POWER AND WATER AUTHORITY
REPORT NO 72/88D

Bore Completion Report
1988
KAKADU NATIONAL PARK

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Water Resources Group
Darwin
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114:HYGEO
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AMG</td>
<td>Australian Map Grid</td>
</tr>
<tr>
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</tr>
<tr>
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<td>internal diameter</td>
</tr>
<tr>
<td>km</td>
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</tr>
<tr>
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<td>litre per second</td>
</tr>
<tr>
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<tr>
<td>pH</td>
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<td>SWL</td>
<td>standing water level</td>
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1. INTRODUCTION

The objective of this work was to investigate the groundwater potential and subsequently construct production bores providing an adequate water supply at each of the following locations:

- Boggy Plain Access Road
- Barramundi Gorge
- Waterfall Creek
- Rangers Headquarters
- Gimbat

The work, which involved hydrogeological study, investigation drilling, construction and testing of the production bores, was carried out during 1988 on behalf of the Australian National Parks and Wildlife Service.

The above mentioned areas lie in the monsoonal climate with an average annual rainfall of 1340 mm. The wet season lasts from November to March and mean temperatures range from 25°C to 35°C. Mean annual pan evaporation is about 2200 mm.

The above investigated part of the Kakadu National Park belongs to the following major physiographic divisions (Reference 2 and 3).

- Floodplains
- Lowlands
- Arnhem Land Plateau

The Floodplains extend along the coast, major rivers and their tributaries and also contain perennial swampland, Woolwonga Swamp, Magella Plains, Didygeegee Swamp. The Floodplains consist mainly of Quaternary estuarine and alluvial deposits. The type of vegetation occurring on the floodplain indicates the duration of flooding. The area is flooded for a period between two and six months and is dominated by sedges. Herbaceous swamp vegetation covers places flooded for between six and nine months. The permanently wet areas are characterised by stands of paperbark, Pandanus and freshwater mangrove.

The Lowlands (or Northern Plains on Mundogie Map Sheet) are the largest physiographic unit in the area. They are characterised by undulating plains of Cainozoic sand and patches of laterite. The predominant vegetation in the area is eucalypt woodland, tall open forests, savannah grass, scrub and paperbark communities.
The Arnhem Land Plateau is dominated by subhorizontal Middle Proterozoic and volcanic rocks. It rises to over 350m above sea level and in places, is dissected into many small low mesas. The plateau is covered by heath-like shrubs, spinifex, sandstone woodland and predominantly tall open eucalypts forest. It is deeply dissected with permanent springs. The escarpment, covered by rainforests fed by permanent springs, sustains a variety of plants and wildlife.

2. HYDROGEOLOGY

The Kakadu National Park is located in the northeastern part of the Pine Creek Geosyncline of the Lower Proterozoic age. The Pine Creek Geosyncline comprises of 14 km of metasedimentary rocks (with interlayered volcanics) resting on a gneissic and granitic Archaean complexes. Sedimentation took place in one basin and most stratigraphic units are represented throughout the basin (Figure 1). The sediment was regionally deformed and metamorphosed (1800 Ma) to the greenschist facies and amphibolite facies in the west and northeast. The Early Proterozoic metasediments are intruded by pre- and post-orogenic tholeiites and post-orogenic granite plutons. All these rocks are unconformably overlain by the Middle Proterozoic and younger rocks.

ARCHEAN TO EARLY PROTEROZOIC

Nanambu Complex

One bore (25416) was selected for a road construction for the Boggy Plain in the area underlain by the Nanambu Complex which consists of gneiss, granite and schist. The bore was sunk on the lineament trending north at AMG co-ordinates 239200 - 8602150 (Cahill 1:100 000 Sheet 5422). The rocks of the Nanambu Complex have a very low success rate in groundwater supply. The aquifers could only be expected in the weathered and fractured zones of the granite or schist. Drilling was unsuccessful as the bore did not intersect such zone in the basement rocks.

Masson Formation

Two bores (25774 and 25785) were selected at AMG co-ordinates 206200 - 8500800 (Ranford Hill 1:100 000 Sheet 5370) in order to intersect the Masson Formation composed of minor gritty, poorly sorted kaolinitic
quartz sandstone, quartz pebble conglomerate and grey, very fine quartzite. The sites were located on the lineament trending northwest. Drilling was successful and aquifers were encountered with a supply of 9.6 L/s (airlift) between 52.5 m and 60.9 m in fractured quartz pebble conglomerate.

**Cahill Formation**

Bore 25417 for road construction in the Boggy Plain was sunk in the Cahill Formation along the Arnhem Highway at AMG co-ordinates 239550 - 8602200 (Cahill 1:100 000 Sheet 5472). The Cahill Formation is mainly composed of schist, gneiss and quartzite and is known as a good water bearing unit, but only in selected places. During the drilling the aquifers were encountered in quartz-pebble conglomerate between 36.0 m and 41.9 m with a supply of 11.0 L/s (airlift). The site was located on the distinct fault trending north.

**Fisher Creek Siltstone**

Bore 25772 for the camping site next to Barramundi Gorge is located at AMG co-ordinates 221700 - 8527900 (Mundogie 1:100 000 Sheet 5371) and was sunk in the Fisher Creek Siltstone composed of slate, siltstone and arkose sandstone. No previous investigation for groundwater potential was carried out in this formation in the Kakadu National Park area. Geological reconnaissance and preliminary photo-interpretation indicated that the aquifers could only be associated with the secondary porosity of the rocks. The sites were selected in order to encounter aquifers in folded slate strongly cleaved. The aquifers with a supply of approximately 6 L/s were struck in slate interbedded with quartz between 12.0 m and 24.4 m.

**Zamu Dolerite**

Bore 25771 is located at AMG co-ordinates 220100 - 8513100 (Mundogie 1:100 000 Sheet 5371) in a close vicinity of the camping site next to the Waterfall Creek. The site was selected in order to intersect weathered zone of the Zamu Dolerite and aquifer was struck in this zone at the boundary of fresh dolerite. Drilling was successful and aquifers with a supply (airlift) of 5.0 L/s were encountered between 16.4 m and 17.4 m.

Two bores (25775 and 25776) were drilled for the Ranger Station at Gimbat. Bore 25775 located at AMG co-ordinates 241150 - 8498000 (Stow 1:100 000 Sheet 5470) was unsuccessful, where fresh dolerite was
intersected above the pieometric level. Bore 25776 located at AMG co-ordinates 240670 - 8497800 (Stow 1:100 000 Sheet 5470) encountered aquifer in weathered zone on the top of fresh dolerite between 7.5 m and 11.0 m. The supply from the bore was 2.5 L/s but water contained a significant percentage of dark yellow silt. Water was found unsuitable for human consumption.

**Kurrundie Sandstone**

One bore (25773) was selected in the close vicinity of the Ranger Headquarters Stage 3 at AMG co-ordinates 205800 - 8500500 (Ranford Hill 1:100 000 Sheet 5370). The area is underlain by the Kurrundie Sandstone composed of massive, purple, poorly sorted, very coarse to pebbly lithic quartz sandstone. The groundwater potential of this formation is unknown. One bore was sunk on the lineament trending northwest in order to intersect fractured zones in the quartz sandstone. Bore 25773 was drilled to the depth of 84.4 m and stopped in the purple quartz sandstone. Drilling was unsuccessful.

### 3. WATER QUALITY

Water samples were taken from the bores 25417, 25772, 25771, 25774 and 25785. The chemical analyses of the bores were carried out by the East Point Laboratory of Water Directorate, Darwin. The results are summarised in Table 1. The water quality from the above mentioned bores is suitable for human consumption according to the recommended limit for drinking water as adopted by the Australian Water Resources Council/National Health and Medical Research Council (Reference 1). Except for low pH which may be adjusted to acceptable level with suitable treatment.

### 4. WATER DEMAND

**Boggy Plain Road**

Water supply from Bore 25417 should meet demand which is estimated to be 604 m³/d.

**Barramundi Gorge**

Water supply from Bore 25772 should meet demand which is estimated to be 259 m³/d.
| BORE REGISTERED NUMBER | DATE OF SAMPLING | SPECIFIC CONDUCTANCE (μS/m at 25°C) | TOTAL DISLOTTED SOILOES (mg/L by EVAP at 180°C) | pH | SODIUM, Na | POTASSIUM, K | CALCIUM, Ca | MAGNESIUM, Mg | TOTAL HARDNESS (AS CaCO₃) | TOTAL ALKALINITY (AS CaCO₃) | IRON (TOTAL, Fe) | SILICA, SiO₂ | CHLORIDE, Cl- | SULPHATE, SO₄ | NITRATE, NO₃ | BICARBONATE, HCO₃⁻ | FLUORIDE, F | NAOCl | (CALC FROM CHLORIDE) | COMMENTS |
|------------------------|-----------------|------------------------------------|-----------------------------------------------|----|------------|-------------|-------------|--------------|----------------------------|-----------------------------|----------------|----------------|---------------|---------------|---------------|--------------|--------|----------------|-----------|
| 25417                  | 29/6/88         | 145                                | 6.1                                           | 4  | 1          | 11          | 60          | 62           | 0.9                        | 52                          | 1             | 3             | 4             | 1             | 75            | 0.2          | 0.1   | 5             |           |
| 25772                  | 23/6/88         | 50                                 | 5.9                                           | 1  | 1          | 2           | 4           | 21           | 20                         | 0.1                         | 20            | 4             | 1             | 1             | 24            | 0.1          | 7     |               |           |
| 25777                  | 18/6/88         | 580                                | 7.5                                           | 20 | 1          | 53          | 41          | 301          | 324                        | 0.1                         | 98            | 3             | 10            | 1             | 395           | 0.3          | 5     |               |           |
| 25774                  | 27/6/88         | 30                                 | 5.1                                           | 2  | 1          | 3           | 1           | 8            | 7                          | 0.2                         | 14            | 4             | 1             | 1             | 8             | 0.1          | 7     |               |           |
| 25785                  | 9/8/88          | 25                                 | 4.3                                           | 2  | 1          | 1           | 1           | 1            | 1                          | 0.1                         | 14            | 3             | 1             | 1             | 1             | 0.1          | 5     |               |           |

Analysis in milligrams per litre - mg/L (unless otherwise stated)

WATER QUALITY DATA
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<tr>
<th>BORE REGISTERED NUMBER</th>
<th>DATE OF SAMPLING</th>
<th>CADMIUM, Cd</th>
<th>MANGANESE, Mn</th>
<th>LEAD, Pb</th>
<th>ZINC, Zn</th>
<th>ARSENIC, As</th>
<th>COPPER, Cu</th>
<th>SELENIUM, Se</th>
<th>CHROMIUM, Cr</th>
<th>NICKEL, Ni</th>
<th>COBALT, Co</th>
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<tbody>
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<td>9.8.88</td>
<td>0.0009</td>
<td>0.002</td>
<td>0.10</td>
<td>0.10</td>
<td>0.001</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
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<td>0.002</td>
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<td>26.9.88</td>
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</tr>
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</table>

Analysis in milligrams per litre. **Total** unless otherwise stated.
Waterfall Creek

Water supply from Bore 25771 should meet demand which is estimated to be 604 m³/d.

Range Headquarters

Water supply from Bore 25774 and 25785 should meet demand which is estimated to be 1209.6 m³/d and 1036 m³/d respectively.

5. BORE CONSTRUCTION AND DEVELOPMENT

Boggy Plain Road

During June 1988 two bores (25416 and 25417) were drilled for the road construction. Bores were sunk on the fractured zone of fault trending north. Bore 25416 penetrated the Nanambu Complex to a depth of 71.3 m and was unsuccessful. Bore 25417 encountered aquifers between 36 m and 42 m in the fractured zones of the Cahill Formation and was constructed with steel casing and stainless steel screens. A seven hour constant discharge test and recovery test were completed on the bore and water samples were collected. The maximum pumping rate is 7.0 L/s and considered safe but not conservative (see Test Report Bore 25417).

Barrumandi Gorge

Bore 25772 was drilled and constructed with steel casing and stainless steel screens for the camping place at Barramundi Gorge during June 1988. The bore penetrated folded slate of the Fisher Creek Siltstone to the depth of 30.4 m and encountered aquifers between 12.4 m and 24.4 m. A five hour constant discharge test and recovery test were completed on the bore and water samples were collected. The maximum pumping rate is 5.0 L/s and considered safe but not conservative (see Test Report Bore 25772).

Waterfall Creek

During June 1988 Bore 25771 was drilled and constructed with steel casing and stainless steel screens for the camping place at the Waterfall Creek. Bore 25771 penetrated weathered Zamu Dolerite before reaching fresh dolerite at the depth of 19.5 m. The aquifer was encountered between 13.0 m and 17.5 m. A seven hour constant discharge and recovery test were carried out on the bore and water samples were taken. The maximum pumping rate is 7.0 L/s and considered safe but not conservative (see Test Report Bore 25771).
Ranger Headquarters Stage 3

During June and July 1988 three bores (25772, 25774 and 25785) were drilled of which two (25774 and 25785) were constructed with steel casing and stainless steel screens for the Ranger Headquarters. Successful bores intersected the Masson Formation to the depth of 61.0 m and encountered aquifer between 52 m and 55 m in the quartz pebbly conglomerate. A constant discharge test and recovery test were completed on the Bores 25774 and 25785 and water samples were collected. The maximum pumping rate for Bore 25774 is 14.0 L/s and for Bore 25785 is 12.0 L/s. It is considered safe but not conservative (See Test Report Bore 25774 and 25785).

Gimbat Ranger Station

Two bores (25772 and 25776) were drilled in June 1988 in the close vicinity of the Ranger Station and were unsuccessful. Bore 25775 intersected dolerite to the depth of 27.5 m and was unsuccessful. Bore 25776 intersected dolerite to the depth of 45 m and encountered shallow aquifer between 7.5 m and 11.0 m. The water supply was 2.5 L/s but contained very significant percentage of dark yellow silt which did not clear during the airlift remained constant for four hours.

6. RECOMMENDATIONS

It is recommended that:

for Bore 25417
- the pump setting should be 36.0 m below the ground level for a pumping rate ranging between 4.0 and 7.0 L/s.
- the pump setting should be 28.0 m below the ground level for a pumping rate ranging between 1.0 and 4.0 L/s.

for Bore 25772
- the pump setting should be 20.0 m below the ground level for the pumping rate ranging between 1.0 and 3.0 L/s.

114:HYGEO
for Bore 25771
- the pump setting should be 12.5 below the ground level for the pumping rate ranging between 1.0 and 7.0 L/s.

for Bore 25774
- the pump setting should be 50 m below the ground level for the pumping rate ranging between 1.0 and 14.0 L/s.

for Bore 25785
- the pump setting should be 50 m below the ground level for the pumping rate ranging between 1.0 and 12.0 L/s.
REFERENCES


DEPTH BORE GRAPHIC

CONSTRUCTION LOG

STRATA DESCRIPTION

AQUIFERS (WATER STRUCK)

0.75m
0
-2.5
-5.0
-7.5
-10.0
-12.5
-15.0
-17.5
-20.0
-22.5
-25.0
-27.5
-30.0
-32.5
-35.0
-37.5
-40.0
-42.5
-45.0

SANDY CLAY and QUARTZ PEBBLE

SCHIST: white, yellow

SCHIST: yellow, brown

SCHIST: yellow, grey

SCHIST

SCHIST and QUARTZ

S.W.L 33.72m
29/6/88

COMPOSITE LOG OF BORE 25417
POWER AND WATER AUTHORITY

DEPTH (m)  | BORE CONSTRUCTION LOG  | STRATA DESCRIPTION  | AQUIFERS (WATER STRUCK)

0.75m

SAND

SANDY CLAY, MUDSTONE

MUDSTONE, SHALE and QUARTZ

SHALE and QUARTZ

SHALE: grey

S.W.L. 3.72 m
20/06/89

2.2 L/s

5.5 L/s

COMPOSITE LOG OF BORE 25772
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<td>Cement</td>
<td>SANDY CLAY: grey</td>
<td>S.W.L. 4.8 m 17/6/88</td>
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<td>2</td>
<td>152.4 mm ID Steel Casing</td>
<td>SANDY CLAY: grey, yellow</td>
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</tr>
<tr>
<td>4</td>
<td>152.4 mm ID Steel Screens</td>
<td>SANDY CLAY: yellow, brown and DOLERITE</td>
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<tr>
<td>6</td>
<td>0.6 mm Slots</td>
<td>SANDY CLAY: green, brown</td>
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<tr>
<td>8</td>
<td>DOLERITE</td>
<td>DOLERITE: weathered</td>
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</table>

**Compsite Log of Bore 25771**
DEPTH (m) | BORE CONSTRUCTION | GRAPHIC LOG | STRATA DESCRIPTION | AQUIFERS (WATER STRUCK)
---|---|---|---|---
0 | CEMENT | SAND : red, brown
4 | STEEL CASING | SANDSTONE : red, brown, yellow
8 | SAND : yellow, brown
12 | 200 mm ID STEEL CASING | SAND : medium, brown
16 | PACKER | SAND : cemented
20 | 152.4 mm ID STEEL CASING | SAND : cemented and CLAY : yellow, white
24 | 152.4 mm ID SLOTS | SAND and CLAY
28 | SAND : fine | QUARTZ SANDSTONE and QUARTZ PEBBLE CONGLOMERATE : weathered
32 | 0.6 mm SLOTS | SLATE : black, red, grey
36 | SUMP | S.W.L. 40.55m
40 | 152.4 mm ID STEEL CASING | 7.0 L/s
44 | COMPRESS | 9.6 L/s
48 | COMPOSITE LOG OF BORE 25774 |
<table>
<thead>
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<th>DEPTH (m)</th>
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<td>0.31m</td>
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**S.W.L. 41.24 m 8/08/88**

**4.0 L/s**

**SAND : grey, red**

**SAND : coarse, yellow, brown**

**SAND : yellow, white**

**SAND : coarse and GRAVEL**

**COMPOSITE LOG OF BORE 25785**
Major uranium deposit of Alligator Rivers Uranium Field
Boundary of major structural unit
Boundary of Kakadu National Park
Cretaceous sediments
Permian sediments
Early Palaeozoic sediments and basic volcanics
Adelaidean (?) sediments
Carpentarian (?) sediments
Mostly subhorizontal sandstone and volcanics
Granite
Migmatite and anatectic granite
Mostly greenschist-facies metamorphics
Mostly amphibolite-facies metamorphics
Schist and gneiss
Archaean to Early Proterozoic granitic and metamorphic basement

REGIONAL SETTING OF THE KAKADU NATIONAL PARK IN THE PINE CREEK GEOSYNCLINE
(Source: NEEDHAM, R.S. (1982) 1:100 000 GEOLOGICAL MAP COMMENTARY—EAST ALLIGATOR N.T.)
TEST REPORT — BORE RN. 25417

Bore location: KAKADU NATIONAL PARK
SOUTH ALLIGATOR

Client/owner: AUST NATIONAL PARKS & WILDLIFE SERVICE

Client's reference: Domesttic

Map: CAHILL 1:100 000 SHEET 5472

Grid reference: 239550 – 8602200

RECOMMENDATIONS

Pumping rate: 7.0 L/s Pump setting: 36.0 m below ground level

General recommendations are given on the reverse side.

The aquifer and bore can currently sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAWA, WATER DIRECTORATE SASCO HOUSE, DARWIN NT

BORE DATA

Finished depth: 42 m Completion date: 4.6.88 Test date: 28.6.88

Standing water level 23.72 m on 29.6.88 Test rates: 7 L/s Test duration 24 hrs

Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 36.5</td>
<td>203.0 mm ID steel casing</td>
<td>152.4 mm ID steel casing</td>
</tr>
<tr>
<td>0 - 37.9</td>
<td>127.0 mm ID stainless steel screens with 0.5 mm slots</td>
<td></td>
</tr>
<tr>
<td>37.33 - 42.0</td>
<td></td>
<td></td>
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</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.75 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 127 mm Nominal Bore

COMMENTS

1. These results are based on a constant rate test at 7 L/s for 24 hours and assume hydrological conditions remain constant.

2. Provision to obtain water samples at the bore head should be incorporate in any reticulation.

3. If bore is to be pumped at lower rates pump may be set as follows
   1 L/s to 4 L/s pump set can be 28 metres. From 4 L/s to 7 L/s pump setting as recommended.

WATER QUALITY

See water laboratory report (Analysis No. 88/89/0041)
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 a 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. 25772

Bore location: KAKADU NATIONAL PARK
Client/owner: AUST NATIONAL PARKS & WILDLIFE
BARRAMUNDI GORGE
Client's reference: DOMESTIC

Map: MUNDORIE 1:100 000 SHEET 5371
Grid reference: 221700 – 8527900

RECOMMENDATIONS
Pumping rate: 3.0 L/s Pump setting: 20.0 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: PAWA, WATER DIRECTORATE
(In all correspondence refer to the bore’s RN number).

BORO REPORT
Finished depth: 30.4 m Completion date: 16.6.88 Test date: 22.6.88
Standing water level 3.72 m on 20.6.88 Test rates: 5 L/s
Construction details: Test duration 21 hrs

Interval (m) | Description
0 – 15.50 | 203.0 mm ID steel casing
12.72 – 19.05 | 152.4 mm ID stainless steel screens with 1.1 slots
19.05 – 24.70 | 152.4 mm ID steel casing with sump
24.70 – 30.40 | Bore backfilled

Notes: 1. Top of casing as constructed was 0.75 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 Bore

COMMENTS
1. These results are based on a constant rate test at 5 L/s for 21 hours and assume hydrological conditions remain constant.
2. Provisions to obtain water samples at the bore head should be incorporated in any reticulation.
3. Care should be exercised when running the pump as recommended setting is below screens to maximise supply.
4. Pump should be set at 20 m for all pumping rates.

WATER QUALITY
See water laboratory report (Analysis No. 88/89/0092)
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. 25771

Bore location: KAKADU NATIONAL PARK
WATERFALL CREEK

Client/owner: AUST NATIONAL PARKS & WILDLIFE SERVICE

Purpose of supply: DOMESTIC

RECOMMENDATIONS

Pumping rate: 7.0 L/s. Pump setting: 12.5 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 HOURS, DARWIN NT

BORE DATA

Finished depth: 19.5 m. Completion date: 14.6.88
Standing water level: 4.8m on 17.5.88

Test rates: 7 L/s
Test date: 17.6.88
Test duration: 24 hrs

Construction details:

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<tr>
<th>Interval (m)</th>
<th>Description</th>
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<tbody>
<tr>
<td>0 - 13.06</td>
<td>152.4 mm ID steel casing</td>
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<tr>
<td>13.06 - 17.14</td>
<td>152.4 mm ID stainless steel screens with 0.6 mm slots</td>
</tr>
<tr>
<td>17.14 - 17.50</td>
<td>152.4 mm ID sump</td>
</tr>
<tr>
<td>17.50 - 19.50</td>
<td>Backfilled</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.9 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 Bore

COMMENTS

1. These results are based on a constant rate test at 7 L/s for 24 hours and assumes hydrological conditions remain constant.
2. Provisions to obtain water samples at the bore head be incorporated in any reticulation.
3. Pumps should be set at 12.5 m for all pumping rates.

WATER QUALITY

See water laboratory report (Analysis No. 88/89/0091)

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.
TEST REPORT — BORE RN. 25774

Bore location: KAKADU NATIONAL PARK
RANGER HQ

Client/owner: AUST NATIONAL PARKS & WILDLIFE
RANGER HQ

Purpose of supply: DOMESTIC

Map: RANDPORD HILL 1:100 000 SHEET 5370

Grid reference: 206200 - 8500800

RECOMMENDATIONS

Pumping rate: 14 L/s. Pump setting: 50 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, RT.

PAWA, WATER DIRECTORATE

SASCO HOUSE, DARWIN NT

BORE DATA

Finished depth: 61 m Completion date: 21.6.88
Standing water level 40.55 m on 25.6.88

Test date: 27.6.88

Test rates: 14 L/s

Test duration 8 hrs

Construction details:

<table>
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<tr>
<th>Interval (m)</th>
<th>Description</th>
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<tr>
<td>0 - 46.00</td>
<td>203.0 mm ID steel casing</td>
</tr>
<tr>
<td>44.55 - 52.84</td>
<td>152.4 mm ID steel casing and packer</td>
</tr>
<tr>
<td>52.84 - 56.91</td>
<td>152.4 mm ID stainless steel screens with 0.6 mm slots</td>
</tr>
<tr>
<td>56.91 - 61.00</td>
<td>152.4 mm ID steel sump</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.75 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 Bore

COMMENTS

1. These results are based on a constant rate test at 14 L/s for 8 hours and assume hydrological conditions remain constant.

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

3. Care should be taken when fitting the pump to depth of 50 metres as a packer is fitted at 44.55 m reducing the diameter of the bore to 152.4 mm.

4. Pumps should be set at 50 m for all pumping rates.

WATER QUALITY

See water laboratory report (Analysis No. 88/89/0093)
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 core 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 core 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. 25785

Bore location: KAKADU NATIONAL PARK RANGER HQ
Client/owner: AUST NATIONAL PARKS & WILDLIFE SERVICE

Map: RANDFOR HILL 1:100 0000 SHEET 5370
Grid reference: 206200 - 8500700

RECOMMENDATIONS
Pumping rate: 12.0 L/s. Pump setting: 50 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAMA, WATER DIRECTORATE (In all correspondence refer to the bore’s RN number).

SASCO HOUSE, DARWIN NT

BORE DATA
Finished depth: 58.14m. Completion date: 22.7.88
Standing water level 41.24 m on 8.8.88
Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
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<tbody>
<tr>
<td>0 - 47.12</td>
<td>203.0 mm ID blank steel casing</td>
</tr>
<tr>
<td>44.02 - 52.47</td>
<td>152.4 mm ID blank steel casing</td>
</tr>
<tr>
<td>52.47 - 56.60</td>
<td>152.4 mm ID stainless steel screens with 0.5 mm</td>
</tr>
<tr>
<td>56.60 - 58.30</td>
<td>slots</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.31 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 Bore

AQUIFER TEST
Test date: 8.8.88
Test rates: 15.0 L/s
Test duration 18 hrs

WATER QUALITY
See water laboratory report (Analysis No. 88/89/0276)

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.