POWER AND WATER AUTHORITY
REPORT NO 56/92D

BORE COMPLETION REPORT
BORES 28283 AND 28287
GURRH GURRH OUTSTATION
(TABLE HILL)

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LIST OF ABBREVIATIONS

RN - Registered number of the bore
mm - Millimetre
ID - Internal diameter
OD - Outside diameter
kL - Kilolitre
ML - Megalitre
m³/d - Cubic metre per day
L/s - Litre per second (airlifted unless stated)
L/C/D - Litre per capita per day
°C - Degree Celcius
pH - Index of acidity or alkalinity
SC - Specific conductivity in μS/cm
TDS - Total Dissolved Solids
μS/cm - Micro Siemens per centimetre
mg/L - Milligram per litre
SWL - Standing Water Level
TOC - Top of casing
BMR - Bureau of Mineral Resources
INTRODUCTION

Objective of this work was to drill and construct two bores with a minimum of 0.5 L/s sustainable water supply from each bore at Gurrh Gurrh Outstation also known as Table Hill, which has a population of about 70.

Gurrh Gurrh Outstation is situated about 350km east of Darwin and about 30km due southwest (80km by road) from Maningrida in Arnhemland (Figure 1). Access is by gravel road and located at about AMG coordinates 865500 E and 3924000 N, refer to the topographical map of the Tomkinson sheet in the scale of 1:100,000 and the geological map of the Millingimbi sheet in the scale of 1:250,000.

The work was carried out on behalf of the Aboriginal Essential Services of the Power And Water Authority.

Preliminary hydrogeological study, interpretation of aerial photographs, hydrochemical study and other relevant studies were carried out in the office. This followed by the field works, which involved hydrogeological reconnaissance, geophysical surveys (resistivity and soundings), locating bore sites, drilling and constructing the bores during August 1992.

The area lies in the monsoonal climate with a mean annual rainfall of 1400mm and most of the rain falls between November and April. The mean annual pan evaporation is 2500mm.
The area lies within the Arafura Falls physiographic unit, which is one of the major physiographic units in the Arnhemland and comprises of undulating hilly country and broad soil-covered plains with topography varying largely in response to the lithologies or underlying rocks.

Geologically, the area lies in the Arafura Basin and is underlain by rocks of the Buckingham Bay Sandstone Formation of the Wessel Group (Ee) of Cambrian to Ordovician age. These rocks dip gently to the northeast and are composed of massive white medium grained quartz sandstone, purple quartz greywacke, micaceous greywacke and; rippled-marked and cross-bedded. The Buckingham Bay Sandstone Formation unconformably overlies the Lower Proterozoic Kambolgie Sandstone Formation (Phk).

Groundwater potential in the Buckingham Bay Sandstone is generally not very good unless the geologic structures are present and therefore, drilling targets were selected on these structures with the help of resistivity surveys and the airphoto interpretations.

Bore 28282 was sited (Figure 2) on the resistivity anomaly at peg 1350m on the geophysical line 1 which coincided with a photo lineament, however the water supply struck in this bore was very low (0.2 L/s) for constructing a production bore.

Therefore, next bore 28283 was drilled on another resistivity anomaly at peg 1375m on the geophysical line 4 which also coincided with a photo lineament. The Buckingham Bay Sandstone Formation was intersected in this bore and a water supply of 1.0 L/s was struck in fractures. This was constructed as a production bore with 146mm ID pvc casing and 113mm ID stainless steel screen with 1mm aperture and a 113mm ID sump.

In order to construct a second production bore, drilling continued but next three bores (28284, 28285 & 28286) were unsuccessful, despite bores were selected on the geophysical anomalies as well as on geological linements.

Finally in the last bore 28287, a yield of 9.0 L/s was struck within the fractures of the main fault. This was constructed as a production bore with 146mm ID pvc casing and 113mm ID stainless steel screen with 1mm aperture; and 113mm ID stainless steel sump.

In this area, all bores are artesian and required cementing before drilling into the aquifers. Peizometric head in bore 28283 was 0.76m above ground level on 8.9.1992 and in bore 28287 it was 0.45m above ground level on 17.9.1992
Results of chemical analyses of groundwater have been summarised in Table 1. The water quality is within the recommended limit for drinking water as adopted by the Australian Water Resources Council/National Health And Medical Resources Council (Reference 1). Water is slightly corrosive due to low pH, however there is no health risk from it. Concentration of iron is high in both bores, which is only an aesthetic problem than health risk and the water can be treated easily by aeration.

Table 1 Chemical Analysis Results

<table>
<thead>
<tr>
<th>Bore</th>
<th>pH</th>
<th>SC</th>
<th>TDS</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>TH</th>
<th>TA</th>
<th>Fe</th>
<th>SiO₂</th>
<th>Cl</th>
<th>SO₄</th>
<th>NO₃</th>
<th>HCO₃</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN</td>
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</tr>
<tr>
<td>28283</td>
<td>5.2</td>
<td>37</td>
<td>31</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>6</td>
<td>0.5</td>
<td>14</td>
<td>9</td>
<td>1</td>
<td>&lt;1</td>
<td>7</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>28287</td>
<td>4.9</td>
<td>31</td>
<td>32</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>0.1</td>
<td>14</td>
<td>8</td>
<td>1</td>
<td>&lt;1</td>
<td>3</td>
<td>0.1</td>
</tr>
</tbody>
</table>

TH- Total Hardness as CaCO₃; TA- Total Alkalinity as CaCO₃;
Water demand for the community at this outstation is estimated to be 70m³/d considering a peak population of 70 and calculated on the basis of 1000 L/C/D. A supply of 960m³/d from bore 28287 should meet the demand with a standby bore 28283 with a capacity of 86.4m³/d.
RESULTS

Six bores were drilled in this area of which two bores (28283 & 28287) were constructed. Bore 28283 was constructed with 146mm ID class 9 pvc casing, 113mm ID stainless steel screen with 1mm apertures and a sump (Figure 3). Bore 28287 was constructed with 146mm ID class 9 pvc casing, 113mm ID stainless steel screen with 1mm apertures and a sump (Figure 4). Both production bores 28283 and 28287 are within 1km radius of the outstation.

In bore 28283, step pump tests were followed by an 6.6 hours constant rate pump test and water sample was collected during the constant rate pump test for the chemical analysis.

In bore 28287, step pump tests were followed by an 14.5 hours constant rate pump test due to higher water supply rate and water sample was collected during the constant rate pump test for the chemical analysis.

Results of pump tests are provided in Attachments 1 and 2 - Test Reports for both bores (28283 and 28287).

Bore performance curve (Figure 5) for bore 28283 shows that the available drawdown is 29.2m at the maximum safe pumping rate of 1.0 L/s at a pump setting depth of 30.0m.

Bore performance curve (Figure 6) for bore 28287 shows that the available drawdown is 20.8m at the maximum safe pumping rate of 8.0 L/s at a pump setting depth of 24.0m.
COMPOSITE LOG OF BORE 28283
COMPOSITE LOG OF BORE 28287

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**Depth (m)**

- 0.0 m: Top Soil: grey
- 2.0 m: Sandy Clay: grey
- 3.0 m: Sandstone: white with some fracturing
- 5.0 m: Sandstone: highly fractured
- 6.0 m: Sandstone: fractured with Clay
- 8.0 m: Sandstone: highly fractured with orange water staining
- 10.0 m: Sandstone: firm
- 12.0 m: Sandstone: highly fractured
- 14.0 m: Water Table: 1.8 m S.W.L.
- 16.0 m: Aquifer 1.7 L/s: Airlift
- 18.0 m: Aquifer 4.0 L/s: Airlift

**Aquifers (Water Struck)**

- 1.7 L/s: Airlift
- 4.0 L/s: Airlift

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**Graphical Log**

- 1.0 m: Cememted
- 2.0 m: 140mm ID P.V.C. Casing
- 3.0 m: 203mm ID Steel Casing
- 4.0 m: Packer
- 5.0 m: 130mm ID Stainless Steel Sump
- 6.0 m: 130mm ID Stainless Steel Screen

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**AQUIFERS**

- S.W.L.: 1.8 m
- S.W.L.: 1.7 L/s
- S.W.L.: 4.0 L/s

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**Fig. 4**
PUMPED BORE 28283
DATE 8-9-92

BORE PERFORMANCE CURVE
AVAILABLE DRAWDOWN AT RECOMMENDED
PUMP SETTING OF 20.5m

BORE PERFORMANCE CURVE
It is recommended that:

- the pump setting depth should be 30.0m below the ground level for a pumping rate of 1.0 L/s for bore 28283

- the pump setting depth should be 24.0m below the ground level for a pumping rate of 8.0 L/s for bore 28287

- it should be noted that both production bores are artesian and in flood prone area, therefore care should be taken while equipping these bores

- corrosion resistant fittings should be considered when the bore is equipped.

- absorption trenches and septic tanks should be located a minimum of 100m away from the bore.

- both production bores are artesian bores and are prone to flooding during the wet season.
REFERENCES


Plumb, K.A. (1988) - Geology Map of the McArthur Basin, 1,000,000 scale, BMR, 1988
WATER RESOURCES DIVISION

TEST REPORT — BORE RN. 28283

Bore Location: TABLE HILL
Map: TOMKINSON. 1:100,000. Sheet 5773.
Grid Reference: 910 - 489.

Client: AES.
Purpose: DOMESTIC.

***************************************************************************
RECOMMENDATION. Pumping Rate: 1.0 L/s. Pump Setting: 30 m.
For alternative pumping rates or settings contact: Water Resources.
General recommendations are on the reverse side. Sasco House,
In all correspondence please quote bore RN.28283. Darwin NT.

***************************************************************************

BORE DATA.
Finished depth: 33.30 m. Completion Date: 7/9/92. Test Date: 8/9/92.
Standing Water Level: 0.80 m. above G.L. on 8/9/92. Test Rate: 1.0 L/s.
Test Duration: 6.6 Hrs.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2.10 m.</td>
<td>203 mm. ID. steel casing.</td>
</tr>
<tr>
<td>0 - 31.00 m.</td>
<td>146 mm. ID. class 9 PVC. casing.</td>
</tr>
<tr>
<td>30.7 - 31.00 m.</td>
<td>113 mm. ID. packer.</td>
</tr>
<tr>
<td>31.0 - 33.00 m.</td>
<td>113 mm. ID. stainless steel screens, 1 mm. apertures.</td>
</tr>
<tr>
<td>33.0 - 33.30 m.</td>
<td>113 mm. ID. sump.</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.85 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 113 mm.
MINIMUM INTERNAL BORE DIAMETER TO RECOMMENDED PUMP SETTING IS 146 mm.

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COMMENTS.

1. The above recommendations are based on a constant rate test at 1.0 L/s.
   for 6.6 hrs. and assume hydrological conditions remain constant.
2. Provision to monitor water levels and obtain water samples should be
   incorporated when equipping this bore.
3. This water may be corrosive due to low pH and conductivity.
4. This area is prone to flooding during the wet season.
5. This bore may flow and should be suitably sealed if equipped.
6. Solar pumps may be set at 10 m. for rates up to 0.5 L/s.

***************************************************************************
WATER ANALYSIS. No.92/93/0331.

Prepared by: P. REES. Checked by: M. VERMA.
23/9/92. 30/11/92.
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

Viewed at 15:07:13 on 29/07/2010
WATER RESOURCES DIVISION

TEST REPORT — BORE RN. 28287

Bore Location: TABLE HILL
Map: TOMKINSON 1:100,000. Sheet 5773.
Grid Reference: 920 - 487.

Client: AES.
Purpose: DOMESTIC.

RECOMMENDATION. Pumping Rate: 8 L/s. Pump setting: 24 m.
For alternative pumping rates or settings contact:
Water Resources.
General recommendations are given on the reverse side.
In all correspondence please quote bore RN. 28287.

Bore Location: TABLE HILL
Map: TOMKINSON 1:100,000. Sheet 5773.
Grid Reference: 920 - 487.

Client: AES.
Purpose: DOMESTIC.

RECOMMENDATION. Pumping Rate: 8 L/s. Pump setting: 24 m.
For alternative pumping rates or settings contact:
Water Resources.
General recommendations are given on the reverse side.
In all correspondence please quote bore RN. 28287.

For alternative pumping rates or settings contact :
Water Resources.
General recommendations are given on the reverse side.
In all correspondence please quote bore RN. 28287.

Water Resources.
Sasco House,
Darwin NT.

BORO DATA.
Finished depth: 28.3 m. Completion Date: 17/9/92. Test Date: 18/9/92.
Standing Water Level: 1.85 m. on 17/9/92 Test Rate: 8.1 L/s.
Construction details: Test Duration: 14.5 hrs.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2.50 m</td>
<td>203 mm. ID. steel casing.</td>
</tr>
<tr>
<td>0 - 26.00 m</td>
<td>146 mm. ID. class 9 PVC casing.</td>
</tr>
<tr>
<td>25.70 - 26.00 m</td>
<td>113 mm. ID. stainless steel packer.</td>
</tr>
<tr>
<td>26.00 - 28.00 m</td>
<td>113 mm. ID. stainless steel screen, 1 mm aperture.</td>
</tr>
<tr>
<td>28.00 - 28.30 m</td>
<td>113 mm. ID. stainless steel sump.</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 1.00 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 146 mm.

COMMENTS.
1. The above recommendations are based on a constant rate test at 8.1 L/s.
   for 14.5 hrs and assume hydrological conditions remain constant.

2. Provision to monitor water levels and obtain water samples should be incorporated when equipping this bore.

3. This area is prone to flooding during the wet season.

4. Solar pumps may be set at 5 m. for rates up to 0.5 L/s.

WATER ANALYSIS NO.- 92/93/0332.

Prepared by: P.KEES TO.1
23/9/92.

Checked by: M.Verma
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.