GROUNDWATER RESOURCE
MONITORING
CENTRAL AUSTRALIA
1992

G SEIDEL
RESOURCE INVENTORY
WATER RESOURCES BRANCH, ALICE SPRINGS

December 1993
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1. Introduction

This overview of groundwater monitoring is designed to meet two objectives: firstly to summarise data relevant to the continued viability of water supplies in the region, secondly to screen the relevance of data collection programs and to identify targets for review.

A formula for summarising each monitored water supply area was developed after extensive consultation within the Division. This formula necessarily is a compromise but one which we believe meets the primary purpose of this overview, which is to provide a brief yet sufficiently comprehensive entry point to more detailed studies on a case by case basis.

The formula consists of seven components:
1. A Description component which lists location, aquifer (if known) and the most recent report reference dealing with that area.
2. Monitoring objectives specific to each monitoring area. An underlying regional baseline objective is always assumed even if not stated.
3. Production usually stated as annual abstraction.
4. Quality recent values for TDS and any trends if observed. Other quality parameters only if of particular relevance to usefulness of resource.
5. Water levels shown where available as plots versus time for bores representative of the area.
6. Conclusions relevant to monitoring objectives and where applicable concerning the continued viability of a supply.
7. Recommendations concerning the continuation or otherwise of the current monitoring program.

This report also includes supply areas which are not monitored at present but which might be included in the monitoring program sometimes in the future. The presentation for each of these consists of Description, Production, and Monitoring.

The regional monitoring areas do not deal with specific supplies and are presented with the headings: Description, Production, Water Quality, and Water Levels.
2. Monitoring Areas

Monitoring areas are defined as a convenient logical/geographical subdivision for the monitoring activities in the region. For example Papunya is a monitoring area near the community bearing the same name.

In general terms all bores in a monitoring area share a geographical or hydrogeological feature and an overall purpose with corresponding implications for shared monitoring objectives.

In this overview monitoring areas include areas which were already included in the regular water level monitoring program conducted by Water Resources Division during 1991/1992 as well as other areas which were included by Aboriginal Essential Services Division (AES) in their list of major Aboriginal Communities. Data used in this overview include mostly data collected by Water Resources Division but some data (in particular production data) were supplied by AES.

For further information on availability of water level data from our groundwater monitoring program refer to the Groundwater Levels Data Summary Table issued as a companion to this overview.

2.1 Classification of Monitoring Areas

Figure 1 shows a locality plan of Monitoring Regions which contain the Monitoring Areas listed in Table 1.

Table 1 lists all monitoring areas which were part of the monitoring program during 1991/92. The table lists the region in which the area is located, the name of the area, the number of monitoring bores on the data base for that area, and tick marks in Columns named 'Town', 'Comm', 'Agri', and 'Used'. These abbreviations stand for town supply, community supply, agricultural supply, and whether a particular supply is in active use. A supply not in use may be discontinued or marked for future development.
Figure 1 Monitoring Regions and Bores
### Table 1 - Monitoring Areas

<table>
<thead>
<tr>
<th>Region</th>
<th>Area</th>
<th>Bores</th>
<th>Town</th>
<th>Comm</th>
<th>Agri Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tennant Creek</td>
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<td>Tennant Creek</td>
<td>36</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>West</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ti Tree</td>
<td>Dulcie</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TGF</td>
<td>37</td>
<td>X</td>
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<tr>
<td></td>
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<td>35</td>
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<td>X</td>
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<td>Central</td>
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<td></td>
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<tr>
<td></td>
<td>Ti Tree</td>
<td>37</td>
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<td>Warrabri</td>
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<td>Western</td>
<td>Kintore</td>
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<td>Communities</td>
<td>Mount Liebig</td>
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<td>X</td>
</tr>
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<td></td>
<td>Napperby</td>
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<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Nyirripi</td>
<td>6</td>
<td>X</td>
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<td>X</td>
</tr>
<tr>
<td></td>
<td>Papunya</td>
<td>9</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Willowra</td>
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<td>Brewers Plain</td>
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<td></td>
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<td></td>
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<td>38</td>
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<td></td>
<td>Hermannsburg</td>
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Monitoring Overview
<table>
<thead>
<tr>
<th>Region</th>
<th>Area</th>
<th>Bores</th>
<th>Town</th>
<th>Comm</th>
<th>Agri Used</th>
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<td>7</td>
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<td>Santa Teresa</td>
<td></td>
<td>9</td>
<td>X</td>
<td>X</td>
<td></td>
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<td>South Western</td>
<td>Areyonga</td>
<td>5</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ayers Rock Resort</td>
<td>36</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Docker River</td>
<td>10</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Imanpa</td>
<td>11</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Kings Canyon Resort</td>
<td>11</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Uluru</td>
<td>26</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

2.2 Multiple Role Monitoring Areas

Many of the monitoring areas are monitored for more than one reason. Almost in all cases there will be a regional baseline data collection purpose involved. It is important that this is considered when rationalising data collection from any of the monitoring areas. Even if all the primary monitoring objectives for an area have ceased to apply there is likely to be a residual need to still collect at least some data to maintain the regional baseline collection.

2.3 Location Plans of Monitoring Areas

The following six location plans (Figures 2 to 7) correspond to the six Monitoring Regions as shown in Figure 1.
Figure 4 Ti-Tree Region

Figure 5 Alice Springs
3. Collection Activities

3.1 Regular Activities (‘Monitoring Runs’)

Almost all water levels from monitoring areas are collected through a repeating series of monitoring runs which are currently planned a year ahead. Runs are typically organised as one week field trips taking in data collection activities along a particular route of travel. These collection activities include in addition to water level measurements in monitoring bores: collection of stream flow and rainfall records from recording devices, taking samples from water sources, maintenance of recorders, and in some cases reading of flow meters on water pumps.

Table 2 shows the monitoring runs undertaken during 1991/92 under the names included are listed both the groundwater monitoring area and surface water monitoring (e.g. Hugh River). In the table the abbreviation GW stands for groundwater and SW for surface water.
## Table 2 Monitoring Runs 1991/92

<table>
<thead>
<tr>
<th>Name of Run</th>
<th>Areas Included</th>
<th>Type</th>
<th>Number of Runs</th>
<th>Duration (days)</th>
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<tbody>
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<td>Check Survey SW</td>
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<td>Tennant Creek</td>
<td>Barkly TC West Kelly Well Cabbage Gum Marrabri</td>
<td>GW SW</td>
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<td>5</td>
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<tr>
<td>Tennant Creek</td>
<td>Barkly Kelly Well Cabbage Gum Marrabri</td>
<td>GW SW</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Tennant Creek</td>
<td>Barkly Kelly Well Cabbage Gum</td>
<td>GW SW</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ti-Tree Limited</td>
<td>Ti-Tree Central</td>
<td>GW</td>
<td>4</td>
<td>2</td>
</tr>
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<td>Ti-Tree Regional</td>
<td>TGF Ti-Tree Regional Willowra</td>
<td>GW</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Plenty</td>
<td>Plenty Jay Creek</td>
<td>SW</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Plenty</td>
<td>Plenty Jay Creek</td>
<td>Check Survey SW</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Settlements Full</td>
<td>Areyonga Kintore Papunya Hermannsburg Jay Creek Mt. Liebig Napperby Nyirripi Yuendumu</td>
<td>GW</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Settlements</td>
<td>Hermannsburg Jay Creek Mt. Liebig Napperby Nyirripi Yuendumu</td>
<td>GW</td>
<td>2</td>
<td>4</td>
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<tr>
<td>Ayers Rock</td>
<td>Yulara Uluru Imanpa Docker River</td>
<td>GW</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Monitoring Overview  

Page 10
### Name of Run | Areas Included | Type | Number of Runs | Duration (days)
--- | --- | --- | --- | ---
Tennant Creek | Barkly | Check Survey SW | 1 | 5
Kings Canyon | Kings Canyon | GW | 1 | 4
Amadeus | Amadeus Basin Gilbert Springs | GW | 1 | 4
Dulcie | Dulcie Regional | GW | 1 | 5
Locals | Todd River Hugh River Finke River Santa Teresa | SW GW | 7 | 6
Locals | Todd River Hugh River Finke River Santa Teresa | Check Survey SW GW | 1 | 10
Mereenie | Roe Creek Old South Rd. Brewer Est. | GW | 8 | 5
Town | Town Basin Farms Area Commonage Rocky Hill Emily Creek | GW | 4 | 5
### 3.2 Occasional Activities

In addition to the regular monitoring runs the monitoring section is asked occasionally by other Water Resources staff, by Aboriginal Essential Services, PAWA Utilities, or other clients to obtain additional data, mostly to sample bores for water quality.

During 1991/92 the following bores were sampled in response to specific requests:

<table>
<thead>
<tr>
<th>Bore Number</th>
<th>Location</th>
<th>Prod/Monit.</th>
<th>Requested</th>
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<td>RN15469</td>
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<td>RN15471</td>
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<td>RN15472</td>
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<td></td>
<td>Prod.</td>
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<td>RN15326</td>
<td>Aileron</td>
<td>Prod.</td>
<td>AES</td>
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<td>AES</td>
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<td>RN3064</td>
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<td>Monit.</td>
<td>Internal</td>
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<td>RN3758</td>
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<td>RN3923</td>
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<td>RN4957</td>
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<td></td>
</tr>
<tr>
<td>RN5803</td>
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<td></td>
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<td>RN11819</td>
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<td>Prod.</td>
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<td>RN5741</td>
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<td>RN10744</td>
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</tbody>
</table>
4. Overviews by Location

Note: Overviews are presented in alphabetical order of place names (location). Alice Springs, Tennant Creek, and Ti-Tree contain subareas which are kept together. For example entries for Town Basin in Alice Springs will be found as subheading of Alice Springs.

Production figures where available are given in Megalitres/year for the 1991 fiscal year unless stated otherwise.

Some places have alternative names. These are cross referenced in an Index of place names at the end of this report.

4.1 Aileron

Description: Water supply for the Aileron Community near the Stuart Highway between Alice Springs and Ti-Tree and just south of the Aileron homestead. Only one of the six holes drilled into fractured metamorphic rocks of the Arunta group was suitable as a marginal water source. This production bore (RN15326) is capable of up to 1 l/s for short durations and 0.5 l/s continuously (bore completion report by P. Alderson, July 1989). The report warns of the risk of higher salinity water entering the supply. Water in a bore approximately 2 km to the south east (RN15323) has a TDS in excess of 5000 mg/l.

Monitoring Objectives: Originally it was recommended to monitor both water levels and water quality at regular intervals to warn of possible supply failure. According to recent recommendations (H. Beyer, A.E.S.) only water quality is checked.

Production: According to figures by AES approximately 2 Megalitres during 1991.

Quality: TDS values have been gradually increasing from originally 750 mg/l to 1235 mg/l in February 1993.

Water Levels: Initial SWL was 26.2 metres with an available drawdown of 5.3 metres. No subsequent water levels are available.

Conclusions: Long term viability of supply is doubtful, quality is declining.
Recommendations: Increasing monitoring activity should be considered including the taking of water levels.
4.2 Alice Springs

4.2.1 Brewer Estate

Description: Six Monitoring bores are located in the Brewer Estate Industrial Area south of Roe Creek well field. There is effectively no industrial development in this area at present.

Monitoring Objectives: Originally intended to check on contaminating discharge from planned gas refinery plant and to provide baseline before development.

Production: n.a.

Quality: Relatively high salinity. A typical example is RN 13481 showing a TDS of 6700 mg/l in 1983.

Water levels: No significant changes visible on records as shown on Figure 8.

Conclusions: Not a potable water resource. None of the observations to date is of any particular significance.

Recommendation: Review monitoring objectives and the entire program.
Figure 8

Water Levels Brewer Estate

Location of Monitoring Bores
4.2.2 Commonage

Description: Shallow alluvial basin south of Heavitree Gap and to the west of the Todd River. A paleochannel west of the current Todd river bed conducts discharge from the Town Basin aquifer through Blatherskite Gap. The remainder of the Commonage contains minor alluvial aquifers which form a mainly closed system (report 02/91 K.Berry) with occasional flushing eastward after heavy rains. Contains rubbish tip and sewerage lagoons. No current production bores and 44 monitoring bores.

Monitoring Objectives: Were set out most recently in report 02/91 by K.Berry as to observe effects of irrigation, discharge to Ilparpa swamp, seepage from refuse dump, outflow from town basin and to establish overall water movement patterns. Water quality sampling was recommended for 21 bores at annual intervals.

Production: n.a.

Quality: TDS values are highly variable but remaining well above limits for potable water. Detailed analyses intended to allow tracing of water movements.

Water levels: Water levels do show noticeable responses to the processes they are intended to monitor. Figure 9A shows traces from 3 bores in the eastern part of the area close to the Todd river. RN 3597 shows a strong rise between 1972 and 1976 in response to recharge probably from the Todd river. Figure 9B shows the traces of two bores in the western part probably affected by the sewerage lagoons and irrigation.

Conclusion: Quality analyses and water level measurements are producing data meeting the specified monitoring objectives.

Recommendation: Continue monitoring as recommended in report 02/91.
Figure 9 A

Water Levels Commonage

Location of Monitoring Bores
Figure 9 B

Water Levels Commonage

Location of Monitoring Bores
4.2.3 Emily Creek

Description: Mostly weathered Jessie Gap Gneiss and Emily Gap Schist with outcrops of Heavitree Quartzite but containing a shallow alluvial and colluvial basin consisting of detritus from the Arunta Block located around Emily Creek north of Emily Gap. No current development but targeted for possible urban expansion of Alice Springs. Contains 13 monitoring bores. Hydrology of the area is discussed in report 24/84 (McDonald and O'Brien).

Monitoring Objectives: Provide baseline data to monitor effects of urban development.

Production: n.a.

Quality: TDS values range from 1800 to 8500 mg/l with a median around 2500 mg/l. Not a potable resource.

Water levels: Declining at a slight rate averaging approximately 10 cm/year with superimposed variations due to seasonal effects. Six of the monitoring bores are currently dry. Representative water level traces are shown on Figure 3.

Conclusions: Monitoring objective may no longer be of immediate concern since urban expansion into the area is not likely in the near future and baseline data have been collected.

Recommendation: Discontinue monitoring of the dry bores. Consider reduction in frequency of readings for the others. No further quality sampling is required at this time.
Figure 10

Water Levels Emily Plain

Location of Monitoring Bores
4.2.4 Farms Area

Description: Low slopes, alluvial flats and alluvial channels surrounding the banks of the Todd River south of Heavitree Gap and east of the Commonage. Contains a significant number of rural subdivisions. Small local water supplies were used extensively in the past but recently most water has been imported by pipeline from the Alice Springs town supply. Groundwater quality is variable with some usable for limited irrigation some too saline (3000 mg/l) for human consumption. Report 55.1/R16 (Cameron, McNamara 1986) discusses aspects of water availability and use and also warns of the danger of salt mobilisation in the lower slopes and alluvial flats. Any irrigation activities must hence be carefully managed.

Monitoring objectives: Effects of pumping from local supplies, effects of irrigation, and broader variations of potential impact to recharge at the proposed Rocky Hill well field.

Production: No data available in monitoring section.

Quality: TDS highly variable and ranging from 600 to 3000 mg/l. No discernible patterns except for recharge effect from Todd river.

Water levels: As shown on Figure 11 water levels exhibit seasonal effects and variations caused by pumping cycles superimposed on a gradual decline in water levels mostly between 0.2 and 0.3 metres/year.

Conclusions: Is only a minor local resource but because of its strategic position adjoining important aquifer zones for the Alice Springs town supply requires continued monitoring of water levels and quality variations. However a reduction in the number of bores monitored might be considered.

Recommendation: A review of monitoring bores density is appropriate as is a review of the frequency of readings required.
Figure 11

Water Levels Farms Area

Location of Monitoring Bores
4.2.5 Old South Road

Description: The 27 monitoring bores are located in an area also referred to as the 'Aerodrome Area'. This area is between the current bore field (Roe Creek) and another area called 'Rocky Hill' earmarked for future expansion of the Alice Springs water supply. The bores penetrate the same formations as production bores in the Roe Creek field and as future production bores in Rocky Hill. Report 03/79A by J. Verhoeven originally proposed monitoring in this area. Unlike bores inside of a wellfield (e.g. Roe Creek) these bores are not strongly affected by short term variations in pumping and are suitable to show changes of a regional scale.

Monitoring objectives: Provide continuity of coverage between existing and proposed well field. Provide data on water levels showing the regional effects of water abstraction from nearby wellfields and natural changes.

Production: Insignificant at present (isolated stock bores).

Quality: Initial TDS values were all between 500 and 800 mg/l closely resembling water from the Roe Creek field. No subsequent samples were taken.

Levels: Water level traces from 4 monitoring bores are shown on Figure 12. Patterns are consistent with expectations: RN 3602 is the closest to Roe Creek well field and shows the strongest decline in water levels. The rate of decline is still growing. RN 11491 occupies a position in the middle and RN 4693 which is the furthest from Roe Creek is declining slowly and almost in a straight line. RN 4458 which is located to the North East is in a different formation. Water levels there have been rising until recently.

Conclusions: Most bores show the effect of pumping with gradients still increasing. There appear to be little or no seasonal effects. Results could be obtained with readings taken less frequently.

Recommendation: Review frequency of readings for water levels. Consider program of occasional sampling.
Figure 12

Water Levels Old South Road

Location of Monitoring Bores
4.2.6 Pine Gap

Description: Part of the Amadeus Basin west of Roe Creek well field. Two production bores (RN 14520, 14522) supply the Joint Defences Space Research Facility. They tap the same aquifer sequence as the Roe Creek field. Originally there were 6 monitoring bores. Of these 2 are still being monitored by JDSR facility staff.

Monitoring Objectives: Monitor drawdown effects and recharge effects if any. Monitor changes in water quality due to interaction of pumping effect with natural flow patterns.

Production: Production as reported by JDSR staff was 223 Megalitres during 1991/92.

Quality: Water quality closely resembles water for Roe Creek and Old South Road varying typically between 600 and 700 mg/l TDS. Last analysis was 1986.

Levels: Water levels have been declining at a rate of 1.9 metres/year. A sharply delineated trough between 1990 to 1991 was due to a temporary variation in extraction rates by appr. 15%. Water level traces for the two bores still being monitored are shown on Figure 13.

Conclusions: Drawdowns are continuing at a steady rate in accordance with expected behaviour.

Recommendations: Continue current monitoring observations.
Figure 13

Water Levels Pine Gap

Location of Monitoring Bores
4.2.7 Rocky Hill

Description: Part of the Amadeus Basin adjoining Roe Creek and Old South Road to the east. Bores have been drilled into the same sequence as at Roe Creek (see description of Roe Creek for details). At Rocky Hill however the dip of formations is shallower (estimated 10 deg. report 03/79A, J. Verhoeven) and consequently the effective width of the aquifers is substantially more. Also the aquifer sequence appears to be thicker. As a water source it is expected to have a higher production capacity than Roe Creek. It has been earmarked for supplying Alice Springs in the future. 23 bores are being monitored.

Monitoring objectives: Provide information on effects if any of pumping at Roe Creek. Provide baseline data prior to development as production well field.

Production: Insignificant at present (stock bores).

Quality: TDS values are slightly higher than Roe Creek but very similar overall and vary between 500 and 800 mg/l. Some outlying monitoring bores (e.g. RN10722) tap higher salinity fringe waters.

Water Levels: Water levels show a strong response to the processes being monitored. Figure 14 A shows the water level traces for four bores from 1976 to 1992. Figure 14 B shows straight line best fits for the same bores for the last five years. Bore RN11113 which is located in the Todd River floodout shows a rise of approximately 4 metres between 1976 and 1988 with a particularly sharp rise in 1983 which very likely is due to direct recharge as a result of flooding in the Todd River. During the last five years water levels have been falling at almost constant but not uniform rates. RN 4748 which is closest to the Roe Creek borefield fell at a rate of 0.3 metres p.a., bores RN 11152 and RN 11184 which are in the centre and the south eastern end of the well field and appear to be closely coupled (level traces coincide almost totally) fell by an average of 0.08 metres p.a.

Conclusions: The current spread of monitoring bores appears to provide a sufficient set of data to meet the monitoring objectives and also shows evidence of recharge from the Todd River.

Recommendations: Maintain existing monitoring program as is.
Figure 14A

Water Levels Rocky Hill

Location of Monitoring Bores
Figure 14B

Water Levels Rocky Hill

Location of Monitoring Bores
4.2.8 Roe Creek

Description: The Roe Creek well field currently supplies all of the water for the Alice Springs water supply. It took over from the Town Basin as the supply source during the period from 1966 to 1971. Bores are drilled into sedimentary rocks of the Amadeus Basin which extends over a significant area of Central Australia. The major aquifers are within the Mereenie Sandstone and the Pacoota Sandstone formations. Contributions from other formations of the sequence by leakage have not as yet been established as significant.

The sandstone beds are dipping towards the synclinal axis in south. The angle of dip varies but is around 30 degrees around the borefield centre. Updip flows within the aquifers could be expected but have not been demonstrated at this stage.

The production bores are numbered up to P27 at present but not all of the production bores are still in use and some are pumped only intermittently. There are 49 monitoring bores in the area.

The first report on the bore field development is 04/64 (Eggington). Several subsequent reports deal with the well field. A modelling study of the well field has been reported by Jolly, Prowse, Chin in a number of papers, e.g. to Conference on Groundwater in Large Sedimentary Basins, Perth 1990 (Alice Springs library No. 0565).

Monitoring objectives: Monitor drawdown effects from pumping, movement of water into (recharge), through and between aquifers. Monitor quality variations as a result of intra aquifer movements of water. Several aquifers have to be monitored including Mereenie Sandstone, Pacoota Sandstone and the Shannon Formation.

Production: Annual production has risen from about 2500 Megalitres initially to a peak of 12,400 in 1985/86 and continuing at an almost stable level of around 10,500 Megalitres during recent years. There also has been a shift in production emphasis from the eastern to the western part of the well field and recently (since 1984) up to 25 % of the production was obtained from bores in the Pacoota and Shannon
formation just north of the original well field.

**Quality:** Quality of the pumped water depends on the mix of the bores pumped and has typically been in the range of 450 to 550 mg/l. Some samples from some monitoring bores showed up to 700 mg/l TDS.

**Water levels:** Figure 15 A shows water levels versus time from three monitoring bores running in a line from west to east at the southern edge of the well field. A flattening in the slopes has become progressively more evident. Without doubt a significant part of the flattening is due to a change in the pumping distribution, however there appears an indication that the flattening is more than what can be attributed to this effect alone, in particular it appears to go further back in time than the shift in pumping. This effect is currently under investigation.

Figure 15 B shows the levels from three monitoring bores running in a north/south line through the centre of the well field. RN 12792 which is the most northern bore in this group is apparently responding to a recently commissioned production bore pumping from the Paddock. RN 11406 in the centre is highly affected by variations in pumping. RN 4694 on the southern extreme represents a different layer in the sequence above the main aquifer and shows a steady decline.

**Conclusions:** Significant variations in water levels trends have been recorded by the monitoring network which are subject to more detailed analysis. The current monitoring program obviously supplies important information affecting the future performance of the well field.

**Recommendations:** Maintain existing network density and layout at least until ongoing investigations into observed changes in trends have been completed.
Figure 15A

Water Levels Roe Creek

Location of Monitoring Bores
Figure 15B

Water Levels Roe Creek

Location of Monitoring Bores
4.2.9 Town Basin

Description: The Town Basin is the original source of town water for Alice Springs. Its development as a public supply started between 1930 and 1940. It was supplemented from Roe Creek starting in 1964 and since 1969 water from the town basin was used for irrigation only.

As a water source it consists of Quaternary alluvium on either side of the Todd river up to 30 m deep and like most lenticular alluvial deposits it is highly variable in permeability and also water quality.

Recharge is thought to derive mostly from streambed infiltration from the Todd river. Even though the basin proper extends only over about 6 km² as a system it must be considered in conjunction with shallow colluvial and weathered bedrock groundwater zones adjoining the basin.

Monitoring activities have fluctuated over the years. Few readings are available for the period following cessation of pumping for town water in 1969 until 1976. However more recently it has been recognised that the basin requires careful management to avoid degradation. Several recent studies some including modelling have been carried out and there is a high continuing demand for good quality data for this purpose.

Recent reports on the Town Basin are by Evans (14/92) and Berry (09/92)

Monitoring Objectives: Provide data on water level changes and water chemistry for the continued management of the basin. Data should remain sufficiently extensive to support modelling activities required for this management.

Production: Total production from the Town Basin peaked at 1185 ML/Annum in 1962/63, fell to a low of 119 ML in 1971/72 and rose steeply in 1985 to above 600 ML in 1990/91.

Quality: Water quality is highly variable both in time and space. Town water pumped up to 1971 was around 370 mg/l. Further away from the source of recharge (Todd river) the...
salinity increases to reach brackish proportions close to the edges.

**Water levels:** Figure 16 shows the traces from three monitoring bores. They show consistent patterns corresponding to pumping and recharge variations and also the decline in levels from upstream to downstream. The bore numbers starting upstream (i.e. the uppermost trace on the graph) are: RN 5017, 5817 and 13914. The effects of the reduction in pumping from 1964 and the recharge during wet periods around 1973 are clearly shown.

**Conclusions:** Meaningful data have been collected. Basin management and associated modelling continues to require these data for the foreseeable future.

**Recommendations:** In view of some shortcomings in data collections identified by recent studies the scope of monitoring should be systematically examined for its adequacy to support the required modelling studies.
Figure 16

Water Levels Town Basin

Location of Monitoring Bores
4.3 Ali Curung (Warrabri)

Description: Water supply for the Ali Curung Community approximately 300 km north of Alice Springs. There are 2 production bores (RN 5788, 10744) and 2 monitoring bores. Aquifers are calcrete and sandstone classified as Cainozoic with highly variable Transmissivity and semiconfined Storativity. Recharge after heavy rain is believed to be related to the runoff resulting from the rain. Water quality samples taken from bores in the area have ranged from 400 to 3800 mg/l. Both Nitrate levels and Fluoride levels are of concern. A report by Verhoeven and Reid (04/79) describes the supply and recommended the current monitoring program.

Monitoring objectives: Monitor effects of pumping in terms of water levels and quality.

Production: Estimated production for 1991 was 220 Megalitres.

Quality: TDS is relatively high ranging from 930 to 1020 mg/l. Nitrate levels are also high (90 mg/l). No significant change over time has been observed to date.

Water levels: Levels from both monitoring bores plot directly on top of each other. Both traces as shown on Figure 17 show a steep rise in 1976 followed by an exponential decline. The shape is that of a classical hydrograph. The event has been linked to substantial recharge during an extremely wet period from 1975 to 1978.

Conclusions: Current frequency of readings is appropriate in view of the time scale of observed variations. Monitoring only one of the bores would have produced the same result as monitoring 2 virtually identical traces.

Recommendations: Maintain monitoring frequency. Consider reading only one of the monitoring bores in future.
Figure 17

Water Levels Warrabri

Location of Monitoring Bores
4.4 Alpurrurulam (Lake Nash)

Description: Alpurrurulam is a community 650 km north-east of Alice Springs close to the Queensland border. Two production bores RN 13831 and RN 13833 are capable of producing a total of 5.5 l/s from a Tertiary limestone/dolomite aquifer. According to a resource report 08/92 (I. Matthews) the extraction is insignificant in comparison to available storage. Current production is in the order of 40 Megalitres/year but could be more than doubled if bores are equipped as recommended. Quality is acceptable at around 930 mg/l with a marginal Fluoride content of 1.7 mg/l.

Production: 1991 annual production was estimated as 55 Megalitres.

Monitoring: No monitoring of water levels has been carried out to date nor has any been recommended. Monitoring of water quality should be considered in future programs. Cased observation bores are available for monitoring if needed.

4.5 Amoonguna

No current monitoring program. Supplied from Alice Springs town water.
4.6 Amperlatwatye

**Description:** A community located on the Amaroo pastoral lease 345 km north-east of Alice Springs. Two production bores RN 11454 and RN 11455 are capable of a total production of 6.5 l/s. Water is obtained from sedimentary rocks belonging to the Hagan Member of the Chabalowe Formation in the Georgina Basin. According to the recent resource report 36/91 (I. Matthews) the aquifer is extensive with storage well in excess of what is needed to maintain the current water supply. Water quality has remained consistent at around 1000 mg/l to date.

**Production:** The estimated production for 1991 was 20 Megalitres.

**Monitoring:** There are no expected problems concerning quantity or quality of the resource at current or anticipated usage levels. No monitoring program has been requested for this supply.
4.7 Areyonga

**Description:** 5 bores (RN 2830, 10744, 291, 52, 5741) are equipped to supply the Areyonga Community appr. 200 km west of Alice Springs. Aquifers intersected include Hermannsburg sandstone and Parke siltstone belonging to the Pernjara Group and the Bitter Springs Formation. The source is described in a report by R. Reinhard (02/76). 5 monitoring bores are maintained in the area.

**Monitoring objectives:** Monitor drawdown effects from pumping and recharge effects if any.

**Production:** Production according to values supplied by AES was 61 Megalitres for 1991.

**Quality:** Main production bores have an almost steady TDS value of about 470 mg/l. One supplementary bore used for filling a swimming hole is sourced in the Bitter Springs Formation and has a TDS of 1940 mg/l.

**Water Levels:** As Figure 18 shows there appears to be no overall trend in water levels however effects of pumping cycles are obvious. During the last monitoring visit 3 out of 4 monitoring bores were dry.

**Conclusions:** No significant variations have been recorded to date.

**Recommendations:** Unless monitoring objectives are to be changed a review should determine whether monitoring is to continue.
Figure 18

Water Levels Areyonga

Location of Monitoring Bores
4.8 Atitiere (Harts Range)

Description: This community is located along the Plenty Highway about 170 km north-east of Alice Springs. Cainozoic paleo-channels are believed to be recharged by runoff from the Harts Ranges to the south. Three production bores RN 1868, RN 11674 and RN 13995 are pumped producing water in a range between 480 and 970 mg/l TDS. Water levels have been reported to be fluctuating probably in response to recharge, however no monitoring data are available. A resource report (J. Wischusen) is currently in preparation.

Production: About 44 Megalitres has been produced from these bores during 1991.

Monitoring: Drilling of two monitoring bores has been recommended and is expected during 1993.
4.9 Canteen Creek (Orwaitila)

Description: Orwaitila is an aboriginal community 180 km south-east of Tennant Creek. There are a total of three production bores: RN 11452, RN 11453, and RN 15639. According to a resource report 67/90 (J.Wischusen) the bores are thought to tap an aquifer of structurally altered arenite associated with the Kuringa Basalt. The extent of the aquifer depends on the role the structural alteration has played in controlling permeability of the basalt. It is expected that the resource is sustainable at current rates of use.

Production: No production figures are available at present.

Monitoring: This supply is not being monitored at present. Annual measurement of water levels has been recommended in report 67/90.
4.10 Engawala (Alcoota)

Description: Engawala is a community on the Alcoota pastoral lease 150 km north-east of Alice Springs. Originally two production bores RN 11363 and RN 11367 were supplemented by a third one RN 16138 in 1991. All three bores tap the same fracture zone in gneiss of the Arunta Complex according to report 41/91 (I. Matthews). Water which was unacceptable when drilling commenced has improved to acceptable since then (900 - 1000 mg/l).

Another fracture zone to the north is expected to provide a supplementary resource if needed. However the currently used source is expected to be sufficient at current rates of extraction.

Production: In 1991 production was estimated as 4 Megalitres but is expected to rise to about 6 Megalitres/year as a result of a planned tree planting program.

Monitoring: Engawala is not included in the monitoring program at present. However water quality sampling has been recommended at six monthly intervals.
4.11 Finke

Description: Finke is approximately 150 km east of Kulgera and was a railway town until the Ghan Railway was realigned in 1980. Now the water supply serves a medium sized aboriginal community. Until recently two bores RN 4236 (P5) and RN 10982 (P6) were the only active town supply bores tapping the Mooray Sandstone of the Eromanga Basin (belongs to Great Artesian Basin) - see report 57/90 (K.Berry). Water quality is good but sand incursion into production bores has been a recurring problem.

Recently RN 15900 was completed as a new screened production bore which is expected to be free of sanding problems (T.Matthews 1993).

Recharge is thought to occur throughout the substantial outcrop area and is probably well in excess of requirements.

Production: Production was about 65 Megalitres during 1991.

Monitoring: The resource appears to be sustainable in quantity and quality and no requirement for monitoring has been identified.
4.12 Gilbert Springs

Description: A small supply comprising two production bores (RN 11439, 11343) for a small community near Hermannsburg. The bores obtain water from sandstone (probably Hermannsburg sandstone). No resource report is available for this supply. There are 2 monitoring bores in the area.

Monitoring objectives: Apart from monitoring the effects of local pumping the monitoring bores are part of the network operated for maintaining baseline data for the Amadeus Basin.

Production: Production for 1991 was estimated at 5 Megalitres.

Quality: Production bore RN 11439 had a TDS of 465 mg/l and RN 11343 a TDS of 765 mg/l with little variation over time.

Water Levels: There are too few readings for analysis at present.

Conclusions: Very short record. Insufficient data for any conclusions.

Recommendations: No reasons for change.
4.13 Hermannsburg

**Description:** Supply for the Hermannsburg Community 130 km west of Alice Springs. 5 production bores tap fractures in the Hermannsburg Sandstone. The supply is good but production from each bore is limited by the relatively low permeability of the sandstone. Well losses in the bores are also high (50%). Water levels observed so far have been interpreted as indicating a supply where abstraction is matched by recharge most likely from infiltration in outcrop areas approximately 2 km south of the bore field. The most recent resource report is 20/90 (J. Childs). There are 2 monitoring bores in the area.

**Monitoring objectives:** Monitor effect of extraction on water levels.

**Production:** During 1991 approximately 170 Megalitres.

**Quality:** Water chemistry is stable. TDS values for different bores vary from 400 to 800 mg/l.

**Water levels:** The long term trend of water levels appears to be flat however seasonal variations show up strongly with water level 'waves' of close to 5 metres (see Figure 19).

**Conclusions:** Monitoring program is bare minimum at present. Additional water level information would be useful.

**Recommendations:** Consider establishing additional monitoring bores for water level measurements.
Figure 19

Water Levels Hermannsburg

Location of Monitoring Bores
4.14 Ikuntji (Haasts Bluff)

Description: Community supply 270 km west of Alice Springs. Three production bores (RN 15604, 10935, 10369) are drilled into the Arumbera Sandstone which outcrops in a ridge to the north of the bore field. The bores have good capacity but the formation tends to produce excessive suspended solids at high pumping rates. Salinity increases strongly towards the east and likely also with depth. Recharge has been attributed to a nearby creek however no estimate of its amount is available. Report 46/90 (R. Northey) described the supply and recommended a monitoring program. As per recommendation monitoring commenced in 2 bores in 1992.

Monitoring objectives: Monitor effects of abstraction on aquifer and possible recharge effects.


Quality: TDS values ranged from 1100 to 1300 mg/l in 1989/89.

Water levels: Insufficient data for analysis.

Conclusions: Insufficient data at this time.

Recommendations: Insufficient data at this time.
4.15 Imanpa

Description: Community water supply 300 km south west of Alice Springs and adjoining Lasseter Highway. A range of water sources has been identified ranging from potable to not potable tapping beds in a syncline south of Basedow Range. The potable water is obtained from a narrow contact zone between the Winnall Beds and the Stairway Sandstone. The only current production bore (RN 15142) obtains water from there. It is unclear at present whether abstractions are sustainable at or near current rates. 11 monitoring bores have been observed since 1990, however some of them originally terminated in the wrong formation. A comprehensive resource report 19/90 (E.Rooke) also proposed the current monitoring program.

Monitoring objectives: Monitor effects of extraction on water levels, changes in water quality, and effects of recharge.


Quality: TDS from production bore was 785 mg/l in 1988. Other bores have been sampled with TDS up to 9000 mg/l.

Water levels: Four monitoring level traces are show on Figure 20. The record is too short to allow for any significant trends to be established. The apparent sudden drop for RN15572 is not a real drop but a data discontinuity. This bore originally monitored the wrong formation. The bore construction was altered in 1991 to correct this situation.

Conclusions: Insufficient data at present.

Recommendations: Insufficient data at present.
Figure 20

Water Levels Imampa

Location of Monitoring Bores
4.16 Ivupataka (Jay Creek)

Description: Ivupataka is a small community west of Alice Springs. Originally it was supplied from bores drawing from alluvial aquifers. These proved to be of volatile quality and were abandoned as inadequate. Now the supply is drawn from 4 production bores (RN 10504, 10506, 10685, 11751). One bore taps the Jay Creek limestone the others the Arumbera sandstone. Water quality is variable within acceptable limits. There are 7 monitoring bores in the area. The most recent resource report is 06/79 (R.Read).

Monitoring objectives: Monitor the effect of pumping and recharge, observe water quality changes.

Production: According to figures from AES 9 Megalitres were pumped during 1991.

Quality: TDS ranges from 700 to 1600 mg/l for the bores tapping the sandstone and 700 to 1450 mg/l for the bore tapping the limestone aquifer.

Water levels: The measured levels for RN10505 and 10684 show clear effects of pumping cycles and recharge effects interacting (Figure 21). The other two bores RN10574 and 11747 show recharge prior to 1977 and then a steady slow decline.

Conclusions: Water levels are adequately monitored. Continued attention is required to monitor changes in water quality.

Recommendations: No change in water level monitoring is recommended. Increased sampling for water quality should be considered.
Figure 21

Water Levels Iwupataka

Location of Monitoring Bores
4.17 Kaltukajara (Docker River)

Description: 3 production bores (RN 6344, 10391, 10430) supply this community 720 km SW of Alice Springs at the border with Western Australia. Water is obtained from tertiary alluvial deposits which were mapped by drilling and geophysics (Report 07/70 Baybrook). A subsequent drilling report by A. Baker (23/71) is not available in the Alice Springs library. There are 10 monitoring bores in the area.

Monitoring objectives: Monitor the effects of pumping and recharge on water levels.

Production: The reported production for 1991 was 90 Megalitres.

Quality: Water quality is good and consistent. 485 mg/l is a typical value for TDS.

Water levels: A significant recharge event occurred up to 1977. From then on water levels as shown on Figure 22 are essentially flat except for the cyclical effects of pumping shown strongly on the trace for RN 10389.

Conclusions: This is a good quality resource and appears to be sustainable at current rates of extraction.

Recommendations: Review density of monitoring program for this area.
Figure 22

Water Levels Docker River

Location of Monitoring Bores
4.18 Kings Canyon

Description: Kings Canyon was developed as a tourist resort in 1991. Water sources had previously been identified in a number of the sandstone formations which occur in the area and are part of the Amadeus Basin. Practical considerations of access and environmental considerations excluded some of the sources however. Two production bores were drilled obtaining reasonable quality water from the Pacoota Sandstone (RN 15104, 15106).

According to the preceding resource investigation (report 32/86) by McDonald et al. it must be assumed in the absence of other information that recharge is insignificant and that abstraction is from storage.

The completion report for the production bores (17/89) by J. Childs does not make any specific predictions as to future drawdowns but states that pumping rates of 20 l/s and 15 l/s respectively are expected to be sustainable for the life of the resort. Monitoring of water levels and of water quality is recommended at six monthly intervals.

Monitoring objectives: Monitor performance of supply and its effect on water levels and quality.

Production: The reported production for 1991 was 140 Megalitres.

Quality: The TDS measured during 1991 were 875 and 835 mg/l respectively for the two production bores.

Water levels: Insufficient data to establish any trends.

Conclusions: Insufficient data at this time.

Recommendations: Continue monitoring as recommended in above report.
4.19 Kintore (Wulungurru)

Description: Community supply 415 km W of Alice Springs. Precambrian basalt underlies the Heavitree Quartzite south east of Kintore. Drilling, pump testing and surveying of elevations identified a flow of potable water in fractures of the basalt through a gap in the Watertank Ridge estimated as 340 m3/day (report 51/90) by J. Wischusen. Evidence of recharge from flooding of the local creeks has been found in water level changes in 1989. The throughflow quoted above was calculated from water levels after this recharge event.

The throughflow estimated from the 1989 data was higher than the recommended water abstraction. Since then however water levels have fallen substantially and it is now considered likely that the figure for 1989 is not representative of long term throughflow. The management of the borefield may require corresponding adjustments.

Monitoring was recommended to confirm the estimates of throughflow and to capture any future recharge events for more detailed analysis.

The current bore field consists of two production bores (RN 13804, 13485). There are 23 monitoring bores in the area.

Monitoring objectives: Monitor drawdown effects, recharge if any, and any quality variations.

Production: According to a recent AES figures 110 Megalitres were pumped during 1991. The recommended extraction is 87 Megalitres.

Quality: Overall quality appears to be good (700 mg/l TDS) except for a marginal level of Nitrate (57 mg/l).

Water levels: The water level record is still short but shows a decline in water levels as expected for a relatively new well field. 4 representative water level traces are shown in Figure 23.

Conclusions: Cone of depression is still expanding, i.e. no equilibrium condition has been reached.
Recommendations: Continue existing program until recommended review in 1995.
Figure 23

Water Levels Kintore

Location of Monitoring Bores
4.20 Laramba (Napperby)

Description: Community supply 206 km NW of Alice Springs. The aquifers are sandstone and silcrete which are part of a tertiary basin sequence. Report 18/82 (G.Knott) describes the aquifers and their setting. Groundwater flow patterns derived from static water levels suggested recharge centred around the "Patty Well" area. The magnitude of this recharge could not be established from the available data.

1 production bores described in the above report is in use (RN 13213) as is a new standby bore (RN 15890) described in report 56/90 (E.Rooke).

Monitoring objectives: Monitor effects of pumping and recharge on water levels.


Quality: Little change during the period 1981 - 1988. TDS ranged from 990 to 1130 mg/l.

Water levels: Insufficient data for time series analysis.

Conclusions: Insufficient data at this time.

Recommendations: Maintain current program.
4.21 Mount Liebig

**Description:** Community 260km WNW of Alice Springs. The aquifers tapped by the 3 production bores (RN 11171, 15740, 15764) are weakly cemented sandstone, granule conglomerates, and bands of silcrete believed to be of tertiary age. They are covered by a quaternary alluvial fan material conducting recharge waters from Berry Pass Creek. The quantity of recharge appears to be significant but requires further data for confirmation. The relatively small aquifer volume available to the production bores limits the practical extraction rates to well below the combined bore capacity. The resource and bore field capacity was investigated in report 47/90 (E.Rooke). According to the recommendations 5 bores were included in the monitoring program.

**Monitoring objectives:** Monitor effects of pumping and recharge.

**Production:** According to AES figures 60 Megalitres was pumped during 1991.

**Quality:** Water quality appears to be good with TDS ranging from 600 to 700 mg/l in 1990.

**Water levels:** The record is still short. Levels are steady so far (Figure 23).

**Conclusions:** Too early for conclusions.

**Recommendations:** Continue following existing monitoring program.
4.22 Mutitjulu (Ayers Rock)

Description: Supply for community and for National Park ranger settlement 445 km SW of Alice Springs. At least two aquifers have been defined (report 09/79, P.Jolly): Cainozoic sediments connected with siltstones and dolomites of the Pinyinna Beds and unconnected Cainozoic sediments. Recharge is believed to be associated with a fault zone south of Ayers Rock and some direct infiltration. It is limited to areas close to outcrop of the Arkose beds (Ayers Rock). Water quality is variable depending on aquifer and depth. Nitrate is a significant problem in some areas. There are records of 2 production bores (RN 11605, 11827) and 26 monitoring bores.

Monitoring objectives: Monitor effects of abstraction, collect information on recharge cycles in desert environment.

Production: 40 Megalitres during 1991/92.

Quality: Nitrate is not a problem in the 2 production bores according to current standards. TDS values ranged from 640 to 890 mg/l.

Water levels: traces on Figure 25 appear to indicate at least two recharge periods. There is no evidence of a consistent overall trend. Several of the 26 monitoring bores essentially duplicate information from other bores.

Conclusions: Resource sustainable at current rates of extraction. Number of observation bores monitored is probably in excess of requirement.

Recommendations: Maintain existing frequency of readings. Review number of bores included in program.
Figure 25

Water Levels Uluru (Ayer’s Rock)

Location of Monitoring Bores

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4.23 Nturiya (Ti Tree Station)

Description: A small community near Ti-Tree Station on the banks of the Hanson River west of Ti-Tree town obtains its water from two wells RN 2449 and RN 2450 tapping fractured rock. One of the wells has been converted to a secure sanitary construction by filling it with screen, gravelpack and sealing the top. The other is to be converted similarly during 1993.

Water availability and water quality is highly variable apparently in response to recharge from the Hanson river. TDS values have been recorded in the range between 1000 and 2700 mg/l. A maximum continuous pumping rate of 1.5 l/s has been recommended (report 20/91, Childs and Miller). No data available in monitoring section.

Production: Reported production for 1991 was 20 Megalitres.

Monitoring: Nturiya is not on the current monitoring program.
4.24 Nyirripi

Description: Community water supply 460 km NW of Alice Springs. 2 production bores (RN 15472, 15011) tap unconsolidated, probably fluval Cainozoic sediments. Brackish water occurs to the south increasing with depth. Previous production bores suffered from quality degradation. According to report 04/90 (R. Northey) recharge of fresher water from the north is probably insufficient to cover extraction and a deterioration of water quality in time from the new bores can be expected. The current monitoring is as recommended in report 04/90 and includes 6 monitoring bores.

Monitoring objectives: Monitor effects of pumping and recharge and observe any quality changes.

Production: According to AES production was appr. 45 Megalitres during 1991/92.

Quality: Previous production bores (e.g. RN 11386) had deteriorated in quality when pumped. Current bore RN 15472 had a TDS of 585 mg/l in 1990 and 630 mg/l in 1991.

Water levels: Some water levels are shown on Figure 36. However the record is too short to indicate any trends.

Conclusions: Resource appears to be sufficient in terms of quantity but quality could become a problem.

Recommendations: Maintain water level readings and sampling as is.
Figure 26

Water Levels Nyirripi

Location of Monitoring Bores
4.35 Papunya

**Description:** Community 250 km NW of Alice Springs. 5 production bores (RN 7, 1874, 5754, 10063, 10901) tap Tertiary and Quaternary alluvial sediments in a valley system eroded into Precambrian basement rocks. The basin is approximately 100 m deep at its centre. The most recent review is report 42/85 (Water Resources Division). According to this report the well field can be considered stable at current extraction rates. There are 9 monitoring bores in the area.

**Monitoring objectives:** Monitor effects of pumping and recharge.

**Production:** According to AES production was approximately 120 Megalitres during 1991.

**Quality:** TDS values for production bores have ranged from 800 to 1380 mg/l with no consistent trend over time.

**Water levels:** Water levels in observation bores are virtually constant (Figure 27).

**Conclusions:** Resource appears sustainable at current rates of extraction.

**Recommendations:** Review current monitoring program.
Figure 27

Water Levels Papunya

Location of Monitoring Bores
4.26 Pmara Jutunta

**Description:** Combined town water supply for Ti-Tree and community water supply for Pmara Jutunta located 10 km south of Ti-Tree township on the eastern side of the Stuart Highway. RN 10676 (P1) and RN 10674 (P2) are the main production bores. High Nitrate content is a problem in some bores in the area but not in these production bores. The alluvial aquifers providing this supply belong to the same system (basin) as aquifers around Ti-Tree town and the Ti-Tree Farms area west of the Stuart Highway. The most recent review of the resource can be found in Report 02/77 (C.Reinhard).

**Monitoring Objectives:** Monitor effects of drawdown and recharge. Monitor potential inflow of poorer quality water from surrounding aquifers due to drawdowns.

**Production:** Production at the well head was 100 Megalitres in 1989/90 and 108 Megalitres during 1990/91.

**Quality Analysis:** (RN 10676)

Water quality from production bores has been fluctuating within a relatively narrow range from 650 to 900 mg/l without exhibiting any consistent trend.

**Water Levels:** Levels from 5 monitoring bores are shown in Figure 28. The lowest trace shows cyclic variations in level caused by the proximity of this bore (RN 10673) to the production bores. All traces show an overall gradual decline of between 7 and 10 cm/year which is slight.

**Conclusions:** The source appears to be more than adequate for current extraction rates.

**Recommendations:** Water levels appear to be duplicated and a sufficient amount of information to meet the monitoring objectives is likely to be obtainable from a lesser number of bores. Review monitoring program.
Figure 28

Water Levels Pnara Jutunta Ti-Tree

Location of Monitoring Bores
4.27 Santa Teresa

Description: Community supply 80 km SE of Alice Springs. 4 production bores (RN 7228, 7920, 14847, 14851) tap a tertiary sedimentary basin of approximately 100 km² containing exceptionally good quality groundwater (report 20/89A, G.Salas). Previous supply problems were probably due to incursion of fine particles clogging the entry zone into the bore. No estimate of recharge is available. There are 9 monitoring bores in the area.

Monitoring objectives: Monitor effects of pumping and recharge on water levels.


Water levels: Water levels close to pumping bore show a declining trend of around 0.1 m/yr with strong influence from pumping cycles (Figure 29). Bores further away (e.g. RN 5775) appear to be unaffected.

Conclusions: Water levels show response to pumping in a definite pattern. There is no apparent evidence of any recharge.

Recommendations: Maintain program as is.
Figure 29

Water Levels Santa Teresa

Location of Monitoring Bores
4.38 Tara (Neutral Junction)

Description: Tara is an aboriginal community near Neutral Junction just north of Barrow Creek. There is only one production bore: RN 14833 tapping a shallow sandstone aquifer. The bore suffered from continuous sanding problems until 1990 when it was reconditioned and screened. Water quality is poor in surrounding areas but adequate from this production bore. Quality variations after rain appear to indicate the effect of recharge. Report 54/90 (R. Northey) describes the reconditioning and subsequent testing of the bore.

Production: No production values available at present.

Monitoring: No data held in monitoring section.
4.29 Tennant Creek

Tennant Creek contains 3 monitoring areas. The first "Cabbage Gum" covers the area of the first town supply well field. A small amount of water is still pumped from there to supplement the new town supply. "Kelly Well" is the name of the current well field. "Tennant Creek West" covers a possible future water supply source to the west of Kelly Well.

4.29.1 Cabbage Gum

**Description:** Originally contained 21 monitoring bores but after recent reviews only 11 are still active. Cabbage Gum was the main supply area until 1968 and is still used as a minor supplement (RN 1736). It is located 25 km S of Tennant Creek town along the western side of the Stuart Highway. Lateritic aquifers probably of Cainozoic age (Verhoeven, report 01/80) supplying this well field are of limited extent. After development started water levels dropped quickly and now only 2 production bores are still in active use, each capable of producing about 3 l/s. See report 50/90 (J.Childs).

**Monitoring objectives:** The original objective was to monitor the main town supply. Now reduced to monitor supplemental minor resource for changes in water level and quality.

**Production:** Metered production was 57 Megalitres during 1989/90

**Quality:** Little changes in quality were observed. A typical value is 540 for RN 1736 in 1987.

**Water levels:** Figure 29 shows a gradual decline up to the end of 1990 followed by a sharp rise at RN 5358 due to recharge. The recharge effect is less pronounced in other bores.

**Conclusions:** Results show a definite recharge effect. Current residual program of reading 11 bores every 6 months appears to be in accordance with the area's current role.

**Recommendations:** Maintain reduced monitoring program as is.

---

Monitoring Overview
4.19.2 Kelly Well

Description: Comprises the well fields known as Kelly Well and Kelly Well West and covers the main water supply area for Tennant Creek. There were 13 production bores in use in 1992 and 59 bores on the monitoring program. The aquifers are sandstones and vugular siltstones, part of a sedimentary sequence possibly of Cambrian age (Verhoeven report 01/80), which fill in old drainage channels overlying granite. Natural groundwater flow drains in a north westerly direction into the Wiso Basin. At current extraction rates the resource may be sustainable although recharge events will have to be observed to confirm this. Recharge is in the form of natural inflow from the south east and as indicated by water level changes already observed from extended periods of flooding. Refer to report 50/90 (J. Childs) for details.

Monitoring objectives: Monitor effects of pumping and recharge. Provide data for well field modelling to manage the resource.

Production: 1800 Megalitres during 1989/90.

Quality: Quality is good and similar throughout the field. A typical example is a TDS of 665 mg/l measured at RN 12604 in 1988.

Water levels: Figure 30 shows traces from 4 of the monitoring bores. 2 recharge events are shown, one in 1976 the other in 1991, as is the gradual decline in levels between the recharge events.

Conclusions: The monitoring objectives are met by the program more than adequately.

Recommendations: Review data density for monitoring program.
Figure 31

Water Levels Kelly Well

Location of Monitoring Bores
4.29.3 Tennant Creek West

Description: Prospective well field area for future Tennant Creek water supply to the West of current well field (Kelly Well). Reports 01/80 and 27/81 (J. Verhoeven) describe the area and recommended original monitoring program. Cambrian sediments which are part of the Wiso Basin are the major aquifers and include sandstone and dolomitic limestone. Water from the dolomites tends to be higher in salinity (up to 3000 mg/l) than that from the sandstones (430 to 1200 mg/l). The monitoring program has recently been scaled back from 36 to 28 bores.

Monitoring objectives: Provide baseline data for future development. Monitor recharge into aquifer related to the Kelly Well field.

Production: n.a.

Quality: Quality on monitoring bores varies according to the formation tapped and ranges from 430 mg/l to 1200 mg/l. 2 exceptional cases occur at the southern border of the monitoring area where TDS values above 10000 mg/l were recorded.

Water levels: 4 water level traces on Figure 31 show a slow decline until a recharge event in 1991. A sharp decline on one trace in 1988 was due to seismic activity.

Conclusions: Recharge events are visible on several traces. Monitoring objectives are met more than adequately.

Recommendations: Maintain monitoring on reduced number of bores.
Figure 32

Water Levels Tennant Creek West

Location of Monitoring Bores
4.30 Territory Grape Farms

Description: TGF is the name given to this area in the data base but it includes much more than the monitoring bores for Territory Grape Farms. The name Pine Hill had been used before and is probably more appropriate. This monitoring area covers the central part of a significant alluvial basin containing good quality water in the Ti-Tree area. The eastern part is covered by the Pmala Jutunma (Ti-Tree) monitoring area, the western by the Ti-Tree Regional monitoring area. TGF contains two agricultural enterprises depending on irrigation: one is Territory Grape Farms the other Central Australian Produce.

Whether the resource is sustainable at current rates of extraction depends on what recharge can be expected during major wet periods. Insufficient observations are available at present to confirm the magnitude of recharge. For details see report 01/90 (P. McDonald). There are 7 production bores in use and 37 monitoring bores.


Production: Production was approximately 870 Megalitres in 1990/91.

Quality: Quality is reasonable for irrigation ranging from TDS of 490 mg/l (RN 14248 in 1985) to 795 mg/l (RN 14702 in 1987) with no definite pattern of change at this stage.

Water levels: As show on Figure 33 all water levels are declining at steady rates mostly between 0.3 and 0.4 m/year. RN 14852 shows the seasonal effects of pumping, RN 13933 which is on the north eastern edge of the area shows a rise in 1991 which most likely was recharge.

Conclusions: Evidence on whether the resource is being mined is inconclusive at present the observed decline may represent regional drainage between recharge events however it appears likely that there is a local mining effect. No consistent
trend in water quality has been established.

**Recommendations:** Review density of monitoring network but maintain frequency of level readings and regular quality sampling.
4.31 Titjikila (Maryvale)

Description: An aboriginal community near Maryvale station and adjoining the Hugh river south of Alice Springs. Three production bores RN 10530, RN 10534, RN 10535 supply the community, RN 4939 supplies the Homestead and school. The aquifer is sandstone belonging to the Pertnjara Group. The available bore capacity was originally developed to allow development of irrigated market gardening and is in excess of current requirements.


Monitoring: Neither water quality nor quantity are of particular concern. No monitoring program has been requested.

Ti-Tree

Ti-Tree township is currently supplied from a borefield at the Jutunta community. See Pmara Jutunta.
4.32 Wallace Rockhole

Description: Three production bores supply this aboriginal community about 100 km west of Alice Springs and just south of Hermannsburg. No resource report is available for this supply. The major production bore is RN 14166 drilled to a total depth of 220 metres in sandstone (drillers log). The supplementary production bores RN 11337 and RN 11449 also tap sandstones obviously belonging to the Amadeus Basin sequence. Water quality is almost constant around 650 mg/l TDS.


Monitoring: No current monitoring program for Wallace Rockhole.
4.23 Willowra

Description: Community 320 km NW of Alice Springs. There are 2 equipped bores (RN 13203, 14101) and 4 monitoring bores in this area. The resource was originally investigated for irrigation on Willowra Station by G.Ride (report 05/68). In that report it is described as an alluvial basin with a safe yield in the order of 1200 Megalitres/year based on a calculation of underflow. A file note (142.1) by D.Paige and C.Garner 1984 reports on the development of the production bores for this supply.

Monitoring objectives: Monitor effects of pumping and recharge.

Production: 90 Megalitres according to ABS during 1991.

Quality: TDS values for the equipped bores were 825 and 745 mg/l respectively during 1986.

Water levels: Water levels are declining at a rate of appr. 0.15 m/year. Effects of pumping cycles on water levels are also noticeable (Figure34).

Conclusions: No evidence of recharge on available record. The falling water levels could represent the exponential decline which would follow a major recharge event (1976?).

Recommendations: Maintain monitoring program as is.
Figure 34

Water Levels Willowra

Location of Monitoring Bores
4.34 Wilora

Description: Aboriginal community 245 km N of Alice Springs. Georgina Basin sediments (Central Mount Stuart Formation) are overlain by Cainozoic and Quaternary sediments. Potable water is restricted to tertiary paleochannels within the Cainozoic sequence. Within the paleochannels water flows towards the south west in line with the topography, indicating recharge from quaternary sediments associated with surface drainage features. Sustainable yield is estimated to be significantly less than extraction. 2 production bores were completed recently - see report 45/91 (E.Rooke).

Production: Production was estimated by AES at 15 Megalitres for 1991.

Monitoring: Monitoring has been recommended and has commenced. No data are available for analysis yet.
4.35 Wutanurrgra (Epenarra)

**Description:** Epenarra is located about 380 km north of Alice Springs. A water supply drawn from 4 production bores supplies an aboriginal community, school and Epenarra homestead. The two recent production bores RN 15315 and RN 15316 are adjoining the school the other two production bores RN 12685 and RN 12696 are 500 metres to the south. The aquifer consists of stringy alluvial deposits recharged from the Frew river (report 12/89, P.Alderson) and is of low permeability where drilled. Water quality is good (< 400 mg/l TDS).

**Production:** No production figures available at present.

**Monitoring:** No monitoring has been requested.
4.36 Yuelamu (Mount Allen)

Description: An Aboriginal community located about 230 km north-west of Alice Springs. The only bore in use to supplement the supply when surface storage is exhausted is RN 10005. However the water from this bore is of very poor quality (about 2100 mg/l). An investigation in 1989 (report 08/90, R.Northey) studied groundwater prospects in the surrounding areas up to 50 km away and concluded that the prospects of locating good quality water of sufficient quantity are negligible and of acceptable quality water poor close to the community. The best prospects appear to be in the sandstones of the Ngalia Basin sequence.

Production: Reported production for 1991 was 20 Megalitres.

Monitoring: No current monitoring program.
Not on monitoring program at present.
4.37 Yuendumu

Description: Major community 310 km NW of Alice Springs. The four current production bores obtain marginal quality water from fractured Kerridy Formation sandstone (RN 4059, 10556, 10660, 10945). This sandstone is of Palaeozoic age and forms part of the upper Ngalia Basin sequence. Recharge has been calculated to be less than 10% of abstractions. The aquifers appear to be bounded at least on three sides and when pumped behave as a closed reservoir system. Salinity increases with depth and towards the south and east. Some brackish water incursion has occurred rendering water from RN 11409 unfit for human consumption. There are 25 monitoring bores in the area. Report 7/91 (K.Berry) describes the resource and predicts a deterioration of quality severely limiting the long term viability of the supply.

Monitoring objectives: Monitor effects of pumping and recharge on water levels. Monitor expected decline in water quality.

Production: Reported as 210 Megalitres during 1991.

Quality: Water quality has declined markedly for most bores e.g. from 1280 mg/l TDS to 1460 mg/l from 1973 to 1989. Only one bore (RN 10566) has not experienced the same rate of decline as yet (TDS 1075 mg/l in 1989).

Water levels: Figure 35 shows levels from four bores, one close to a production bore two more at the edge of the well field. The rate of decline in the centre of the field is stronger than at the edge indicating either a variation in hydraulic parameters or that the cone of depression is still changing. The effect is an increasing gradient from the edges with implication for the possible rates of brackish water incursion.

Conclusions: Resource is apparently being mined. Quality may deteriorate past acceptable limits in near future. Vigilant monitoring is required for this resource.

Recommendations: Review frequency and density of water level monitoring.

Monitoring Overview
readings, maintain sampling program for quality.
Figure 35

Water Levels Yuendumu

Location of Monitoring Bore
4.28 Yulara

Description: Water supply for the Yulara (Ayers Rock) tourist resort village 445 km SW of Alice Springs. The Dune Plains aquifer from which the supply is obtained consists of Cainozoic unconsolidated sediments. Recharge is derived from outcrops of the "Sedimentaries" and Mount Currie Conglomerates and by direct infiltration over the aquifer area. Four production bores are currently in use, two (RN 13363, 13365) close to the village itself and two (RN 10490, 12058) at the south western corner of the well field. The latter two bores produce better quality water. Water quality is marginal overall and water is treated by desalinisation. Three more bores (RN 12455, 12453, 12458) are likely to enter production during 1992/93. The Dune Plains aquifer supplying this field was described in report 09/80 (G. Knott). A comprehensive resource report was prepared by AGC/Woodward Clyde (External report 0601). There are 36 monitoring bores.

Monitoring objectives: Monitor effects of pumping and recharge. Provide data for well field modelling.

Production: 538 Megalitres during 1990.

Quality: Water quality is marginal to unsuitable for human consumption in its raw form due to high TDS and Nitrate. For production bores TDS values range from 1390 to 2280 mg/l.

Water levels: Figure 36 shows evidence of recharge since 1989 and a dip in levels in one bore (RN 10483) due to recent pumping from the SW corner.

Conclusions: Resource is sustainable overall but requires management to avoid local overabstraction.

Recommendations: Maintain existing monitoring network until effects of redistributed pumping have become clear.
Figure 36

Water Levels Yulara

Location of Monitoring Bores
5. Regional Baseline Monitoring Areas

Activities in the three regional base line areas listed below monitor natural processes in currently un- or under-developed significant water resources.

5.1 Amadeus Basin

Description: The Amadeus Basin is the major sedimentary basin in Central Australia. Extensive aquifers have been identified as part of the basin, the most notable being the Mereenie and associated sandstone formations from which the Alice Springs town water supply is drawn. Several monitoring areas described under Alice Springs (e.g. Roe Creek) are part of the Amadeus Basin.

Report 12/82 by A. McQueen, G. Knott set out monitoring objectives for general coverage of the north eastern portion of the basin to:

- provide information for long term development and management of the Alice Springs water supply.
- determine whether areas exist with potential for agricultural development.

Annual measurements were proposed for that purpose.

Production: Major production is for the Alice Springs water supply and dealt with there. Significant abstractions occur at Deep Well and Orange Creek, both for irrigated agriculture. Other abstractions mostly for stock are insignificant.

Quality: Significant variations in quality occur between aquifers and different parts of the basin and no meaningful average can be stated.

Water levels: Water levels are essentially flat away from development areas however at least one bore (RN 13667) which is one of the bores shown on Figure 37 shows evidence of interaction with natural recharge/discharge cycles most likely due to the vicinity of the Hugh River.
Figure 37

Water Levels Amadeus Region

Location of Monitoring Bores
5.2 Dulcie Regional

Description: The Dulcie sandstone outcrops as a syncline in a NW to SE trending belt extending from east of Neutral Junction to near Jervois. It was investigated as a potential water source originally by D. Woolley and reported in BMR record 1965/154. Expected horticultural developments were the reason for the work. A project file (50.2 P1) contains additional information about the original investigations.

Production: No specific information is available on production however some small stock supplies are in use.

Quality: Quality is highly variable according to area. Substantial areas contain good quality water with TDS values measured as low as 290 mg/l.

Water Levels: Records are too short at present to exhibit any trends.
5.3 Ti Tree Regional

Description: This monitoring area covers the eastern portion of the Ti-Tree Basin. The central portion is covered by the TGF and the western portion by the Pmara Jutunta/Ti-Tree monitoring area; both of these areas contain significant water supplies currently in use. The Ti-Tree Regional area however contains only minor stock supplies and for practical purposes may be considered undeveloped.

The basin is of Cainozoic age and consists of mudstones, sandstones, chaledonic limestones, and some conglomerates underlying unconsolidated alluvium and colluvium or aeolian sediments. The water bearing strata among these are highly variable in lithology.

Water quality is highly variable. Water fit for human consumption occurs mostly near the currently developed parts of the basin.

Report 01/90 by P.McDonald summarises information on the basin and recommends monitoring in accordance with the degree of development and review of monitoring requirements annually.

Because of the interconnection between basin parts abstraction from the developed parts may impact on other units.

Production: Other than that from the developed portion discussed already elsewhere only minor abstraction mostly for stock.

Quality: Too variable to make any general statements.

Water levels: As shown on Figure 38 the levels are almost constant with time however significant changes occur with location.
Figure 38

Water Levels Ti-Tree Region

Location of Monitoring Bores
6. Summary of Recommendations

Recommendations are summarised into five groups. These groups are not exclusive. For example several monitoring areas are listed both as recommended for a review in network density and in frequency of readings.

1. Review programme objectives: A total rethink is recommended concerning the programme for the area including its objectives. At the end of such a review there should be a major change in the programme or the programme should be dropped. The need for such a review typically arises when developments overtake the assumptions made when the programme was initiated.

Monitoring areas recommended for such a review are Brewer Estate, Emily Creek and Papunya.

2. Review nature of data collected: This recommendation results from a perceived mismatch between the monitoring objectives stated and the type and quality of data collected.

Monitoring areas recommended for this kind of review are Aileron, Old South Road, Town Basin, Iwupataka, Yuendumu.

3. Review network density: This review is suggested where readings from monitoring bores appear to duplicate readings from other bores or where significant areas of an aquifer are not monitored in accordance with needs.

Monitoring areas recommended for a network density review are Emily Creek, Farms Area, Ali Curung, Areyonga, Hermannsburg, Docker River, Ayers Rock, Pmara Jutunla, Kelly Well, Territory Grape Farms, Yuendumu.

4. Review frequency of readings: Data reading frequency does not match the rate at which changes are occurring either by being too frequent or by being too widely separated to capture all significant variations.

Monitoring areas recommended for such a review are Aileron,
Emily Creek, Farms Area, Old South Road, Kelly Well.

5. New inclusions: Recommended for inclusion in the monitoring programme as a result of recent studies: Lake Nash, Harts Range, Canteen Creek, Engawala.

An argument often raised when a reduction in frequency of readings or network density is proposed is that when field personell are on location for other readings then taking an extra reading takes little extra time. This argument ignores the cumulative effect of many such "little extras" and also ignores the impact of unnecessary (and hence unwanted) extra data on data processing and plotting of graphs. It is suggested that the above negative aspects of unplanned data collection outweighs the potential benefits of capturing an additional and unexpected significant event.
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