Alice Springs – Darwin Railway Investigation

Water Supplies

200kms (origin Alice Springs) to Tennant Creek
Date: June 1984

PREPARED BY:

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Alice Springs

WATER DIVISION
DEPARTMENT OF TRANSPORT AND WORKS
NORTHERN TERRITORY OF AUSTRALIA
ALICE SPRINGS - DARWIN RAILWAY
WATER SUPPLIES 200 km - TENNANT CREEK

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SYMBOLS AND ABBREVIATIONS

<table>
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<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Internal Diameter</td>
</tr>
<tr>
<td>GL</td>
<td>Ground Level</td>
</tr>
<tr>
<td>km</td>
<td>kilometre</td>
</tr>
<tr>
<td>L/s</td>
<td>Litres per second</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligrams per Litre</td>
</tr>
<tr>
<td>mm</td>
<td>millimetre</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Number (of bore)</td>
</tr>
<tr>
<td>SWL</td>
<td>Standing Water Level</td>
</tr>
<tr>
<td>TDS</td>
<td>Total Dissolved Solids</td>
</tr>
</tbody>
</table>

(1 L/s = 86.4 kilolitres/day = 86.4 cubic metres/day)
1. INTRODUCTION

This report presents results of investigation and development of water supplies carried out over a section of the proposed Alice Springs - Darwin railway. This section, of total distance 267 kilometres, is from chainage 200 km (origin Alice Springs) to Tennant Creek (chainage 87 km, origin Dixon Creek).

Included in the report are results of drilling and testing of bores, appraisal of groundwater availability on this section of the route, and details of bores provided for use during construction of the line.

Separate reports present details of water supplies along other sections of the proposed route.
2. BACKGROUND

The Northern Territory Department of Transport and Works has been commissioned by Australian National to investigate surface water and groundwater resources, and to develop water supplies, along the route of the proposed Alice Springs to Darwin railway (correspondence D. Smith/N. Watson dated 28 May 1981 - Australian National reference C.R.609/81).

A preliminary report compiling water resource data was prepared for Australian National by the Water Division of the Department of Transport and Works in December 1981 (Reference 2). This report listed existing water supplies along the route, and anticipated requirements in terms of number of bores to be drilled and expected supplies.

As reliable sources of surface water are not available between Alice Springs and Tennant Creek, investigation of this section has been confined to sources of groundwater. Field operations commenced in May 1982. A report covering the first 200 kilometres north of Alice Springs was produced in April 1983 (Reference 4).

Due to the difficulties inherent in providing access suitable for movement of heavy drilling equipment, commencement of operations on each stage has followed fixing and clearing of the alignment.
3. WATER REQUIREMENTS

Water will be required during the construction phase of the railway project for conditioning of earthfill, concrete construction, and for camp supplies. Parameters supplied by Australian National as a guide for establishment of supplies are as follows:

(a) **Water quality**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthworks</td>
<td>quality not a problem</td>
</tr>
<tr>
<td>Concrete batching</td>
<td>less than 5000 mg/L dissolved solids</td>
</tr>
<tr>
<td>Camp supplies</td>
<td>meeting current criteria for potable water</td>
</tr>
</tbody>
</table>

Current criteria for potable water as adopted by the Commonwealth Department of Health (1980) (Reference 1) sets the following maximum concentrations for those characteristics likely to be found at problem levels in water supplies available:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solids</td>
<td>1500 mg/L</td>
</tr>
<tr>
<td>Nitrate</td>
<td>45 mg/L</td>
</tr>
<tr>
<td>Fluoride</td>
<td>1.5 mg/L</td>
</tr>
</tbody>
</table>

(b) **Quantity of supply**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bore spacing</td>
<td>optimum 20-30 km, maximum 40 km</td>
</tr>
<tr>
<td>Supply</td>
<td>preferred minimum of 2-3 L/s, with a minimum acceptable yield of 1 L/s in any bore.</td>
</tr>
</tbody>
</table>
4. FIELD OPERATIONS

4.1 Timetable, and scope of work
Tenders were called in November 1982 for drilling and test pumping of bores between Alice Springs and Tennant Creek. This contract was awarded to Australian Hydrogeologists International Pty. Ltd., who carried out organisation and supervision of drilling and testing, bore design, and preparation of recommendations on pumping rates for each bore. Drilling and pumping operations were subcontracted to F. J. Leonhardt Pty. Ltd.

Drilling of the section covered in this report commenced in June 1983 and continued with little interruption until testing was completed in October 1983. A total of 15 bores were drilled and 10 of these were test pumped.

Field operations were halted in October before investigation drilling had been completed between Dixon Creek and Tennant Creek. No investigation had been planned however within 40 kilometres of Tennant Creek as water supplies are available from the Kelly Well borefield, located close to the proposed railway route.

Geophysical resistivity traversing was carried out by Water Division at a number of locations to target drilling sites. Down-hole geophysical logs were run on several bores to identify unstable formations and to assist in setting screens.

4.2 Drilling method
A Cyclone TH60 rotary drilling rig was used in the construction of all bores. Down-hole rotary percussion drilling methods were used except where formation characteristics (soft and/or unconsolidated zones) required that rotary methods be adopted.

Drilling mud (biopolymer) was used in the construction of RN 13750 only. Use of foam additives was frequently necessary where soft zones were encountered, to overcome problems of hole instability and loss of drilling returns.

Successful bores were cased with Australian Water Well Association (AWWA) steel casing, with an internal diameter of 140 mm, except for RN 13750, where casing of 150 mm internal diameter was used to allow drilling to continue beyond the bottom of the cased length.

Casing joints were screwed and/or welded. Perforated lengths of casing or stainless steel wire screens were placed opposite producing zones in each bore.

A concrete block, at ground level, was placed around the casing, and bores capped. Bores abandoned due to insufficient supply or instability were backfilled.

Each production bore has been marked with an aluminium tag bearing the registered number of the bore.

4.3 Test pumping
Test pumping was carried out to determine hydraulic characteristics of bores and aquifers. Generally the
following tests were performed on each bore:

(a) Multi-rate test - consisting of up to five consecutive stages at different pumping rates, each stage of up to one hundred minutes duration.

(b) Constant discharge test - of up to twenty-four hours duration, at a pumping rate approximating the long-term rate suggested by the multi-rate test.

(c) Recovery - to measure the response of the aquifer on cessation of pumping.

From test results, a recommendation on a maximum continuous pumping rate for each bore has been made.
5. HYDROGEOLOGY

5.1 200 km to Dixon Creek

The 200 km chainage point north of Alice Springs is at the northern edge of the Ti Tree groundwater basin. The availability of water supplies in this basin is discussed in the report covering the 0-200 km section of the route (Reference 4).

North of the 200 km point, sandstones and siltstones of the Central Mt. Stuart Beds, underlain by Proterozoic crystalline rocks, outcrop extensively to beyond Redbank Creek (chainage 250 km). Supplies of water have been obtained from granite, and from sandstones of the Central Mt. Stuart Beds, and the adjoining Grant Bluff Formation, at a number of locations in the Barrow Creek - Neutral Junction area, but not all bores have been successful. The sandstones are considered to be a better prospect than the granite, gneiss or schist which all occur in the Neutral Junction area. RN 13748, at 222 km, obtained 6 L/s from sandstones thought to be Central Mt. Stuart Beds.

Where the proposed route passes over Redbank Creek at approximately 250 km north of Alice Springs no outcrop occurs. Drilling here (RN 13749 and RN 13750) penetrated poorly consolidated clays and sands which may be much younger than the surrounding outcrop of Proterozoic rocks. RN 13750 has a recommended yield of only 2 L/s, but it is possible that larger supplies are available in this area.

No outcrop is present from approximately 260 km north of Alice Springs to the Osborne Range. Three bores were drilled in the 270 km area, into rocks presumably of the Hatches Creek Group. Large supplies are present here (RN 13761 obtained in excess of 10 L/s) but siting is critical due to formation instability, evidenced by the collapse and abandonment of RN 13751 and RN 13759.

The quartzites of the Osborne Range are unlikely to yield useful supplies unless drilling takes place on a substantial fracture. Similarly, the metamorphic rocks which outcrop several kilometres north of the range are not recommended as a source of water. Little data is available on sub-surface geology along the route north of the Osborne Range. RN 13752 obtained 2 L/s from sandstone interbedded with shale at a site near the Murray Downs road (chainage 296.8 km). The extent of the aquifer here cannot be ascertained without further drilling.

Cainozoic sediments are present further to the north where the route crosses the Stuart Highway. RN 13201 (chainage 322.1 km) obtained 5 L/s here from calcrete. Cainozoic aquifers extend to the Wycliffe Well area, and continue north to Wauchope. Many good supplies of water have been found in these sediments in the Warrabri-Wycliffe Creek region (Reference 7).

Although a supply of 2 L/s was obtained from fractured quartzite at RN 13755 (chainage 358.6 km) near Wauchope, the quartzites of the Younghusband Range, and the granite at the Devils Marbles, are not good prospects for water supplies unless sizeable fractures are available. RN 13757 was drilled to 107 metres into
quartzite at Dixon Creek for a supply of less than 0.4 L/s.

5.2 Dixon Creek to Tennant Creek

Between Dixon Creek and Gilbert Creek no outcrop is present. Drilling at RN 13756 (Dixon Creek, chainage 00 km) was unsuccessful in schist and gneiss, while RN 13758 at Bonney Creek (chainage 4.2 km) achieved only 1 L/s. A similar supply is available at nearby Bonney Bore (RN 435).

Large supplies (10 L/s) are reported in the McLaren Creek homestead area; the aquifer here may extend east to the railway route. Bitumen Bore (RN 2320) south of McLaren Creek on the Stuart Highway, and now abandoned, was reported to have a 'good' yield.

Several kilometres north of Gilbert Creek the route passes over an extensive area of granite, where prospects for successful drilling must be considered low.

Using electrical resistivity methods, a drilling site was selected in the broad channel of Edinburgh Creek at chainage 50 km (Dixon Creek origin), but drilling did not take place due to cessation of field operations. Some calcrete is present at the surface here but may not extend below the water table.

Rocks of the Hatches Creek Group, the north-eastern end of the Murchison Range, occur north of the 50 km point, but these mainly quartzites/silicified siltstones show little porosity at the surface and are likely to be poor aquifers.

Further to the north supplies are available from the Kellywell Borefield, which contributes to the Tennant Creek water supply. Water for construction purposes should be obtainable from standpipes located within the borefield, and if required, from other outlets between this borefield and Tennant Creek.

The borefield area falls within the Tennant Creek Water Control District. Should drilling be proposed a permit must be obtained through Water Division, Department of Transport and Works.

5.3 Groundwater prospects - summary

Should further development of water supplies be required, prospects are summarised as follows:

* 200 km to Dixon Creek

200 - 260 km
Fair, good prospects for small supplies.

260 - 310 km
Largely unknown, poor in Osborne Range area.

310 - 355 km
Very good

355 - 379 km
Generally poor, water in fractured rock.

* Dixon Creek to Tennant Creek

00 - 30 km
Poor to fair, may be good supplies at McLaren Creek.

30 - 60 km
Probably poor.

60 - 87 km
Supplies available from existing facilities.

- 8 -
6. RESULTS

A total of 15 bores were drilled between 200 km and Tennant Creek. Test pumping was performed on ten of these, with nine bores recommended for production of water supplies.

Drilling results are presented in Table 6.1. Air-lift yields shown for each bore were measured during the drilling operation and do not necessarily indicate the rate at which bores may be pumped.

Table 6.2 lists production bores with details relating to construction pump setting etc. Included are details of RN 13747 at chainage 197 km (origin Alice Springs).

Bores are referred to by Registered Number (RN) and by chainage, in kilometres, from the respective origin. Where the origin is Alice Springs the prefix A/S is used before the chainage. For bores north of Dixon Creek origin the prefix D/C is used.

In tables and appendices, all bores are listed in increasing distance from the origin.

Bore locations are shown on maps following the tables. Figure 1 shows bore locations along the 200 km to Dixon Creek section. Figure 2 shows details between Dixon Creek and Tennant Creek.

Parameters for yield and spacing of supplies were met for the 200 km to Dixon Creek section of the route, but further drilling may be required north of Dixon Creek.

Chemical analyses of production bore waters is listed in Table 6.3. All supplies are chemically suitable for earthworks and concrete construction, and most are suitable for drinking.

Details of additional water bores along the route are shown in Table 6.4. The details are generally unchecked and yields untested. As most of these bores are privately owned, intending users will need to reach agreement with landholders.

Kellywell Borefield

Supplies should be available from standpipes within the borefield. Permission to use this supply, and for use of RN 13201 (chainage A/S 322.1 km) must be obtained from the Area Manager, Department of Transport and Works, Tennant Creek.

Notes on recommendations

* Pumping rate

The maximum pumping rate recommended has been arrived at by analysis of test pumping data, and is made on the basis of a continuous pumping regime. A continuous pumping regime is recommended in all bores to encourage stable water flow and aquifer conditions. Should intermittent pumping be necessary, an appropriate pump rate can be derived from the drawdown-yield curves which are included for each bore (Appendix C).
Continuous pumping at rates in excess of that recommended may fork the bore, leading to aquifer instability and pump damage.

* Pump setting

The pump setting recommended (or a reduced setting level if a lower discharge is required) is determined by bore construction. A deeper pump setting will not increase bore yield, and may lead to aquifer and pump damage, and silting of the bore.
This table summarises results of all bores drilled. Details of bores recommended for use are included in Table 6.2.

<table>
<thead>
<tr>
<th>R.N.</th>
<th>Chainage (km)</th>
<th>Airlift Yield (L/s)</th>
<th>Depth (m)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>13748</td>
<td>A/S 222.0</td>
<td>5</td>
<td>122</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13750</td>
<td>A/S 249.0</td>
<td>5</td>
<td>152.5</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13749</td>
<td>A/S 249.0</td>
<td>6</td>
<td>127</td>
<td>Abandoned &amp; backfilled due to instability</td>
</tr>
<tr>
<td>13759</td>
<td>A/S 269.4</td>
<td>1.5</td>
<td>57.9</td>
<td>Unstable - backfilled</td>
</tr>
<tr>
<td>13751</td>
<td>A/S 269.5</td>
<td>4</td>
<td>106.7</td>
<td>Cased &amp; tested, later abandoned due to instability. Casing removed &amp; bore backfilled</td>
</tr>
<tr>
<td>13761</td>
<td>A/S 270.2</td>
<td>4.5</td>
<td>76.2</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13760</td>
<td>A/S 273.0</td>
<td>0.4</td>
<td>100.6</td>
<td>Insufficient supply. Backfilled</td>
</tr>
<tr>
<td>13752</td>
<td>A/S 296.8</td>
<td>2.5</td>
<td>100.6</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13753</td>
<td>A/S 343.9</td>
<td>5</td>
<td>33.5</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13754</td>
<td>A/S 344.0</td>
<td>5</td>
<td>58.4</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13755</td>
<td>A/S 358.6</td>
<td>5</td>
<td>95.0</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13757</td>
<td>A/S 379.0</td>
<td>0.4</td>
<td>107</td>
<td>Insufficient supply. Backfilled</td>
</tr>
<tr>
<td>13756</td>
<td>D/C 0.0</td>
<td>0.3</td>
<td>119.4</td>
<td>Insufficient supply. Backfilled</td>
</tr>
<tr>
<td>13758</td>
<td>D/C 4.2</td>
<td>1.0</td>
<td>118.9</td>
<td>Cased &amp; tested</td>
</tr>
<tr>
<td>13762</td>
<td>D/C 25.1</td>
<td>2</td>
<td>106.7</td>
<td>Cased &amp; tested</td>
</tr>
</tbody>
</table>
### TABLE 6.2 SUMMARY - PRODUCTION BORES

<table>
<thead>
<tr>
<th>Registered Number (RN)</th>
<th>Chainage (km)</th>
<th>Recommended Pumping rate (L/s)</th>
<th>Recommended Pump setting (m)</th>
<th>Minimum bore diameter (mm)</th>
<th>Standing water level (m)</th>
<th>Salinity (mg/L TDS)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>13747</td>
<td>A/S 197.0</td>
<td>4</td>
<td>28</td>
<td>140</td>
<td>6.6</td>
<td>2110</td>
<td></td>
</tr>
<tr>
<td>13748</td>
<td>A/S 222.0</td>
<td>6</td>
<td>95</td>
<td>140</td>
<td>38.2</td>
<td>1750</td>
<td></td>
</tr>
<tr>
<td>13750</td>
<td>A/S 249.0</td>
<td>2</td>
<td>100</td>
<td>152</td>
<td>31.5</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>13761</td>
<td>A/S 270.2</td>
<td>10</td>
<td>45</td>
<td>140</td>
<td>29.7</td>
<td>590</td>
<td></td>
</tr>
<tr>
<td>13752</td>
<td>A/S 296.8</td>
<td>2</td>
<td>88</td>
<td>140</td>
<td>35.2</td>
<td>1990</td>
<td></td>
</tr>
<tr>
<td>13201</td>
<td>A/S 322.1</td>
<td>5</td>
<td>60</td>
<td>140</td>
<td>18.5</td>
<td>1230</td>
<td></td>
</tr>
<tr>
<td>13753</td>
<td>A/S 343.9</td>
<td>5</td>
<td>12</td>
<td>140</td>
<td>6.0</td>
<td>1300</td>
<td>N.T. Government bore</td>
</tr>
<tr>
<td>13754</td>
<td>A/S 344</td>
<td>8</td>
<td>40</td>
<td>140</td>
<td>6.4</td>
<td>1130</td>
<td>Water level should be monitored if pumped with RN 13754</td>
</tr>
<tr>
<td>13755</td>
<td>A/S 350.6</td>
<td>2</td>
<td>32</td>
<td>140</td>
<td>20.8</td>
<td>630</td>
<td>Supply drawn from deeper aquifer than RN 13753</td>
</tr>
<tr>
<td>13758</td>
<td>D/C 4.2</td>
<td>1</td>
<td>33</td>
<td>140</td>
<td>9.1</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>13762</td>
<td>D/C 25.1</td>
<td>1</td>
<td>66</td>
<td>140</td>
<td>16.9</td>
<td>4300</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Pump setting and standing water level are measured from ground level.
2. Minimum bore diameter refers to section above pump setting only.
<table>
<thead>
<tr>
<th>RN</th>
<th>Chainage (km)</th>
<th>Total dissolved solids (mg/L)</th>
<th>Specific conductance (μS/cm)</th>
<th>pH</th>
<th>Temperature (°C)</th>
<th>Sodium (mg/L)</th>
<th>Potassium (mg/L)</th>
<th>Magnesium (mg/L)</th>
<th>Total alkalinity (mg CaCO3/L)</th>
<th>Total hardness (mg CaCO3/L)</th>
<th>Iron (μg/L)</th>
<th>Silica (mg/L)</th>
<th>Chloride (mg/L)</th>
<th>Bicarbonate (mg/L)</th>
<th>Fluoride (mg/L)</th>
<th>Sodium (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13747</td>
<td>A/S 197.0</td>
<td>2110</td>
<td>3000</td>
<td>7.1</td>
<td>28.5</td>
<td>284</td>
<td>68</td>
<td>208</td>
<td>137</td>
<td>1082</td>
<td>0.5</td>
<td>84</td>
<td>640</td>
<td>530</td>
<td>5</td>
<td>308</td>
</tr>
<tr>
<td>13748</td>
<td>A/S 222.0</td>
<td>1750</td>
<td>3100</td>
<td>7.1</td>
<td>31.5</td>
<td>318</td>
<td>32</td>
<td>136</td>
<td>94</td>
<td>740</td>
<td>0.7</td>
<td>20</td>
<td>600</td>
<td>309</td>
<td>35</td>
<td>306</td>
</tr>
<tr>
<td>13750</td>
<td>A/S 249.0</td>
<td>930</td>
<td>1600</td>
<td>7.1</td>
<td>27.5</td>
<td>150</td>
<td>64</td>
<td>72</td>
<td>62</td>
<td>434</td>
<td>1.1</td>
<td>13</td>
<td>280</td>
<td>131</td>
<td>1</td>
<td>357</td>
</tr>
<tr>
<td>13761</td>
<td>A/S 270.2</td>
<td>590</td>
<td>970</td>
<td>7.0</td>
<td>25</td>
<td>99</td>
<td>29</td>
<td>33</td>
<td>34</td>
<td>222</td>
<td>0.3</td>
<td>49</td>
<td>170</td>
<td>91</td>
<td>33</td>
<td>127</td>
</tr>
<tr>
<td>13752</td>
<td>A/S 296.8</td>
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7. REFERENCES


4. McDonald, P.S. Alice Springs - Darwin Railway Investigation, Water Supplies 00 kms to 200 kms Department of Transport and Works, N.T. Water Division, April 1983


7. Verhoeven, T.J. and Read, R.E. Warrabri Community Water Supply Water Division, Department of Transport and Works, N.T. 1978
9. APPENDICES - PRODUCTION BORES

Production bore details are appended as follows:

A. Bore completion reports

B. Bore construction and lithology diagrams.

Construction details of each bore are shown, with a strata log compiled at each site.

C. Drawdown - yield curves

These curves are derived from test pump data and are used in the calculation of maximum pumping rate.
APPENDIX A

Bore completion reports
**Identification:**
- **Bore Name:** RAILWAY 197 km
- **Location:** 100 m WEST OF CENTRELINE
- **Map:** SF53-6
- **Scale:** 1:250 000
- **Grid Reference:** 3247 5695 AMG

**Recommendations:**
- See attached bore yield curves, Drawing No.: 2068 - 28-30
- **Maximum continuous pumping rate:** 4 LITRES PER SECOND
- **Pump setting:** 28 METRES

**Bore Data:**
- **Total Depth:** 34.9 METRES
- **Minimum bore diameter:** 140 MILLIMETRES (ABOVE SCREENS)
- **Date bore completed:** 11.3.83
- **Standing water level:** 6.63 METRES at 2 / 3 1983

**Construction:**

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<th>INTERVAL</th>
<th>DESCRIPTION</th>
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<tr>
<td>0 - 6</td>
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<td>0 - 31.3</td>
<td>140 mm ID blank steel casing</td>
</tr>
<tr>
<td>30.9 - 34.5</td>
<td>Neoprene seal and 100 mm diameter wedge</td>
</tr>
<tr>
<td>34.5 - 34.9</td>
<td>wire stainless steel screen. Aperture width 0.25 mm</td>
</tr>
<tr>
<td></td>
<td>sump</td>
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<tr>
<td></td>
<td>Casing plumbness tested X/no Passed yes/no Max Deviation at</td>
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**Water Analysis:**
- See attached analysis. Laboratory Register No.: 83/1094

**Comments:**

Prepared by: P. MCDONALD
Designation: SC. 2
Date: JUNE 1983

Approved by: [Signature]
Designation: SC 2
Date: July 1983.
IDENTIFICATION:
Bore Name: RAILWAY A/S 222 km
Location: 100 m east of centreline
Map: SF53-6
Scale: 1:250 000
Grid Reference: 412260 584320 AMG

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: w 2098-28-32
Maximum continuous pumping rate: 5 Litres per second
Pump setting: 95 metres

BORE DATA:
Total Depth: 122 metres
Minimum bore diameter: 140 millimetres
Date bore completed: 3.6.83
Standing water level: 38.2 metres at 21 / 9 / 1983

CONSTRUCTION:

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<tr>
<td>98 - 122</td>
<td>140 mm ID casing with 9 mm perforations</td>
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Casing straightness tested, Passed yes/no
Casing plumbness tested, Passed yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis. Laboratory Register No.: __

COMMENTS:

Prepared by: P. MCDONALD
Designation: SC. 2
Date: SEPTEMBER 1983

Approved by: [Signature]
Designation: [Signature]
Date: August 1984

- 21 -
DEPARTMENT OF TRANSPORT AND WORKS - WATER INVESTIGATIONS UNIT

BORE COMPLETION REPORT

IDENTIFICATION:
Bore Name: Railway A/S 249 km
Location: 95 m east of centreline
Map: SP53-6
Scale: 1 : 250 000
Grid Reference: 417200 609800 AMG

File: 41.2
Registration No.: 13750
Index No.: 28/211
Advice No.: -
Location Sketch Dwg No.: -

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: W2L03-28-36
Maximum continuous pumping rate: 2 Litres per second
Pump setting: 100 metres

BORE DATA:
Total Depth: 152 metres, backfilled to sump at 142.7 metres
Minimum bore diameter: 152 millimetres (see construction details)
Date bore completed: July 1983
Standing water level: 30.3 metres at 21/9/1983

CONSTRUCTION:

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<td>125 mm stainless steel wedge wire screen</td>
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<tr>
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<td>with 0.65 mm aperture</td>
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<td>127 mm blank steel sump</td>
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Casing straightness tested yes/no Passed yes/no
Casing plumbness tested yes/no Passed yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis. Laboratory Register No.: -

COMMENTS:

Prepared by: P. MCDONALD
Designation: SC. 2
Date: SEPTEMBER 1983

Approved by: 
Designation: 
Date: 

- 22 -
IDENTIFICATION:
Bore Name: Railway A/S 270.2 km
Location: 150 m west of centreline
Map: SF56-6
Scale: 1:250 000
Grid Reference: 421 500 630 200 AMG

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: W2107-28-40
Maximum continuous pumping rate: 10 Litres per second
Pump setting: 45 metres (deepest permissible setting 70 metres)

BORE DATA:
Total Depth: 76.2 metres
Minimum bore diameter: 140 millimetres
Date bore completed: September 1983
Standing water level: 28.9 metres at 21 / 9 / 1983

CONSTRUCTION:

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<td>73.1 - 76.2</td>
<td>150 mm stainless steel wedge wire screen. Aperture 0.5 mm</td>
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Casing straightness tested yes/no Passed yes/no
Casing plumbness tested yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis. Laboratory Register No.: —

COMMENTS:
Testing has been carried out on this bore at pumping rates up to 10 Litres per second. If the bore is to be pumped at rates exceeding 10 Litres per second further testing should be carried out.

Prepared by: P. MCDONALD
Designation: SC. 2
Date: OCTOBER 1983

Approved by: 
Designation: 
Date: August 1984
DEPARTMENT OF TRANSPORT AND WORKS - WATER INVESTIGATIONS UNIT

BORE COMPLETION REPORT

IDENTIFICATION:
Bore Name: Railway A/S 296.8 km
Location: 110 m west of centreline
Map: SF53-6
Scale: 1:250 000
Grid Reference: 419 300 656 500 ANG

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: W2105-28-38
Maximum continuous pumping rate: 2 Litres per second
Pump setting: 88 metres

BORE DATA:
Total Depth: 100.6 metres
Minimum bore diameter: 140 millimetres
Date bore completed: August 1983
Standing water level: 34.8 metres at 21 / 9 / 1983

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<td>88.2 - 100.6</td>
<td>140 mm ID steel casing with 8 mm perforations</td>
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Casing straightness tested XX/XX/no Passed yes/no
Casing plumbness tested XX/XX/no Passed yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis. Laboratory Register No.: —

CONTENTS:

Prepared by: P. NCDONALD
Designation: SC.2
Date: SEPTEMBER 1983

Approved by: 
Designation: 
Date: August 1984
**IDENTIFICATION:**

- **Bore Name:** Warrabri Road Bore
- **Location:** Warrabri turnoff
- **Map:** SF53-2
- **Scale:** 1:250 000
- **Grid Reference:** 417 270 681 650 AMG
- **File:** 51.1D
- **Registration No.:** 13201
- **Index No.:** 33/123
- **Advice No.:** —
- **File:** 51.1D
- **Registration No.:** 13201
- **Index No.:** 33/123
- **Advice No.:** —
- **Location Sketch Draw No.:** —

**RECOMMENDATIONS:**

- See attached bore yield surveys, Drawing No.: W1905-14-67
- Maximum continuous pumping rate: 5 Litres per second
- Pump setting: 60 metres

**BORE DATA:**

- **Total Depth:** 85 metres
- **Minimum bore diameter:** 140 millimetres
- **Date bore completed:** 17.11.81
- **Standing water level:** 18.5 metres at 25 / 11 / 19 81

**CONSTRUCTION:**

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<td>79.0 - 85.0</td>
<td>140 mm ID blank steel casing</td>
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**WATER ANALYSIS:**

- See attached analysis. Laboratory Register No.: —

**COMMENTS:**

- **Bore location Chainage:** 322.1 km
- **Origin:** Alice Springs
- **170 m east of centreline**

**Prepared by:** P. MCDONALD
**Designation:** SC.2
**Date:** June 1984

**Approved by:**
**Designation:**
**Date:** August 1984
DEPARTMENT OF TRANSPORT AND WORKS - WATER INVESTIGATIONS UNIT

BORE COMPLETION REPORT

IDENTIFICATION:
Bore Name: Railway A/S 343.9 km
Location: 100 m east of centreline
Map: SF53-2
Scale: 1 250 000
Grid Reference: 417 050 703 500 AMG

File: 51.2
Registration No.: 23753
Index No.: 33/139
Advice No: -
Location Sketch Dwg No.: -

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: W2109-33-5
Maximum continuous pumping rate: 5 Litres per second
Pump setting: 12 metres

BORE DATA:
Total Depth: 33.5 metres
Minimum bore diameter: 140 millimetres
Date bore completed: August 1983
Standing water level: 5.45 metres at 21/9/1983

CONSTRUCTION:

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<td>150 mm stainless steel screen. Aperture 0.6 mm</td>
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<td>140 mm ID blank steel casing with steel sump</td>
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Casing straightness tested yes/no Passed yes/no
Casing plumbness tested yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis, Laboratory Register No.: -

COMMENTS:
Water level in this bore should be monitored if pumped simultaneously with RN 13754

Prepared by: P. MCDONALD
Designation: SC.2
Date: SEPTEMBER 1983

Approved by: Eng
Designation: Eng
Date: August 1984
DEPARTMENT OF TRANSPORT AND WORKS - WATER INVESTIGATIONS UNIT

BORE COMPLETION REPORT

IDENTIFICATION:
Bore Name: Railway A/S 344 km
Location: 120 m east of centreline
Map: SP52-2
Scale: 1:250 000
Grid Reference: 417 100 703 600 AMG

File: 51.2
Registration No.: 13754
Index No.: 33/140
Advice No: -
Location Sketch Dwg No.: -

RECOMMENDATIONS:
See attached bore yield curves, Drawing No.: W211-33-7
Maximum continuous pumping rate: 8 Litres per second
Pump setting: 40 metres

BORE DATA:
Total Depth: 58.4 metres
Minimum bore diameter: 140 mm
Date bore completed: August 1983
Standing water level: 5.8 metres at 21/9/1983

CONSTRUCTION:
INTERVAL DESCRIPTION
As per construction diagram

Casing straightness tested yes/no Passed yes/no
Casing plumbness tested yes/no Passed yes/no Max Deviation at

WATER ANALYSIS:
See attached analysis. Laboratory Register No.: -

COMMENTS:

Prepared by: P. MCDONALD
Designation: SC.2
Date: SEPTEMBER 1983

Approved by: 
Designation: 
Date: 

- 27 -
**Identification:**

- **Bore Name:** Railway A/S 358.6 km
- **Location:** 600 m west of centreline
- **Map:** SF53-2
- **Scale:** 1:250 000
- **Grid Reference:** 417 750 718 700 MGR

**Recommended:**

- See attached bore yield curves, Drawing No.: W2176-33-10
- Maximum continuous pumping rate: 2 Litres per second
- Pump setting: 32 metres

**Bore Data:**

- **Total Depth:** 95 metres
- **Minimum bore diameter:** 140 millimetres
- **Date bore completed:** 17.8.83
- **Standing water level:** 19.9 metres at 21/9/1983

**Construction:**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 6 m</td>
<td>200 mm steel surface casing</td>
</tr>
<tr>
<td>0 - 32.2 m</td>
<td>140 mm ID blank steel casing</td>
</tr>
<tr>
<td>32.2 - 39 m</td>
<td>140 mm ID casing with 9 mm perforations</td>
</tr>
<tr>
<td>39 - 95 m</td>
<td>Open hole, nominal dia. 200 mm</td>
</tr>
</tbody>
</table>

**Water Analysis:**

- See attached analysis. Laboratory Register No.: —

**Comments:**

Prepared by: P. MCDONALD  
Designation: SC.2  
Date: JUNE 1984
**IDENTIFICATION:**

- **Bore Name:** Railway D/C 4.2 km
- **Location:** 150 m west of centreline
- **Map:** SF53-2
- **Scale:** 1:250 000
- **Grid Reference:** 421 000, 740 100 AMG
- **File:** 51.2
- **Registration No.:** 13758
- **Index No.:** 33/144
- **Advice No.:**
- **Location Sketch Dwg No.:**

**RECOMMENDATIONS:**

- See attached bore yield curves, Drawing No.: 2178-33-12
- Maximum continuous pumping rate: 1 Litre per second
- Pump setting: 33 metres

**BORE DATA:**

- **Total Depth:** 118.9 metres
- **Minimum bore diameter:** 140 mm
- **Date bore completed:** 5.9.83
- **Standing water level:** 9.1 metres at 21 / 9 / 1983

**CONSTRUCTION:**

<table>
<thead>
<tr>
<th>INTERVAL (m)</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 33</td>
<td>140 mm ID blank steel casing</td>
</tr>
<tr>
<td>33 - 39.3</td>
<td>150 mm dia. stainless steel screen. Aperture 0.75 mm</td>
</tr>
<tr>
<td>39.3 - 118.9</td>
<td>Open hole, nominal dia. 200 mm</td>
</tr>
</tbody>
</table>

Casing straightness tested **yes/no** Passed yes/no
Casing plumbness tested **yes/no** Max Deviation at

**WATER ANALYSIS:**

See attached analysis. Laboratory Register No.: 

**COMMENTS:**

Prepared by: P. MCDONALD
Designation: SC.2
Date: JUNE 1983

Approved by: 
Designation: 
Date: August 1983
Bore Name: Railway D/C 25.1 km
Location: 106 m east of centreline
Map: SP53-2
Scale: 1:250 000
Grid Reference: 416 550 759 930 ANG

Identification:
File: 51.2
Registration No.: 13762
Index No.: 33/145
Advice No.: —
Location Sketch Dwg No.: —

Recommendations:
See attached bore yield curves, Drawing No.: 2180-33-14
Maximum continuous pumping rate: 1 Litre per second
Pump setting: 66 metres

Bore data:
Total Depth: 104 metres
Minimum bore diameter: 140 millimetres
Date bore completed: 12.9.83
Standing water level: 16.0 metres at 21 / 9 / 1983

Construction:

<table>
<thead>
<tr>
<th>INTERVAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4.5 m</td>
<td>200 mm steel surface casing</td>
</tr>
<tr>
<td>0 - 66.1 m</td>
<td>140 mm ID blank steel casing</td>
</tr>
<tr>
<td>66.1 - 97.8 m</td>
<td>140 mm ID casing with 9 mm perforations</td>
</tr>
<tr>
<td>97.8 - 104.1 m</td>
<td>140 mm ID blank steel casing</td>
</tr>
</tbody>
</table>

Casing straightness tested %/no Passed yes/no
Casing plumbness tested %/no Passed yes/no Max Deviation at

Water Analysis:
See attached analysis. Laboratory Register No.: —

Contents:

Prepared by: P. MCDONALD
Designation: SC.2
Date: JUNE 1984

Approved by: [Signature]
Designation: Eng.
Date: August 1984
APPENDIX B

Bore construction and lithology diagrams

Depths shown are measured from ground level.
CONSTRUCTION DETAILS

RAILWAY 197 km RN 13747

WATER DIVISION
DEPARTMENT OF TRANSPORT AND WORKS
NORTHERN TERRITORY OF AUSTRALIA

CONCRETE BLOCK
STEEL Casing

6m

G劳动

7.2m

203mm ID steel surface casing

STANDING WATER LEVEL AT 11/3/83

140mm ID blank steel casing

100mm diameter stainless steel wedge wire screen; aperture 0.25mm

BLANK ENDED SUMP

FILE

SCALE

DATE

CODE

PROJECT LOC.

SPEC.

ENGINEER

P R I N C I P A L

CHIEF ENG.

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-32-
silty sand
silty sand, calcrete
calcrete
calcrete and silty sand
weathered red shale with silty sand
shale/sandstone
sandstone/shale
sandstone/quartzite
shale/sandstone
sandstone/shale
sandstone

CONSTRUCTION DETAILS
RN 13748
RAILWAY A/S 222km
**Bore Lithology and Construction Details**

**sinked water level at 3/7/83**

- 152 mm ID blank steel casing
- Cement grout
- *j* latch
- Packer
- 127 mm stainless steel wedge wire screen, aperture 0.65 mm
- Sump
- Backfilled below sump

**Lithology**

- **medium - fine sand**
- medium sand, angular gravel
- clay - calcite with sand and gravel
- clayey fine - medium sand
- mottled sandy clay
- mottled clay
- interbedded clay and chert
- interbedded clay, chert and gravel
- poorly sorted fine - medium sandstone

**Drawing Information**

- Designer: AHI Pty. Ltd.
- Drawn: L. Schnitzer Sep '83
- Checked:
- Title: **Bore Lithology and Construction Details**
- Sheet No.: 2102-28-35
- Code: A4
- Scale: As Shown
- Date: September 1983
- File: A4

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Page 36 of 55.
fine silty sand
concrete and sand
fine-medium sand
silty mottled sand
sandy siltstone
medium-very fine poorly sorted sandstone with shale interbeds

203mm ID surface casing
welded steel ring joining casings
203mm ID blank steel casing

standing water level at 10/9/83

wire screen aperture 0.5mm
150mm stainless steel wedge
base plate

top of aquifer 59m

73.1m
76.2m

57
30
27
15
3

GL
4.5m

AHI Pty. Ltd.
L. Schnitzer Sep'83

DESIGNER
DRAWN
CHECKED

DESIGNER
DRAWN
CHECKED

NORTHERN TERRITORY OF AUSTRALIA
DEPARTMENT OF TRANSPORT AND WORKS

BORE LITHOLOGY AND CONSTRUCTION DETAILS
RN 13761
RAILWAY A/S 270.2km

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FILE

DRAWING No.
2106-28-39

AMEND
A4

- 35 -
DESIGNER
LM.S.
DESIGN PROJECT LDR

DEPARTMENT OF TRANSPORT AND WORKS
NORTHERN TERRITORY OF AUSTRALIA

CONSTRUCTION DETAILS
RN 13201
WARRABRI ROAD BORE

SCALE
As Shown
DATE
June 1984
FILE

SHEET No.
DRAWING No.
CODE
2174-33-8
AMEND
A4

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Technical Report WRA84025

Bore Lithology and Construction Details
RN 13755
TWG4
Railway A/S 358-6km
Bore Lithology and Construction Details

RN 13758

RAILWAY D/C 4.2km

DESIGNER
AHI Ply Ltd

DRAWN
L.M.S. June '84

CHECKED

DESIGN PROJECT LDR

NORTHERN TERRITORY OF AUSTRALIA
DEPARTMENT OF TRANSPORT AND WORKS

SHEET No. CODE SCALE
2177-33-11

DATE
June 1984

FILE

This Drawing is a copyright and the property of the Department of Transport and Works.
silty sand (weathered gneiss)
clay/sand
silty sand (weathered gneiss)
clay (weathered porphyry)
slate/phylite

welded steel ring joining casings
concrete block

200mm surface casing

standing water level 21/9/83

140mm ID steel casing

9mm perforations

backfilled
casing open ended
APPENDIX C

Drawdown - yield curves
DEEPEST PERMISSIBLE PUMP SETTING
28 METRES BELOW GROUND LEVEL

These curves are based on a 1 m³/sec pumping test at a discharge of 4 m³/sec setting
assumed that hydraulic gradients were maintained at other levels.
These curves are based on a 1 day pumping test at a discharge of 4.8 litres per second.
They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 1.5 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a ½ day pumping test at a discharge of 10 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 3 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 4 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 7.6 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 2.5 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 1 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.
These curves are based on a 1 day pumping test at a discharge of 1.5 litres per second. They assume that hydrologic conditions will not change for other pumping rates and periods.

DESIGNER
R. Jones

DRAWN
L.M.S. June '84

CHECKED

DESIGN PROJECT LDR

NORTHERN TERRITORY OF AUSTRALIA
DEPARTMENT OF TRANSPORT AND WORKS

SHEET No. CODE SCALE
AMEND

DRAWDOWN YIELD RELATIONSHIP

RAILWAY D/C 25.1 km
Reg. No. 13762 Date Tested Oct. '83

2180-33-14 A4

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