POWER AND WATER AUTHORITY
WATER DIRECTORATE

Report No 6987 D

BORE COMPLETION REPORT
BUCHANAN HIGHWAY
BORE 24815, 24816 AND 24817

D KARP
Hydrogeologist
Water Resources Group
Darwin
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1. GROUNDWATER QUALITY
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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>AMG</td>
<td>Australian Map Grid</td>
</tr>
<tr>
<td>°C</td>
<td>degree Celsius</td>
</tr>
<tr>
<td>ID</td>
<td>internal diameter</td>
</tr>
<tr>
<td>km</td>
<td>kilometre</td>
</tr>
<tr>
<td>L/s</td>
<td>litre per second</td>
</tr>
<tr>
<td>L/c/d</td>
<td>litre per day</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>m³/d</td>
<td>cubic metres per day</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligram per litre</td>
</tr>
<tr>
<td>pH</td>
<td>acidity and alkalinity index</td>
</tr>
<tr>
<td>SWL</td>
<td>standing water level</td>
</tr>
<tr>
<td>us/cm</td>
<td>microsiemens per centimetre</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

The objective of this work was to construct three production bores for an adequate supply of groundwater for road construction along Buchanan Highway.

The work was carried out on behalf of the Roads Division, Department of Transport and Works by the Power and Water Authority.

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

The climate is semi-arid. Rainfalls mainly during a well defined wet season between November and March. Mean annual rainfall averages about 533 mm.

2. HYDROGEOLOGY

The area lies in the north Wiso Basin and is underlain by Middle Cambrian Age sediments of Montejinni Limestone. It is consists mainly of grey-brown calcilutite, minor dolomite, butt and red brown calcareous mudstone.

Groundwater potential in Montejinni Limestone is good but lost circulation due to cavities creates bore construction problems. Three production bores 24815, 24816 and 24817 were drilled and constructed in Montejinni Limestone.

3. WATER QUALITY

Water samples were collected during the test pumping. The chemical analysis of the bore water was carried out by the East Point Laboratory of Power and Water Authority. The results, given in Table 1, indicate that the water quality of the three production bores are within the recommended limit for drinking water as adopted by the Australian Water Resources Council/National Health and Medical Research Council.
4. WATER DEMAND

Water demand for a road construction could be met by the supply from bores 24815, 24816 and 24817.

RESULTS

Bores 24815, 24816 and 24817 were constructed with steel casing.

An eight hour constant discharge test and recovery test were carried out on all three bores. The maximum continuous pumping rate and pump setting are based on available hydraulic data considered safe but not conservative (see attached test reports).

RECOMMENDATIONS

It is recommended that:

- for Bore 24815 the pump setting should be 121 m below ground level for a pumping rate of 2.0 L/s.
- for Bore 24816 the pump setting should be 150 m below ground level for a pumping rate of 6 L/s.
- for Bore 24817 the pump setting should be 140 m below ground level for a pumping rate of 8 L/s.
<table>
<thead>
<tr>
<th>Analysis in milligram per litre - mg/l (unless otherwise stated)</th>
<th>WATER QUALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORE REGISTERED NUMBER</td>
<td>SODIUM, Na</td>
</tr>
<tr>
<td></td>
<td>POTASSIUM, K</td>
</tr>
<tr>
<td></td>
<td>CALCIUM, Ca</td>
</tr>
<tr>
<td></td>
<td>MAGNESIUM, Mg</td>
</tr>
<tr>
<td></td>
<td>TOTAL HARDNESS AS CaCO₃</td>
</tr>
<tr>
<td></td>
<td>TOTAL ALKALINITY AS CaCO₃</td>
</tr>
<tr>
<td></td>
<td>IRON (TOTAL) Fe</td>
</tr>
<tr>
<td></td>
<td>SILICA, SiO₂</td>
</tr>
<tr>
<td></td>
<td>CHLORIDE, Cl</td>
</tr>
<tr>
<td></td>
<td>SULPHATE SO₄</td>
</tr>
<tr>
<td></td>
<td>NITRATE, NO₃</td>
</tr>
<tr>
<td></td>
<td>BICARBONATE, HCO₃</td>
</tr>
<tr>
<td></td>
<td>FLUORIDE, F</td>
</tr>
<tr>
<td></td>
<td>NaCl (Calc from Chloride)</td>
</tr>
<tr>
<td></td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td>SPECIFIC CONDUCTANCE, uS/cm at 25°C</td>
</tr>
<tr>
<td></td>
<td>TOTAL DISSOLVED SOLIDS (US)</td>
</tr>
<tr>
<td></td>
<td>DATE OF EVAP. AT 180°C</td>
</tr>
<tr>
<td></td>
<td>COMMENTS</td>
</tr>
</tbody>
</table>
TEST REPORT — BORE RN. 24815

Bore location: BUCHANAN HIGHWAY
Map: Hidden Valley 1:100 000 Sheet 5464
Grid reference: 262000 - 8145270

Client/owner: ROADS DIVISION
Client's reference: Road 1/87
Purpose of supply: Road construction

RECOMMENDATIONS
Pumping rate: 2.0 L/s. Pump setting: 121 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).

RECOMMENDATIONS
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).

BORE DATA
Finished depth: 159.6 m Completion date: 24/4/87 Test date: 4/5/87
Standing water level 88.27 m on 2/5/87 Test rates: 3 L/s Test duration 12 hrs
Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 12.6 m</td>
<td>203 mm ID Steel casing</td>
</tr>
<tr>
<td>0 - 106.4 m</td>
<td>152 mm ID Steel casing</td>
</tr>
<tr>
<td>106 - 119.48 m</td>
<td>152 mm ID Steel casing with perforations</td>
</tr>
<tr>
<td>119.48 - 136.5 m</td>
<td>152 mm ID Steel casing</td>
</tr>
<tr>
<td>134.5 - 159.6 m</td>
<td>Open hole</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.65 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 Nominal size

COMMENTS
1. The above recommendations are based on a 12 hour test at 3.0 L/s and assume that hydrologic conditions will not change.
2. Boundary conditions encountered during testing restrict the pumping of this bore to 12 hour intervals. Further testing would be required to establish parameters for long term pumping.

WATER QUALITY
See water laboratory report (Analysis No. 86/87/2128)

WRD4020 By: J Rykiert
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. 24816

Bore location: Buchanan Highway  
Client/owner: Roads Division  
Client's reference: Road 2/87  
Purpose of supply: Road construction

Map: Flat Top Hill  
Grid reference: 221750 - 8147350

RECOMMENDATIONS
Pumping rate: 6 L/s. Pump setting: 150.0 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: APAWA, Water Directorate (In all correspondence refer to the bore's RN number).

SASCO House, Darwin

BORE DATA
Finished depth: 191.8 m  
Completion date: 30/4/87  
Test date: 14/5/87

Standing water level: 106.38 m on 13/5/87

Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 8.3</td>
<td>203 mm ID Steel casing</td>
</tr>
<tr>
<td>0 - 177.86</td>
<td>152 mm ID Steel casing</td>
</tr>
<tr>
<td>177.86 - 190.9</td>
<td>152 mm ID Steel casing with perforations</td>
</tr>
<tr>
<td>190.9 - 191.8</td>
<td>152 mm ID Steel casing</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.65 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 Nominal size

COMMENTS
1. These recommendations are based on a constant discharge test at 6.6 L/s for 8 hours and assume that hydrologic conditions will not change.

WATER QUALITY

See water laboratory report (Analysis No. 86/87/2131)

WRD020 By: J Rykiert
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. 24817

Bore location: Buchanan Highway
Client/owner: Roads Division
Client’s reference: Roads 3/87
Purpose of supply: Road construction

Map: Hidden Valley 1:100 000 Sheet 5464
Grid reference: 240350 - 8145950

RECOMMENDATIONS
Pumping rate: 8 L/s. Pump setting: 140 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: PAMW, Water Directorate (In all correspondence refer to the bore's RN number).

BORE DATA
Finished depth: 200.3 m Completion date: 5/5/87 Test date: 9/5/87
Standing water level: 115.10 m on 7/5/87 Test rates: 3.7 to 8 L/s
Construction details: Test duration 7 hrs
Interval (m) Description
0 - 6.0 203 mm ID Steel Casing
0 - 197.0 152.4 mm ID Steel Casing
197 - 200.3 152.4 mm ID Steel Casing with perforations

Notes: 1. Top of casing as constructed was 1.0 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 152.4 mm Nominal Size

COMMENTS
1. The above recommendations are based on a multi rate test to 8 L/s and drawdown observations during 33 hours of pumping at 6 L/s and assumes hydrological conditions will not change.

WATER QUALITY
See water laboratory report (Analysis No. 86/87/2129)

WRD4020 By: J Rylkert
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