DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 64/51
G.S. No. 3661
Hyd. No. 1871
D.M. 198/67

COUNTY MUSGRAVE GROUNDWATER INVESTIGATION

PROGRESS REPORT FOR PERIOD ENDING 31ST DECEMBER, 1966

Co. Musgrave

COUNTY MUSGRAVE

Polda Basin

Pumping from the trench at Polda was recommenced by the E. & W.S. Department during October. Static water levels recorded in observation bores in the vicinity of the trench during early November shows that the piezometric surface was about one foot below the recorded level for the same period last year. About three and a half inches of rain were recorded in the area towards the end of November. The water levels of observation holes in the vicinity of the trench rose about one foot within a week, even though pumping from the trench was continued at the same rate throughout the period. Away from the trench the rise in water levels was about six inches or less, but in general, a higher level was maintained throughout December. This may indicate that recharge was localised to a small area. In the immediate vicinity of the trench area the rise in water levels was almost instantly.

The attached map of County Musgrave area shows amended salinity zones to conform with the introduced new presentation of water analyses. Prior to June, 1966, all full analyses showed the carbonate content expressed as carbonate. After that date they have been expressed as bicarbonate. Correcting the previous analyses for bicarbonates yields higher salinities. For example, the water intersected in observation bore twelve in the Hundred of Squire showed a total salinity of 958 parts per million

containing 147 parts per million carbonate ion (CO_3)". Conversion yields 1,110 parts per million total dissolved salts and 299 parts per million of bicarbonate ion (HCO^1_3).

The area within the 1,000 parts per million isohalsine is slightly smaller than that shown in the previous maps. In the Polda Basin this difference is very slight, while in other areas of County Musgrave it becomes significant.

Hundreds of Ward and Talia

General

One drilling plant completed eight boreholes during the period. Three of these boreholes were drilled south of Bramfield in the Hundred of Ward, while the remainder were drilled in the Hundred of Talia. A total of 474 observation bores has now been completed on a rough grid pattern in County Musgrave. An additional six large diameter boreholes, together with a further 40 observation bores, were completed for pump test purposes. Most of the bores were five inches in diameter in which 2½ inch slotted water pipes were installed. The pump test bores were of 16 or 42 inch diameter. A total footage of more than 30,000 feet was drilled in the four and a half years since drilling commenced on 28th September, 1962. This completes the cable-tool rig programme. Future drilling of observation holes will be done with a rotary drilling plant.

HYDROGEOLOGY

Groundwater in the two most northerly of the eight boreholes drilled was of poor quality. The salinity content in borehole 474 is 2,400 parts per million. The six other boreholes intersected the shallow aeolianite aqifer, yielding ood quality water of less than 1,000 parts per million of total dissolved salts. Low salinity groundwater of 450 parts per million was

encountered in observation holes 470 and 471. It is reported that the aquifer appears to be highly permeable so that large supplies of groundwater probably could be obtained in this area.

The shallow aeolianite aquifer has been proved over a large area in the Hundreds of Kappawanta and Ward and to a small extent in the Hundred of Talia. Wherever the shallow aquifer is present the groundwater always contains less than 3,000 parts per million total dissolved salts.

Levelling of observation holes in County Musgrave is up to date, and a contour plan of the surface and a map showing the piezometric surface are attached. The piezometric surface map shows that there is an elongate high extending from the southern portion of the Hundred of Kappawanta to observation hole 401 on the eastern boundary of this Hundred. The gradient of the piezometric surface is steep towards the south, being of the order of 80 feet per mile. This steep gradient suggests relatively impermeable sediments forming the aquifer. Groundwater in this area is very saline. To the west and north of observation bore 401 the gradient of the piezometric surface is about three and a half feet per mile, possibly indicating highly permeable sediments. This area where the gradient is three and a half feet per mile covers the northern half of the Hundred of Kappawanta. The surface contour plan is based on surface elvation at the observation bore sites. It is not a true representation of the surface configuration. Comparing this map with the piezometric surface map shows that the piezometric surface reflects the surface contours. Anomalies in the piezometric surface do not occur. The low gradients of the piezometric surface therefore do not have to represent the highest permeability zones of the aquifer. It is recommended therefore that a 13 inch diameter borehole be drilled in the zone wherethe gradient is 3½ feet per mile and a second 13 inch diameter borehole further to the west where the gradient increases to about 60 feet per mile as shown on the salinity plan. Pump testsshould be carried out on

these large sized boreholes and therefore at least four observation bores should be drilled in the vicinity of them for aquifer characteristic calculations.

There is a relatively narrow trough filled with permeable sediments connecting the shallow aquifers underlying the Hundred of Kappawanta and the Bramfield area.

Between the shallow aquifer of the Polda Basin and the equivalent aquifer in the Hundred of Kappawanta, there is a marked east-west trending scarp. Both the surface and the piezometric surface rise sharply to the south of Polda Basin. There is evidence of an aeromagnetic anomaly in this area and it is probable that faulting has occurred. It is hoped that a pending geophysical survey may clarify the situation.

Calcreted and slightly rubbly aeolianite is exposed at the surface over most the area, suggesting that run off is limited or not occurring. However, there was an accumulation of rain water on the surface in two small depressions in the Hundred of Kappawanta, after the heavy rains recorded in late November, one to a depth of about nine inches, and the other one to a maximum depth of 24 inches. The maximum length of the larger depression was about 210 yards, with a width of about 150 yards. The small depression was about 150 yards by 110 yards. Both areas are surrounded by large gum trees. After six weeks, the smaller depression appeared dry at the surface, but was still wet at about two inches depth. The larger depression still contained about 20% of its original volume of water. Examination of the depression floor revealed that clay and silt had formed a seal against downward percolation. The evaporation figures available show that all of the water could have been lost by evaporation alone. Recharge of the aquifer, therefore probably has not occurred at these sites.

CONCLUSIONS

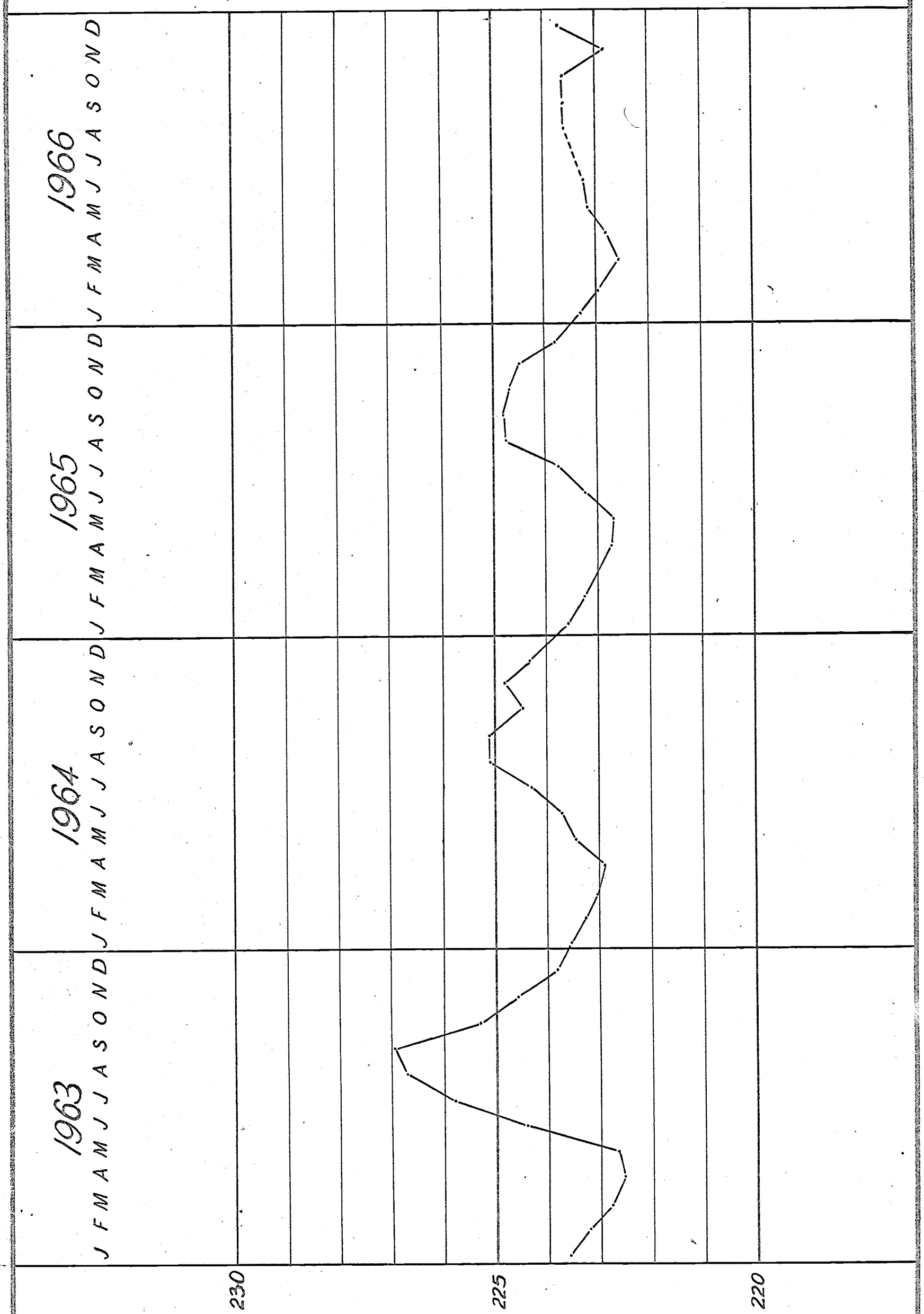
Occurrences of aeolianite forming an aquifer at shallow depths, as proved, underlies the northern portion of the Hundred

of Kappawanta and extending into the Hundred of Ward. This shallow aquifer contains groundwater of less than 1,000 parts per million of total dissolved salts, which is similar to the situation in the Polda Basin. The aquifer is probably very permeable, the gradient of the piezometric surface being less than four feet per mile. Testing the aquifer potentials by means of pump tests is recommended

Saline water occurs in areas where low permeable sediments occur and where the gradient of the piezometric surface is steep and up to 80 feet per mile. In such areas the aquifer probably would yield small supplies. Further test drilling will be done in the Sheringa and Tooligie area and will commence as soon as rotary drilling plant becomes available, probably in March.

TMS:CAE:CM
23.3.1967

T.M. STEEL
GEOLOGIST
HYDROGEOLOGY SECTION



DEPARTMENT OF MINES — SOUTH AUSTRALIA

Drn. T.M.S.
Tcd. MRL.
Ckd. L.V.W.
Exd.

POLDA BASIN
OBSERVATION BORE 30
STATIC WATER LEVEL

SCALE:

S 5090

DI. 2/4

DATE: 18·3·66

SCALE

0 4 8 12 16

MILES

N

COLTON

TALIA

Mt. Wedge

TINLINE

SQUIRE

McINTOSH

YERRA

Railway

Polda H.S.

T.B.1

P.T.4

P.T.5

P.T.6

P.T.7

T.B.3

LOCK

Road

BARWELL

McLACHLAN

Bramfield

ELLISTON

KAPPAWANTA

Kappawanta H.S.

WARD

HUDD

BLESING

COWAN

Murdinga

WAY

Sheringa

PEARCE

HAIG

PEACHNA

Tooligie

LEGEND

Salinity in parts per million

0-1000

1000-3000

3000-7000

7000-14000

14000-

Bore P.T.4

63-907

R.G. Shepherd Assistant Senior Geologist

S.A. Department of Mines

N

COLTON

TALIA

TINLINE

SQUIRE

McINTOSH

ULYERRA

BARWELL

McLATHLAN

BRAMFIELD

ELLISTON

WARD

HUDD

KAPPAWANTA

KAPPAWANTA H. S.

BLESING

COWAN

WAY

SHERINGA

PEARCE

HAIG

PEACHNA

TOOLUKE

Vide Plan 54435
P.T. Bores 4 to 7 housed in 80Ch Val
Vide Plan 63409
Bores 150-153
& Pump Test Bores 1 & 3

Surface Contours
Hts. above Mean Sea Level (Pt. Lincoln)

> 250	
200 - 250	
150 - 200	
100 - 150	
50 - 100	
< 50	

To accompany report by T. Steel 31.2.66

S.A. DEPT. OF MINES

POLDA BASIN INVESTIGATIONS Cº MUSGRAVE
PLAN SHOWING SURFACE CONTOURS
as at October 1966

Req. No.
D.M.
Compiled from

Associated Drawing No. | No. Amendment Exd. Date

Approved Passed
Director of Mines

Drn. T Steel
Tcd. S.v.C.
Chd.
Exd.

Scale: 2 miles to 1 inch
67-82
DI 2/4
Date 22 - 8 - 68

N

COLTON

TALIA

TINLINE

SQUIRE

Mc INTOSH

ULYERRA

BARWELL

McLACHLAN

LOCK

Mt WEDGE

POLDA HILLS

Vide Plan 5443S
P.T. Bores 4 to 7 housed in 80 Ch Val
Vide Plan 5360S
Bores 150-163
& Pump Test Bores 1 & 3

BRAMFIELD

ELLISTON

WARD

HUDD

KAPPAWANTA

KAPPAWANTA H.S.

BLEGING

COWAN

WAY

SHERINGA

PEARCE

HATG

PEACHNA

TOOLIGIE

Contour Interval 20'
R.L. Datum - Mean Seq Level (Pt. Lincoln)
To accompany report by T Steel 3.12.66

S.A. DEPT. OF MINES

POLDA BASIN INVESTIGATIONS Cº MUSGRAVE
PLAN SHOWING PIEZOMETRIC SURFACE
as at October 1966

Associated Drawing No.	No. Amendment Exd. Date	Req. No. D.M. Compiled from	Approved	Passed	Scale : 2 miles to 1 inch
			Director of Mines	Drn. T. Steel Tcd. S.v.C. Ckd. Exd.	67-83 DI 2/4 Date