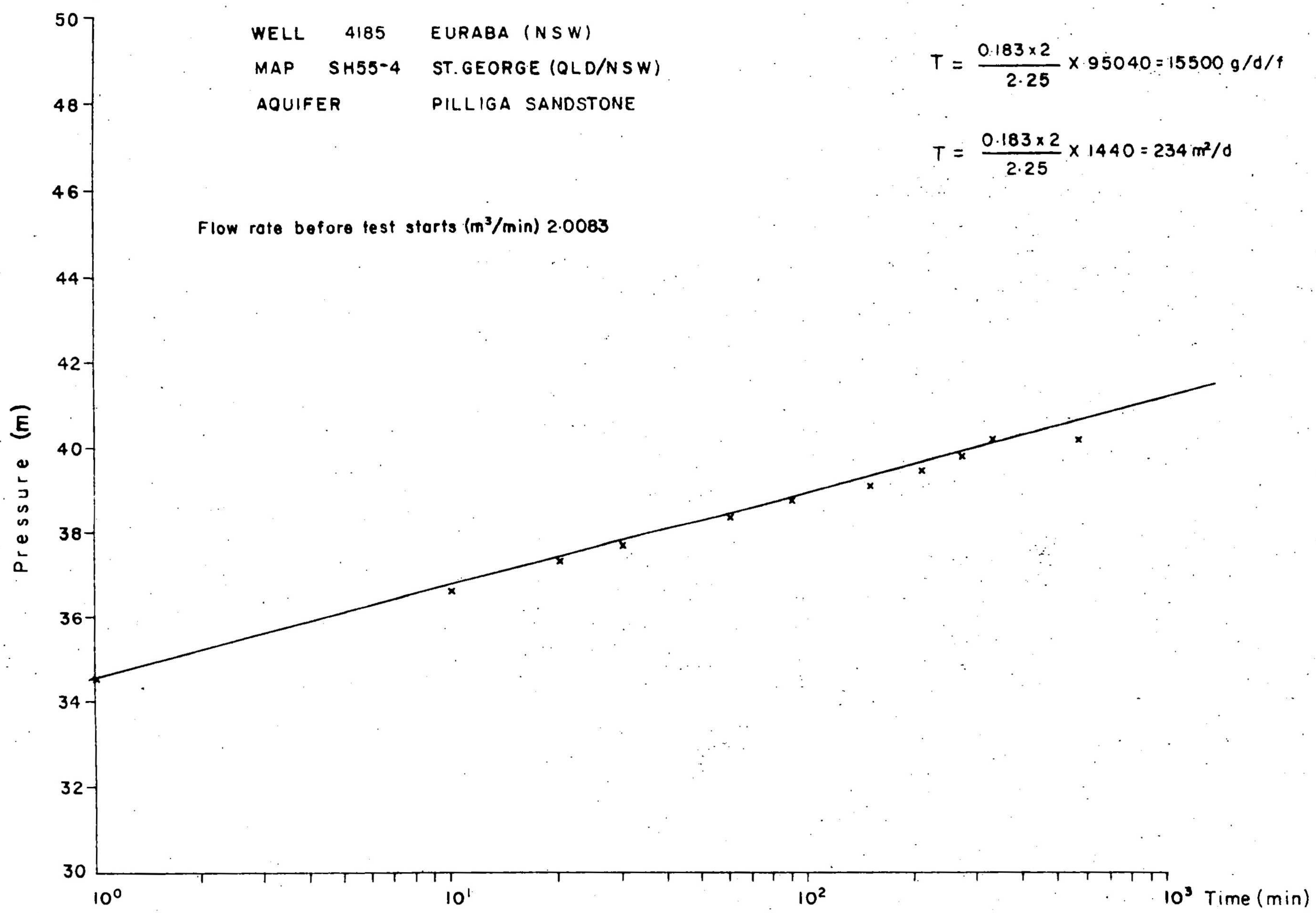
C : a constant

All transmissivity values were made available to us, and were recorded as such in the GAB ADP System.

In New South Wales, many recovery tests had been made and the existing data were recorded and automatically plotted on a semi-logarithmic scale, thus allowing interpretation by use of the modified Jacob Method (Kruseman & De Ridder, 1970). An example is given in Figure 4. Another program was used to determine the hydraulic conductivity values. The thickness of the formation tested was estimated by subtracting the depth at which the flow was first recorded during drilling, from the total depth of the bore. No account was taken of a possible partial penetration. Nonetheless, it is believed that in most cases the permeable layer was entirely tapped, as the drilling generally stopped at an impermeable layer and the flow was measured every time a new permeable material was struck.

Unfortunately, practically all of the tests were made on artesian bores, i.e. in the second confined aquifer unit.

FIG 4-EXAMPLE OF RECOVERY TEST PLOT



(ii) Vertical hydraulic conductivity (confining beds).

Values were evaluated after the final regrouping of the GAB formations into hydrogeological units (see section 3.1.). No measurement of vertical hydraulic conductivity values have been made in formations considered impervious in the GAB area. The question was therefore approached indirectly. Starting from the available composite logs of petroleum exploration wells, the confining units were divided into layers belonging to four rock types, namely sandstone (1), sandstone dominant, siltstone, shale (2), shale dominant, siltstone, sandstone (3), and shale (4). As such, the lithological types represent a 'permeability' scale of four values, each value differing from each other by a factor of 10, and derived from values found in the literature (Castany, 1967; Todd, 1959). A program KVERT weighs the conductivity values according to the thickness of each layer, and produces an average value for the total thickness of the confining unit. The formula used is

$$K_{av} = \frac{D}{\frac{d_1}{K_1} + \frac{d_2}{K_2} + \ldots + \frac{d_n}{K_n}}$$

with D = total thickness of confining unit (L)

d_1 = thickness of layer 1 (L)

K_1 = vertical hydraulic conductivity of layer 1 (LT^{-1})

K_{av} = average vertical hydraulic conductivity (LT^{-1})

It is assumed that, during the calibration process, only the 'permeability' scale needs to be adjusted by multiplying or dividing by a constant.

(iii) Storage coefficient.

No field value is available in the GAB area. As for the vertical hydraulic conductivity, this parameter has been evaluated after delineating the hydrogeological units. For the second confined aquifer unit, advantage has been taken of the approximate relation that exists between the transit time of an acoustic pulse through a rock and the rock's porosity (Scott Keys & McCary, 1971). Acoustic logs are available for most petroleum exploration wells.

A program (CALSTOR) determines the porosity and subsequently calculates the storage coefficient of each permeable layer of the second confined aquifer unit. These are then added together to provide the total storage coefficient.

Formulae used are

1) $$\Delta t = \frac{p}{V_f} + \frac{1 - p}{V_m}$$

with $\Delta t = \frac{1}{Vr}$ = interval transit time (TL^{-1})

Vr: velocity of signal in rock (LT^{-1})

p : porosity (dimensionless)

Vf : velocity of signal in fluid (LT^{-1})

Vm : velocity of signal in matrix (LT^{-1})

Vf is roughly constant, being 5000-5400 feet per second. Vm is known experimentally for different type of rocks.

For sandstone an average value is 16 500 feet per second

2) $$S = \gamma D \left(\frac{p}{E_w} + \frac{1}{E_m} \right)$$ (Jacob, 1940)

with S: storage coefficient ($L^3L^{-2}L^{-1}$)

γ: specific weight of water

D: thickness of layer

p: porosity

E_w: modulus of elasticity of water

Em: modulus of elasticity of matrix

γ is taken as 1000 kg per m^3.

Ew is approximately 20 000 kg per cm^2

Em is approximately 175 000 kg per cm^2 for sandstone

3) $ST = S_1 + S_2 + \ldots\ldots + Sn$

with ST = total storage coefficient of aquifer unit

S1 = storage coefficient of layer 1

Unfortunately no sonic log has been obtained in formations containing the first confined aquifer unit as they are situated too high in the Cretaceous to be of interest to petroleum exploration companies. The approximation recommended by the U.S. Geological Survey (Lohman, 1972) was therefore used for the first confined aquifer,

i.e. $S = 10^{-6} \times D$

with S: Storage coefficient

D: effective thickness in feet of permeable material (see definition, section 3.2.1.2.).

c) <u>Head values corresponding to initial steady-state and present-day state.</u>

(i) Second confined aquifer unit.

The depths of artesian bores tapping the second aquifer unit vary considerably, as does the water temperature and the salt content. For pressure measurements to be comparable, it is therefore necessary to correct for these two parameters.

Corrections were made using the program PIEZOM, using pure water at 15°C as a standard reference, and the results were automatically plotted versus time. A first selection of values was then based on the following criteria:

Present-day state. Values correspond to measurements made in 1972, providing

1) the bore elevation has been surveyed.

2) full recovery is known to have been achieved when the pressure was measured.

3) a number of successive measurements produces a smooth and coherent curve. It has been noticed that the decrease in pressure with time (as well as in free artesian discharge) obeys, to the first approximation, a law of the type (Fig. 5):

$$P = Poe^{-at} + Pc$$

with P: pressure (or discharge) at time t

P_o: pressure (or discharge) at time t_o

t: time elapsed since t_o

a: constant

P_c: constant asymptot to the curve.

Obviously these three ideal conditions can only be found in areas of high bore-density. Where they cannot be simultaneously fulfilled they are dropped in the order; 1,2,3. A particular case exists where, the third condition at least being fulfilled, there was no measurement in 1972. In this case, if the last measurement is not too old, the curve has been extrapolated forward. Finally, in areas where only a few bores exist, single values corresponding to measurements taken between 1970 and 1973 were accepted.

Initial steady-state. The same criteria have been applied to bores drilled before 1914. When no measurement was available at the completion date but condition 3 was fulfilled, the curve has been extrapolated backwards.

(ii) First confined aquifer unit.

Most bores drilled in the first confined aquifer unit are subartesian and, unlike artesian bores, have been partly discarded as potential sources of information on groundwater. Very few have been levelled. Usually the only water-level measurement has been made at the completion of the bore. The water-temperature has not been taken. No details are available as to measurement technique or recovery state at measurement time. The overall reliability of selected values is therefore much more doubtful than that for the second confined aquifer unit. The selection process consisted of finding, in each 1:250 000 Sheet area, bores which had water-level measurements taken between 1967 and 1972 for the present-day state, and before 1921 for the initial steady-state. The dates of the water-level measurements usually correspond to the completion date of the respective bores.)

d) Evaluating the water table heads.

The occurrence of groundwater and the corresponding water-levels have been recorded by drillers at the sites of most artesian water-bores. If the first water-level recorded within, say, the first 60 m coincides with the depth at which the driller recognized a saturated material, then it is a reasonable assumption that this level corresponds with the water-table depth. A program (PINLI) researched such conditions occurring in the list of water-levels recorded. In some cases, two values exist at the same bore location, owing mainly to a perched water-table. Manual checking was sufficient to make a decision as to whether the lower depth corresponded to the general water-table - the one to be considered - or to an error caused by an insufficient recovery time.

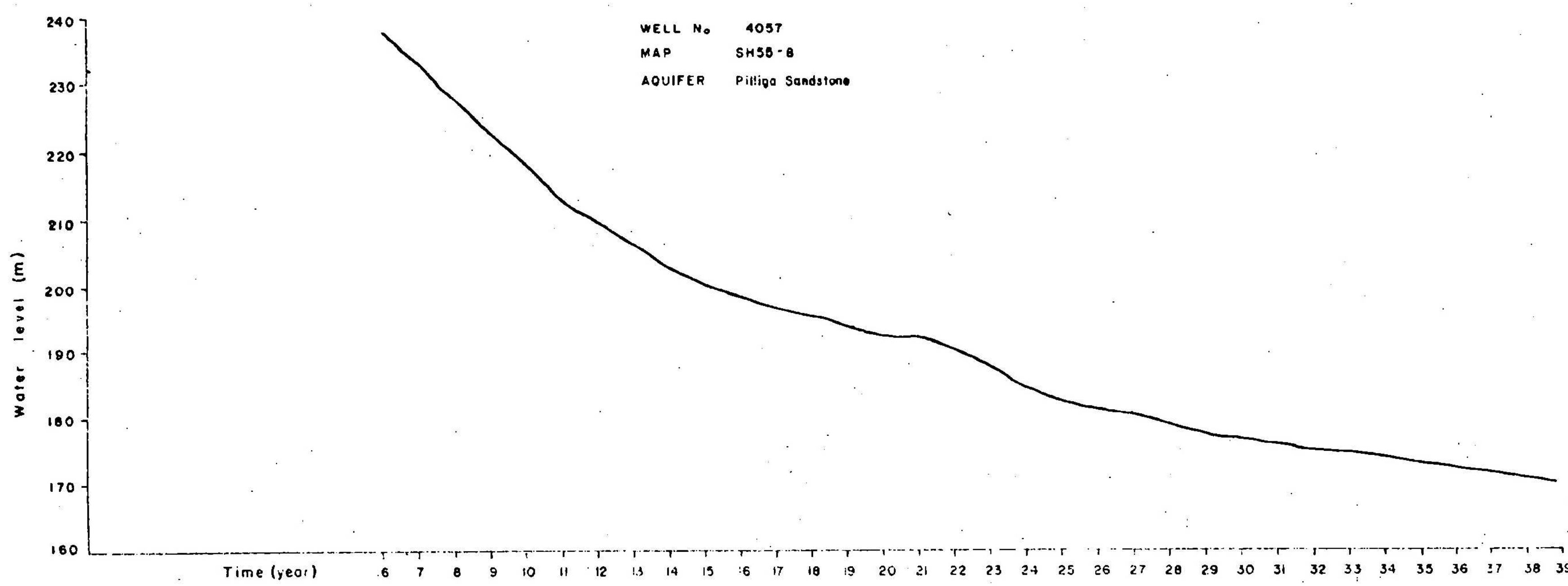
2.2.2. RESULTS

The most important processed hydrologic data are presented in the following tables.

Table 2 shows, for each 1:250 000 Sheet area, the number of bores tapping a particular formation. The numbers include:

a) bores known to be exclusively tapping the formation indicated.

FIG 5-EXAMPLE OF RECESSION CURVE



b) bores about which nothing is known but that the total depth exceeds the top of the formation.

More detailed information is included in computer print-outs held by BMR.

Table 3 lists, for each 1:250 000 Sheet area, the bores which have been submitted to a hydraulic test, the formation in which the tapping part of the well lies, the transmissivity value calculated from the test, and the horizontal hydraulic conductivity as deduced from the thickness of the layer tapped.

Table 4 gives (alphabetically) petroleum exploration wells for which porosity and storage coefficient values could be evaluated from sonic logs. As explained above, these values only cover aquifers contained in CA2. Where possible, some detail has been provided as to which formation the porosity values refer to. However, the storage coefficient values are usually given for several grouped formations.

Table 5 shows, for the same petroleum exploration wells as above plus some additional water-bores and stratigraphic holes, the vertical hydraulic conductivity values which are attributed to layers comprising the confining beds. The values are attributed on the basis of the lithology of the layers, together with a consideration of the average value for the whole thickness of CB1 and CB2.

Tables 6 and 7 list all bores tapping CA1 for which a water-level measurement has been made; either at a period where it can be assumed that initial steady-state conditions prevailed or in recent years (between 1968 and 1972). The tables also show those bores whose head value has been used for the preparation of potentio-metric maps.

Tables 8 and 9 provide the same information as Tables 6 and 7 for bores tapping CA2. They also indicate which bores have been subjected to a sufficient number of relatively accurate pressure measurements to enable 'recession curves', to be drawn thus providing grounds for a higher reliability of the value shown.

3. HYDROGEOLOGICAL DOCUMENTS

3.1. FINAL BASIN PICTURE

3.1.1. REMARKS ABOUT THE FIRST ASSUMPTIONS

At the beginning of the project, when the decision was made to simulate the reservoir as a multilayered system, the emphasis was placed on the 'artesian' aquifers, whilst the 'subartesian' aquifers were ignored. However, from the subsequent compilation of geological information, and from the analysis of hydrologic data collected in the States, the following facts gradually emerged:-

a) the geology in the Great Artesian Basin does not accord, at least at the scale of such an immense basin, with the above-mentioned simple reservoir structure. Thus aquifer-bearing formations in the Cambrian, Triassic, Jurassic, and Early Cretaceous are all somewhat inter-connected in some part of the Basin. For instant the Ronlow Beds (permeable sandstone) in the eastern Eromanga Basin (intake area) span the entire Jurassic sequence; the Birkhead Formation, which contains some aquifers, wedges out in the west, probably leaving the Hutton and Adori Sandstone separated only by a very thin semi-pervious bed; the Algebuckina Sandstone in the South Australian part of the GAB is equivalent to the sequence from the Adori to the Hooray Sandstone. Other examples could be given which illustrate some horizontal or vertical connections between the 'artesian' aquifers. Also although these continental formations are remarkable continuous, facies changes occur in which a semi-pervious unit grades into an aquifer; for example, the Evergreen Formation passing to a permeable sandstone (Boxvale Member).

b) Many 'subartesian' and some 'artesian' water-bores have been drilled to the Mackunda and lower Winton Formations. Although much less spectacular than the high-discharging; free-flowing bores tapping the other aquifers, they produce a significant, economically important amount of groundwater. When this fact was realized, it was appreciated that Cretaceous aquifers could no longer be ignored in the simulation of the GAB.

c) After information on 'artesian bores' was collected, the bores were sorted according to which aquifer formation they tapped. A selection of neighbouring bores tapping different aquifers allowed for a comparison of heads to be made, but no significant differences were noticed. To support this finding, the available data on deepened bores were analysed (Table 10). Some comments are necessary to interpret them. Deepening was a remedy for artesian bores whose natural discharge dropped to a low figure or to nil. In the last case, the recurrence of a free-flow can only be attributed to the tapping of a higher-pressure aquifer. But when the bore did not cease to flow before deepening, the improvement can be due either to a greater pressure or to a thicker aquifer section being tapped, thus increasing the transmissivity. Table 10 does not show which of the two cases applied when the bores were deepened, since this information was not available. However, the rate of success of resultant increased flow is only 50% or less for bores initially drilled in Jurassic aquifers and nearly 90% for bores initially tapping the Winton-Mackunda aquifers. We can therefore assume that those bores in the Jurassic which experienced a better natural discharge after deepening did not cease to flow, and profited by a greater transmissivity, the pressure remaining about the same. On the other hand, bores which ceased flowing before deepening did not improve as the pressure in deeper Jurassic aquifers was similar to that of the first aquifer tapped.

d) Many 'artesian' bores jointly tap several aquifer formations, thus making it difficult to know from where the water is discharged.

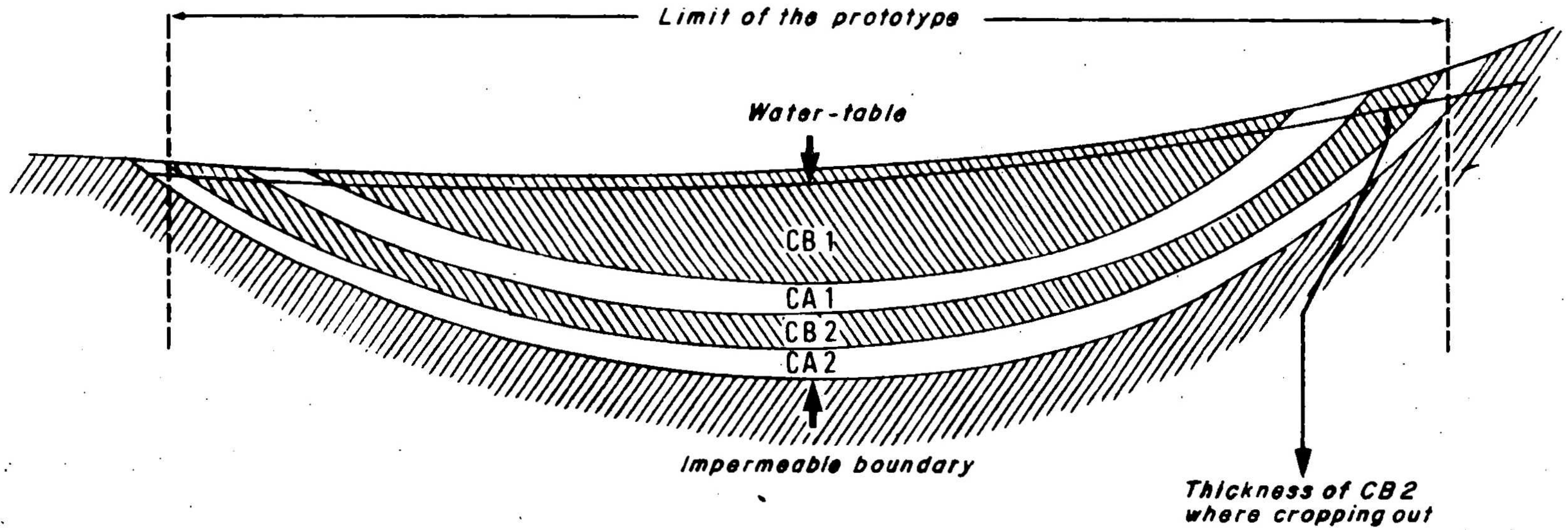
e) Finally, the preparation of potentiometric maps corresponding to aquifers units as defined above would have been an impossible undertaking, as measurement points are numerous in the Upper Jurassic aquifers, few in the Middle Jurassic aquifers, and very limited in Triassic aquifers.

3.1.2. ACTUAL ASSUMPTIONS

The reservoir structure finally chosen as the best compromise between the complex actual system and the ideal multilayered system suitable for computer simulation, consists of (Fig. 6):

a) first confining bed (CB1). It corresponds with those Lower Cretaceous formations that are included between the water-table and the top of the first confined aquifer. Thus the water-table is no longer considered as lying in an upper unconfined aquifer, but in a mere potential limit allowing for the computation of the upward vertical leakage. This option is

Fig 6-Diagram showing the hydrological structure of the GAB prototype



justified by the fact that where CB1 and CB2 crop out, a water-table cannot be consistently defined.

b) first confined aquifer (CA1). Whereas the lower limits of the formations containing CA1 are relatively easy to determine as the top of the Allaru Mudstone or equivalents, the upper limit is often uncertain as the permeable zones in the Winton Formation are lenticular, though quite probably connected. The upper limit was picked by considering two sources of information. The composite logs of petroleum exploration wells gave a first indication as to the approximate depth where sandstone beds became relatively more abundant in the Winton Formation. This limit was then checked against depths at which the first pressure water in the Winton Formation was reported by drillers. Between these two limits the aquifer appears to be diffuse.

c) second confining bed (CB2). This unit, where it is overlain by formations including CA1, is well defined between the top of the Alluru Mudstone or equivalents, and the top of CA2. In regions where CB2 crops out, its thickness has been taken as the difference between the top of CA2 and the water-table.

d) second confined aquifer (CA2). This is the best defined unit as the formations which contain it are readily recognizable in all geophysical logs run in petroleum exploration wells. These formations include all Lower Jurassic formations, the lower part of the Lower Cretaceous, and, in certain areas, older sedimentary rocks of Cambrian, Permian, and Triassic age.

3.1.3. DOCUMENTS NECESSARY

Two sets of documents are strictly necessary for simulating the reservoir and calibrating the distribution of the hydraulic parameters. The first set consists of input documents and includes :

- The lateral extent and vertical relations between aquifers through confining beds,

- Parameters of confined aquifer units. These are: effective thickness, horizontal hydraulic conductivity, and storage coefficient.

- Parameters of confining beds. These are: thickness and vertical hydraulic conductivity.

- Upper potential limit: the water-table.

The second set contains calibration documents:

- Maps of observed potentials at initial steady-state.

- Maps of observed potentials at present-day state.

The next section briefly discusses these documents and some others which, though not strictly indispensable, represent important intermediate steps.

3.2. DESCRIPTION OF DOCUMENTS

3.2.1. INPUT DOCUMENTS

3.2.1.1. GEOMETRY OF THE SYSTEM

The lateral extent of the four hydrogeological units are shown in Plate 3. Topographic contours and the positions of cross-section lines shown in Plates 4 to 9 have also been indicated.

(a) CA2. The 'inner boundary' corresponds to that line where the uppermost permeable layer of CA2 becomes confined. The 'outer boundary' corresponds to the bottom of the lowermost permeable layer of CA2. The aquifers crop out in between. Several features are noticeable :

- the two boundaries are open in the north towards the Carpentaria Basin. As indicated in Section 2.1. the reservoir extends beneath the Gulf of Carpentaria. However, this part of the reservoir has not been included in the simulation.

- The outer boundary is left open in two places: immediately west of Brisbane, and close to the crossing of the Tropic of Capricorn with the border between Queensland and the Northern Territory. In both places this is due to an extension of permeable layers of CA2, into, respectively, a subsidiary basin (Lower Jurassic sandstone into the Moreton Basin) and an older basin (Cambrian limestone into the Georgina Basin).

- To the south, inner and outer boundaries coincide. The explanation for this differs to the east and west of Lake Frome. To the east, up to the Macquarie River, the permeable layers of CA2 pinch out southwards but remain concealed beneath the Cretaceous confining beds of CB2. To the west, the boundary has been chosen so as to follow the alignment of springs which undoubtedly form an emergence line and consequently a natural limit to the aquifers. It lies a very short distance from the Eromanga Basin limit.

(b) CA1. No special feature characterizes the inner and outer limits of CA1. Their general smoothness suggests, however, that they are more uncertain than those of CA2. This uncertainty is due to the 'diffuse' nature of the CA1 aquifers, and is particularly evident in the case of the inner limit as this does not correspond to a lithostratigraphic limit as was the case for CA2. Therefore, arbitrary decisions sometimes had to be made. One usual criterion for locating the inner limit was the appearance on maps of subartesian bores. But the main question still pending is the limit assumed in the southeast corner where a large area is shown to correspond with outcropping CA1. Here the choice has been made that CA1 is definitely linked with the Winton and Mackunda Formations, while the aquifers contained in the Coreena and Doncaster Member Mudstones have been considered as minor and ignored. There is, however, a possibility that these aquifers could be in hydraulic continuity with the aquifers of the Winton and Mackunda Formations on each side of the Eulo Ridge. In that case, CA1 should extend as a confined lobe into the Surat Basin.

The structure of the reservoir is better visualized on the six cross-sections (Plates 4 to 9). However, the vertical exaggeration of 500:1 considerably distorts reality. It must also be emphasized that these are not geological sections, but rather merely indicate the intervals corresponding to each of the four hydro-geological units.

The lithology has also been simplified: only four grain types are shown. Furthermore, because CA1 consists of a great number of alternating sandstone and fine-grained sediment bands, the symbol representing it is purely diagrammatic.

3.2.1.2. PARAMETERS OF CONFINED AQUIFERS

The horizontal flow through aquifer units depends on their transmissivity; that is, the product of the horizontal hydraulic conductivity and the effective thickness. The effective thickness is that part of the total thickness which can be considered as permeable. Plates 10 and 11 show isopachs and lines of equal proportion of permeable material for CA1 and CA2, respectively. Point values have been determined from resistivity or gamma-ray logs obtained in oil exploration wells.

Both CA1 and CA2 isopachs reflect the general structure of the GAB. In the northeast, CA2 shows a local thickening (contour 200 m) due to the contribution there of the Clematis Sandstone. Percentages of permeable material are very consistent in CA1, extreme values being 20% and 50%. Unlike CA1, however, CA2 consists of thick layers of sandstone, whose proportion to the total thickness is generally greater and more variable than that of CA1, namely between 30% and 100%.

It was mentioned above that no means were available to derive values of horizontal hydraulic conductivity and specific storage for CA1. We therefore made the assumption that both parameters were constant over the whole area of CA1. The horizontal hydraulic conductivity was assigned a value of 10 m day^{-1}, the average value for CA2, as the permeable material of CA1 is very similar to that of CA2. The specific storage was chosen as 10^{-6} per foot, which is an average figure for unconfined aquifers. Selected horizontal hydraulic conductivity values, and storage coefficient contours of CA2, as shown in Plate 12. It can be readily seen that the space distribution of hydraulic conductivity is not favourable to interpolation or to extrapolation. Large areas are devoid of point values. Storage coefficients derived from sonic logs are rather consistent throughout CA2, with an average value of 5×10^{-4}.

3.2.1.3. PARAMETERS OF CONFINING BEDS

The exchange of water from one aquifer to another through a confining bed is proportional to the vertical hydraulic conductivity and inversely proportional to the thickness of the confining bed. Plates 13 and 14 show the isopachs and vertical hydraulic conductivity point values for CB1 and CB2 respectively.

(a) CB1. The isopachs were mainly derived from petroleum exploration well composite logs, but again the difficulty of picking the top of CA1 necessitated confirmation from another source. Additional point values were obtained by systematically searching for the depth of the first pressure waters. The values shown in Plate 13 result from petroleum exploration well information, from direct analyses of water levels in water-bores and from a comparison between water-table contours and a contour map based on the depth of the first pressure water recorded.

The average thickness of CB1 is about 200 m, with a maximum of 600 m.

Owing to large variations between adjacent point values, no attempt was made to contour vertical hydraulic conductivities. Instead, they were used as an indication of the order of magnitude, rather than as absolute and reliable data (see section 2.2.1.3.). On the whole, the vertical hydraulic conductivity is relatively high, owing to a relatively high proportion of sandy layers, with common values of 10^{-3} m/day.

(b) CB2. The isopach map of CB2 was compiled by using the interval between the top of the first aquifer of CA2, and either the bottom of CA1 (Allaru Mudstone or equivalent) where CA1 exists, or the water-table where CB2 crops out. The intervals were determined from water-bores and petroleum exploration well logs, and also from comparisons of contour maps of the top of CA2 and the water-table. The average thickness of CB2 is 500 m, i.e. more than twice that of CB1, and reaches up to 800 m.

Vertical hydraulic conductivity values seem to be very constant throughout the area covered by CB2, but are one order of magnitude smaller than those of CB1. This reflects the more argillaceous nature of formations comprising CB2.

3.2.1.4. WATER-TABLE

Owing to the difficulties encountered in defining a water-table aquifer (geometry and hydraulic parameters), it was decided to regard the water-table as the upper, fixed, potential limit of the system and to lie within the first confining bed. The basic data to compile the water-table contour map (Plate 15) were obtained as explained in section 2.2.1.3. A large number of point values are available, most of them concentrated in the eastern part of the GAB. The relative 'internal consistency' of these numerous values probably makes the water-table contour map (Plate 15) the most reliable synthesis of all. Of note are the large bulges which correspond to the major bulges which correspond to the major topographic highs in the northeast, and which are surrounded by the two well marked drainage patterns of north Queensland towards Lake Eyre, and of southeast Queensland towards the Darling River Valley at Bourke. Also important is the closing of the contours around Lake Eyre, though mainly derived from the topography, thus making it the main discharge area of all groundwater of the Basin, as can also be inferred directly from the topography of the GAB area.

One may wonder why the water-table is assumed to remain at a constant level when the potential of confined aquifers obviously varies with time. A simple argument justifies the assumption. The water-table has an average depth of 30 m, so that in the present short term consideration it is essentially isolated from any sort of exchange with the surface (such as recharge by rainfall and discharge by evapotranspiration. Exchanges with the underlying confined aquifer, however, appear more significant. Let us suppose that the potential variation in the depth of CA1 is as large as 20 m. Assuming that the storage coefficient is about 5×10^{-4} for CA1 and o.1 m below the water-table, an equivalent change in storage in the water-table aquifer would result in a lowering of the water-table of

$$X = \frac{20 \times 5 \times 10^{-4}}{10^{-1}} = 0.1 \text{ m}$$

It is obvious that even if observed values of the water-table were available for different periods, such fluctuations could not be detected.

3.2.1. <u>CALIBRATION DOCUMENTS</u>

3.2.2.1. MAPS OF OBSERVED POTENTIALS AT INITIAL STEADY-STATE

Initial steady-state equipotential lines of CA1 and CA2 are shown in Plates 16 and 17 respectively.

(a) CA1. Point values are unfortunately largely restricted to the eastern half of the area. The sparseness of bores in the western part of CA1 which is also the 'lower end' of the aquifer makes it reasonable to assume that little change has occured in the potentiometry with time. Add the fact that along the outcrop rim the equipotential lines are coincident with the water-table contours, and it becomes possible, with the help of the present-day-state equipotential map, to draw contours within the area devoid of data.

(b) CA2. The distribution of point value is slightly better than for CA1. Most of them are in the north and northeast, a fair number in the southeast, some in the southwest but there are few in the west. The same principle as for CA1 was applied to draw equipotential lines in this area.

Both these maps show a strong degree of similarity to the water-table map. This is an indication of a system dominated by an areal variation in vertical leakage (though both confining beds are thick and poorly permeable) rather than by horizontal flow. The reason for this is the fact that the GAB is a closed system with a topographic low beneath sea-level, so that groundwater can only escape vertically. Ultimately, groundwater flow is governed by the topography. If one concentrates on the lower parts of the potentiometric surfaces, one notes that -

1. Three prominent drainage lines are common to the water-table, CA1, and CA2, and run more or less parallel to each other trending south-southwest. All three correspond to actual stream valleys, which in turn coincide with structural lineaments (that are quite likely to provide privileged vertical leakage paths).

2. Also common to the three is the obvious discharge area of Lake Eyre.

3. An east-west drainage line in the south is peculiar to CA1, and corresponds to the narrow outcrop area of the unit. The swamps near the Queensland/New South Wales border are the surface manifestation of a discharge from CA1.

4. Two features are peculiar to CA2. One is a drainage line that follows the Paroo River valley, and is explained by the presence of the Eulo Ridge which is actually surrounded by springs. Before exploitation of the GAB commenced these springs must have discharged large quantities of groundwater.

The drainage line extends south and the equipotential lines abut against the limit of CA2. Here the discharge of groundwater is again evidenced by the presence of a swamp area.

The other feature is the drainage area in the northwest, precisely where Cambrian limestone of the Georgina Basin underlie the usual Jurassic aquifers of CA2. It corresponds to the presence of many springs, jointly discharging groundwater from both the GAB and the Georgina Basin.

3.2.2.2. MAPS OF OBSERVED POTENTIALS AT PRESENT-DAY STATE

The potentiometric surfaces of CA1 and CA2, corresponding approximately to 1972, are shown in Plates 18 and 19 respectively.

(a) CA1. There are as many point values as for the initial steady-state values but their distribution is more satisfactory; there are fewer in the centre-east, but some in the centre and the southwest.

(b) CA2. More points than for the initial steady-state values were used in general, especially in the west.

For both confined aquifers the general trends are very much like those some seventy years before, but with a moderate lowering of the CA1 potentiometric surface of about 10 m in the eastern half and a more important lowering of 20 to 40 m in the same area for that of CA2. The most perceptible changes are probably those in east Queensland, south of Eulo Ridge, and in New South Wales.

One important feature for both aquifers is that the potentiometry on the margins appears to be the same as that for the initial steady-state. For CA1 this follows from the fact that in the outcrop areas, the potential contour lines must be connected with those of the water-table (which is assumed to be at constant level). For CA2 with the exception of the southern margin the same explanation stands. In the northeast (Eromanga Basin) an additional reason to believe that the potentiometry for CA2 did not drop significantly in the outcrop area is the existence of numerous outflow springs which mark the margins of the Hutton Sandstone. To the south, however, head values have changed because the margin is impermeable - and modelled as such - owing to the absence of outcrop of formations belonging to CA2.

4. CALIBRATION

4.1. BRIEF OUTLINE OF CALIBRATION PRINCIPLE

Before any operational simulation of a groundwater system can be undertaken with some chance of success, the set of time-independent input data must be checked against some sort of reference, and adjusted accordingly. Usually the geometric data of the system are regarded as sufficiently descriptive of the reality, and are therefore subject to only minor changes during the calibration period. In contrast, the known hydraulic parameters are generally scarce and scattered, so that any assessment of their distribution involves an element of guesswork. Thus the calibration process mainly consists of adjusting the hydraulic parameter values until a response is obtained from the 'simulator' (GABSIM simulation program fed with data particular to the GAB groundwater system) which matches the chosen requirements. The most usual test consists of comparing an observed state (at a given time) of the potentiometric surface(s) of aquifer(s) with the output of a simulation run, given the initial and boundary conditions.

One difficulty of the method, is that the adjustment of several parameters at the same time by a trial-and-error process, without any guidance other than good justment and previous results of known alterations, requires time. There is, however, the possibility of dividing the hydraulic parameters into two groups, and to calibrate the parameters belonging to the first group and then those belonging to the second group. If the system can be considered at steady-state, i.e. no change in storage occurs in the system, then the equations describing the groundwater flow of the multilayered system only include transmissivity and vertical hydraulic conductivity parameters. If the system is in unsteady-state - i.e. experiencing a change in storage - then the equations also include the storage coefficient symbol. Thus the calibration process is conducted in two steps, namely the calibration of the steady state followed by the calibration of the unsteady-state. In the GAB case, the references were the potentiometric maps corresponding to the state of the aquifers before the effect of exploitation made itself felt, and in 1972, after three-quarters of a century of exploitation.

4.2. GENERATION OF INPUT DATA

The documents summarizing the basic data have to be further transformed in order for them to be 'digestible' by the computer. The whole process, including the steps described earlier, is shown in Figure 7 (Ungemach, 1975). Notes on the basic and preliminary steps of the transformation are given below.

4.2.1. DISCRETIZED MAP OF THE RESERVOIR GEOMETRY

Figure 8 indicates how the main geometrical features of the GAB system have been reduced to a network of squares or a 'mesh', each 25 km wide. Each square can be immediately located in plan by the co-ordinates I, J, of its centre or 'node'. The squares must also, however, be vertically differentiated as the layers CB1, CA1, CB2, and CA2 are superposed in that order. An additional index is therefore used which enables the distinction of the four hydrogeological units.

This grid map is the basic framework on which are shown the values of the parameters which appear in the fundamental equation.

4.2.1. DISCRETIZED MAPS OF INPUT AND CALIBRATION DOCUMENTS

The parameters presented in the earlier described documents were allocated to the relevant nodes of the grid map. To do this manually would have meant a great many hours of tedious work. An alternative, which was devised by G. Seidel, consisted of submitting all contoured maps to a digitization table. Specific values were picked at the intersection of contour lines with the initially specified grid lines. An interpolation program (MAPDIG) subsequently processed the discretized contour lines and automatically allocated a value to each node. The procedure was applied to isopach maps (4 maps), potentiometric maps (5 maps including the water table), the CA2 storage coefficient (1 map), and percentage contour maps of permeable material from CA1 and CA2 (2 maps). Though requiring some manual checking and modification on the limits of resulting maps, the method was quite satisfactory and saved much time.

4.2.3. AREAL DISTRIBUTION OF HYDRAULIC PARAMETERS

Except for the storage coefficients of CA2, whose values could be contoured and treated as indicated above, the hydraulic parameters had to be assumed to be constant over large areas, or even over the whole of the unit area. Included in the latter case are the horizontal hydraulic conductivity and the specific storage (L^{-1}) of CA1. Figure 9, 10, and 11 show the assumptions that were made on the areal distribution of, respectively, the horizontal hydraulic conductivity of CA2, the vertical hydraulic conductivity of CB2, and the vertical hydraulic conductivity of CB1. One point worth noticing is that, owing to the lack of information on spring discharge, the vertical hydraulic conductivity values have been arbitrarily and tentatively increased by an order of magnitude in all meshes where there are numerous springs.

4.2.4. GROUNDWATER DISCHARGE

Calibration of the unsteady state requires that the amount of groundwater discharged from aquifers be known in both space and time. This data is then used to compile (by program) the total discharge per year per mesh. For this purpose, the registration numbers of the bores contained within each mesh, have been assigned to the corresponding mesh node.

4.3. EARLY RESULTS OF CALIBRATION

The account given here covers the first 13 calibration runs of the steady-state. These trials were conducted between 9 August and 6 September 1974. The set of hydraulic parameters used is an earlier version than the one shown on Figure 9, 10, and 11. The new set results, in fact, from an analysis of these 13 calibration runs.

The main means of control of the quality of the output of the runs were maps giving the difference in value between the observed and the calculated heads for each aquifer.

Although the results obtained so far have no merits other than documented experience, the brief comments on the 13 runs shown in Table 11, serve as an example of the methods involved in the calibration procedure.

The main conclusions to be drawn from these first attempts are

- the number of hydraulic parameters to be adjusted makes it necessary to calibrate CA1 and CA2 separately.

- the choice of the mesh size is such that vertical flows are of the same order of magnitude as horizontal flows.

Consequently the model is sensitive to changes in vertical hydraulic conductivity values.

- automatic discretization has proved very efficient, but demands a manual checking in order to avoid serious errors on limits.

5. CONCLUSIONS

This report attempts to summarize the results obtained to date (early 1975) in the study of the GAB groundwater system. The results are based solely on existing geological and hydrological data, the collection and evaluation of which necessitated a great deal of time. Although much remains to be done, and many further refinements will be necessary, the main objective of the project has been achieved; namely the setting up of a hydrogeological 'prototype' to represent the groundwater system existing in the whole GAB area. This prototype, comprising two confined aquifers, has proved to be the most suitably adapted representation of the GAB that is currently available. Although still in progress, the calibration of the **GABSIM** simulator (GABSIM program and prototype) appears to yield results consistent with observations on the potentiometry of the tapped aquifers.

An additional section of the study to be commenced in the near future, the groundwater chemistry investigation, is expected to lead to further modifications and refinements of the prototype. As such, this section will probably represent the last phase of the study that is based on the synthesis of existing data. Further important progress in the knowledge of the GAB will certainly necessitate field investigations.

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TABLE 2 : FORMATIONS TAPPED BY WATER-BORES

1:250 000 Map Sheet Number	Formation tapped	Number of bores	1:250 000 Sheet Number	Formations tapped	Number of bores
F 54 2	Jkh	13	F 55 10	Re	1
"	Jlh	13	F 54 13	Jkh	20
F 54 3	Jkh	109	F 54 14	Kw/Klm	1
"	Jlh	65	"	Jkh	61
"	Re	1	"	E	1
"	Jkh, Jlh	11	"	Jkh, E	2
F 54 4	Jkh	113	F 54 15	Kw/Klm	9
"	Ja	3	"	Jkh	4
"	Jlh	116	"	Jlh	3
"	Re	9	F 54 16	Kw/Klm	62
"	Jkh, Jlh	28	"	Jkh	4
"	Jkh, Ja	1	F 55 13	Kw/Klm	33
"	Jkh, Ja, Jlh	2	"	Klc/Kld	2
F 55 1	Jlh	1	"	Jkh	36
F 54 7	Kw/Klm	23	"	Ja	18
"	Jkh	62	"	Jmb	2
"	Jlh	20	"	Jlh	69
"	Re	5	"	Re	10
"	Jkh, Jlh	5	"	Klc/Kld, Jkh,	2
F 54 8	Kw/Klm	138	"	Jkh, Ja	5
"	Jkh	8	"	Ja, Jlh	5
"	Jlh	46	"	Ja, Jmb, Jlh	1
"	Re	21	"	Jkh, Ja, Jlh	8
"	Jkh, Jlh	10	"	Klc/Kld, Jkh, Ja	2
"	Jlh, Re	1	"	Klc/Kld, Jkh, Ja, Jlh	4
"	Jkh, Jlh, Re	1	"	Jkh, Re	2
F 55 5	Kw/Klm	2	"	Jkh, Ja, Jlh, Re	1
"	Jkh	35	F 55 14	Klc/Kld	1
"	Jlh	29	"	Jkh	6
"	Re	12	"	Jlh	9
"	Kw/Klm, Jkl,	1	"	Re	3
"	Jlh, Re	1	G 54 1	Kw/Klm	1
F 54 10	Jkh	50	"	Jkh	10
F 54 11	Kw/Klm	20	"	E	3
"	Jkh	23	"	Jkh, E	1
"	Jlh	2	G 54 2	Jkh	13
"	Re	1	G 54 3	Kw/Klm	25
F 54 12	Kw/Klm	313	"	Jkh	1
"	Jkh	2	G 54 4	Kw/Klm	40
"	Jlh	10	"	Jkh	2
"	Re	1	"	Jkh, Ja	3
F 55 9	Kw/Klm	55	G 55 1	Kw/Klm	143
"	Jkh	62	"	Klc/Kld	1
"	Ja	14	"	Jkh	12
"	Jlh	28	"	Ja	6
"	Re	18	"	Jlh	6
"	Jkh, Ja	4	"	Jlp	2
"	Ja, Jlh	3	"	Re	1
"	Jmb, Jlh	2	"	Ja, Jlh	1
"	Jkh, Ja, Jlh	6	"	Jkh, Ja, Jlh	2
"	Jlh, Re	2	"	Klc/Kld, Jkh, Ja, Jlh	1
"	Jkh, Ja, Jlh, Re	1	"	Jkh, Ja, Jlh, Re	1

Table 2.

1:250 000 Map Sheet Number	Formation tapped	Number of bores
G 55 2	Klo	3
"	Jkh	24
"	Ja	8
"	Jlh	5
"	Jlp	13
"	Re	3
"	Jkh, Ja	1
"	Ja, Jlh	1
"	Jlh, Jlp	6
"	Jkh, Jlh, Jlp	1
"	Jlh, Jlp, Re	1
"	Jkh, Ja, Jlh, Jlp	1
F 53 6	Jkh	4
F 53 7	Jkh	5
G 54 5	Jkh	2
G 54 6	Kw/Klm	6
"	Jkh	2
G 54 8	Kw/Klm	70
"	Ja, Jlh	1
G 55 5	Kw/Klm	65
"	Jkh	3
"	Ja	5
"	Re	1
"	Jkh, Ja, Jlh	1
G 55 6	Kw/Klm	26
"	Klc/Kld	5
"	Jkh	4
"	Ja	4
"	Jlh	1
"	Re	7
"	Jkh, Ja	1
"	Ja, Jlh	2
"	Jlh, Re	4
G 55 7	Jlp	18
G 55 8	Jlh	28
"	Jlb	2
"	Jlp	22
"	Re	8
"	Jlh, Jlp	1
"	Jlh, Re	2
G 53 11	Klo, Jua	7
G 54 9	Kw/Klm, Klo, Jua	21
G 54 10	Kw/Klm	4
G 54 11	Kw/Klm	3
G 54 12	Kw/Klm	44
"	Ja	4
G 55 9	Kw/Klm	50
"	Jkh	2
"	Ja	6
"	Jlh	1
"	Re	1
"	Jkh, Ja	1
"	Klc/Kld, Jkh, Ja,	1
G 55 10	Kw/Klm	2
"	Klc/Kld	1
"	Klo	1
"	Jkh	48
"	Ja	5
"	Jlh	4
"	Jkh, Ja	2
"	Ja, Jlh	3
"	Jkh, Ja, Jlh	2
G 55 11	Klc/Kld	14
"	Klo	1
"	Jkh	17
"	Ja	1
"	Jlh	11
"	Jlp	2
"	Ja, Jlh,	1
"	Jkh, Ja, Jlh, Jlp	1
G 55 12	Kly	13
"	Jkh	89
"	Ja	8
"	Jlh	3
"	Jlp	11
"	Kly, Jkh	4
"	Jkh, Ja, Jlh, Jlp	2
"	Jlh, Re	1
G 56 9	Klmo	3
"	Jug	3
"	Js	6
G 53 15	Klo, Jua	20
G 53 16	Klo, Jua	1
G 54 13	Klo, Jua	4
G 54 14	Klo, Jua	4
G 54 15	Kw/Klm	3
"	Ja, Jlh	1
G 54 16	Kw/Klm	87
"	Jkh	3
G 55 13	Kw/Klm	45
"	Klc/Kld	14
"	Klo	1
"	Jkh	38
G 55 14	Kw/Klm	1
"	Klc/Kld	14
"	Jkh	93
"	Ja	3
"	Klc/Kld, Jkh	1
"	Jkh, Ja	2
G 55 15	Klc/Kld	1
"	Kly	4
"	Klmo	5
"	Jug	40
"	Ja	7
"	Jug, Ja	5
"	Klc/Kld, Jug, Ja	1
"	Kly, Klmo,	1
"	Ja, Jlh	1

1:250 000 Map Sheet Number	Formation tapped	Number of bores	1:250 000 Sheet Number	Formation tapped	Number of bores
G 55 16	Klc/Kld	1	H 55 5	Kw/Klm	22
"	Kly	1	"	Jkh	127
"	Klmo	7	"	Kw/Klm, Jkh	6
"	Jug	4	H 55 6	Kw/Klm	29
"	Js	1	"	Jkh	148
"	Jlh	1	"	Kw/Klm, Jkh	7
"	Jug, Js	1	H 55 7	Jp	43
"	Klmo, Jug, Js, Jlh, Jlp, Re	1	"	Klmo, Jug	12
			"	Klmo, Jug, Jp	5
G 56 13	Klc/Kld	4	H 55 8	Klmo, Jug,	10
"	Klmo	16	"	Jp	51
"	Jug	32	"	Klmo, Jug, Jp	11
"	Klc/Kld, Klmo	1	H 54 10	Klo, Jua	11
"	Klmo, Jug	2	H 54 11	Jkh	7
"	Jug , Jlh, Jlp	1	H 54 12	Jkh	8
"	Jug, Jlh, Jlp,Re	2	H 55 9	Jkh	79
H 53 3	Klo, Jua	22	H 55 10	Jkh	7
H 53 4	Klo, Jua	3	"	Jp	2
H 54 1	Klo, Jua	3	"	Jkh, Jp	1
H 54 2	Kw/klm, Klo, Jua	21	H 55 11	Klmo, Jug	17
H 54 3	Kw/Klm	19	"	Jp	109
"	Ja	1	"	Klmo, Jug, Jp	6
H 54 4	Kw/Klm	21	H 55 12	Klmo, Jug	5
"	Jkh	6	"	Jp	125
H 55 1	Kw/Klm	14	"	Klmo, Jug, Jp	5
"	Klc/Kld	54	H 55 15	Jp	82
"	Klo	18	H 55 16	Jp	30
"	Jkh	164	"	Jlh	1
"	Klc/Kld, Klo	3	"	Jp, Jlh	2
"	Klc/Kld, Klo	3			
"	Klo, Jkh	1			
"	Klc/Kld, Jkh	1			
"	Klc/Kld. Klo, Jkh	1			
H 55 2	Klc/Kld	51			
"	Klo	3			
"	Jkh	126			
"	Klc/Kld, Jkh	1			
"	Klo, Jkh	2			
H 55 3	Klc/Kld	3			
"	Klo	2			
"	Jkh	8			
H 55 4	Jp	14			
"	Klmo, Jug	3			
"	Klmo, Jug, Jp	11			
"	Jp, Jkh	1			
"	Jug, Jp. Klh, Jlp	2			
H 56 1	Jp	8			
"	Klmo, Jug	184			
"	Klmo, Jug, Jp	3			
"	Jp, Jlh, Jlp	1			
H 53 7	Klo, Jua	2			
H 53 8	Klo, Jua	30			
H 54 5	Klo, Jua	28			
H 54 6	Kw/Klm, Klo, Jua	69			
H 54 7	Kw/Klm, Jkh	8			
H 54 8	Kw/Klm	4			
"	Jkh	20			

TABLE 3 RESULTS OF HYDRAULIC TESTS

1:250 000 Sheet Number	Registered Number	Formation tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
F 54 3	2338	HOORAY	109	3.7
	2464	"	520	34
	5154	"	60	1.3
	8393	"	894	13.5
	11284	"	19	1.1
	14278	"	35	2.8
	14338	"	24	1
	14339	"	32	3.3
	15404	"	131	4
	15573	"	794	52
	15813	"	37	2
	16168	"	58	1.7
	16610	"	163	33
	17880	"	45	2
	17926	"	38	0.5
	30892	"	125	3.5
	30980	"	71	5.8
	34664	"	29	1.1
	3	HUTTON	2023	51
	12	"	43	0.9
	166	"	161	2.7
	374	"	372	5.3
	12784	"	983	13
	14076	"	75	1.1
	15472	"	155	5.4
	15748	"	191	2.8
	15863	"	111	4.1
	16293	"	57	2.1
	16964	"	158	2.4
	32352	"	565	19
F 54 4	391	HOORAY	44	3.7
	10831	"	119	1.5
	13985	"	18	1
	14172	"	135	2.7
	14266	"	35	16
	15176	"	210	8.4
	15243	"	334	5.1
	15285	"	761	15
	16120	"	14	2.6
	16759	"	551	82
	30829	"	177	5.5
	31109	"	10	0.4
	11959	HUTTON	223	7.4
	12789	"	434	23
	14053	"	472	4.4
	14487	"	298	8
	14686	"	193	2
	15721	"	387	3.3
	17562	"	290	12.8
	31713	"	328	6.2

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
F 54 7	15934	HOORAY	50	1.3
	13264	HOORAY	56	4.1
	12039	HUTTON	87	19
	126	CLEMATIS	553	4.8
F 55 5	36464	HOORAY	253	?
F 55 9	128	HOORAY	546	?
	88	HUTTON	642	17.5
F 54 13	15413	HOORAY	69	0.6
	5101	"	25	0.6
F 54 15	5102	HOORAY	250	8.7
F 55 13	384	HOORAY	15	0.3
	4995	HUTTON	715	43
	11258	"	134	5.3
	11369	"	314	31
G 54 1	2807	HOORAY	267	5.2
	4323	"	472	13
	13149	"	5.6	0.1
	13649	"	89	5
	602419	"	18	0.1
G 54 2	2062	"	1505	8.8
	3822	"	231	2.7
	12165	"	103	6.1
	12312	"	346	6
	12607	"	520	?
	15816	"	28	1.7
G 54 3	14486	HOORAY	58	3.5
G 55 1	11445	HOORAY	96	6.5
	17263	HUTTON	36	0.3
	601494	"	65	0.6
	17223	CLEMATIS	134	4.5
G 55 2	16203	HOORAY	107	7.
	17442	"	41	2.7
	14154	ADORI	195	5.5
	16056	"	25	2
G 54 5	14645	HOORAY	145	3.4
G 54 6	12177	HOORAY	61	2.3
G 55 7	14297	PRECIPICE	1346	129
	14508	"	55	5
	15122	"	70	4
	15952	"	46	3.3
	32504	"	4	0.6
	614296	"	107	2.6
G 55 8	11409	"	25	0.8
	17448	"	5	0.1

Table 3.

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
G 55 8	15549	HUTTON	7	0.4
	30259	"	16	1.5
	30974	"	6	0.4
	17070	CLEMATIS	15.5	0.5
	30972	"	41	2.7
G 56 5	15590	PRECIPICE	211	3.8
	35256	"	223	3.2
	35740	"	11	18
	16872	CLEMATIS	84	2
	17849	"	119	2
G 55 10	50	HOORAY	358	2
	96	"	486	8
	4001	"	28	2.4
	11907	"	20	0.9
	12745	"	11	1.6
	16982	HUTTON	3068	167
G 55 12	13816	HOORAY	12	0.5
	13921	"	10	0.4
	14109	BUNGIL	.1	?
	14159	"	1	0.1
	14307	MOOGA + GUBBERAMUNDA	2.4	0.2
	14600	"	16	0.4
	14708	"	10	0.3
	14810	GUBBERAMUNDA	49	?
	14950	"	3.6	0.06
	15572	MOOGA + GUBBERAMUNDA	5	0.07
	15696	GUBBERAMUNDA	8.3	?
	16204	MOOGA + GUBBERAMUNDA	11	0.2
	16300	"	13	0.5
	16325	"	4	0.1
	16631	BUNGIL	76	?
	17479	MOOGA	2.6	0.2
	17859	MOOGA + GUBBERAMUNDA	50	3.7
	30567	MOOGA	8	0.2
	110841	"	19	0.2
G 56 9	14540	ADORI	1.7	?
G 55 13	1338	HOORAY	413	2.9
	32802	"	1.9	0.1
G 55 14	31	"	327	?
	67	"	259	6.1
	98	"	909	6.1
	2049	"	375	?
	4463	"	28	0.8
	11315	"	2.4	1.1
	11948	"	26	0.7
	12805	"	9	0.2
	16306	"	3.9	1.8
	16420	"	19	2
	114049	"	49	1

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
G 55 15	89	MOOGA + GUBBERAMUNDA	358	3.4
	149	"	2295	6.9
	11857	MOOGA	16	0.5
	14869	MOOGA + GUBBERAMUNDA	11	0.2
	40	ADORI	2160	6.3
G 56 13	10644	"	64	8.4
	17511	MOOGA + GUBBERAMUNDA	4.7	0.04
	30316	"	1.2	0.09
	30710	"	.7	0.1
H 55 1	1833	CADNA-OWIE	2.5	0.08
	6751	HOORAY	2.5	0.3
	9763	"	23	3
	9864	"	27	6.7
	10285	CADNA-OWIE	29	1.9
	10610	HOORAY	1.3	0.5
	11778	"	1.8	0.1
	11795	"	4	0.3
	11846	"	9	0.4
	11889	CADNA-OWIE	5.6	0.6
	11936	HOORAY	.9	0.3
	11938	"	7.2	0.8
	12329	"	1.9	0.3
	12749	"	9	0.5
	12767	"	5.8	0.6
	12823	"	1.5	?
	12826	"	.9	0.6
	13529	"	3.6	0.2
	13559	"	8.7	5.8
	13610	CADNA-OWIE	1.6	0.1
	14013	HOORAY	1.4	2.3
	14077	"	3.7	2.5
	14078	"	40	22
	14481	"	1.1	0.3
	15041	"	.2	0.06
	15441	HOORAY + CADNA-OWIE	2.9	0.2
	16387	HOORAY	1.6	0.3
	16530	"	1.9	0.2
	16733	HOORAY + CADNA-OWIE	11	1.1
	17428	HOORAY	46	4.3
	30410	"	1010	34
	101833	"	2.5	0.3
	105602	"	3.3	0.2
	111908	"	1.1	0.04
H 55 2	1319	HOORAY	167	?
	1805	"	787	?
	1808	"	210	?
	11749	"	1.1	0.1
	11835	"	8.1	0.1
	11842	"	3.1	0.4
	11935	"	21	1.3
	12114	"	11	0.6
	12363	"	18	0.6
	12705	"	1.4	0.05

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2 day)	Hydraulic Conductivity (m/day)
H 55 2	12832	HOORAY + CADNA-OWIE	.7	0.2
	13360	HOORAY	3.5	0.3
	13416	"	1196	21
	13487	CADNA-OWIE	2.1	0.8
	13590	HOORAY	.8	0.3
	15684	"	17	0.3
	15858	"	.6	0.04
	16709	"	.7	0.03
	30092	"	349	8.3
	30830	"	6.2	1.3
	32645	"	517	9.5
H 55 3	64	GUBBERAMUNDA	343	3.7
	147	"	131	0.3
	167	"	338	3
	16476	MOOGA + GUBBERAMUNDA	94	2.2
	16783	"	121	0.5
	16788	"	117	0.6
	16837	"	85	1.3
H 55 4	73	"	216	0.9
	106	"	262	1.
	132	"	130	0.6
	133	"	194	1.3
	134	"	422	?
	14712	"	101	2.2
H 56 1	12639	"	3.6	0.2
	13632	"	4	0.1
	13888	"	5.4	?
	15654	"	2.4	0.3
	16039	"	7.4	0.3
	16126	"	7.7	?
	16140	"	15	1.6
	16251	"	3.1	0.1
	16281	"	108	2.6
	16354	MOOGA	3.8	0.2
	16402	MOOGA + GUBBERAMUNDA	32	1.4
	16524	"	4.3	0.2
	17330	"	36	4.4
	17410	"	176	19
	17436	"	5.4	0.3
	18117	MOOGA	3.6	0.2
	18136	MOOGA + GUBBERAMUNDA	110	2.1
	18182	"	1847	15
	30081	MOOGA	326	7.8
	34814	MOOGA + GUBBERAMUNDA	28	3.3
	34985	"	11	1
	4021	PILLIGA	358	1.4
	4340	"	114	0.4
H 54 8	3529	HOORAY	417	8.
	4092	"	6.4	0.1
	103627	"	97	2.8
	604103	"	31	0.7
	604506	"	104	?

Table 3.

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2 day)	Hydraulic Conductivity (m/day)
H 55 5	3708	HOORAY	23	3.2
	3710	"	39	0.7
	3862	"	56	2.2
	3908	"	63	4.1
	4047	"	36	40
	4104	"	2.2	0.1
	4254	"	49	8.5
	4283	"	5	?
	4289	"	47	0.7
	4592	"	27	3.1
	4659	"	28	0.4
	4663	"	4	1.1
	8382	"	9	0.3
	8475	"	19	2.7
	11266	"	4.3	0.5
	11271	"	48	?
	12246	"	5	0.4
	13140	"	35	23
	18053	"	202	5.5
H 55 6	3337	"	273	21
	4006	"	9	?
	4043	"	12	1.3
	4196	"	38	?
	4213	"	28	0.2
	4219	"	24	?
	4279	"	33	0.3
	4541	"	63	1.7
	4609	"	22	1.6
	4665	"	97	3.3
	4757	"	12	2.6
	8317	"	2.3	0.1
	8540	"	5.3	0.4
	12335	"	49	3.6
	12274	"	43	2.1
	12314	"	62	2.8
	12428	"	2.8	0.4
	12480	"	9.2	0.6
	12852	"	6.8	1.3
	14317	"	5.4	3.6
	14564	"	4.5	1.
	14588	"	19	0.7
	15751	"	13	0.9
	16020	"	4.2	0.6
	18041	"	7.3	1.2
	21046	"	114	3.4
	21144	"	63	4.8
	21207	"	45	5.1
	27500	"	15	0.4
	118041	"	42	3.5
	603770	"	173	4
H 55 7	4307	MOOGA + GUBBERAMUNDA	7.7	?
	4366	HOORAY	77	0.7
	12310	"	9.7	0.4
	12490	GUBBERAMUNDA	1.7	0.02

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
H 55 7	4005	PILLIGA	103	?
	4085	"	357	2.5
	4210	"	43	1
	4218	"	21	?
	4251	"	60	0.5
	4362	"	93	6.9
	12451	"	78	0.3
	21603	"	2.2	0.14
	4222	"	273	3,8
H 55 8	14520	GUBBERAMUNDA	11	4.5
	4029	PILLIGA	112	1
	4057	"	91	0.6
	4060	"	77	0.4
	4061	"	56	0.5
	4088	"	206	2.
	4106	"	49	0.4
	4107	"	160	0.5
	4199	"	204	0.9
	4220	"	130	1.6
	4263	"	74	0.4
	4317	"	70	?
	4322	"	238	1.5
	4323	"	204	0.9
	4326	"	134	0.8
	4331	"	170	0.9
	4356	"	45	0.4
	4378	"	133	1
	4406	"	174	1
	4431	"	103	0.9
	4432	"	136	0.4
	4471	"	171	1
	4477	"	347	2.7
	4546	"	167	3.2
	4558	"	191	1
	4564	"	109	1.3
	5594	"	143	1.2
H 56 5	4022	"	121	?
	4080	"	52	?
	4204	"	238	0.9
H 54 11	4457	"	6	0.1
	9478	"	147	?
	11192	"	53	35
H 55 9	4183	GUBBERAMUNDA	1536	66
	12197	MOOGA + GUBBERAMUNDA	25	0.6
	19111	"	71	0.7
	604412	"	35	0.4
H 55 10	4401	GUBBERAMUNDA	50	0.6
	4440	"	25	?

1:250 000 Sheet Number	Registered Number	Formation Tapped	Transmissivity (m^2/day)	Hydraulic Conductivity (m/day)
H 55 11	4033	GUBBERAMUNDA	38	1.2
	4076	"	238	8.
	4100	"	19	15
	4110	"	76	0.8
	4205	"	32	0.2
	4217	"	31	4
	4280	"	167	1.7
	4305	"	168	?
	4311	"	120	8
	4388	"	115	?
	4441	"	194	?
	4450	"	267	?
	4453	"	43	?
	4454	"	231	3.4
	4487	"	142	1.2
	4492	"	48	1.5
	4493	"	38	3.2
	4533	"	141	?
	4622	"	155	?
	201654	"	123	0.7
H 55 12	4016	"	120	0.6
	4054	"	223	1.2
	4064	"	19	0.2
	4244	"	231	1.4
	4278	"	166	1.4
	4399	"	156	1
	4408	"	46	2
	4488	"	311	4.4
	4606	"	86	?
	4692	"	95	?
	604244	"	79	0.5
H 55 15	4052	"	60	?
	4069	"	38	?
	4089	"	104	0.8
	4239	"	147	1.1
	4324	"	48	?
	4482	"	122	?
	4617	"	111	1.5
H 55 16	4161	"	51	3.4
	4595	"	61	?

TABLE 4 ESTIMATES OF POROSITY AND STORAGE COEFFICIENTS FROM PETROLEUM EXPLORATION WELLS

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Formation	Porosity (dimensionless)	Storage Coefficient (dimensionless)
ALLANDALE	24 25 00	145 54 15	70823	183	226	HOORAY	0.26	9×10^{-5}
				317	335	"	0.24	
				504	577	LOWER JUR	.26	3.6×10^{-4}
				586	745	"	.24	
				976	1040	CLEMATIS	.19	7×10^{-5}
ALTON	27 56 13	149 22 13	644053	866	885	GUBBERAMUNDA	0.26	
				975	1000	"	0.26	4.8×10^{-1}
				1042	1068	"	0.28	
				1662	1685	LOWER JUR	0.19	1×10^{-4}
				1723	1775	"	0.13	
ARRABURRY	27 11 35	141 04 50	692035	1670	1705	HOORAY	0.17	1.1×10^{-4}
				1740	1790	"	0.15	
				2030	2180	LOWER JUR	0.13	1.8×10^{-4}
BARADINE W. 1	30 53 49	148 46 11	631206	262	470	PILLIGA	0.26	3.9×10^{-4}
BELMORE	23 57 42	143 25 35	70555	585	658	HOORAY	0.19	1.8×10^{-4}
				786	840	ADORI	0.17	
				930	990	LOWER JUR	0.15	1.4×10^{-4}
				990	1045	"	0.13	
BERYL	22 22 08	143 58 26	644050	765	826	HOORAY	0.23	1×10^{-4}
				893	980	LOWER JUR	0.16	1.2×10^{-4}
BETOOTA	25 42 30	140 49 46	621045	1225	1280	HOORAY	0.23	9×10^{-5}
				1370	1570	LOWER JUR	0.23	3.4×10^{-4}
BLACK MOUNTAIN	23 21 00	140 34 30	621082	39	116	HOORAY	0.29	1.5×10^{-4}
CANAWAY	25 56 05	143 57 47	631018	985	1055	HOORAY	0.23	
				1075	1145	WESTBOURNE	0.19	2.8×10^{-4}
				1185	1225	ADORI	0.17	
				1290	1500	LOWER JUR	0.15	2.7×10^{-4}
COONGIE	27 12 03	140 06 56	70106	1620	1750	HOORAY	0.19	1.4×10^{-4}
				1965	2160	"	0.15	2.5×10^{-4}
COTHALOW	25 43 47	144 23 41	621080	1175	1245	HOORAY	0.23	1.8×10^{-4}
				1285	1330	ADORI	0.23	
				1410	1450	LOWER JUR	0.26	2.4×10^{-4}
				1450	1600	"	0.22	
CUMBROO	26 13 40	143 22 47	682043	1480	1555	HOORAY	0.15	1.2×10^{-4}
				1655	1695	ADORI	0.13	
				1770	1920	LOWER JUR	0.11	1.7×10^{-4}
DARTMOUTH	26 08 39	145 20 34	664216	860	920	HOORAY	0.29	2×10^{-4}
				1100	1140	ADORI	0.29	
				1230	1350	LOWER JUR	0.24	2.1×10^{-4}

Table 4.

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Formation	Porosity (dimensionless)	Storage Coefficient (dimensionless)
EASTWOOD	24 46 23	145 20 56	692024	825	842	CADNA-OWIE	0.23	
				896	965	HOORAY	0.23	2.1×10^{-4}
				1086	1105	"	0.20	
				1146	1190	ADORI	0.19	
				1230	1490	LOWER JUR	0.15	2.5×10^{-4}
				1525	1630	CLEMATIS	.11	1.2×10^{-4}
ETONVALE	25 09 40	144 59 40	621079	1035	1060	CADNA-OWIE	0.13	
				1110	1120	HOORAY	0.09	1.4×10^{-4}
				1272	1320	ADORI	0.05	
				1420	1615	LOWER JUR	0.05	2.1×10^{-4}
				1615	1690	"	0.02	
FERMOY	23v08 32	143 03 26	644086	1075	1168	HOORAY	0.15	1.2×10^{-4}
				1415	1520	LOWER JUR	0.07	1×10^{-4}
GILMORE	25 21 33	144 48 38	644039	1192	1310	HOORAY	0.19	2.7×10^{-4}
				1372	1435	ADORI	0.19	
				1515	1770	LOWER JUR	0.15	3.3×10^{-4}
GILPEPPEE	26 25 25	141 33 17	692040	1875	1920	HOORAY	0.16	
				1980	2010	WESTBOURNE	0.15	1.5×10^{-4}
				2035	2075	ADORI	0.13	
				2160	2490	LOWER JUR	0.17	4.7×10^{-4}
GURRA	29 07 21	140 12 45	70283	1035	1165	HOORAY	0.29	3.4×10^{-4}
				1165	1208	"	0.23	
HALE RIVER	25 15 50	136 43 35	664227	872	956	HOORAY	0.19	
				972	1080	"	0.22	5.8×10^{-4}
				1093	1277	"	0.15	
				1282	1305	"	0.15	
KALLADEINA	27 39 28	139 24 00	674244	1388	1485	ALGEBUCKINA	0.24	2.4×10^{-4}
				1555	1600	"	0.20	
				1710	1920	LOWER JUR	0.19	3.1×10^{-4}
KUMBARRIE	28 54 58	140 11 00	70365	1165	1380	HOORAY	0.23	3.6×10^{-4}
LEOPARDWOOD	25 37 10	144 40 13	654181	1210	1245	HOORAY	0.23	1.2×10^{-4}
				1330	1370	ADORI	0.20	
				1445	1600	LOWER JUR	0.18	2.4×10^{-4}
				1650	1680	"	0.12	
MAC DILLS	25 43 50	135 47 25	654156	464	580	HOORAY	0.29	
				580	640	"	0.22	7.3×10^{-4}
				640	720	"	0.15	
				720	890	"	0.23	
MARDUROO	24 02 20	139 54 15	644107	286	295	HOORAY	0.23	
				316	331	"	0.20	6×10^{-5}
				344	359	"	0.19	

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Formation	Porosity (dimensionless)	Storage Coefficient (dimensionless)
MERRIMELIA	27 47 04	140 06 54	644101	1640	1920	ALGEBUCKINA	0.15	3.7 x 10^{-4}
				2010	2160	LOWER JUR	0.11	1.7 x 10^{-4}
MOONIE	27 44 44	150 15 24	621084	752	798	GUBBERAMUNDA	0.26	
				825	870	WESTBOURNE	0.28	3.2 x 10^{-4}
				944	992	SPRINGBOKE	0.25	
				1025	1075	WALLOON	0.25	
				1400	1473	LOWER JUR	0.17	1.3 x 10^{-4}
				1550	1570	"	0.15	
MOUNT HOWITT	26 37 27	142 29 17	664195	1125	1230	HOORAY	0.23	2.4 x 10^{-4}
				1340	1380	ADORI	0.18	
				1480	1705	LOWER JUR.	0.15	2.9 x 10^{-4}
ORIENT 2	27 40 30	143 11 45	621085	715	845	HOORAY	0.23	3.5 x 10^{-4}
				890	975	"	0.20	
PAGET	27 27 46	150 31 31	631329	382	482	HOORAY	0.26	
				493	605	WESTBOURNE	0.28	3.3x10^{-4}
				730	760	SPRINGBOKE	0.22	
				1167	1193	LOWER JUR.	0.11	
				1200	1250	"	0.9	8 x 10^{-5}
				1270	1280	"	0.11	
PANDIEBURRA	26 45 34	139 25 03	631002	1330	1550	ALGEBUCKINA	0.23	3.7 x 10^{-4}
				1600	2030	LOWER JUR.	0.15	5.7 x 10^{-4}
POONAROONA	27 54 20	137 54 50	644097	1210	1370	ALGEBUCKINA	0.24	
				1370	1430	"	0.20	5.1 x 10^{-4}
				1430	1515	"	0.21	
QUILBERRY	26 25 03	145 30 07	644115	592	610	HOORAY	0.29	
				670	700	"	0.29	1.8 x 10^{-4}
				745	763	WESTBOURNE	0.29	
				812	834	ADORI	0.29	
				895	1010	LOWER JUR.	0.26	2.1 x 10^{-4}
ST GEORGES	27 58 48	148 32 48	631047	713	807	GUBBERAMUNDA	0.20	4.4 x 10^{-4}
				837	860	"	0.19	
				1360	1400	LOWER JUR	0.11	1.4 x 10^{-5}
STORMHILL	24 08 45	143 35 06	692007	1060	1200	HOORAY	0.18	
				1200	1230	WESTBOURNE	0.20	2.4 x 10^{-4}
				1295	1325	ADORI	0.09	
				1425	1515	LOWER JUR	0.09	9 x 10^{-5}
TOWERHILL	21 43 06	144 40 50	674271	338	348	HOORAY	0.26	2 x 10^{-5}
				466	600	LOWER JUR	0.22	2.3 x 10^{-4}
				740	915	"	.2	2.8 x 10^{-4}
WEEDINA	28 28 31	135 39 20	70205	0	67	"	0.26	1.3 x 10^{-4}
WHYENBIRRA	28 36 50	147 21 55	664236	586	710	HOORAY	0.26	3.4 x 10^{-4}
YANTABULLA	29 29 00	144 52 30	716655	223	248	"	0.22	4 x 10^{-5}

TABLE 5 ESTIMATES OF VERTICAL HYDRAULIC CONDUCTIVITY FROM PETROLEUM EXPLORATION WELLS

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	To (m)	Confining Bed	Vertical hydraulic conductivity (m/day)	Weighted vertical hydraulic conductivity
ALLANDALE	24 25 00	145 54 15	70823	60	183	CB2	.0001	.0001
ALTON	27 56 13	149 22 13	644053	9	120	CB 2	.1	
				120	250	"	.001	
				250	332	"	.01	
				332	430	"	.001	.00056
				430	546	"	.01	
				546	653	"	.0001	
				653	855	"	.001	
ARRABURRY	27 11 35	141 04 50	692035	82	155	CB 1	.01	.00018
				155	247	"	.0001	
				945	1575	CB 2	.0001	
				1575	1670	"	.001	.00011
BARADINE W1	30 53 49	148 46 11	631206	35	79	CB 2	.001	
				79	98	"	.01	
				98	177	"	.001	.0012
				177	202	"	.01	
				202	262	"	.001	
BELMORE	23 57 42	143 25 35	70555	32	131	CB 2	.0001	
				131	218	"	.001	
				218	520	"	.0001	.00012
				520	549	"	.01	
				549	585	"	.0001	
BERYL	22 22 08	143 58 26	644050	204	670	CB 2	.0001	.00012
				670	765	"	.01	
BETOOTA	25 42 30	140 49 46	621045	47	61	CB 1	.01	.0012
				61	120	"	.001	
				485	990	CB 2	.0001	
				990	1225	"	.01	.00014
BINYA	26 41 57	148 31 20	631060	90	278	CB 2	.0001	.0001
BLACK MOUNTAIN	23 21 00	140 34 30	621082	36	39	CB 2	.1	.1
CANAWAY	25 56 05	143 57 47	631018	69	131	CB 1	.001	.001
				550	900	CB 2	.0001	
				900	914	"	.1	.00012
				914	985	"	.01	
COONGIE	27 12 03	140 06 56	70106	17	138	CB 1	.1	
				138	304	"	.0001	.00017
				855	1285	CB 2	.0001	
				1285	1340	"	.01	.00012
				1340	1388	"	.001	

Table 5.

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Confining Bed	Vertical hydraulic conductivity (m/day)	Weighted vertical hydraulic conductivity
COTHALOW	25 43 47	144 23 41	621080	22	42	CB 1	.01	
				42	196	"	.001	.0011
				585	1090	CB 2	.0001	
				1090	1110	"	.01	
				1110	1123	"	.001	
				1123	1132	"	.01	.00014
				1132	1140	"	.001	
				1140	1155	"	.01	
				1155	1175	"	.001	
CUMBROO	26 13 40	143 22 47	682043	41	375	CB 1	.001	.001
				810	1333	CB 2	.0001	
				1333	1360	"	.01	
				1360	1480	"	.001	.00012
DARTMOUTH	26 08 39	145 20 34	664216	282	440	CB 2	.0001	
				440	503	"	.01	.00013
				503	764	"	.0001	
				764	860	"	.001	
EASTWOOD	24 46 24	145 20 56	692024	35.1	546	CB 2	.001	
				546	597	"	.01	
				597	683	"	.001	.00028
				683	825	"	.0001	
ETONVALE	25 09 40	144 59 40	621079	50	92	CB 1	.1	
				92	130	"	.001	.00208
				557	1035	CB 2	.0001	.0001
FERMOY	23 08 32	143 03 26	644086	84	107	CB 1	.0001	
				107	206	"	.001	.00031
				491	555	CB 2	.001	
				555	1075	"	.001	.00011
GALWAY	25 04 30	142 33 41	664224	113	126	CB 1	.01	
				126	139	"	.001	
				139	142	"	.001	
				142	227	"	.001	.00051
				227	250	"	.0001	
				250	320	"	.001	
				889	905	CB 2	.01	
				905	921	"	.001	
				921	1003	"	.0001	.00011
				1010	1398	"	.0001	
				1398	1433	"	.001	
				1433	1501	"	.0001	
GILMORE	25 21 33	144 48 38	644039	64	204	CB 1	.001	.001
				640	1115	CB 2	.0001	.00012
				1115	1192	"	.01	
GILPEPPEE	26 25 25	141 33 17	692040	37	122	CB 1	.1	
				122	244	"	.001	.00014
				244	697	"	.0001	
				1130	1355	CB 2	.001	
				1355	1710	"	.0001	.00019
				1710	1875	"	.001	

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Confining Bed	Vertical hydraulic conductivity (m/Day)	Weighted vertical hydraulic conductivity
HALE RIVER	25 15 50	136 43 35	664227	52	128	CB 2	.1	.00011
				128	872	"	.0001	
KALLADENA	27 39 28	139 24 00	674244	17	138	CB 1	.1	.00017
				138	304	"	.0001	
				855	1285	CB 2	.0001	.00012
				1285	1340	"	.001	
				1340	1388	"	.01	
KUMBARRIE	28 54 58	140 11 00	70365	11	118	CB 1	.0001	.0001
				655	865	CB 2	.0001	
				865	1070	"	.001	.00031
				1070	1380	"	.01	
LEOPARDWOOD	25 37 10	144 40 13	654181	47	104	CB 1	.0001	.00017
				104	159	"	.001	
				623	1050	CB 2	.0001	
				1050	1210	"	.01	.00014
LOVELLE DOWNS	22 12 37	142 33 05	722669	56	156	CB 1	.001	.001
				507	762	CB 2	.001	
				762	830	"	.0001	.00046
				830	1025	"	.001	
MAC DILLS	25 43 50	135 47 25	654156	41	438	CB 2	.0001	
				438	464	"	.01	.00011
MARDUROO	24 02 20	139 54 15	644107	4	21	CB 2	.1	
				21	286	"	.001	.0011
MERRIMELIA	27 47 04	140 06 54	644101	15	32	CB 1	.1	
				32	130	"	.0001	.00025
				130	305	"	.001	
				975	1570	CB 2	.0001	.0001
MINIMA	28 21 33	150 06 56	621306	12	373	CB 2	.0001	
				373	473	"	.001	
				473	546	"	.0001	
				546	555	"	.01	
				555	590	"	.001	
				590	632	"	.01	
				632	639	"	.001	
				639	667	"	.01	.00018
				667	678	"	.001	
				678	686	"	.01	
				686	716	"	.001	
				716	795	"	.01	
				795	885	"	.001	

Name	Latitude	Longitude	Completion Report Reference Number	from (m)	to (m)	Confining Bed	Vertical hydraulic conductivity (m/day)	Weighted vertical hydraulic conductivity
MOKARI	26 19 06	136 26 22	664194	14	85	CB 1	.1	
				85	99	"	.001	
				99	163	"	.1	.0023
				163	250	"	.001	
				620	780	CB 2	.0001	
				780	795	"	.001	
				795	820	"	.0001	
				820	850	"	.001	
				850	870	"	.0001	.00012
				870	900	"	.001	
				900	912	"	.0001	
				912	943	"	.001	
				943	1190	"	.0001	
				1190	1202	"	.001	
				1202	1240	"	.0001	
MOONIE	27 44 44	150 15 24	621084	24	64	CB 2	.1	
				64	228	"	.0001	
				228	305	"	.001	
				305	393	"	.01	.00037
				393	640	"	.001	
				640	752	"	.01	
NARYILCO	28 27 04	141 42 23	631300	72	152	CB 1	.0001	.0001
				442	595	CB 2	.001	
				595	637	"	.0001	
				637	690	"	.001	.00018
				690	715	"	.0001	
				715	750	"	.001	
				750	932	"	.0001	
OOROONOO	23 10 48	141 33 18	621202	335	381	CB 2	.001	
				381	501	"	.0001	
				501	520	"	.001	
				520	591	"	.0001	.00013
				591	625	"	.001	
				625	722	"	.0001	
				722	742	"	.001	
ORIENT 2.	27 40 30	143 11 45	621085	122	335	CB 2	.0001	
				335	405	"	.01	.00011
				405	715	"	.0001	
PAGET	27 27 46	150 31 31	631329	47	70	CB 2	.1	
				70	148	"	.0001	
				148	198	"	.01	.00034
				198	382	"	.001	
PANDIEBURRA	26 45 34	139 25 03	631002	13	45	CB 1	.1	
				45	210	"	.001	.00119
POONAROONA	27 54 20	137 54 50	644097	0	95	CB 1	.001	
				95	147	"	.0001	.00031
				147	213	"	.001	
				675	1210	CB 2	.001	.001

Table 5.

Name	Latitude	Longitude	Completion Report Reference Number	From (m)	To (m)	Confining Bed	Vertical hydraulic conductivity (m/day)	Weighted vertical hydraulic conductivity
PURNI	26 16 53	136 06 23	631209	8	134	CB 1	.1	
				134	168	"	.0001	.00048
				168	180	"	.001	
				387	420	CB 2	.0001	
				420	436	"	.01	
				436	470	"	.001	
				470	612	"	.0001	
				612	696	"	.001	
				696	737	"	.0001	.00013
				737	745	"	.001	
				745	980	"	.0001	
				980	990	"	.01	
				990	1020	"	.0001	
QUILBERRY	26 25 03	145 30 07	644115	58	124	CB 2	.0001	
				124	221	"	.001	
				221	320	"	.001	.00019
				320	513	"	.0001	
				513	592	"	.01	
ST GEORGES	27 58 48	148 32 48	631047	45	120	CB 2	.1	
				120	256	"	.001	
				256	290	"	.01	
				290	357	"	.0001	.00035
				357	463	"	.001	
				463	540	"	.0001	
				540	713	"	.001	
SALTERN CREEK	23 20 54	144 56 24	644042	5	430	CB 2	.0001	.0001
SANDY CAMP	30 51 12	147 45 00	631201	15	85	CB 2	.0001	
				85	97	"	.1	.00043
				97	149	"	.01	
				149	452	"	.001	
STORMHILL	24 08 45	143 35 06	692007	29	183	CB 2	.001	
				183	412	"	.01	.00016
				412	1000	"	.0001	
THE BROTHERS	24 15 40	139 20 30	644127	8	15	CB 2	.1	
				15	268	"	.0001	.0001
THUNDERBOLT	22 22 00	145 00 00	674245	36	95	CB 2	.01	.00014
				95	242	"	.0001	
TOWERHILL	21 43 06	144 40 50	674271	60	330	CB 2	.001	.00102
				330	338	"	.01	
TREGOLE	26 27 58	146 59 32	664233	41	52	CB 2	.001	.00208
				52	67	"	.01	
WANAARING	30 04 00	143 42 00	-	0	50	CB 2	.0001	
				50	84	"	.001	
				84	98	"	.0001	
				98	129	"	.001	
				129	141	"	.0001	.00021
				141	180	"	.001	
				180	218	"	.0001	

Name	Latitude	Longitude	Completion Report Reference Number	From (m)	To (m)	Confining Bed	Vertical hydraulic conductivity (m/day)	Weighted vertical hydraulic conductivity
WANAARING	30 04 00	143 42 00	-	218	265	CB 2	.001	
(Cont.)				265	296	"	.0001	
				296	352	"	.001	
WELLMORINGLE	29 07 50	146 35 10	-	26	51	CB 2	.01	
				51	82	"	.0001	
				82	117	"	.001	
				117	122	"	.0001	
				122	134	"	.001	.00056
				134	146	"	.01	
				146	169	"	.1	
				169	180	"	.01	
				180	352	"	.001	
WERRINA 1.	28 47 49	149 24 00	692011	34	236	CB 2	.001	
				236	305	"	.01	
				305	320	"	.001	
				320	357	"	.01	
				357	462	"	.0001	
				462	520	"	.001	
				520	550	"	.0001	.00032
				550	565	"	.001	
				565	595	"	.0001	
				595	630	"	.01	
				630	674	"	.001	
WHYENBIRRA	28 36 50	147 21 55	664236	22	119	CB 2	.1	
				119	231	"	.1	
				231	262	"	.01	.00045
				262	372	"	.0001	
				372	513	"	.001	
				513	586	"	.01	
WITCHERRIE	26 21 41	135 39 44	631208	3	113	CB 2	.001	.00015
				113	302	"	.0001	
YANTABULLA	29 29 00	144 52 30	716655	3	162	CB 2	.0001	
				162	197	"	.001	.00012
				197	223	"	.0001	

TABLE 6 CA1 HEAD VALUES AT INITIAL STEADY-STATE

Map Number	Well Number or name	Surveyed	Elevation (m)	Level (m)	Year	Retained for map	Head (m)
F 54 7	1325		224	- 58	1917	•	166
	1326		213	- 61.5	1917	•	151.5
	7382		225	- 91.5	1916	•	133.5
F 54 8	3553	•	239	- 30	1907	•	209
	3554		247	- 13	1907	•	234
	4116		234.5	- 27.5	1909	•	207
	4117	•	234	- 45	1909	•	189
	4118		232	- 46	1909	•	186
	4120		249	- 54	1909	•	195
	5551		244	- 44	1914	•	200
	5632		284	- 47	1915	•	237
	6760		247	- 55	1916	•	192
F 54 11	1505		167.5	- 36.5	1915	•	131
	1515		170	- 39	1912	•	131
	2488		161.5	- 43.5	1913	•	118
	2490		172	- 56	1914	•	116
F 54 12	2971	•	353	- 41	1908	•	312
	3839	•	226	- 27	1909	•	199
	4097	•	211	- 31	1905	•	180
	4098	•	198	- 34	1906		164
F 54 15	2240	•	186.5	- 37.5	1912	•	149
F 54 16	2644		195	- 56	1914		139
	2646		198	- 32	1914	•	166
	4414	•	234	- 53	1911		181
	4415	•	236	- 40	1913		196
	5622		238	- 55	1916	•	183
	5624		235	- 56	1917	•	179
	5628		232	- 51	1919	•	181
	6003		189	- 38	1914	•	151
	7367		201	- 34	1914	•	167
	7719		213.5	- 14.5	1912	•	199
	10616		244	- 67	1912	•	177
F 55 13	1309		244	- 42	1913	•	202
	1471		211	- 30	1912	•	181
	3449		213.5	- 49.5	1911	•	164
	9488		226	- 62	1912		164
G 54 3	2096	•	167	- 27	1914	•	140
	2098	•	163.5	- 25.5	1915	•	138
	2101	•	185	- 35	1915	•	150
	2282		158.5	- 16.5	1918	•	142
	2283		164.5	- 18.5	1918	•	146
	2099	•	163.5	- 26.5	1919		137

Map Number	Well Number or name	Surveyed	Elevation (m)	Level (m)	Year	Retained for map	Head (m)
G 55 1	1060		232	- 48	1912	•	184
	1074		207	- 94	1912		113
	1082		224	- 61	1910		163
	1105	•	261.5	- 19.5	1910	•	242
	1106	•	262.5	- 18.5	1910	•	244
	1107		253	- 21	1910	•	232
	1109		256	- 19	1913		237
	1304		244	- 19	1911	•	225
	1542		284	- 22	1914		262
	1544		304.5	- 18.5	1913	•	286
	1547		284	- 31	1913		253
	3036	•	225	- 28	1912	•	197
	3056		210	- 16	1907	•	194
	3942		235	- 28	1914		207
	4280		213.5	- 46.5	1909		167
	4281	•	222	- 49	1909	•	173
	6361		225.5	- 64.5	1914		161
G 54 7	2281		122	- 9	1918	•	113
	5472		105.5	- 15.5	1918	•	90
G 54 8	3930		198	- 32	1911		166
	3934		213.5	- 36.5	1913	•	177
	3935		201	- 30	1913	•	171
	5240		201	- 24	1913	•	177
	6626		177	- 22	1912	•	155
G 55 5	4489		329	- 27	1912		302
	4591		351	- 67	1912		284
	6992		262	- 38	1912		224
	6993		247	- 38	1912		209
	9465		241	- 9	1912		232
G 55 6	4085		328	- 31	1912	•	297
	7714		348	- 22	1913	•	326
G 54 11	4449		116	- 15	1918	•	101
	5467		107	- 10	1916	•	97
	5468		97.5	- 14.5	1916	•	83
	5470		91.5	- 10.5	1917		81
	5471		113.5	- 15.5	1918	•	98
G 54 12	2093		174	- 11	1917	•	163
	5080		198	- 24	1915	•	174
	5081		180	- 25	1914	•	155
	6371		176.5	- 13.5	1916	•	163
	6373		167.5	- 9.5	1914	•	158
	6374		170.5	- 18.5	1914	•	152
	6375		170.5	- 15.5	1915	•	155
	6421		207	- 61	1915	•	146
	6451		170.5	- 25.5	1902	•	145
	6888		198	- 27	1917	•	171

Map Number	Well Number or name	Surveyed	Elevation (m)	Level (m)	Year	Retained for map	Head (m)
G 55 9	5378		253	- 27	1922	*	226
	5379		235	- 34	1922	*	201
	5561		241	- 46	1922	*	195
	5734		250	- 28	1922	*	222
G 54 15	6052		87.5	- 47.5	1919	*	40
G 54 16	6301		131	- 30	1921	*	101
	6973		152.5	- 12.5	1920	*	140
	6978		149.5	- 30.5	1920	*	119
	6987		155.5	- 30.5	1920	*	125
	6989		152.5	- 30.5	1921	*	122
	6990		152.5	- 30.5	1921	*	122
G 55 13	6690		149	- 6	1917	*	143
	6701		146.5	- 9.5	1917	*	137
	6716		149	- 9	1917	*	140
	6717		152.5	- 6.5	1917	*	146
	6720		152.5	- 7.5	1917	*	145
	6723		149	- 9	1917	*	140

TABLE 7 CA1 HEAD VALUES AT PRESENT-DAY STATE

Map Number	Well Number or name	Surveyed	Elevation (m)	Level or pressure (m)	Year	Retained for map	Head (m)
F 54 8	3566		241	- 44	1971	•	197
	4101	•	234	- 36	1971		198
	5753		189	- 58	1972		131
	5757		195	- 40	1972	•	155
	8913		226	- 40	1971		186
	9435		228.5	- 28.5	1971	•	200
	9945		228.5	- 37.5	1971		191
	10881		228.5	- 39.5	1971		189
	10883		225.5	- 42.5	1972	•	186
	11269		234.5	- 43.5	1971	•	191
	11273		228.5	- 22.5	1971		206
	11490		228.5	- 33.5	1971		195
	11567		244	- 38	1971		206
	13258		238	- 38	1971		200
F 54 11	1502		171	- 23	1968	•	148
	1503		167	- 32	1968	•	135
	14073		177	- 37	1968	•	140
F 54 12	1529		176	- 46	1968	•	130
	4133	•	206	- 55	1971	•	151
	6079		213.5	- 59.5	1971		154
	7011		173.5	- 43.5	1971	•	130
	7575				1971	•	216
	9446		213.5	- 23.5	1971	•	190
	9605		213.5	- 35.5	1971		178
	9778		177	- 45	1971		132
	10720		252	- 37	1971		215
	10993		232	- 10	1968	•	222
	11271		216	- 31	1971		185
	12836		201	- 37	1971	•	164
	13447		206	- 27	1971	•	179
	13911		219.5	- 37.5	1971		182
	14085		183	- 45	1971	•	138
	15546		207	- 41	1971	•	166
F 54 15	2249		152.5	- 42.5	1968	•	110
	7251		190	- 55	1968	•	135
	13858		192	- 39	1968		153
	13963		222.5	- 53.5	1968		169
	14475		195	- 35	1968	•	160
F 54 16	4790		225.5	- 44.5	1968	•	181
	4791	•	218	- 35	1968	•	183
	5615		215.5	- 40.5	1968	•	185
	5622		238	- 24	1968		114
	5624		235	- 90	1968	•	145
	5626		232	- 47	1968	•	185
	5628		232	- 4	1968	•	182
	6941		207	- 37	1968	•	170
	7367		201	- 29	1968	•	172
	7368		198	- 47	1968	•	151
	13452		244	- 6	1968		238

Map Number	Well Number or name	Surveyed	Elevation (m)	Level or pressure (m)	Year	Retained for map	Head (m)
G 54 3	2102	*	188.5	- 31.5	1970	*	157
	4146	*	161	- 49	1970	*	112
	5342		180	- 21	1970		159
	11293		164.5	- 16.5	1970		148
	10566		189	- 49	1970	*	140
	13379		164.5	- 25.5	1970	*	139
	13436		171	- 53	1970	*	118
	13514		189	- 28	1970		161
	13805		183	- 15	1968		168
	13806		174	- 14	1970		160
	13812		146.5	- 22.5	1970	*	124
	15061		183	- 27	1970	*	156
G 55 1	1060		232	- 47	1969	*	185
	1068		241	- 43	1969		198
	1076		210	- 43	1969	*	167
	1077		216	- 43	1969	*	173
	1542		284	- 54	1969	*	230
	1549		290	- 43	1969	*	247
	1550		293	- 43	1969	*	250
	3036	*	225	- 19	1969	*	206
	3493	*	231.5	- 33.5	1969	*	198
	3494		241	- 43	1969	*	198
	3495		228.5	- 33.5	1969	*	195
	4502		292.5	- 39.5	1969	*	253
	6425		280.5	- 60.5	1969	*	220
	10416		250	- 40	1969	*	210
	10657		286.5	- 20.5	1969	*	266
	11266		288	- 24	1969	*	264
	11965		290	- 38	1969	*	252
	11979		259	- 37	1969	*	222
	12578		279	- 30	1969		249
	14227		286.5	- 27.5	1969		259
	14902		290	- 43	1969		247
	15034		286.5	- 26.5	1969	*	260
	15358		262	- 0.5	1969		261.5
G 54 6	16472		61	- 18	1965	*	43
G 54 7	5871		161.5	- 33.5	1970	*	128
	13498		164.5	- 37.5	1970	*	127
	13965		250	- 59	1970		191
	15531		100.5	- 8.5	1970		92
	33326		155.5	- 16.5	1970	*	139
	33335		113	- 18	1970	*	95
	33336		140	- 29	1970	*	111
G 54 8	3058		180	- 21	1970		159
	5867		146.5	- 19.5	1970	*	127
	5982		152.5	- 36.5	1970	*	116
	5989		152.5	- 20.5	1970	*	132
	13056		143	- 26	1970	*	117
	13687		155.5	- 46.5	1970	*	109
	14066		167.5	- 42.5	1970	*	125
	30796		183	- 17	1970		166
	35973		155.5	- 16.5	1970	*	139
	35974		143	- 14	1970	*	139

Map Number	Well Number or name	Surveyed	Elevation (m)	Level or pressure (m)	Year	Retained for map	Head (m)
G 55 5	3392	*	331	- 41	1969	*	290
	4501		340	- 26	1969	*	314
	16437		-	-	1965	*	230
	15119		-	-	1965	*	268
G 53 11	Hamilton Ck.		149.5	- 1.5			148
	Opossum		152.4	- 35.4			117
G 54 10	Bulls Hole		53.3	- 18.3			35
	Pillathilparric		113	- 23			90
	Wongyana		53	- 23			30
	Needle Hill		107	- 46			61
G 54 12	16345		155.5	- 22.5	1965	*	133
G 55 9	17284		213.5	- 17.5	1965	*	196
G 54 14	Patchawarra		61.2	- 19.2			42
G 54 16	16304		152.5	- 15.5	1965	*	137
	16522		186	- 9	1965	*	177
G 55 13	30696		152.5	- 3.5	1968	*	149
	34039		158.5	- 15.5	1969	*	143
H 54 1	Kopperamanna		16.1	- 15.1			1
	Mulka		64.5	- 16.5			48
H 54 3	13328		102	- 70	1965	*	32
	16582		94.5	- 76.5	1965	*	18
	16627		97.5	- 57.5	1966	*	40
	16700		94.5	- 57.5	1966	*	37
H 54 4	16199		146.5	- 21.5	1965	*	125
	16343		128	- 32	1965	*	96
	16936		113	- 13	1966	*	100
H 54 5	Lake Harry		44.6	- 7.6			37
	Duckannina		37.6	- 4.6			33
	Clayton Downs		42.5	- 5.5			37
	Clayton		34.6	- 7.6			
	Sinclair		55	- 28			27
	Tarkahina		54.8	- 8.8			46
H 54 6	Coonanna		81	- 49			32
	Woolatchie		96.5	- 24.5			72

TABLE 8 CA2 HEAD VALUES AT INITIAL STEADY-STATE

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 54 2	2691		1896		163	•
	2698		1896		130	
	2745		1915		152	
	2755		1896		196	•
F 54 3	300		1907		199	
	301		1907		178	
	302		1907	•	168	
	2068		1913		201	
	2322	•	1915		120	
	2459		1915		162	
	2460		1915		176	
	2479		1915		157	
	2478		1915		140	
	3517	•	1896		157	•
	3518	•	1896		139	•
	3540		1896		239	
	4330		1897		214	•
F 54 4	299		1906		287	
	1858		1897		262	•
	1866		1897		246	•
	1867		1897		252	•
	1913		1913		289	
	3599	•	1915		262	
	4196		1911		282	
	4222		1899		271	
	4329	•	1897		250	•
	4342		1915		210	
	4350	•	1921		223	
	4358	•	1915		253	
	4470		1897		294	
	4478		1897		298	
	360		1899		265	
F 54 7	379		1904		229	
	385		1896		214	•
	2284		1896	•	225	
	2286		1896		227	
	2548	•	1896		238	•
	2550	•	1896		242	•
	2551		1915		194	
	2564		1917	•	195	
	2581		1896		200	•
	2584	•	1896	•	224	•
	2585	•	1896	•	232	•
	2603	•	1915		208	
	2926		1916		192	
	3248	•	1896	•	242	•
	3252	•	1903		233	
	3253	•	1889	•	252	
	3256		1910		272	
	3263		1900		236	

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 54 7	3264		1910		219	
(Cont.)	3266	•	1902		340	
	4153	•	1899		234	
	4154	•	1899		220	
	4158	•	1914		206	
	2548	•	1915		203	
F 54 8	1963		1901		264	
	3128	•	1915		288	
	3355	•	1914		259	
	3549	•	1899	•	256	•
	3586	•	1901	•	277	•
	3592	•	1907		253	
	3593		1879	•	288	•
	4369		1888	•	270	
	4376		1914	•	243	
	4443		1910		271	
	1039		1897		290	
	4370		1908		257	
F 55 5	1041		1897		298	
	1045		1909		283	
	1049		1914		282	
	1434		1894		282	
	1581		1893		338	•
	1897	•	1913		274	
	2175		1897		261	
	2192		1897		267	•
	2193		1897		270	•
	2196		1897		267	
	3336		1918		332	
	362		1911		269	
F 54 10	4798		1896		193	•
F 54 11	1678		1913		202	•
	3417	•	1915		202	
	3455		1896		209	•
	3461		1913		195	•
	3468		1917		193	
F 54 12	417		1896	•	244	•
	2350	•	1891	•	281	•
	2351	•	1905		249	
	4096		1914		223	
	4730	•	1904	•	265	•
F 55 9	1202		1897		247	•
	1203	•	1897		251	•
	1221		1912		247	
	1630		1913		244	
	1633	•	1894		274	
	1634	•	1898		257	
	1639	•	1913		241	
	1649	•	1912		241	
	1843		1897		260	•
	2172		1898		247	•
	2173	•	1897		266	

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 55 9 (Cont.)	2177		1897		259	•
	2178		1898		249	•
	2181		1897		268	
	2183		1891		268	•
	2185		1891		262	
	2186		1897		262	
	2187		1897		258	
	2189		1897		267	
	2262		1906		267	
	3858	•	1898		261	•
	1631	•	1913		255	
	901		1898		235	
	2262		1914		258	
	308	•	1914		249	
F 54 15	1675		1917		201	•
	2237		1917		183	•
F 54 16	4909		1899		233	•
F 55 13	119	•	1898	•	300	
	135	•	1920		245	
	278	•	1888	•	288	•
	312	•	1887	•	279	
	313	•	1893		290	•
	314	•	1899		279	
	1240	•	1897		258	
	1354	•	1899		277	
	1366	•	1896	•	288	•
	1372	•	1893		294	
	1387	•	1899		290	
	1390	•	1891	•	295	•
	1394		1899	•	279	
	1447	•	1893		276	•
	1457		1917		236	
	1926	•	1907		257	
	2136	•	1896	•	284	
	2149	•	1912		268	
	2155	•	1912		265	
	2978	•	1898		310	
	3018	•	1899		260	
	4162				260	
	4283	•	1893	•	320	
	4284	•	1892		285	
	4285		1890		281	
	4286	•	1892	•	309	
	4289	•	1898		278	
	4290	•	1912		266	
	4302		1891		280	
	4308		1912		251	
	4309		1912		248	
	4310		1912		247	
	4450	•	1897		286	•
	4451	•	1893	•	299	
	4452	•	1898		276	
	4892	•	1899		278	
	4897	•	1918		265	
	313	•	1904		276	

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 55 13	3016	•	1907		259	
(Cont.)	4452	•	1905		273	
	371	•	1897		307	
F 55 14	287	•	1887		300	
	1391	•	1896		295	
	2145	•	1907		276	
G 54 1	316	•	1905		183	
	4323	•	1922	•	130	
G 54 2	2062	•	1922		163	
	3822		1922		166	•
G 55 1	317	•	1898		352	
	318	•	1901		353	
	378		1910		332	
	4270		1908		320	
	2977	•	1896		319	•
G55 2	94	•	1910		351	
	375	•	1900		364	•
	398	•	1898		430	•
	1102	•	1898		337	•
	4056	•	1898		365	•
	4435	•	1898		420	•
	4436	•	1898		421	•
G 55 6	3337	•	1898		420	•
G 55 9	4968	•	1917		313	
G 55 10	50	•	1910		329	
	334	•	1890		364	•
	1197		1909		371	
	1288	•	1915		313	
	1291	•	1915		330	
	1559	•	1910		348	
	1561	•	1915		330	
	1566	•	1915		326	
	1511	•	1915		335	
	1612	•	1913		355	
	2001	•	1915		347	
	2870	•	1914		317	
	4001	•	1910		290	
	4696	•	1911		341	
	4963	•	1915		328	
G 55 11	285	•	1910		359	
	1602	•	1916		361	
	1603	•	1913		373	
	1604	•	1916		354	
	1609	•	1916		355	
	2621	•	1918		352	
	2622	•	1918		364	
	3979	•	1918		349	
	4585	•	1916		355	
	4686	•	1908		351	
	4695	•	1911		341	

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
G 55 12	404	*	1901		326	
	405	*	1901		329	*
G 53 15	72037 Plantation	*	?		102	*
	Oodnadatta				120	*
G 54 13	Mount Gason				96	*
	Myrramitta				114	*
	Mungarani				99	*
G 54 14	22009 Patchawarra		1914		61	
G 55 13	1461	*	1898		314	*
	4976	*	1913		268	
G 55 14	31	*	1911		285	
	1335	*	1911		310	*
	1337	*	1911		276	
	1562	*	1917		322	
	2044	*	1910		302.5	
	2048	*	1910		305	
	2049	*	1914		291	
	2051	*	1915		292	
	2109	*	1896		248	
	2110	*	1911		275	
	2119	*	1911		273	
	2120	*	1911		278	
	2270	*	1911		254	
	3998	*	1910		307	
	4463		1912		250	
	4956		1911		294	
G 55 15	26	*	1912		299	*
	39	*	1915		299	*
	(**) 40	*	1917		294	
	108	*	1912		291	
	124		1895		231	
	1958	*	1914		297	*
	2762	*	1917		315	
	2770	*	1912		335	*
	2975				317	*
	4584	*	1915		312	
	37	*	1917		288	
	38		1917		298	
	2762		1918		316	
	(**) 61	*	1917		333	
H 53 3	73022 Garden Bore		1914		74	*
	83029 3 Mound Springs	*	?		62.5	*
H 55 1	1490	*	1912		216	*
	2273		1903		253	*
	2427		1912		194	
	2429				162	
	4560		1912		215	
	4564		1917		235	

Table 8.

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
H 55 2	338		1895	•	352	
	1319	•	1912		252	
	1806	•	1911		250	
	1807	•	1911		251	
	2265	•	1911		253	
	2271	•	1896		260	
	4557	•	1896		280	•
H 55 3	3819		1912		248	
H 55 4	132		1914	•	270	
	133		1915	•	280	
	134		1917	•	274	
	397		1904	•	297	
	4121		1908	•	277	•
	4132		1907	•	278	•
H 56 1	4021		1909	•	279	•
H 53 8	84019 Margaret Ck.	•	1896		45	•
H 54 5	4019 Coolong	•	1927		45	•
	4020 Well Creek	•	1915		75	
	4023 Two Mile Bore	•	1915		74	•
	4065 Clarks	•	1915		82	•
H 55 5	4047	•	1909		127	•
	..4279	•	1893	•	168	•
	4289				145	•
	4444				173	•
	** 4592	•	1907		155	
H 55 6	4006	•	1907		156	
	4043	•	1908		143	
	4196	•	1907		142	
	4213	•	1908		183	
	4219	•	1907		176	
	4295	•	1908		147	
	4371	•	1909		154	
	4541	•	1909		180	
	4600	•	1908		148	
	4609	•	1909		233	
H 55 7	4005	•	1906	•	201	•
	4190	•	1898	•	283	
	4210	•	1904	•	192	•
	4218	•	1908		238	
	4251	•	1914		215	
	4362	•	1898	•	169	
	4366	•	1905	•	185	•
	4222		1915		248	
H 55 8	4029	•	1908	•	245	•
	5057	•	1897	•	320	
	4060	•	1906	•	255	•
	4061	•	1908	•	235	•
	4107	•	1905		248	
	4183	•	1910		184	
	4199	•	1913		235	

Map Sheet Number	Well Name or number	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
H 55 8 (Cont.)	4220	*	1907	*	254	*
	4238	*	1910	*	232	
	4317	*	1904	*	253	
	4322	*	1908	*	253	
	4323	*	1908	*	253	
	4326	*	1903	*	244	
	4356	*	1909	*	230	
	4378	*	1907	*	248	
	4406	*	1922		244	
	4431	*	1906	*	252	
	4432	*	1902	*	290	
	4471	*	1909	*	228	
	4477	*	1909	*	255	
	4546	*	1905		245	
	4558	*	1903	*	272	
H 56 5	4022	*	1900	*	275	*
	4027	*	1908	*	276	*
	4080	*	1914	*	279	*
	4204		1896	*	296	
H 55 10	4401	*	1907	*	132	*
	4440	*	1907		120	
	4534	*	1907		157	
H 55 11	4622		1907	*	223	
	4533		1901	*	181	*
	4487		1912	*	173	
	4217		1903	*	162	
	4205		1902	*	175	*
	4185		1916	*	196	
	4157		1914	*	162	
	4441		1904	*	175	
	4453		1902	*	175	
	4280		1904	*	192	*
	4305		1904	*	207	
H 55 12	4399		1910	*	216	*
	4488		1912	*	207	*
H 55 15	4289				197	*
	4324		1900	*	194	*
	4617		1904	*	223	*
H 55 16	4595		1904	*	237	*

TABLE 9 CA2 HEAD VALUES AT PRESENT-DAY STATE

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 54 3	3		1972	•	125	•
	374		1972	•	133	•
	2450		1972	•	142	•
F 54 4	4218		1972		257.5	
	4470		1972	•	270	•
	17060		1971		204	•
	35631				209	•
	31109				234	•
	30829				252	•
F 54 7	379		1972	•	175	
	2564		1972	•	179	•
	2568		1972	•	144	•
	2584		1972	•	179	
	3248		1972	•	242	
	3253		1972	•	183	•
	3266		1972	•	188	•
	2586				182	•
	2614				188	•
	3263				172	•
	4153			•	178	•
F54 8	1039		1972	•	268	
	1968		1972	•	206	•
	2930	•	1972	•	191	•
	3549		1972	•	201	
	3586		1972	•	248	•
	3593		1972	•	247	•
	3620		1972	•	233	•
	4369		1972	•	218.5	•
	3355	•	1972	•	251	•
F 55 5	1045		1972	•	274	•
F 54 12	2350		1972	•	228	
	2351				220	•
	3242				240	•
	4096				202	•
	4729				232	•
	4730			•	237	•
	14269				205	•
F 55 9	1649		1972	•	233	•
	2183		1972	•	257	•
	3858	•	1972	•	233	•
F 55 13	119	•	1972	•	245	•
	1366		1972	•	257	•
	1390	•	1972	•	265	•
	1394		1972	•	265	•
	4285	•	1972	•	242.5	•
	4451	•	1972	•	247	•
	2155				260	•
	4284				251	•

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
F 55 14	2145	•	1972	•	265	•
G 55 1	318	•	1972		325	•
G 55 2	94	•	1972	•	331	•
G 55 7	14297		1972		503	•
	14508		1972		531	•
	15122		1972		485	•
	15952		1972		525	•
	17633		1973		534	•
	17723		1973		557	•
	30049		1973		533	•
	32502		1972		424	
	32504		1970		506	•
	35604		1973		530	•
	35605		1973		515	•
	14296		1972		560	
G 55 8	15292		1972		232	
G 54 9	Pandieburra	•	1969		97	•
G 55 9	165		1972		285	•
	1181				322	•
G 55 10	96	•	1972	•	276	•
	4963				320	•
	334	•	1972		304	•
	4089		1969		320	•
G 54 13	Mirramitta	•	1972		74.5	
	Mount Gason	•	1973		88.5	
G 55 13	4979		1972	•	213	•
G 55 14	67		1972	•	222.5	•
	98		1972	•	242	•
	1334	•	1972	•	239	•
	1336		1972	•	235	•
	4983			•	254	•
G 55 15	23		1972	•	249	•
	37		1972		220	
	38	•	1972	•	252	
	61	•	1972	•	235	
	89		1972	•	234	•
	149		1972	•	233	•
	150		1972	•	222	
	2975		1972	•	241	
	11857		1972		252	•
G 55 16	127		1972	•	228	•
H 54 1	Cannuwakakina	•	1973		89	•
	Kopperamanna	•	1973		92	•
	Mungeranie	•	1971		93	

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
H 54 2	Gidgealpa	•	1966		118	
	Dullingari	•	1966		90	
H 55 1	5726		1972		152	
	7400		1972		137	
	4560				189	•
	7683				207	•
H 55 2	107		1972	•	186	•
	338		1972	•	191	
	1808	•	1971		249	
	13493		1972		146	•
H 55 3	55		1972	•	232	•
	64		1972	•	202	
	147		1972	•	218	•
	167		1972	•	211	•
H 55 4	59		1972	•	218	•
	73		1972	•	225	
	106		1972	•	212.5	•
	132		1972	•	208	•
	133		1972	•	214	•
	134		1972	•	213	•
	173				225	•
	397		1972	•	216	•
	4121		1972	•	212	
	4132		1972	•	208	
	4185			•	213	•
H 56 1	4175		1972		232	•
	4340		1972		214	•
H 54 5	Frome Creek	•	1966		70	•
	Lake Harry	•	1973		87	•
	Duckanina	•	1973		90	
	Clayton	•	1973		78	
	10304				90	•
H 54 6	Tilcha 2	•	1966		93	
	Coonanna	•	1966		99	
H 55 5	4104				133	•
	4254				147	•
	4289		1972	•	131	•
	8382				169	•
	11271		1972	•	141	•
H 55 6	4213		1972		146	•
	4665	•	1972	•	135	•
	8317		1972	•	155	•
	8540		1972	•	146	•
	12314		1972		178	•
H 55 7	4085		1972	•	182	
	4362		1972	•	138	•

Table 9.

Map Sheet Number	Well Number or name	Elevation surveyed	Year	Recovery curve	Head (m)	Retained for map
H 55 8	4057	•	1972	•	169	•
	4060	•	1972		192	•
	4088		1972	•	182.5	
	4107	•	1972		198	•
	4220	•	1972	•	176	•
	4323	•	1972	•	190	•
	4326		1972	•	200	•
	4376	•	1972	•	172	•
	4432	•	1972	•	161	•
	4477	•	1972	•	189	
H 54 11	4457				83	•
	11192		1972	•	84	•
H 55 10	4401	•	1972	•	111	•

TABLE 10. DEEPENED BORES

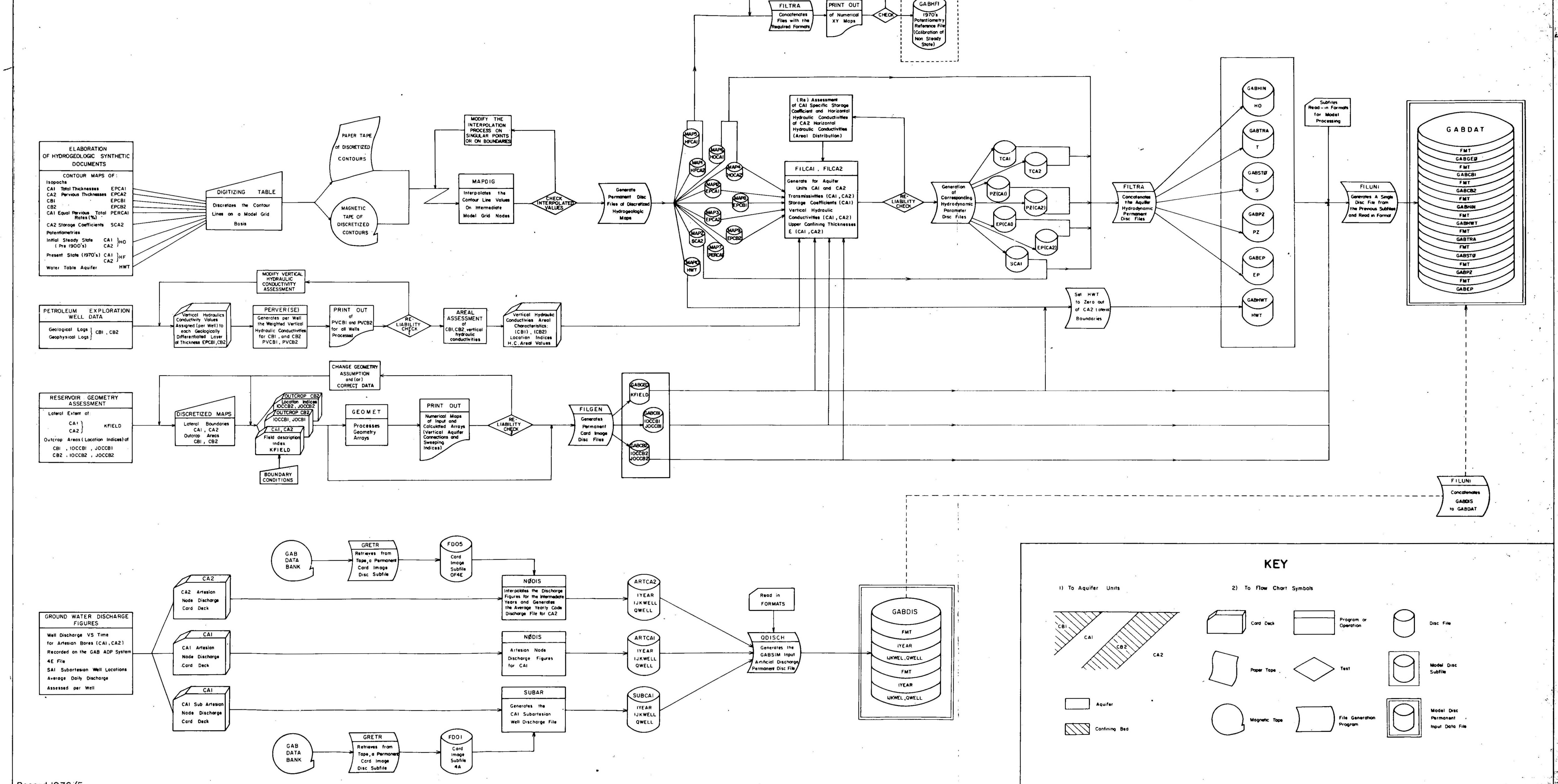
Formations initially tapped	Deepened in							
	WINTON-MACKUNDA F.		HOORAY S.		HUTTON S.		CLEMATIS S.	
	successful	unsuccessful	successful	unseccessful	successful	unsuccessful	successful	unsuccessf
WINTON-MACKUNDA F. Total : 9 Rate of success: 8/9	3		5	1				
HOORAY S. Total : 32 Rate of success: 16/32			15	14	2	1		
HUTTON S. Total : 13 Rate of Success: 4/13					3	5	1	2
CLEMATIS S. Total : 1 Rate of success: 1/1							1	

TABLE 11 - Outline of results obtained from the 13 first calibration runs

Run No	Aquifers modelled	loaded on	Returned on	Corrections made to previous run	Comments on results	Diagnosis
1	CA1 & CA2	9 Aug 11.00	9 Aug 15.15		Positive difference of heads (calculated values smaller than observed ones) for both aquifers. Less pronounced for CA1, except some high isolated values (90,100 m) without apparent effect on neighbouring points	Precision test possib insufficient Vert. hyd. conduct. values too high
2	CA1 & CA2	9 Aug 16.45	9 Aug 17.15	Precision test reduced from 10^{-2} to 10^{-3}	No significant change	Precision test not responsible
3	CA1 & CA2	9 Aug 18.30	12 Aug 12.30	Vert. hyd. conduct. values divided by 10	93 iterations instead of 34 (difficulty to converge) CA2 : potentials still too low except SW CA1 : rather worse than run 1	)
3^1	CA1 & CA2	12 Aug 10.30	12 Aug 12.30	Vert. hyd. conduct. values divided by 50	CA2 : SW potentials too high; better elsewhere, though still too low CA1 : potentials too high everywhere	) Calibration should be performed on each aquifer separately
4	CA2	12 Aug 12.00	13 Aug	Vert. hyd. conduct. as in run 3 Potentials in CA1 kept fixed at initial values	sec run 4^1	
4^1	CA2	12 Aug 14.30	12 Aug 17.30	CA1 potentials fixed vert. hyd. conduct. as in run 3^1	Potential values too low in E half	Transmissivity values too low in E half, in Coonamble Lobe in particular, also Sur Basin and far North
5	CA2	13 Aug 10.00	14 Aug	Sweeping direction changed from N - S to W - E; no other change	Same result as 4^1	

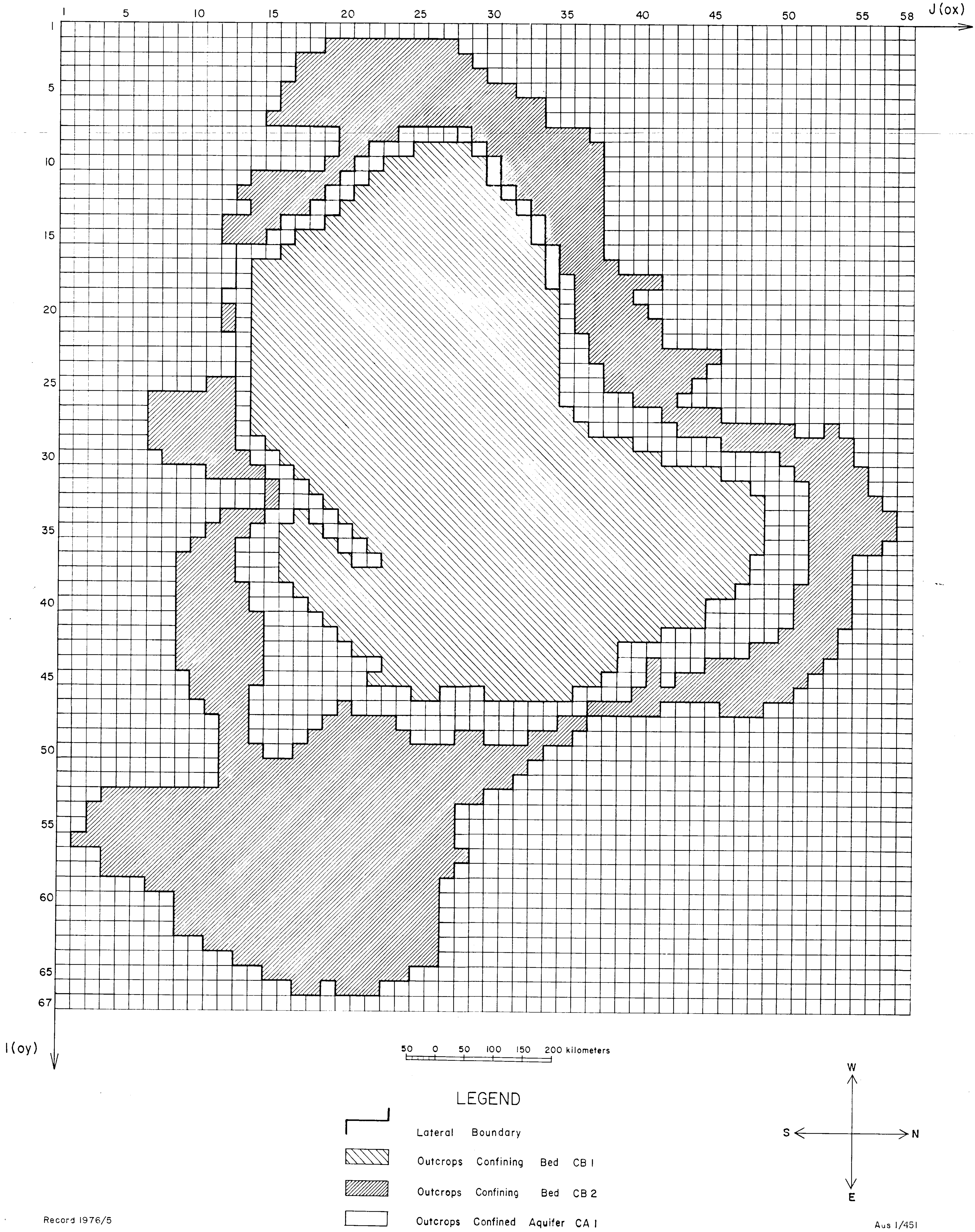
Run No	Aquifers modelled	loaded on	Returned on	Corrections made to previous run	Comments on results	Diagnosis
6	CA2	14 Aug	14 Aug	-hor. hydr. conduct. uniformly set to 10m/day - original vert. hydr. conduct. divided by 50 - Introduction of arbitrary spring discharge (no. of springs per mesh times 50 m^3/h.) - some corrections in CA1 potentials on limits	Main trends all represented, particularly in NE recharge area, but all contours are smoothed. Potential values too low in far N and SE. Too high W of NSW and Lake Eyre area	Best version
7	CA2	20 Aug 10.40	20 Aug 14.30	Try with hor. hydr. cond. set to 10m/day and vert. hydr. cond. set to 5.10^{-11} m/day	N and NE potentials too low, the rest too high	Kv too small
8	CA2	20 Aug 15.00	20 Aug	Vert. hydr. cond. set to 10^{-10} m/day	Error on reading formats of T- Same remark applied to run 7	Blank run
9	CA2	21 Aug 08.45	21 Aug 16.00	Reading format of changed. Vert. hydr. cond. set to 5.10^{-11} m/day	Generally flat; to low in NE; too high in SW	GABSIM very sensitive to changes in vert. h cond. for vertical fl is of same order of magnitude as horizont flux
10	CA1	21 Aug 13.00	21 Aug		Good results except near limits	Values at limits wron
11	CA1	5 Sept	6 Sept	Regeneration of GWT values. Application to CA1 limits	Too low	Too high transmissivi values in outcrop areas

GENERATION OF THE MODEL INPUT DATA FILE-FIG 7



Aus 1/450

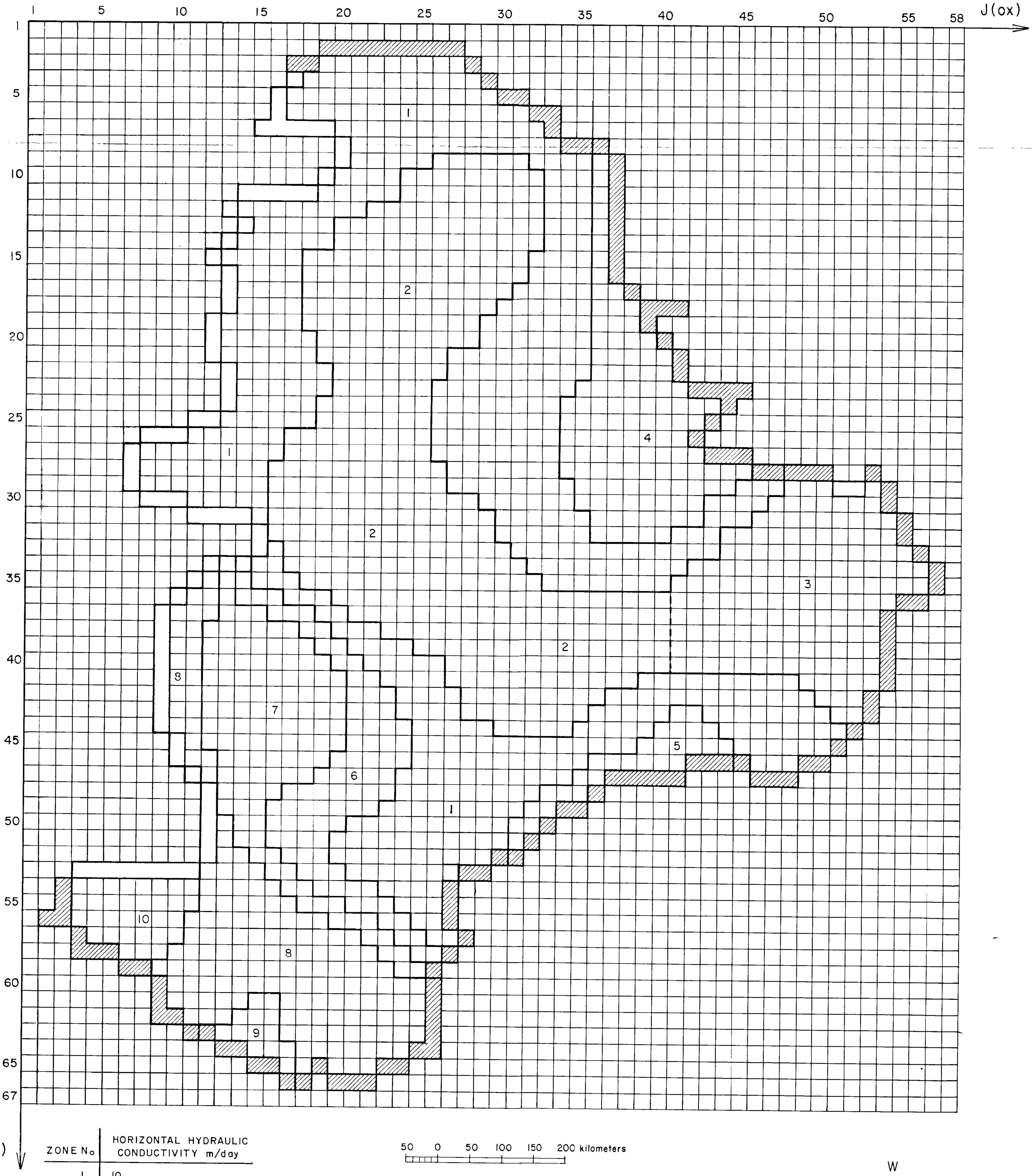
FIG.8-GAB. GEOMETRY FEATURES



Record 1976/5

Aus 1/451

FIG 9-CA 2 DISTRIBUTION OF HORIZONTAL HYDRAULIC CONDUCTIVITY



ZONE No	HORIZONTAL HYDRAULIC CONDUCTIVITY m/day
1	10
2	5
3	5
4	15
5	15
6	5
7	2·5
8	1
9	2
10	2

LEGEND

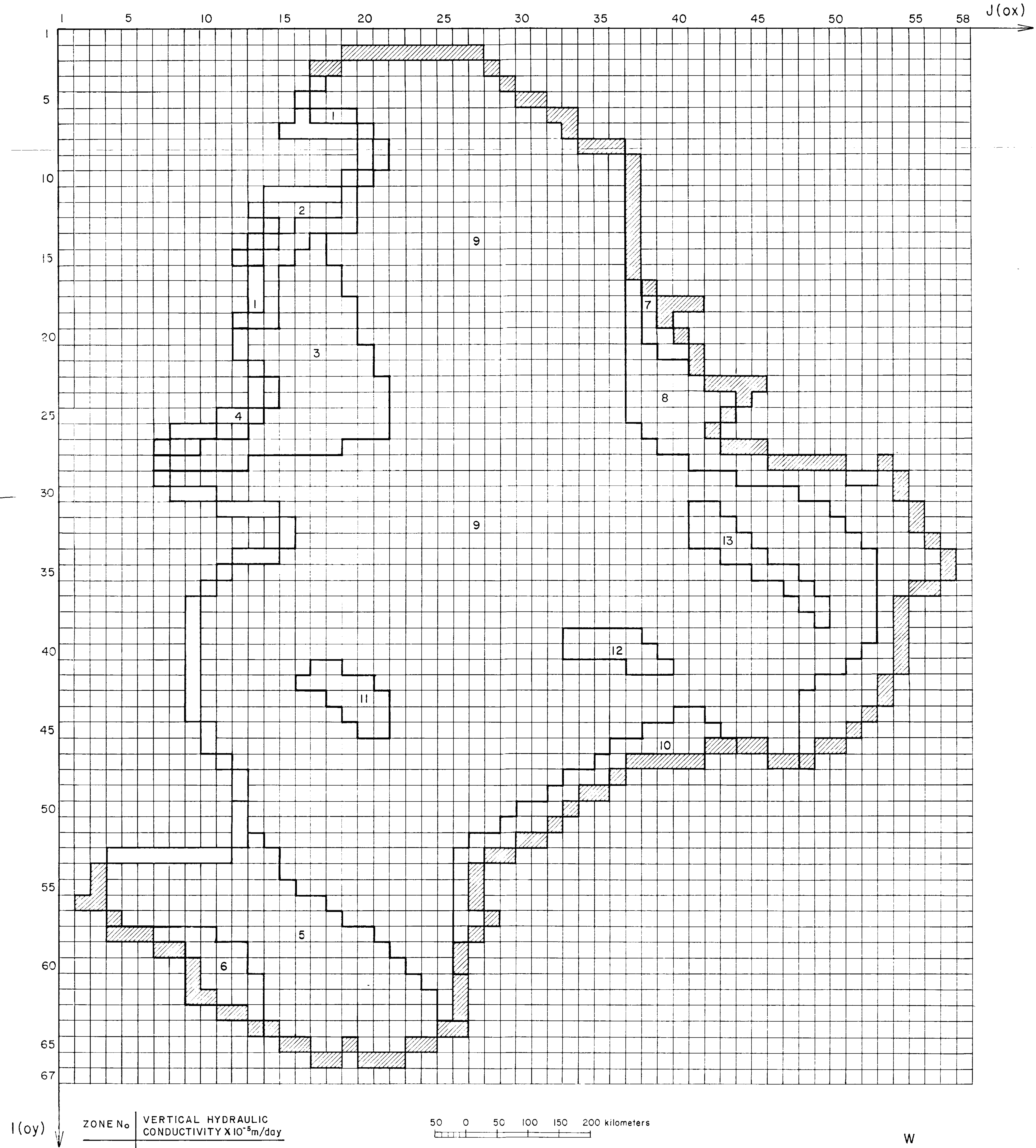
Imposed Head

Zero Flux (Impervious Boundary)

6 Zone number

Aus 1/452

FIG10-CB2 DISTRIBUTION OF VERTICAL HYDRAULIC CONDUCTIVITY



ZONE No	VERTICAL HYDRAULIC CONDUCTIVITY X 10^{-5} m/day
1	200
2	300
3	100
4	200
5	50
6	100
7	200
8	100
9	20
10	10
11	200
12	100
13	100

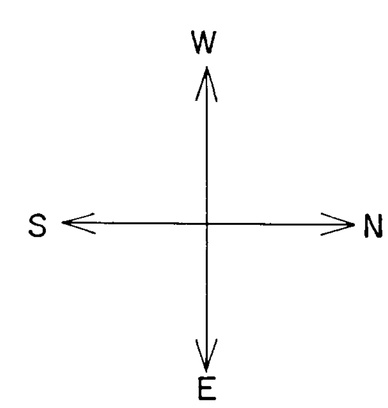
50 0 50 100 150 200 kilometers

LEGEND

Imposed Head

Zero Flux (Impervious Boundary)

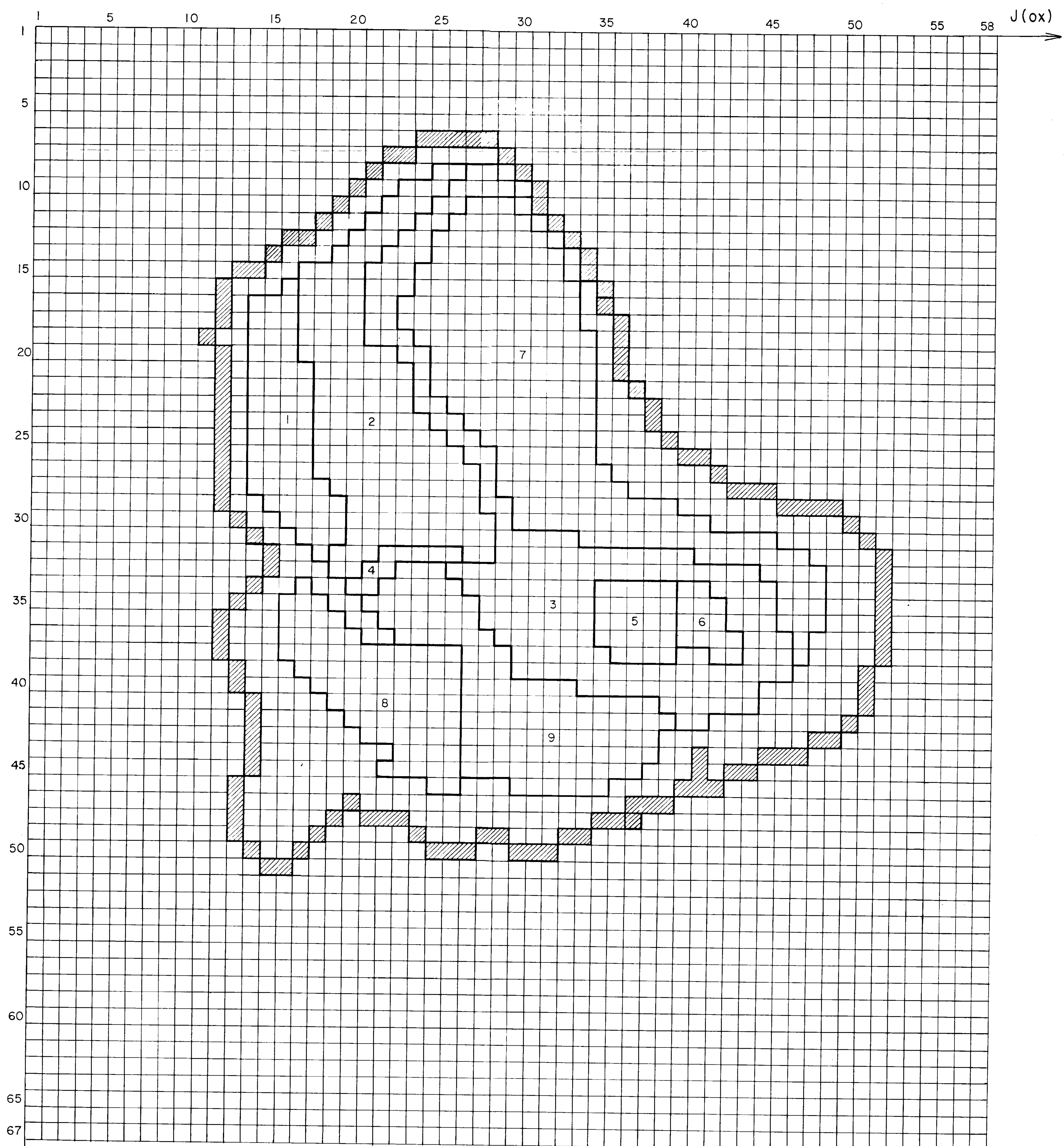
12 Zone number



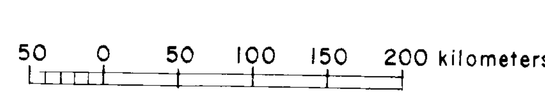
Record 1976/5

Aus 1/453

FIG 11 - CB 1 DISTRIBUTION OF VERTICAL HYDRAULIC CONDUCTIVITY

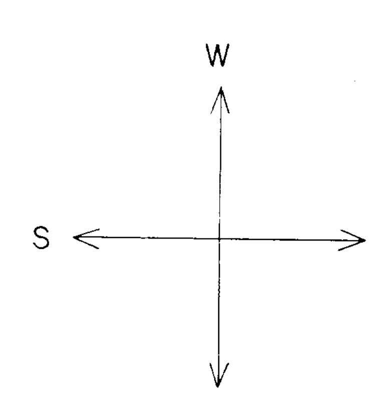


ZONE No	VERTICAL HYDRAULIC CONDUCTIVITY X10^{-5}m/day
1	10
2	20
3	50
4	50
5	20
6	20
7	100
8	100
9	100



LEGEND

Imposed Head



Record 1976/5

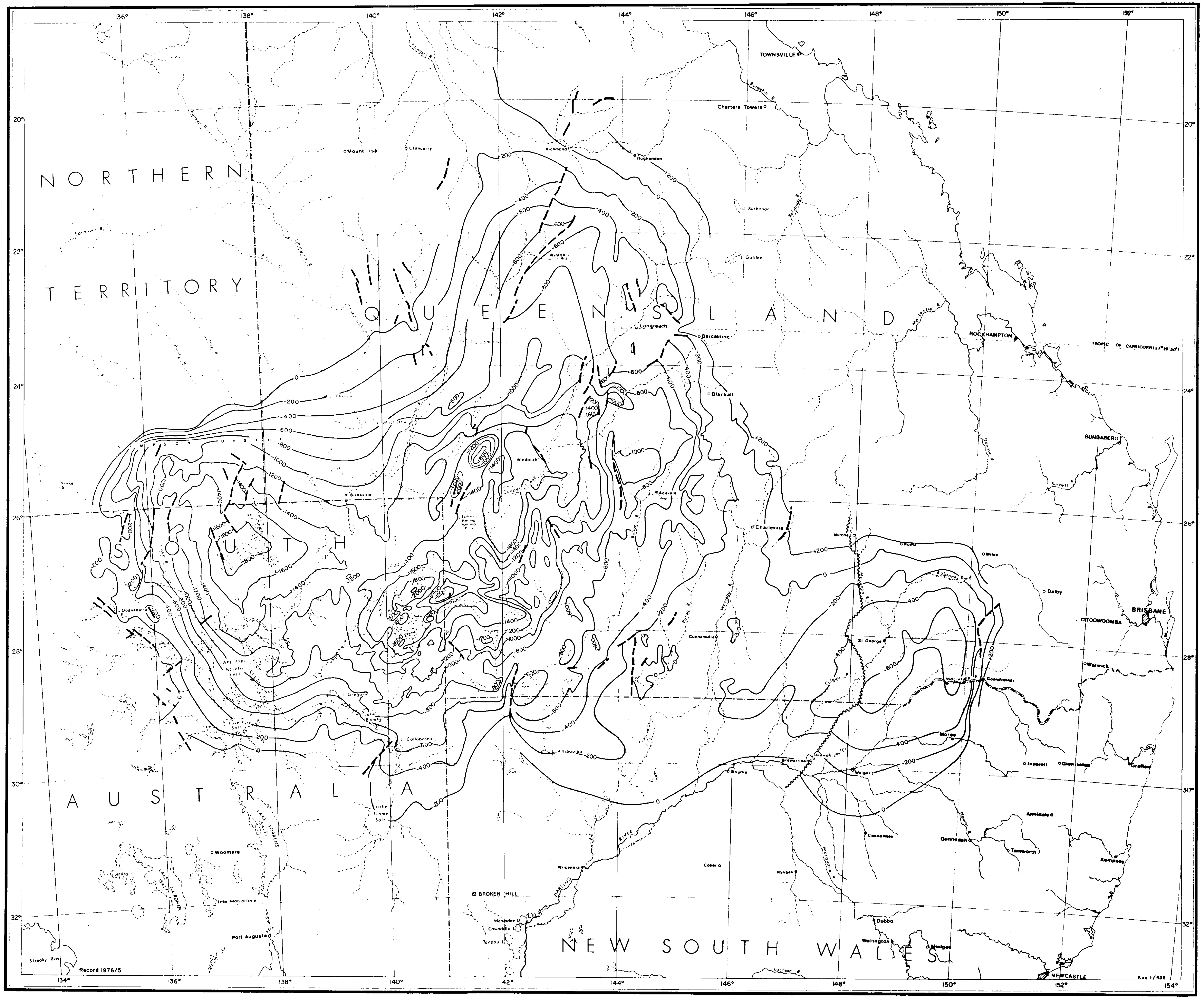
Aus 1/454

GREAT ARTESIAN BASIN
HYDROGEOLOGICAL STUDY

STRUCTURE CONTOUR MAP
Top of the Hooray Sandstone and Cadna-owie Formation (Eromanga Basin) and Mooga Sandstone (Surat Basin)

0 100 250km

Scale 1:5 000 000



Lake, perennial

Lake, intermittent

River, perennial

River, intermittent

Town

State boundary

Fault

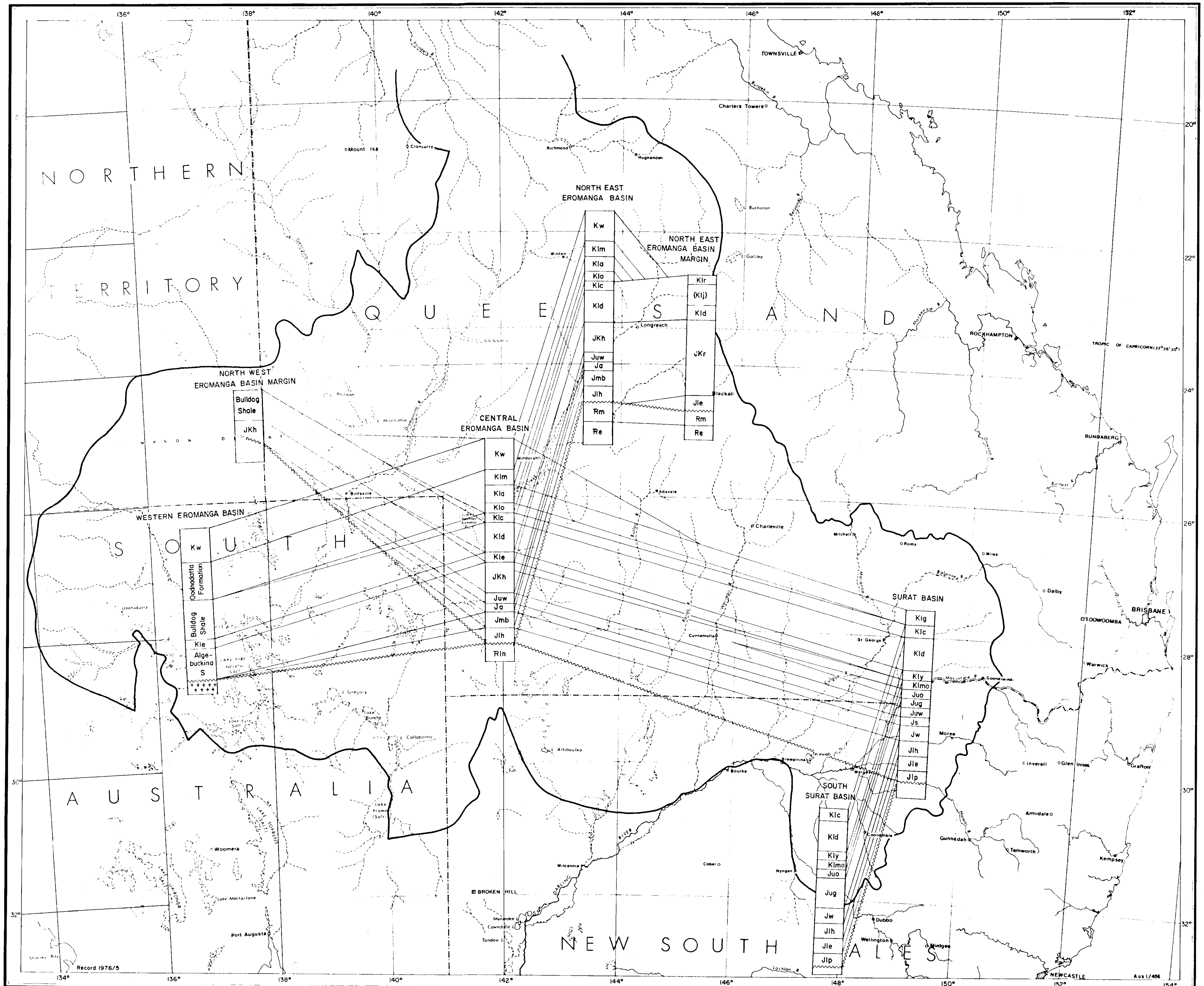
Boundary between Cadna-owie Formation and Mooga Sandstone

—400— *Contours in metres, datum mean sea level, contour interval 200 metres*

PLATE 1

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CORRELATIONS OF JURASSIC AND CRETACEOUS FORMATIONS



Scale 1:5 000 000

Lake, perennial

Lake, intermittent

River, perennial

River, intermittent

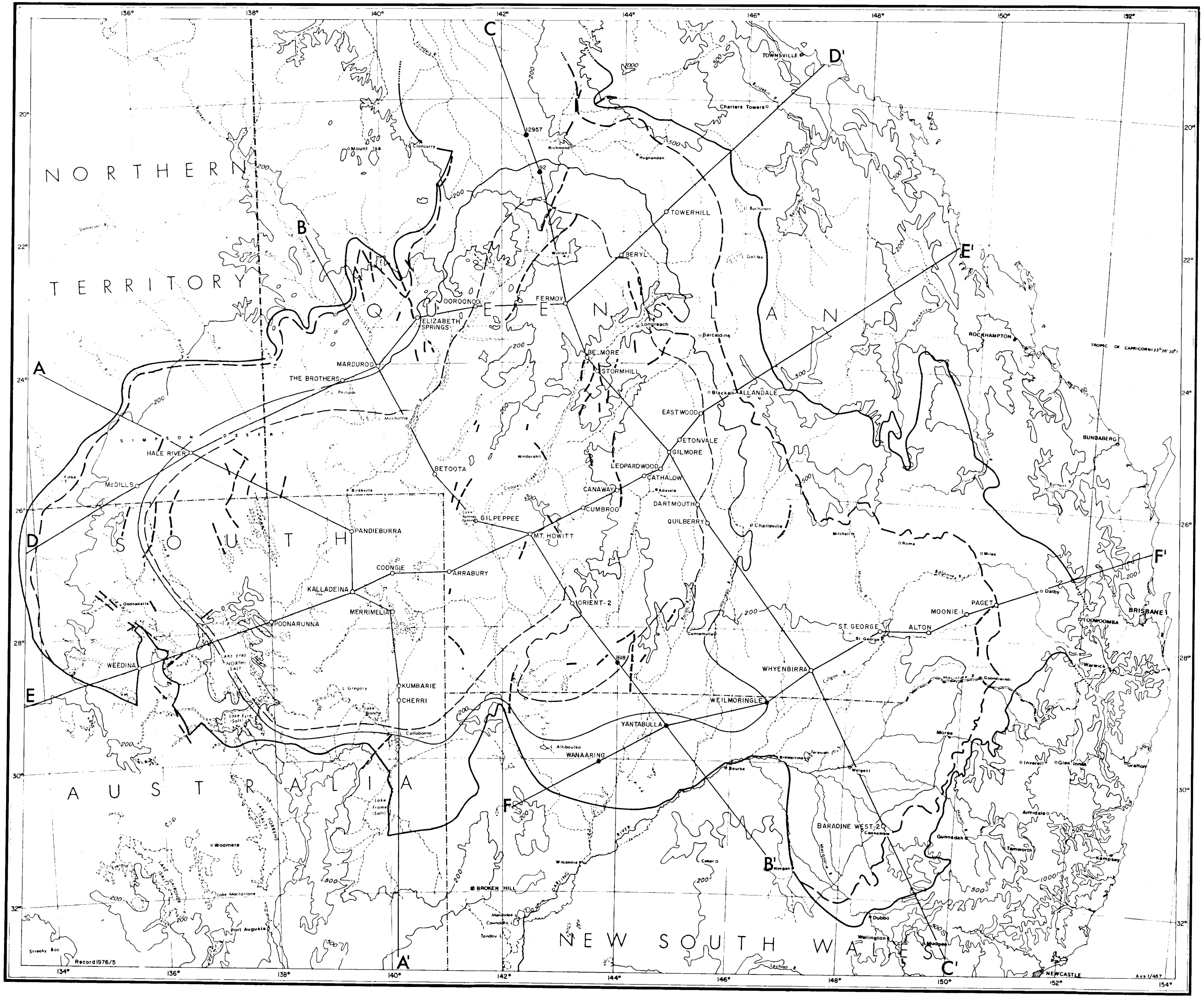
Town

State boundary

PLATE 2

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

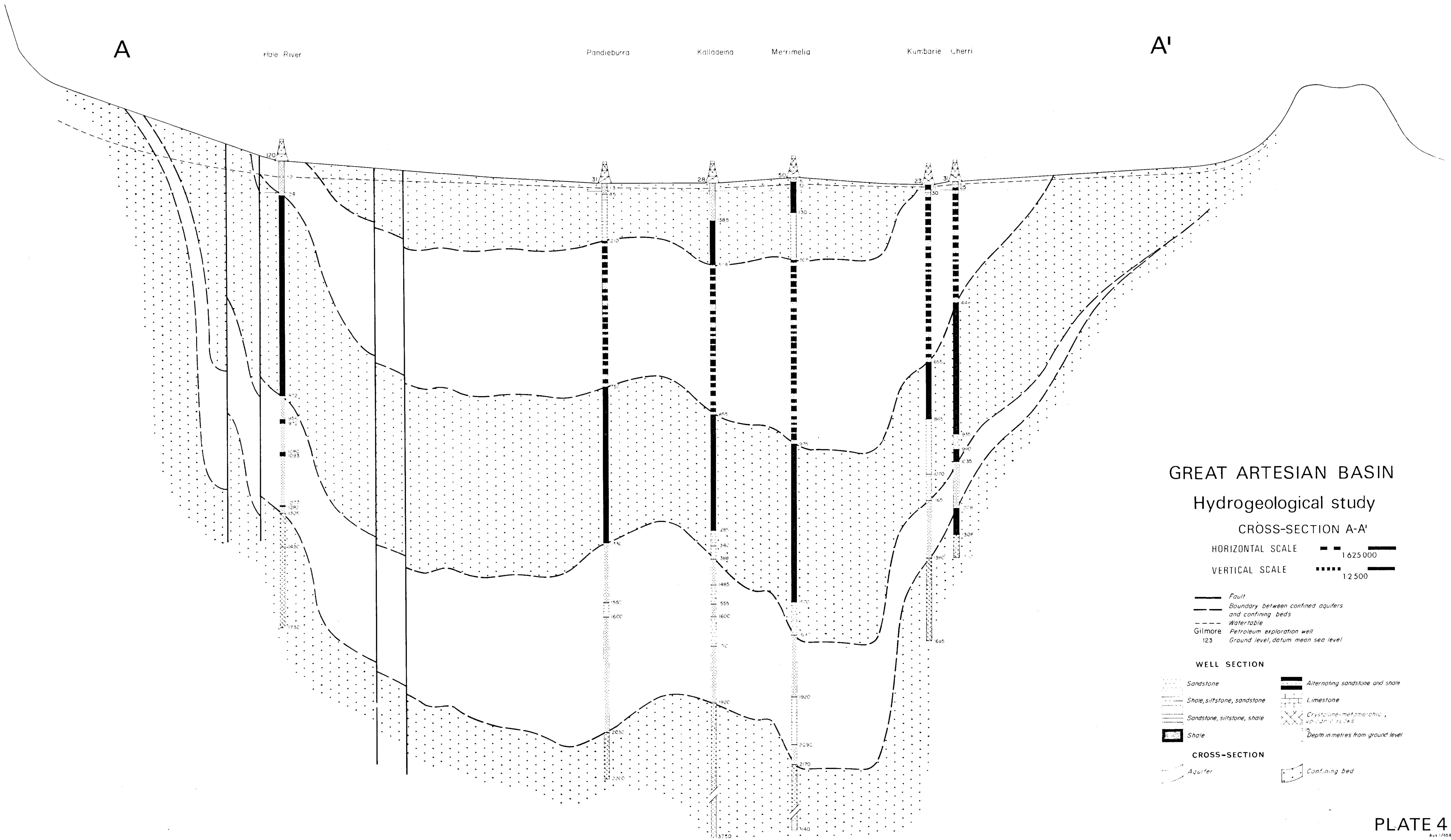
LATERAL EXTENT OF HYDROGEOLOGICAL UNITS, TOPOGRAPHIC CONTOURS AND POSITION OF CROSS-SECTIONS



Scale 1:5 000 000

	Lake, perennial
	Lake, intermittent
	River, perennial
	River, intermittent
	Town
	State boundary
	Fault
	Boundary between confined aquifer 1 and confining bed 1
	Boundary between confined aquifer 1 and confining bed 2
	Boundary between confined aquifer 2 and confining bed 2
	Boundary between confined aquifer 2 and hydrogeological basement
A ——— A'	Cross-section line (plates 4-9)
—200—	Topographic contours in metres, datum mean sea level
•	Stratigraphic drillhole or waterwell
GILMORE ○	Petroleum exploration well

PLATE 3



GREAT ARTESIAN BASIN

Hydrogeological study

CROSS-SECTION A-A'

PLATE 4

Record 1976/5

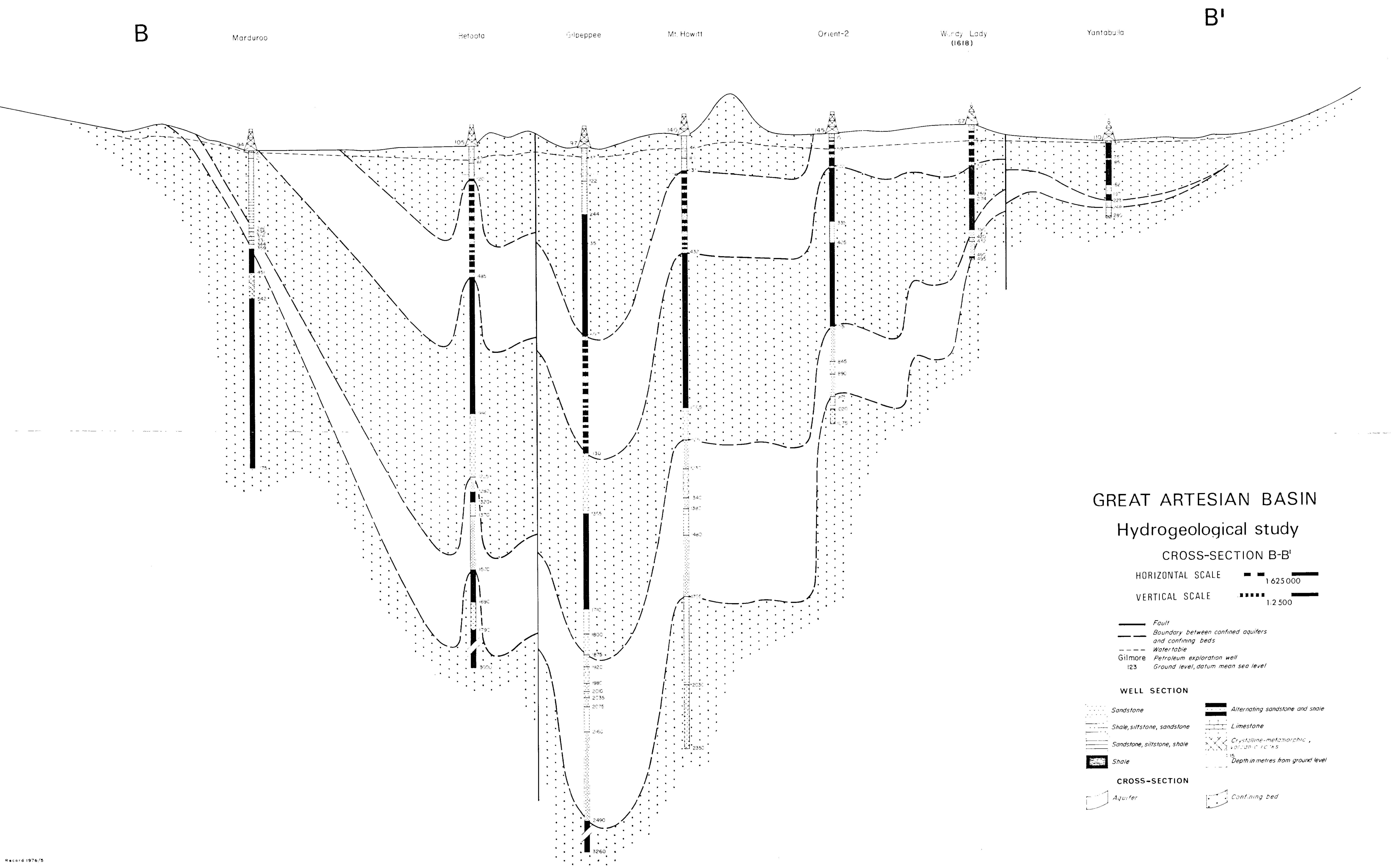
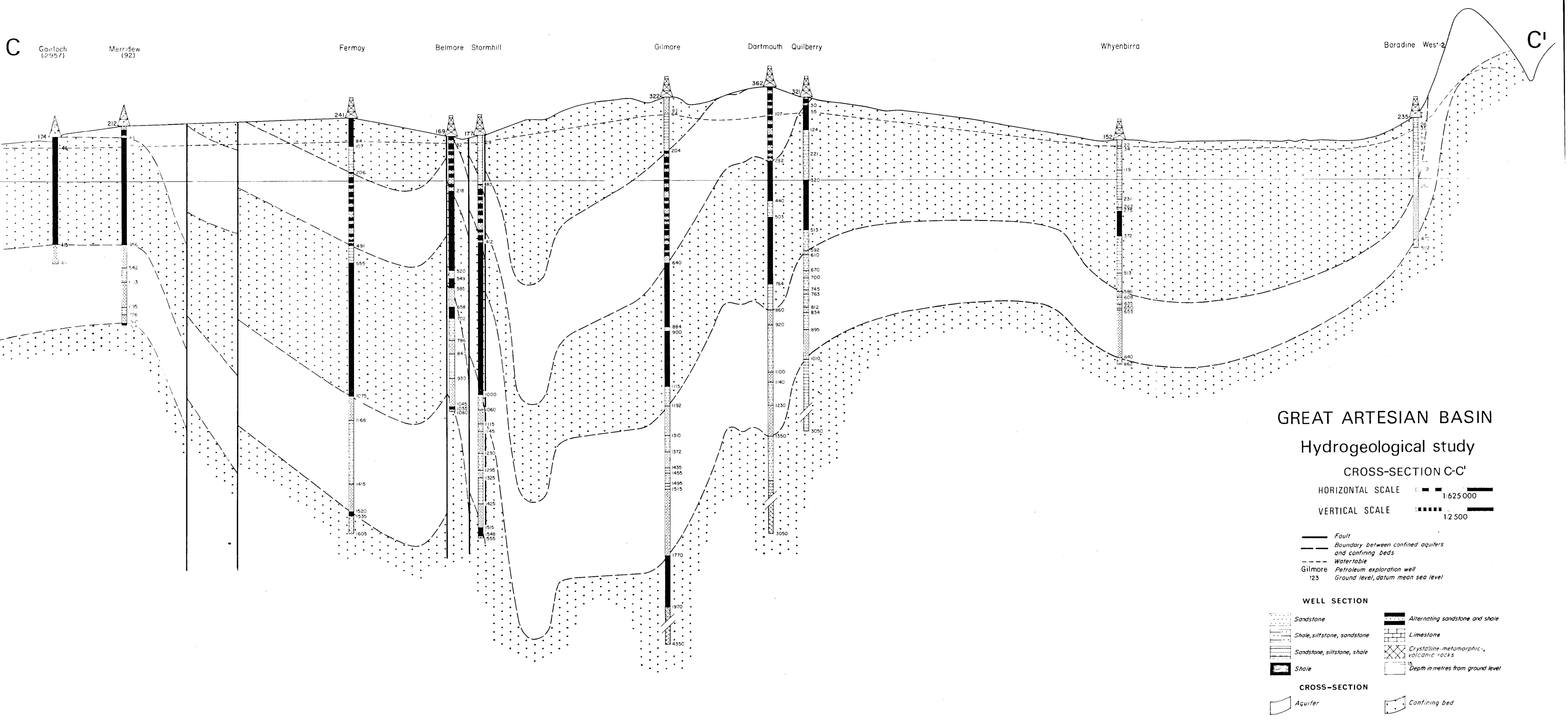

B
B'
Marduroo
Betoota
Gilpeppee
Mt. Howitt
Orient-2
Windy Lady
(1618)
Yantabulla
GREAT ARTESIAN BASIN
Hydrogeological study
CROSS-SECTION B-B'
HORIZONTAL SCALE
1:625 000
VERTICAL SCALE
1:2 500
Fault
Boundary between confined aquifers and confining beds
Watertable
Gilmore Petroleum exploration well
123 Ground level, datum mean sea level
WELL SECTION
Sandstone
Alternating sandstone and shale
Shale, siltstone, sandstone
Limestone
Sandstone, siltstone, shale
Crystalline-metamorphic, volcanic rocks
Shale
Depth in metres from ground level
CROSS-SECTION
Aquifer
Confining bed
Record 1976/5

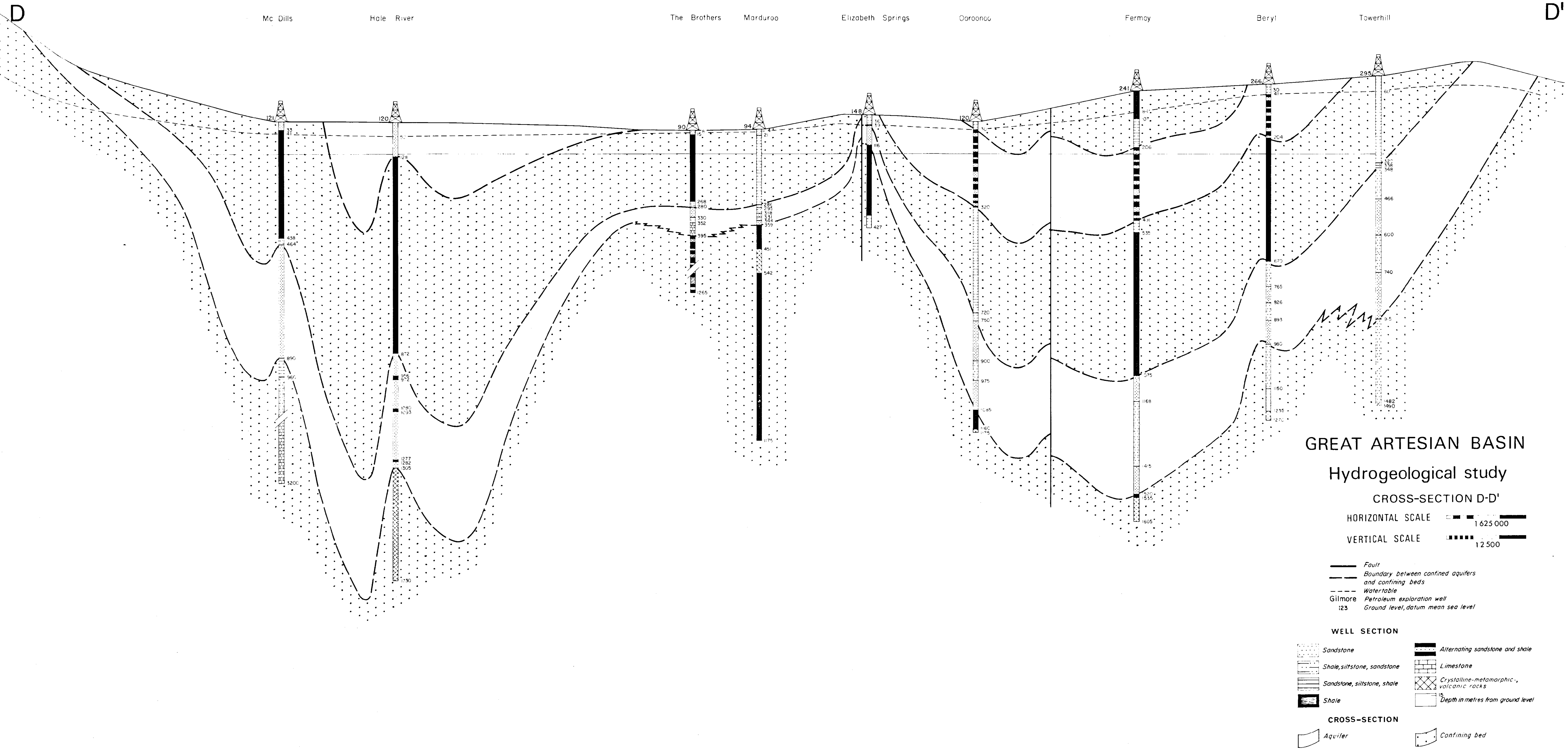
PLATE 5



Record 1976/5

PLATE 6

Aus 1/460



GREAT ARTESIAN BASIN

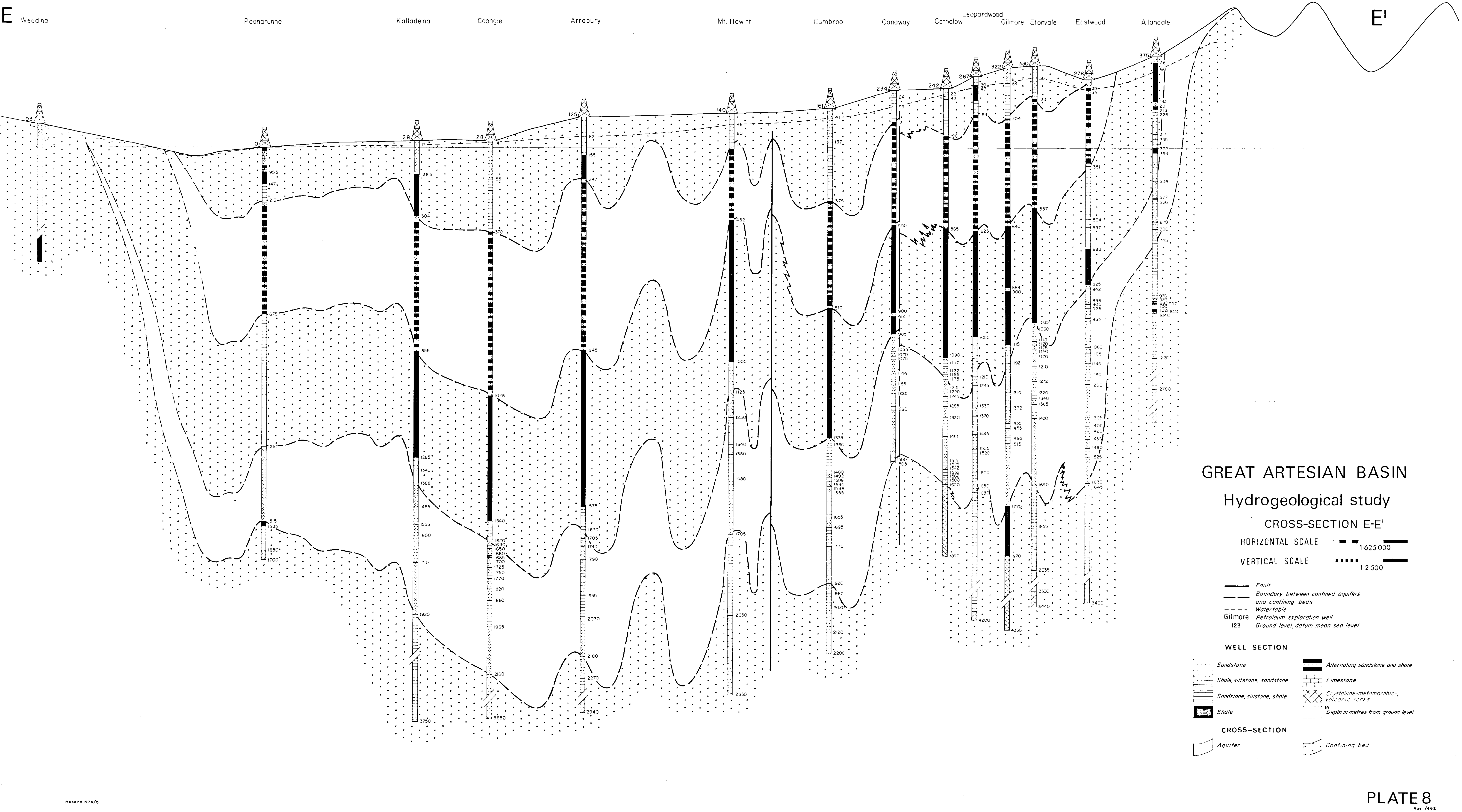
Hydrogeological study

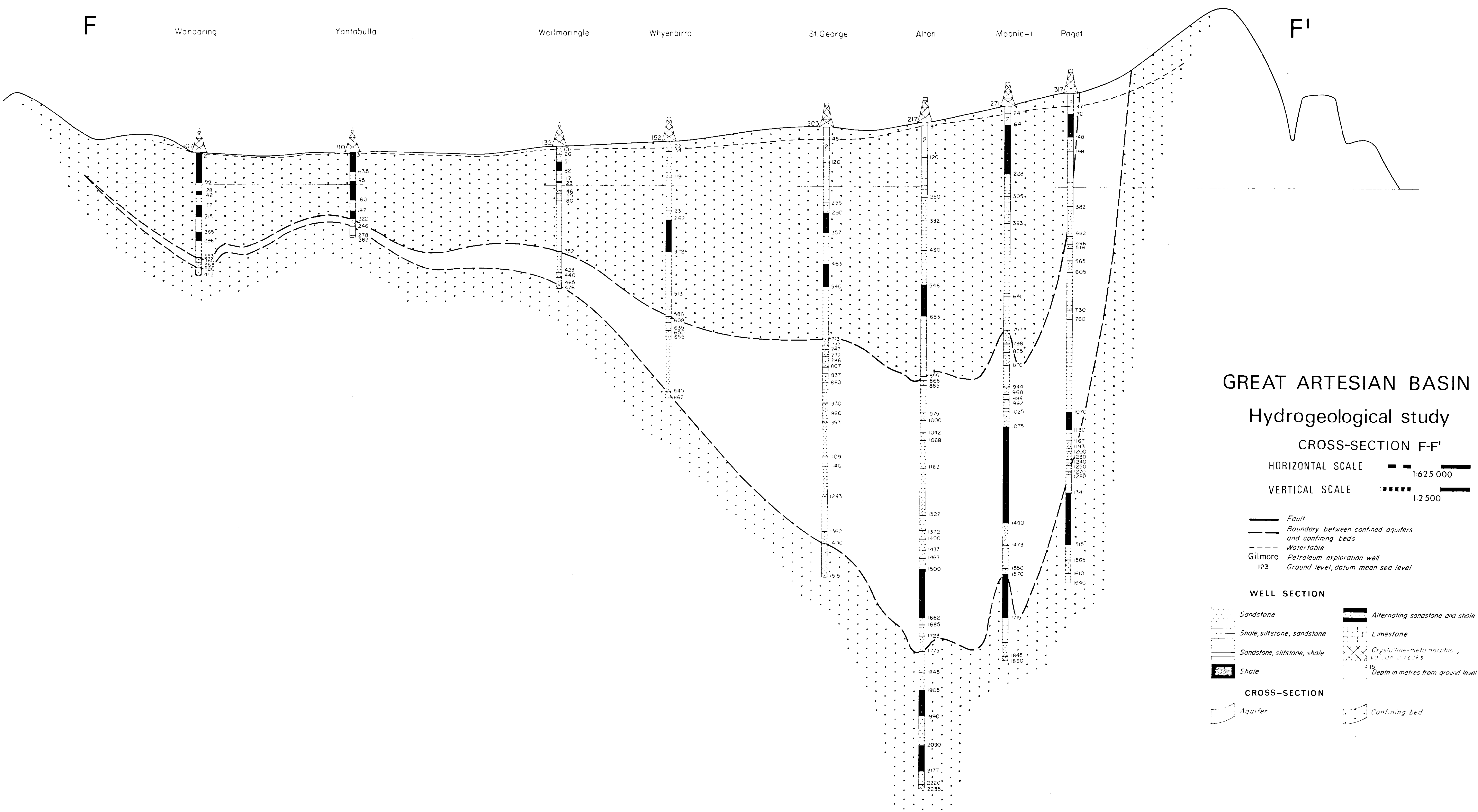
CROSS-SECTION D-D'

Record 1976/5

PLATE 7

Aus 1/461


E
Weedina
Poonarunna
Kalladeina
Coongie
Arrabury
Mt. Howitt
Cumbroo
Canaway
Cathalow
Leopardwood
Gilmore
Etonvale
Eastwood
Allandale
E'
GREAT ARTESIAN BASIN
Hydrogeological study
CROSS-SECTION E-E'
HORIZONTAL SCALE 1:625 000
VERTICAL SCALE 1:2 500
Fault
Boundary between confined aquifers and confining beds
Watertable
Gilmore Petroleum exploration well
123 Ground level, datum mean sea level
WELL SECTION
Sandstone
Shale, siltstone, sandstone
Sandstone, siltstone, shale
Shale
Alternating sandstone and shale
Limestone
Crystalline-metamorphic-, volcanic rocks
15 Depth in metres from ground level
CROSS-SECTION
Aquifer
Confining bed
Record 1976/5
PLATE 8
Aus 1/462



Record 1976/5

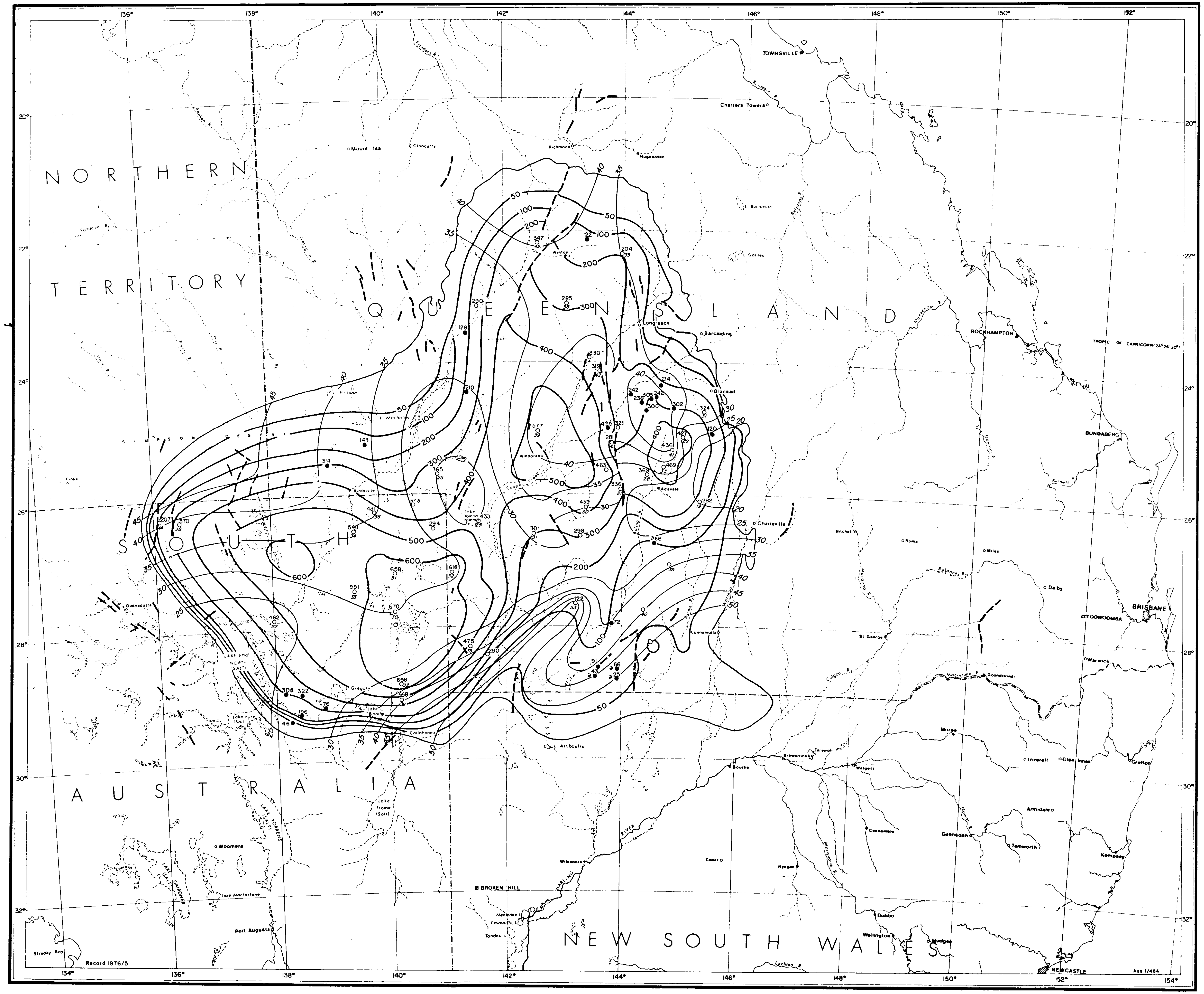
PLATE 9

Aus 1/463

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CONFINED AQUIFER 1

Total and proportion of permeable thickness



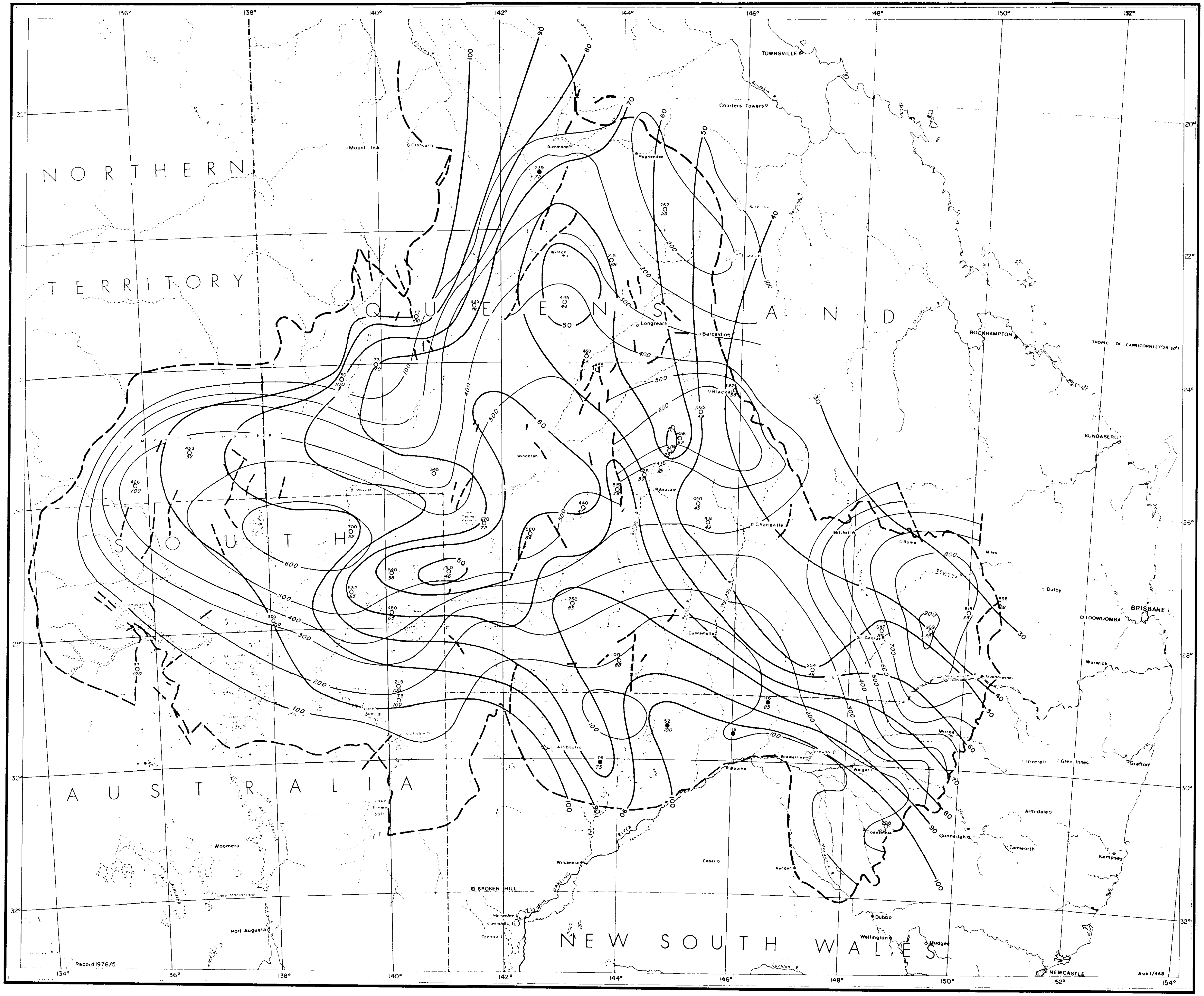
0 100 250km

Scale 1:5 000 000

	Lake, perennial
	Lake, intermittent
	River, perennial
	River, intermittent
	Town
	State boundary
	Fault
	Boundary between confined aquifer 1 and confining bed 2
50	Total thickness of confined aquifer 1 (in metres)
30	Percentage of permeable to total thickness of confined aquifer 1
○	Petroleum exploration well
●	Waterwell
—50—	Contour line of total thickness (in metres)
30—	Contour line of percentage of permeable to total thickness

PLATE 10

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

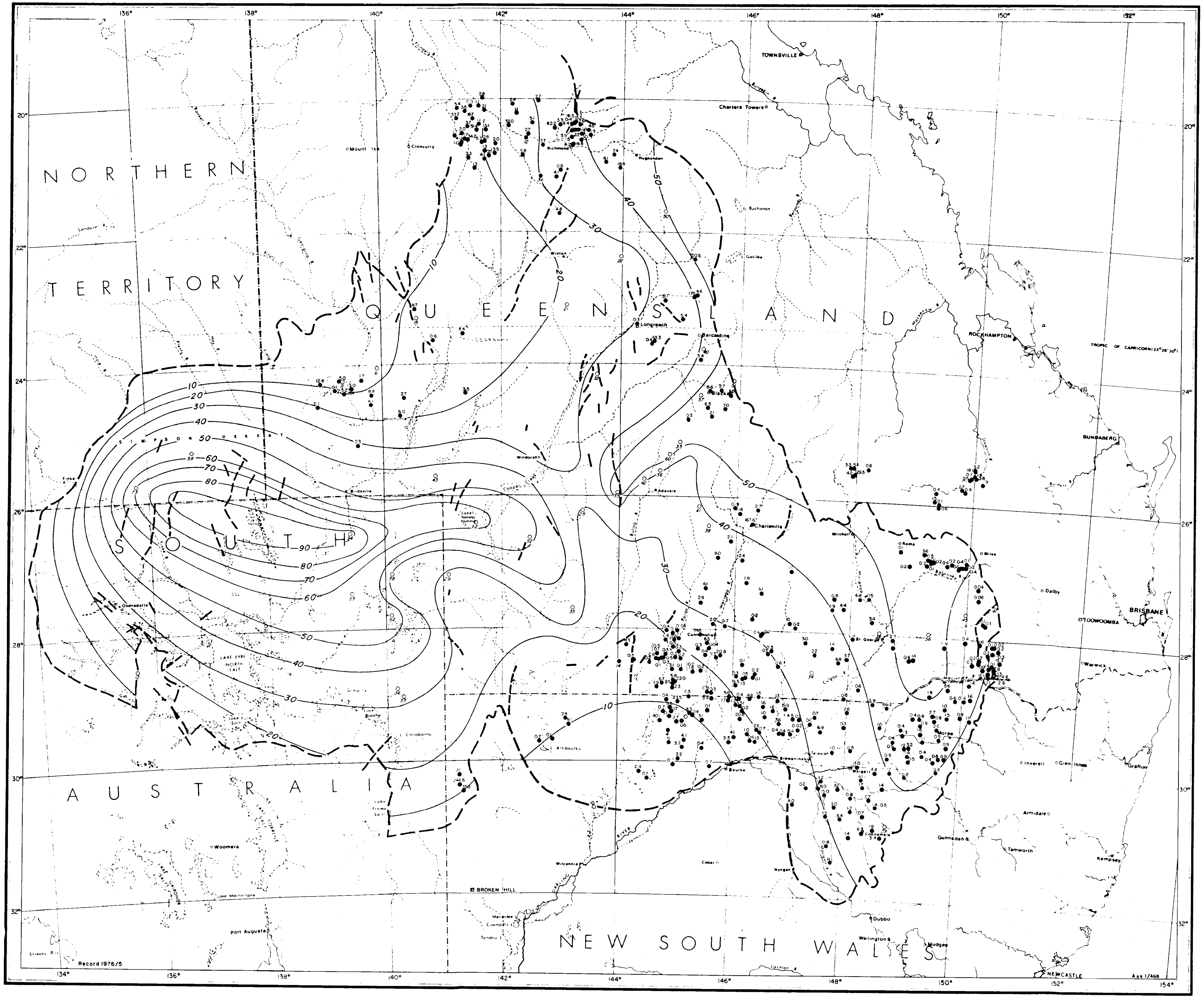


CONFINED AQUIFER 2
Total and effective thickness

Scale 1:5 000 000

- Lake, perennial
- Lake, intermittent
- River, perennial
- River, intermittent
- Town
- State boundary
- Fault
- Boundary between confined aquifer 2 and confining bed 2
- 150 — Total thickness of confined aquifer 2 (in metres)
- 50 — Percentage of permeable to total thickness of confined aquifer 2
- o — Petroleum exploration well
- —300— Contour line of total thickness (in metres)
- —100— Contour line of percentage of permeable to total thickness

PLATE 11



GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CONFINED AQUIFER 2
Horizontal hydraulic conductivity and storage coefficient

0 100 250 km

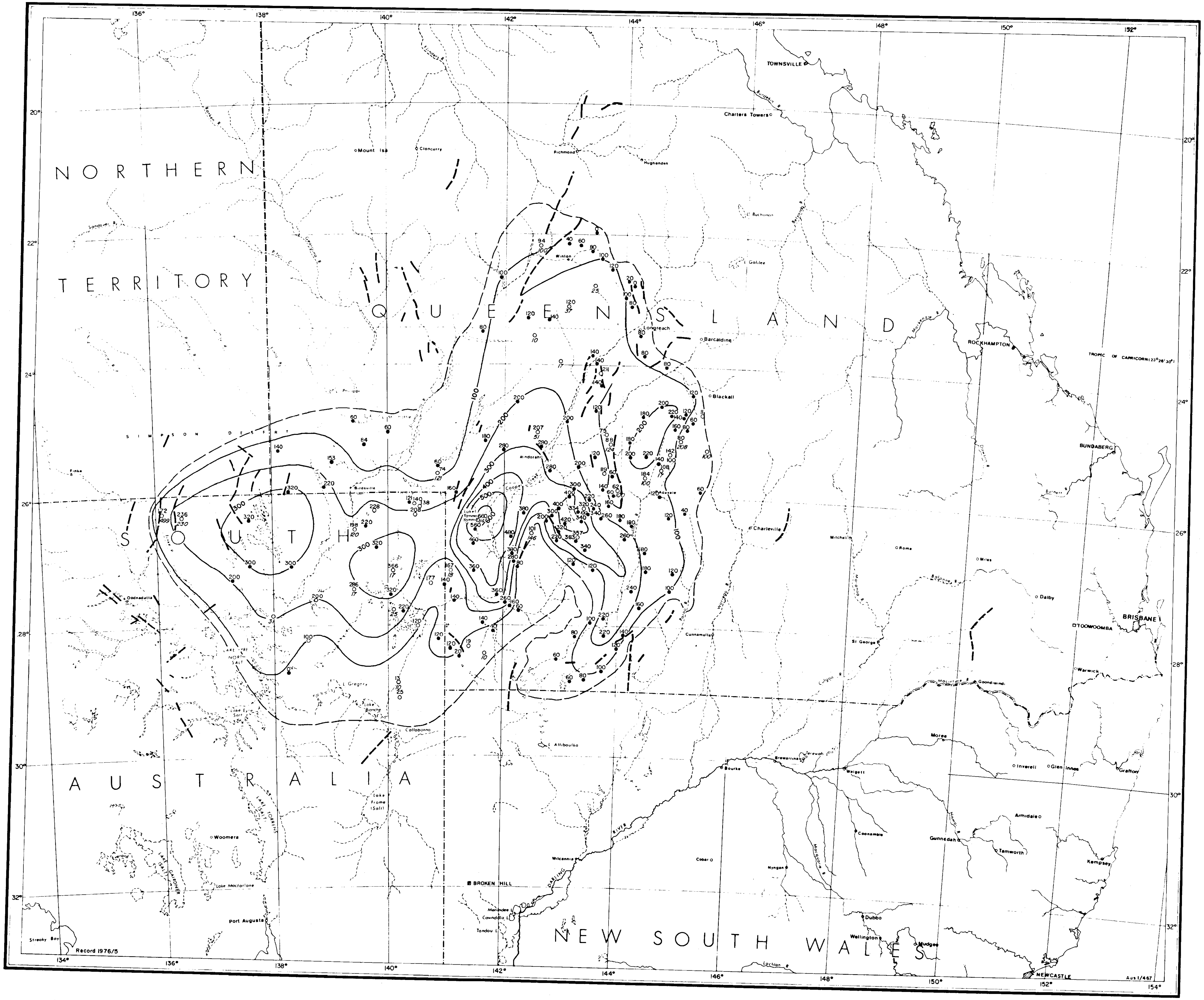
Scale 1:5 000 000

Lake, perennial
Lake, intermittent
River, perennial
River, intermittent
Town
State boundary

Fault
Boundary between confined aquifer 2 and confining bed 2
Petroleum exploration well
Waterwell
Horizontal hydraulic conductivity in m/day
Storage coefficient $\times 10^{-5}$
Contour line of storage coefficient

PLATE 12

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY



CONFINING BED 1

Thickness and vertical hydraulic conductivity

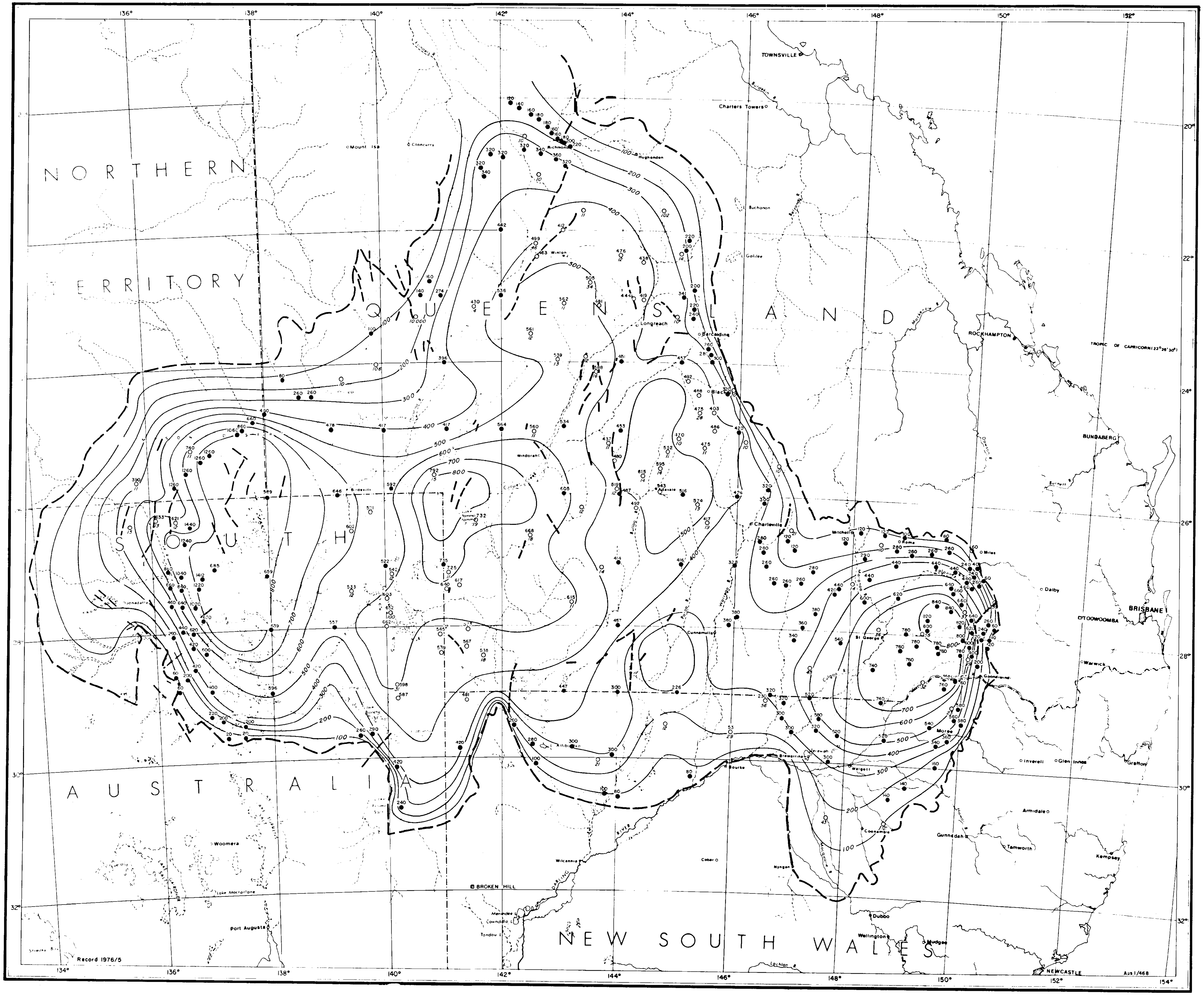
- Lake, perennial
- Lake, intermittent
- River, perennial
- River, intermittent
- Town
- State boundary
- Fault
- Boundary between confining bed 1 and confined aquifer 1
- 120 Thickness (in metres)
- ○ Petroleum exploration well
- ● Waterwell
- 17 Vertical hydraulic conductivity X10^{-5} m/day
- —100— Contour line of thickness (in metres)

PLATE 13

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CONFINING BED 2
Thickness and vertical hydraulic conductivity

Scale 1:5 000 000



Lake, perennial
Lake, intermittent
River, perennial
River, intermittent
Town
State boundary
Fault
Boundary between confined aquifer 2 and confining bed 2
○ Petroleum exploration well, waterwell
12 Vertical hydraulic conductivity $X10^{-5}$ m/day
—200— Contour line of thickness (in metres)
● Point values differences from maps of the watertable and structure contour maps of the bottom of confined aquifer 1 and the top of confined aquifer 2

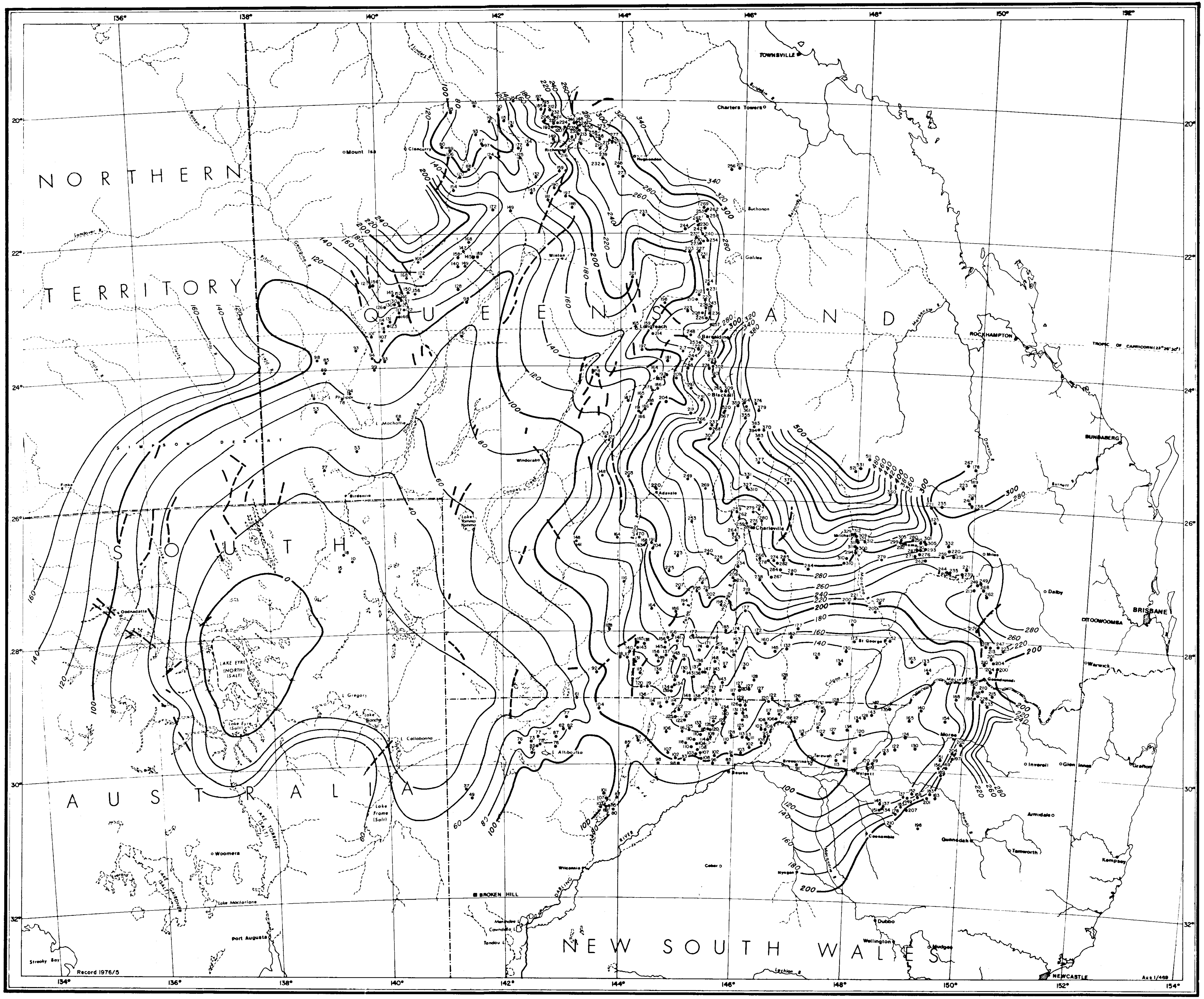
PLATE 14

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

WATERTABLE

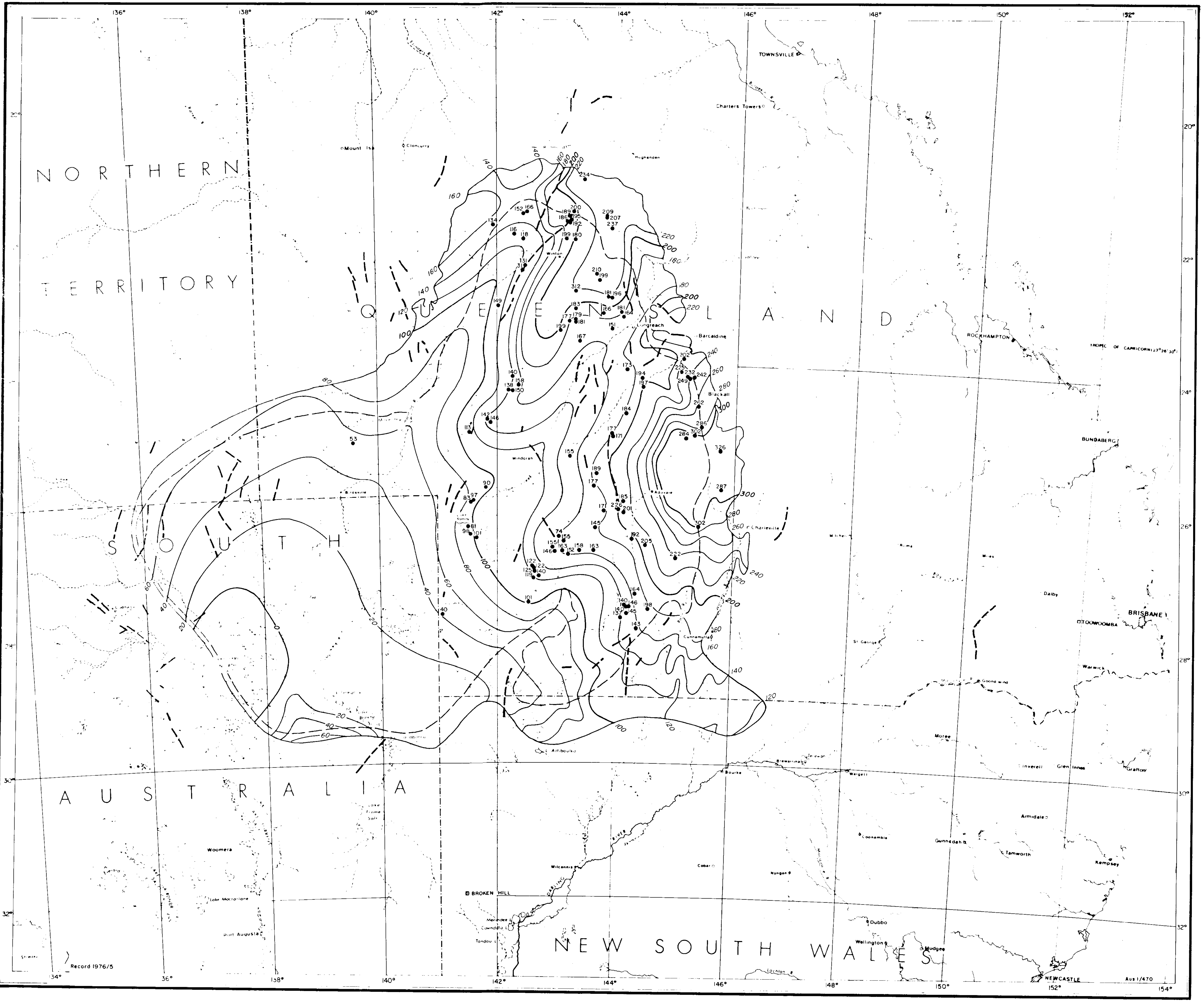
0 100 250km

Scale 1 5 000 000



Lake, perennial
Lake, intermittent
River, perennial
River, intermittent
Town
State boundary
Fault
165 Head in metres, datum mean sea level
Waterwell
—100— Isopotential line

PLATE 15



GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CONFINED AQUIFER 1

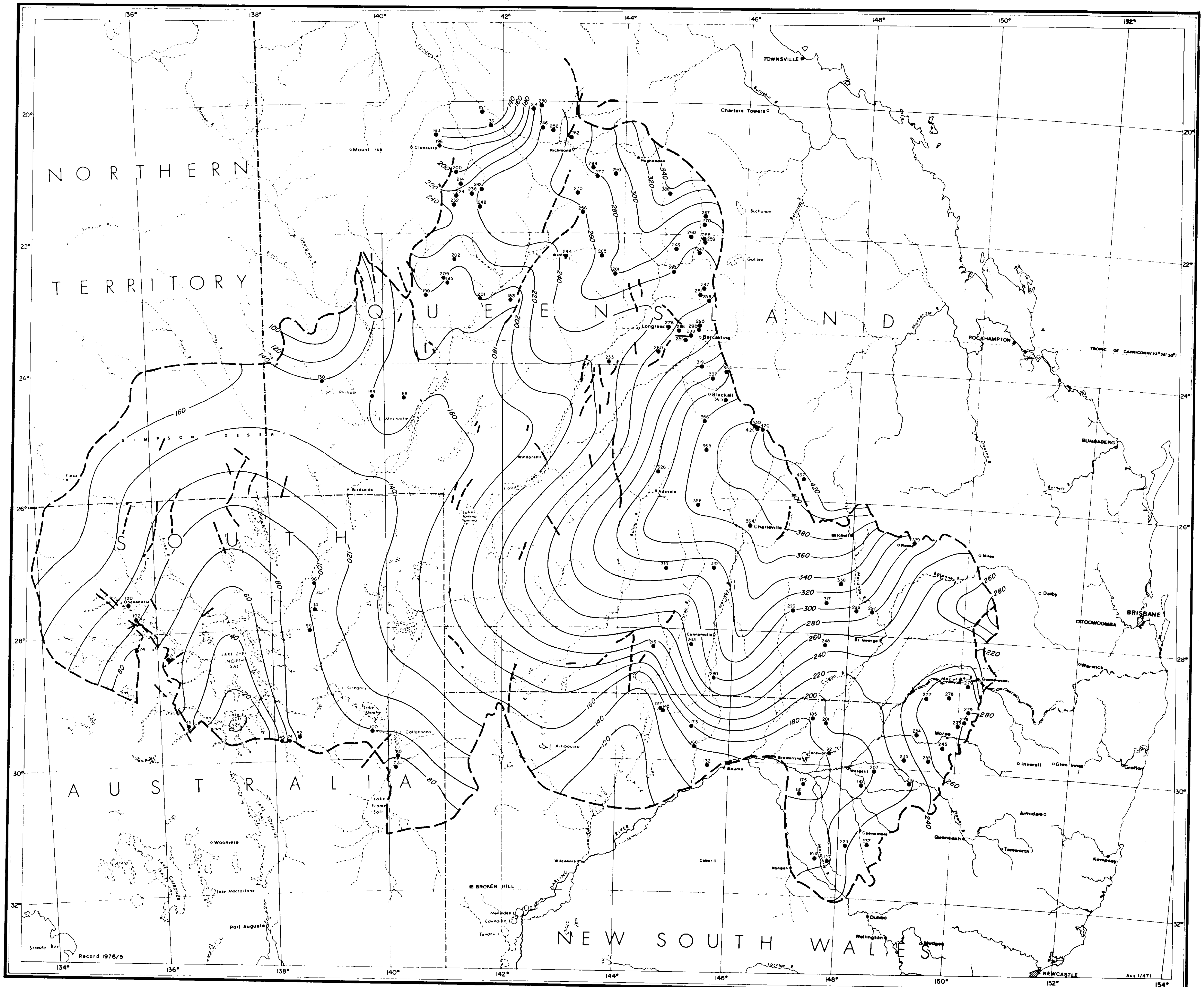
Potentiometric surface 1900

Scale 1 5 000 000

- Lake, perennial
- Lake, intermittent
- River, perennial
- River, intermittent
- Town
- State boundary
- Fault
- Boundary between confined aquifer 1 and confining bed 2
- Boundary between confined aquifer 1 and confining bed 1
- 150 Head in metres, datum mean sea level
- Waterwell
- —20— Isopotential line

PLATE 16

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

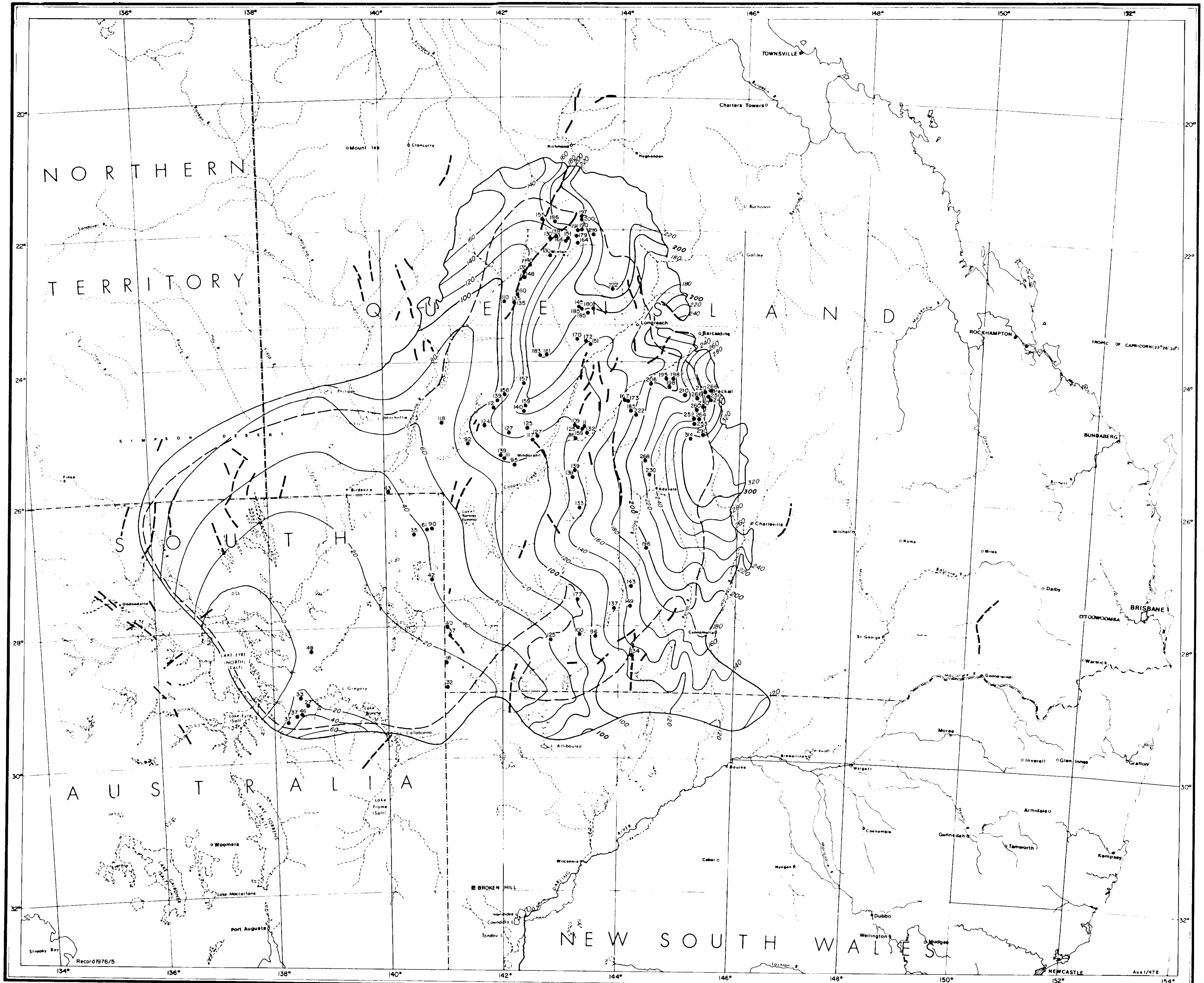


CONFINED AQUIFER 2
Potentiometric surface 1900

0 100 250km
Scale 1 5 000 000

Lake, perennial
Lake, intermittent
River, perennial
River, intermittent
Town
State boundary
Fault
Boundary between confined aquifer 2 and confining bed 2
150 Head in metres, datum mean sea level
Waterwell
—60— Isopotential line

PLATE 17



GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY

CONFINED AQUIFER 1

Potentiometric surface 1970

0 100 250km

Scale 1 5 000 000

Lake, perennial

Lake, intermittent

River, perennial

River, intermittent

Town

State boundary

Fault

Boundary between confined aquifer 1 and confining bed 2

Boundary between confined aquifer 1 and confining bed 1

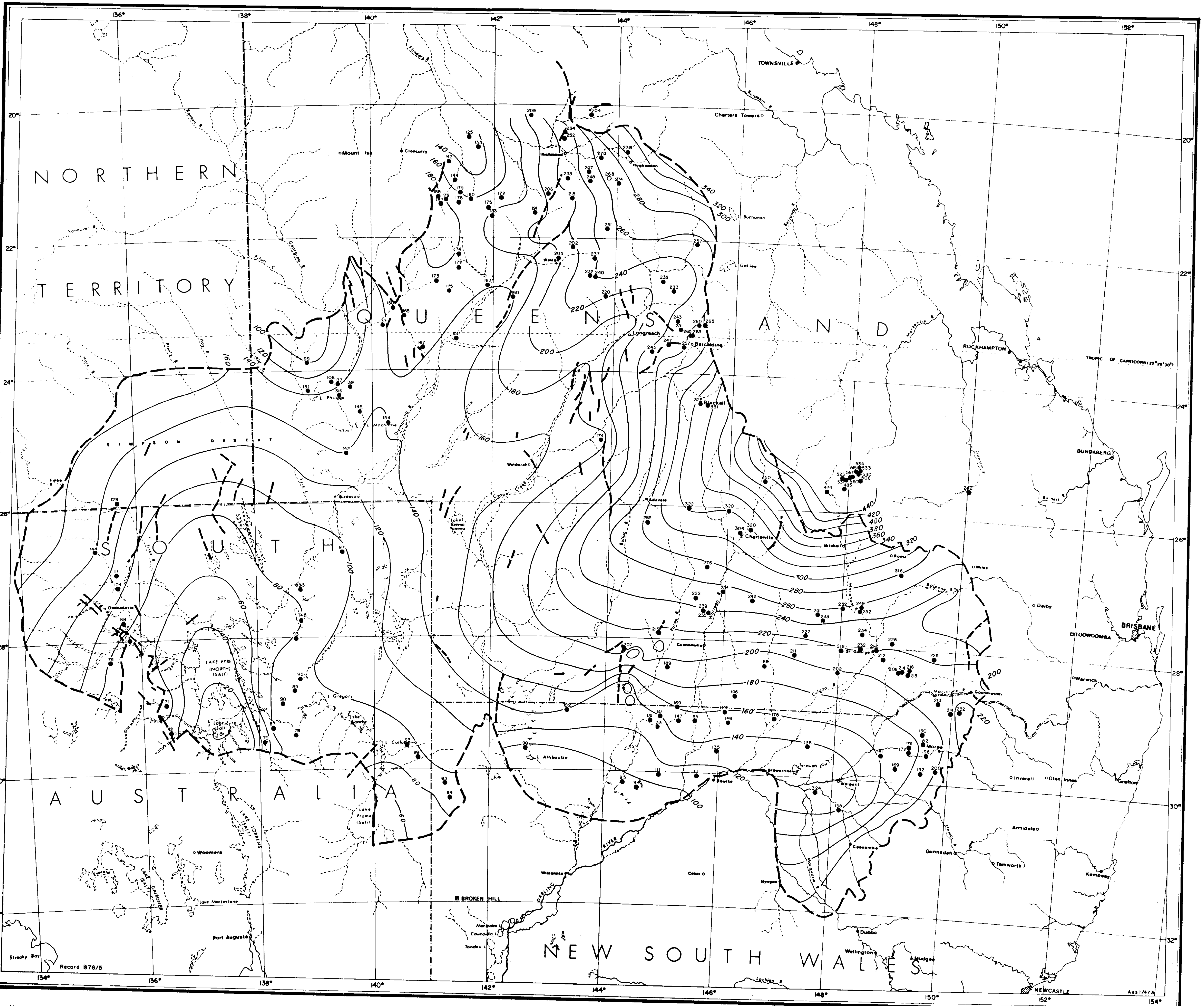
·50 Head in metres, datum mean sea level

● Waterwell

—20— Isopotential line

PLATE 18

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY



CONFINED AQUIFER 2
Potentiometric surface 1970

0 100 250km

Scale 1:5 000 000

Lake, perennial

Lake, intermittent

River, perennial

River, intermittent

Town

State boundary

Fault

Boundary between confined aquifer 2 and confining bed 2

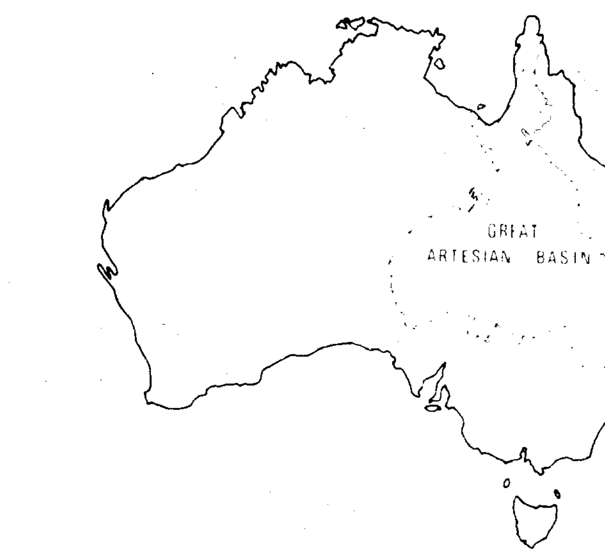
150 Head in metres, datum mean sea level

• Waterwell

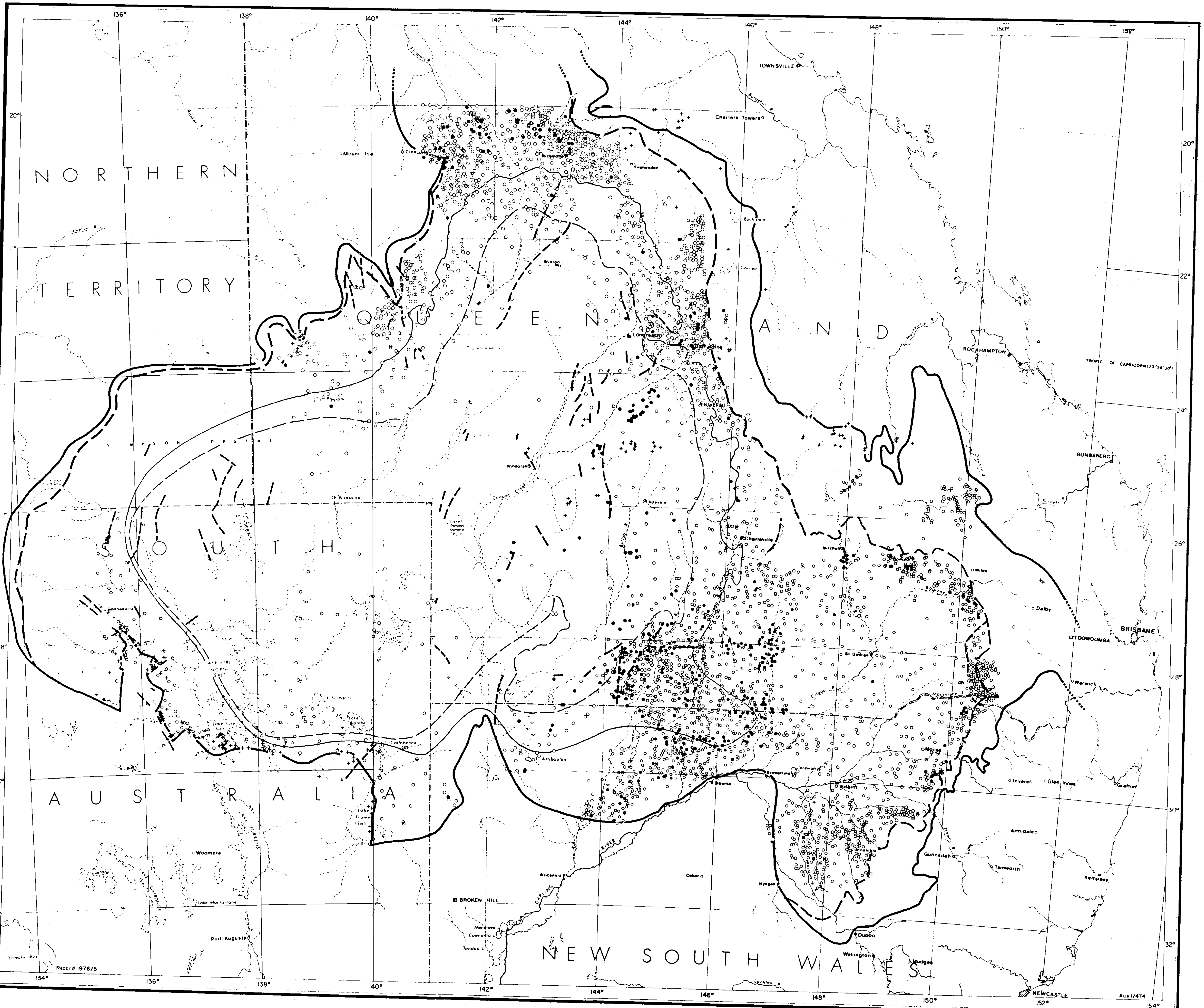
—60— Isopotential line

PLATE 19

GREAT ARTESIAN BASIN HYDROGEOLOGICAL STUDY



SPRINGS AND WATERWELLS



Lake, perennial
Lake, intermittent
River, perennial
River, intermittent
Town
State boundary
Fault
Boundary between confined aquifer 1 and confining bed 1
Boundary between confined aquifer 1 and confining bed 2
Boundary between confined aquifer 2 and confining bed 2
Boundary between confined aquifer 2 and hydrogeological basement
Spring
Waterwell tapping confined aquifer 1
Waterwell tapping confined aquifer 2

PLATE 20