DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
ENGINEERING DIVISION

# GROUNDWATER POTENTIAL FOR IRRIGATION IN THE NORTH PARA RIVER CATCHMENT

by

M.A. COBB
GEOLOGIST II
GROUNDWATER SECTION

Rept.Bk.No. 76/101
G.S. No. 5774
Hyd. No. 2741
D.M. No. 562/75

CONTENTS



TABLES



PLANS

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 76/101
G.S. No. 5774
Hyd. No. 2741
D.M. No. 562/75

# GROUNDWATER POTENTIAL FOR IRRIGATION IN THE NORTH PARA RIVER CATCHMENT


## ABSTRACT

Groundwater suitable for the irrigation of vines is found in the sediments of the Barossa Valley south of the North Para River. Similar resources can be obtained from selected units in the surrounding hard rocks.

No reasonable estimate of the total available resources can be made at present but an evaluation programme in progress is planned to be completed by the end of 1978.


## INTRODUCTION

Settlement of the Barossa Valley commenced in 1836 and since that date the area has developed into one of the country's most important wine producing areas. The area planted to vines is still increasing with a parallel increase in the development of the water resources both surface and underground. Irrigation of vines and other crops, notably vegetables, is made possible by exploitation of groundwater by way of wells.

The Department of Agriculture and Fisheries is in the process of preparing an inventory of the soil and water resources, and horticultural industries, in an area defined as the catchment of the North Para River upstream from Lyndoch. This Department has been asked to provide information on the groundwater resources of the area including areas available for future exploitation.

Since the report by Chugg (1955) no systematic work on groundwater in the Barossa region has been undertaken. His report was basically a collation of all data on bores and wells in the area, an initial interpretation of the geology and hence aquifer systems, and some comments on areas where additional groundwater could be withdrawn. This Department is at present in the early stages of a hydrogeological study of the Barossa Valley region and it is not yet possible to satisfactorily quantify the groundwater resources of the areas.

This report is intended to summarise existing data and to make some general comments on the potential for additional irrigation of vines etc.

## GEOLOGY AND HYDROGEOLOGY

The area in question can be subdivided naturally into two different geological and hence hydrogeological regions. The first is a sequence of Tertiary to Recent unconsolidated sediments which make up the Barossa Valley proper and underlie the larger drainage lines. The second is the much older Adelaidean and Hawker/Kanmantoo Groups basement (hard) rocks which underlie and surround the younger sediments.

The former are the most important aquifer system and their properties are relatively uniform over a reasonable area. The aquifer characteristics of the hard rocks are much more erratic, though well construction and development is, in general, much simpler.

A summary of the major geological and hydrogeological units is given in Table 1 and a simplified geological plan in Figure 2.

## 1. Barossa Valley Sedimentation and other post-Adelaidean sediments

The Barossa Valley is an asymetric sediment filled valley arcuate in plan surrounded by rocks of the Adelaide System and Hawker/Kanmantoo Groups. The maximum thickness of sediment is approximately 200 m close to the eastern margin.

Groundwater movement is to the south with discharge to surface drainage (North Para River) and to wells. Recharge is from the upper reaches of the North Para River and from scarp consequent streams. This is reflected in salinities which range from 400 to 500 mg/1 to over 14,000 mg/1 - the higher salinities being found north of the North Para River (Fig. 4), where the freshening effects of recharge from the River are non-existent (Herraman 1976).

Apart from shallow water table wells the two developed aquifers consist of an upper fine white sand most consistent in the Nuriootpa-Lights Pass region and secondly a series of basal coarse sands and gravels. These two aquifer systems have an average salinity of 1000-1200 mg/1. Well yields vary over a wide range reflecting such a variation in aquifer properties. Yields can vary from less than 0.1 litres per second (1/sec) to over 20 1/sec and values around 5-10 1/sec are common. As the aquifer material is unconsolidated, proper well construction is essential to prevent ingress of sand etc. into the well and more importantly the contamination of usable groundwater by overlying or underlying higher salinity water. Controls under the Water Resources Act, 1976 will ensure that future wells are properly constructed.

A similar sequence of Tertiary?-Recent sediments are found along present drainage lines in the Lyndoch-Williamstown area. Although this area is not in the catchment of the North Para above Lyndoch it is an important area for vine irrigation. Salinities suitable for irrigation are common (Fig. 3) and well yields similarly, so, e.g. 2.5-10 1/sec. (Herraman 1976).

Information available to date can be summarised as follows:-

(1) Water of a quality suitable for vine irrigation can be found throughout most of the Barossa Valley (sediments) south of the North Para River. Some areas of more saline water table groundwater overlie better quality semi-confined groundwater hence well construction becomes very important.

(2) An assessment of the safe yield of the Barossa Valley sediments is in an early stage. There is no evidence to suggest that water levels or potentiometric heads are falling or that any deterioration in quality is occurring.

(3) Well yields from bores constructed in the coarser unconsolidated sediments are in general suitable for drip, spray or furrow irrigation. To ensure the well is efficient for a maximum period proper completion in the aquifer is essential. This entails the installation and development of a properly designed sand screen. If this is not done then a reduction in supply or the collapse of the well is the end result.

(4) Present concentrated development is in the Nuriootpa-Lights Pass area. Until a safe yield determination is made it is difficult to indicate areas where additional exploitation can occur without deleterious effects.

However, the increased use of the deeper (basal) sands and gravels is to be anticipated.

(5) The sediment infilled valleys in the Lyndoch-Williamstown region provide an area where suitable groundwater is being developed. Additional exploitation for vine irrigation is to be expected.

2. The Hard Rock Areas

The Barossa Valley is underlain and surrounded by basement (hard) rocks of the Adelaide System. Groundwater is stored and transmitted in such rocks by means of fractures, that is secondary porosity and permeability is dominant and primary properties negligible or non-existent. The enlargement of fractures in the calcareous rocks (marble) by solution activity is of importance.

The extreme variability in rock types (mineralogy, chemical composition, competence) leads to a similar variability in groundwater salinity and well yields on a local scale. Hence only general statements can be made about the groundwater potential for a particular rock type (reference should be made to Fig. 2 for the distribution of these rock types). Individual exceptions will always be found in such hydrogeological environments.

(1) Adelaide System (Torrensian-Sturtian-Marinoan)

The normal rock types preclude these areas as actual and potential areas of groundwater suitable for vine irrigation. Quartzites, thin marbles, etc. within these sediments are often capable of yielding to individual wells water of suitable quality and of acceptable quantities for local irrigation. However it must be stressed that this is on the local scale only.

(2) Hawker/Kanmantoo Groups

In general the same comments as above can be made i.e. large scale vine irrigation is not generally feasible. The exception to this is where wells intersect the Cambrian marbles (e.g. Angaston Marble) where adequate supplies of suitable quality can often be developed (Fig. 2). Development of groundwater in the marbles northwest of the Barossa Valley is anticipated since the quality of the groundwater in the overlying sediments is unsuitable for vine irrigation.

## SUMMARY

Groundwater suitable in quality for vine irrigation is available in the Barossa Valley sediments, south of the North Para River. This groundwater is extensively developed for irrigation but additional development, particularly of the deepest aquifers, is to be anticipated. The volume of available groundwater resources is at present unknown, as a resource investigation is in its early stages.

The surrounding hard rock aquifers supply limited groundwater for irrigation. Individual wells or well groupings can supply suitable quality and quantity of groundwater depending on local rock type, recharge characteristics, etc. The greatest potential hard rock aquifers are the Cambrian marbles of which there has been little development to date.

M.A. COBB
GEOLOGIST II
GROUNDWATER SECTION

10th August, 1976

## REFERENCES

Chugg, R.I., 1955. The Hydrology of the Barossa Valley. Geol. Surv. S. Aust. Rept. Invest. 2.

Herraman, P.D., 1976. Barossa Valley Hydrogeological Investigation Progress Report No. 1. Field Survey, Hd. Barossa. S. Aust. Dept. Mines unpub. rept. R.B.76/20.

Herraman, P.D., 1976. Barossa Valley Hydrogeological Investigation, Progress Report No. 2. Field Survey, Hd. Belvidere. S. Aust. Dept. Mines unpub. rept. R.B. 76/103.

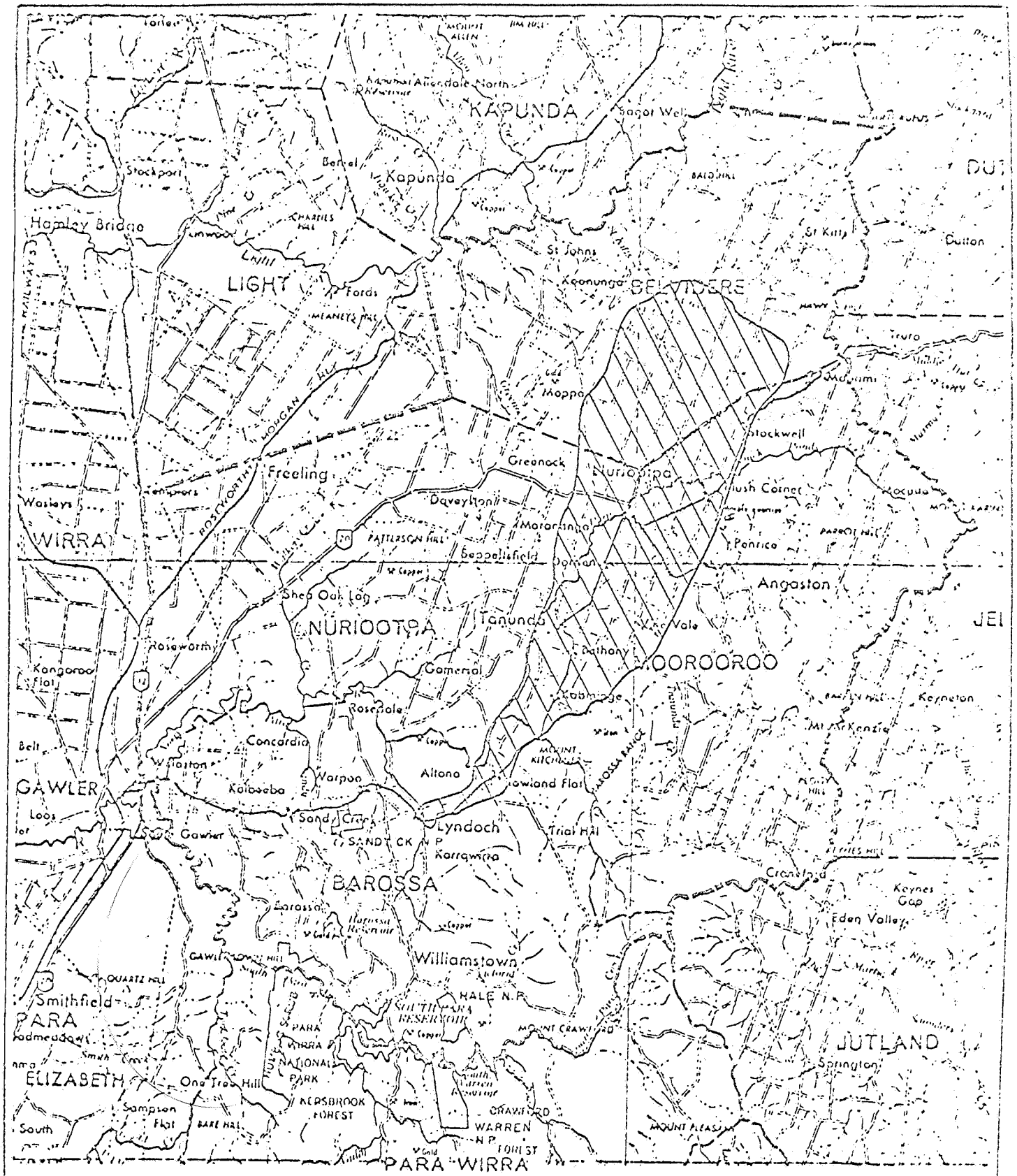
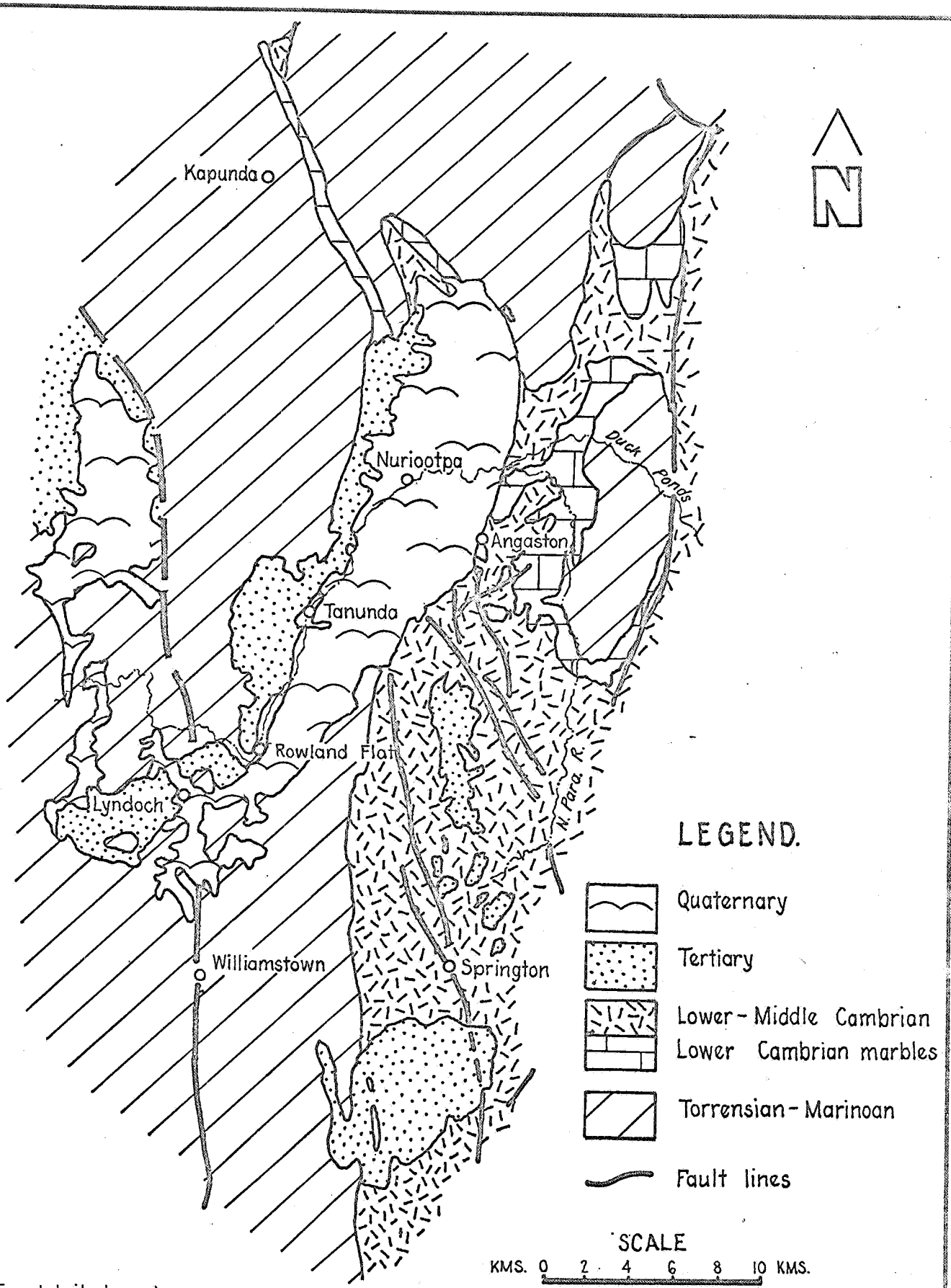



FIG. 1

| | | |
|---|---|---|
| | DEPARTMENT OF MINES - SOUTH AUSTRALIA | Scale: 1:250 000 |
| Compiled: M.A.C. | BAROSSA VALLEY HYDROGEOLOGICAL INVESTIGATION | Date: 26 July 1973 |
| Drn A.F. \| Ckd. | HDS. BELVIDERE, MOOROOROO, NURIOOTPA, BAROSSA | Drg No S10400 GH |
| | LOCALITY PLAN | |



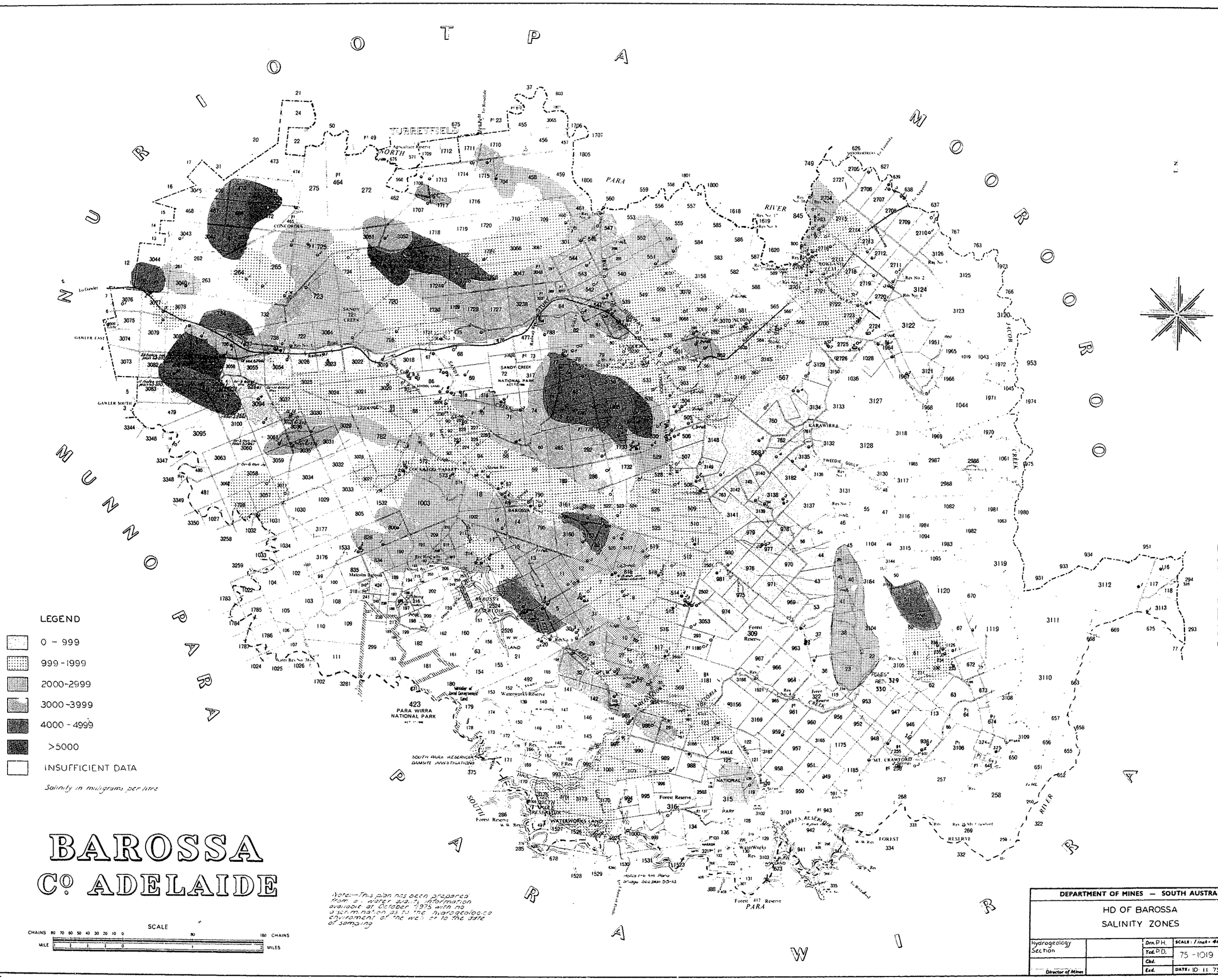

For detailed geology see
Adelaide 1:250000 geological plan.

FIG. 2

| | DEPARTMENT OF MINES — SOUTH AUSTRALIA | Scale : 1:250000 |
|---|---|---|
| Compiled : M. Cobb | BAROSSA VALLEY GENERALIZED GEOLOGY | Date : 29th July 1976 |
| Drn. T.E. \| Ckd | | Drg. No. S 12292. |

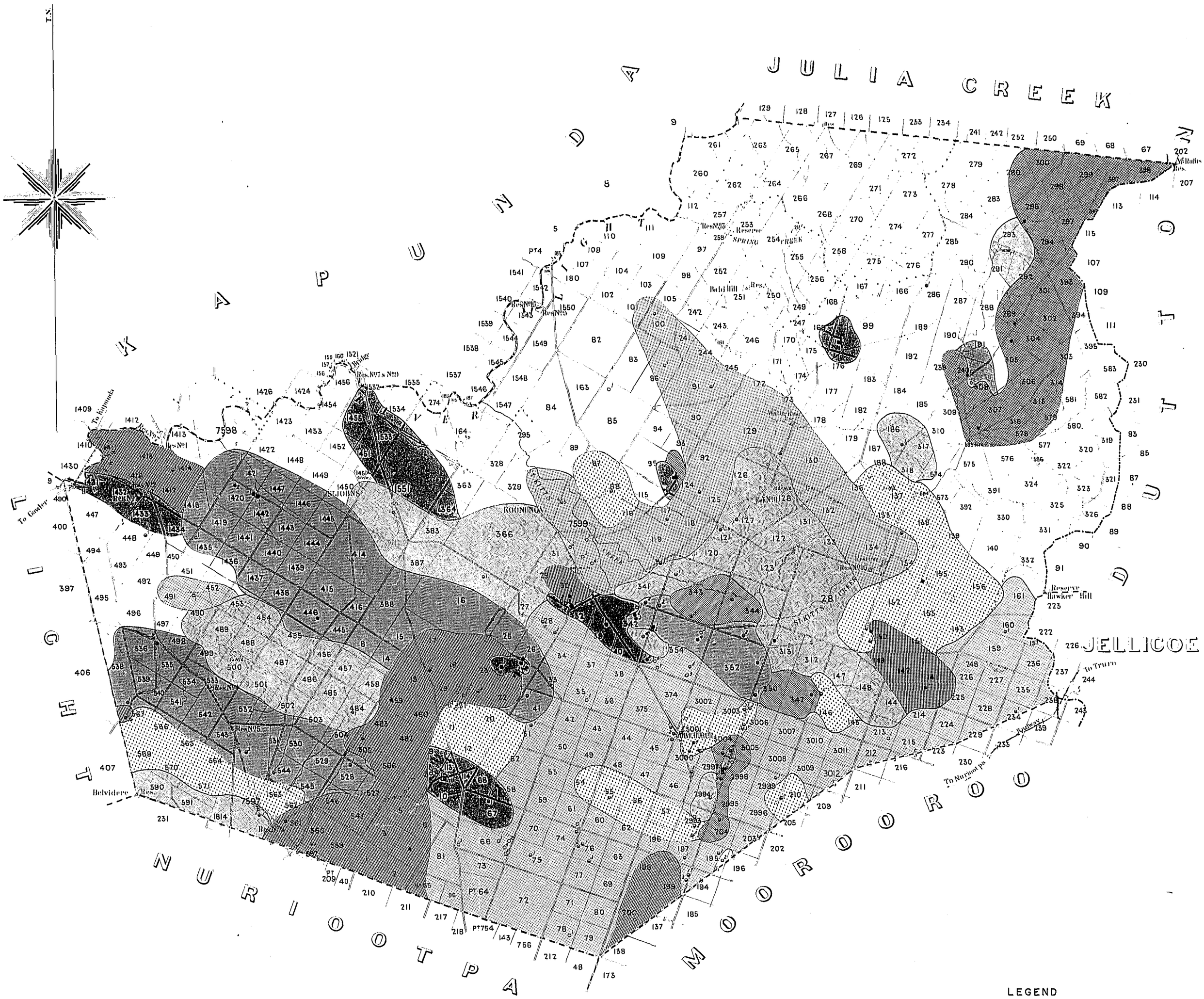
750—8.74 F332 O

GB28-1, 6728, IV, 6629-II, 6729


NURIOOTPA
MOOROOROO
MUNNO PARA
PARA WIRRA
JUTLAND
TURRETFIELD
NORTH
PARA
RIVER
SANDY CREEK
NATIONAL PARK
GAWLER EAST
GAWLER SOUTH
CONCORDIA
LARAWIRRA
TWEEDIE GULLY
JACOB CREEK
BAROSSA RESERVOIR
SOUTH PARA RESERVOIR
PARA WIRRA NATIONAL PARK
MT. CRAWFORD FOREST RESERVE
SOUTH PARA
PARA
LEGEND
0 - 999
999 - 1999
2000-2999
3000-3999
4000 - 4999
>5000
INSUFFICIENT DATA
Salinity in milligrams per litre
BAROSSA
Co ADELAIDE
SCALE
CHAINS 80 70 60 50 40 30 20 10 0 80 160 CHAINS
MILE 1 0 1 2 MILES
Note:—This plan has been prepared from all water analysis information available at October 1975 with no examination as to the hydrogeological environment of the well or to the date of sampling.
DEPARTMENT OF MINES — SOUTH AUSTRALIA
HD OF BAROSSA
SALINITY ZONES
Hydrogeology Section
Director of Mines
Drn. P.H.
Tcd. P.D.
Ckd.
Esd.
SCALE: 1 inch = 40 chains
75 - 1019
DATE: 10 11 75

6628-I.

# BELVIDERE
## Cº LIGHT




LEGEND

- 1–999
- 1000–1999
- 2000–2999
- 3000–3999
- 4000–4999
- >5000
- Insufficient data

NOTE: This plan has been prepared from all salinity analysis available at March 1976 with no discrimination as to the hydrogeological enviroment of the well or to the date of the analysis.

SCALE
1:31,680 or 40 CHAINS TO 1 INCH

CHAINS 80 40 0 1 2 MILES
METRES 1000 500 0 1 2 3 4 5 KILOMETRES

FIG. 6

DEPARTMENT OF MINES — SOUTH AUSTRALIA

HUNDRED OF BELVIDERE
APPROXIMATE SALINITY ZONES

| | | | |
|---|---|---|---|
| | | Drn. P.H. | SCALE: 1:31,680 |
| | | Tcd. G.J.T. | 76–442 |
| | | Ckd. | |
| Director of Mines | | Exd. | DATE: |

BELVIDERE 72-298 GK6