DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

Rept.Bk.No. 80/74

WATER WELL DRILLING 1979/80- NORTH EAST PASTORAL DISTRICT

GEOLOGICAL SURVEY

BY

X.P. SIBENALER

ENGINEERING DIVISION

AUGUST, 1980.

D.M.E. NO: 79/79
HYDRO. NO: 79/13

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DEPARTMENT OF MINES AND ENERGY
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WATER WELL DRILLING 1979/80 - NORTH EAST PASTORAL DISTRICT

ABSTRACT

Rotary water well drilling for stock purposes in the Olary Ranges and southern Frome Embayment was regarded as generally successful with yields ranging from 30-80 kilolitres per day. Groundwater salinity ranged from 1800-6000 mg/l in the fractured rocks and 9000-11000 mg/l in a Tertiary palaeo-channel of the Frome Embayment. Paleo channels can be an important and reliable source of groundwater where surface water supplies are unreliable.

INTRODUCTION

In December 1978 a request was received from the Stock-owners Association, through the Pastoral Board, for Departmental assistance in obtaining reliable groundwater supplies for stock use in that portion of the North East Pastoral District where water well drilling has generally been unsuccessful. The area encompasses two different hydrogeological environments - the unconsolidated sediments of the southern Frome Embayment and fractured rocks of the Olary Ranges. In the southern Frome Embayment, the prospects of completing successful stock wells in Tertiary palaeochannels, outlined by extensive mineral drilling activity in the area, are thought to be good. Previous water well drilling in the northern portion of the Olary Ranges between Olary and Mingary has generally been unsuccessful. However, the location of most of these holes was not based on hydrogeological considerations and depths were generally restricted by the inadequate percussion drilling method.

In order to increase our understanding of the hydrogeology of the southern Frome Embayment, in particular the Tertiary palaeochannels, and to further investigate the potential of a fractured rock aquifers in arid parts of the State, Departmental scout drilling was proposed.

The 13-hole drilling programme over seven properties was prepared in consultation with the Pastoral Board and was carried out between December 1979 and February 1980. Drilling and completion costs of successful holes were recouped from respective stockowners.

DRILLING AND COMPLETION TECHNIQUE

Although the same Rotary drilling rig was used in the two different hydrogeological environments, drilling technique and well completions varied. Due to the very corrosive nature of the groundwater, P.V.C. casing was used in all productive wells.

Olary Range: Rotary-Hammer drilling in the fractured rock aquifer was rapid and was effected without major difficulties. The 140 mm holes were initially drilled to total depth with rotary-hammer. Successful holes were reamed to 250mm O.D. into fresh bedrock and 150 mm P.V.C. casing inserted. The lower stable portion of productive wells wasl1eft open.

Southern Frome Embayment: The following method was generally adopted during drilling and completion of wells:

(i) rapid rotary-air drilling to unstable sands

(ii) deepening to target depth with fluid-mud circulation (cmc, rotrol, bentonite)

(iii) when required, wire-line logging (gamma, neutron, self-potential, point resistivity) to assist in selecting the 2 m interval to be screened.

(iv) reaming (200 mm I.D.) to required depth

(v) screen and case hole, cement where required and develop.

Overall, no major problems were encountered with the drilling aspects of the operation. Completion with P.V.C. casing and attached screen, however, presented many difficulties. These are outlined below:

(i) the screen and light P.V.C. casing being very buoyant in the thick stabilizing mud, running casing down the hole was a major and slow operation.

(ii) the 6 m P.V.C. lengths were not straight.

Although the clearance between casing and side of each hole was thought to be adequate (25 mm), combination of casing curvature and buoyancy commonly resulted in the bottom of the screen scraping the side of the hole. In 2 of the 3 holes, the application of extra force (using Rig pull down), required to lower the casing over the last few metres, resulted in screen detachment at the threads.

The overall cost to the Department was significant, the above problem resulting in the loss of 2 screens and over 50 man days.

DRILLING RESULTS

The programme was generally successful, productive stock wells being completed on all properties except Aroona (Olary Ranges) and Wompinie (Frome Embayment). Successful wells were regarded as those wells with a groundwater salinity of less than 12 000 mg/l and a yield greater than 20 kL/day. The upper allowable limit for radium 226 concentration is harder to define. Water with radium 226 content greater than 3 pci/L is generally regarded as being unfit for human consumption. The radium 226 upper limit for stock purposes has not yet been quantified. However, groundwater with radium 226 concentration greater than 100 pci/L is being used for stock water without any apparent adverse effects.

The results are discussed below and well locations are shown in Fig. 1 and geological and composite logs included in Appendix A.

A. OLARY RANGES

TABLE 1

Olary Ranges - Drilling Results

SUCCESSFUL WELLS

Station	Unit No.	Depth (m)	S.W.L. (m)	Salinity (mg/l)	Radium pci/l	Yield kl/day	Permit No.
Devonborough Downs	6932-116	41	12.9	1608	<0.5	50	6184
Ballara	7033-102	48	24.3	5803	1.0	50	6187B

UNSUCCESSFUL WELLS

Station	Unit No	Depth	Salinity	Radium	Permit No.
Aroona	7033-110	66	28224	9.3	6182A
	7033-111	84	16647	-	6182B
	7033-112	60	35409	80	6183
Ballara	7033-101	54	16500	0.5	6187A

Devonborough Downs (Fig. 2)

Hole No. 6932-116:ssuccessful well drilled on the inferred unconformable contact between siltstones (Pualco Tillite and Belair Subgroup) and near deeply incised creek.
An adequate supply of surprisingly good quality groundwater that is suitable for most domestic and all stock purposes, was obtained from strongly fractured metasiltstones. The results of a short discharge test are discussed in Appendix C.

Aroona (Fig. 3)

The major part of the property is underlain by crystalline basement of the Willyama complex and previous drilling in that rock type has been unsuccessful. Best prospects in this area for stock quality groundwater were considered to be associated with post-Willyama metamorphosed quartzite of the Cutana Beds that occur as a long sinouous ridge in Cutana and Aroona. (Pitt, G.M. 1979)

Hole 7033-110 was drilled N.W. of Aroona at the intersection of a major creek and a quartzite ridge where small supplies of stock quality groundwater have reputedly been derived from the adjoining slate bedrock. Very saline groundwater was cut at about 60 m in strongly fractured quartzite. In retrospect any flow in a creek with an extensive clayey watershed in a very arid region can be expected to be saline. Flushing of the aquifer would thus not be effective.

Hole 7033-111 was located 5 km S.E. of Aroona near the inferred contact between quartzite of the Cutana Beds and an amphibolite dyke. Although salinity was significantly better than in the previous hole, water too saline for stock was cut at 78 m in meta-quartzite beneath a thick sequence of clay and mica schist. Localised recharge is therefore not expected to occur.

Hole 7033-112 was sited 8 km west of Aroona at the

headwaters of a creek intersecting quartzite where creek flow is expected to be fresher. This third attempt was carried out after encouraging results were obtained at Ballara in a superficially similar hydrogeological environment. Unfortunately, only a thin quartzite was penetrated here, the strata being dominantly mica schist. Of further interest was the high concentration of Radium-226.

Ballara (Fig. 3)

After two failures at Aroona, the prospects of obtaining suitable groundwater in Ballara were considered to be low. Drilling was concentrated in the S.W. portion of the property where a small area of metamorphosed post-Willyama sediments occurs.

Hole 7033-101 was sited at the inferred extension of faulted Adelaidean quartzite-sandstone sediments. In view of the high salinity groundwater in granitic gneiss, the drilling of an additional hole southwest of the fault to intersect quartzite bedrock was not warranted.

Hole 7033-102 was located at the headwaters of a creek draining a sandstone/quartzite rise. Stock quality water was cut at 36 m in weakly fractured quartzite. The supply increased from 25 to 55 kl/day in strongly stained sandstone from 43 to 48 m. SOUTHERN FROM

B. SOUTHERN FROME EMBAYMENT

EMB

TABLE 2

Southern Frome Embayment - Drilling Results

SUCCESSFUL WELLS

Station	Unit No.	Depth (m)	S.W.L. (m)	Salinity mg/l	Radium pci/l	Aquifer Unit	Yield kl/day	Permit No.
Kalkaroo	7034-20	91.5	50	9 200	33	UPPER	70	6164
Mooleu-looloo	7034-19	106	26.9	11 685*0 11 100**	23 45	MIDDLE?	30 3	6165
Yarramba	7034-40	95	27.5	10 250	70	BASAL?	80	6166-D

*: Sample collected at end of development
**: Sample collected after 2 hrs pumping

UN

UNSUCCESSFUL WELLS

Moo

Station	Unit No.	Depth	Salinity	Permit No.	Comments
Wompinie7	7034-36	102	-	6170	dry
Yarramba	7034-37	90	-	6166A	Inadequate Tertiary Sands
Yarramba	7034-38	126	-	6166B	" " "
Yarramba	7034-39	102	9 500	6166C	Unable to complete as productio well due to detachment of screen.

Drilling targets in the southern Frome Embayment are Tertiary palaeochannels occurring under a cover of Quaternary to Recent sediments. Because of their association with uranium mineralisation these channels have been, and are, primary exploration targets for exploration companies. A number of channels have at this stage been outlined. Of interest in this programe is the major Yarramba palaeochannel which is extensive in the area and which is known to contain usable stock water. Three separate sand units have been defined in the channel, uranium mineralisation and higher salinity being mainly associated with the basal sands and the more clayey banks of the buried channel.

Wompinie (Fig. 4)

Two sites were selected on poorly defined Tertiary palaeochannels. The most promising site located on the "Beefsteak" channel east of the property, was rejected by the lessee because of its remoteness.

Hole No. 7034-36 was drilled on a possible Tertiary channel outlined from resistivity soundings. Although a reasonable thickness of sand was penetrated, these were thought to be unsaturated and the hole was abandoned at 102 m in gritty silty clay, possibly weathered granitic basement. A mineral exploration hole drilled 3 km N.E. from this hole along the trend of the channel (?), inter-sected water of unknown quality in granitic basement. Since groundwater from that aquifer in nearby private wells is too saline no attempt was made to deepen hole 7034-36 into fresh granite.

Kalkaroo (Fig. 4)

Hole 7034-20 was selected on Yarramba palaeochannel. Of concern here was the proximity to the Honeymoon uranium ore body. It was therefore thought important to complete the hole in the upper sand unit.

The hole was subsequently drilled to 93 m, fine well sorted clean sands (upper unit) being intersected between 90-92.5 m. As previously mentioned, completion difficulties were encountered and it is suspected that the 0.4 mm screen became partly detached, allowing an unusually great amount of sand to be airlifted. The hole was finally completed with a 0.18 mm aperture, 100 mm diameter telescopic screen between 90-91.5 m. Although the airlifted yield was only 30-40 kL/day, pumping at up to 70 kL/day may be expected.

Mooleulooloo (Fig. 4)

Groundwater prospects in Mooleulooloo were considered to be very poor and did not warrant scout drilling. However a A1 hole was drilled in the adjoining property, appropriate arrangements having been made between the two adjoining lessees.

For hole no. 7034-19 which was sited on Yarramba channel, a long term small supply of 30 kL/day was obtained from the 104-106 m screened interval (middle unit?). Results from the short discharge test, outlined in Appendix C, appear to indicate recompacting of the very plastic softclay overlying the sand unit. This effect has already been reported in previous investigations at Honeymoon (Waterhouse, Beal 1978).

The water quality is marginal, both in terms of total dissolved solids and radium -226 concentration. Of concern is the apparent increase in radium from 23 pCi/L during airlifting to 45 pCi/L after 2 hrs pumping. Additional sampling after a long pumping period is required to investigate the extent of this trend.

Yarramba (Fig. 4)

The first attempt (Hole No. 7034-37) was made at the poorly defined northern extremity of the Yarramba palaeochannel. The

hole was drilled to a depth of 90 m into dark grey-black shaley clay without intersecting any significant sand units.

The second hole (No. 7034-38) was sited about 1 km NNW of the successful Mooleulooloo hole in the middle of the defined palaeochannel. Here again no significant Tertiary sand units were intersected and the hole was abandoned at 126 m in indurated clay.

Atthe third site, 300 m S.E. of the Mooleulooloo hole, significant sand development was encountered between 80 m and 102 m. However, successful completion was a problem and a replacement hole was eventually required. The short discharge test (Appendix C) possibly indicates recompaction of the soft clay units as a result of excessive drawdown. Quality is comparable to adjoining well 7034-19, and yield is significantly greater.

DISCUSSION AND RECOMMENDATIONS

Olary Ranges

At this stage only very broad generalisations pertinent to fractured rock aquifers can be made for the area investigated. It appears that: (1) very saline groundwater is generally associated with crystalline basement rock of the Willyama Complex and the metamorphosed Torrensian? Cutana Beds; (2) very deep groundwater is invariably too saline for stock requirements.

Prospects of obtaining stock quality groundwater in Aroona which is essentially underlain by crystalline basement and highly metamorphic Adelaidean sediments (Cutana Beds) and where the potentiometric surface is deep are therefore considered to be very poor. To better quantify prospects in relation to a particular rock formation, and recharge potential, a complete appraisal of all drill hole data in the Olary Ranges is recommended.

Southern Frome Embayment

Drilling in the Yarramba palaeochannel was generally successful, except possibly in terms of well completion technique. It has been shown to be an important source of groundwater, albeit limited to sheep usage, in an area almost totally dependent on unreliable surface water.

Hydrogeological points of interest are outlined below:

(1) Although there is doubt as to the validity of airlifted water samples and the number of available sampling points is inadequate, it appears that groundwater from the upper portions of the aquifer system generally has a total dissolved solids content less than 12000 mg/L and as such is suitable for sheep. The radium 226 concentration is not expected to be high except in the immediate vicinity of uranium mineralisation.

(2) Drilling has also confirmed that the channel meanders very erratically, as shown by the absence of significant sand development in hole 703437, sited in the middle of the channel, approximately 1 km NW from well 703419.

(3) Recompaction of the soft malleable clay, due to excessive draw down in production wells, appears to be a characteristic feature of the palaeochannel. This has been previously discussed in a Departmental report on the investigations of the aquifer system at the Honeymoon Deposit.

As previously discussed, the use of PVC casing and attached close-ended screen was not successful. The following alternatives should be considered in any future Departmental drilling programme in the area:

- completion with PVC casing and either attached open ended screen or telescopic screen to eliminate buoyancy problems.

- use of straight and strong fibre glass casing. Furthermore casing lengths can easily be disconnected if necessary. The high cost is, however, a drawback.

Resampling, water level monitoring and levelling of all productive/observation wells in the Yarramba channel is recommended to accurately determine the groundwater quality and potentiometric gradients of the sand aquifers.

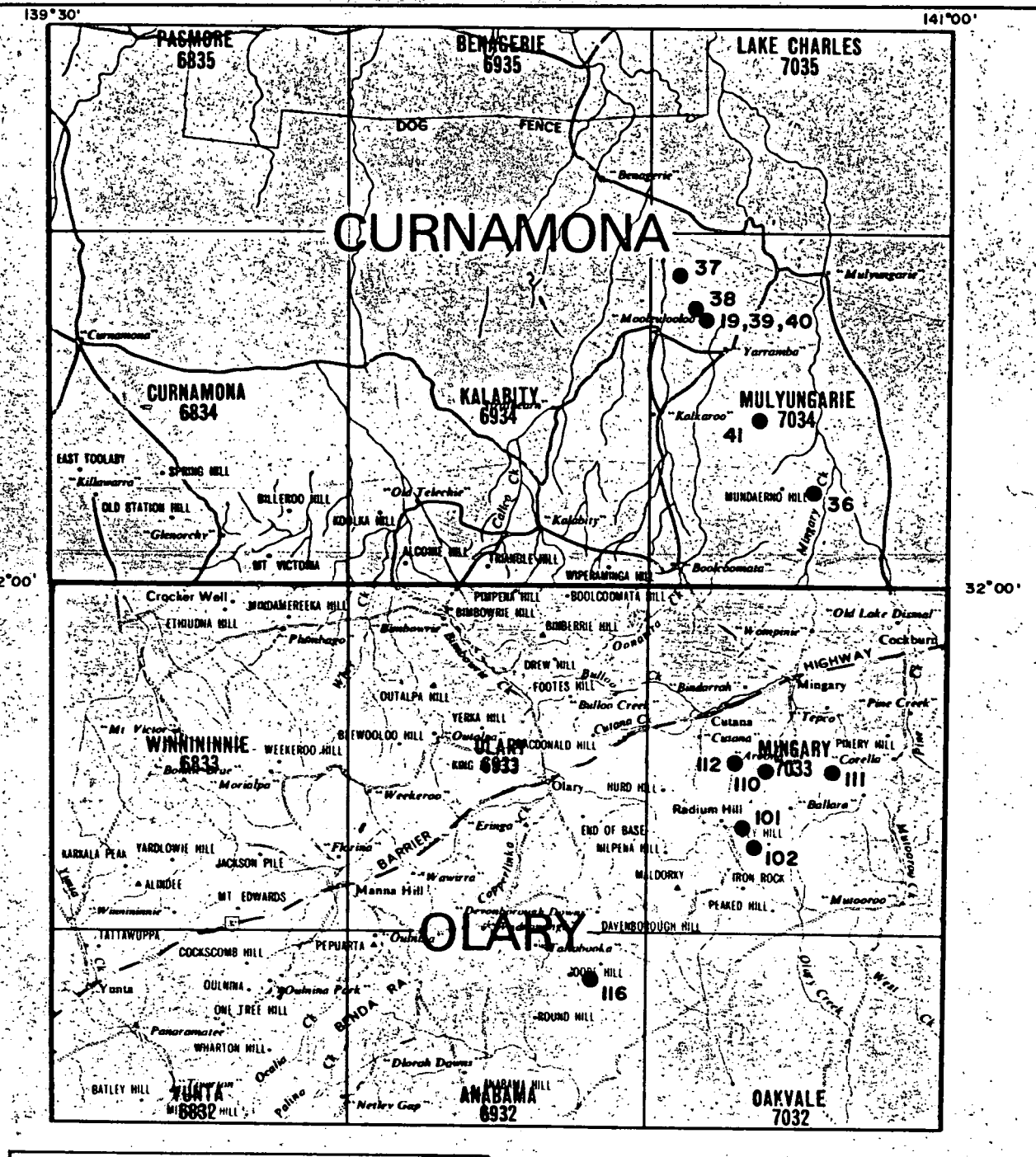
X.P. Sibenaler

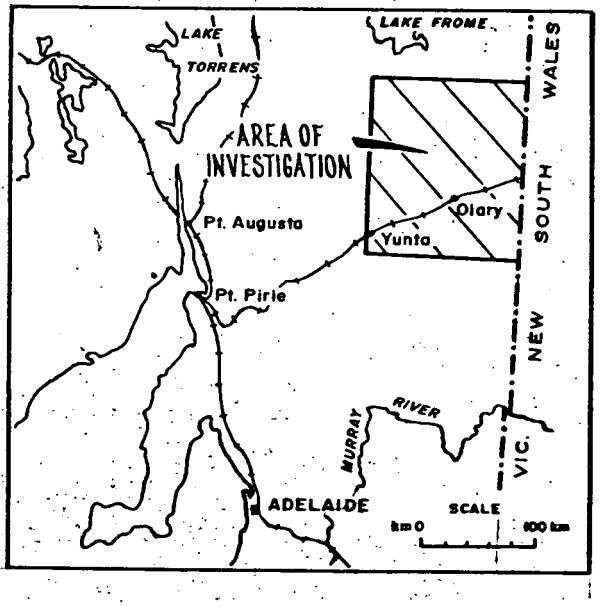
X.P. SIBENALER, MAIG RPS
Geologist,
Groundwater and Engineering

REFERENCES

PITT, G.M., 1979. The Cutana Beds. Quart. Geol. Notes, S. Aust., 71: 19-23.

WATERHOUSE, J.D. and BEAL, J.C., 1978. An assessment of the hydrogeology of the Southern Frome Embayment with particular respect to possible exploitation of uranium deposits. S. Aust. Dept. Mines and Energy. unpubl. Rept. 803.





● — Well

116 — Well number (prefix with 1:100 000 sheet number to obtain unit number).

Wells completed during 1979 - 1980 drilling programme.

SCALE

km 5 0 5 10 km

FIG. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION

WELL LOCALITY PLAN

COMPILED X.P.S.	C.D.O. 19.8.80 DATE
DRAWN M.R.	SCALE As shown
DATE May 1980	PLAN NUMBER S 14794
CHECKED	

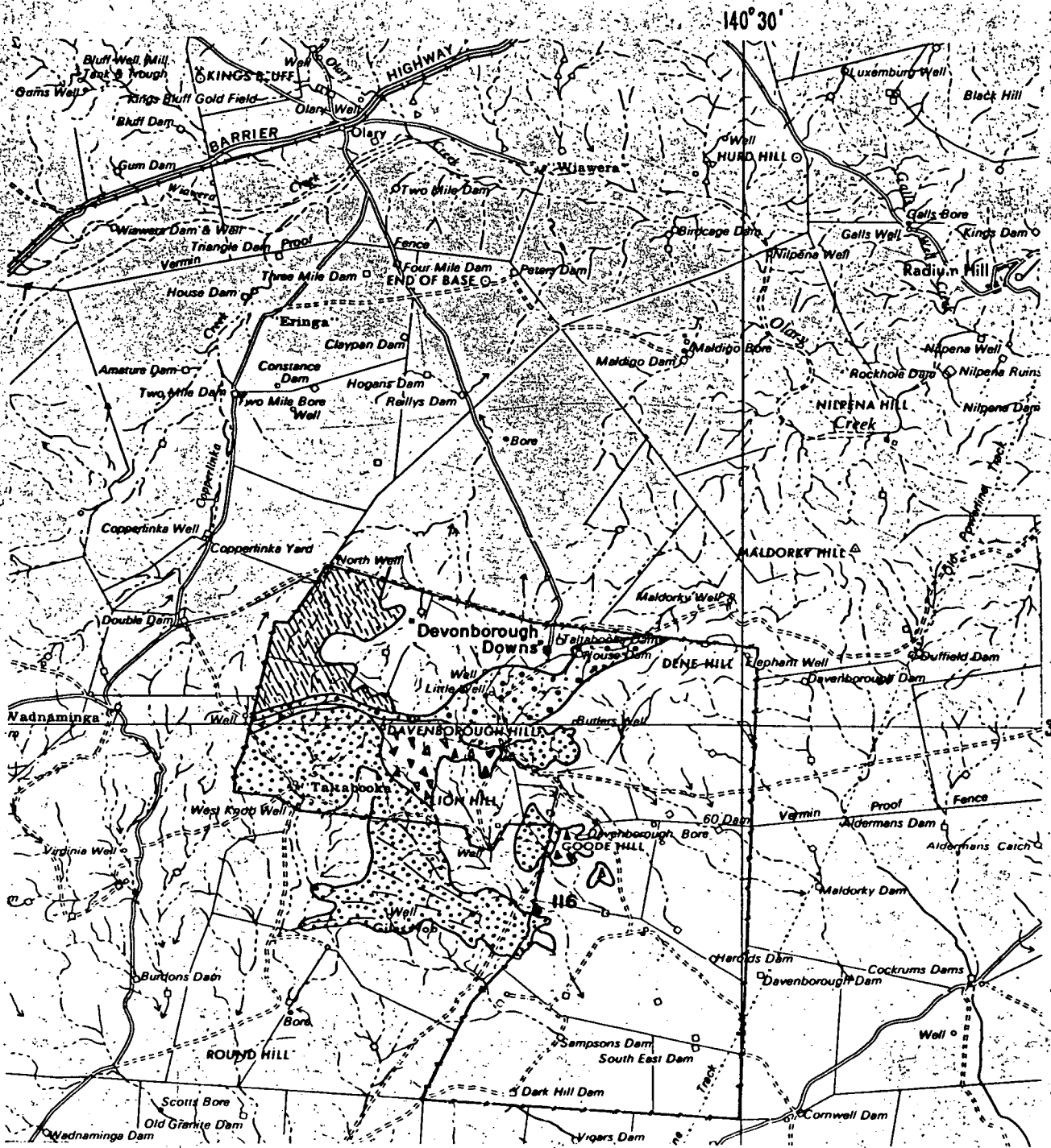


FIG. 2

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED X.P.S.	C.D.O.	19.8.80 DATE
NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION	DRAWN M.R.	SCALE	As shown
DEVONBOROUGH DOWNS WELL LOCATION AND GENERALISED PRE-CAMBRIAN GEOLOGY	DATE May 1980	PLAN NUMBER	S 14795
	CHECKED		

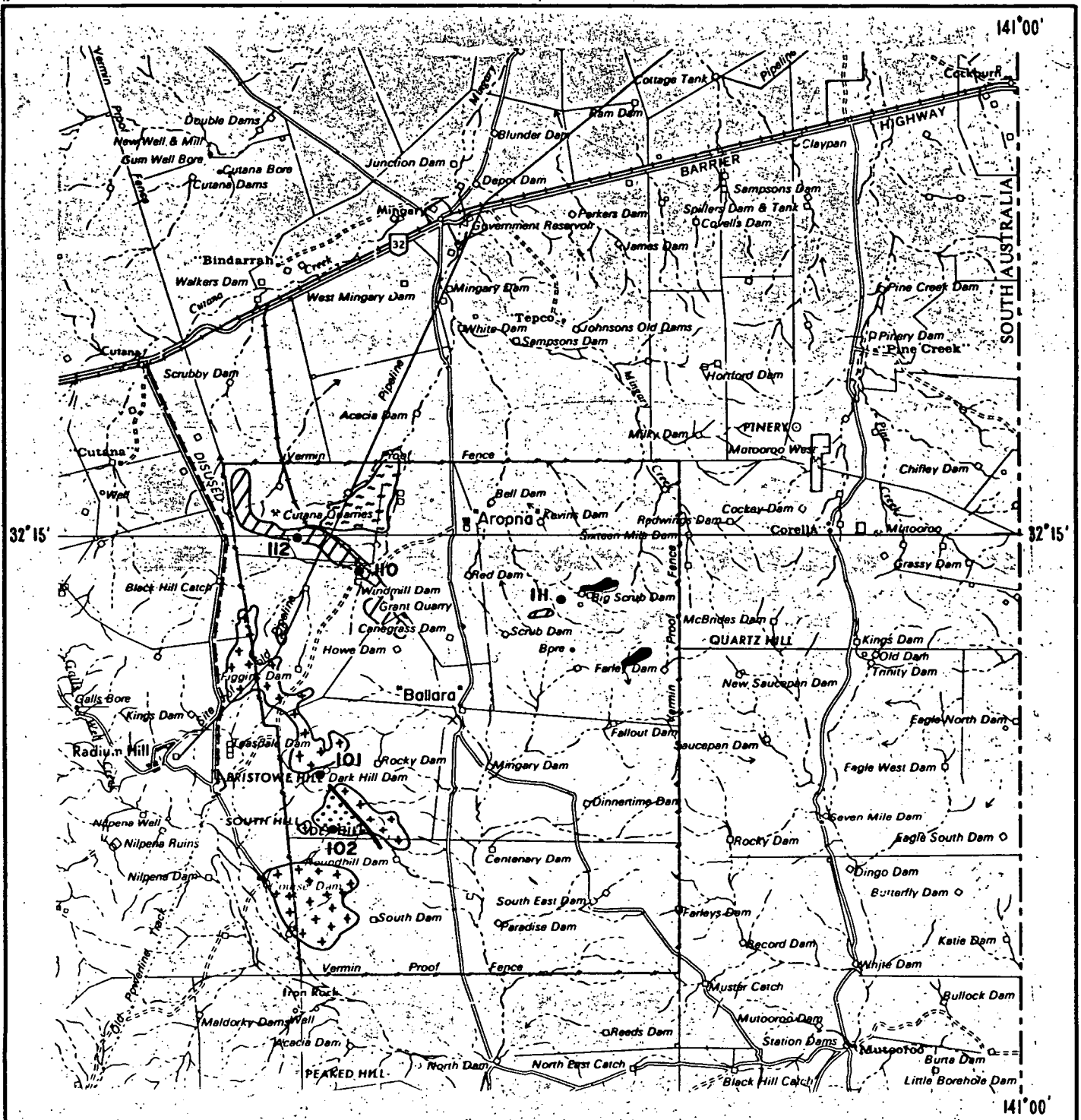
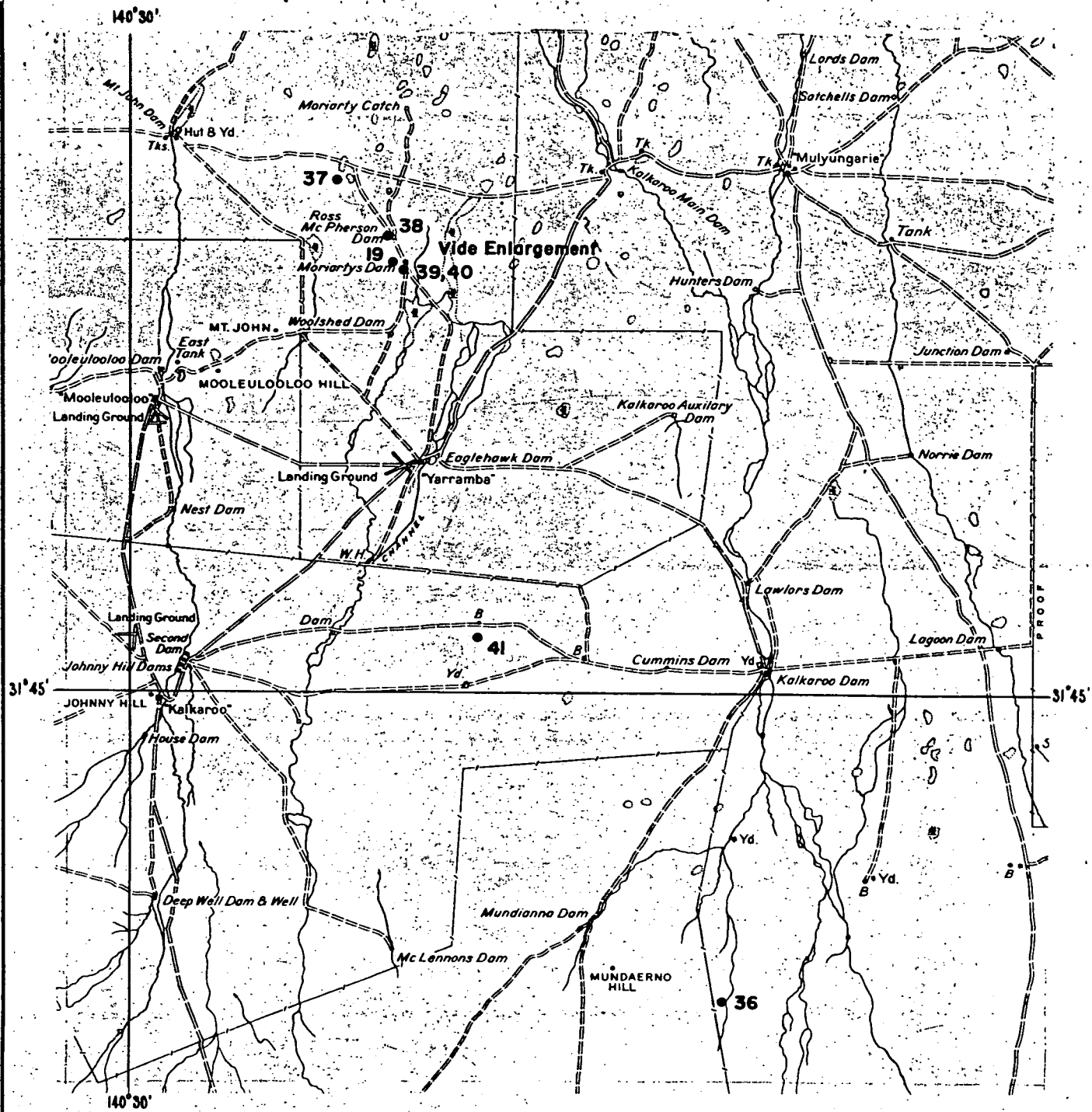
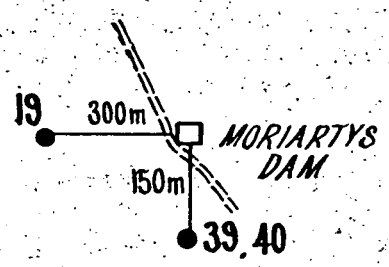


FIG. 3

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED X.P.S.	C.D.O. 19.8.80 DATE
NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION	DRAWN M.R.	SCALE As shown
AROONA, BALLARA	DATE May 1980	PLAN NUMBER S 14796
WELL LOCATION AND GENERALISED PRE-CAMBRIAN GEOLOGY	CHECKED	



ENLARGEMENT



(Not to scale)

Well

36 — Well number (prefix with 7034000WW000 to obtain unit number).

SCALE

km 5 0 5 10 km

FIG. 4

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	COMPILED X.P.S.	CDO. 19.8.80 DATE
NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION WOMPINIE, KALKAROO, MOOLEULOOLOO, YARRAMBA WELL LOCALITY PLAN	DRAWN M.R.	SCALE As shown
	DATE May 1980	PLAN NUMBER S 14797
	CHECKED	

APPENDIX A

Geological Logs

and

Composite Logs

DEPARTMENT OF MINES & ENERGY – SOUTH AUSTRALIA
ENGINEERING DIVISION

COMPOSITE WELL LOG – GROUNDWATER

PERMIT No.	6166-C
UNIT/STATE No.	7034000WW00039
SERIAL No.	
FOLDER No.	F 096133
DRG. No.	80-271
SHEET	OF

CONSTRUCTION DETAILS

DRILLING TECHNIQUE: ROTARY
CIRCULATION: 0-60 m: Fluid; 60-120 m: Fluid with CMC and 1 bag of mud.
START: 4/2/80
FINISH: 9/2/80
TOTAL DEPTH: 102 m

	Inches	m.m	From(m)	To(m)
HOLE DIAMETER	8	2000	0	102
CASING DIAMETER (Cemented) P.V.C.		150	0	1
CASING DIAMETER (Uncemented)		150	1	93
SCREEN DETAILS Make / Model Dimensions Surescreen 0·4 mm, 125 mm; 2m Stainless Steel			93	95

PROJECT: NORTH EAST PASTORAL DISTRICT – GROUNDWATER INVESTIGATION
LOCATION: YARRAMBA H.S. – CURNAMONA 1:250,000
SECTION: HUNDRED
CO-ORDINATES
REFERENCE ELEV.
SURFACE ELEV.
DATUM
LOGGED BY: X.P.S.
DATE: 5/2/80
TRACED BY: M.R.
DATE: 28/4/80

TYPE OF LOG	16 IN. NORMAL	64 IN. NORMAL	6FT. LATERAL	S.P.	POINT RESISTIVITY	NEUTRON	GAMMA RAY	TEMPERATURE	
DATE OF RUN				6/2/80	6/2/80	6/2/80	6/2/80		
FIRST READING (m)				103	103	102·2	102·8		
LAST READING (m)				0	0	0	0		
INTERVAL MEASURED(m)									
CASING : LOGGER (m)				Nil	Nil	Nil	Nil		
CASING : DRILLER (m)				Nil	Nil	Nil	Nil		
DEPTH REACHED (m)									
BOTTOM : DRILLER (m)				102	102	102	102		
MUD TYPE ROTROL/QUICKGEL									
MUD RESISTIVITY									
RECORDED BY B. YOUNG									

WELL SYMBOLS

CONSTRUCTION LOG
- Casing seal
- Casing shoe
- Wire wound screen
- Slotted casing
- Cemented Interval
- Gravel packed Interval

HYDROGEOLOGICAL LOG
- Core Interval
- Aq Aquifer
- Cb Confining bed
- T Transmissivity m²/day m⁻¹
- S Storage Coefficient/Specific Yield
- θ Porosity
- K Hydraulic conductivity m/day

DEPTH TO WATER(m)	DEPTH TO S.W.L(m)	YIELD m³/day	YIELD Method of Test	TOTAL DISSOLVED SOLIDS mg/litre	TOTAL DISSOLVED SOLIDS Analysis W. No.
760	24	400 ·	AIR LIFT		

REMARKS: Cased and screened well abandoned when screen parted from casing. Due to excessive airlifting, hole collapsed around screen. Replacement hole 7034/40 (GIGG D) drilled 40 m north.

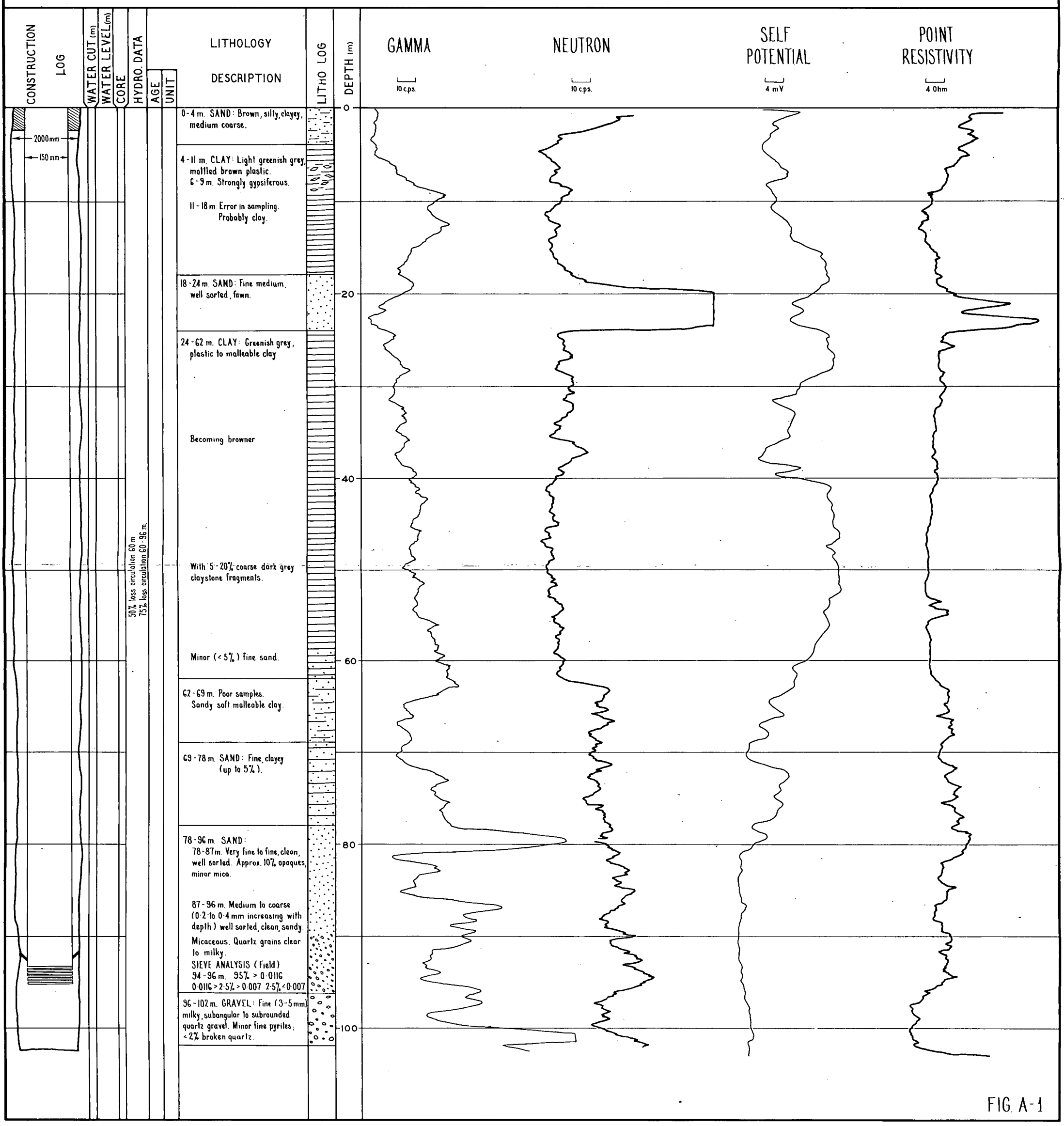


FIG. A-1

1923

DEPARTMENT OF MINES & ENERGY – SOUTH AUSTRALIA
ENGINEERING DIVISION

COMPOSITE WELL LOG – GROUNDWATER

PERMIT No.	6166 B
UNIT/STATE No.	7034000WW00038
SERIAL No.	
FOLDER No.	F 096132
DRG. No.	80-272
SHEET	OF

CONSTRUCTION DETAILS

DRILLING TECHNIQUE : ROTARY
CIRCULATION : FLUID / MUD
START : 30/1/80
FINISH : 31/1/80
TOTAL DEPTH :

	Inches	m.m	From(m)	To(m)
HOLE DIAMETER				
CASING DIAMETER (Cemented)				
CASING DIAMETER (Uncemented)				
SCREEN DETAILS Make / Model Dimensions				

PROJECT : N.E. PASTORAL DISTRICT GROUNDWATER INVESTIGATION
LOCATION : YARRAMBA H.S. CURNAMONA 1:250,000
SECTION : HUNDRED
CO-ORDINATES :
LOGGED BY : X.P.S.
REFERENCE ELEV. : DATE : 30/1/80
SURFACE ELEV. : TRACED BY : M.R.
DATUM : DATE : 28/1/80

TYPE OF LOG	16 IN. NORMAL	64 IN. NORMAL	6FT. LATERAL	S.P.	POINT RESISTIVITY	NEUTRON	GAMMA RAY	TEMPERATURE	
DATE OF RUN				31/1/80	31/1/80	31/1/80	31/1/80		
FIRST READING (m)				127	127	127	127		
LAST READING (m)				16	16	17	0		
INTERVAL MEASURED(m)									
CASING : LOGGER (m)				Nil	Nil	Nil	Nil		
CASING : DRILLER (m)				Nil	Nil	Nil	Nil		
DEPTH REACHED (m)									
BOTTOM : DRILLER (m)				126	126	126	126		
MUD TYPE									
MUD RESISTIVITY									
RECORDED BY									

WELL SYMBOLS

CONSTRUCTION LOG
- Casing seal
- Casing shoe
- Wire wound screen
- Slotted casing
- Cemented Interval
- Gravel packed Interval

HYDROGEOLOGICAL LOG
- Core Interval
- Aq Aquifer
- Cb Confining bed
- T Transmissivity m^2/day m^{-1}
- S Storage Coefficient/Specific Yield
- θ Porosity
- K Hydraulic conductivity m/day

DEPTH TO WATER(m)	DEPTH TO S.W.L.(m)	YIELD m^3/day	YIELD Method of Test	TOTAL DISSOLVED SOLIDS mg./litre	TOTAL DISSOLVED SOLIDS Analysis W. No.

REMARKS : ABANDONED AND BACKFILLED

CONSTRUCTION LOG | WATER CUT (m) | WATER LEVEL (m) | CORE | HYDRO. DATA | AGE | UNIT | LITHOLOGY DESCRIPTION | LITHO LOG | DEPTH (m) | GAMMA 10 c.p.s. | NEUTRON 20 c.p.s. | SELF POTENTIAL 4 mV | POINT RESISTIVITY 4 Ohm

0 - 4 m Brown sands Clayey sands
4 - 5 m Gypsum
5 - 24 m CLAY :- Light grey green mottled brown clay.
Stiff brown clay.
Gritty, indurated.
24 - 34 m SAND :- Light grey, well sorted fine sands, clear.
34 - 120 m. CLAY :- Dark grey, plastic.
Sandy malleable clay.
Grey brown mottled dark grey plastic clay.
48 - 50 m Sandy (10 - 20%) clay Dark grey to brownish grey indurated and plastic clay.
Grey malleable clay
Grey and dark grey, gritty, orange staining.
Talcose, grey clay.
Mainly light grey and white greasy gritty clay.
Fine sandy (~30%) light grey clay, micaceous, soft, malleable.
~ minor (~5%)
Medium coarse sands and dark blue grey mottling.
Dark blue grey clay.
Medium coarse clayey sand - pyritic, subrounded.
Dark grey black plastic clay
White gritty clay and dark grey plastic clay, ~ 10% sand, pyritic.
120 - 123 m. Pyritic, medium coarse sands.
123 - 126 m CLAYSTONE :- Dark brown indurated claystone with minor orange yellow staining

Mud level

FIG. A-2

1923

DEPARTMENT OF MINES & ENERGY – SOUTH AUSTRALIA
ENGINEERING DIVISION

COMPOSITE WELL LOG – GROUNDWATER

PERMIT No.	6165
UNIT/STATE No.	7034000WW00019
SERIAL No.	
FOLDER No.	F 096006
DRG. No.	80-273
SHEET	OF

CONSTRUCTION DETAILS

DRILLING TECHNIQUE: ROTARY
CIRCULATION: FLUID/MUD
START: 21/1/80
FINISH: 24/1/80
TOTAL DEPTH: 131

	Inches	m.m	From(m)	To(m)
HOLE DIAMETER	8½	2125	0	131
CASING DIAMETER (Cemented) P.V.C.		150	Surface	36
CASING DIAMETER (Uncemented) P.V.C.		150	36	104
SCREEN DETAILS Make / Model Dimensions Stainless Steel Surescreen WELL-MASTER 0·4 aperature, 2 m.		150	104	106

PROJECT NORTHEAST PASTORAL DISTRICT – GROUNDWATER INVESTIGATIONS
LOCATION YARRAMBA H.S.; CURNAMONA 1:250,000
SECTION HUNDRED
CO-ORDINATES
LOGGED BY D.K. Clarke
REFERENCE ELEV.
DATE 22/1/80 - 23/1/80
SURFACE ELEV.
TRACED BY M.R.
DATUM
DATE 1/5/80

TYPE OF LOG	16 IN. NORMAL	64 IN. NORMAL	6FT. LATERAL	S.P.	POINT RESISTIVITY	NEUTRON	GAMMA RAY	TEMPERATURE	
DATE OF RUN				23/1/80	23/1/80		23/1/80		
FIRST READING (m)				127	127	126	131		
LAST READING (m)				4	4	3	0		
INTERVAL MEASURED(m)									
CASING: LOGGER (m)				Nil	Nil	Nil	Nil		
CASING: DRILLER (m)				Nil	Nil	Nil	Nil		
DEPTH REACHED (m)									
BOTTOM: DRILLER (m)									
MUD TYPE									
MUD RESISTIVITY									
RECORDED BY									

WELL SYMBOLS

CONSTRUCTION LOG
- Casing seal
- Casing shoe
- Wire wound screen
- Slotted casing
- Cemented Interval
- Gravel packed Interval

HYDROGEOLOGICAL LOG
- Core Interval
- Aq Aquifer
- Cb Confining bed
- T Transmissivity m^3/day m^{-1}
- S Storage Coefficient/Specific Yield
- θ Porosity
- K Hydraulic conductivity m/day

DEPTH TO WATER(m)	DEPTH TO S.W.L (m)	YIELD m^3/any	YIELD Method of Test	TOTAL DISSOLVED SOLIDS mg/litre	TOTAL DISSOLVED SOLIDS Analysis W No.
30 - 36 ?	–	Small	–	18000	Field
~ 80	26·9	40	2 hr. discharge test.	111000	W 893/80
~ 80	26·9	40	Air lifting	11685	W 896/80

RADIUM ^{226} 45 pCi/ℓ
RADIUM ^{226} 23 pCi/ℓ

REMARKS:

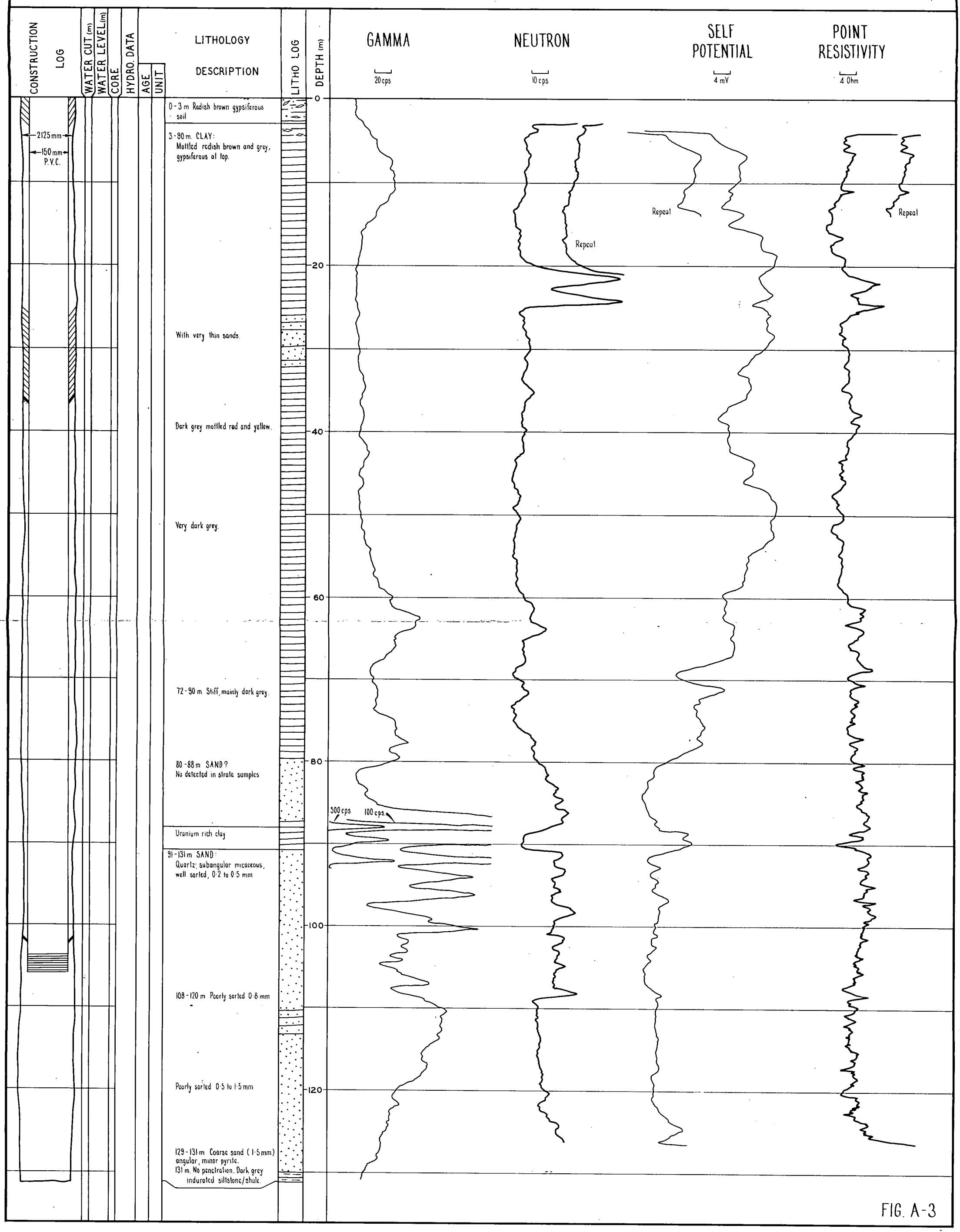


FIG. A-3

1923

DEPARTMENT OF MINES & ENERGY – SOUTH AUSTRALIA
ENGINEERING DIVISION

COMPOSITE WELL LOG – GROUNDWATER

PERMIT No.	6170
UNIT/STATE No.	7034000WW00036
SERIAL No.	
FOLDER No.	F 084120
DRG. No.	80–274
SHEET	OF

CONSTRUCTION DETAILS

DRILLING TECHNIQUE: ROTARY
CIRCULATION: AIR FLUID MUD (Quickgel, Rotrol)
START: 10/1/80
FINISH: 12/1/80
TOTAL DEPTH: 102 m

	Inches	m.m	From(m)	To(m)
HOLE DIAMETER				
CASING DIAMETER (Cemented)				
CASING DIAMETER (Uncemented)				
SCREEN DETAILS Make / Model Dimensions				

PROJECT NORTHEAST PASTORAL DISTRICT
GROUNDWATER INVESTIGATIONS
LOCATION WOMPINIE HS., CURNAMONA 1:250,000
SECTION HUNDRED
CO-ORDINATES
LOGGED BY X.P.S.
REFERENCE ELEV. DATE JAN. 1980
SURFACE ELEV. TRACED BY M.R.
DATUM DATE 29/4/80

TYPE OF LOG	16 IN. NORMAL	64 IN. NORMAL	6FT. LATERAL	S.P.	POINT RESISTIVITY	NEUTRON	GAMMA RAY	TEMPERATURE	
DATE OF RUN				12/1/80	12/1/80	12/1/80	12/1/80		
FIRST READING (m)				102	102	102	102		
LAST READING (m)				0	1	1	0		
INTERVAL MEASURED(m)									
CASING: LOGGER (m)				Nil	Nil	Nil	Nil		
CASING: DRILLER (m)				Nil	Nil	Nil	Nil		
DEPTH REACHED (m)									
BOTTOM: DRILLER (m)				102	102	102	102		
MUD TYPE									
MUD RESISTIVITY									
RECORDED BY									

WELL SYMBOLS

CONSTRUCTION LOG

- Casing seal
- Casing shoe
- Wire wound screen
- Slotted casing
- Cemented Interval
- Gravel packed Interval

HYDROGEOLOGICAL LOG

- Core Interval
- Aq Aquifer
- Cb Confining bed
- T Transmissivity m^3/day m^{-1}
- S Storage Coefficient/Specific Yield
- θ Porosity
- K Hydraulic conductivity m/day

DEPTH TO WATER(m)	DEPTH TO S.W.L.(m)	YIELD m³/day	YIELD Method of Test	TOTAL DISSOLVED SOLIDS mg./litre	TOTAL DISSOLVED SOLIDS Analysis W. No.

REMARKS: HOLE ABANDONED AND BACKFILLED

CONSTRUCTION LOG | WATER CUT (m) | WATER LEVEL (m) | CORE | HYDRO. DATA | AGE | UNIT | LITHOLOGY DESCRIPTION | LITHO LOG | DEPTH (m)

0–9 m CLAY:
Dark brown sandy and gritty clay, thin clayey fine to medium red brown sands.

9–12 m. SAND:
Brown poorly sorted (fine to pebbly) quartz sands. Minor opaques.
12–18 m. Moderately sorted, generally coarse.

18–30 m CLAY:
Brown and grey sandy (<10%) clay, gritty in places.
27–30 m. Grey claystone with minor sands

30–38 m Poor sample
Sand – medium grained.
Clayey at depth.

38–46 m Poor sample
Clayey sand. ?

46–50 m CLAY:
Grey white, malleable.

50–56 m. No sample.
Probably fine clayey sand

56–62 m No sample.
As above, more clayey with thin sand interbeds

62–82 m SAND:
Fine to medium, angular clean sands, ~10% coarse.
66 m – Coarse (~10% very coarse), stained, yellowish.
Minor large mica flakes.
Well sorted medium clean quartz sand.
2–5% mica.
5–10% darkly stained quartz.
~2% opaques
Poorly sorted very coarse quartz fragments with white clay encrustation.

82–87 m CLAYEY SAND:
Poor sample.

87–102 m Sandy CLAY and thin sands Loss of circulation – sand lens?
Poorly sorted sands (contaminated? sample) high percentage of white gritty clay.
Minor mica.
Light grey, silty clay with thin very coarse sands. Minor mica.

Mud drilling

Weathered granite bedrock

GAMMA 5 c.p.s. | NEUTRON 20 cps | SELF POTENTIAL 2 mV | POINT RESISTIVITY 2 Ohm

FIG. A-4

PROJECT: North East Pastoral District
GROUNDWATER INVESTIGATIONS

LOCATION OR COORDS:

SEC. HD. EL Surface m EL Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: P. No 6184

UNIT / STATE NO: 6932000WW00116

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No.:
	24m				seepage				W —
	27	12.9m	24	27	10	½	airlift		
	31		24	31	25	½	airlift		
	33		24	33	30	½	airlift		
	36		24	36	35	½	airlift	1608	4994-79

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	3		clay	brown clay with minor gravels			150	0	12
3	6		gravels	alluvial gravels					
6	12		strongly to completely weathered meta-siltstone	micaceous clay with fragments of rounded metasiltstone					
12	41		metasiltstone	12-33m, 37-38m: strongly fractured, stained broken dark grey metasiltstone, micaceous. Quartz veining. Pyritic in places 38-41m: minor fracturing, dark grey black					

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

PERMIT No. 6184 DEVONBOROUGH DOWNS H.S.
Productive stock well. Discharge tested at over 50 kl/day

DRILL TYPE: ROTARY-HAMMER

CIRCULATION: AIR/Fluid

SHEET 1 OF 1

COMPLETED: 4/12/79

LOGGED BY: XPS

DATE: 4/12/79

PROJECT: N.E. Pastoral District GROUNDWATER INVESTIGATION

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface m

EL Ref. Point m Datum

HOLE NO: P.No 6187A

UNIT / STATE NO 7033OOOWW101

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	45	29.6m	45	54	20	¼	airlift	16202	W 4993-79

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	1		top soil and calcrete						
1	43		mica schist	soft weathered mica schist biotite granitic gneiss, grey minor fracturing and quartz veining.					
43	54		gneiss						

REMARKS:

Backfilled saline well. Ballava H.S.

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE: ROTARY/HAMMER

CIRCULATION: AIR

SHEET 1 OF 1

COMPLETED: 10/12/79

LOGGED BY: XPS

DATE: 10/12/79

PROJECT: N.E. Pastoral District
GROUNDWATER INVESTIGATIONS

LOCATION OR COORDS:

SEC. HD.

EL Surface m
EL Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: P.No 6187B
UNIT / STATE NO: 7033000WW102
DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	36m	24.3	36	42	25	½	airlift	5803	W — 4992-79
			36	48	55	½			

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	6		Top soil	brown sandy silty clay			150	0	6
6	18		quartzite	strongly stained (brown to black) fractured quartzite					
18	33		sandstone	strongly indurated white medium sandstone with minor quartzite					
33	43		quartzite	dark grey fine-medium quartzite, modurately to weakly stained					
43	48		sandstone	medium grained indurated yellowish sandstone up to 20% opaques strongly stained and clayey in places.					

REMARKS: productive stock well. Ballava H.S.

*NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE: Rotary/Hammer
CIRCULATION: Air
SHEET 1 OF 1

COMPLETED: 12/12/79
LOGGED BY: XPS
DATE: 12/12/79

PROJECT: North East Pastoral District GROUNDWATER INVESTIGATION.

LOCATION OR COORDS:

SEC. HD.

EL Surface m

EL Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: P.No. 6182A

UNIT / STATE NO: 7633OOOWWOO110

DM 79/79

AQUIFER	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
SUMMARY:	60-66m							28224	W — 4990-79

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	5		sandy clay	brown sandy (40%) clay					
5	9		sandstone	white fine-medium friable sandstone with minor chips of indurated quartzite.					
9	66		quartzite	fractured to strongly fractured (with common clay filling) stained brownish to white quartzite					

REMARKS:

Backfilled saline well. AROONA H.S.

*NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE: Rotary Hammer

COMPLETED: 5/12/79

CIRCULATION: Air/Fluid

LOGGED BY: XPS

SHEET 1 OF 1

DATE: 5/12/79

PROJECT: N.E. Pastoral District GROUNDWATER INVESTIGATIONS

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface m

EL Ref. Point m Datum

HOLE NO: P.No. 6182E

UNIT / STATE NO 7033OOWW00111

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	78	64.5	78	84	35	¼	airlift	16647	W — 4989-79

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	3		clay	brown silty sandy clay					
3	9		sands	light brown mottled cream clayey (40%) medium coarse sands.					
9	18		clay	white gritty very fine sandy clay?					
18	38		metaquartzite?	broken coarse to pebbly quartz fragments, with up to 50% clay matrix					
33	36		clay						
36	78		mica schist	mica (biotite, fine grained, up to 70%) schist 45-54; qtz fragments, coarse to pebbly					
78	84		meta quartzite	stained fractured micaceous meta quartzite?					

REMARKS:

Backfilled saline well. AROONA H.S.

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE Rotary/Hammer

CIRCULATION: Air/

SHEET 1 OF 1

COMPLETED:

LOGGED BY: XPS

DATE:

PROJECT: N.E. Pastoral District Groundwater Investigations

LOCATION OR COORDS:

SEC. HD.

EL Surface m

EL Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: P.No. 6183

UNIT / STATE NO. 7633OOOWWOO112

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	58		58	59	5	½	airlift	35409	W — 4991-79

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	3		clay	brown silty sandy clay with calcrete					
3	24		mica schist	fine grained grey to light brown, clayey in parts (<5%) strongly micaceous schist.					
24	27		quartzite	whitish fine-medium indurated quartzite, commonly stained brown.					
27	60		mica schist	strongly micaceous (50-90%) v. fine grained schist - indurated at depth. up to 10% opaques 42-48: 20% clay					

REMARKS: * NOTE: 110 kl / day = 1000gals / hr.

Backfilled saline well. Note high radium -226 content
AROONA H.S. (80 pci/l)

DRILL TYPE: Rotary/Hammer

CIRCULATION: Air

SHEET 1 OF 1

COMPLETED: 13/12/79

LOGGED BY: XPS

DATE: 13/12/79

PROJECT: GROUNDWATER INVESTIGATIONS

LOCATION OR COORDS: N.E. PASTORAL DISTRICT

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface m

EL Ref. Point m Datum

HOLE NO P.No. 6166A

UNIT / STATE NO 7034OOOWWOOO37

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	2		Sand	Brown medium coarse sands					
2	4		Clay	brown sandy clay with up to 30% sands					
4	5		Sand	coarse poorly sorted sands-gypsiferous					
5	17.5		Clay	Clay-very stiff, lightsbrown mottled grey 5-6: 20% sandy 7-9: 10-2% gypsum					
17.5	24		Sand	fine light grey well sorted clean sands					
24	60		Clay	24-26: sandy (30-40%) dark grey clay 26-63: dark grey, minor orange red spotting, clay, generally stiff, brown mottling, gritty at depth.					
60	86		Sandy Clay	60-80: light grey malleable clay, talcose sandy (very fine, 5 to10%) 80-85: as above, micaceous, up to 50% ?fine sands 85-86: as above, with minor very coarse quartz fragments					
86	90		Clay	Dark grey to black plastic clay becoming more shaly with depth					

REMARKS:

ABANDONED

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE: Rotary

COMPLETED 30/1/80

CIRCULATION: Fluid-Mud

LOGGED BY: XPS

SHEET 1 OF 2

DATE: 30/1/80

PROJECT: N.E. Pastoral District Groundwater Investigation

LOCATION OR COORDS:

SEC. HD.

EL Surface m

EL Ref. Point m Datum

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

HOLE NO: 6166AD

UNIT / STATE NO: 7034OOOWWOO40

DM 79/79

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
	60m	27.5	93	95	700	2	pump		W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	4		Sand	brown, silty, clayey, medium coarse			150	0	93
4	11		Clay	grey green clay, strongly gypsiferous between 4-6m.			PVC		
11	15		Sand-clay	poor sampling - At least 50% medium sands		Scr	15	92	95
							-25 mm aperture		
15	68		Clay	15-60: green to grey plastic to malleable 60-61: dark grey indurated clay 61-68: light bluish grey soft clay greasy, micaceous					
68	72		Sandy clay	poor samples - as 61-68 with up to 20-30% v fine sands					
72	75		Clayey sand	poor sampling: 60% v. fine sands in v. light bluish grey soft malleable clay matrix					
75	87		sands?	poor sampling: as above?					
87	93		sands	medium to v. coarse (size increasing with depth)					
93	101		fine gravel	generally well rounded					

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

Replacement productive well for 6166-C.

One 2m 115 mm screen lost down hole. Located at about 96m

DRILL TYPE: Rotary

CIRCULATION: Mud

SHEET 1 OF 2

COMPLETED: 5/3/80

LOGGED BY: XPS

DATE: 13/2/80

PROJECT:

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface m

EL Ref. Point m Datum

HOLE NO:

UNIT / STATE NO

DM

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
101	102		clayey fine gravel	fine well rounded gravel in whitish white clay matrix (30%) minor black indurated black clay fragments.	*sieve analysis 90-96m 13% .6mm 51% .3mm 85% .15mm				

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

During well completion, large amount of clean sands airlifted through gap between initial screen and casing. Sand sieve analysed*

DRILL TYPE:

CIRCULATION:

SHEET 2 OF 2

COMPLETED:

LOGGED BY: XPS

DATE:

PROJECT: N.E. PASTORAL DISTRICT
GROUNDWATER INVESTIGATIONS

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface Approx. 115-2 m Datum

EL Ref. Point

HOLE NO: P.No 6164

UNIT / STATE NO
7034OOOWWOOO20

DM 79/79

AQUIFER	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	Analysis No:
SUMMARY:	90	51.5? 31.5m?	90	92	40	¼ hr 1 hr	airlift airlift	11100 8200	W Field Analysis 993/80

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
0	3		Clay	Sandy brown clay			150	0	90.6m
3	24		Sand	3-9m: poorly sorted coarse to very coarse brown sands 9-15m: medium light brown sorted sands 15-18m: clayey 18-24: fine well sorted light brown sands			Screen 100 Inner seal Rubber Linatex seal	90 89.5m 90.5m	91.5m
24	66		Claystone and Stiff Clay	Drk grey claystone, stained red and yellow brown and stiff plastic grey to dark grey clay					
66	78		Silt	whitish grey silts (66-69m: poor sample) 75-78m: " ")	UPPER UNIT				
78	90		Silty v. fine sands	white-light grey silty to very fine sands 84m: thin hard bands of pyritic siltstone micaceous, a 5% opaques					
90	92.4		fine to medium sands	well sorted, subr, clean, light fawn, micaceous (2-5%)					
90	92.4		"	minor opaques (3%)					
92.4			Sandyclay	poor sample, sandy white (kaolinite malleable soft clay. END OF HOLE	- UPPER CLAY				

REMARKS:

Drilling 0-24m: air) 5 3/8" cutting blades
24-90m: fluid)
90-92.5m: mud, 8½" Roller bit.

* NOTE: 110 kl / day = 1000gals / hr.

Approx. sieve analysis 90-92m
10% .3mm
50% 0.2mm-0.3mm
40% .2mm

DRILL TYPE: Rotary

CIRCULATION: Air/Fluid/Mud

SHEET 1 OF 2

COMPLETED: March 80

LOGGED BY: XPS

DATE: 16/1/80

PROJECT:

LOCATION OR COORDS:

SEC. HD.

MINES DEPARTMENT — SOUTH AUSTRALIA
ENGINEERING DIVISION

WATER WELL LOG

EL Surface m

EL Ref. Point m Datum

HOLE NO:

UNIT / STATE NO

DM

AQUIFER SUMMARY:	DEPTH TO WATER CUT (m)	DEPTH TO STANDING WATER (m)	INTERVAL TESTED From:	INTERVAL TESTED To:	SUPPLY kilolitres/day*	SUPPLY Test Length (hrs)	SUPPLY Method	TOTAL DISSOLVED SOLIDS milligrammes/litre	TOTAL DISSOLVED SOLIDS Analysis No:
									W —

DEPTH (m) From	DEPTH (m) To	GRAPHIC LOG	ROCK / SEDIMENT NAME	GEOLOGICAL DESCRIPTION	FORMATION / AGE	DEPTH CORE SAMPLE	CASING Dia(mm)	CASING From(m)	CASING To(m)
			Remarks:	Hole initially screened (90-92m) with 0.4mm 150mm screen. On airlifting, very large amount of fine-medium sands airlifted. On standing, sand penetrated 20m inside casing, which appears to indicate detachment of screen. Hole cleaned to 92m and 100mm telescopic 0.18mm screen lowered down hole.					

REMARKS:

* NOTE: 110 kl / day = 1000gals / hr.

DRILL TYPE:

CIRCULATION:

SHEET 2 OF 2

COMPLETED:

LOGGED BY: PS

DATE:

APPENDIX B

Groundwater Analyses

WATER ANALYSIS REPORT

SAMPLE No. W4994-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	38.2	1.9
MAGNESIUM	(Mg)	69.4	5.7
SODIUM	(Na)	445	19.4
POTASSIUM	(K)	26.1	0.7
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	234	3.8
SULPHATE	(SO_4)	288	6.0
CHLORIDE	(Cl)	617	17.4
FLUORIDE	(F)		
NITRATE	(NO_3)	9	0.1
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ) 27.6	DIFF = 0.3	
ANIONS	(me/ℓ) 27.4	SUM = 55.0	

$\frac{\text{DIFF } 100}{\text{SUM}}$ = 0.5%

DERIVED AND OTHER DATA

	MILLIGRAMS PER LITRE mg/ℓ
CONDUCTIVITY (E.C.) MICRO-S/cm AT 25 DEG.C	3065
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	1608
C. RESIDUE ON EVAP. AT 180 DEG.C	
TOTAL HARDNESS AS $CaCO_3$	381
CARBONATE HARDNESS AS $CaCO_3$	192
NON-CARBONATE HARDNESS AS $CaCO_3$	189
TOTAL ALKALINITY AS $CaCO_3$	192
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.9
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO(me/ℓ) 70%

Radium^{-226} : < 0.5 pCi/l

NAME - DEVONBOROUGH DOWNS
ADDRESS
DATE COLLECTED 03-12-79
SAMPLE COLLECTED BY: DME

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 6932-116
D.M. No. 79/79

B1

WATER ANALYSIS REPORT

SAMPLE No. W4993-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	587	29.3
MAGNESIUM	(Mg)	1070	88.0
SODIUM	(Na)	3610	157.0
POTASSIUM	(K)	65.1	1.7
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	455	7.5
SULPHATE	(SO_4)	4339	90.3
CHLORIDE	(Cl)	6307	
FLUORIDE	(F)		
NITRATE	(NO_3)	1	
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ)	276.0	DIFF = .3
ANIONS	(me/ℓ)	275.6	SUM = 551.6

DIFF 100 / SUM = .1%

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 20598

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE mg/ℓ
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	16202
C. RESIDUE ON EVAP. AT 180 DEG.C	

TOTAL HARDNESS AS $CaCO_3$	5869
CARBONATE HARDNESS AS $CaCO_3$	373
NON-CARBONATE HARDNESS AS $CaCO_3$	5496
TOTAL ALKALINITY AS $CaCO_3$	373
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.8
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO(me/ℓ) 56.9%

Radium^{226} : 0.5 pCi/l

NAME - BALLARA ST.
ADDRESS
DATE COLLECTED 10-12-79
SAMPLE COLLECTED BY: A. STUMMER

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7033-101
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. W4992-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	428	21.4
MAGNESIUM	(Mg)	250	20.6
SODIUM	(Na)	1318	57.3
POTASSIUM	(K)	42.6	1.1
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	231	3.8
SULPHATE	(SO_4)	950	19.8
CHLORIDE	(Cl)	2679	75.5
FLUORIDE	(F)		
NITRATE	(NO_3)	22	0.4
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ)	100.3	DIFF = .9
ANIONS	(me/ℓ)	99.5	SUM = 199.8

DIFF 100 / SUM = 0.4%

DERIVED AND OTHER DATA

	MILLIGRAMS PER LITRE mg/ℓ
CONDUCTIVITY (E.C.) MICRO-S/cm AT 25 DEG.C	
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	5803
C. RESIDUE ON EVAP. AT 180 DEG.C	
TOTAL HARDNESS AS $CaCO_3$	2097
CARBONATE HARDNESS AS $CaCO_3$	189
NON-CARBONATE HARDNESS AS $CaCO_3$	1908
TOTAL ALKALINITY AS $CaCO_3$	189
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.5
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO(me/ℓ)	57.1%

Radium^{-226}: 1.0 pCi/l

NAME - BALLARA
ADDRESS
DATE COLLECTED 11/12/79
SAMPLE COLLECTED BY: DME

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7033-102
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. W4990-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	715	35.7
MAGNESIUM	(Mg)	984	80.9
SODIUM	(Na)	8227	357.9
POTASSIUM	(K)	35.4	0.9
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	303	5.0
SULPHATE	(SO_4)	4039	84.1
CHLORIDE	(Cl)	14070	396.8
FLUORIDE	(F)		
NITRATE	(NO_3)	5	0.1
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ)	475.4	DIFF = 10.5
ANIONS	(me/ℓ)	485.9	SUM = 961.3

DIFF 100 / SUM = 1.1%

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 34519

	MILLIGRAMS PER LITRE mg/ℓ
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	28224
C. RESIDUE ON EVAP. AT 180 DEG.C	
TOTAL HARDNESS AS $CaCO_3$	5835
CARBONATE HARDNESS AS $CaCO_3$	248
NON-CARBONATE HARDNESS AS $CaCO_3$	5587
TOTAL ALKALINITY AS $CaCO_3$	248
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.7
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO(me/ℓ)

Radium ^{226}: 9.3 pCi/l

NAME - ADDRESS AROONA ST.
DATE COLLECTED 5/12/79
SAMPLE COLLECTED BY: DME

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7033-110
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. 4989-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	888	44.3
MAGNESIUM	(Mg)	450	37.0
SODIUM	(Na)	4500	195.7
POTASSIUM	(K)	38.5	1.0
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	114	1.9
SULPHATE	(SO_4)	2748	57.2
CHLORIDE	(Cl)	7967	224.7
FLUORIDE	(F)		
NITRATE	(NO_3)		
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ)	278.1	DIFF = 5.7
ANIONS	(me/ℓ)	283.7	SUM = 561.8

$\frac{\text{DIFF } 100}{\text{SUM}}$ = 1.0%

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 22846

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE mg/ℓ
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	16647
C. RESIDUE ON EVAP. AT 180 DEG.C	

TOTAL HARDNESS AS $CaCO_3$	4069
CARBONATE HARDNESS AS $CaCO_3$	93
NON-CARBONATE HARDNESS AS $CaCO_3$	3976
TOTAL ALKALINITY AS $CaCO_3$	93
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.9
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO(me/ℓ)

NAME - AROONA ST.
ADDRESS
DATE COLLECTED 8/12/79
SAMPLE COLLECTED BY: DME

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7033-111
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. W4991-79 JOB No. 3101-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	1067	53.2
MAGNESIUM	(Mg)	1310	107.7
SODIUM	(Na)	9867	492.2
POTASSIUM	(K)	82.8	2.1
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	303	5.0
SULPHATE	(SO_4)	5474	114.0
CHLORIDE	(Cl)	17460	492.4
FLUORIDE	(F)		
NITRATE	(NO_3)		
PHOSPHATE	(PO_4)	1	

TOTALS AND BALANCE

CATIONS	(me/ℓ)	592.3	DIFF = 19.0
ANIONS	(me/ℓ)	611.3	SUM = 1203.6

DIFF 100 / SUM = 1.6%

A very strong sulphide odour present

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 40796

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE mg/ℓ
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	35409?
C. RESIDUE ON EVAP. AT 180 DEG.C	

TOTAL HARDNESS AS $CaCO_3$	8055
CARBONATE HARDNESS AS $CaCO_3$	248
NON-CARBONATE HARDNESS AS $CaCO_3$	7807
TOTAL ALKALINITY AS $CaCO_3$	248
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	6.3
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO(me/ℓ)	72.5%

Radium^{226} : 80.0 pCi/l

NAME - AROONA ST.
ADDRESS
DATE COLLECTED 12/12/79
SAMPLE COLLECTED BY: DME

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7033-112
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. W896/80 JOB No. 3995-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	530	26.4
MAGNESIUM	(Mg)	305	25.1
SODIUM	(Na)	3283	142.8
POTASSIUM	(K)	19.8	0.5
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	177	2.9
SULPHATE	(SO_4)	1721	35.8
CHLORIDE	(Cl)	5740	161.9
FLUORIDE	(F)		
NITRATE	(NO_3)		
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE			
CATIONS	(me/ℓ)	194.8	DIFF = 5.7
ANIONS	(me/ℓ)	200.6	SUM = 395.4

$\frac{\text{DIFF } 100}{\text{SUM}}$ = 1.5%

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 7746

TOTAL DISSOLVED SOLIDS	MILLIGRAMS PER LITRE mg/ℓ
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	11685
C. RESIDUE ON EVAP. AT 180 DEG.C	

TOTAL HARDNESS AS $CaCO_3$	2578
CARBONATE HARDNESS AS $CaCO_3$	145
NON-CARBONATE HARDNESS AS $CaCO_3$	2434
TOTAL ALKALINITY AS $CaCO_3$	145
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	8.1
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	

SODIUM TO TOTAL CATION RATIO(me/ℓ) 73.3%

Radium^{226}: 23.0 pCi/l

NAME - MOOLEULOOLOO
ADDRESS
DATE COLLECTED 28/1/80
SAMPLE COLLECTED BY: F. STUMMER, airlifting

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7034-19
D.M. No. 79/79

WATER ANALYSIS REPORT

SAMPLE No. W893/80 JOB No. 3995-80

CHEMICAL COMPOSITION

		MILLIGRAMS PER LITRE mg/ℓ	MILLEQUIVS. PER LITRE me/ℓ
CATIONS			
CALCIUM	(Ca)	510	25.4
MAGNESIUM	(Mg)	289	23.8
SODIUM	(Na)	3178	138.2
POTASSIUM	(K)	15.0	0.4
IRON	(Fe)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO_3)		
BICARBONATE	(HCO_3)	184	3.0
SULPHATE	(SO_4)	1643	34.2
CHLORIDE	(Cl)	5386	151.9
FLUORIDE	(F)		
NITRATE	(NO_3)		
PHOSPHATE	(PO_4)		

TOTALS AND BALANCE

CATIONS	(me/ℓ)	187.8	DIFF = 1.3
ANIONS	(me/ℓ)	189.1	SUM = 377.0

DIFF 100 / SUM = 0.3%

DERIVED AND OTHER DATA

CONDUCTIVITY (E.C.)
MICRO-S/cm AT 25 DEG.C 16897

	MILLIGRAMS PER LITRE mg/ℓ
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO_3=CO_3)	11112
C. RESIDUE ON EVAP. AT 180 DEG.C	
TOTAL HARDNESS AS $CaCO_3$	2463
CARBONATE HARDNESS AS $CaCO_3$	151
NON-CARBONATE HARDNESS AS $CaCO_3$	2312
TOTAL ALKALINITY AS $CaCO_3$	151
FREE CARBON DIOXIDE (CO_2)	
SUSPENDED SOLIDS	
SILICA (SiO_2)	
BORON (B)	

	UNITS
REACTION - pH	7.1
TURBIDITY (JACKSON)	
COLOUR (HAZEN)	
SODIUM TO TOTAL CATION RATIO(me/ℓ)	73.6%

Radium^{226}:45 pCi/l

NAME - MOOLEULOOLOO
ADDRESS
DATE COLLECTED 31/01/80
SAMPLE COLLECTED BY: DME, after 2 hrs pumping

FIELD TEMP. °C
FIELD pH @ °C
FIELD COND. µ-S/cm

OBS. No.
HOLE No. 7034-19
D.M. No. 79/79

SAMPLE ID. W992/80 JOB NO. 4013-80

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	447	22.3
MAGNESIUM	(MG)	297	24.4
SODIUM	(NA)	3128	136.1
POTASSIUM	(K)	19.4	.5
IRON	(FE)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO3)		
BICARBONATE	(HCO3)	184	3.0
SULPHATE	(SO4)	1441	14.6
CHLORIDE	(CL)	5781	151.8
BROMIDE	(BR)		
FLUORIDE	(F)		
NITRATE	(NO3)	<1	
PHOSPHATE	(PO4)		

DERIVED AND OTHER DATA	MILLIGRAMS PER LITRE MG/L
CONDUCTIVITY (E.C. MICRO-S/CM AT 25 DEG. C 14012.	
TOTAL DISSOLVED SOLIDS	
A. BASED ON E.C.	
B. CALCULATED (HCO3+CO3)	11444.
C. RESIDUE ON EVAP. AT 180 DEG. C	
TOTAL HARDNESS AS CACO3	2388.
CARBONATE HARDNESS AS CACO3	151.
NON-CARBONATE HARDNESS AS CACO3	2237.
TOTAL ALKALINITY AS CACO3	151.
FREE CARBON DIOXIDE (CO2)	
SUSPENDED SOLIDS	
SILICA (SIO2)	
BORON (B)	

TOTALS AND BALANCE				UNITS
CATIONS (ME/L)	184.1	DIFF =	5.1	
ANIONS (ME/L)	189.4	SUM =	373.4	
DIFF*100. / SUM	= 1.4 %			
REACTION - PH				7.3
TURBIDITY (JACKSON)				
COLOUR (HAZEN)				
SODIUM TO TOTAL CATION RATIO (ME/L)				73.8 %

REMARKS

DATE ANALYSED 27/3/80

Radium^{226} = 70 pCi/l

NAME-
ADDRESS-

HUNDRED-
SECTION-PERMIT 6166
HOLE NO-~~17-A2-8809~~ 7034 - 40
SUPPLY-

WATER CUT- 50 M
WATER LEVEL-
DEPTH HOLE-

DATE COLLECTED 05/03/80
DATE RECEIVED

SAMPLE COLLECTED BY-F.STUMMES

WATER ANALYSIS REPORT — AMDEL COMPUTER SERVICES

SAMPLE ID. W993/80 — JOB NO. 4033-80

CHEMICAL COMPOSITION		MILLIGRAMS PER LITRE MG/L	MILLIEQUIVS. PER LITRE ME/L
CATIONS			
CALCIUM	(CA)	402	20.1
MAGNESIUM	(MG)	257	21.1
SODIUM	(NA)	2705	117.7
POTASSIUM	(K)	19.2	.5
IRON	(FE)		
ANIONS			
HYDROXIDE	(OH)		
CARBONATE	(CO3)		
BICARBONATE	(HCO3)	215	3.5
SULPHATE	(SO4)	1413	29.4
CHLORIDE	(CL)	4507	127.1
BROMIDE	(BR)		
FLUORIDE	(F)		
NITRATE	(NO3)	<1	
PHOSPHATE	(PO4)		

TOTALS AND BALANCE

CATIONS (ME/L) 159.4 DIFF = .7
ANIONS (ME/L) 160.0 SUM = 319.4

DIFF*100. / SUM = .2 %

DERIVED AND OTHER DATA	MILLIGRAMS PER LITRE MG/L	UNITS
CONDUCTIVITY (E.C.) MICRO-S/CM AT 25 DEG. C 13130.		
TOTAL DISSOLVED SOLIDS		
A. BASED ON E.C.		
B. CALCULATED (HCO3=CO3)	9409.	
C. RESIDUE ON EVAP. AT 180 DEG. C		
TOTAL HARDNESS AS CACO3	2061.	
CARBONATE HARDNESS AS CACO3	176.	
NON-CARBONATE HARDNESS AS CACO3	1885.	
TOTAL ALKALINITY AS CACO3	176.	
FREE CARBON DIOXIDE (CO2)		
SUSPENDED SOLIDS		
SILICA (SIO2)		
BORON (B)		
REACTION - PH		6.3
TURBIDITY (JACKSON)		
COLOUR (HAZEN)		
SODIUM TO TOTAL CATION RATIO (ME/L)		73.8 %

REMARKS

DATE ANALYSED 27/3/80

Radium^{226} = 33 pCi/l

Ra 226

NAME- DAMAE
ADDRESS-

DATE COLLECTED 06/03/80
DATE RECEIVED

HUNDRED-KALKAROO STATION
SECTION-PERMIT 6164
HOLE NO-~~12-02-0002~~ 7304 -20
SUPPLY-
SAMPLE COLLECTED BY-F.STUMMER

WATER CUT- 90 M
WATER LEVEL-
DEPTH HOLE-

APPENDIX C

Well Discharge Test Analyses

INTRODUCTION

Short discharge tests were carried out on 3 productive wells where a submersible pump was available. Because of the difficulty in accurately controlling the discharge rate, and the probability that the wells were not fully developed the test data is only of limited use.

Olary Ranges

Well No. 6932-116 Aquifer: fractured siltstone metasediment. The test was carried out in two stages, steps 1 and 2 for 25 and 15 minutes respectively without recovery and step 3 for 40 minutes after the well had fully recovered. Because of possible development of the aquifer during the high pumping second step, the data could not be used to derive the drawdown equation (Fig. C-1). From the limited data, the long term pumping rate and specific capacity have been estimated at about 60 kL/day and 6 m^3/day/m respectively. The well should be capable of yielding up to 90 kL/day for short pumping periods (6 hrs) with a pump setting of 40 m.

SOUTHERN FROME EMBAYMENT

Well No. 7034-19 Aquifer: Tertiary sands (middle Unit?)
Five steps, for a total pumping period of 220 minutes, were carried out, with full recoveries between all steps except 3a and 3b. As has been previously reported for this aquifer system (Waterhouse, Beal 1978), excessive drawdown during the first step has possibly resulted in repacking of the soft clays above and within the sand aquifer with a subsequent reduction in transmissivity (Fig. C-2). The final value of T (0.4 m^2/day) is very low and not consistent for well sorted, clean (?) medium sands (as determined from poor strata samples), and could be due to either the presence of thin clayey interbeds (as shown in the gamma logs) or to a poorly developed screen.

From extrapolation of the test curves, the recommended long term pumping rate is 30 kL/day with a pump setting at 90m.

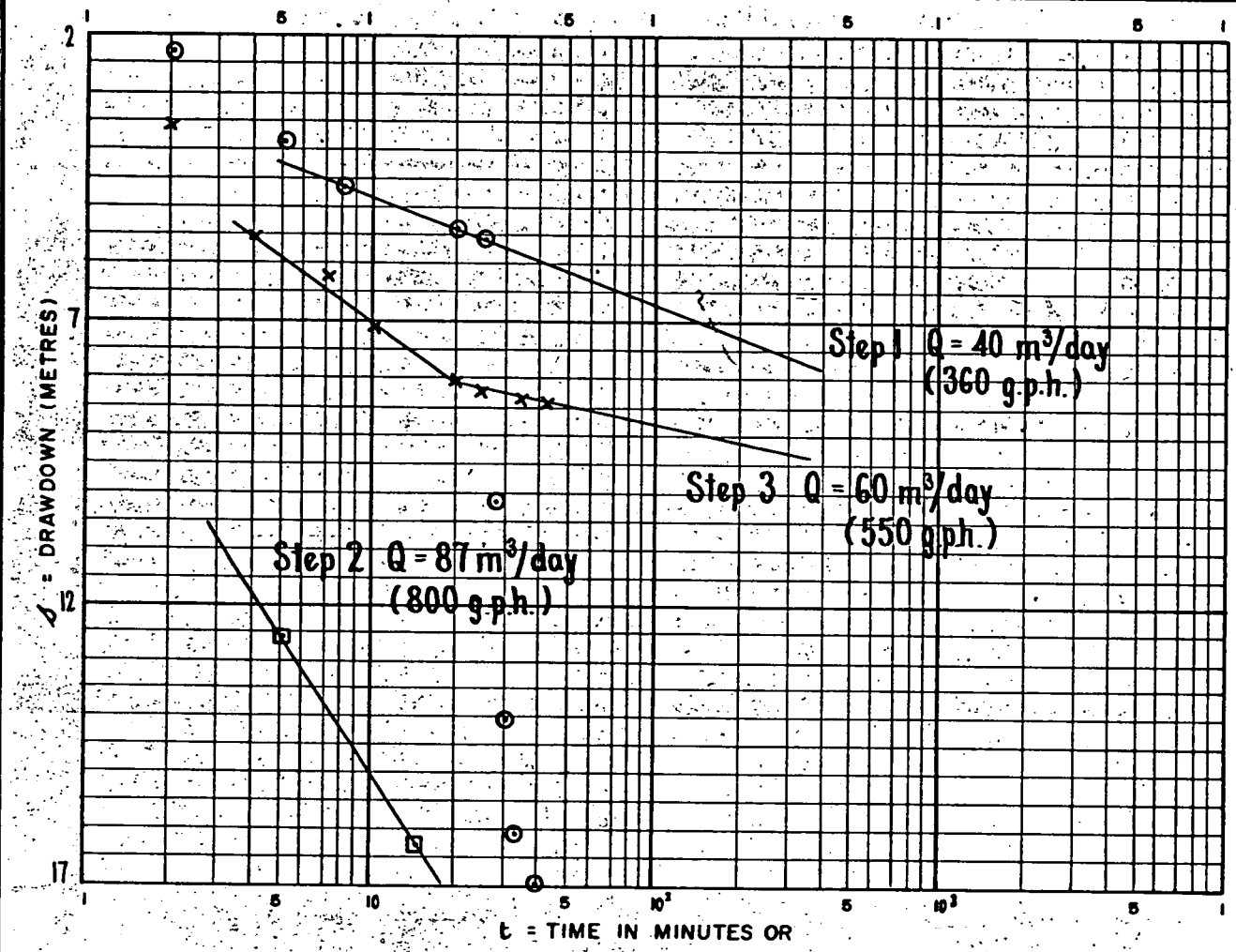
Well No. 6166-D: YARRAMBA

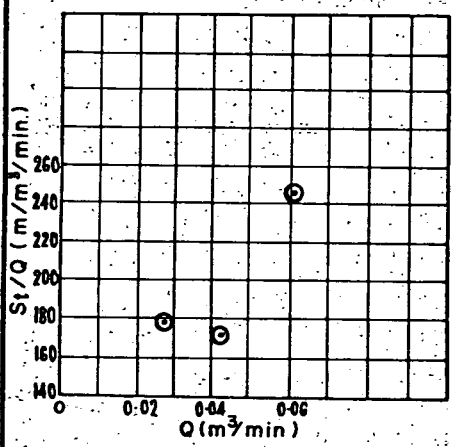
Aquifer: Tertiary sands (middle - basal Unit?)

Three steps of 30,100 and 10 minutes were carried out on this well with full recovery between each step.

Here again the transmissivity of the aquifer was reduced after the first step from 3 to 0.6 m^2/day, (Fig. C-3) although the drawdown plot for the second step appears to indicate the intersection of a recharge boundary after 50 minute pumping at 78 kL/day.

From the results, the long term capacity of this well can confidently be set at over 80 kL/day with a pumping level of about 60 m.





STEP	Q (m³/min)	$S_t = 1$	$\frac{S_t=1}{Q}$	$S_t = 10$	$\frac{S_t=10}{Q}$	$S_t = 100$	$\frac{S_t=100}{Q}$	Δs	$\frac{\Delta s}{Q}$	T*
1	0·027			4·8	178			1·9	0·05	4
2	0·061			15	246			7·8	0·09	2
3	0·042			7·2	171		Early	3·6	0·06	3
							Late	1	0·02	9

* JACOB EQUATION : $T = \frac{0 \cdot 183 . Q}{\Delta s}$

STATE/UNIT No. 6932/116

INTERVAL TESTED
From 27 m. to 41 m.

HOLE DEPTH 41 m.

AQUIFER
From ____ m. to ____ m.

LENGTH OF TEST 90 minutes

DEPTH OF PUMP INTAKE 30 m.

DEPTH OF WATER LEVEL AT START OF TEST 12·56 m.

AVAILABLE DRAWDOWN ____ m.

WELL EQUATION : $S = aQ + cQ^2 + b.Q.\log_{10}t$

OR $\frac{S_t}{Q} = a + cQ + b.\log_{10}t$

From $\frac{S_t}{Q}$ versus Q, a =

b =

c =

=

Therefore S_t = Q + Q^2 + $\log_{10}t$

NOTE :- See plan no. S 14797 for location of well.

WELL RECOVERY

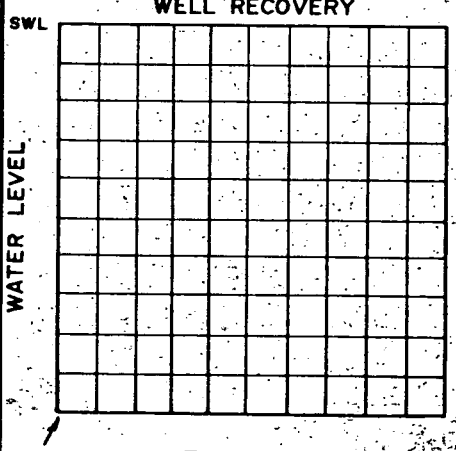
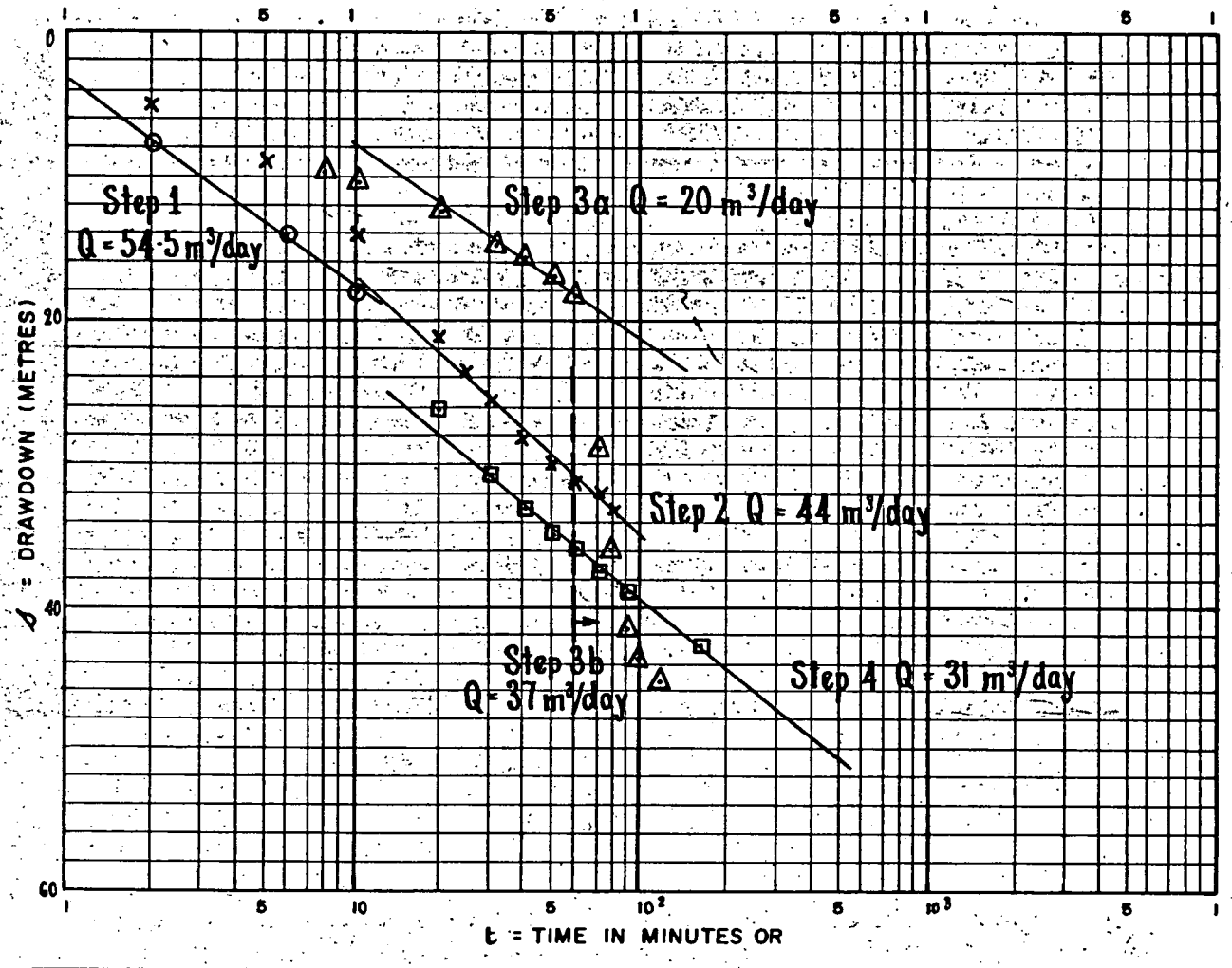
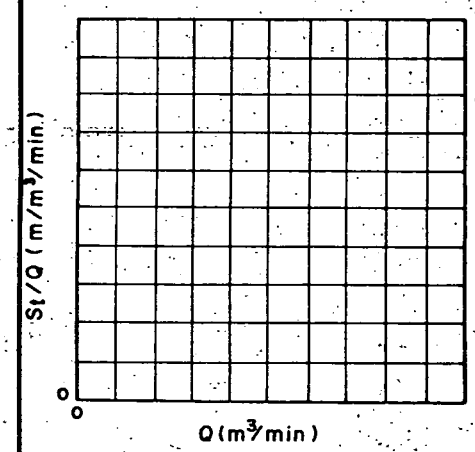


FIG. C-1

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE
COMPILED X.P.S.	NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION	DATE May 1980
DRN M.R. CKD	WELL No. 6932000WW00116	PLAN NUMBER S 14798
19·8·80	STEP DRAWDOWN TEST	





STEP	Q (m³/min)	$S_t = 1$	$\frac{S_t=1}{Q}$	$S_t = 10$	$\frac{S_t=10}{Q}$	$S_t = 100$	$\frac{S_t=100}{Q}$	Δs	$\frac{\Delta s}{Q}$	T*
1	0·038							15		0·7
2	0·031							18		0·4
3a	0·014							11		0·3
3b	0·026							21·5		0·3
4	0·021							16		0·4

* JACOB EQUATION : $T = \frac{0{\cdot}183.\,Q}{\Delta s}$

STATE/UNIT No. 7034/19

LENGTH OF TEST 220 minutes

INTERVAL TESTED

From 104 m. to 106 m.

DEPTH OF PUMP INTAKE 72 m.

HOLE DEPTH 106 m.

DEPTH OF WATER LEVEL AT START OF TEST 27 m.

AQUIFER

From 90 m. to 130 m.

AVAILABLE DRAWDOWN 45 m.

WELL EQUATION : $S = aQ + cQ^2 + b.Q.\log_{10}t$

OR $\frac{S_t}{Q} = a + cQ + b.\log_{10}t$

From $\frac{S_t}{Q}$ versus Q, a =

b =

c =

=

Therefore S_t = Q + Q^2 + $\log_{10}t$

NOTE : See plan no. S 14794 for location of well

WELL RECOVERY

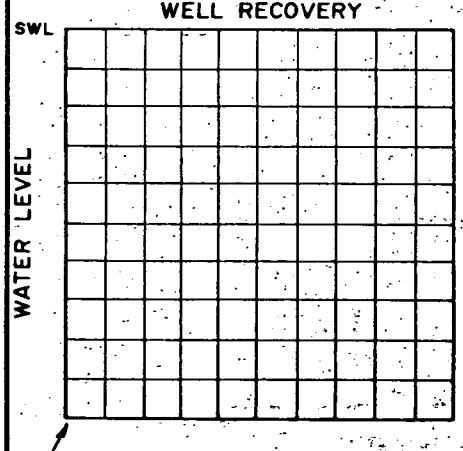
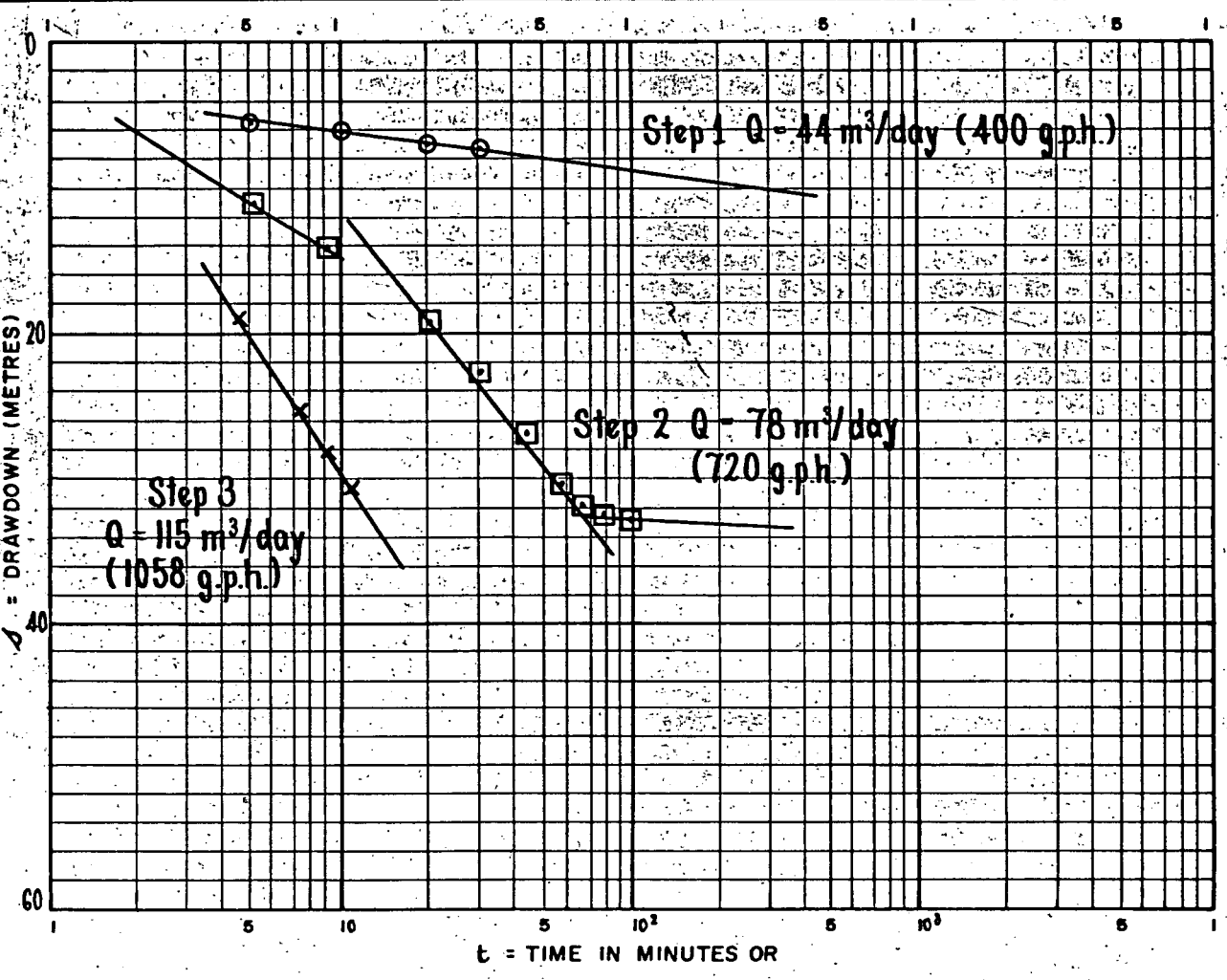
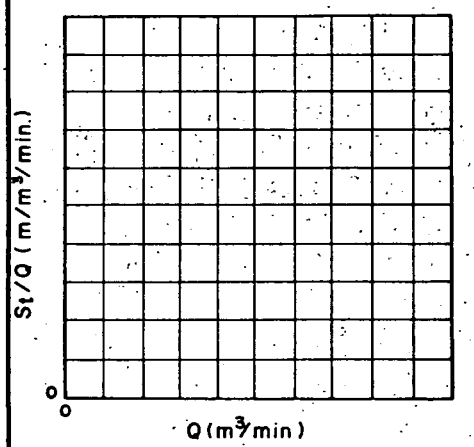


FIG. C-2

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE:
COMPILED: X.P.S.	NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION	DATE May 1980
DRN. M.R. CKD.	WELL No. 7034000WW00019	PLAN NUMBER
14.8.80	STEP DRAWDOWN TEST	S 14799





STEP	Q (m³/day)	$S_t = 1$	$\frac{S_t = 1}{Q}$	$S_t = 10$	$\frac{S_t = 10}{Q}$	$S_t = 100$	$\frac{S_t = 100}{Q}$	Δs	$\frac{\Delta s}{Q}$	T*
1	44							2·5		3
2	78						Middle	24		0·6
3	115							29·5		0·7

* JACOB EQUATION : $T = \frac{0{\cdot}183.\,Q}{\Delta s}$

STATE / UNIT No. 7034 / 40

LENGTH OF TEST 120 minutes

INTERVAL TESTED

From 93 m. to 95 m.

DEPTH OF PUMP INTAKE 58 m.

HOLE DEPTH ..... m.

DEPTH OF WATER LEVEL AT START OF TEST 27·5 m.

AQUIFER

From 78 m. to 102 m.

AVAILABLE DRAWDOWN 30 m.

WELL EQUATION : $S = aQ + cQ^2 + b.Q.\log_{10} t$

OR $\frac{S_t}{Q} = a + cQ + b.\log_{10} t$

From $\frac{S_t}{Q}$ versus Q, a =

b =

c =

=

Therefore S_t = Q + Q^2 + $\log_{10} t$

NOTE :- See plan no. S 14797 for location of well.

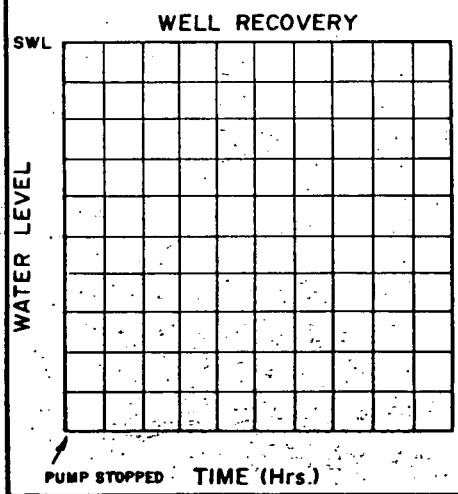


FIG. C-3

	DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA	SCALE
COMPILED X.P.S.	NORTH EAST PASTORAL DISTRICT GROUNDWATER INVESTIGATION	DATE May 1980
DRN M.R. CKD	WELL No. 7034000WW00040	PLAN NUMBER S 14800
19.8.80	STEP DRAWDOWN TEST	

1931