IPOLEPA ROADS BORES
Bore Completion Report
RN 16879, RN 16880 and RN 16881

R PAUL
HYDROGEOLOGIST
WATER RESOURCES BRANCH
ALICE SPRINGS

December 1996
SYNOPSIS

A production bore, RN 16880, was constructed at Ipolera for Transport and Works as a water supply for maintenance of the Mereenie Loop Road. The bore has a maximum recommended yield for a 35 day continuous pumping period of 3.0 L/s. A standby bore, RN 16881, was also constructed with a maximum recommended yield for a 35 day continuous pumping period of 0.7 L/s.

The water is drawn from fractured Ljiltera Member of the Pertnjara Group.

Keywords

Subject: Road Maintenance Water Supply Bores

Geology: Amadeus Basin
Ljiltera Member
Pertnjara Group

Location: Ipolera
Ltalaltuma Aboriginal Land Trust
Mereenie Loop Road
TABLE OF CONTENTS

1. INTRODUCTION 1
2. REGIONAL HYDROGEOLOGY 2
3. DRILLING 3
4. TEST PUMPING 5
5. CONCLUSIONS 6
6. RECOMMENDATIONS 6

LIST OF TABLES

1. AIRLIFT YIELDS AND EC VALUES FROM IPOLERA BORES AND MEREENIE LOOP ROAD INVESTIGATION BORES 2
2. SUMMARY OF DRILLING, 1996 4
3. RN 16880 AND RN 16881 BORE CONSTRUCTION SUMMARY 4
4. PUMP SETTINGS FOR IPOLERA BOREHOLES 5

LIST OF FIGURES

1. LOCATION MAP
2. LOCAL GEOLOGY MAP
3. BORE LOCATION MAP
4. DRAWDOWN-YIELD RELATIONSHIPS FOR RN 16880
5. DRAWDOWN-YIELD RELATIONSHIPS FOR RN 16881
LIST OF APPENDICES

A. COMPOSITE LOGS AND GEOLOGICAL LOGS
B. TEST PUMPING
C. TEST REPORT - RN 16880 & RN 16881
D. WATER QUALITY ANALYSES
### LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bgl</td>
<td>below ground level</td>
</tr>
<tr>
<td>CRT</td>
<td>constant rate test</td>
</tr>
<tr>
<td>EC</td>
<td>electrical conductivity</td>
</tr>
<tr>
<td>ID</td>
<td>inside diameter</td>
</tr>
<tr>
<td>km</td>
<td>kilometres</td>
</tr>
<tr>
<td>L/s</td>
<td>litres per sec</td>
</tr>
<tr>
<td>m</td>
<td>metres</td>
</tr>
<tr>
<td>mg/l</td>
<td>milligrams per litre</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>RN</td>
<td>registered number</td>
</tr>
<tr>
<td>s</td>
<td>drawdown</td>
</tr>
<tr>
<td>SWL</td>
<td>standing water level</td>
</tr>
<tr>
<td>T</td>
<td>transmissivity</td>
</tr>
<tr>
<td>TDS</td>
<td>total dissolved solids</td>
</tr>
<tr>
<td>μS/cm</td>
<td>microsiemens per centimetre</td>
</tr>
</tbody>
</table>

### DISTRIBUTION LIST

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2. WATER RESOURCES LIBRARY, ALICE SPRINGS  
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5. PRINCIPAL ENGINEER GROUNDWATER  
6. AUTHOR
1. INTRODUCTION

Water Resources Branch were requested by the Construction Agency of Transport and Works to drill and test pump bores at Ipolera, 40 km west south-west of Hermannsburg on Litaltuma Aboriginal Land Trust (NT Portion 2075). Four L/s of water was required for maintenance of the Mereenie Loop road (Fig. 1).
2. REGIONAL HYDROGEOLOGY

Ipolera is situated on sedimentary rocks of the Amadeus Basin (Fig. 2). The Ljiltera Member of the Amadeus Basin outcrops to the south of Ipolera, while north of Ipolera Cenozoic sands, silts and gravels cover the Amadeus Basin sediments. The Amadeus Basin sediments are exposed again north of Mereenie Loop road. The Undandita Member, younger than the Ljiltera Member, is not exposed in the area but from previous drilling is known to underlie the Mereenie Loop road area. Three bores were drilled previously at Ipolera, and four bores were drilled into the Undandita Member near the Mereenie Loop road (Fig. 3). Table 1 shows a summary of airlift yield and EC values for the Mereenie Loop and Ipolera bores.

Table 1. Airlift Yields and EC Values from Ipolera Bores and Mereenie Loop Road Investigation Bores

<table>
<thead>
<tr>
<th>RN Number</th>
<th>Name</th>
<th>Depth Constructed</th>
<th>Yield (L/s)</th>
<th>EC (μS/cm)</th>
<th>Geological Unit</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN 6632</td>
<td>Ipolera No. 1</td>
<td>39.6 m</td>
<td>-</td>
<td>780</td>
<td>De</td>
<td></td>
</tr>
<tr>
<td>RN 6633</td>
<td>Ipolera No. 2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>De</td>
<td></td>
</tr>
<tr>
<td>RN 14955</td>
<td>No. 1 Duplicate</td>
<td>48.25 m</td>
<td>2.5</td>
<td>815</td>
<td>De</td>
<td></td>
</tr>
<tr>
<td>RN 13845</td>
<td>Road Bore 1/83</td>
<td>100.0 m</td>
<td>Dry</td>
<td>Du</td>
<td>Backfilled</td>
<td></td>
</tr>
<tr>
<td>RN 13846</td>
<td>Road Bore 2/83</td>
<td>100.0 m</td>
<td>Dry</td>
<td>Du</td>
<td>Backfilled</td>
<td></td>
</tr>
<tr>
<td>RN 13847</td>
<td>Road Bore 3/83</td>
<td>150.0 m</td>
<td>0.25</td>
<td>4,200</td>
<td>Du</td>
<td>Backfilled</td>
</tr>
<tr>
<td>RN 16699</td>
<td></td>
<td>211.5 m</td>
<td>Dry</td>
<td>Du</td>
<td>Backfilled</td>
<td></td>
</tr>
</tbody>
</table>

Du Undandita Member
De Ljiltera Member

From the results of past drilling the prospects of finding water close to Mereenie Loop road are small and Ipolera is the closest area with a known water supply. Water at Ipolera is drawn from fractures in the Ljiltera Member of the Pertnjara Group. The Ljiltera Member is a poor to moderate fractured aquifer with low transmissivity.
3. DRILLING

Three sites were drilled between 10/09/96 and 26/09/96 and two were completed as production boreholes.

The first site, RN 16879, was drilled near the access road to Ipolera approximately 1 km from RN 14955, the water supply bore for Ipolera community (Fig. 3). The second site was drilled 1 km to the west of RN 14955. The third site was drilled 1 km to the west of RN 16680 as a standby borehole. Figure 3 shows the bore locations, Table 2 has a summary of drilling and construction details are in Table 3. The composite logs and geological logs of the three sites are in Appendix A.
### Table 2. Summary of Drilling, 1996

<table>
<thead>
<tr>
<th>RN Number</th>
<th>Easting (AMG)</th>
<th>Northing (AMG)</th>
<th>Date Drilled</th>
<th>Depth Drilled (m)</th>
<th>Airlift Yield (L/s)</th>
<th>EC (μS/cm)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN 16879</td>
<td>233700</td>
<td>7345646</td>
<td>10-12/09/96</td>
<td>120.9</td>
<td>0.6</td>
<td>702</td>
<td>Abandoned due to low yield</td>
</tr>
<tr>
<td>RN 16880</td>
<td>231529</td>
<td>7343871</td>
<td>12-21/09/96</td>
<td>163.6</td>
<td>5.8</td>
<td>830</td>
<td>Cased with 152 mm ID steel</td>
</tr>
<tr>
<td>RN 16881</td>
<td>230530</td>
<td>7343602</td>
<td>14-20/09/96</td>
<td>179.0</td>
<td>1.2</td>
<td>1090</td>
<td>Cased with 152 mm ID steel</td>
</tr>
</tbody>
</table>

### Table 3. RN 16880 and RN 16881 Bore Construction Summary

<table>
<thead>
<tr>
<th>RN Number</th>
<th>Recommended Pumping Rate (L/s)</th>
<th>Casing Diameter and Type</th>
<th>Completion Depth (m)</th>
<th>Slotted Depth (m)</th>
<th>SWL (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN 16880</td>
<td>3.0</td>
<td>152 mm ID Steel</td>
<td>163.6</td>
<td>81.8-88.3 &amp; 147.0-153.5m</td>
<td>34.01 (24/09/96)</td>
</tr>
<tr>
<td>RN 16881</td>
<td>0.7</td>
<td>152 mm ID Steel</td>
<td>111.8</td>
<td>102.3-108.8m</td>
<td>51.81 (20/09/96)</td>
</tr>
</tbody>
</table>

Slots 6 mm wide cut using oxy torch.
4. TEST PUMPING

The two production boreholes, RN 16680 and RN 16681, were test pumped as follows: A four step step-test and recovery followed by a 25 hour constant rate test and recovery. Details of the test pumping are in Appendix B.

Table 4 shows the recommended pump inlet setting and pumping rate and Test Reports are in Appendix C.

<table>
<thead>
<tr>
<th>RN Number</th>
<th>SWL (m b toe)</th>
<th>Recommended Pump Setting (m bgl)</th>
<th>Available Drawdown (m)</th>
<th>Recommended Pumping Rate for 35 Days (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN 16880</td>
<td>34.75 (24/9/96)</td>
<td>81.0 m</td>
<td>46.25</td>
<td>3.0</td>
</tr>
<tr>
<td>RN 16881</td>
<td>52.13 (20/9/96)</td>
<td>101.0 m</td>
<td>48.90</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Drawdown - Yield relationships have been calculated for RN 16880 and 16881 (Fig. 4 and Fig. 5). Water analyses are in Appendix D.
5. CONCLUSIONS

Three bores sites were drilled at Ipolera. One site was abandoned due to low yield while the other two were cased with 152 mm ID steel. The aquifer is fractured Ljiltera Member. The recommended pumping rates are shown in Table 4. The water quality is good.

6. RECOMMENDATIONS

1. Bore RN 16880 should be pumped at a maximum continuous rate for a 35 day period of 3.0 L/s.

2. Bore RN 16881 should be pumped at a maximum continuous rate for a 35 day period of 0.7 L/s.

3. The SWL and total depth should be noted each time pumping equipment is removed from the bore.
Os, nannSOi.Jr,g

5

Qo: I p,jJuvial silt and sand

Qo Coarse sand and gravel

as Sand

Op Clay, minor sand

10 ".....---.~~'

"15

Qe I Lijiltera Member, pebbly sandstone, sandstone rare conglomerate

R+:~

GEOLOGY OF THE IPOLERA AREA

after Shaw & Warren et al, 1995)

Hermannsburg Sandstone, reddish-brown sandstone

FIGURE 2
IPOLERA ROADS BORE
BORE LOCATION MAP

FIGURE 3
These curves are based on a 25 hour pumping test at a discharge of 4.0 litres per second. They assume that hydrological conditions will not change for other pumping rates and periods.

SWL (24/09/1996) 34.75 m btec

Figure 4
These curves are based on a 25 hour pumping test at a discharge of 1.0 litre per second. They assume that hydrological conditions will not change for other pumping rates and periods.

Date Tested 21/09/1996

SWL (20/09/1996) 52.13 m bloc
APPENDIX A

COMPOSITE LOGS AND GEOLOGICAL LOGS
## WATER RESOURCES

### COMPOSITE LOG OF BORE

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION</th>
<th>GRAPHIC LOG</th>
<th>STRATA DESCRIPTION</th>
<th>GROUNDWATER INFLOWS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>270mm diameter hole</td>
<td>-4.0m</td>
<td>SAND: dark reddish orange</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>BACKFILLED</td>
<td>203mm diameter hole</td>
<td>SANDSTONE: dark reddish brown medium grained poorly sorted sub-angular to sub-rounded, feldspathic quartz sand.</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td>SANDSTONE: as above except fine grained and also bands of Siltstone very dark reddish brown (20% of sample)</td>
<td>-</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td>SANDSTONE: dark reddish brown fine to medium grained poorly sorted sub-angular to sub-rounded feldspathic quartz sand.</td>
<td>-</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td>▼ SWL 21.02m 12/9/96</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td>0.2 L/s EC=180μS/cm</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>0.4 L/s EC=782μS/cm</td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td>0.5 L/s EC=719μS/cm</td>
</tr>
<tr>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td>0.6 L/s EC=702μS/cm</td>
</tr>
<tr>
<td>160</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DATE DRILLED: 10-12/09/96

IPOLERA - ROADS BORE RN 16879

clog-015.dgn
Avis: 13/01/97

SAND: dark reddish orange

SANDSTONE: dark reddish brown medium grained poorly sorted sub-angular to sub-rounded, feldspathic quartz sand.

SANDSTONE: as above except fine grained and also bands of Siltstone very dark reddish brown (20% of sample)

SANDSTONE: dark reddish brown fine to medium grained poorly sorted sub-angular to sub-rounded feldspathic quartz sand.
WATER RESOURCES
COMPOSITE LOG OF BORE

DEPTH (m)  BORE CONSTRUCTION  GRAPHIC LOG  STRATA DESCRIPTION  GROUNDWATER INFLOWS

0  - 3.8m  CALCRETE  SAND
200mm ID steel casing

3.8m  SANDSTONE: dark reddish brown medium grained poorly sorted sub-angular to sub-rounded feldspathic quartz sand
152mm ID steel casing

80mm ID steel casing

152mm ID steel casing

From Driller's Log
Fractures at: 79.3m to 80.8m
82.9m to 84.7m
145.4m to 146.4m
148.0m to 149.0m

0  0.3 L/s EC=840μS/cm
0.9 L/s

2.3 L/s EC=826μS/cm

5.8 L/s EC=830μS/cm

24/09/96

SWL 34.01m

IPOLERA - ROADS BORE  RN 16880

DATE DRILLED 12-21/09/96

27.3mm diameter hole

205mm ID steel casing

162mm ID steel casing

TD 163.24m

END PLATE

SANDSTONE: as above and SILTSTONE (40%) as above

SANDSTONE: reddish brown fine grained, poorly sorted sub-angular to sub-rounded feldspathic quartz sand with minor bands of very dark reddish brown SILTSTONE.

SANDSTONE: reddish brown fine grained, mainly fine grained, poorly sorted, sub-angular to sub-rounded feldspathic quartz sand with minor bands of very dark reddish brown SILTSTONE.
## WATER RESOURCES

### COMPOSITE LOG OF BORE

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CALCRETE SAND</td>
</tr>
<tr>
<td>0-4.6m</td>
<td>SANDSTONE: reddish brown, medium grained poorly sorted, sub-angular to sub-rounded feldspathic quartz sand.</td>
</tr>
<tr>
<td>4.6m</td>
<td>SANDSTONE: as above with minor bands of very dark reddish brown SILTSTONE</td>
</tr>
<tr>
<td>10-20</td>
<td>SANDSTONE: reddish brown mainly fine grained - poorly sorted, sub-angular to sub-rounded feldspathic quartz sand with minor bands of very dark reddish brown SILTSTONE</td>
</tr>
<tr>
<td>20-90</td>
<td>SANDSTONE: as above with minor bands of very dark reddish brown SILTSTONE</td>
</tr>
<tr>
<td>90-118.8m</td>
<td>END PLATE</td>
</tr>
<tr>
<td>118.8m</td>
<td>BORE BACKFILLED TO 118.8m</td>
</tr>
<tr>
<td>179.0m</td>
<td>TD</td>
</tr>
</tbody>
</table>

### STRATA DESCRIPTION

- **SANDSTONE**: reddish brown, medium grained poorly sorted, sub-angular to sub-rounded feldspathic quartz sand.
- **SANDSTONE**: as above with minor bands of very dark reddish brown SILTSTONE
- **SANDSTONE**: reddish brown mainly fine grained - poorly sorted, sub-angular to sub-rounded feldspathic quartz sand with minor bands of very dark reddish brown SILTSTONE
- **SANDSTONE**: as above
- **SANDSTONE** and **SILTSTONE** (40%) as above

### GROUNDWATER INFLOWS

- 0.1 L/s EC≤1010μS/cm
- 1.8 L/s EC≥1032μS/cm

### FROM DRILLERS LOG

- Fractures at: 90.0m to 90.8m
- 105.7m to 106.8m

---

**IPOLERA - ROADS BORE**

**RN 16881**

*DATE DRILLED 14-20/09/96*

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*Source: Department of Lands, Planning and Environment*
RN 16879

Geological Log

0 - 3.0 m  SAND, dark reddish orange (10R 5/6), slightly silty, fine to coarse grained, poorly sorted, sub-angular to rounded quartz grading to friable SANDSTONE, reddish brown (10R 4/4).

3.0 - 33.0 m  SANDSTONE, dark reddish brown (10R 3/4), medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand.

33.0 - 48.0 m  SANDSTONE, dark reddish brown (10R 3/4), fine grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone is approximately 20% of the sample.

48.0 - 120.87 m  SANDSTONE, dark reddish brown (10R 4/4), fine to medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand.

EOH.

Colours all described from wet samples.

Stratigraphy:  Ljiltera Member of the Pertnjara Group.
Age:  Devonian
RN 16880

Geological Log

<table>
<thead>
<tr>
<th>Depth Range (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2.8 m</td>
<td>SAND, moderate reddish orange (10R 5/6), slightly silty, fine to medium grained, poorly sorted, sub-angular to sub-rounded quartz.</td>
</tr>
<tr>
<td>2.8 - 3.6 m</td>
<td>CALCRETE, pale greyish orange (10YR 8/4), calcite matrix surrounding a medium grained quartz sand.</td>
</tr>
<tr>
<td>3.6 - 9.0 m</td>
<td>SANDSTONE, dark reddish brown (10R 3/4), medium to fine grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand.</td>
</tr>
<tr>
<td>9.0 - 21.0 m</td>
<td>SANDSTONE, reddish brown (10R 4/4), fine to medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone &lt; 10 % of sample.</td>
</tr>
<tr>
<td>21.0 - 159.0 m</td>
<td>SANDSTONE, dark reddish brown (10R 3/4), medium to fine grained but mainly fine grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone &lt; 10 % of sample. Driller's log reports fractures at: 79.3 - 80.8 m  82.9 - 84.7 m  145.4 - 146.4 m  148.0 - 149.0 m</td>
</tr>
<tr>
<td>159.0 - 163.24 m</td>
<td>SANDSTONE, moderate reddish brown (10R5/6), fine grained, moderately sorted, sub-angular to sub-rounded, feldspathic quartz sand with bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone approximately 10 % of sample.</td>
</tr>
</tbody>
</table>

EOH.

Colours all described from wet samples.

Stratigraphy: Ljiljera Member of the Pertjara Group.

Age: Devonian
Geological Log

0 - 1.5 m  SAND, moderate reddish brown (10R 5/6), slightly silty, fine to medium grained, poorly sorted, sub-angular to sub-rounded quartz.

1.5 - 4.1 m  CALCRETE, white (N9), calcite matrix surrounding a fine to medium grained quartz sand.

4.1 - 15.0 m  SANDSTONE, reddish brown (10R 4/4), medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand.

15.0 - 48.0 m  SANDSTONE, reddish brown (10R 4/4), medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone < 10 % of sample.

48.0 - 174.0 m  SANDSTONE, reddish brown (10R 4/4), fine to medium grained but mainly fine grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone < 10 % of sample.

Driller's log reports fractures at:
90.0 - 90.8 m
105.7 - 106.8 m

174.0 - 179.0 m  SANDSTONE, reddish brown (10R 4/4), fine to medium grained, poorly sorted, sub-angular to sub-rounded, feldspathic quartz sand with minor bands of SILTSTONE, dark reddish brown (10R 2.5/4). Siltstone approximately 40 % of sample.

EOH.

Colours all described from wet samples.

Stratigraphy:  Ljiltera Member of the Pernjara Group.
Age:  Devonian
APPENDIX B

TEST PUMPING
TABLE OF CONTENTS

B1. INTRODUCTION
B2. TRANSMISSIVITY VALUES
B3. BORE EFFICIENCY

LIST OF TABLES

B1. TEST PUMPING PROGRAM
B2. CALCULATED TRANSMISSIVITY VALUES
B3. BORE EFFICIENCY, IPOLERA BORES

LIST OF FIGURES

B1. RN 16880 STEP-DRAWDOWN GRAPH
B2. RN 16880 BIRSOY-SUMMERS GRAPH
B3. RN 16880 THEIS TYPE CURVE GRAPH
B4. RN 16880 JACOB METHOD GRAPH
B5. RN 16880 BIRSOY-SUMMERS RECOVERY METHOD GRAPH
B6. RN 16881 STEP-DRAWDOWN GRAPH
B7. RN 16881 BIRSOY-SUMMERS GRAPH
B8. RN 16881 THEIS TYPE CURVE GRAPH
B9. RN 16881 JACOB METHOD GRAPH
B10. RN 1688 THEIS RECOVERY GRAPH
B1. INTRODUCTION

The test pumping program for both bores consisted of a four step step test followed by a 25 hour CRT. Figures B1 to B5 show step-drawdown graph, Birsoy-Summers graph, Theis curve graph, Jacob method graph and CRT recovery graph for RN 16880 while Figures B6 to B10 show the same graphs for RN 16881. Table B1 lists a summary of the test pumping program.

Table B1 Test Pumping Program

<table>
<thead>
<tr>
<th>RN 16680</th>
<th>Step Test started 21/09/96.</th>
<th>Constant rate test started 23/09/96</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 1</td>
<td>Step 2</td>
</tr>
<tr>
<td>Q (L/s)</td>
<td>2.05</td>
<td>3.0</td>
</tr>
<tr>
<td>Time (min)</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Bore forked at 270 minutes. Pumping rate decreased to 4.0 L/s for 1230 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery was also measured from 1530 minutes to 1800 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RN 16881</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>CRT</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q (L/s)</td>
<td>0.7</td>
<td>0.9</td>
<td>1.1</td>
<td>1.3</td>
<td>1.01</td>
<td>-</td>
</tr>
<tr>
<td>Time (min)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>1500</td>
<td>300</td>
</tr>
</tbody>
</table>

B2. TRANSMISSIVITY VALUES

The CRT and step test have been used to calculate T for RN 16880 and RN 16881. The Birsoy-Summers method used the step test data while the other methods used the CRT data. The recovery of RN 16880 was analysed by the Birsoy-summers recovery method as this method can be used on variable rate pumping tests. Table B2 lists the methods used and values calculated.

Table B2 Calculated Transmissivity Values

<table>
<thead>
<tr>
<th>Method</th>
<th>RN 16880 Transmissivity (m²/day)</th>
<th>RN 16881 Transmissivity (m²/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birsoy-Summers</td>
<td>5.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Theis Type Curve</td>
<td>5.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Jacob method</td>
<td>5.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Theis Recovery</td>
<td>5.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Average</td>
<td>5.125</td>
<td>1.15</td>
</tr>
</tbody>
</table>
The transmissivity is low in both bores because the aquifer is fractured Ljiljeta Member and, from the driller's log, there are fractures in 5.3 m of drilling in RN 16880 and in 1.9 m of drilling in RN 16881.

B3. BORE EFFICIENCY

The Step test has been used to calculate the efficiency of the bore. The drawdown in a pumping bore is made up of two components, aquifer loss and well loss (Clark, 1977). The aquifer loss is that part of the drawdown caused by resistance to laminar flow within the aquifer. The well loss results from resistance to turbulent flow in the zone adjacent to the bore, and through the screen or slotted casing. The relationship between the components is given by the formula $s = BQ + CQ^2$, where $BQ =$ aquifer loss and $CQ^2 =$ well loss. The well efficiency is calculated from $BQ/(BQ + CQ^2) \times 100$ and is in Table B3.

<table>
<thead>
<tr>
<th>Bore Efficiency, Ipolera Bores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table B3.</strong></td>
</tr>
<tr>
<td><strong>Bore Efficiency %</strong></td>
</tr>
<tr>
<td><strong>Q (L/s)</strong></td>
</tr>
<tr>
<td><strong>Q (m³/day)</strong></td>
</tr>
<tr>
<td><strong>Q (100 mins)</strong></td>
</tr>
<tr>
<td><strong>Drawdown (m)</strong></td>
</tr>
<tr>
<td><strong>BQ (m)</strong></td>
</tr>
<tr>
<td><strong>CQ² (m)</strong></td>
</tr>
<tr>
<td><strong>Calculated Drawdown (%)</strong></td>
</tr>
<tr>
<td><strong>Bore Efficiency %</strong></td>
</tr>
<tr>
<td><strong>RN 16880</strong></td>
</tr>
<tr>
<td>B=0.064835 C=0.000402034 Calculated from Hantush-Bierschenk method.</td>
</tr>
<tr>
<td>Q</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>2.05</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>4.5</td>
</tr>
<tr>
<td>6.0</td>
</tr>
<tr>
<td><strong>RN 16881</strong></td>
</tr>
<tr>
<td>B=0.26988 C=0.00034323 Calculated from Hantush-Bierschenk method.</td>
</tr>
<tr>
<td>Q</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>0.7</td>
</tr>
<tr>
<td>0.9</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.3</td>
</tr>
</tbody>
</table>

The bores show average bore efficiency for oxy slotted casing. Bore RN 16881 shows slightly better bore efficiency than RN 16880 but is being pumped at lower rates than RN 16880.

References:

Vol. 10, pp. 125-143
Figure B1
Figure B2
Theis Curve

Pumping Well RN16880

Concrete WELL

Project Number R/SA8004 for Transport & Works

Figure B3
Discharge = 5.0 L/sec for 270 minutes
= 432 m³/day

Δs = 15.13 m

T = (2.3Q) / 4πΔs
= 5.2 m²/day

Figure B4
Figure B5

RN 16880 RECOVERY FROM CONSTANT RATE TEST ON 26/09/1996
Corrected for Variable Pumping Rate

Birsoy-Summers Recovery method
\[
\Delta s/Q_o = 0.0357 \\
T = 2.30/4\pi \Delta s/Q_o \\
= 5.1 \text{ m}^2/\text{day}
\]

Correlation:
\[
y = 0.01661 \ln(x) - 0.0054 \\
R^2 = 0.9904
\]
Base Drawdown Determination

Well RN168

Step 1: Bore 14.748 meters

Step 2: Bore 5.52 meters

Step 3: Bore 5.356 meters

Step 4: Bore 5.6129 meters

Figure B6
Project Number RSA48004 for TRANSPORT AND WORKS

Stope Is 0.1/1962 days/m² x log(min)

\[ s/Q \text{ (d/m²)} = 0.011069 \text{ d/m²} \]

Equation for the best fit line:

\[ s/Q \text{ (d/m²)} = 0.14962 \log(\text{Cd/m²}) + 0.011069 \]

Transmittivity is 1.2 m²/day

Arqutod Time (BeAc) minutes

Figure B7
Figure B8

- Transmissivity: 1.05744 m²/day
- Hydraulic Conductivity: 1.06 m/day
- Storage Coefficient: 0.00122369 cm/sec
- Specific Capacity: 0.152276
- Log of Drawdown (u): -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6
- Log of Head (/u): 0, 1/3, 1, 2, 3, 4, 5, 6

Technical Report WRA87029

Figure B9

RN 16881 - Jacob Method

Discharge = 1.01 L/sec for 1500 minutes
= 87.3 m³/day

Δs = 13.65 m

T = (2.3Q)/4πΔs
= 1.2 m²/day
Figure B10

Transmissivity = 1.69 m²/day
Pumping Well RN16881
Project Number RSA8004 for TRANSPORT AND WORKS

Thesis Recovery

Log of Time (Days)

Log of Drawdown

Well RN16881 of distance of 0.075 meters
APPENDIX C

TEST REPORT - RN 16880 & RN 16881
TEST REPORT - BORE RN. 16880

Bore Location: Ipolera
Client: Construction Agency, Transport and Works
Intended Use: Road maintenance
Map: Hermannsburg
Grid Reference: 231529 E 7343871 N

RECOMMENDATIONS

Pumping Rate: 3.0 L/sec    Pump Setting: 81.0 m below Ground Level.

General recommendations are given on the reverse side. The bore pumping rate has been calculated for 35 days continuous pumping. Further advice can be obtained from:

Water Resources Branch, Nth Stuart Highway, ALICE SPRINGS, NT., 0870

(In all correspondence please refer to bore's RN number)

COMPLETION DETAILS

Finished depth: 163.57 m    Test Date: 25/09/1996
Completion Date: 21/09/1996    Test Rates: 4.0 L/sec
Standing Water Level: 34.75 m on 24/09/1996    Test Duration: 25 hours

BORNE CONSTRUCTION

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 3.8</td>
<td>203 mm ID blank steel casing</td>
</tr>
<tr>
<td>0.0 - 81.1</td>
<td>152 mm blank steel casing</td>
</tr>
<tr>
<td>81.1 - 88.3</td>
<td>152 mm slotted steel casing</td>
</tr>
<tr>
<td>88.3 - 147.0</td>
<td>152 mm blank steel casing</td>
</tr>
<tr>
<td>147.0 - 153.5</td>
<td>152 mm slotted steel casing</td>
</tr>
<tr>
<td>153.5 - 163.6</td>
<td>152 mm blank steel casing</td>
</tr>
</tbody>
</table>

WARNING: Minimum internal bore diameter is 152 mm.

Notes:
1. Top of casing as constructed was 0.74 m above ground level.
2. All depths are measured from natural ground level.
3. Test rates are not necessarily indicative of sustainable long term pumping rates.

COMMENTS

The above recommendations are based on a constant rate test at 4.0 L/sec for 25 hours and assume hydrological conditions will remain constant.

The SWL and total depth of the bore should be recorded each time pumping equipment is removed from the bore.

WATER QUALITY

Prepared by: B Paul
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.

3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertiliser and other chemicals at least 50 m away.

4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.

5. Pumping the bore a higher than recommended rates may fork the bore leading to instability or pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.

6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

IN ADDITION, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.

BORE LOCATION MAP
WATER RESOURCES DIVISION
DEPARTMENT OF LANDS, PLANNING AND ENVIRONMENT

TEST REPORT - BORE RN. 16881

Bore Location: Ipolera
Client: Construction Agency, Transport and Works
Intended Use: Road maintenance
Map: Hermannsburg
Grid Reference: 230510 E 7343602 N

RECOMMENDATIONS

Pumping Rate: 0.7 L/sec  Pump Setting: 101.0 m below Ground Level.

General recommendations are given on the reverse side. The bore pumping rate has been calculated for 35 days continuous pumping. Further advice can be obtained from:

Water Resources Branch, Mch Stuart Highway, ALICE SPRINGS, NT, 0870

(In all correspondence please refer to bore's RN number)

COMPLETION DETAILS

Finished depth: 111.8 m  Test Date: 21/09/1996
Completion Date: 20/09/1996  Test Rates: 1.0 L/sec
Standing Water Level: 52.13 m on 20/09/1996  Test Duration: 25 hours

BORE CONSTRUCTION

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 4.5</td>
<td>203 mm ID blank steel casing</td>
</tr>
<tr>
<td>0.0 - 102.3</td>
<td>152 mm blank steel casing</td>
</tr>
<tr>
<td>102.3 - 111.8</td>
<td>152 mm slotted steel casing</td>
</tr>
<tr>
<td>108.8 - 111.8</td>
<td>152 mm blank steel casing</td>
</tr>
</tbody>
</table>

WARNING: Minimum internal bore diameter is 152 mm.

Notes:
1. Top of casing as constructed was 0.5 m above ground level.
2. All depths are measured from natural ground level.
3. Test rates are not necessarily indicative of sustainable long term pumping rates.

COMMENTS

The above recommendations are based on a constant rate test at 4.0 L/sec for 25 hours and assume hydrological conditions will remain constant.

The SWL and total depth of the bore should be recorded each time pumping equipment is removed from the bore.

WATER QUALITY

Prepared by: B Paul
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.

3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertiliser and other chemicals at least 50 m away.

4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.

5. Pumping the bore a higher than recommended rates may fork the bore leading to instability or pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.

6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

IN ADDITION, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.

BORE LOCATION MAP
APPENDIX D

WATER QUALITY ANALYSES
**ANALYSIS - PHYSICAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.3</td>
</tr>
<tr>
<td>Electrical conductivity</td>
<td>721</td>
</tr>
<tr>
<td>Total dissolved solids (mg L⁻¹)</td>
<td>408</td>
</tr>
</tbody>
</table>

**ANALYSIS - CHEMICAL (mg L⁻¹)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium, Na</td>
<td>[31118] 33</td>
</tr>
<tr>
<td>Potassium, K</td>
<td>[31118] 12</td>
</tr>
<tr>
<td>Calcium, Ca</td>
<td>[31110] 55</td>
</tr>
<tr>
<td>Magnesium, Mg</td>
<td>[31118] 31</td>
</tr>
<tr>
<td>Iron, (total) Fe</td>
<td>US</td>
</tr>
<tr>
<td>Total Hardness (as CaCO₃) Calculation</td>
<td>280</td>
</tr>
<tr>
<td>Total Hardness (as CaCO₃) Titration</td>
<td>2400</td>
</tr>
<tr>
<td>Total Alkalinity (as CaCO₃)</td>
<td>199</td>
</tr>
<tr>
<td>Silica, SiO₂</td>
<td>[4500-Si O] 27</td>
</tr>
</tbody>
</table>

**ANALYSIS - ADDITIONAL (mg L⁻¹)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, Cu</td>
<td>[31118]</td>
</tr>
<tr>
<td>Manganese, Mn</td>
<td>[31118]</td>
</tr>
<tr>
<td>Zinc, Zn</td>
<td>[31118]</td>
</tr>
</tbody>
</table>

**Notes**

- **U/S**: DENOTES UNSUITABLE FOR ANALYSIS
- **I/S**: DENOTES INSUFFICIENT SAMPLE
- **#**: DENOTES TOTAL ANALYSIS

This report relates specifically to the "sample tested as received".


---

**DATE:** 14 MAR 1997

**CHECKED:** [Signature]

**SIGNATURE:** [Signature]

---

Leaves marked "N" not tested
Leaves marked "L" noted as lower than indicated.
Leaves marked "R" noted as over the guidelines for drinking water. Cat. L in Australia: 1997 = 3. W.R.C. and the A.W.R.C.
Leaves marked "M" noted as meets health related limits.

---

This page was viewed at 13:07:59 on 29/07/2010.
### ANALYSIS - PHYSICAL

- pH: 7.6
- Electrical conductivity (microsiemens/cm at 25°C): 648
- Total dissolved solids (mg L⁻¹ - dried at 105°C): 356

### ANALYSIS - CHEMICAL (mg L⁻¹)

- Sodium, Na: 29
- Potassium, K: 5
- Calcium, Ca: 44
- Magnesium, Mg: 34
- Iron, (total) Fe: 0.2
- Total Hardness (as CaCO₃) Calculation: 249
- Total Hardness (as CaCO₃) Titratin: 220
- Total Alkalinity (as CaCO₃): 208
- Silica, SiO₂: 20

### ANALYSIS - ADDITIONAL (mg L⁻¹)

- Copper, Cu: [311B]
- Manganese, Mn: [311B]
- Zinc, Zn: [311B]

**Notes:**
- U/S DENOTES UNSUITABLE FOR ANALYSIS
- S/S DENOTES INSUFFICIENT SAMPLE
- F DENOTES FILTRATE ANALYSIS
- T DENOTES TOTAL ANALYSIS

This report relates specifically to the "sample lost as received".


**DATE:** 14 MAR 1997

**CHECKED:**

**SIGNATORY:** E. G.
### ANALYSIS - PHYSICAL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>[4500-HT B]</td>
<td>7.3</td>
</tr>
<tr>
<td>Electrical conductivity</td>
<td>[25108]</td>
<td>1000</td>
</tr>
<tr>
<td>Total dissolved solids</td>
<td>[25400]</td>
<td>533</td>
</tr>
</tbody>
</table>

### ANALYSIS - CHEMICAL (mg L⁻¹)

<table>
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<tr>
<th>Parameter</th>
<th>Units</th>
<th>Value</th>
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<tbody>
<tr>
<td>Sodium, Na</td>
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<td>66</td>
</tr>
<tr>
<td>Potassium, K</td>
<td>[31118]</td>
<td>9</td>
</tr>
<tr>
<td>Calcium, Ca</td>
<td>[31118]</td>
<td>63</td>
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<tr>
<td>Magnesium, Mg</td>
<td>[31118]</td>
<td>44</td>
</tr>
<tr>
<td>Iron, (total) Fe</td>
<td>[31118]</td>
<td>0/6</td>
</tr>
<tr>
<td>Total Hardness (as CaCO₃) Calculation</td>
<td>[23408]</td>
<td>388</td>
</tr>
<tr>
<td>Total Hardness (as CaCO₃) Titratin</td>
<td>[23408]</td>
<td>0</td>
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<tr>
<td>Total Alkalinity (as CaCO₃)</td>
<td>[23208]</td>
<td>203</td>
</tr>
<tr>
<td>Silica, SiO₂</td>
<td>[4500-50]</td>
<td>14</td>
</tr>
</tbody>
</table>

### ANALYSIS - ADDITIONAL (mg L⁻¹)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper, Cu</td>
<td>[31118]</td>
<td>0</td>
</tr>
<tr>
<td>Manganese, Mn</td>
<td>[31118]</td>
<td>0</td>
</tr>
<tr>
<td>Zinc, Zn</td>
<td>[31118]</td>
<td>0</td>
</tr>
</tbody>
</table>

---

This report relates specifically to the "sample tested as received".

Additional notes:

- Water samples were analyzed for a variety of chemical parameters, including pH, electrical conductivity, total dissolved solids, sodium, potassium, calcium, magnesium, iron, and silica.

- Copper, manganese, and zinc levels were also determined.

- The results indicate that the water quality meets the prescribed standards, with some parameters falling within the specified limits.

- Dates and signatures are included to authenticate the report.
**Technical Report WRA87029**

**Technical Report WRA87029**

**WATER CHEMISTRY LABORATORY**

**Sample Information**
- **Date Received in Lab:** 30/01/96
- **Time Sampled:** 0800
- **Date Sampled:** 02/01/96
- **Location:** Jopall (S02G)
- **Sample:** Masters

**Analysis - Physical**

- **pH:** 7.0
- **Electrical Conductivity (mhos/cm at 25°C):** 701
- **Turbidity (NTU's):** Not applicable
- **Total Dissolved Solids (mg L⁻¹ dried at 180°C):** 438

**Analysis - Chemical (mg L⁻¹)**

- **Na (mg L⁻¹):** 29
- **Cl⁻ (mg L⁻¹):** Not applicable
- **SO₄²⁻ (mg L⁻¹):** Not applicable
- **Ca (mg L⁻¹):** 57
- **Mg (mg L⁻¹):** 23
- **HCO₃⁻ (mg L⁻¹):** 307
- **CO₃²⁻ (mg L⁻¹):** 0
- **OH⁻ (mg L⁻¹):** 0
- **F⁻ (mg L⁻¹):** 0.3
- **NO₃⁻ (mg L⁻¹):** 94
- **SiO₂ (mg L⁻¹):** Not applicable

**Analysis - Additional (mg L⁻¹)**

- **Cu (mg L⁻¹):** Not applicable
- **Mn (mg L⁻¹):** Not applicable
- **Zn (mg L⁻¹):** Not applicable

**Report Details**

- **Sample Number:** 43/203 A
- **Date Sampled:** 02/01/96
- **Time Sampled:** 0800
- **Date Received:** 30/01/96

*This report relates specifically to the sample tested as received.*

**Checked by**

**Signature**

**Date:** 4 FEB 1997

---

**Notes:**

- Level of dissolved oxygen was measured.
- Level of dissolved oxygen was measured.

---

Viewed at 13:07:59 on 29/07/2010

Page 48 of 72.
### WATER CHEMISTRY LABORATORY

**Project No.:** 49.3.0.3.

<table>
<thead>
<tr>
<th>Date Received in Lab:</th>
<th>Time Sampled:</th>
<th>Date Sampled:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>05:30</td>
<td>24.9.96</td>
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**G.S. No.:**

<table>
<thead>
<tr>
<th>Depth (m):</th>
<th>Q:</th>
<th>Map:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.2b</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

**Location:**

<table>
<thead>
<tr>
<th>Location:</th>
<th>Field Temp °C</th>
<th>Field pH:</th>
<th>Field Conc (ppm):</th>
</tr>
</thead>
<tbody>
<tr>
<td>[G.P.O.]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ANALYSIS - PHYSICAL**

- **pH:** 8.1
- **Electrical Conductivity:** [28.103]
- **Total Dissolved Solids (mg L⁻¹ - dried at 180°C):** [28.400]

**ANALYSIS - CHEMICAL (mg L⁻¹):**

- **Sodium, Na:** [66]
- **Potassium, K:** [7]
- **Calcium, Ca:** [72]
- **Magnesium, Mg:** [49]
- **Iron (total Fe):** [0.7]
- **Total Hardness (as CaCO₃):** [356]
- **Total Alkalinity (as CaCO₃):** [220.08]
- **Silica, SiO₂:** [1.5]

**ANALYSIS - ADDITIONAL (mg L⁻¹):**

- **Copper, Cu:** [66]
- **Manganese, Mn:** [66]
- **Zinc, Zn:** [66]

The report relates specifically to the 'sample tested as received'.

The test methods used, denoted with a bracket, refer to the 1992 15th edition of Standards Methods for the Examination of Water and Wastewater, AWWA, AWWA-3, which refers to the Methods of the American Public Health Association, Inc., and the American Water Works Association, Inc., and the Water Pollution Control Federation.
DRILLING AT SIX HERMANNSBURG OUTSTATIONS 1987

(UNDARANA, IPOLERA, ANTJAKWERA, LYILJERA, KWALA AND INTJARRTNAMA)

Prepared by:

Gabriel Salas
Hydrogeology Section
Water Resources Branch
ALICE SPRINGS
July 1987
TABLE OF CONTENTS

1. INTRODUCTION
2. WATER DEMAND
3. HYDROGEOLOGY
4. DRILLING RESULTS
   4.1 Hermannsburg Sandstone
   4.2 Brewer Conglomerate
5. PUMPING TESTS
6. WATER QUALITY RESULTS
7. CONCLUSIONS
8. RECOMMENDATIONS

ATTACHMENTS

FIGURE 1: LOCATION MAP
TABLE 1: DRILLING RESULTS
TABLE 2: BORE CONSTRUCTION & PUMPING RECOMMENDATIONS
TABLE 3: WATER QUALITY ANALYSES
APPENDIX: TEST REPORTS (RECOMMENDATIONS FOR USE)

LIST OF ABBREVIATIONS

RN Registered Number
L/s litres per second
m metre
mm millimetre
km kilometre
mg/L milligrams per litre
μS/cm micro-Siemens per centimetre
TDS Total Dissolved Solids
SWL Standing Water Level (m below ground level)
1. INTRODUCTION

The objective of the work described in this report was to construct 'potable water supply bores for six outstations in the vicinity of Hermannsburg. The names of the outstations and their locations are shown in Figure 1.

The work was carried out by Water Resources Branch, PAWA, on behalf of the Office of Local Government. Bores were drilled and constructed by the period drilling contractor.

Geological field work was undertaken in March 1987. Eight sites were selected for drilling. Successful bores were test pumped in June 1987. All field work was carried out in co-ordination with the Hermannsburg community advisor, Mr Glenn Auricht.

The aim of this report is to provide recommendations on the use of the recently constructed bores. The report also presents brief hydrogeological comments that could assist future groundwater investigations in the area.

2. WATER DEMAND

According to information provided by the community advisor, the population at each outstation will be less than 50 people. An output of 1 L/s per constructed bore was considered sufficient for most of the outstations. The exception was Ipolera, an outstation where a small tourist operation will be developed. It was estimated that Ipolera would require a bore yielding 2 L/s.

These estimates were based on the present water demand at the Uluru aboriginal community. The community has 200 inhabitants; 1987 records show it to consume an average of less than 400 litres per person per day. This demand could be met by a bore yielding 1 L/s.
3. HYDROGEOLOGY

All the outstations lie in the area between the Krichauff and Macdonnell Ranges (Figure 1). The average annual rainfall in the region is approximately 250 mm, and average annual evaporation exceeds 2500 mm.

Both the Macdonnell and Krichauff Ranges are formed by rocks of the Amadeus Basin sequence. Some formations within this sequence are capable of yielding potable groundwater supplies.

Outstations Ipolera, Antjakwera (Sugar Creek), Ljiljera, and Intjarrtnama, located at the foot of the Krichauff Ranges, are underlain by Hermannsburg Sandstone. This sandstone usually provides supplies of less than 3 L/s when drilled to depths sometimes exceeding 200 m.

Outstations Kwala and Undarana are located away from the ranges, on the Missionary Plain. The plain is underlain by Brewer Conglomerate. Bores drilled in this formation have generally been saline or dry. Drilling for these outstations was nevertheless recommended, because of their proximity to major creeks. Such proximity often has a favourable influence through recharge on the water quality of otherwise saline aquifers. The possibility of fresh water being available in usable amounts near the outstations was also supported by the presence, in both areas, of small potable groundwater supplies. At Kwala there is an old unregistered well constructed in the sand of the Ellery Creek which is used occasionally. At Undarana, a seismic hole (RN 5089) was cased and provides a supply of less than 0.3 L/s. Neither supply meets present groundwater demands.
4. DRILLING RESULTS

Drilling results are summarised in Table 1. They show that the bores drilled in Hermannsburg Sandstone were successful, while the bores drilled in Brewer Conglomerate were unsuccessful.

4.1 Hermannsburg Sandstone

The bores drilled in Hermannsburg Sandstone could be further subdivided into bores that were less than 100 m deep and bores that were over 100 m deep.

Bores less than 100 m deep were constructed at Ipolera and Antjakwera. In both locations the siting of the bores was based on air photo interpretation. The bores were placed in line with major lineaments crossing the nearby ranges. Such lineaments are formed by erosional incisions in the outcrops of Hermannsburg Sandstone and are characterised by straight line drainage patterns. They were interpreted as representing fracture zones. This interpretation seems confirmed by the higher yield obtained at Antjakwera and the shallower water strike at both locations (Table 1).

Bores over 100 m deep were drilled at Intjarrtnama and Ljiljera. At Intjarrtnama no structural features were seen on air photographs and the bore was 194.4 m deep. At Ljiljera, groundwater feeds permanent springs discharging from small fractures in outcrop. Consequently, no use was made of air photo interpretation. The bore was sited along the strike of these fractures, less than 40 m from the springs. However, it struck sufficient water only after drilling progressed beyond 100 m (Table 1).

That the distinction is not due merely to position up or down dip was verified by comparison with production bores in the Hermannsburg borefield, where no such correlation exists.
4.2 Brewer Conglomerate

At Undarana three unsuccessful bores were drilled. The first two bores, RN 14953 and RN 14954 were sited 300 to 400 m north of the existing low yielding production bore (RN 5089) and struck no supplies (Table 1). The third bore, RN 14958, was sited 50 m from the existing production bore. Seepage was struck; as it had a specific conductance much greater than the value reflecting potable salinity, the hole was backfilled.

At Kwala a bore was drilled next to the existing well. It struck, at 15 m, groundwater with high specific conductance values (Table 1). It was also backfilled.

5. PUMPING TESTS

A preliminary test, five 30-minute step-drawdown tests, and a 24 hour constant rate test were performed on each of the cased bores. Recovery of the bores after pumping was also measured. Time-drawdown graphs and data obtained are available at the Water Resources Library in Alice Springs. Test reports are appended to this report; recommendations relevant to equipping the bores are included in Table 2.

6. WATER QUALITY RESULTS

Water samples were collected during the pumping tests. Chemical analyses were carried out; results are presented in Table 3. They show that groundwaters struck at Ipolera, Antjakwera, Ljiljera and Intjarntnama satisfy the guidelines for human consumption set by the Australian Water Resources Council and the National Health and Medical Research Council.
7. CONCLUSIONS

1. Successful bores were completed at outstations Ipolera, Antjakwera, Ljiljera and Intjarrtnama. At each one of these outstations the client’s requirement was met as potable supplies of 2 L/s or more were obtained. Unsuccessful drilling was carried out at Undarana and Kwala, where bores were either saline or dry.

2. Drilling results suggest that a strict geological control exists in the Hermannsburg area over the occurrence of potable groundwater supplies.

Supplies can be obtained only by drilling into favourable formations, such as Mereenie, Pacoota and Hermannsburg Sandstones. These formations crop out in limited areas, within and next to the Krichauff and Macdonnell ranges and in the vicinity of Gosses Bluff (Figure 1).

The groundwater source most accessible to drilling in the area is the Hermannsburg Sandstone. This sandstone, which provided all the potable supplies found by the present drilling programme, crops out mainly on the margins of the Missionary Plain, and also in the Macdonnell and Krichauff Ranges.

Outside of these areas, in the general area of the Missionary Plains, groundwater prospects are extremely poor. The four bores drilled away from the ranges during the present drilling programme were either saline or dry.

Groundwater supplies for Kwala may exist south of its present location, in the vicinity of the Krichauff Ranges. Groundwater supplies for Undarana may be found some 10 km north or northwest of its present location, next to the MacDonnell Ranges. Both proposed areas are underlain by
3. Factors normally having a positive influence on the occurrence of potable supplies, such as proximity to recharge sources, seem to have little weight in the Hermannsburg area. For example, levels of salinity were high at a shallow bore drilled next to Ellery Creek, one of the main streams crossing the area (RN 14959).

4. The Hermannsburg Sandstone is not an ideal target as bores are generally deep and supplies are usually small. The depth of production bores in Hermannsburg Sandstone can, nevertheless, be decreased and their yield increased by siting them on geological structures such as fracture zones or faults. Two bores, RN 14955 and RN 14956, struck such targets. The former was only 48.3 m deep and the latter obtained an airlifted yield of 10 L/s.

Such structural targets can sometimes be detected by air photo interpretation. Resistivity traversing could perhaps assist in their location especially in areas next to the Krichauff Ranges, where piezometric levels are high and fractures (occasionally forming permanent springs) may be detectable as conductors.
8. RECOMMENDATIONS

1. All the bores should be equipped in accordance with the data set out in the attached test reports. Any bore not equipped must be kept sealed by a screwed or welded cap.

2. Due to the confined nature of the aquifer, no particular pollution protection radius has been specified. Bore headworks should prevent the ponding of runoff around any bore, and fuel storage tanks should not be sited immediately upslope of any bore. Pit latrines or septic systems nearby should be sited and constructed according to Department of Health standards.

3. Maximum continuous pumping rates, as recommended in Table 2, should not be exceeded. As the pumping rates were derived from pumping tests on the bores, they do not necessarily coincide with airlifted yields listed in Table 1, which are preliminary estimates made during drilling.

4. No additional drilling is recommended at Kwala or Undarana. The present drilling program has confirmed the low groundwater potential in the vicinity of these outstations.

5. Due to the difficulties that groundwater exploration can encounter in the areas surrounding Hermannsburg, groundwater supplies should be secured and tested before incurring the expense of building living facilities such as those at Undarana. This recommendation applies in particular to the area of the Missionary Plain, where groundwater resources are scarce, and in general, to all communities wanting to establish themselves in localities where permanent surface water is not available.
ATTACHMENTS

Figure and Tables
### TABLE 1

**DRILLING RESULTS (HERMANNBURG OUTSTATIONS 1987)**

<table>
<thead>
<tr>
<th>BH LOCATION</th>
<th>GEOLOGICAL FORMATION</th>
<th>LITHOLOGY</th>
<th>TOTAL DEPTH</th>
<th>AQUIFER DEPTHS AND AERIATED YIELDS</th>
<th>TOTAL AERIATED YIELD</th>
<th>SPECIFIC CONDUCTANCE</th>
<th>CONSTRUCTION STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>14952</td>
<td>Intjaramna Hermannsburg Sandstone</td>
<td>Sandstone</td>
<td>194.6 m</td>
<td>121 m + 0.3 L/s 145 m + 0.6 L/s 176 m + 0.9 L/s 188 m + 0.2 L/s</td>
<td>2 L/s</td>
<td>810</td>
<td>Cased for Test Pumping (see Table 2)</td>
</tr>
<tr>
<td>14953</td>
<td>Undarana Brewer Conglomerate</td>
<td>Brown, calcareous, clayey semi-consolidated sandstone</td>
<td>60.5 m</td>
<td>Dry Hole</td>
<td>Dry Hole</td>
<td>--</td>
<td>Backfilled</td>
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<tr>
<td>14954</td>
<td>Undarana Brewer Conglomerate</td>
<td>Same as above</td>
<td>60.5 m</td>
<td>Dry Hole</td>
<td>Dry Hole</td>
<td>--</td>
<td>Backfilled</td>
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<tr>
<td>14955</td>
<td>Ipolera Hermannsburg Sandstone</td>
<td>Sandstone</td>
<td>48.3 m</td>
<td>22 m + 0.25 L/s 26 m + 1 L/s 44 m + 1.25 L/s</td>
<td>2.5 L/s</td>
<td>970</td>
<td>Cased for Test Pumping (See Table 2)</td>
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<tr>
<td>14956</td>
<td>Antjekweru Hermannsburg Sandstone</td>
<td>Sandstone</td>
<td>78.0 m</td>
<td>75 m + 10 L/s</td>
<td>10 L/s</td>
<td>1000</td>
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<td>14957</td>
<td>Ljiljera Hermannsburg Sandstone</td>
<td>Sandstone</td>
<td>112.2 m</td>
<td>58 m + 0.2 L/s 107 m + 1.8 L/s</td>
<td>2 L/s</td>
<td>800</td>
<td>Cased for Test Pumping (See Table 2)</td>
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<tr>
<td>14958</td>
<td>Undarana Brewer Conglomerate</td>
<td>Brown, calcareous, weathered sandstone, calcarenite interbedded with siltstone</td>
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<td>Seepage Only</td>
<td>Seepage Only</td>
<td>3000</td>
<td>Backfilled</td>
</tr>
<tr>
<td>14959</td>
<td>Kuala Brewer Conglomerate</td>
<td>Gravel, weathered sandstone</td>
<td>15.0 m</td>
<td>11 m + 1 L/s</td>
<td>1 L/s</td>
<td>5700</td>
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### TABLE 2

**BORE CONSTRUCTION DETAILS AND PUMPING RECOMMENDATIONS (HERMANSBURG OPERATIONS 1987)**

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<thead>
<tr>
<th>RH (REGISTERED NUMBER)</th>
<th>LOCATION (SEE FIGURE 1)</th>
<th>SURFACE CASING (DEPTH - ID)</th>
<th>INTERNAL CASING (DEPTH - ID)</th>
<th>PERFORATIONS (DEPTH INTERVAL)</th>
<th>RECOMMENDED PUMP SETTING</th>
<th>RECOMMENDED MAXIMUM CONTINUOUS PUMPING RATE</th>
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<td>14952</td>
<td>Intjartnama</td>
<td>2.3 m - 203 mm</td>
<td>195 m - 152 mm</td>
<td>182.6 m - 188.6 m</td>
<td>142 m</td>
<td>41 m</td>
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<tr>
<td>14955</td>
<td>Ipolea</td>
<td>0.1 m - 203 mm</td>
<td>48.2 m - 152 mm</td>
<td>37 m - 43 m</td>
<td>36 m</td>
<td>16.9 m</td>
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<tr>
<td>14956</td>
<td>Antjaikwaara</td>
<td>6.5 m - 203 mm</td>
<td>79.2 m - 152 mm</td>
<td>72.7 m - 78.8 m</td>
<td>60 m</td>
<td>2.7 m</td>
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<tr>
<td>14957</td>
<td>Ljiljera</td>
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<td>112.5 m - 152 mm</td>
<td>95.2 m - 105.7 m</td>
<td>80 m</td>
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*ID = INTERNAL DIAMETER*
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<tr>
<th>BORE REGISTERED NUMBER</th>
<th>DATE OF SAMPLING</th>
<th>SPECIFIC CONDUCTANCE µS/cm</th>
<th>TOTAL DISSOLVED SOLIDS TDS</th>
<th>pH</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>CaCO₃</th>
<th>CaCO₃</th>
<th>Fe</th>
<th>SiO₂</th>
<th>Cl</th>
<th>SO₄</th>
<th>NO₃</th>
<th>HCO₃</th>
<th>F</th>
<th>NaCl</th>
<th>COMMENTS</th>
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<td>520</td>
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<td>50</td>
<td>8</td>
<td>60</td>
<td>53</td>
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<td>23</td>
<td>120</td>
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<td>354</td>
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<td>4</td>
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<td>48</td>
<td>147</td>
<td>54</td>
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<td>0.2</td>
<td>242</td>
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<td>1180</td>
<td>710</td>
<td>7.5</td>
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<td>9</td>
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<td>271</td>
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<td>157</td>
<td>85</td>
<td>14</td>
<td>331</td>
<td>0.4</td>
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<td>53</td>
<td>10</td>
<td>73</td>
<td>35</td>
<td>327</td>
<td>247</td>
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<td>15</td>
<td>92</td>
<td>66</td>
<td>&lt;1</td>
<td>301</td>
<td>0.3</td>
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<td>Ljiljera Pumping test</td>
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<td>1500</td>
<td>6.5-8.5</td>
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<td>0.3</td>
<td>400</td>
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<td>45</td>
<td>0.5-1.7</td>
<td>maxima, except pH range</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14959</td>
<td>10/4/87</td>
<td>6500</td>
<td>4000</td>
<td>7.5</td>
<td>885</td>
<td>22</td>
<td>243</td>
<td>209</td>
<td>1465</td>
<td>304</td>
<td>U/S</td>
<td>36</td>
<td>1634</td>
<td>677</td>
<td>4</td>
<td>370</td>
<td>0.6</td>
<td>2693</td>
<td>Kwala drilling</td>
</tr>
</tbody>
</table>

**TABLE 3**

**WATER QUALITY DATA**

**HERMANNSSBURG OUTSTATIONS 1987**

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**Page 63 of 72.**
APPENDIX

Test Reports
TEST REPORT — BORE RN 14952

Bore location: Hermannsburg
Outstation INTJARRTNAMA.

Map: SF 53.1
Grid reference: 616-001

Client/owner: Office of Local Government
Client’s reference:
Purpose of supply: Outstation

RECOMMENDATIONS
Pumping rate: maximum 2 L/s. Pump setting: 142 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can/cannot sustain higher pumping rates with deeper pump settings or for short
periods in favourable seasons. Further advice can be obtained from: Water Resources Branch
(In all correspondence refer to the bore’s RN number). Nth Stuart Hwy Alice Springs

BORE DATA
Finished depth: 194.6 m
Completion date: 2/4/87
Standing water level: 41.72 m on 26/6/87
Test date: 29/6/87
Test rates: 2.02 L/s
Test duration: 29 hrs

Construction details:
Interval (m) Description
0 - 2.3 203 mm Steel Surface Casing
0 - 182.56 152 mm ID Blank Steel Casing
182.56 - 188.58 152 mm ID Perforated Casing x 9 mm Holes
188.58 - 195 152 mm ID Blank Steel Casing

Notes:
1. Top of casing as constructed was 0.60 m above ground
2. All depths are measured from natural ground level
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm

COMMENTS

WATER QUALITY

See water laboratory report (Analysis No. )
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention to the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.
2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.
3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertilizer and other chemicals at least 50 m away.
4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.
5. Pumping the bore at higher than recommended rates may fork the bore leading to instability or pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.
6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

In addition, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.

BORE LOCATION MAP
TEST REPORT — BORE RN 14955

Bore location: Hermannsburg Outstation IPOLERA

Client/owner: Office of Local Government

Client's reference:

Purpose of supply: Outstation

Map: SP 53.13

Grid reference: 553-011

RECOMMENDATIONS

Pumping rate: maximum 2 L/s. Pump setting: 36 m below ground level

General recommendations are given on the reverse side.

The aquifer and bore can/cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: Water Resources (in all correspondence refer to the bore's RN number), Nth Stuart Hwy Alice Springs

BORE DATA

Finished depth: 48.30 m Completion date: 4/4/87

Standing water level 16.02 m on 16/6/87

Construction details:

Test rates: 2.5 L/s

Test duration 24 hrs

Interval (m) Description

0 - 9.1 203 mm ID Steel Surface Casing
0 - 36.98 152 mm ID Blank Steel Casing
36.98 - 43.00 152 mm ID Perforated Casing x 9 mm Holes
43.00 - 48.30 152 mm ID Blank Casing

Notes: 1. Top of casing as constructed was 0.40 m above ground
2. All depths are measured from natural ground level
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm

COMMENTS

The recommended maximum pumping rate of this bore could become significantly reduced if nearby bore RN 6632 is pumped at the same time.

WATER QUALITY

See water laboratory report (Analysis No,
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention to the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.

3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertilizer and other chemicals at least 50 m away.

4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.

5. Pumping the bore at higher than recommended rates may fork the bore leading to instability or pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.

6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

In addition, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.
TEST REPORT — BORE RN 14956

Bore location: Hermannsburg Outstation ANJAKIERA

Client/owner: Office of Local Government
Client's reference:
Purpose of supply: Outstation

Map: SF 53.13
Grid reference: 574-015

RECOMMENDATIONS
Pumping rate: maximum 8 L/s. Pump setting: 60 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can/cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from Water Resources (in all correspondence refer to the bore's RN number). Nth Stuart Hwy Alice Springs

BORE DATA
Finished depth: 78.80 m Completion date: 7/4/87
Standing water level 3.12 m on 20/6/87
Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
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<tbody>
<tr>
<td>0 - 6.3</td>
<td>203 mm ID Surface Casing Steel</td>
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<td>0 - 72.72</td>
<td>152 mm ID Blank Steel Casing</td>
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<tr>
<td>72.72 - 78.80</td>
<td>152 mm ID Perforated Steel Casing x 9 mm Holes</td>
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</table>

Test date: 23/6/87
Test rates: 10 L/s
Test duration 24 hrs

AQUIFER TEST

Notes:
1. Top of casing as constructed was 0.40 m above ground
2. All depths are measured from natural ground level
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm

COMMENTS

WATER QUALITY

See water laboratory report (Analysis No.)

RN 14956
Bore location: Hermannsburg
Outstation ANJAKIERA

Client/owner: Office of Local Government
Client's reference:
Purpose of supply: Outstation

Map: SF 53.13
Grid reference: 574-015

RECOMMENDATIONS
Pumping rate: maximum 8 L/s. Pump setting: 60 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can/cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from Water Resources (in all correspondence refer to the bore's RN number). Nth Stuart Hwy Alice Springs

BORE DATA
Finished depth: 78.80 m Completion date: 7/4/87
Standing water level 3.12 m on 20/6/87
Construction details:

<table>
<thead>
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<th>Interval (m)</th>
<th>Description</th>
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<td>203 mm ID Surface Casing Steel</td>
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<td>0 - 72.72</td>
<td>152 mm ID Blank Steel Casing</td>
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<tr>
<td>72.72 - 78.80</td>
<td>152 mm ID Perforated Steel Casing x 9 mm Holes</td>
</tr>
</tbody>
</table>

Test date: 23/6/87
Test rates: 10 L/s
Test duration 24 hrs

AQUIFER TEST

Notes:
1. Top of casing as constructed was 0.40 m above ground
2. All depths are measured from natural ground level
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm

COMMENTS

WATER QUALITY

See water laboratory report (Analysis No.)
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

Attention to the following points will ensure a long and safe life for the bore supply and help prevent pollution of the groundwater resource.

1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.
2. Seal the space between the casing and pump equipment to prevent entry of vermin, dirt and pollutants.
3. Maintain pumping equipment in good order to prevent pollution. Prevent spillage of fuel and oil on the ground around the bore. Store fertilizer and other chemicals at least 50 m away.
4. Keep stock away from the bore head. Discourage domestic activity at the bore. The first tap on the pipeline should not be less than 5 m from the bore head.
5. Pumping the bore at higher than recommended rates may fork the bore leading to instability or pump maintenance problems. Seek the professional advice of an hydrogeologist or groundwater engineer.
6. If the bore is no longer required, the casing is to be removed or securely capped and the bore backfilled with clayey material. A cement plug may be required in some instances.

In addition, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.

BORE LOCATION MAP
TEST REPORT — BORE RN 14957

Bore location: Hermannsburg Outstation LYILJERA
Client/owner: Office of Local Government
Client's reference:
Purpose of supply: Outstation

Map: SF 53.13
Grid reference: 581-015

RECOMMENDATIONS
Pumping rate: maximum 2 L/s. Pump setting: 80 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can/cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: Water Resources (In all correspondence refer to the bore's RN number). Nth Stuart Hwy Alice Springs

BORE DATA
Finished depth: 112.2 m Completion date: 8/4/87 Test date: 24/6/87
Standing water level 5.40 m on 22/6/87 Test rates: 2.02 L/s
Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.6 203 mm ID Surface Casing</td>
</tr>
<tr>
<td>0</td>
<td>99.16 152 mm ID Blank Steel Casing</td>
</tr>
<tr>
<td>99.16 - 105.68</td>
<td>152 mm ID Perforated Steel Casing x 9 mm Holes</td>
</tr>
<tr>
<td>105.68 - 112.20</td>
<td>152 mm ID Blank Steel Casing</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.48 m above ground
2. All depths are measured from natural ground level
3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 152 mm

COMMENTS

WATER QUALITY

See water laboratory report (Analysis No.)
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

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