POWER AND WATER AUTHORITY

WATER SUPPLY
INVESTIGATIONS FOR
UPGRADING OF THE
VICTORIA HIGHWAY
From 67km West of Katherine
to the Western Australia Border
1990

REPORT 28/1991

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Water Resources Division
Darwin
March 1991
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<td>litre per second</td>
</tr>
<tr>
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</tr>
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1. INTRODUCTION

This report describes an investigation for water supplies along the Victoria Highway. Bores were requested by the Department of Transport and Works for upgrading of the highway from 67 km west of Katherine to the Western Australian border.

Included in the report are results from drilling and testing of bores, chemical analysis of groundwaters, appraisal of groundwater availability, and an assessment of surface water supplies where groundwater could not be found.

The study area is shown in Figure 1. All quoted distances in this report are in kilometres west of Katherine.
2. BACKGROUND

The Water Resources Division of the Power and Water Authority was commissioned by the Department of Transport and Works to explore and develop water resources along the Victoria Highway.

Streams along the highway are ephemeral so that groundwater was sought in the first instance. Where groundwater was not found surface sources were investigated.

In a preliminary desktop study in May 1990 available groundwater data was gathered and potential bore sites were selected using satellite imagery and aerial photographs. Areas requiring geophysical investigation for drill site selection were delineated. Bore sites were pegged during June and early July in conjunction with geophysical resistivity investigations. Drilling by the Water Resources Division (WRD) period contractor (Gorey and Cole Drillers Pty Ltd) commenced in early July. Production bores were subsequently test pumped by a WRD crew to determine safe yields and pump settings.

Unsuccessful drilling at 225 km and between 390 km and 405 km necessitated the investigation of potential surface water sources, and a deep bore was attempted using a WRD drilling rig at 386 km, during October.
3. WATER REQUIREMENTS

Water supplies were to be proven for conditioning of earthfill, concrete construction, and camp needs. Criteria to be met were:

(a) Quantity

Bore Spacing - as close as possible to the highway in the locations requested by the Department of Transport and Works - 15 km being the preferred separation between supply sources.

Supply - preferred minimum of 4 L/s from each source, with a minimum acceptable yield of 1 L/s.

(b) Water Quality

Earthworks - less than 10,000 mg/L total dissolved solids (TDS).

Concrete Batching - less than 2000 mg/L TDS; less than 300 mg/L chloride.

Camp Supplies - meeting current NHMRC and AWRC guidelines (1987), i.e.

<table>
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<tr>
<td>Sulphate</td>
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<td>Hardness</td>
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4. GROUNDWATER RESOURCES

4.1 Hydrogeology

The Victoria Highway traverses the Daly River Basin for 100 km west of Katherine and thereafter the Victoria River Basin to the Western Australia border. Four distinct hydrogeological environments exist:

1. the siltstones, sandstones, and calcareous rocks of the Daly River Basin (Jinduckin Formation and Tindall Limestone);

2. the basalts at the eastern edge of the Victoria River Basin (Antrim Plateau Volcanics);

3. sandstones of the Victoria River Basin (Stubb Formation, Jasper Gorge Sandstone);

4. Victoria River Basin siltstones (Bynoe Formation, Skull Creek Formation, Timber Creek Formation, Angalarri Siltstone, Ranford Formation).

4.1.1 Jinduckin Formation and Tindall Limestone

These mainly carbonate sediments occur in the region of Scott Creek (67 km west of Katherine, Figure 1.1).

The Middle Cambrian to Lower Ordovician Jinduckin Formation consists predominantly of sandstone and siltstone with minor marl, dolomite, and chert. Aquifers have been struck in the Jinduckin Formation in sandstone, dolomite, and chert beds and especially where fracturing is present. Bore yields up to 12 L/s have been developed (RN 22166, Katherine). The underlying Middle Cambrian Tindall Limestone (crystalline limestone with minor calcilutite) is a more reliable aquifer with groundwater present in cavernous and fractured limestone throughout the sequence. High yielding bores (up to 90 L/s) are located in
areas where cavernous development exists at least 10 m below the standing water level (eg Katherine supply bores RN 6983, RN 7807). Road bore RN 27072 encountered a total of 14 L/s from aquifers in both the Jinduckin Formation and Tindall Limestone.

4.1.2 Antrim Plateau Volcanics

The Lower Cambrian Antrim Plateau Volcanics are exposed between 100 km and 155 km. They are composed of massive and vesicular basalt lava flows with occasional feldspathic sandstone interbeds. Groundwater occurs in interbedded sediments, joints, fractures, and in the vesicular and weathered zones of the basalt flows. The groundwater regime is generally shallow. Most aquifers are less than 100 m below the ground surface and many are within 30 m. The volcanics generally possess poor aquifer potential; yields up to 6 L/s were encountered (RN 27188) but dry holes are common (e.g. RN 27073, RN 27077).

4.1.3 Stubb Formation and Jasper Gorge Sandstone

Proterozoic Stubb Formation rocks underly and outcrop in the Sullivan Creek Valley (155 km to 192 km west of Katherine, Figures 1.2, 1.3). The flat-lying or shallow dipping sediments consist of more than 150 m of grey siltstone and shale, with minor sandstone interbeds, overlain by up to 40 m of flaggy and blocky quartz sandstone. The Stubb Formation is generally a poor aquifer material, but where fracturing occurs in sandstone beds or interbeds, groundwater supplies of up to 3 L/s have been encountered (RN 27079).

The Adelaidean Jasper Gorge Sandstone is encountered at shallow depths between Big Horse and Peartree Creeks (295 km to 310 km west of Katherine, Figure 1.4). Bores sited on lineations have yielded up to 13 L/s from fractures within the quartz sandstone (RN 27085, RN 27086).

The Jasper Gorge Sandstone occurs at depth (325 m at RN 26895, Figure 1.5) beneath the Angalarri Siltstone on the Baines-
Angalarri Plains, however neither primary nor secondary porosity were apparent throughout the sequence. Aquifer potential of the Jasper Gorge Sandstone at depth is considered very poor on the basis of the single investigation bore completed (RN 26895).

4.1.4 Bynoe Formation, Skull Creek Formation, Timber Creek Formation, Angalarri Siltstone, Ranford Formation

The Proterozoic siltstones of the Victoria River Basin are impermeable and yield very little groundwater.

The Bynoe Formation (micaceous and dolomitic siltstone) underlies the Victoria Highway between Coolibah turnoff (214 km) and Brownies Creek (240 km). Small (less than 1 L/s) unsustainable supplies have been encountered in this formation (RN 27081) but most holes were dry (RN 27080, RN 27081).

The Skull Creek Formation is exposed between Brownies Creek (240 km) and the Bullita turnoff (273 km). The top of the Skull Creek Formation is marked by the Bardia Chert Member which overlies dolomitic siltstones, silty dolomites and dolomite of shallow marine origin. Small groundwater supplies (less than 3 L/s) have been extracted from shallow weathered zones in the siltstones or from fractured dolomite in the sequence (RN 27083, RN 27084).

The Timber Creek Formation underlies alluvium immediately south of Timber Creek township (282 km west of Katherine, Figure 1.3, Figure 1.4). This formation consists of dolomitic siltstone, siltstone, fine sandstone, dolomite, and minor chert. Timber Creek town water supply is drawn from fractured brittle beds within this Formation. Road bore RN 27185 was constructed in the north-south trending zone of fracturing which extends through the township.

The Angalarri Siltstone is a very poor prospect for groundwater. It consists of impermeable siltstone and shale with minor sandstone interbeds and extends from Peartree Creek (310 km) to Donkey Gap (455 km). A thickness of 325 m has been determined at RN 26895, near the Kildurk turnoff. No adequate groundwater
supplies have been derived from the Angalarri Siltstone in the study area, and an attempt to extract water from the underlying Jasper Gorge Sandstone at RN 26895 was unsuccessful. Seepage supplies only were derived from weathered siltstone at depths less than 25 m adjacent to surface watercourses (e.g. RN 27087, RN 27048).

The Proterozoic Ranford Formation has been encountered in drillholes south of the Victoria Highway near to the Western Australia border (RN 27174 - RN 27177). Only seepage supplies or dry holes have been drilled in this formation consisting mainly of shale/siltstone with some fine sandstone. The lack of permeability of these sediments indicates very poor aquifer potential.

4.2 Drilling

Thirty seven bores were drilled between July and November 1990. Depths ranged between 25.8 and 123 metres and one deep bore was drilled to 388 m. Eleven production bores were constructed with recommended yields of between 1 and 14 L/s. A summary of production bores is given in Table 4.1 and investigation bores are reviewed in Table 4.3.

Most of the drilling was carried out under contract using an Ingersoll Rand TH60 rig. Down hole rotary percussion drilling was employed in all cases. Successful bores were constructed with 152 mm ID steel casing with slots or stainless steel screens adjacent to the aquifer zones. Construction details are given in Appendix 1. A concrete block was placed around the casing at ground level and the bores sealed with a welded cap. Unsuccessful bores were backfilled.

A Power and Water Authority rig was employed to drill the deep bore, RN 26895, near the Kildurk turnoff. This bore, situated in an area with no successful bores (in Angalarri Siltstone), sought to extract water from the underlying Jasper Gorge Sandstone. The Sandstone was drilled between 325 m and 388 m depth with no aquifers encountered.
4.3 Test Pumping

Tests were carried out on twelve production bores to determine safe pumping rates and pump settings. Test procedures included:

(a) multi-rate step drawdown test consisting of up to four consecutive stages at different pumping rates, each stage of one hundred minutes duration;

(b) constant discharge test of eight hours duration, at a pumping rate approximating the long-term rate suggested by the multi-rate test;

(c) recovery test to measure the response of the aquifer on cessation of pumping;

(d) the extraction of a pumped water sample for laboratory chemical analysis.

4.4 Results

Results of the tests and other details of the bores are given in Table 4.1 and Appendix 1. Chemical analyses are given in Table 4.2.

Groundwater supplies were developed at most locations requested by the Department of Transport and Works. However, because of unsuccessful investigation drilling, production bores have not been constructed at 225 km, 360 km, 390 km, 405 km and 460 km.

Chemical water quality has generally been within the established criteria, however fluoride levels for RN 27072 (67 km) and RN 27085 (306 km) exceed potable water standards.

Several bores require special mention.

1. RN 24168 at Keep River National Park may be utilised for the 460 km chainage. This bore was previously test pumped for
the Conservation Commission of the Northern Territory (CCNT). Discoloration is expected to occur due to iron oxide in the sandstone at this bore.

2. RN 26163 (420 km), previously lined with PVC casing, has been relined with steel casing.

3. Bore 26746 (420 km), drilled in 1989 by the Army adjacent to Brownies Creek (240 km), was found on pumping to be incapable of sustaining 0.5 L/s. Consequently another bore was drilled at the Skull Creek crossing (RN 27083, 244 km) with a recommended pumping rate of 1 L/s.

4. RN 27086 was drilled to replace Peartree Bore (RN 5780) at 314 km which had collapsed at the base of the surface casing.

5. RN 27187 (112 km) has been left without casing, but at the request of the Department of Transport and Works may be constructed at a later date.
5. Surface Water Resources

Surface water resources were investigated at three locations where groundwater was not found. These were at Coolibah Homestead on the Victoria River (214 km), the West Baines River (379 km) and Saddle Creek (398 km). Further study is required if capacity figures are to be derived.

1. Coolibah Crossing

The Victoria River is within 5 km of the highway (214 km west of Katherine) at the Coolibah Homestead. Gauging station GS 8110007 was opened at Coolibah Homestead in 1966 and flow records are available for the site between 1966 and 1991. Continuous substantial wet season flow in the river normally reduces early in the dry season. With the recession of flow the river reduces to a series of substantial water holes (Figure 3) which would provide a source throughout the dry season.

2. West Baines River

The West Baines River crosses the highway at 379 km. At the highway the catchment area is 10204 square kilometres. Gauging station GS 8110006 was opened in 1960 and flow records are available to 1991. During the wet season there is normally some flow in the river but flow ceases early in the dry season. Dry conditions have been recorded from April to December.

To provide a water supply during the dry season a storage would have to be constructed. The river cross section at the highway is approximately 60 metres wide and 6 metres deep. A temporary weir constructed upstream of the highway bridge designed for overflow condition would provide a suitable storage. Alternatively, a turkey nest tank could be constructed adjacent to the river and filled during the wet season.
Sizing of the turkey nest or weir would be very much dependent upon the road construction timing. The high evaporation rates in the area would mean that road construction would have to be carried out early in the dry season to minimise evaporation loss.

3. Saddle Creek

Saddle Creek crosses the highway at 398 km. At the highway the catchment area is 234 km². Gauging station GS 8110107 was opened in 1969 and flow records are available to 1991. Flow in the Creek during the wet season is intermittent. The records show that the creek can be dry in any month of the year.

The creek is 10 metres wide and 4 metres deep at the highway and would probably not provide an adequate storage if a weir was constructed. However, an off stream storage in the form of a turkey nest tank with pumping from the stream would be satisfactory.

Timing of road construction is again important to minimise the high evaporative loss.
6. CONCLUSIONS

1. Production bores were constructed at 11 points between 67 km west of Katherine and the Western Australian border on the Victoria Highway.

2. Criteria for yield and spacing of bores have been met except for sites in rocks of low permeability (shales/siltstones).

3. Groundwater supplies have not been developed for the 225 km, 360 km, 390 km and 405 km chainages. The geological formations which are extensive at these localities have very poor groundwater potential as indicated by numerous dry bores in these units.

4. Bore 26895, drilled to 388 m in an area where shallow groundwater supplies are inadequate (near the Kildurk turnoff), did not intercept any aquifers.

5. Limited surface water is available from pools in the Victoria River near the Coolibah Crossing (214 km). Impounding of wet season flows of the West Baines River (379 km) and Saddle Creek (398 km) would give surface water supplies for these localities. Further study is required before quantitative values could be assigned to the capacity of surface water supplies.
7. RECOMMENDATIONS

1. Production bores should be equipped as set out in the bore completion reports in Appendix 1, or as summarised in Table 4.1.

2. It may be necessary to locate bores at distances more remote to the Highway (10 to 20 km or more) if further drilling is required at areas that have shown poor groundwater potential to date.

NOTES ON RECOMMENDATIONS

Pumping Rate

The maximum pumping limit recommended in this report is a safe but not conservative maximum. It has been arrived at by analysis of all current physical and hydraulic information about the bore. Exceeding this maximum pumping rate will fork the bore and may lead to aquifer instability. The rates are based on 8 hour pumping tests and assume that hydrologic conditions in the bore remain constant.

Pump Setting

The recommended pump settings are the shallowest depth from which the appropriate yield may be pumped.
8. REFERENCES


ACKNOWLEDGEMENTS

The author would like to acknowledge the assistance given by both colleagues and staff of the Geophysical and Technical Services Sections of PAWA in undertaking this project.

In particular, the professional advice and direction of Mr Hayat Qureshi, Supervising Hydrogeologist, Geophysicist Mr Keith Martin, and Messrs Bill Stall and Peter Espie (Contract Supervisors).
Appendix 1

Production Bore Test Reports/Bore Location Maps and Composite Logs of Bores
Bore location: KEEP RIVER NATIONAL PARK

Client/owner: Conservation Commission of NT
Client's reference: 
Purpose of supply: Domestic

Map: Keep 1:100 000 Sheet 4766
Grid reference: 031-354

RECOMMENDATIONS
Pumping rate: 0.6 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: Water Resources Div (In all correspondence refer to the bore's RN number).

Sasco House, Darwin

BORE DATA AQUIFER TEST

Finished depth: 78.8 m Completion date: 14/11/85 Test date: 29/11/85
Standing water level 6.20 m on 29/11/85 Test rates: 1.0 L/s
Test duration 24 hrs

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<td>0 - 5.5</td>
<td>219 mm O.D. Steel Surface Casing</td>
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<td>0 - 54.4</td>
<td>168.3 mm O.D. Blank Steel Casing</td>
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<tr>
<td>54.4 - 66.6</td>
<td>168.3 mm O.D. S/Casing with 9.5 mm Perforations</td>
</tr>
<tr>
<td>66.6 - 78.8</td>
<td>168.3 mm O.D. Blank 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 155 mm

COMMENTS

1. The above recommendations are based on a 24 hour test at 1.0 L/s and assume the hydrologic conditions will not change with long term pumping.
2. Provision to obtain water samples at the bore head should be incorporated in any reticulation.
3. This bore will produce fines and discolour if pumped above the recommended rate. This discoloration could also occur momentarily on initial starting therefore it would be advisable to incorporate a fines separator or pump to waste system in the reticulation.

WATER QUALITY

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

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

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

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

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

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

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

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

In addition, please ensure that the BORE IDENTIFICATION TAG is retained securely at all times. The registered bore number is Water Resources Division's only reference to the scientific and engineering data on this bore, and hence important to WRD's further advice to bore owners.
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<td>CEMENT</td>
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<tr>
<td>152mm ID STEEL CASING</td>
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<td></td>
</tr>
<tr>
<td>203mm ID STEEL CASING</td>
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<td></td>
</tr>
<tr>
<td>152mm ID SLOTTED STEEL CASING</td>
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<td></td>
</tr>
<tr>
<td>152mm ID STEEL SUMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29/11/85</td>
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<td></td>
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<tr>
<td>SWL 6.2m</td>
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</tr>
<tr>
<td>SANDSTONE: white and grey, silicified</td>
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<td></td>
</tr>
<tr>
<td>SANDSTONE: reddish brown, ferruginous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE: dark red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SANDSTONE: reddish brown, ferruginous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHALE: red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SANDSTONE: reddish brown, ferruginous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUARTZ SANDSTONE: coarse grained, poorly sorted, rounded</td>
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<td></td>
</tr>
<tr>
<td>SANDSTONE: weathered reddish brown, white, ferruginous</td>
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</tr>
<tr>
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<tr>
<td>QUARTZ SANDSTONE: reddish brown, coarse grained, well sorted</td>
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<td>0.9L/s</td>
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<tr>
<td>0.4L/s</td>
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**COMPOSITE LOG OF BORE 24168**
Technical Report WRD91028

WATER DIRECTORATE

TEST REPORT — BORE RN. 26163

Bore location: SCOTTS BORE
420 km Peg Victoria Highway

Client/owner: T & W Roads
Client's reference: Purpose of supply: Road construction

Map: Newry 1:100 000 Sheet 4765
Grid reference: 542100 - 8229850

RECOMMENDATIONS

Pumping rate: 14.0 L/s. Pump setting: 27 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: PNWR, Water Resources

(In all correspondence refer to the bore's RN number). SASCO House, DARWIN NT

BORE DATA

Finished depth: 58.3 m. Completion date: Test date: 3/9/90
Standing water level 16.76 m on 3/9/90 Test rates: multi rates to 18 L/s

Construction details:

Interval (m) Description
0 - 19.30 152 mm ID Blank steel casing
19.30 - 25.80 152 mm ID Slotted steel casing
25.80 - 45.30 152 mm ID Blank steel casing
45.30 - 51.80 152 mm ID Slotted steel casing
51.80 - 58.30 152 mm ID Blank steel casing

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 152 mm nominal bore

AQUIFER TEST

Test rates: multi rates to 18 L/s Test duration: 8 hrs

COMMENTS

1. The above recommendations are based on a multi rate test at rates to 18 L/s and assume that hydrological conditions remain constant.

2. Provision should be made when equipping this bore to allow water levels to be monitored while pump is operating.

3. For pumping rates to 6 L/s pump may be set at 18.5 m.

NB: On no account should pump be set between 19 m and 26 m due to risk of aquifer or bore damage.

WATER QUALITY

See water laboratory report (Analysis No. GC/91/011)

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 work 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.
WATER DIRECTORATE

TEST REPORT — BORE RN. 27072

Bore location: SCOTT CREEK
VICTORIA HIGHWAY

Client/owner: TRANSPORT & WORKS
Client's reference: ROADS BORE
Purpose of supply: ROAD CONSTRUCTION

Map: BOWMAN 1:100 000
Grid reference: 103-489

RECOMMENDATIONS
Pumping rate: 14 L/s. Pump setting: 25 m below ground level

General recommendations are given on the reverse side.
The aquifer and bore can support higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: WATER RESOURCES
(WATER DIRECTORATE)

RECOMMENDATION ARE BASED ON A 8 HOURS CONSTANT RATE TEST AT 14 L/S AND ASSUME HYDROLOGICAL CONDITIONS REMAIN CONSTANT.

PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.

BORE DATA

Finished depth: 91.60 m Completion date: 6/7/90
Standing water level 8 m on 16/7/90

Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 61.43</td>
<td>203mm ID STEEL CASING</td>
</tr>
<tr>
<td>61.43 - 85.88</td>
<td>152.4mm ID STEEL CASING</td>
</tr>
<tr>
<td>85.88 - 90.0</td>
<td>152.4mm ID SPLITTED STEEL CASING</td>
</tr>
<tr>
<td>90.0 - 91.6</td>
<td>152.4mm ID S/S SCREENS WITH 0.5mm SLOTS</td>
</tr>
<tr>
<td></td>
<td>152.4mm ID STEEL PUMP</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.63 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: 17/7/90
Test duration 8 hrs

WATER QUALITY

See water laboratory report (Analysis No. 90/90/00/21)

WRC4020

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
## Depth Bore Graphic

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Construction Log</th>
<th>Graphic Log</th>
<th>Strata Description</th>
<th>Aquifers (Water Struck)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.637</td>
<td>CEMENT</td>
<td>152mm ID STEEL CASING</td>
<td>SANDY CLAY: some laterite pebbles</td>
<td>SWL 8.43m 16/7/90</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>152mm ID STEEL CASING</td>
<td>SILTSTONE: red, green, and brown with sandstone bands and minor dolomite and marl</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>152mm ID SLOTTED STEEL CASING</td>
<td>LIMESTONE: grey fractured limestone with some sandstone</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>152mm ID STAINLESS STEEL SCREENS WITH 0.5mm APERTURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Fall In</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
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<td>85</td>
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<tr>
<td>90</td>
<td></td>
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<td>95</td>
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<tr>
<td>100</td>
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</tr>
<tr>
<td>105</td>
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<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Composite Log of Bore 27072

- 0.5 L/s
- 0.5 L/s
- 5.5 L/s
- 7.5 L/s
- 10 L/s
Bore location: AGATE CREEK
VICTORIA HIGHWAY

Map: HOBART 1:1000000
Grid reference: 684-937

RECOMMENDATIONS
Pumping rate: 1.2 L/s. Pump setting: 50.0 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 RESOURCES
41200 HOUSE
(In all correspondence refer to the bore's RN number).

BORE DATA
Finished depth: 97-60 m Completion date: 10/7/90 Test date: 19/7/90
Standing water level 6-90 m on 19/7/90 Test rates: 1.7 L/s
Construction details: Test duration 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.0</td>
<td>203mm ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 76.68</td>
<td>152.4 mm ID STEEL CASING</td>
</tr>
<tr>
<td>64.11 - 70.15</td>
<td>152.4 mm ID SLOTTED STEEL CASING</td>
</tr>
<tr>
<td>76.68 - 97.60</td>
<td>OPEN HOLE</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.50 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. THE ABOVE RECOMMENDATIONS ARE BASED ON A 6 HOURS CONSTANT RATE TEST AT 1.7 L/S
   AND ASSUME HYDROLOGICAL CONDITIONS REMAIN CONSTANT.
2. PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVEL TO BE
   MONITORED WHILE PUMP IS OPERATING.

WATER QUALITY
See water laboratory report (Analysis No. 90/91.0012)
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.
**DEPTH BORE. GRAPHIC STRATA AQUIFERS**

**CONSTRUCTION LOG**

**DEPH (m)**

**CONSTRUCTION**

**GRAPHIC LOG**

**STRATA DESCRIPTION**

**AQUIFERS (WATER STRUCK)**

**0.50m**

- **BLACK SOIL**
  - BASALT: brown, highly weathered

**10.00m**

- **BASALT: brown and grey, slightly weathered to fresh. Calcite infilling of fractures**

**15.00m**

- **SANDSTONE: tan and pink quartz sandstone**

**20.00m**

- **SILTSTONE: with bands of SANDSTONE**

**25.00m**

- **SILTSTONE: banded grey and brown**

**COMPOSITE LOG OF BORE 27076**

**SWL 6.30m 19/7/90**

**1.2L/s f--'**

**Viewed at 15:07:26 on 29/07/2010 Page 33 of 71.**
WATER DIRECTORATE

TEST REPORT — BORE RN. 27078

Bore location: AGATE CREEK
Client/owner: TRANSPORT AND WORKS
VICTORIA HIGHWAY
Client’s reference: ROADS BORE
Purpose of supply: ROAD CONSTRUCTION

Map: HOGARTH :1:100000
Grid reference: 678-946

RECOMMENDATIONS
Pumping rate: 1 L/s. Pump setting: 20 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 RESOURCES
(In all correspondence refer to the bore’s RN number): SASCO HOUSE

BORE DATA AQUIFER TEST
Finished depth: 98.65 m Completion date: 11/7/90 Test date: 23/7/90
Standing water level 6.62 m on 23/7/90 Test rates: 3 L/s
Construction details: Test duration 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>MM ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 85.43</td>
<td>152.4mm ID STEEL CASING</td>
</tr>
<tr>
<td>85.43 - 98.65</td>
<td>OPEN HOLE</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.50 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. THE ABOVE RECOMMENDATIONS ARE BASED ON A 3 HOURS CONSTANT RATE TEST AT 3 L/S
   AND ASSUME HYDROLOGICAL CONDITIONS REMAIN CONSTANT.
2. PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE
   MONITORED WHILE PUMP IS OPERATING.

WATER QUALITY
See water laboratory report (Analysis No. 90/41/0373)

VIEWED AT 15:07:26 ON 29/07/2010
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.
DEPTH BORE GRAPHIC STRATA AOUIFEHS

CONSTRUCTION LOG DESCRIPTION (WATER STRUCK)

b.5Qd

ALLUVIUM/BLACK SOIL
BASALT: brown, grey highly weathered. Some quartz/calcite veining

SWL 6.62m 23/7/90

BASALT: brown, slightly weathered to fresh

BASALT: brown, slightly fractured, with quartz veins

SILTSTONE: green and brown, with intermittent pink and white sandstone bands

SANDSTONE: pink, slightly fractured quartz sandstone with some siltstone bands

SHALE

COMPOSITE LOG OF BORE 27078
TEST REPORT — BORE RN. 27079

Bore location: ESCAREMENT CREEK  VICTORIA HIGHWAY
Client/owner: TRANSPORT AND WORKS  ROADS BORE
Purpose of supply: ROAD CONSTRUCTION

Map: GREGORY 1:100000
Grid reference: 358-743

RECOMMENDATIONS
Pumping rate: 2 L/s. Pump setting: 24 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore can withstand higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PAWA, WATER RESOURCES (In all correspondence refer to the bore’s RN number). SABCO HOUSE

BORE DATA
Finished depth: 68.40 m Completion date: 19/7/90 Test date: 28/7/90
Standing water level 5.25 m on 27/7/90 Test rates: 3 L/s
Construction details: Test duration 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 12.5m</td>
<td>203mm ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 68.40m</td>
<td>152.4mm ID STEEL CASING</td>
</tr>
<tr>
<td>16.66 - 29.70</td>
<td>152.4mm ID SPLITTED STEEL CASING</td>
</tr>
<tr>
<td>60.28 - 62.34</td>
<td>152.4mm ID 3/8 SCREENS WITH 0.7mm SLOTS</td>
</tr>
<tr>
<td>62.34 - 68.40</td>
<td>152.4mm ID STEEL SUMP</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.50 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. THE ABOVE RECOMMENDATIONS ARE BASED ON A 8 HOURS CONSTANT RATE TEST AT 3 L/S AND ASSUME HYDROLOGICAL CONDITIONS REMAIN CONSTANT.
2. PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.

WATER QUALITY
See water laboratory report (Analysis No. [Details])

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 work 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.
DEPTH BORE GRAPHIC STRATA AQUIFERS

CONSTRUCTION LOG DESCRIPTION (WATER STRUCK)

• ALLUVIUM: silt, clay, gravel

SWL 5.45m 27/7/90

SHALE: grey shale with intermittent grey sandstone beds

SANDSTONE: white fine quartz, with some fracturing

SANDSTONE: white cemented fine quartz sandstone with rare fracturing

COMPOSITE LOG OF BORE 27079
RECOMMENDATIONS

Pumping rate: 1 l/s. Pump setting: 18 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: PAWA (In all correspondence refer to the bore's RN number).

SASCO HOUSE

BORE DATA

Finished depth: 62.3 m Completion date: 10/8/90 Test date: 22.8.90

Standing water level 6.90 m on 21.8.90 Test rates: 1.9 l/s

Test duration 8 hrs

Construction details:

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.5</td>
<td>203MM ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 30</td>
<td>152.4MM ID STEEL CASING</td>
</tr>
<tr>
<td>18 - 24</td>
<td>152.4MM ID SLOTTED STEEL CASING</td>
</tr>
<tr>
<td>30 - 62.3</td>
<td>OPEN HOLE</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.67 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. THE ABOVE RECOMMENDATIONS ARE BASED ON A 8 HOURS CONSTANT RATE TEST AT 1.9 l/s AND ASSUME HYDROLOGICAL CONDITIONS REMAINS constant.

2. PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.

WATER QUALITY

See water laboratory report (Analysis No. 96/31/21/53)
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

NOTE: NOT TO SCALE
<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION LOG</th>
<th>STRATA DESCRIPTION (WATER STRUCK)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ALLUVIUM: clay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interbedded SILTSTONE/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SANDSTONE/SHALE with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rare chart</td>
</tr>
</tbody>
</table>

**SWL 6.90m 21/8/90**

**Interbedded SILTSTONE/SANDSTONE/SHALE with rare chart**

**COMPOSITE LOG OF BORE 27083**
### BORE DATA

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3.8</td>
<td>203mm ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 80.86</td>
<td>152.4mm ID STEEL CASING</td>
</tr>
<tr>
<td>74.85 - 80.86</td>
<td>152.4mm ID SLOTTED STEEL CASING</td>
</tr>
<tr>
<td>80.86 - 100</td>
<td>OPEN HOLE</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.82 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
- **Finished depth:** 100m
- **Completion date:** 14/8/90
- **Test date:** 25/8/90
- **Test rates:** 3.8 L/s
- **Test duration:** 8 hrs
- **Standing water level:** 6.38 m on 24.8.90

### COMMENTS

1. **THE ABOVE RECOMMENDATIONS ARE BASED ON A 3 HOURS CONSTANT RATE TEST AT 3.8 L/s AND ASSUME HYDROLOGICAL CONDITIONS REMAINS CONSTANT.**

2. **PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.**

### WATER QUALITY

See water laboratory report (Analysis No. 90/90/85)
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.
ALLUVIUM: clay, silt

SANDSTONE

DOLOMITIC SILTSTONE/SHALE: green and red laminated dolomitic siltstone with interbeds of shale. Some fracturing

DOLOMITE: dolomite with some fracturing. Cavity between 79.0 and 79.4m

SWL 6.38m 24/8/90

COMPOSITE LOG OF BORE 27084
TEST REPORT — BORE RN. 27085

Bore location: "SANDY CREEK"
Victoria Highway
Map: Auvergne 1:100 000 Sheet 4966
Grid reference: 638900 – 3275400

Client/owner: T & W Road
Client’s reference:
Purpose of supply: Road Construction

RECOMMENDATIONS
Pumping rate: 12.0 L/s. Pump setting: 35 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore area cannot sustain higher pumping rates with deeper pump settings or for short periods in favourable seasons. Further advice can be obtained from: PWA, SASCO House
(In all correspondence refer to the bore’s RN number). P O Box 1096, DARWIN NT

BORE DATA
Finished depth: 55.6 m Completion date: 14/8/90 Test date: 29/9/90
Standing water level 6.32 m on 30/8/90 Test rates: 12 L/s
Construction details:
Test duration 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 3</td>
<td>203 mm ID Blank steel casing</td>
</tr>
<tr>
<td>0 – 36</td>
<td>152 mm ID Blank steel casing</td>
</tr>
<tr>
<td>36 – 49</td>
<td>152 mm ID Slotted steel casing</td>
</tr>
<tr>
<td>49 – 55.6</td>
<td>152 mm ID Blank steel casing</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.58 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 bore

COMMENTS
1. The above recommendations are based on an 8 hour constant rate test at 12 L/s and assume that hydrological conditions remain constant.
2. Provision should be made when equipping this bore to allow water levels to be monitored while pump is operating.

NB: This bore may produce some fines at higher rates.

WATER QUALITY
See water laboratory report (Analysis No. 94/91

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

Area 7

NOTE: NOT TO SCALE
### DEPTH BORE GRAPHIC STRATA AQUIFERS

<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION LOG</th>
<th>STRATA DESCRIPTION</th>
<th>AQUIFERS (WATER STRUCK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.58m</td>
<td></td>
<td>TOPSOIL: sandy</td>
<td>SWL 6.32m 30/8/90</td>
</tr>
<tr>
<td>152mm ID</td>
<td></td>
<td>SANDSTONE: pink and white cemented fine to medium grained quartz sandstone. Rare lenses of green siltstone. Highly fractured</td>
<td>12L/s</td>
</tr>
<tr>
<td>152mm ID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>152mm ID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203mm ID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203mm ID</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMPOSITE LOG OF BORE 27085**

220-91-03-1003
Bore location: "PEAR TREE CREEK" - Victoria Highway
Client/owner: T & W Roads
Client's reference:
Purpose of supply: Road construction
Map: Auvergne 1:100 000 Sheet 4966
Grid reference: 634100 - 8266300

RECOMMENDATIONS
Pumping rate: 13.0 L/s. Pump setting: 25 m below ground level
General recommendations are given on the reverse side.
The aquifer and bore cannot sustain higher pumping rates for short
periods in favourable seasons. Further advice can be obtained from:
PAWA, Water Resources
(In all correspondence refer to the bore's RN number).

BORE DATA
Finished depth: 30.30 m Completion date: 17/8/90 Test rate: multi rate to 18 L/s
Standing water level 7.24 m on 1/9/90 Test duration: 8 hrs
Construction details: Test: duration 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6</td>
<td>203 mm ID Blank steel casing</td>
</tr>
<tr>
<td>0 - 25.8</td>
<td>152 mm ID Blank steel casing</td>
</tr>
<tr>
<td>25.8 - 27.87</td>
<td>150 mm ID Stainless steel screens, 1 mm aperture</td>
</tr>
<tr>
<td>27.87 - 30.30</td>
<td>152 mm ID Blank steel casing</td>
</tr>
</tbody>
</table>

Notes: 1. Top of casing as constructed was 0.62 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 150 mm nominal bore

COMMENTS
1. The above recommendations are based on a multi rate test at rates to
18 L/s and assume that hydrological conditions remain constant.
2. Provision should be made when equipping this bore to allow water levels
to be monitored while pump is operating.

WATER QUALITY
See water laboratory report (Analysis No. QC1910120)
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, hence important to WRD's further advice to bore owners.

BORE LOCATION MAP

T/off 28km from Timber Ck on left (South)
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>BORE</th>
<th>GRAPHIC</th>
<th>STRATA</th>
<th>AQUIFERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>(m)</td>
<td>CONSTRUCTION LOG</td>
<td>DESCRIPTION</td>
<td>(WATER STRUCK)</td>
<td></td>
</tr>
<tr>
<td>0.62m</td>
<td>Multicoloured broken SANDSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>White cemented fine to medium grained quartz SANDSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.24m</td>
<td>Slightly fractured SANDSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/90</td>
<td>White and green cemented fine to medium quartz SANDSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220-91-03-1003</td>
<td>Highly fractured white and green quartz SANDSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.3L/s</td>
<td>White and green SANDSTONE with bands of SILTSTONE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMPOSITE LOG OF BORE 27086**
POWHER_~

hitTER DI~EORATE

TEST REPORT — BORE RN. 27135

Bore location: TIMBER CREEK, VICTORIA HIGHWAY  Client/owner: TRANSPORT AND WORKS

Purpose of supply: ROAD CONSTRUCTION

Map: AUVERGNE 1:100 000

Grid reference: 586-671

RECOMMENDATIONS

Pumping rate: 4.5 L/s. Pump setting: 30 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: P.AM.

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

BORE DATA

Finished depth: 49.5 m. Completion date: 10.10.90

Standing water level 8.1 m on 22.10.90

Test date: 22.10.90

Test rates: 5.2 L/s

Construction details:

Test duration: 8 hrs

<table>
<thead>
<tr>
<th>Interval (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6.5</td>
<td>203MM ID STEEL CASING</td>
</tr>
<tr>
<td>0 - 49.5</td>
<td>152.4MM ID STEEL CASING</td>
</tr>
<tr>
<td>34.5 - 36.5</td>
<td>154 MM ID 5/8 SCREENS 0.3MM SLOTS</td>
</tr>
<tr>
<td>36.5 - 43</td>
<td>152.4MM ID STEEL CASING SLOTTED</td>
</tr>
</tbody>
</table>

Notes:
1. Top of casing as constructed was 0.50 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

COMMENTS

1. THE ABOVE RECOMMENDATIONS ARE BASED ON A 8 HOUR CONSTANT RATE TEST AT 5.2 L/S AND ASSUME HYDROLOGICAL CONDITIONS REMAIN CONSTANT.
2. PROVISIONS SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.

WATER QUALITY

See water laboratory report (Analysis No. 92/ 511/ 0227)
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.
<table>
<thead>
<tr>
<th>DEPTH (m)</th>
<th>BORE CONSTRUCTION LOG</th>
<th>STRATA DESCRIPTION</th>
<th>AQUIFERS (WATER STRUCK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-0.60m</td>
<td>152mm ID SLOTTED STEEL CASING</td>
<td>TOPSOIL and CLAY</td>
<td>0.5L/s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White SILTSTONE and grey LIMESTONE</td>
<td>1L/s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CHERT and LIMESTONE</td>
<td>5L/s</td>
</tr>
<tr>
<td></td>
<td>152mm ID STEEL CASING</td>
<td>Pink and grey LIMESTONE</td>
<td>5L/s</td>
</tr>
<tr>
<td></td>
<td>203mm ID STEEL CASING</td>
<td>Interbedded pink, grey, and green LIMESTONE and SHALE</td>
<td>5L/s</td>
</tr>
<tr>
<td></td>
<td>152mm ID STAINLESS STEEL SCREENS-0.9mm APERTURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>152mm ID STEEL SUMP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMPOSITE LOG OF BORE 27185**
### TEST REPORT — BORE RN. 27188

**Bore location:** ARCONA CREEK, VICTORIA HWY  
**Client/owner:** TRANSPORT AND WORKS ROADS  
**Client's reference:**  
**Purpose of supply:** ROAD CONSTRUCTION

**Map:**  
**Grid reference:** 755-171

### RECOMMENDATIONS

**Pumping rate:** 6 L/s. **Pump setting:** 18 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: PAW - WATER DIRECTORATE SADOO LEVEL

(In all correspondence refer to the bore’s RN number).

### BORE DATA

<table>
<thead>
<tr>
<th>Description</th>
<th>Interval (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>203 MM ID STEEL CASING</td>
<td>0 - 6.5</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>0 - 78.5</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>11 - 17</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>42 - 48.5</td>
</tr>
<tr>
<td>152.4 MM NG1IN.i.L 3:RE</td>
<td>65.5 - 72</td>
</tr>
</tbody>
</table>

**Completed depth:** 80 m  
**Completion date:** 16.10.90  
**Test date:** 18.10.90  
**Test rates:** 6.5 L/s  
**Test duration:** 8 hrs

**Standing water level:** 7.18 m on 18.10.90

Notes:  
1. Top of casing as constructed was 0.58 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

<table>
<thead>
<tr>
<th>Description</th>
<th>Interval (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>203 MM ID STEEL CASING</td>
<td>0 - 6.5</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>0 - 78.5</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>11 - 17</td>
</tr>
<tr>
<td>152.4MM ID STEEL CASING SLOTTED</td>
<td>42 - 48.5</td>
</tr>
<tr>
<td>152.4 MM NG1IN.i.L 3:RE</td>
<td>65.5 - 72</td>
</tr>
</tbody>
</table>

**Test rates:** 6.5 L/s  
**Test duration:** 8 hrs

### COMMENTS

1. THE ABOVE RECOMMENDATIONS ARE BASED ON A 8 HOURS CONSTANT RATE TEST AT 6.5 L/S AND ASSUME HYDROGEOLOGICAL CONDITIONS REMAINING CONSTANT.

2. PROVISION SHOULD BE MADE WHEN EQUIPPING THE BORE TO ALLOW WATER LEVELS TO BE MONITORED WHILE PUMP IS OPERATING.

### WATER QUALITY

See water laboratory report (Analysis No. 9C/91/2475)

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.
**STRATA AQUIFERS DESCRIPTION (WATER STRUCK)**

**REGOLITH:**
- Topsoil
- Clay
- Weathered basalt

**BASALT:**
- Reddy brown and grey, fractured
- Intermittent sandstone bands
- Fracturing between 42 and 45m and 70 and 72m

**COMPOSITE LOG OF BORE 27188**

- **Depth (m):**
  - 0.58
  - 15.8
  - 20.3
  - 24.8
  - 29.3
  - 33.8
  - 38.3
  - 42.8
  - 47.3
  - 51.8
  - 56.3
  - 60.8
  - 65.3
  - 69.8
  - 74.3
  - 78.8
  - 83.3
  - 87.8
  - 92.3
  - 96.8
  - 101.3
  - 105.8
  - 110.3

- **Cement:**
- 152mm ID steel casing
- 203mm ID steel casing

- **Fall In:**
- 152mm ID slotted steel casing

- **Aquifer SWL:**
  - 7.16m
  - 18/10/90

- **Flow Rates:**
  - 2 L/s
  - 1 L/s
  - 3 L/s

**NOTE:**
- The diagram shows the construction and stratigraphy of bore 27188 with detailed descriptions of the strata and aquifers encountered.
Appendix 2

Geophysical Investigation
1. INTRODUCTION

Approximately 35 km of apparent electrical resistivity profiling was undertaken during a four week period, 12 June to 7 July 1990. The geophysical study was conducted at areas where available remote data (bore logs, geological maps, satellite and aerial photographs) was insufficient to confidently select bore sites. Surveys were undertaken around the 180 km, 225 km, 255 km, 300 km, 390 km, 405 km and 460 km chainages.

2. INSTRUMENTATION AND TECHNIQUES

Apparent resistivity instrumentation consisted of a 300 W DC transmitter with a high impedance digital voltmeter used as a receiver.

Vertical electric soundings (VES) were conducted using a Schlumberger array, with a maximum AB/2 of 400 m, while the half potential electrode separation (MN/2) was moved from 0.5 m to 10 m with one intermediate step. AB/MN was kept greater than 5. The frequency of sampling was greater than 6 points per decade. These soundings allowed determination of the appropriate configuration for resistivity traversing.

Traverses were undertaken using a pole-dipole array with 50 m or 100 m electrode spacing. The infinite current electrode was located at least 1000 metres away from, and perpendicular to, the profiling direction. All profiles were pegged, flagged, and orientated with a compass.

3. RESULTS

The Schlumberger sounding data was inverted using the programme Grendl which was developed by Macquarie University and CSIRO. Generally the VES data was fair to good.
Apparent resistivity profiling around the 180 km, 255 km, and 300 km chainages was useful in locating groundwater supplies. Successful bores, located on low resistivity anomalies, were encountered at first attempt at each locality.

Profiling around the 225 km, 360 km, 390 km, and 460 km chainages indicated no anomalous zones because of the homogeneous nature of the underlying siltstones. Geological structures, apparent on aerial photographs, resulted in no significant fracturing of the siltstones and no electrical resistivity contrast. No productive zones were located at these localities and bores were unsuccessful.
<table>
<thead>
<tr>
<th>BORE</th>
<th>APPROXIMATE</th>
<th>I. 100, 000 MAP</th>
<th>GRID REFERENCE</th>
<th>TOTAL DEPTH</th>
<th>SWL</th>
<th>RECOMMENDED</th>
<th>RECOMMENDED</th>
<th>(TDS)</th>
<th>GEOLOGICAL SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>CHAINAGE (km West of Katherine)</td>
<td>SHEET</td>
<td>GRID REFERENCE</td>
<td>TOTAL DEPTH</td>
<td>SWL</td>
<td>YIELD</td>
<td>PUMP SETTING</td>
<td>(mg/L)</td>
<td>SETTING</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(m)</td>
<td>(m)</td>
<td></td>
<td>(l/s)</td>
<td>(m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27072</td>
<td>67</td>
<td>Bowen</td>
<td>810000-834000</td>
<td>91.6</td>
<td>8.4</td>
<td>14</td>
<td>25</td>
<td>300</td>
<td>Inducin Formation/Tindall Limestone</td>
</tr>
<tr>
<td>27188</td>
<td>116</td>
<td>Willeroo</td>
<td>775500-831700</td>
<td>80</td>
<td>7.2</td>
<td>6</td>
<td>18</td>
<td>530</td>
<td>Antrim Plateau Volcanics</td>
</tr>
<tr>
<td>27076</td>
<td>140.5</td>
<td>Hogarth</td>
<td>768400-829300</td>
<td>97.6</td>
<td>6.9</td>
<td>1.2</td>
<td>50</td>
<td>335</td>
<td>Antrim Plateau Volcanics</td>
</tr>
<tr>
<td>27078</td>
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<td>Hogarth</td>
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<td>Antrim Plateau Volcanics</td>
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<tr>
<td>27079</td>
<td>185</td>
<td>Gregory Creek</td>
<td>755800-827400</td>
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<td>5.5</td>
<td>2</td>
<td>24</td>
<td>615</td>
<td>Stubb Formation</td>
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<tr>
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<td>Stokes</td>
<td>665000-825900</td>
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<td>6.9</td>
<td>1</td>
<td>18</td>
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<td>Skull Creek Formation</td>
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<tr>
<td>27084</td>
<td>255</td>
<td>Stokes</td>
<td>677800-825800</td>
<td>109</td>
<td>6.4</td>
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<td>465</td>
<td>Skull Creek Formation</td>
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<tr>
<td>27185</td>
<td>282</td>
<td>Auvergne</td>
<td>658600-826700</td>
<td>49.5</td>
<td>6.1</td>
<td>4.5</td>
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<tr>
<td>27085</td>
<td>305</td>
<td>Auvergne</td>
<td>638900-8275400</td>
<td>55.6</td>
<td>6.3</td>
<td>12</td>
<td>35</td>
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<td>Jasper Gorge Sandstone</td>
</tr>
<tr>
<td>27086</td>
<td>314</td>
<td>Auvergne</td>
<td>634100-8266300</td>
<td>30.3</td>
<td>7.2</td>
<td>13</td>
<td>25</td>
<td>225</td>
<td>Jasper Gorge Sandstone</td>
</tr>
<tr>
<td>26163</td>
<td>420</td>
<td>Newry</td>
<td>542100-8229850</td>
<td>58.3</td>
<td>16.8</td>
<td>14</td>
<td>27</td>
<td>1000</td>
<td>Skinner Sandstone</td>
</tr>
<tr>
<td>24168</td>
<td>468</td>
<td>Keep</td>
<td>403100-8235400</td>
<td>78.8</td>
<td>6.2</td>
<td>1</td>
<td>20</td>
<td>145</td>
<td>Deadley Knob Member</td>
</tr>
<tr>
<td>BORE REGISTERED NUMBER</td>
<td>DATE OF SAMPLING</td>
<td>SPECIFIC CONDUCTANCE (µS/M at 25°C)</td>
<td>TOTAL DISSOLVED SOLIDS (mg/L at 25°C)</td>
<td>SODIUM, Na</td>
<td>POTASSIUM, K</td>
<td>CALCIUM, Ca</td>
<td>MAGNESIUM, Mg</td>
<td>TOTAL HARDNESS (as CaCO₃)</td>
<td>TOTAL ALKALINITY (as CaCO₃)</td>
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Analysis in milligrams per litre - mg/L (unless otherwise stated)

WATER QUALITY DATA - TABLE 4.2

PRODUCTION BORES
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<th>REGISTERED GRID REFERENCE</th>
<th>MAP NAME (1:100 000)</th>
<th>AILIFT YIELD (L/s)</th>
<th>DEPTH (m)</th>
<th>GEOLOGICAL SETTING</th>
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<tbody>
<tr>
<td>26895 572000-8237000</td>
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### Table 4: Summary: Investigation Bore Field

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<th>REGISTERED No.</th>
<th>GRID REFERENCE</th>
<th>MAP NAME (1:100,000)</th>
<th>AIRLIFT YIELD (L/s)</th>
<th>DEPTH (m)</th>
<th>GEOLOGICAL SETTING</th>
<th>REMARKS</th>
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Figures
Bore Location Map: 180km to 280km

LEGEND
- Production Bore
- Investigation Bore

Bore Location Map: 280km to 380km

LEGEND
- Production Bore
- Investigation Bore
BORE LOCATION MAP: 380km to WESTERN AUSTRALIA BORDER

LEGEND
- Production Bore
- Investigation Bore

Fig. 2.5
MORPHOLOGY OF VICTORIA RIVER ADJACENT TO THE COOLIBAH CROSSING
(as on 6/11/71)

LEGEND
- Gravel and roundstones
- Low stage flow
- Sandy
- Rock ledges with breaks and steps
- W/H Waterhole