Bore Completion Report

BORE 25126

BINJAREE OUTSTATION

M N Verma
Hydrology Division
Water Resources Group
Darwin
January 1988
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Aboriginal Essential Service Branch
Water Directorate (Darryl Day) 3

Regional Manager
Office of Local Government
Northern Territory, Katherine 1

Water Directorate Library, Darwin 1

Water Directorate Library, Alice Springs 1

Water Directorate Bore Data File 1

Hydrology Division, Darwin 3
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1. WATER QUALITY DATA
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre</td>
</tr>
<tr>
<td>m³/d</td>
<td>Cubic metre per day</td>
</tr>
<tr>
<td>L/s</td>
<td>Litre per second</td>
</tr>
<tr>
<td>L/d</td>
<td>Litre per day</td>
</tr>
<tr>
<td>L/c/d</td>
<td>Litre per capita per day</td>
</tr>
<tr>
<td>pH</td>
<td>Index of acidity or alkalinity</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Number of the bore</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

The objective of this work was to construct one production bore for the community at Binjaree Outstation with an adequate potable groundwater supply. The population of Binjaree Outstation is about forty.

Binjaree Outstation is situated beside Katherine River and some 16 Km west of Katherine township and is accessible by Victoria Highway (14 Km) and 2 Km of gravel road.

The work was carried out on behalf of the Department of Community Development of the Northern Territory, which is now the Department of Local Government since 1st July 1987.

Preliminary hydrogeological study, interpretation of aerial photographs, hydrochemical study and other relevant studies of the area were carried out in the office. This followed by the field works, which involved hydrogeological reconnaissance, locating bore sites, drilling and constructing the bores during May 1987.

The area lies in the tropics having monsoonal rains from November to April. Mean annual rainfall averages about 1000 mm and most of it falls between December and March.

2. HYDROGEOLOGY

The area lies in the Daly River Basin and is underlain by the Lower Cambrian age sediments of the Jinduckin Formation and the Tindall Limestone. See Reference 1.

The Jinduckin Formation consists of calcareous sandstone and siltstone occasionally interbedded and silicified; often also with some thin interbedded mudstone and gypsum; mudstone layers are thicker at depth. The Tindall Limestone consists mainly limestone and some chert at upper layer. See Attachment 1 (Stratigraphy and lithology of the bore 24818).
Groundwater potential in above formations are good, but in the Jinduckin Formation, the water quality is not good mainly due to sulphate content, deriving from the gypsum in the sediments of the Jinduckin Formation. Water quality of the Tindall Limestone is, however good.

During 1985, one bore 24301 was drilled and constructed to a depth of 37.0 m with a yield of 2.0 L/s. But, the chemical analysis showed that this water was very high in sulphate contents and therefore not suitable for the human consumption.

This new bore 24818 was drilled through the Jinduckin Formation up to the top of Tindall Limestone and all aquifers in the Jinduckin Formation was sealed off and then drilled through to the Tindall Limestone. The contact was determined by geological logging on site and confirmed by the geophysical downhole logging.

Yield in bore 24818 was 8.0 L/s, but could not be constructed due to problem associated with cementing the aquifers (in the Jinduckin Formation). Therefore, another bore 25126 was drilled 10 m away from 24818, which was finally constructed to the requirements with a yield of 13 L/s. This bore 25126 is a flowing bore and with a water level (head) of 2 bar (i.e. 20.42 m above ground level). See Table 2 (Composite Log of the Bore 25126).

3. WATER QUALITY

Water samples were taken during the drilling and airlifting. Specific conductivity, temperature and pH readings were taken on site to keep checking the water quality as the drilling progressed. The chemical analysis of the bore water was carried out by the East Point Laboratory of the Water Directorate, Darwin. The result is given in Table 1; and it indicates that the water quality of the production bore is within the recommended limit for drinking water as adopted by the Australian Water Resources Council/National Health and Welfare Research Council (Reference 5).
REFERENCES


4. WATER DEMAND

The water demand for this area (households and garden) is estimated to be about 432 m$^3$/day. This water demand could be met with the water supply (1,123 m$^3$/day) from this flowing bore 25126.

5. RESULTS

Location of the production bore 25126 is AMG Co-ordinates 195400-8930550 (Manbulloo Sheet No. 5868, 1:50 000).

The bore was constructed with steel casing and stainless steel screens. Composite bore log of the bore is shown in Table 2.

The flow rate and the piezometric head of this bore (25126) was measured for an hour. This indicated that the water head is 2 Bars i.e. 20.42 m above the ground level. This means that no pump would be required to obtain the water supply.

6. RECOMMENDATIONS

Followings are the recommendations:

- Absorption trenches and septic tanks should not be constructed within 100 m radius of the bore.
- Water may be piped and used directly from the bore; or may be stored in a tank and then gravity fed into the mains.
- A pump at bore may only be necessary if the net height is higher 20.42 m above ground level.
**TEST REPORT — BORE RN. 25126**

**Bore location:** Binjaree Outstation  
**Client/owner:** Aboriginal Reserve  
**Client's reference:**  
**Purpose of supply:** Domestic and Irrigation

**Map:** Manbulloo 1:50 000 Sheet 5368 -iv  
**Grid reference:** 195400 - 8930550

**RECOMMENDATIONS**

- **Pumping rate:** 8.0 L/s  
- **Pump setting:** m below ground level

General recommendations are given on the reverse side. The aquifer and bore cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: (In all correspondence refer to the bore’s RN number).

**BORE DATA**

- **Finished depth:** 213.3 m  
- **Completion date:** 6.7.87  
- **Test date:** 18.8.87  
- **Flowing water level:** 20.42 m above ground.

**Construction details:**

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 190.0</td>
<td>152 mm ID steel casing</td>
</tr>
<tr>
<td>190.0 - 197.0</td>
<td>152 mm open hole</td>
</tr>
<tr>
<td>197.9 - 219.3</td>
<td>142.8 mm open hole</td>
</tr>
</tbody>
</table>

**AQUIFER TEST**

- **Test rates:** 13.0 L/s  
- **Test duration:** hrs

**Notes:**
1. Top of casing as constructed was 0.09 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 normal size

**COMMENTS**

1. Recommended pumping rate is 8 L/s, however the pump may not be required if the water is reticulated directly from the bore to taps as the piezometric level is 20.42 m above the ground level.
2. Provisions to obtain water samples at the bore head should be incorporated in any reticulation.

**WATER QUALITY**
## Table 1

**Groundwater Quality**

<table>
<thead>
<tr>
<th>BORE REGISTERED NUMBER</th>
<th>DATE OF SAMPLING</th>
<th>SPECIFIC CONDUCTANCE (Umho at 25°C)</th>
<th>TOTAL DISSOLVED SOLIDS (mg/l, evap. at 100°C)</th>
<th>pH</th>
<th>SODIUM, Na</th>
<th>POTASSIUM, K</th>
<th>CALCIUM, Ca</th>
<th>MAGNESIUM, Mg</th>
<th>TOTAL HARDNESS (AS CaCO₃)</th>
<th>TOTAL ALKALINITY (AS CaCO₃)</th>
<th>IRON (TOTAL), Fe</th>
<th>SILICA, SiO₂</th>
<th>CHLORIDE, Cl</th>
<th>NITRATE, NO₃</th>
<th>BICARBONATE, HCO₃</th>
<th>CHLORIDE FROm CHLORINE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25126</td>
<td>12,8.87</td>
<td>595</td>
<td>335</td>
<td>7.3</td>
<td>7</td>
<td>5</td>
<td>73</td>
<td>34</td>
<td>322</td>
<td>0.2</td>
<td>28</td>
<td>6</td>
<td>15</td>
<td>&lt;1</td>
<td>383</td>
<td>0.4</td>
<td>10</td>
</tr>
</tbody>
</table>

Analysis in milligrams per litre - mg/l. (unless otherwise stated)
**STRATIGRAPHY AND LITHOLOGY OF THE BORE 24818**

<table>
<thead>
<tr>
<th>DEPTH (in m)</th>
<th>STRATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>Reddish to pale yellow sandy, silty soil with some coarse grained subangular to subrounded quartz sand</td>
</tr>
<tr>
<td>6 - 9</td>
<td>Red, calcareous mudstone, interbedded with grey, red, calcareous siltstone,</td>
</tr>
<tr>
<td>9 - 12</td>
<td>As above</td>
</tr>
<tr>
<td>12 - 15</td>
<td>Grey, brown, reddish, calcareous siltstone</td>
</tr>
<tr>
<td>15 - 18</td>
<td>Grey, red calcareous siltstone as above interbedded with grey mudstone.</td>
</tr>
<tr>
<td>18 - 21</td>
<td>Brown, reddish siltstone</td>
</tr>
<tr>
<td>21 - 22</td>
<td>Light grey, subangular to subrounded, very fine to fine grained calcareous sandstone.</td>
</tr>
<tr>
<td>22 - 23</td>
<td>Light grey and grey siltstone</td>
</tr>
<tr>
<td>23 - 24</td>
<td>Light grey, subangular, fine grained, sandstone</td>
</tr>
<tr>
<td>24 - 27</td>
<td>Grey light grey, very fine grained, calcareous sandstone interbedded with red mudstone aquifer at 26.5m Yield = 0.7 L/s conduct: = 740 pH = 7.92 temp = 31.5°C Bottle no PW86</td>
</tr>
<tr>
<td>27 - 30</td>
<td>Grey, very fine to fine grained, subrounded silicified, calcareous sandstone, interbedded with grey mudstone</td>
</tr>
<tr>
<td>30 - 33</td>
<td>Light grey, fine grained, subrounded sandstone aquifer at 33.0 Yield = 2.5 L/s conduct = 485 pH = 8.12 temp = 32°C Bottle No. PU26</td>
</tr>
<tr>
<td>DEPTH (in m)</td>
<td>STRATA DESCRIPTION</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>33 - 36</td>
<td>Grey siltstone interbedded with red, calcareous mudstone</td>
</tr>
<tr>
<td>36 - 39</td>
<td>Grey, fine grained, porous, calcareous sandstone interbedded with light grey, calcareous porous siltstone. Aquifer at 39.4 Yield = 8.0 L/s, conduct = 979, pH = 7.87, temp = 32°C, Bottle No PW 71</td>
</tr>
<tr>
<td>39 - 42</td>
<td>Grey, fine grained, calcareous sandstone</td>
</tr>
<tr>
<td>42 - 43</td>
<td>Sandstone as above interbedded with red siltstone</td>
</tr>
<tr>
<td>43 - 45</td>
<td>Red siltstone interbedded with red mudstone and some light cream, pink 8mm to 12mm thick gypsum bands.</td>
</tr>
<tr>
<td>45 - 48</td>
<td>Grey, calcareous siltstone interbedded with grey, fine grained sandstone. Water sample at 45m Bottle No PJ82 conduct = 1275, pH = 7.84, temp = 32°C</td>
</tr>
<tr>
<td>48 - 51</td>
<td>Red mudstone, interbedded with light cream 5mm to 15mm thick gypsum bands.</td>
</tr>
<tr>
<td>51 - 54</td>
<td>Grey, calcareous, vuggy sandstone and some cream, white gypsum, interbedded red mudstone. Water sample at 54m (field analysis): conduct = 487, pH = 7.69, temp = 32°C</td>
</tr>
<tr>
<td>54 - 56</td>
<td>Grey v. fine grained sandstone</td>
</tr>
<tr>
<td>56 - 57</td>
<td>Red mudstone and some cream, white gypsum</td>
</tr>
<tr>
<td>57 - 60</td>
<td>Red mudstone interbedded with light grey, fine grained calcareous, sandstone</td>
</tr>
</tbody>
</table>
Bore 24818 Cont

<table>
<thead>
<tr>
<th>DEPTH (in m)</th>
<th>STRATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 - 61</td>
<td>Light grey, silicified, vuggy sandstone</td>
</tr>
<tr>
<td>61 - 63</td>
<td>Red mudstone with pink gypsum</td>
</tr>
<tr>
<td>63 - 66</td>
<td>Light grey, grey v.fine grained sandstone interbedded with light grey siltstone and some pink gypsum</td>
</tr>
<tr>
<td>66 - 69</td>
<td>Grey v.fine to fine grained calcareous sandstone interbeds grey siltstone and light pink gypsum</td>
</tr>
<tr>
<td>69 - 72</td>
<td>Grey, v.fine to fine grained calcareous sandstone interbedded with grey mudstone and white gypsum</td>
</tr>
<tr>
<td>72 - 75</td>
<td>Sandstone as above</td>
</tr>
<tr>
<td>75 - 78</td>
<td>Red mudstone interbedded with grey siltstone and pink gypsum</td>
</tr>
<tr>
<td>78 - 81</td>
<td>Grey siltstone interbedded with dark grey, fine grained sandstone and white, transparent gypsum</td>
</tr>
<tr>
<td>81 - 84</td>
<td>Dark grey fine grained sandstone</td>
</tr>
<tr>
<td>84 - 87</td>
<td>Red, silicified (?)mudstone and white gypsum</td>
</tr>
<tr>
<td>87 - 90</td>
<td>Red, minor grey mudstone interbedded with grey siltstone and pink gypsum</td>
</tr>
<tr>
<td>90 - 93</td>
<td>As above</td>
</tr>
<tr>
<td>93 - 96</td>
<td>Red mudstone and gypsum</td>
</tr>
<tr>
<td>96 - 99</td>
<td>As above</td>
</tr>
<tr>
<td>99 - 102</td>
<td>As above</td>
</tr>
<tr>
<td>102 - 105</td>
<td>Red mudstone and some gypsum</td>
</tr>
<tr>
<td>105 - 108</td>
<td>As above</td>
</tr>
<tr>
<td>108 - 112</td>
<td>Red, grey mudstone and pink gypsum</td>
</tr>
<tr>
<td>112 - 115</td>
<td>Red, grey mudstone</td>
</tr>
<tr>
<td>115 - 118</td>
<td>As above mudstone and some pink gypsum</td>
</tr>
</tbody>
</table>

129: HYGEO
<table>
<thead>
<tr>
<th>DEPTH (in m)</th>
<th>STRATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>118 - 121</td>
<td>Grey siltstone interbedded with mudstone and pink up to 20mm thick gypsum bands</td>
</tr>
<tr>
<td>121 - 124</td>
<td>Grey siltstone and white, transparent 15mm to 20mm thick gypsum bands</td>
</tr>
<tr>
<td>124 - 129</td>
<td>Grey siltstone interbedded with red and some white gypsum</td>
</tr>
<tr>
<td>129 - 132</td>
<td>Grey siltstone and some transparent, white, pink gypsum</td>
</tr>
<tr>
<td>132 - 135</td>
<td>Silicified, light grey siltstone</td>
</tr>
<tr>
<td>135 - 138</td>
<td>Red mudstone interbedded with pink and white transparent gypsum bands 15mm to 20mm thick</td>
</tr>
<tr>
<td>138 - 141</td>
<td>Light grey, v. fine sandstone and grey siltstone: with some transparent 8mm thick gypsum bands</td>
</tr>
<tr>
<td>141 - 144</td>
<td>Light grey calcareous, v.fine grained to fine grained light grey sandstone interbedded with grey siltstone interbedded with gypsum</td>
</tr>
<tr>
<td>144 - 147</td>
<td>Grey red siltstone interbedded with light grey silicified v.fine sandstone and 5mm to 20mm thick gypsum bands</td>
</tr>
<tr>
<td>147 - 150</td>
<td>Grey, dark grey siltstone interbedded with light grey mudstone and 5mm to 20mm thick bands of gypsum</td>
</tr>
<tr>
<td>150 - 153</td>
<td>Siltstone, sandstone as above and 5mm thick bands of gypsum</td>
</tr>
<tr>
<td>153 - 154</td>
<td>As above</td>
</tr>
<tr>
<td>154 - 155</td>
<td>As above</td>
</tr>
<tr>
<td>155 - 156</td>
<td>Light grey fine grained sandstone</td>
</tr>
</tbody>
</table>
**Bore 24818 Cont**

<table>
<thead>
<tr>
<th>DEPTH (in m)</th>
<th>STRATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>156 - 157</td>
<td>Light grey, v.fine grained silicified sandstone and some pink, grey chert interbedded with grey siltstone and pink gypsum bands, 10mm thick</td>
</tr>
<tr>
<td>157 - 158.5</td>
<td>Pink, grey chert and white transparent 30mm to 40mm thick bands of gypsum in siltstone and sandstone</td>
</tr>
<tr>
<td>158.5 - 160.3</td>
<td>Light grey, v.fine to fine grained silicified sandstone</td>
</tr>
<tr>
<td>160.3 - 162</td>
<td>Red mudstone and pink gypsum bands 5mm to 10mm thick</td>
</tr>
<tr>
<td>162 - 166</td>
<td>Light grey siltstone, interbedded with red, grey mudstone and some pink gypsum bands 10mm to 26mm thick</td>
</tr>
<tr>
<td>166 - 169</td>
<td>Sandstone: v.fine to fine silicified grey, calcareous</td>
</tr>
<tr>
<td>169 - 172</td>
<td>Sandstone as above interbedded with grey, red siltstone and red mudstone:</td>
</tr>
<tr>
<td>172 - 175</td>
<td>Grey, v.fine grained to fine grained silicified sandstone with pyrite and transparent gypsum bands 5mm thick</td>
</tr>
<tr>
<td>175 - 176</td>
<td>Grey siltstone</td>
</tr>
<tr>
<td>176 - 177</td>
<td>Grey siltstone interbedded with fine grained silicified sandstone with 8mm to 12mm thick bands of pink gypsum</td>
</tr>
<tr>
<td>177 - 178</td>
<td>Red mudstone</td>
</tr>
<tr>
<td>178 - 181</td>
<td>Grey siltstone interbedded with v.fine grained sandstone</td>
</tr>
<tr>
<td>181 - 182</td>
<td>Siltstone, sandstone as above and interbedded with mudstone</td>
</tr>
</tbody>
</table>

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129: HYGEO
<table>
<thead>
<tr>
<th>DEPTH (in m)</th>
<th>STRATA DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>182 - 184</td>
<td>As above</td>
</tr>
<tr>
<td>184 - 186</td>
<td>Grey, v.fine sandstone interbedded with grey siltstone and grey mudstone</td>
</tr>
<tr>
<td>186 - 187</td>
<td>Red, grey mudstone</td>
</tr>
<tr>
<td>187 - 188</td>
<td>Mudstone as above</td>
</tr>
<tr>
<td>188 - 190.9</td>
<td>Light grey, v.fine grained to coarse grained subangular poorly sorted sandstone interbedded with grey siltstone</td>
</tr>
<tr>
<td>190.9 - 193</td>
<td>Light grey, medium to coarse grained water calcareous worn sandstone reacting more with 10% HCl</td>
</tr>
<tr>
<td>193 - 194</td>
<td>Grey mudstone</td>
</tr>
<tr>
<td>194 - 195</td>
<td>Grey mudstone</td>
</tr>
<tr>
<td>195 - 197</td>
<td>Grey mudstone interbedded with red v.fine sandstone</td>
</tr>
<tr>
<td>197 - 198</td>
<td>Grey mudstone</td>
</tr>
<tr>
<td>198 - 199</td>
<td>As above</td>
</tr>
<tr>
<td>199 - 200</td>
<td>Red mudstone</td>
</tr>
<tr>
<td>200 - 202</td>
<td>Red siltstone interbedded with some red mudstone</td>
</tr>
<tr>
<td>202 - 203</td>
<td>Some pink brown chert and pink, white, brownish limestone</td>
</tr>
</tbody>
</table>

Summary

0 - 6m  Top soil
6 - 202m Jinduckin Formation
202 - 203m Tindall Limestone
**DEPTH SORE GRAPHIC CONSTRUCTION LOG**

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION</th>
<th>GRAPHIC LOG</th>
<th>STRATA DESCRIPTION (WATER STRUCK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Gate Valve Flange</td>
<td>Yellow sandy silty soil (Cainozoic Age)</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>27.3 mm ID casing</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>152 mm ID casing</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>45</td>
<td>Centralizers every 20 metres</td>
<td>Calcareous siltstone, mudstone and sandstone often interbedded, thin bands of gypsum - Jinduckin Formation (Cambrian Age)</td>
<td>60</td>
</tr>
<tr>
<td>90</td>
<td>1.0 L/sec</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>105</td>
<td>15 L/sec</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>120</td>
<td>Flowing 5.0 L/sec</td>
<td></td>
<td>105</td>
</tr>
<tr>
<td>135</td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td>135</td>
</tr>
<tr>
<td>165</td>
<td></td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>180</td>
<td></td>
<td></td>
<td>155</td>
</tr>
<tr>
<td>195</td>
<td></td>
<td></td>
<td>165</td>
</tr>
<tr>
<td>210</td>
<td>142.8 mm open hole</td>
<td>Pink brown Chert, limestone - Tindall Limestone (Cambrian Age)</td>
<td>180</td>
</tr>
<tr>
<td>225</td>
<td></td>
<td></td>
<td>195</td>
</tr>
<tr>
<td>240</td>
<td></td>
<td></td>
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<tr>
<td>255</td>
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<td>270</td>
<td></td>
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<td>255</td>
</tr>
<tr>
<td>285</td>
<td></td>
<td></td>
<td>270</td>
</tr>
</tbody>
</table>

**COMPOSITE LOG OF BORE 25126**

Water Level
(Piezometric Level)
20.42 m above Ground Level.
Bore Completion Report

BORE 25410

DISTRICT HOSPITAL NHULUNBUY

D Karp
Hydrology Division
Water Resources Group
Darwin
January 1988
LIST OF TABLES

1. GROUNDWATER QUALITY

17:HYGE01
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMG</td>
<td>Australian Map Grid</td>
</tr>
<tr>
<td>°C</td>
<td>degree Celsius</td>
</tr>
<tr>
<td>km</td>
<td>kilometre</td>
</tr>
<tr>
<td>L/s</td>
<td>litre per second</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>m³</td>
<td>cubic metre</td>
</tr>
<tr>
<td>m³/d</td>
<td>cubic metres per day</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

The objective of this work was to investigate the groundwater potential and subsequently construct a production bore providing a water supply for irrigation at the Gove District Hospital.

The work was carried out in October and November 1987 by the Water Resources Group of the Water Directorate on behalf of the Department of Health and Community Services - East Arnhem Region.

Preliminary hydrogeological study, interpretation of aerial photographs, hydrochemical study and other relevant studies of the area were carried out in the office. Hydrogeological field reconnaissance was completed in October 1987.

The Gove District Hospital is situated in Nhulunbuy town at the AMG co-ordinates 693300 - 8652000 (Gove 1:100 000 Sheet 6273).

Nhulunbuy town occupies the northern part of Gove Peninsula. It has a monsoonal climate with highest and lowest recorded temperatures of 45.6°C and 11.3°C respectively. The average maximum temperature between 30°C and 33°C occurs during the wet season which lasts from November to March. The wet season begins and ends at Gove about one month later than western Arnhem Land. The average minimum temperature between 20.0°C and 26.5°C occurs during the dry season between May and September. The average annual evaporation is 2667 mm and average annual rainfall is 1429 mm.

Arnhem Land is divided into three major physiographic units - the Arafura Fall, the Gulf Fall and the Coastal Plain.

The Arafura Fall in the Gove Peninsula area could be described as a unit containing three main geomorphological features: Plateau, Plateau remnants and Slopes of intermediate level.

The Plateau which originally occupied the whole of the Gove Peninsula, at present covers central and eastern parts of the peninsula and is elevated between 60 and 80 metres above sea level.
The Plateau remnants occur to the west. The best example of Plateau remnants occur east of the Speedway and behind the Gove Hospital. The plateau and plateau remnants are the remnants of a peneplain which was extending throughout the region during Mesozoic and Tertiary times.

The Plateau and Plateau remnants are surrounded by the Slopes of intermediate level. This unit has developed from plateau during the erosion period. Elevation on its surface ranges from 2 to 40 metres above sea level.

2. HYDROGEOLOGY

The Gove Peninsula is located in the northern part of the Proterozoic Arnhem Block and is covered by geological map Arnhem Bay - Gove NT 1:250 000 Sheet SD53-3/4.

The area is underlain by the Archaean Bradshaw Granite and covered by the Lower Cretaceous Mullaman Beds underlyng the Cainozoic sediments. The Bradshaw Granite is outcropping close to the drilling area. The biggest outcrops are on Drimmie Head, Wargarpunda Point and west of Mount Saunders. The Bradshaw Granite consists of foliated garnetiferous granite and garnetiferous gneiss with abundant metamorphic inclusions. It is covered by Mullaman Beds composed mainly of white and yellow sandy claystone, ferruginous sandstone, grits, clean white quartz sandstone, and dolomitic siltstone. The overlying Cainozoic sediments mainly consist of sand, residual soil, lateritic soil, bauxite and laterite. The lateritisation occurred throughout the Northern Territory during the Tertiary peneplanation. Well developed lateritic profiles consists commonly of a ferruginous zone, a mottled zone and a pallid zone.

The investigation drilling carried out in October 1987 in the Gove District Hospital area encountered the major aquifers in weathered zone within granite between 21.0 m and 40.5 m of depth with supply between 0.2 L/s and 2.0 L/s.
3. WATER QUALITY

Water samples were collected during the drilling, and test pumping. The results are given in Table 1. The chemical analysis of the water was carried out by the East Point Laboratory of Water Resources Darwin. The results indicate that the water quality of the production bore are within the recommended limit for drinking water as adopted by the Australian Water Resources Council/National Health and Medical Research Council (Reference 1) except for pH which can be adjusted to an acceptable level with a suitable treatment.

4. WATER DEMAND

The water demand for irrigation at the Gove District Hospital could be met with supply from the Bore 25410 which is estimated to be 112.3 m³/d.

5. RESULTS

During the investigation drilling, four bores (25336, 25337, 25338 and 25410) were drilled and one (25410) was constructed with Class 9 PVC casing and stainless steel screens.

A twenty four hour constant discharge and recovery test was conducted on Bore 25410 and water samples were collected.

The test-pump shows that Bore 25410 could yield 1.3 L/s (see Test Report Bore 25410). The maximum continuous pumping rate and pump setting depth is based on available hydraulic data which is considered safe but not conservative.
6. RECOMMENDATIONS

It is recommended that:

- the pump setting for the Bore 25410 should be 38.0 m from ground level for a pumping rate of 1.3 L/s.

- absorption trenches and septic tanks be located a minimum of 100 metres from the bore.
REFERENCE


TEST REPORT — BORE RN. 25410

Bore location: GOVE DISTRICT HOSPITAL GROUNDS
Client/owner: GOVE DISTRICT HOSPITAL

Map: GOVE 1:100 000 SHEET 6273
Grid reference: 693200 - 8651900

Client’s reference: Purpose of supply: IRRIGATION

RECOMMENDATIONS

Pumping rate: 1.3 L/s. Pump setting: 38 m below ground level

General recommendations are given on the reverse side.

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

SAECO House, DARWIN NT

BORE DATA

Finished depth: 39.4 m Completion date: 31/10/87 Test date: 20/11/87
Standing water level 6.10 m on 21/11/87 Test rates: 1.4 L/s
Construction details: Test duration 23 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2.2</td>
<td>203 mm ID Steel casing</td>
</tr>
<tr>
<td>0 - 25.9</td>
<td>147 mm ID PVC Class 9 casing</td>
</tr>
<tr>
<td>25.9 - 39.4</td>
<td>152 mm ID PVC Class 9 casing with 3mm x 200 mm slots</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.37 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 147 mm Nominal Size

COMMENTS

1. These recommendations are based on a 20 hour constant drawdown test at fork conditions and a flow rate of 1.4 L/s and assumes hydrologic conditions will remain constant.
2. For long term pumping a suitable pump should be selected to enable continuous pumping whilst bore is at a fork condition.
3. Provision to monitor water levels whilst bore is equipped by installing a 25 mm socket in the bore capping should be incorporated to monitor effects of long term pumping at fork conditions.

WATER QUALITY

See water laboratory report (Analysis No. 87/88/0875)

WRD4020
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

C. L. DUFFIELD, Government Printer of the Northern Territory
**TEST REPORT — BORE RN. 25335**

**Bore location:** GOVE SPEEDWAY  
**Client/owner:** GOVE SPEEDWAY  
**Client’s reference:**  
**Purpose of supply:** IRRIGATION

**Map:**  
**Grid reference:**

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**RECOMMENDATIONS**

- **Pumping rate:** 1.0 L/s  
- **Pump setting:** 16.5 m below ground level

General recommendations are given on the reverse side. The aquifer and bore cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAWA, Water Directorate (in all correspondence refer to the bore's RN number). SASCO House, DARWIN NT

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**BORE DATA AQUIFER TEST**

- **Finished depth:** 23.7 m  
- **Completion date:** 23/10/87  
- **Test date:** 23/11/87

**Standing water level:** 5.14 m on 21/11/87  
**Construction details:** Test duration 24 hrs  
**Test rates:** 1.0 L/s

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5.9</td>
<td>203 mm ID Steel casing</td>
</tr>
<tr>
<td>0 - 13.7</td>
<td>147 mm ID PVC casing Class 9</td>
</tr>
<tr>
<td>13.7 - 14.7</td>
<td>152 mm ID Stainless steel screen with 0.5 mm slots</td>
</tr>
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<td>14.7 - 16.7</td>
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<td>17.7 - 23.7</td>
<td>147 mm ID PVC casing Class 9 with sump</td>
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</tbody>
</table>

**Notes:**
1. Top of casing as constructed was 0.7 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 147 mm Nominal Size

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**COMMENTS**

1. These results are based on constant rate test at 1 L/s for 24 hours duration and assume hydrological conditions remain constant.

2. Provisions to obtain water samples at the bore head should be incorporated in any reticulation.

3. As pump setting is below screens care should be taken when running pump and it should be noted minimum nominal diameter for bore is 147 mm.

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**WATER QUALITY**

See water laboratory report (Analysis No. 87/87/0876)

WRD4020
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1. Construct a concrete apron around the bore head to prevent surface flow, seepage and waste from entering the bore.

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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.
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TEST REPORT — BORE RN. 25339

Bore location: COVE SPEEDWAY
Client/owner: SPEEDWAY COVE
Client's reference: SPEEDWAY COVE
Purpose of supply: IRRIGATION

RECOMMENDATIONS
Pumping rate: 1.5 L/s. Pump setting: 17.5 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAWA, Water Directorate (In all correspondence refer to the bore's RN number).

BOR Data
Finished depth: 20.9 m Completion date: 28/10/87 Test date: 25/11/87
Standing water level: 5.46 m on 24/11/87 Test rates: 2.0 L/s
Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5.7</td>
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</tr>
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</table>

Notes: 1. Top of casing as constructed was 0.47 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 147 mm Nominal Size

COMMENTS
1. These results are based on constant rate test at 2.0 L/s for 24 hours duration and assume hydrological conditions remain constant.
2. Provisions to obtain water samples at the bore head should be incorporated in any reticulation.
3. AS PUMP SETTING IS BELOW SCREENS CARE SHOULD BE TAKEN WHEN RUNNING PUMP AND IT SHOULD BE NOTED THAT MINIMUM NOMINAL DIAMETER OF BORE IS 147 mm.

WATER QUALITY
See water laboratory report (Analysis No. 87/88/0877)

WRD4020
RECOMMENDATIONS FOR FINISHING, OPERATING AND PROTECTING GROUNDWATER BORES

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TEST REPORT — BORE RN. 25410

BORE DATA

Finished depth: 39.4 m  Completion date: 31/10/87  Test date: 20/11/87
Standing water level 6.10 m on 21/11/87  Test rates: 1.4 L/s
Construction details:

<table>
<thead>
<tr>
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</thead>
<tbody>
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WARNING: MINIMUM INTERNAL BORE DIAMETER IS 147 mm Nominal Size

COMMENTS

1. These recommendations are based on a 20 hour constant drawdown test at fork conditions and a flow rate of 1.4 L/s and assumes hydrologic conditions will remain constant.

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3. Provision to monitor water levels whilst bore is equipped by installing a 25 mm socket in the bore capping should be incorporated to monitor effects of long term pumping at fork conditions.

WATER QUALITY

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TEST REPORT — BORE RN. 25339

Bore location: GOVE SPEEDWAY
Client/owner: SPEEDWAY GOVE
Client's reference:
Purpose of supply: IRRIGATION

Map:
Grid reference:

RECOMMENDATIONS
Pumping rate: 1.5 L/s. Pump setting: 17.5 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAXA, Water Directorate
(In all correspondence refer to the bore's RN number).

BORE DATA
Finished depth: 20.9 m Completion date: 28/10/87 Test date: 25/11/87
Standing water level 5.46 m on 24/11/87
Test rates: 2.0 L/s
Test duration 24 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
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</tr>
</thead>
<tbody>
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</table>

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3. Test rates are not indicative of safe long term pumping rates.

WARNING: MINIMUM INTERNAL BORE DIAMETER IS 147 mm Nominal Size

COMMENTS
1. These results are based on constant rate test at 2.0 L/s for 24 hours duration and assume hydrological conditions remain constant.
2. Provisions to obtain water samples at the bore head should be incorporated in any reticulation.
3. AS PUMP SETTING IS BELOW SCREENS CARE SHOULD BE TAKEN WHEN RUNNING PUMP AND IT SHOULD BE NOTED THAT MINIMUM NOMINAL DIAMETER OF BORE IS 147 mm.

WATER QUALITY
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<table>
<thead>
<tr>
<th>Analysis in milligrams per litre - mg/l (unless otherwise stated)</th>
<th>Groundwater Quality</th>
<th>GROUNDWATER QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TABLE 1</strong></td>
<td>BORE REGISTERED NUMBER</td>
<td>25410</td>
</tr>
<tr>
<td>SODIUM, Na</td>
<td>60</td>
<td>5</td>
</tr>
<tr>
<td>POTASSIUM, K</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>CALCIUM, Ca</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>MAGNESIUM, Mg</td>
<td>2540</td>
<td>60</td>
</tr>
<tr>
<td>TOTAL HARDNESS AS CaCO₃</td>
<td>360</td>
<td>60</td>
</tr>
<tr>
<td>TOTAL ALKALINITY AS CaCO₃</td>
<td>690</td>
<td>60</td>
</tr>
<tr>
<td>IRON (TOTAL) Fe</td>
<td>0.3</td>
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<tr>
<td>SILICA, SiO₂</td>
<td>40</td>
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<tr>
<td>CHLORIDE, Cl</td>
<td>160</td>
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<td>SULPHATE SO₄</td>
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<tr>
<td>NITRATE, NO₃</td>
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<td>40</td>
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<tr>
<td>BICARBONATE, HCO₃</td>
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<tr>
<td>FLUORIDE, F</td>
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<tr>
<td>NaCl (CALC FROM CHLORIDE)</td>
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<td>60</td>
</tr>
<tr>
<td>pH</td>
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<td>6.1</td>
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<tr>
<td>SPECIFIC CONDUCTANCE US/CM AT 25°C</td>
<td>590</td>
<td>590</td>
</tr>
<tr>
<td>TOTAL DISSOLVED SOLIDS (mg/l by evap. at 180°C)</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>DATE OF SAMPLING</td>
<td>20.11.92</td>
<td></td>
</tr>
<tr>
<td>COMMENTS</td>
<td></td>
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</tr>
</tbody>
</table>
LATERITE & CLAY: red, yellow
CLAY: yellow, white
GRANITE: weathered

COMPOSITE LOG OF BORE 25410