DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 80/32

HUNDRED OF NARACOORTE
WATER WELL SURVEY

GEOLOGICAL SURVEY

ENGINEERING DIVISION

By

D.R. LANG

MAY, 1980.

Eng. No. 77/67
D.M. No. 327/75

CONTENTS

FIGURES

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept. Bk. No. 80/32
D.M. No. 327/75
Eng. No. 77/67

HUNDRED OF NARACOORTE
WATER WELL SURVEY

ABSTRACT

As part of groundwater investigations in the South East of South Australia, a water well survey was carried out to upgrade existing data and collect new information. Out of a total of 930 recorded wells about 550 were visited.

Most groundwater throughout the area is extracted from a shallow unconfined aquifer. Supplies up to 9 000 kl/day are obtained with salinities ranging between 400 - 9 000 mg/l. Groundwater is used for irrigation of pasture grasses, stock and domestic supplies.

A deeper confined aquifer has been used so far only for supplying Naracoorte town with potable water. The two aquifers are separated by a confining bed of lignitic clays.

Groundwater pollution is suspected to be occurring at the Naracoorte Saleyards and other potential sources of groundwater pollution are the E. & W.S. Department Sewage Treatment Works, the municipal refuse tip, and numerous drainage wells throughout the area. Pollution monitoring at the Saleyards and the Sewage Treatment Works is being carried out by the E. & W.S. Department.

INTRODUCTION

The Hundred of Naracoorte is situated 350 km south-east of Adelaide (Fig. 1) and includes the township of Naracoorte.

As part of groundwater investigations in the South East of South Australia, a water well survey was carried out between January 1978 and February 1979 to upgrade and collect new information. Field work was undertaken by all field staff at the Naracoorte office including some staff from the drilling section.

A survey of the township and environs was carried out during May and June 1976 and is subject of a separate report (Wilksch, 1976).

PHYSIOGRAPHY

Topography

The area to the west of the township is predominantly flat (Naracoorte Plains) with frequent depressed areas containing numerous ephemeral lakes, some of which are salty. Two north-west-trending dune ranges (the Naracoorte East and West Ranges) are located in the eastern part of the Hundred, between which the Caves Valley occurs. Elevations range from 60 metres above sea level on the plain to 100 metres in the Naracoorte Range.

Surface Hydrology

The main source of surface drainage is the Naracoorte Creek which enters the Hundred in the northeast and passes through the dune ranges in the northern section of Naracoorte to Lake Ormerod in the west. Man-made drains, in conjunction with a natural water course, drain low lying areas across the plains and east of Naracoorte. There are small perennial springs along Caves Valley from which there is flow northward along the valley. The creek in its natural state was ephemeral but since construction of the drains flow is perennial. There are no gauging stations along any of the drains or the creek.

Climate

The area covered by the survey has a Mediterranean type climate of cold and wet winters and hot, dry summers. The average annual rainfall measured at the Naracoorte Post Office is 584 mm. Rainfall statistics for Naracoorte township are presented in Fig. 2.

Vegetation

The surveyed area has been generally cleared for stock grazing with small areas along the dune ranges remaining as natural scrub containing eucalypts, banksias and bracken fern. Large areas of irrigated pasture grasses occur on the plains.

LAND USE

Sheep and cattle grazing is predominant throughout the area with some areas being used alternatively to grow grain crops. Several dairies occur northeast of the township and a small area of pine trees is grown in the southeast corner of the Hundred.

Approximately 10% of the plains are used for flood irrigation of pasture grasses.

GEOLOGY

Sediments occurring in the area are Tertiary - Quaternary in age with a total thickness of approximately 250 metres. The younger sediments (Quaternary) occur mainly on the plains and within the Naracoorte Range. They consist of sand, clay, silt and marl associated with swamp deposits. Limestone and marl equivalent to the Padthaway Formation are also known to occur. The ranges are comprised of partly cemented sands (Bridgewater Formation).

Tertiary sediments consisting of sands (Parilla Sands) and fossiliferous limestone (Gambier Limestone) do not outcrop west of the Naracoorte Range but occur at or close to the surface east of the Kanawinka Fault. The latter trends in a north-westerly direction through Naracoorte.

Deeper Tertiary sediments consist of lignitic clays and underlying silty sands.

HYDROGEOLOGY

Aquifers

Groundwater occurs in two aquifers throughout the area.

1. Unconfined Aquifer

Most groundwater used throughout the hundred is extracted from an unconfined aquifer from which yields of up to 9 000 kl/day are obtained. This aquifer may contain up to four units (Fig. 3):-

i) Bridgewater Formation: an aeolian limestone with a thickness varying from 5 - 30 metres.

ii) Padthaway Formation: a limestone and marl aquifer varying between 6 - 10 metres occurring in the Naracoorte Plains and in Caves Valley.

iii) Parilla Sands: a silty quartz sand up to 10 metres thick,

iv) Gambier Limestone: a white to yellow fossiliferous limestone, varying between 60 - 90 metres thick,

2. Confined Aquifer

This aquifer consists of a silty quartz sand 12 - 27 metres thick, occurring at a depth of about 130 metres and separated from the unconfined aquifer by a confining bed of black lignitic clays. Only town water supply wells and Dept. of Mines and Energy observation wells intersect this aquifer. Town water supplies are extracted from this aquifer because it is free of pollution. The pollution potential is very low due to the thickness of the overlying confining bed (up to 70 m).

Standing Water Levels

The water levels in the unconfined aquifer range from 0.4 m to 32 m. On the plains most water levels are less than 7 m, but in the ranges water levels are up to 32 m from the surface.

Potentiometric levels for the confined aquifer (where known) are below those in the unconfined aquifer.

Salinities

Salinities in the unconfined aquifer vary between 400 - 9 000 mg/l with an average of approximately 1 600 mg/l. Confined aquifer salinities range between 1 200 - 1 600 mg/l.

WELL CONSTRUCTION AND EQUIPMENT

Most drilled wells are cased with galvanised fluming or steel casing, with later wells being cased with PVC casing. A few older wells were hand dug and lined with stone (Chinaman wells) or timber but most are unlined. Most wells are equipped with windmills, while a few domestic wells have either submersible or small centrifugal pumps. The irrigation wells are equipped with either large centrifugal or turbine pumps.

WELL USE

A total of 934 wells are recorded in the Hundred of Naracoorte and about 550 of these were visited during the survey. Approximately half of the wells are used for stock purposes (Table 1).

STATUS	NO. OF WELLS
Stock	348
Irrigation	75
Unknown	73
Firefighting	1
Backfilled	24
Unequipped	69
Not in use	58
Domestic	85
Stock and Irrigation	42
Town Water Supplies	7
Drainage	15
Dry hole	7
Industrial	2
Engineering Investigations	10
Hydrogeological Observations	19
Waste Disposal	1
Stock and Domestic	63
Domestic and Irrigation	1
General	6
Abandoned	28
	TOTAL - 934

TABLE 1. Number and Status of Wells

POLLUTION POTENTIAL

The main potential source of groundwater pollution is from effluent disposal lagoons at the Naracoorte Saleyards, east of Naracoorte. Wastes from concrete holding pens are washed into a catchment pit from where the waste water gravitates into aerobic and anaerobic disposal lagoons. The effluent from these lagoons is then pumped into an old quarry west of the saleyards from where it is used for limited flood irrigation.

Effluent in the old quarry is in direct contact with highly permeable Gambier Limestone and the risk of contamination is considered to be high. Pollution monitoring has continued since 1977 (Lang, 1977) and a detailed report is in progress.

Treated water from the Engineering and Water Supply Department Sewage works, west of Naracoorte, is discharged into a small lake from where it is subjected to evaporation and downward percolation through the soil profile. Overflow from this lake passes into the Naracoorte Creek. Monitoring of the treated water is carried out by the E. & W.S. Department on a regular basis.

Other potential sources of groundwater pollution are:-

1) the municipal refuse tip which is in an abandoned quarry in the Naracoorte East Range and about 3 km south-east of the township. The effect of any groundwater pollution to domestic and stock wells down gradient of the refuse tip is not known and no investigations have been carried out.
2) numerous drainage wells which occur throughout the whole area, for the disposal of stormwater runoff
3) poorly constructed wells into the confined aquifer.

WELL DATA

All the information collected during the survey was compiled for the bore general file and well locations (Fig. 4) are plotted on either 1:50 000 cadastral plans or 1:10 000 enlargements.

DL:NK

D. LANG
FIELD ASSISTANT

GROUNDWATER & ENGINEERING SECTION

REFERENCES

LANG, D.R., 1977. Naracoorte Saleyards and Abattoir Pollution Monitoring Progress Report No. 1. S.A. Dept. Mines and Energy. Rept. Bk. 77/60 (unpublished).

WILKSCH, D.R., 1976. S.E. Township Well Surveys No. 1 Naracoorte, S.A. Dept. Mines Rept. Bk. 76/141 (unpublished).

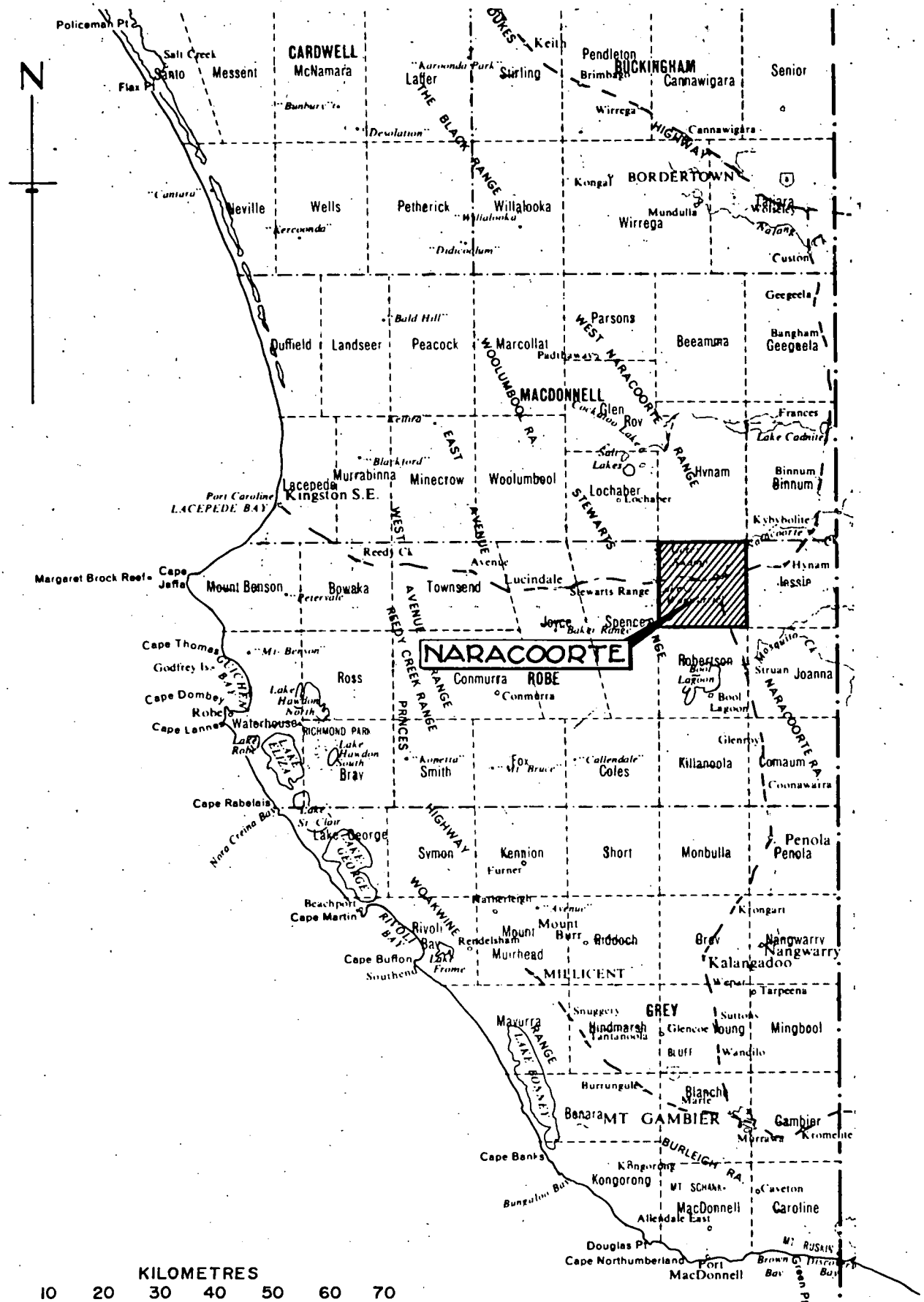
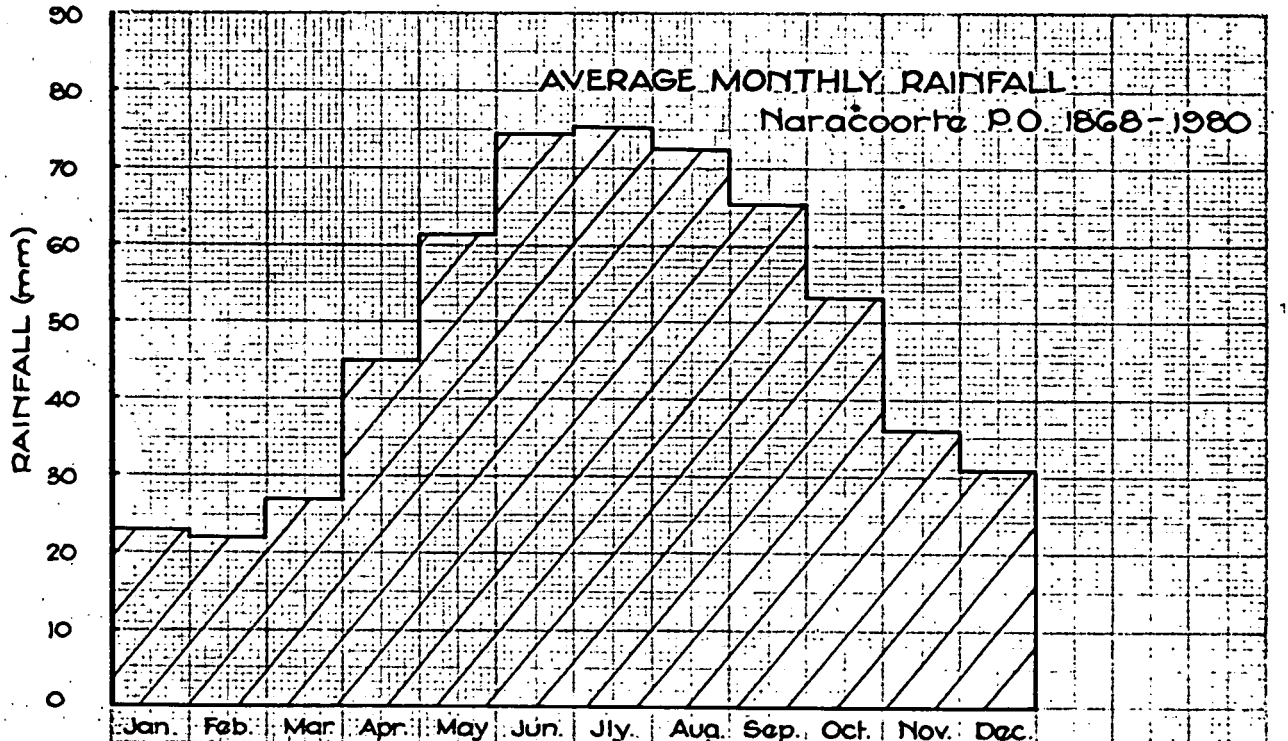


Figure.... 1.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	Scale : 1:1000,000
Compiled : D. LANG	HD. NARACOORTE WATER WELL SURVEY	Date : May '80
Drn. C.J.W. Ckd.	LOCALITY PLAN	Drg. No. S14844
MR.		

1864



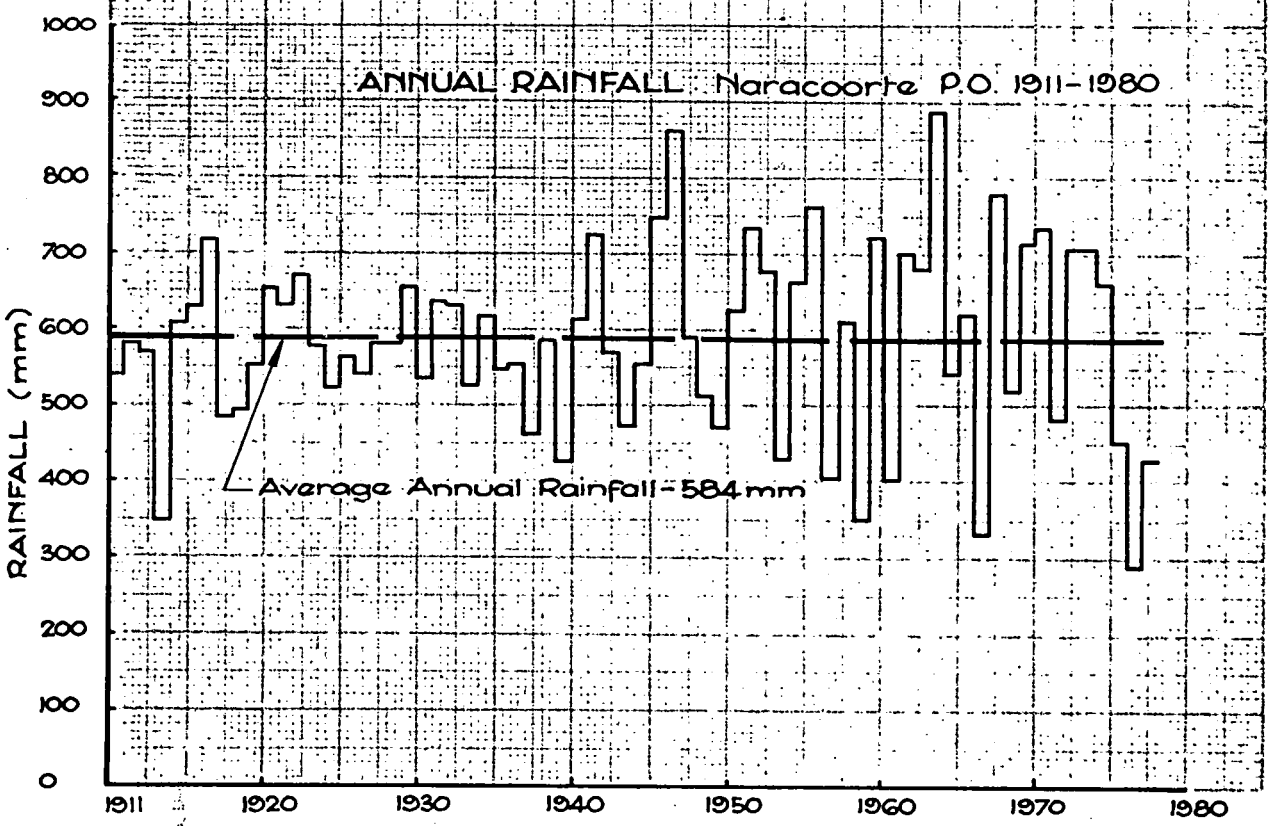
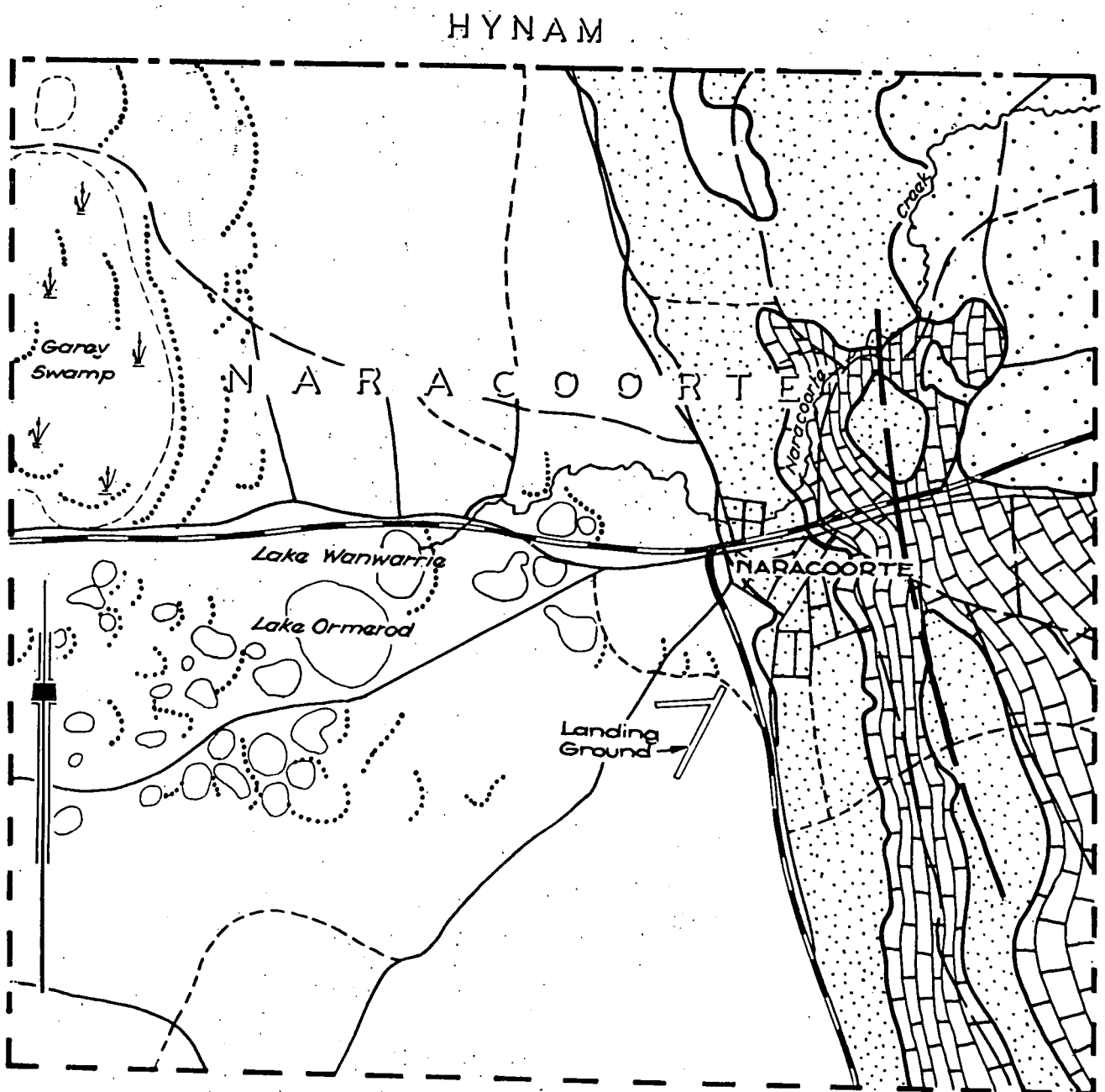


Figure..... 2.

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE
COMPILED D. LANG	HD. NARACOORTE WATER WELL SURVEY	DATE May '80
DRN C.J.W. CKD	RAINFALL STATISTICS NARACOORTE P.O.	PLAN NUMBER S14845.

1864



REFERENCE

Interdunal swamp, marsh, lunette and lake deposits of clay, marl and silt.

BRIDGEWATER FORMATION. Stranded coastal dunes, beach ridges and beach deposits.

PARILLA SAND. Predominantly a red brown medium grained quartz

GAMBIER LIMESTONE. White to cream yellow coquinitic bryozoal limestone.

Fault.....
Railway.....
Main Road.....
Secondary Road.....
Track.....
Lake.....
Swamp.....

SCALE

2 0 2 4 6

Kilometres

Figure.... 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

COMPILED D. LANG	WR C.D.O. 23·6·80 DATE
DRAWN C.J.W.	SCALE 1:100,000
DATE May '80	PLAN NUMBER 514846.
CHECKED	

HD. NARACOORTE WATER WELL SURVEY

GENERALISED GEOLOGY

1864

COMPILED A.F.W.

DRN C.J.W. CKD

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

HD. NARACOORTE WATER WELL SURVEY

GEOLOGICAL SECTION

NARACOORTE AREA

SCALE

DATE 17-8-78

PLAN NUMBER
5 14847.

Note: Taken from Report Book 78/41.

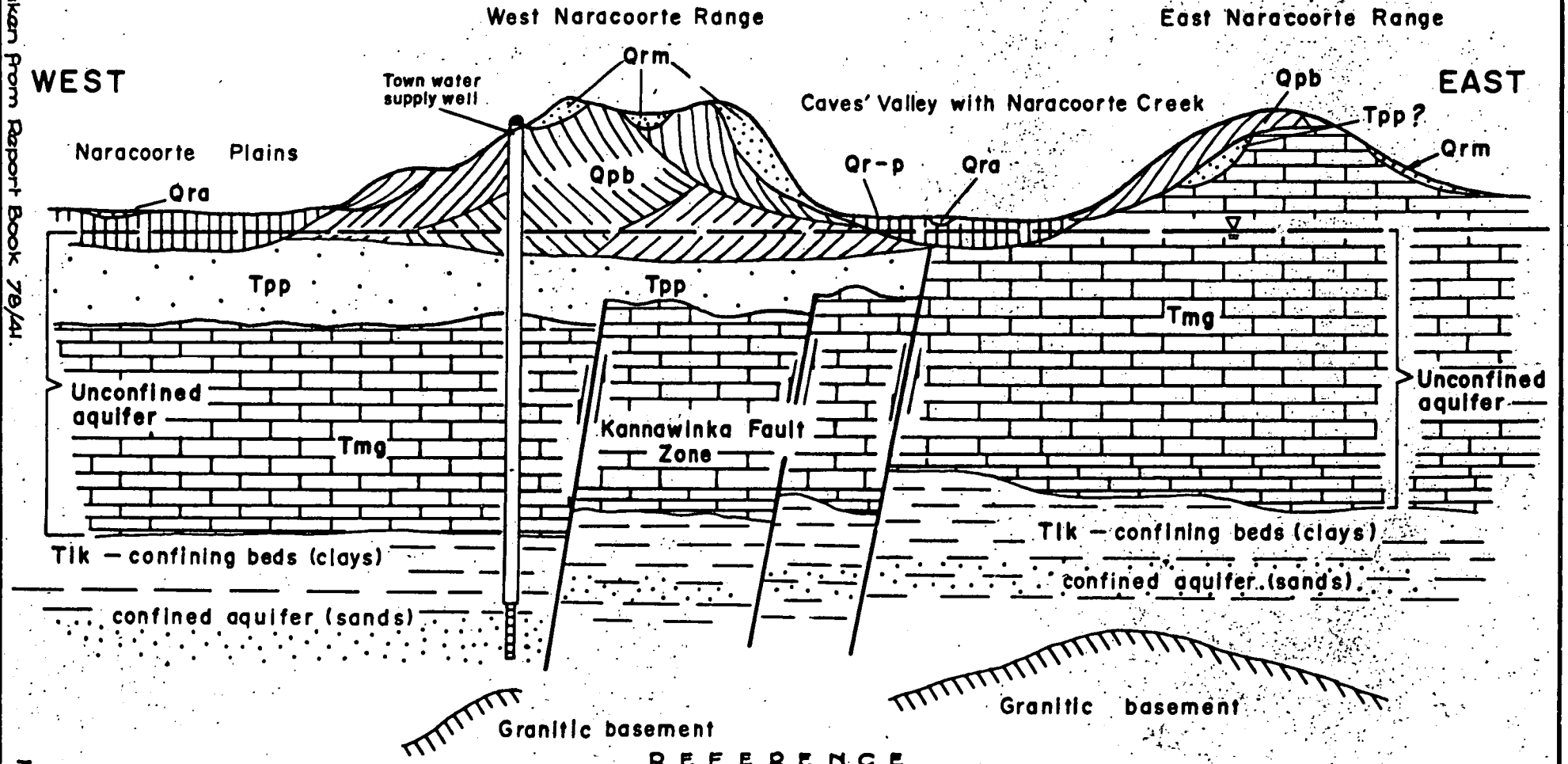


Figure 4.

REFERENCE

Qra	Lake, creek alluvium – sands and clays, some evaporative deposits in salt lakes.
Qrm	Molineaux Sand – Fine to medium quartz sands. Unconsolidated dunes and sheets
Qr-p	Padthaway Formation – Limestones and clays of interdunal flats.
Qpb	Bridgewater Formation – Cemented calcareous sand dunes. – stranded beach ridges
Tpp	Parilla Sand – Sands and clays ferruginous – weakly cemented
Tmg	Gambier Limestone – cemented fossiliferous limestone and marl at depth.

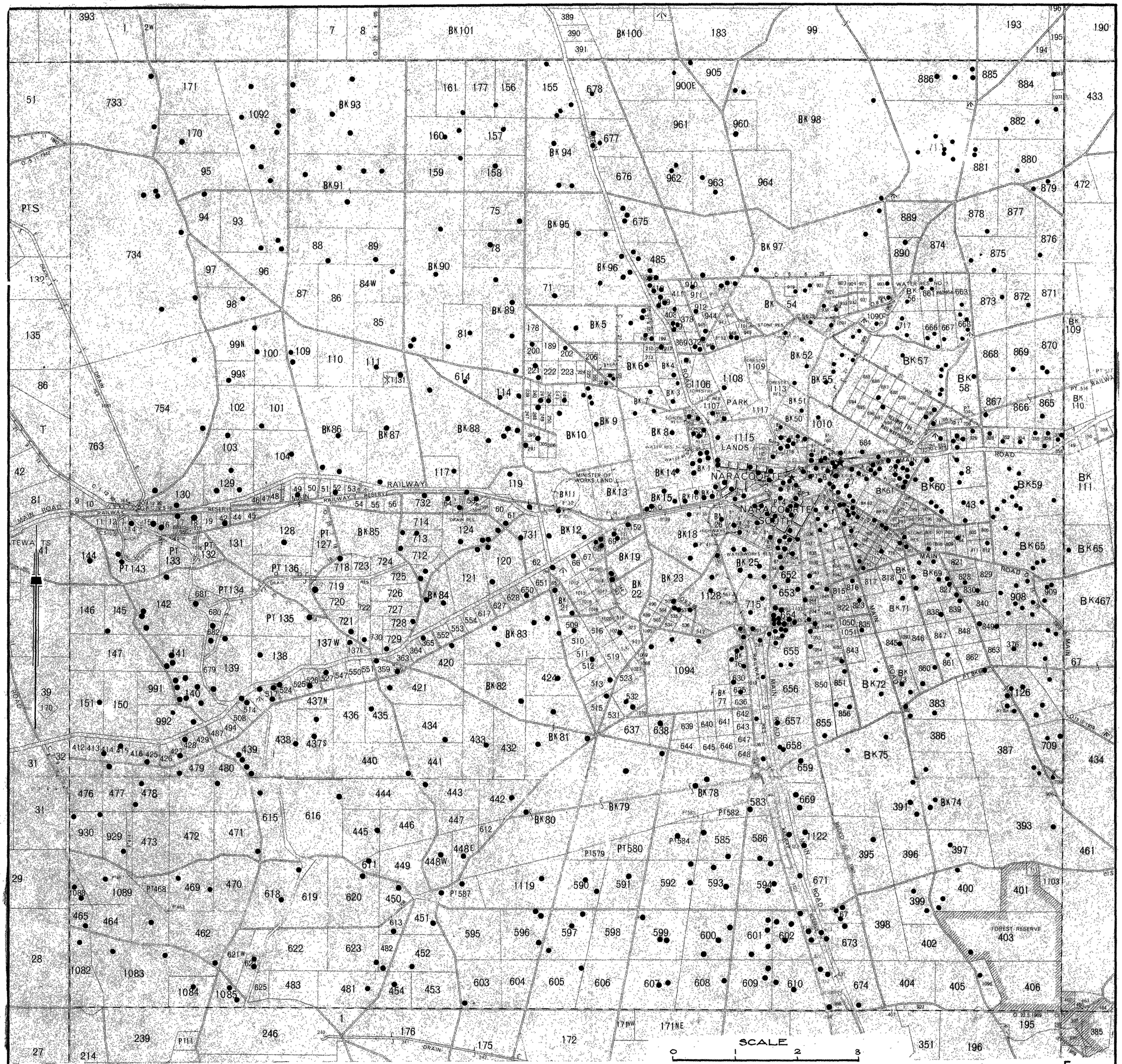


Figure.... 5.

REFERENCE

Well.....

For well unit numbers and accurate well locations see metric scale well locations plans held in Drawing Office file

1864

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

HD. NARACOORTE WATER WELL SURVEY

WELL LOCATION PLAN

COMPILED D. LANG	C.D.O. 23·6·80 DATE
DRAWN C.J.W.	SCALE 1:50,000
DATE May '80	PLAN NUMBER 80-306
CHECKED	