Department for Water Resources

DWR

Hydrogeological report on water well monitoring in Aboriginal lands – April to October 2000

Sandy Dodds and Lloyd Sampson

Hydrogeological report on water well monitoring in Aboriginal lands — April to October 2000

A.R. (Sandy) Dodds and Lloyd D. Sampson

Groundwater Assessment
Resource Assessment Division

May 2001

Report DWR 2001/005

Government of South Australia

Department for Water Resources

Resource Assessment Division
Department for Water Resources
Level 6, 101 Grenfell Street, Adelaide
GPO Box 1047, Adelaide SA 5001

Phone	National	(08) 8226 0222
	International	+61 8 8226 0222
Fax	National	(08) 8463 3146
	International	+61 8 8463 3146
Website	www.dwr.sa.gov.au	

Preferred way to cite this publication
Dodds, A. R. and Sampson, L. D., 2001. Hydrogeological report on water well monitoring in Aboriginal lands — April to October 2000. *South Australia. Department for Water Resources. Report,* DWR 2001/005.

Cover photo — Northeasterly view towards Benagerie Ridge from Tonga Hill, central eastern South Australia (PIRSA photo 047612).

FOREWORD

South Australia's water resources are fundamental to the economic and social wellbeing of the State. Water resources are an integral part of our natural resources. In pristine or undeveloped situations, the condition of water resources reflects the equilibrium between rainfall, vegetation and other physical parameters. Development of surface and groundwater resources changes the natural balance and causes degradation. If degradation is small, and the resource retains its utility, the community may assess these changes as being acceptable. However, significant stress will impact on the ability of a resource to continue to meet the needs of users and the environment. Degradation may also be very gradual and take some years to become apparent, imparting a false sense of security.

Management of water resources requires a sound understanding of key factors such as physical extent (quantity), quality, availability, and constraints to development. The role of the Resource Assessment Division of the Department for Water Resources is to maintain an effective knowledge base on the State's water resources, including environmental and other factors likely to influence sustainable use and development, and to provide timely and relevant management advice.

Bryan Harris
Director, Resource Assessment Division
Department for Water Resources

ABBREVIATIONS

General

d	day
m.	month
SWL	standing water level

Measurement

Units of measurement used in this volume are those of the International System of Units (SI) and are not included here.

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Report DWR 2001/005

Hydrogeological report on water well monitoring in Aboriginal lands — April to October 2000

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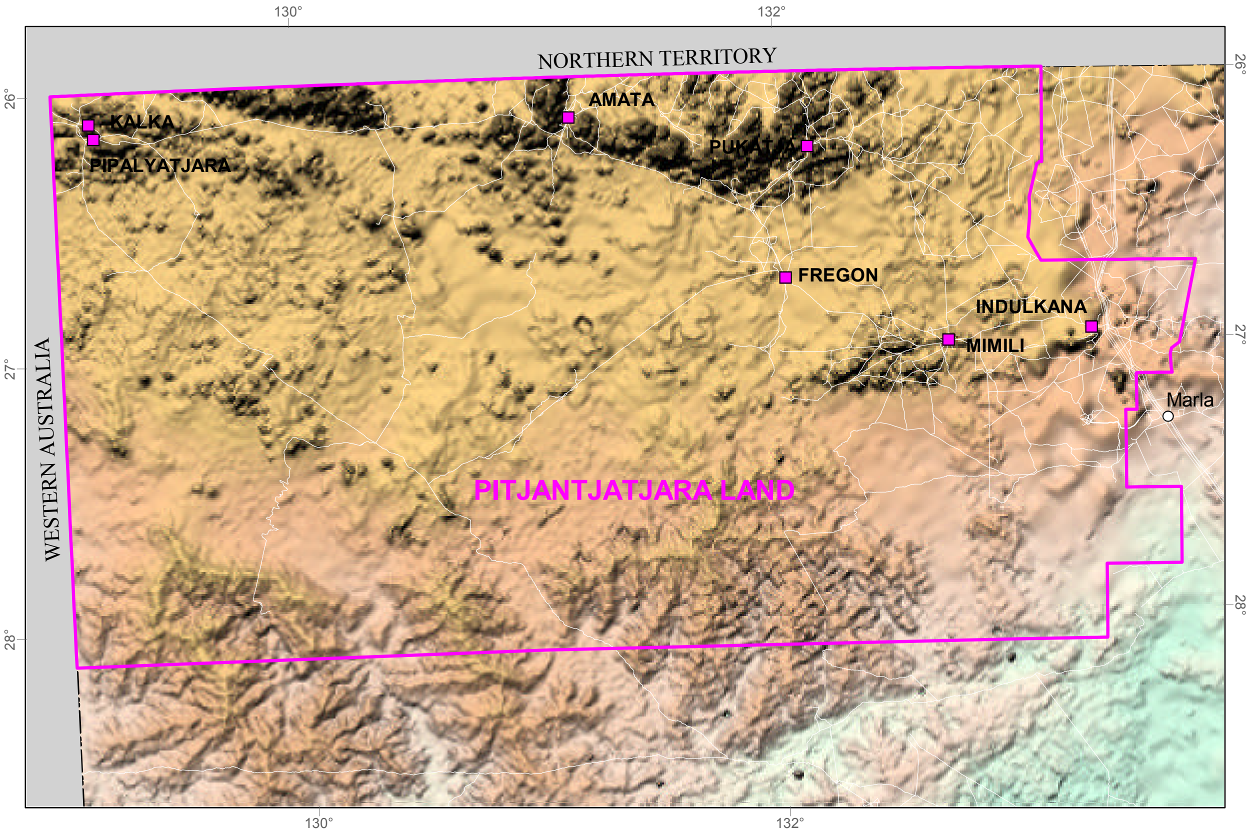
ABSTRACT

Water well monitoring data from wells on Aboriginal lands (Pitjantjatjara, Yalata and Nepabunna) are summarised for the period April to October 2000. Equipment failure was high with faults recorded at 17 wells, particularly the 2100P standing water level measurement units. These units are progressively being replaced with a modified design that should reduce failure frequency.

The rainfall events that occurred in the central and eastern parts of the Pitjantjatjara lands in February 2000 continue to recharge aquifer(s) at Amata, Pukatja and Indulkana, with the aquifers at Amata rising by 3–4 m and possibly still rising.

INTRODUCTION

This report comprises brief comments on the download of water level, well production and rainfall data of wells on Aboriginal lands (Pitjantjatjara, Yalata and Nepabunna) for the period April to October 2000. It is supplemental to earlier reports that contain previous data, the results of geophysical logging of the wells and background well information (Dodds and Sampson, 1999a, b, 2000; Sampson and Dodds, 2000). Areas undergoing water well monitoring are located in Figure I.



Department for Water Resources

0 50 100 Kilometers

Projection - Equidistant Conic

Water well monitoring in Aboriginal Lands

LOCALITY MAP

PIRSA Publishing Sevices AV:200213-001

Figure I

ANALYSIS OF LOGGING DATA

PITJANTJATJARA LANDS

1 Indulkana

OVERVIEW

Water production data for the community at Indulkana is summarised in Table 1.1 for the latest four well monitoring periods, covering October 1998 to October 2000. The data is incomplete because one of the major supply wells (IR 1) is corrupted. However, it appears that the community supply now comes primarily from the two new wells in the Indulkana Range — IR 1 and IR 2 (Fig. 1.1). It seems likely that the aquifers for at least five wells (IMB 19, IMB 19A, IMB 25, IMB 27 and IR 2) were recharged in 2000 (Fig. 1.2). Wells outside the Indulkana Range seem to have recovered primarily as a result of decreased pumping rather than from recharge.

A rainfall event of 28 mm occurred in April with a number of smaller events occurring throughout the period. Total rainfall for April to October 2000 was 86.3 mm.

Table 1.1 Water production at Indulkana, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
IMB 19	954.1	990.9	2 096.2	**125.2**
IMB 19A	1 828.7	2 159.0	3 340.0	**512.4**
IMB 25	6 039.0	3 367.0	1 347.0	**1.5**
IMB 26	1 145.6	2 816.0	0.8	**0.3**
IMB 27	1 528.7	787.8	111.3	**0.2**
IR 1	–	–	5 565.6	**–**
IR 2	–	–	4 863.1	**4 970.6**
Total	**11 496.1**	**10 120.7**	**17 324.0**	**56 10.2***

* Not including IR 1 which had a faulty flow meter (see App. 1).

IMB 19

Water levels continued to rise in IMB 19 during this monitoring period, occurring primarily in two stages in late March and mid April 2000. The first event coincided with a cessation in pumping while the second coincided with a rainfall event of 14 mm (Fig. 1.3). Overall the water level rose about 2 m and is now within 1 m of the level the water reached at the time of drilling.

Subsequent to the rainfall event in mid April, the water level rose to 15.2 m, about the same level at the time of drilling, and remained there until water extraction started in mid May 2000. This level was probably maintained by an aquifer of very low capacity, which was recharged by the rains in February and April and was exhausted by the pumping in mid and late May. Following the end of May, the water level has been constant at about 16.5 m.

A substantial correction of 0.292 m was required to be applied to the logger standing water level (SWL) datum at the end of the monitoring period. In the absence of any obvious shifts this correction was applied as a constant drift over the period.

Production from IMB 19 was significantly less than previous monitoring periods with the maintenance of a pumping rate of 0.11 L/s (Fig. 1.4).

IMB 19A

As observed in the previous monitoring period (October 1999 to April 2000), the water level in IMB 19A recovered quickly when rested after an extensive pumping period. This is shown in April 2000 with the water level recovering to 26.8 m which is above that at the time of drilling (28 m).

The complex relationship between SWL, pumping rate and recharge make the assessment difficult, but the data suggests that there was recharge to this aquifer resulting from the February 2000 rains. The SWL unit failed during the monitoring period (Fig. 1.5); some data in April to May 2000 and all data after August 2000 being erroneous.

The pumping rate for IMB 19A was similar to previous periods, however the overall production was significantly reduced, only 512 kL compared to over 2000 kL for the previous period. The reduction in water production, combined with aquifer recharge, resulted in the water level stabilising at 26.7 m.

IMB 25

The watertable continued to recover during this period, rising to a level of 9.9 m in IMB 25 (manual measure, October 2000), the highest since mid 1995 and close to that at the time of drilling the well in 1987 (9.7 m). There was a net rise of 1 m over this monitoring period.

The well was not pumped during this period and has not been used since early February 2000; prior to the rainfall events. The time at which the water level commences to recover coincides with the cessation of pumping (Fig. 1.6). Following the rainfall events in February and April 2000 there is no marked increase in the recovery rate of the watertable indicating that the recovery is primarily due to the lack of pumping. The SWL measuring unit failed again in September 2000.

IMB 26

IMB 26 was not pumped during this monitoring period, with the SWL remaining close to surface. The SWL measuring unit failed in August 2000 (Fig. 1.7).

IMB 27

IMB 27 was not pumped during this monitoring period, which saw a net rise in the watertable of about 1.8 m. In April 2000, a significant rainfall event occurred in which over 40 mm of rain fell in four days and a rise in SWL of 1.4 m over the following week. The overall drop in water level, about 0.4 m, over the last four months, (without pumping) suggests a natural drainage of water within the aquifer after the recharge. The water level is now 8 m higher than it was at the time of drilling.

In 1999, the water level recovered to a non-pumping level of about 26 m (Dodds and Sampson, 1999b), but a dramatic change in the previous monitoring period (October 1999 to April 2000) saw this level rise to about 12 m. As the well was rarely used during this period, the total rise of water level by 14 m suggests this results mainly from recharge (Fig. 1.8). The logger failed to record SWL data, so the response time of the aquifer to the rainfall in February 2000 could not be ascertained.

Previously IMB 27 has been slow to recover after extensive pumping (Dodds and Sampson, 1999a, b), however, the final water level does not drop significantly. The well appears to be constructed in a poorly performing aquifer, resulting in a relatively low (10 kL/d) but sustainable supply.

Subsequent to the rainfall events in February and April 2000, water cuts not encountered during the drilling of the well have been recharged. The well has rarely been used since the rainfall events so that the extent and sustainability of the aquifers are not known.

IR 1

The data loggers for IR 1 both failed and have resulted in a lack of data. The SWL has dropped from 37.5 m at the time of drilling to 38.4 m in April 2000 and 39 m in October 2000, which suggests the fall is a result of pumping (Fig. 1.9).

IR 2

IR 2 produced a large proportion of Indulkana's water supply (5 ML). While the SWL has dropped from 55 m at the time of drilling to 56 m in October 2000, the water level remained constant during this monitoring period. A correction of -0.272 m was required to the logger SWL datum at the end of the period, which has been applied as a constant drift over the period. The well seems to be sustaining the current pumping rates without causing undue strain on the aquifer (Fig. 1.10).

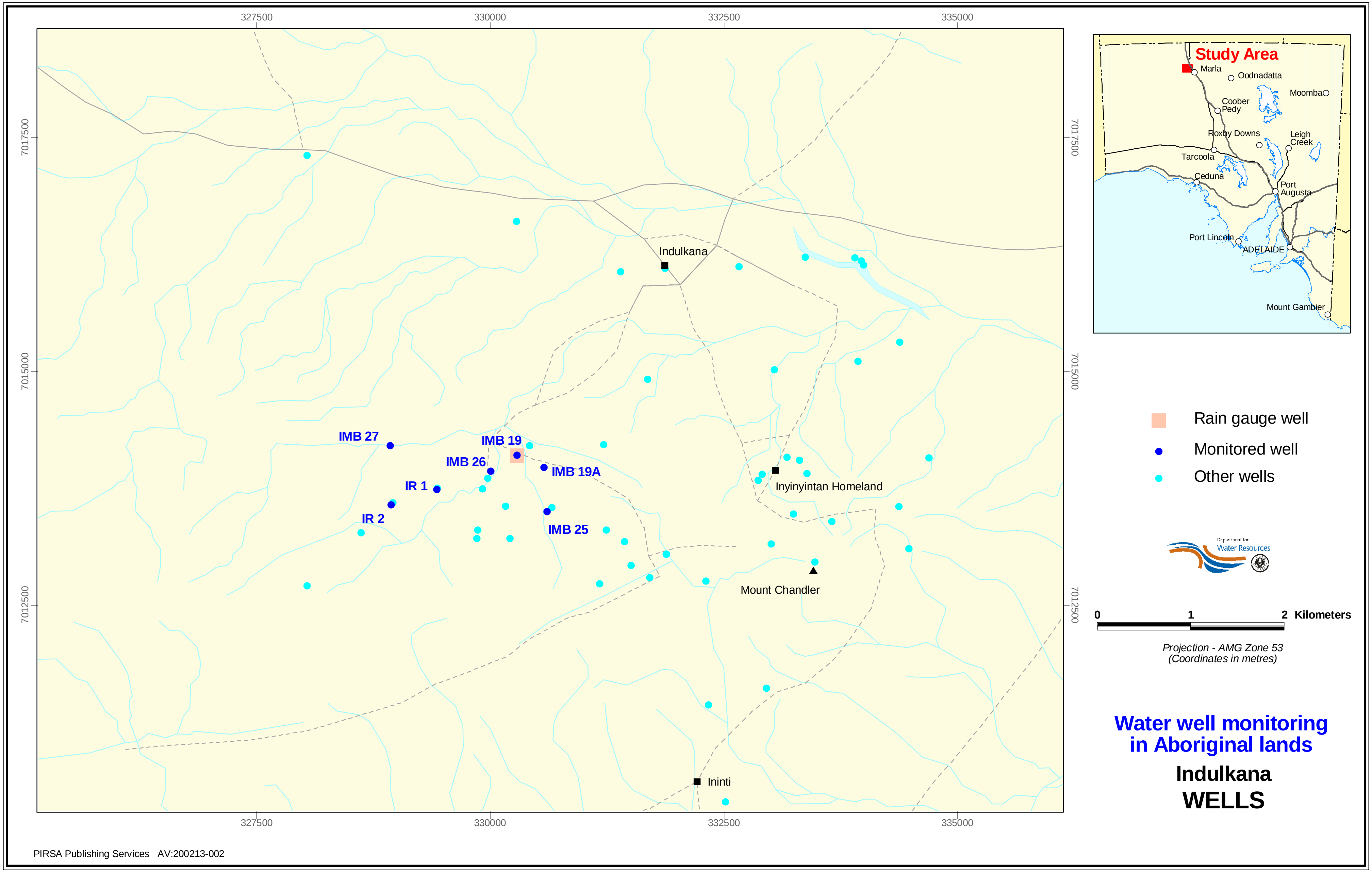
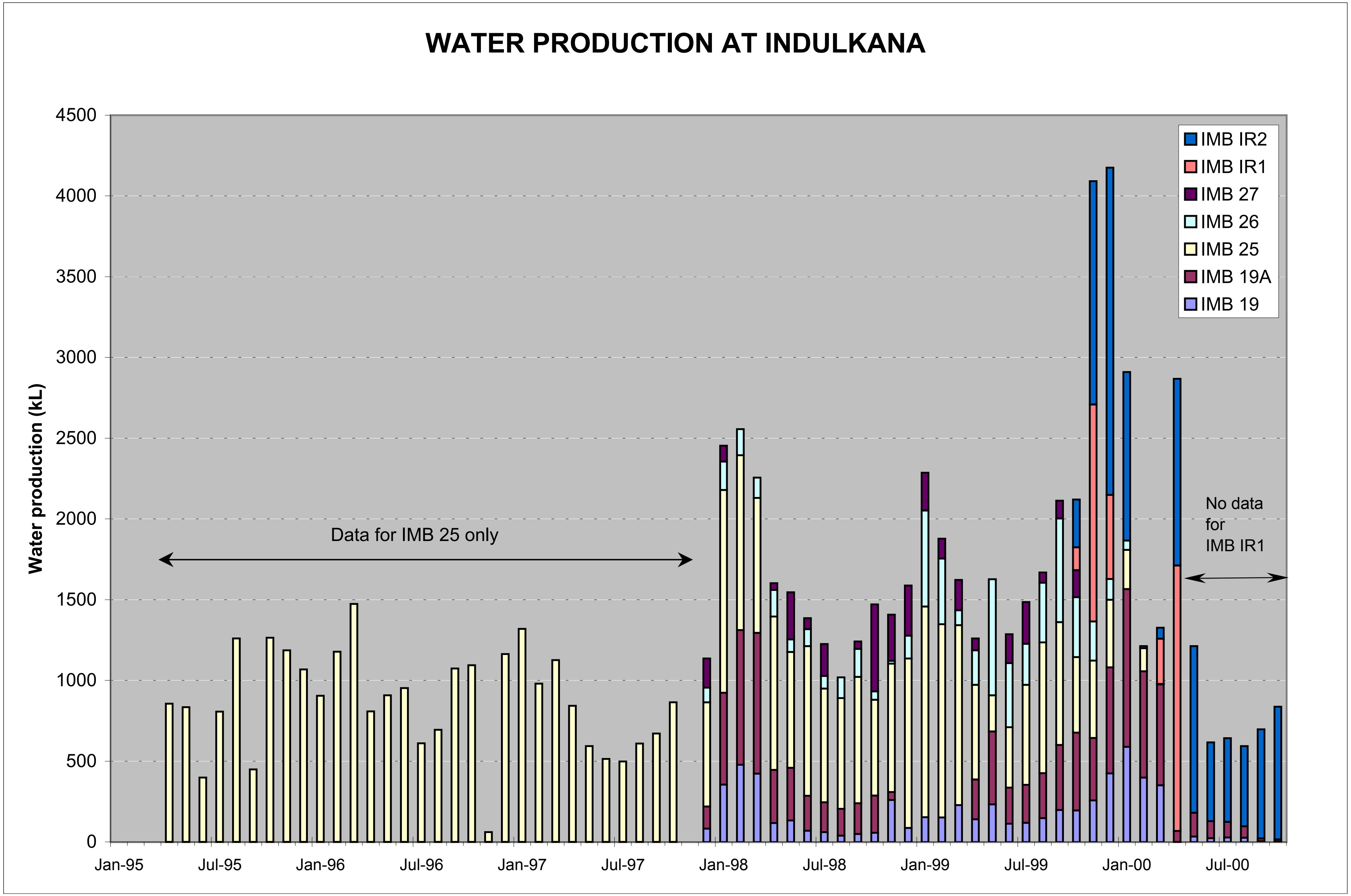
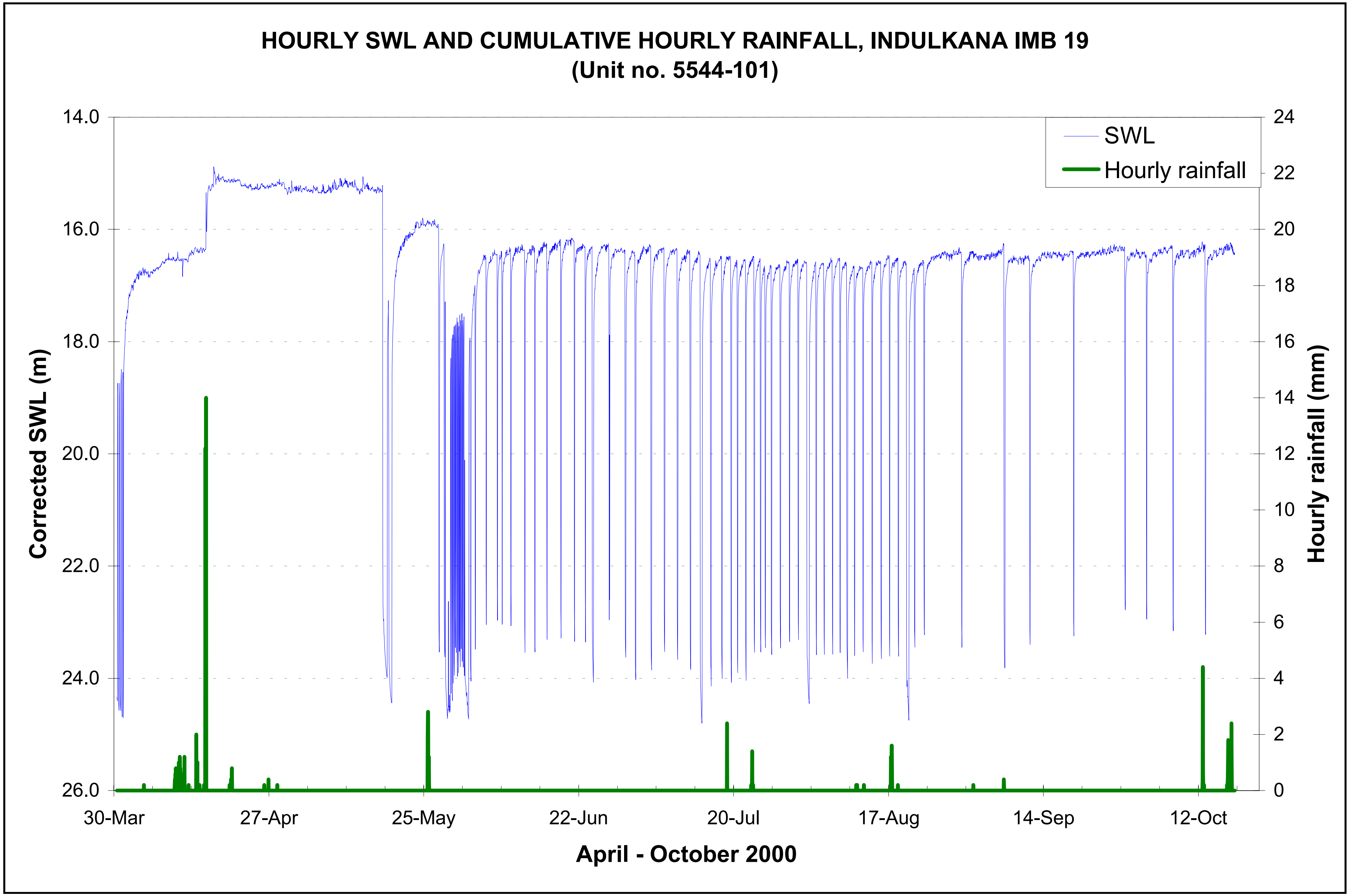

327500
330000
332500
335000
7017500
7015000
7012500
Indulkana
Inyinyintan Homeland
Mount Chandler
Ininti
IMB 27
IMB 19
IMB 26
IMB 19A
IR 1
IR 2
IMB 25
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
1
2
Kilometers
Projection - AMG Zone 53
(Coordinates in metres)
Water well monitoring in Aboriginal lands
Indulkana
WELLS
PIRSA Publishing Services AV:200213-002

Figure 1.1



WATER PRODUCTION AT INDULKANA
Water production (kL)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
IMB IR2
IMB IR1
IMB 27
IMB 26
IMB 25
IMB 19A
IMB 19
Data for IMB 25 only
No data for IMB IR1

Figure 1.2



HOURLY SWL AND CUMULATIVE HOURLY RAINFALL, INDULKANA IMB 19
(Unit no. 5544-101)
SWL
Hourly rainfall
Corrected SWL (m)
14.0
16.0
18.0
20.0
22.0
24.0
26.0
Hourly rainfall (mm)
24
22
20
18
16
14
12
10
8
6
4
2
0
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.3

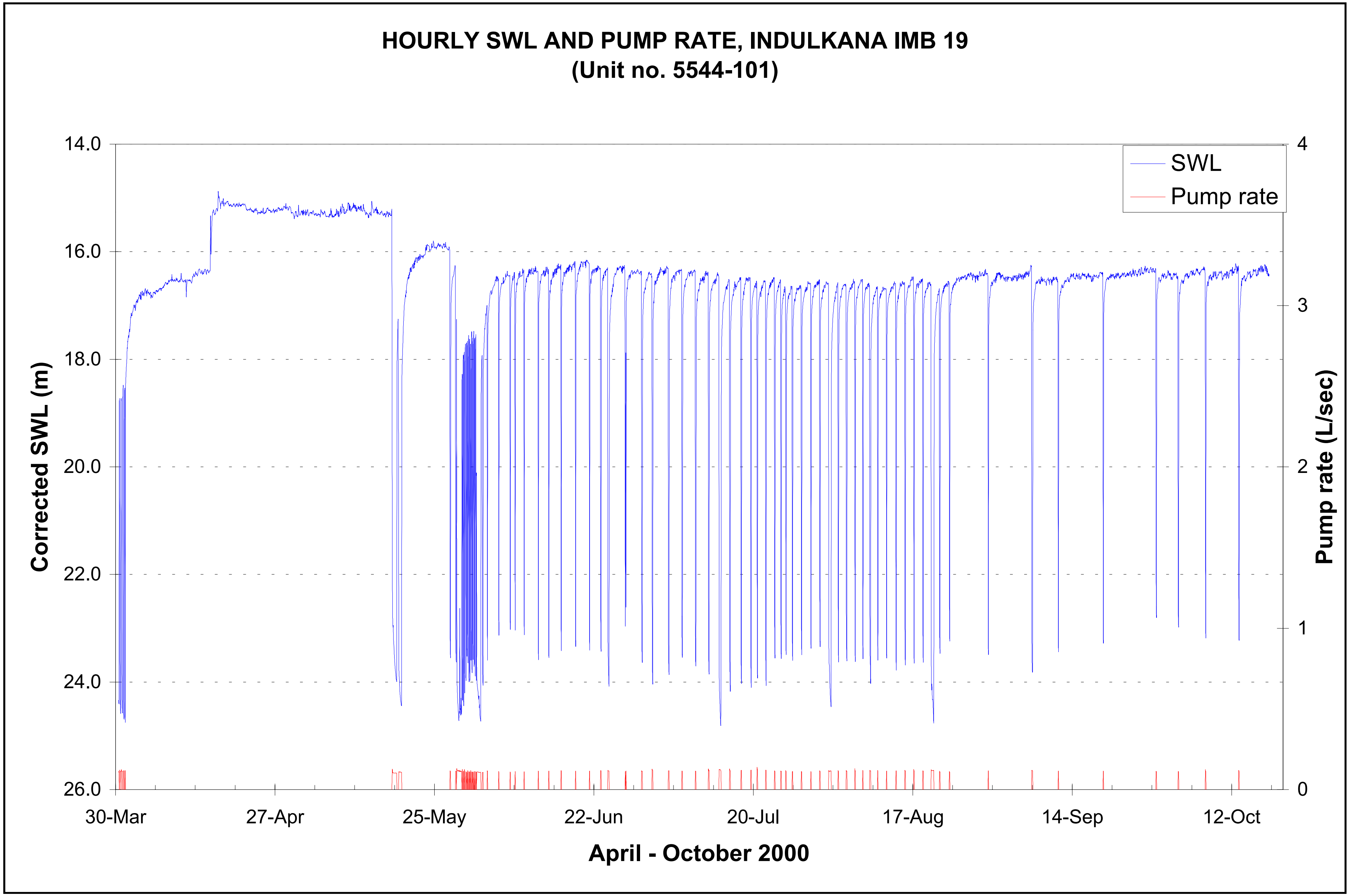

HOURLY SWL AND PUMP RATE, INDULKANA IMB 19
(Unit no. 5544-101)
SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
14.0
16.0
18.0
20.0
22.0
24.0
26.0
4
3
2
1
0
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.4

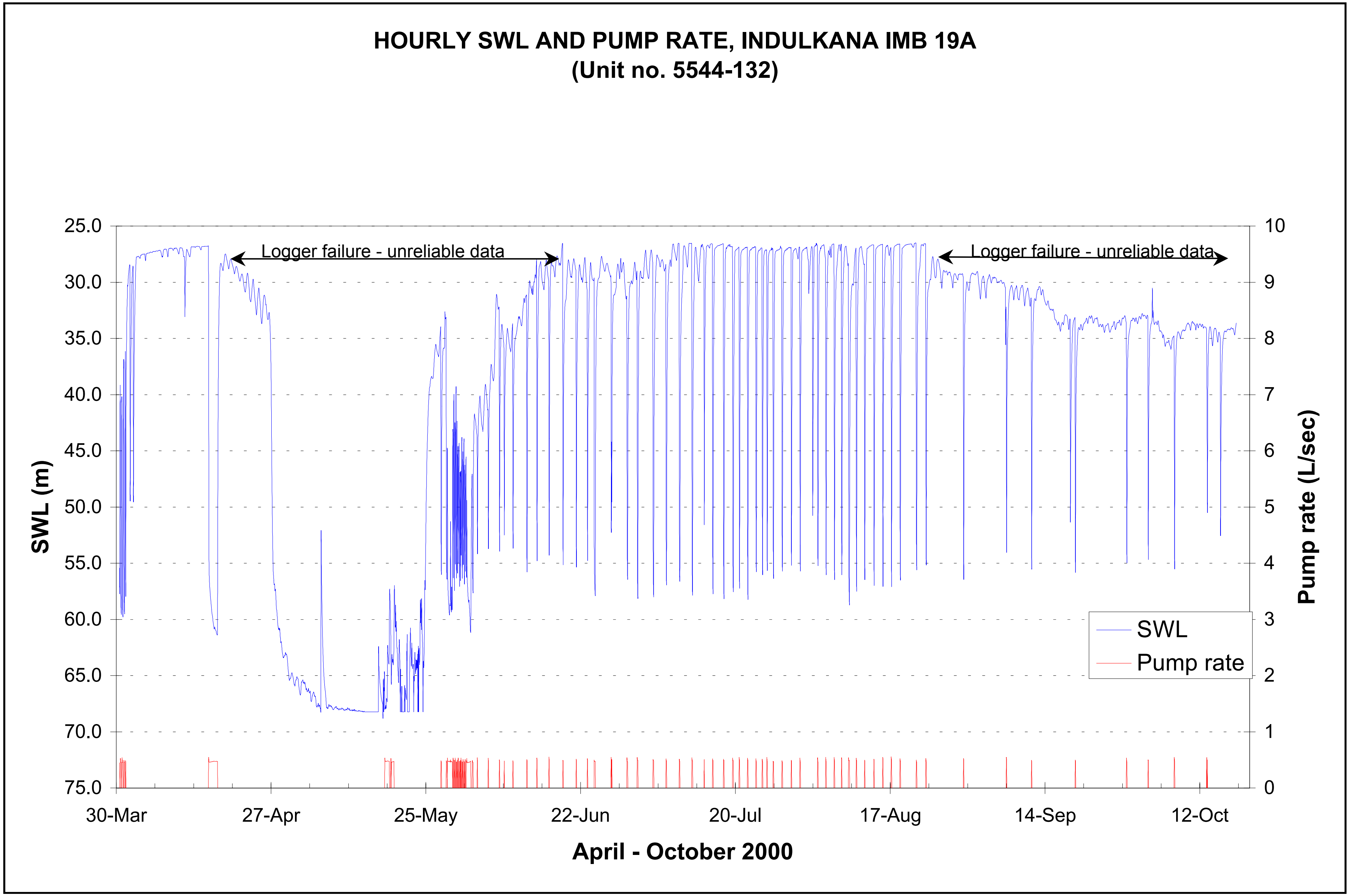
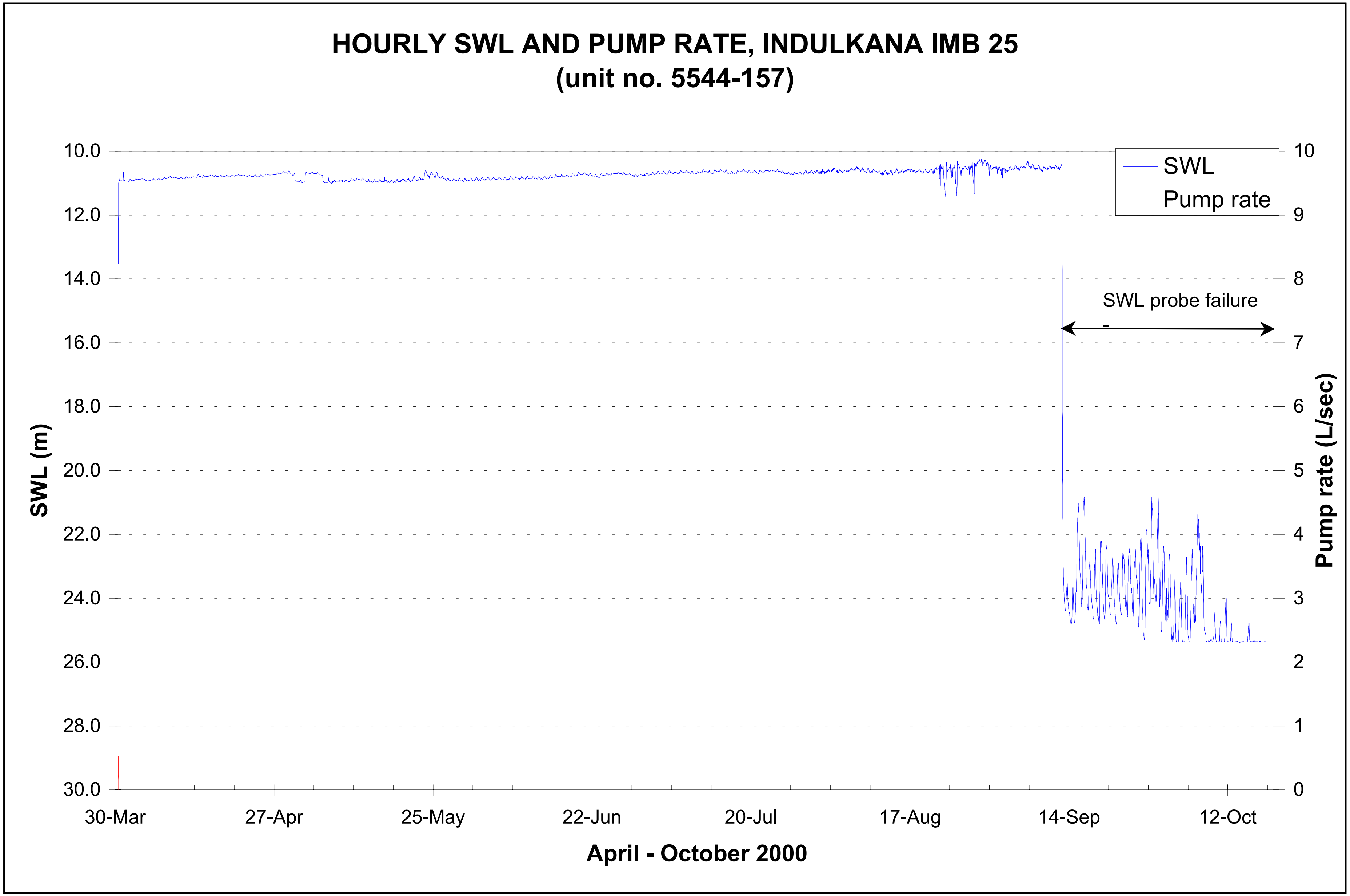
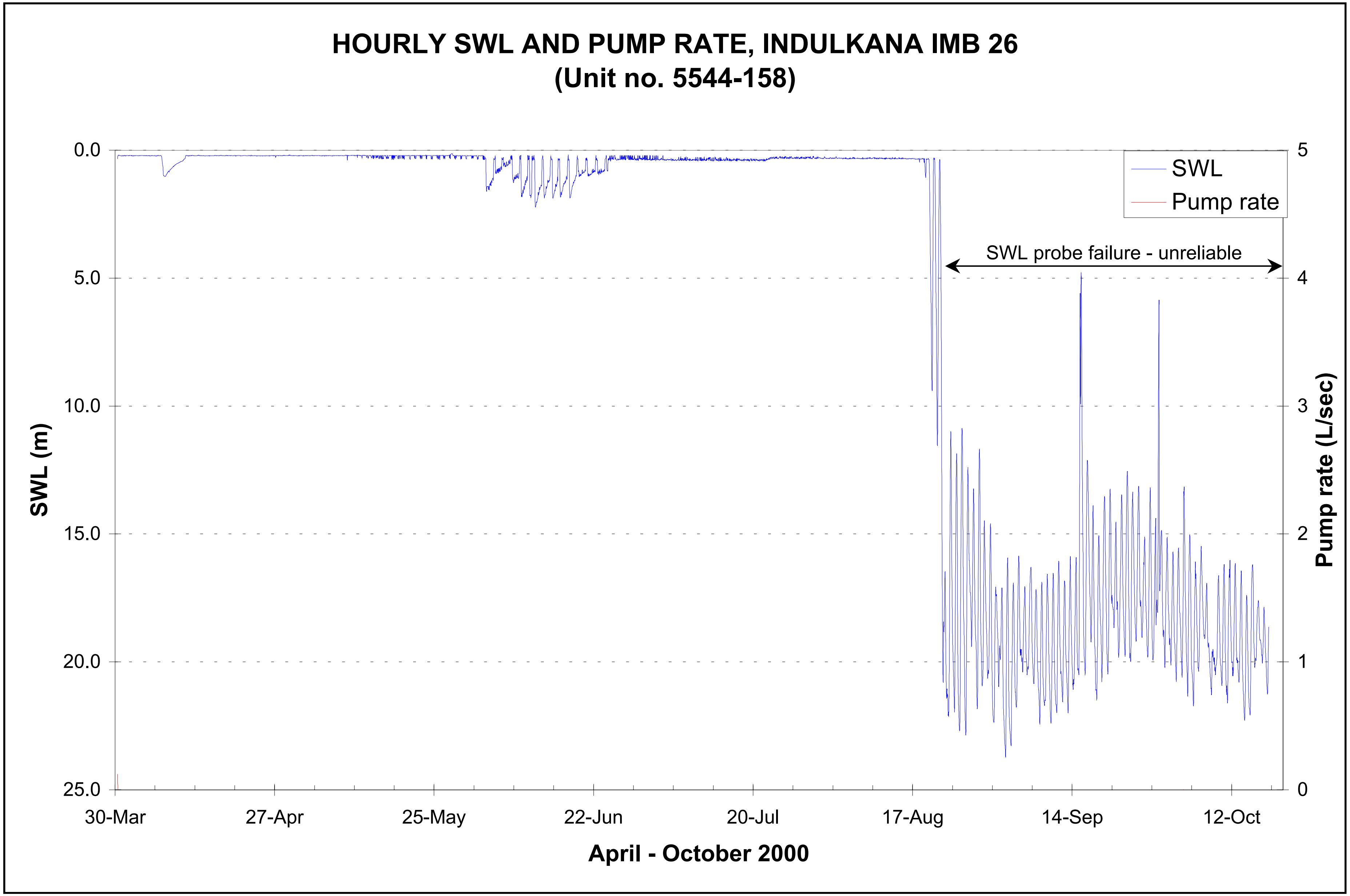

HOURLY SWL AND PUMP RATE, INDULKANA IMB 19A
(Unit no. 5544-132)
Logger failure - unreliable data
Logger failure - unreliable data
SWL (m)
Pump rate (L/sec)
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
75.0
10
9
8
7
6
5
4
3
2
1
0
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000
SWL
Pump rate

Figure 1.5



HOURLY SWL AND PUMP RATE, INDULKANA IMB 25
(unit no. 5544-157)
SWL
Pump rate
SWL probe failure
SWL (m)
Pump rate (L/sec)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
10
9
8
7
6
5
4
3
2
1
0
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.6



HOURLY SWL AND PUMP RATE, INDULKANA IMB 26
(Unit no. 5544-158)
SWL
Pump rate
SWL probe failure - unreliable
0.0
5.0
10.0
15.0
20.0
25.0
5
4
3
2
1
0
SWL (m)
Pump rate (L/sec)
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.7

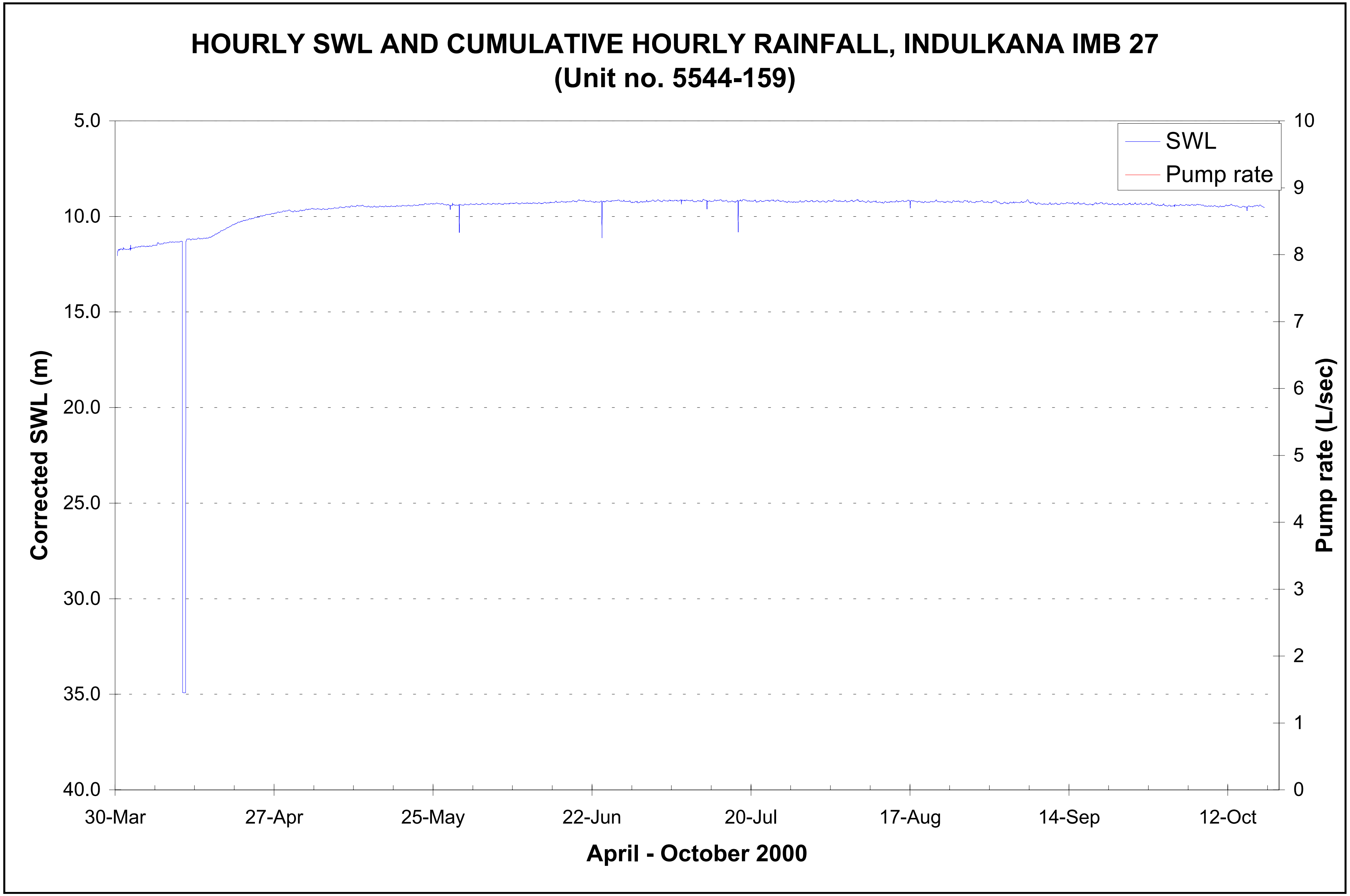

HOURLY SWL AND CUMULATIVE HOURLY RAINFALL, INDULKANA IMB 27
(Unit no. 5544-159)
SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
5.0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
10
9
8
7
6
5
4
3
2
1
0
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.8

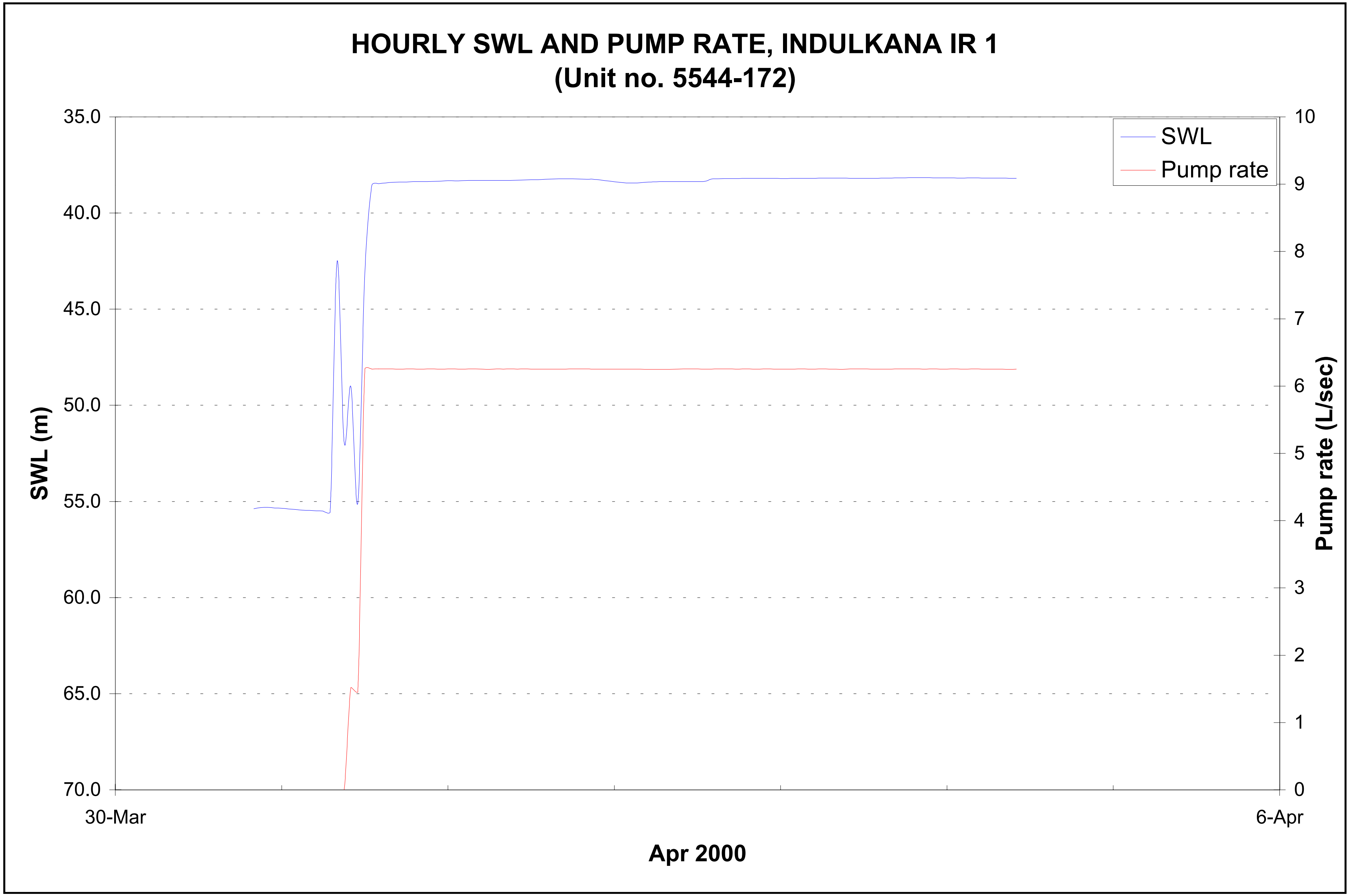
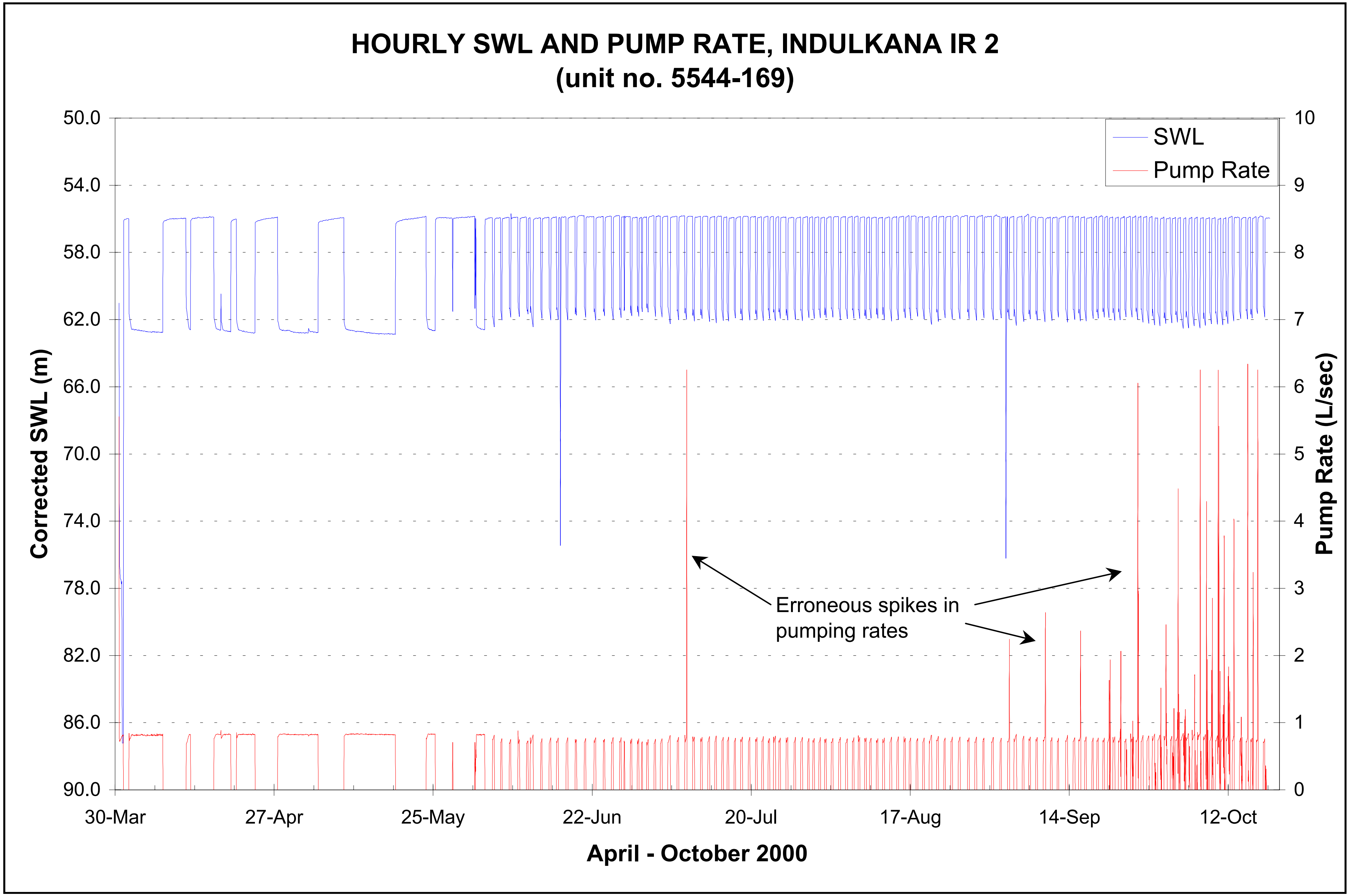

HOURLY SWL AND PUMP RATE, INDULKANA IR 1
(Unit no. 5544-172)
SWL (m)
35.0
40.0
45.0
50.0
55.0
60.0
65.0
70.0
Pump rate (L/sec)
10
9
8
7
6
5
4
3
2
1
0
30-Mar
6-Apr
Apr 2000
SWL
Pump rate

Figure 1.9



HOURLY SWL AND PUMP RATE, INDULKANA IR 2
(unit no. 5544-169)
SWL
Pump Rate
Corrected SWL (m)
Pump Rate (L/sec)
50.0
54.0
58.0
62.0
66.0
70.0
74.0
78.0
82.0
86.0
90.0
10
9
8
7
6
5
4
3
2
1
0
Erroneous spikes in pumping rates
30-Mar
27-Apr
25-May
22-Jun
20-Jul
17-Aug
14-Sep
12-Oct
April - October 2000

Figure 1.10

2 Mimili

OVERVIEW

Water production data for the community at Mimili is summarised in Table 2.1 for the latest four well monitoring periods, covering October 1998 to October 2000. The wells are located in Figure 2.1 and appear to produce current levels of water extraction without causing undue strain on the aquifer. Although the SWL units on both wells failed at times, the available readings still reveal the general constancy of the water levels. The data collected suggests the pumping regime for the wells appears to have changed with the pumping rates for both wells being highly variable. Total production was marginally less than the previous period (October 1999 to April 2000), but 30% higher than for April to October 1999 (Fig. 2.2).

Total rainfall for the monitoring period was 64.2 mm. There is no evidence of recharge to the aquifers from the significant rainfall in February 2000 and the lesser event in April (30.8 mm).

Table 2.1 Water production at Mimili, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
M 1	11 502.0	6 481.0	7 451.0	**6 591.9**
M 3	8 126.0	3 319.0	6 390.0	**6 304.0**
Total	**19 628.0**	**9 800.0**	**13 841.0**	**12 895.9**

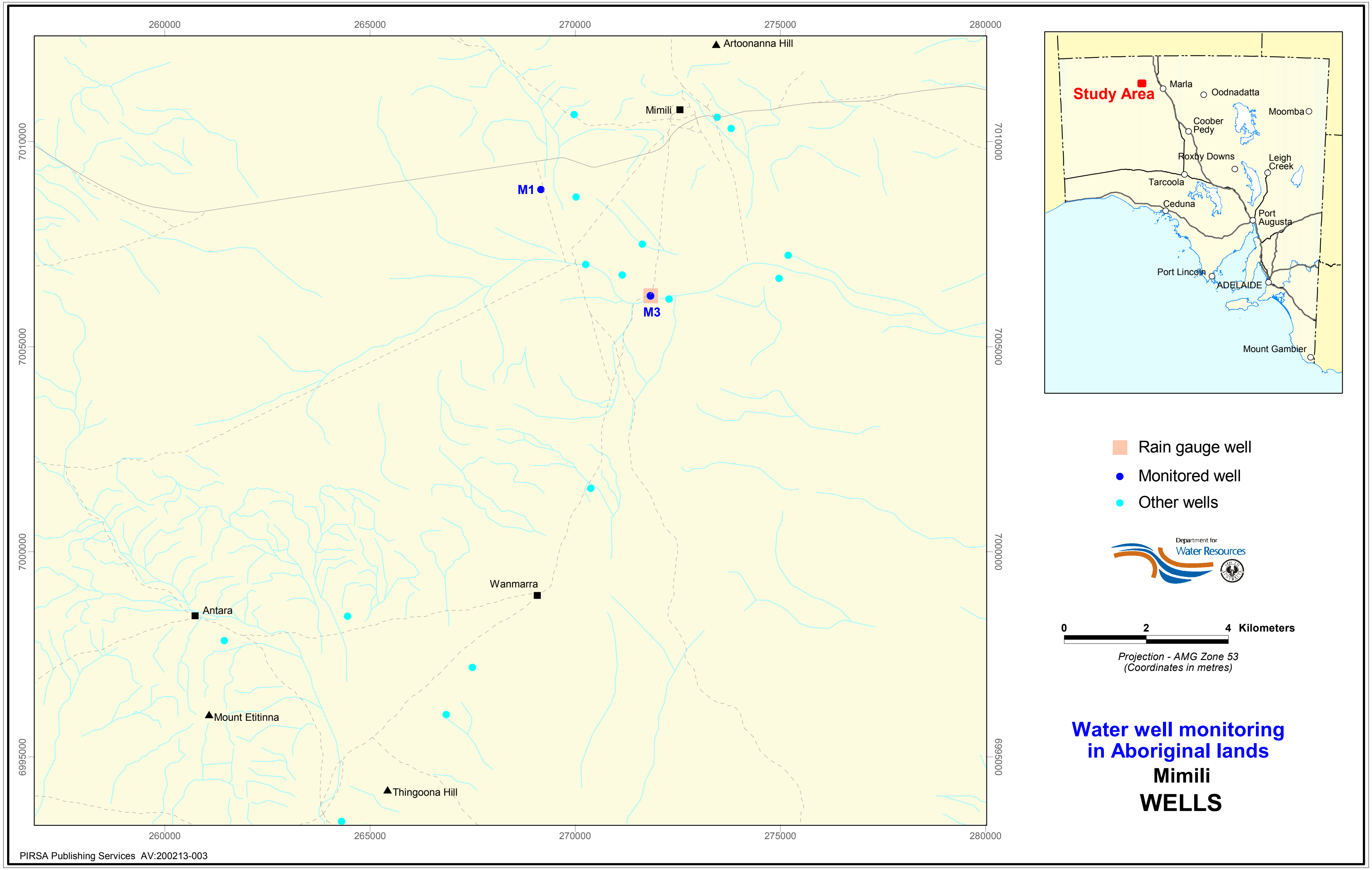
M 1

The SWL in M 1 remains constant and has risen slightly by 0.4 m since early 1998. Much of this rise occurred during the previous monitoring period (October 1999 – April 2000). This rise was not accounted for at the time of reporting. Overall M 1, which produces half of Mimili’s water needs, appears to cope adequately with the load.

Although the SWL unit had temporary failures in June and August 2000, the unit appears to have recovered (Fig. 2.3). However, the overshoot in the SWL, when the pump turns off, suggests that water is flowing back into the well from the distribution system through a faulty non-return valve. Pumping rates for the well were erratic, when compared to the previous monitoring period.

M 3

Data collected for M 3 over this monitoring period is inaccurate due to a failed SWL probe, however, a manual SWL measurement was taken at download time. The reading indicates there was no further water level drop (Figs 2.4–2.5).



260000
265000
270000
275000
280000
7010000
7005000
7000000
6995000
Artoonanna Hill
Mimili
M1
M3
Wanmarra
Antara
Mount Etitinna
Thingoona Hill
Study Area
Marla
Oodnadatta
Coober Pedy
Moomba
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
2
4
Kilometers
Projection - AMG Zone 53
(Coordinates in metres)
Water well monitoring
in Aboriginal lands
Mimili
WELLS
PIRSA Publishing Services AV:200213-003

Figure 2.1

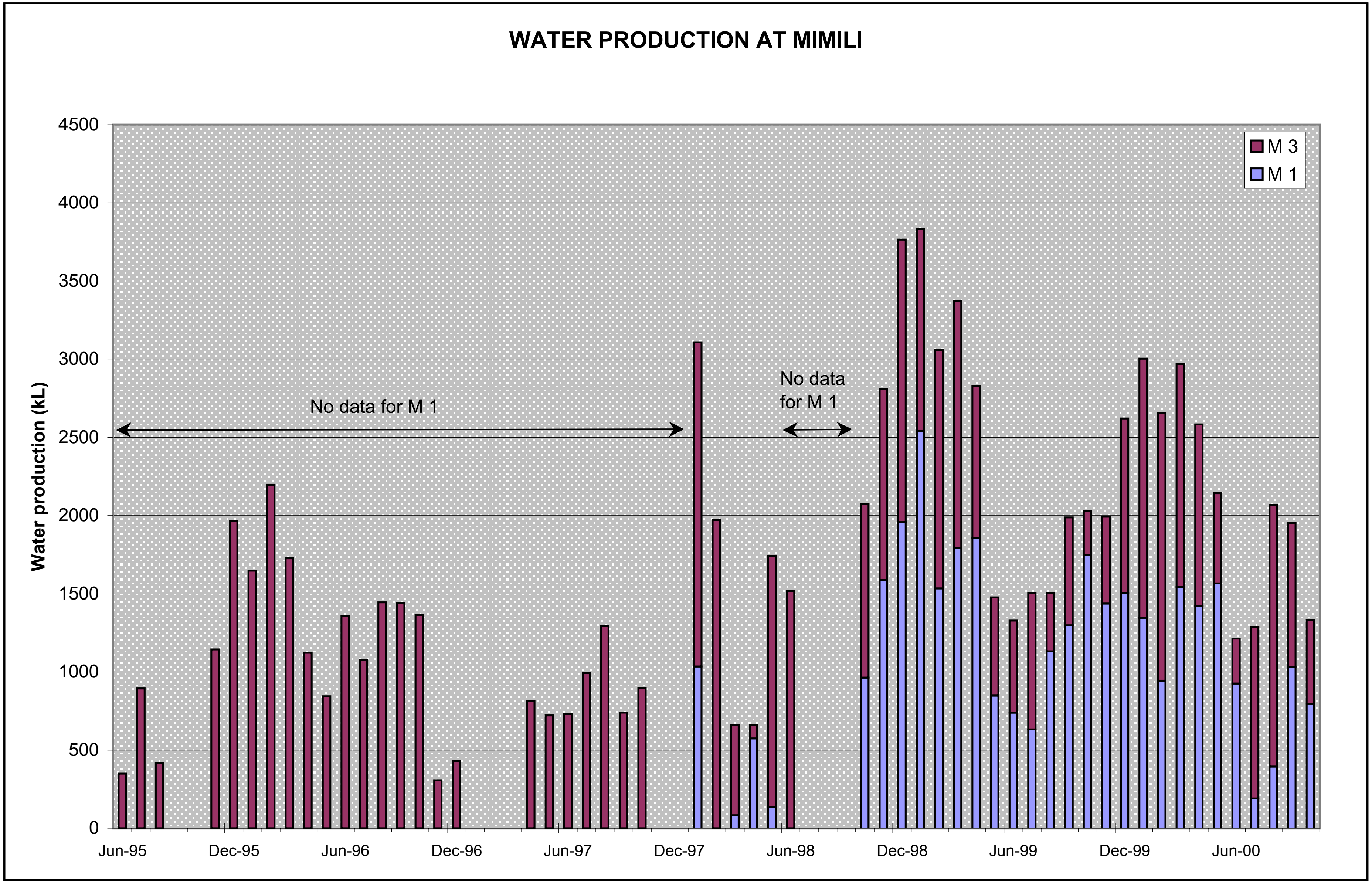

WATER PRODUCTION AT MIMILI
Water production (kL)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
M 3
M 1
No data for M 1
No data
for M 1
Jun-95
Dec-95
Jun-96
Dec-96
Jun-97
Dec-97
Jun-98
Dec-98
Jun-99
Dec-99
Jun-00

Figure 2.2

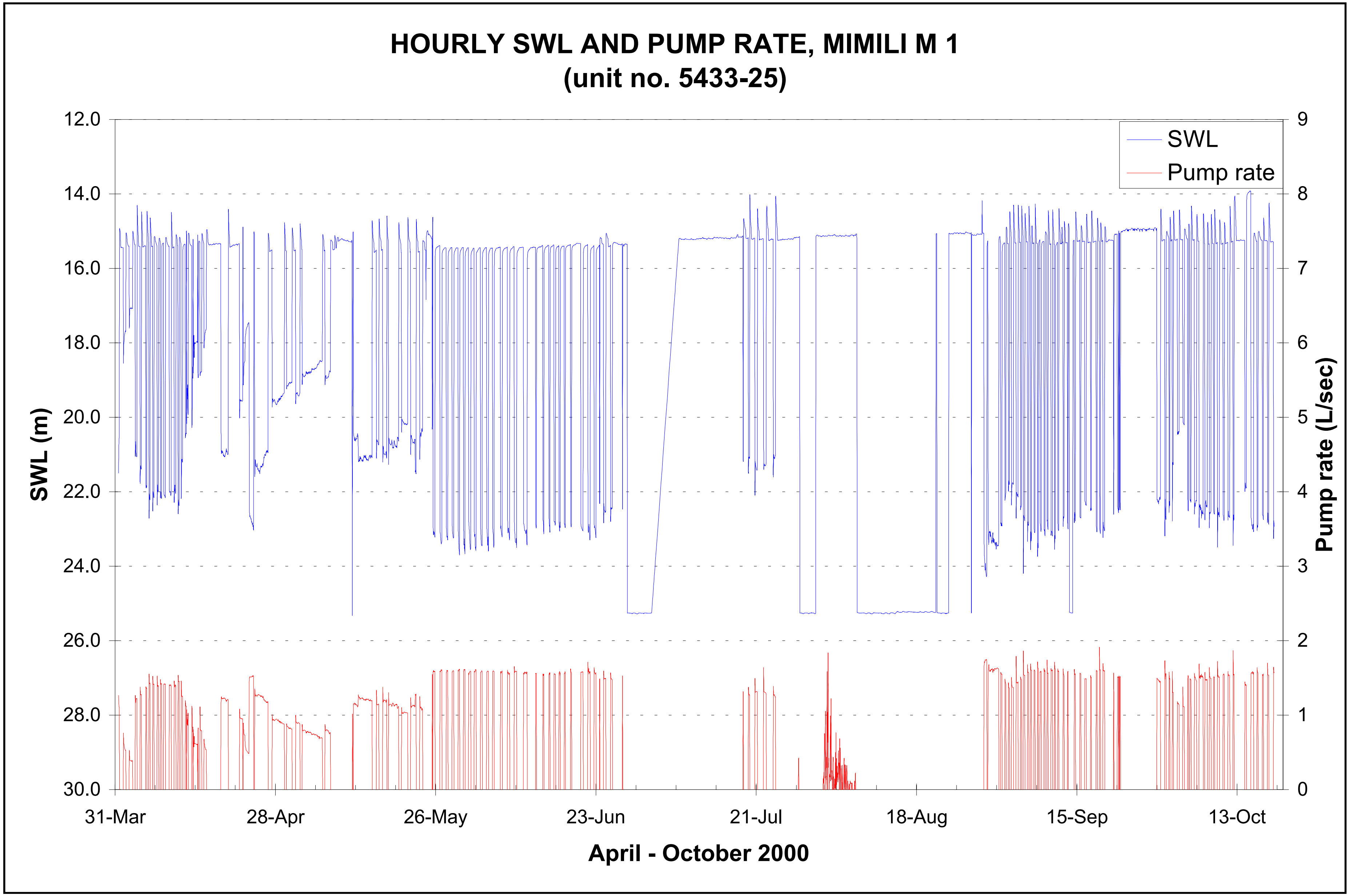

HOURLY SWL AND PUMP RATE, MIMILI M 1
(unit no. 5433-25)
SWL
Pump rate
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
SWL (m)
9
8
7
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 2.3

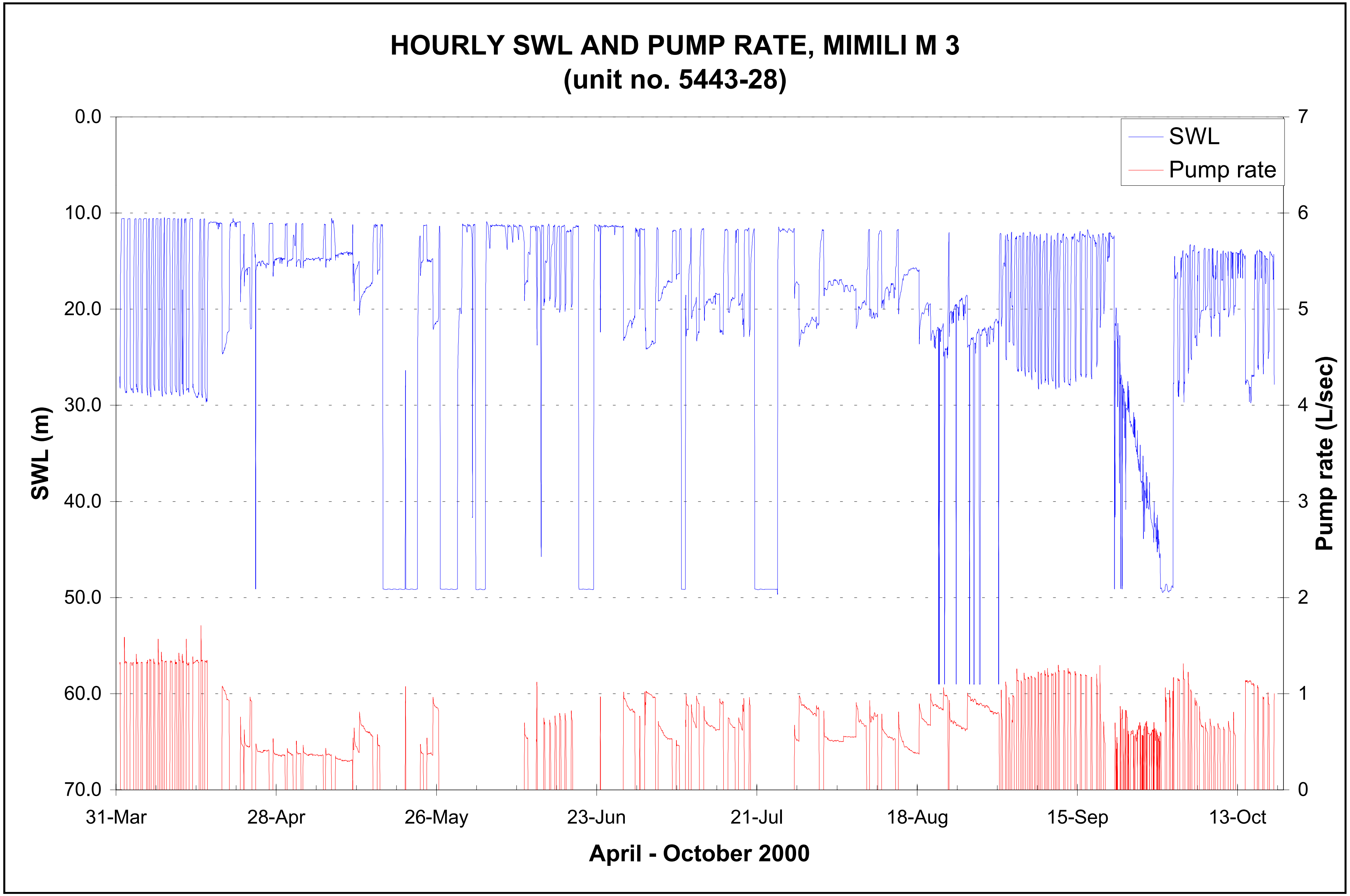
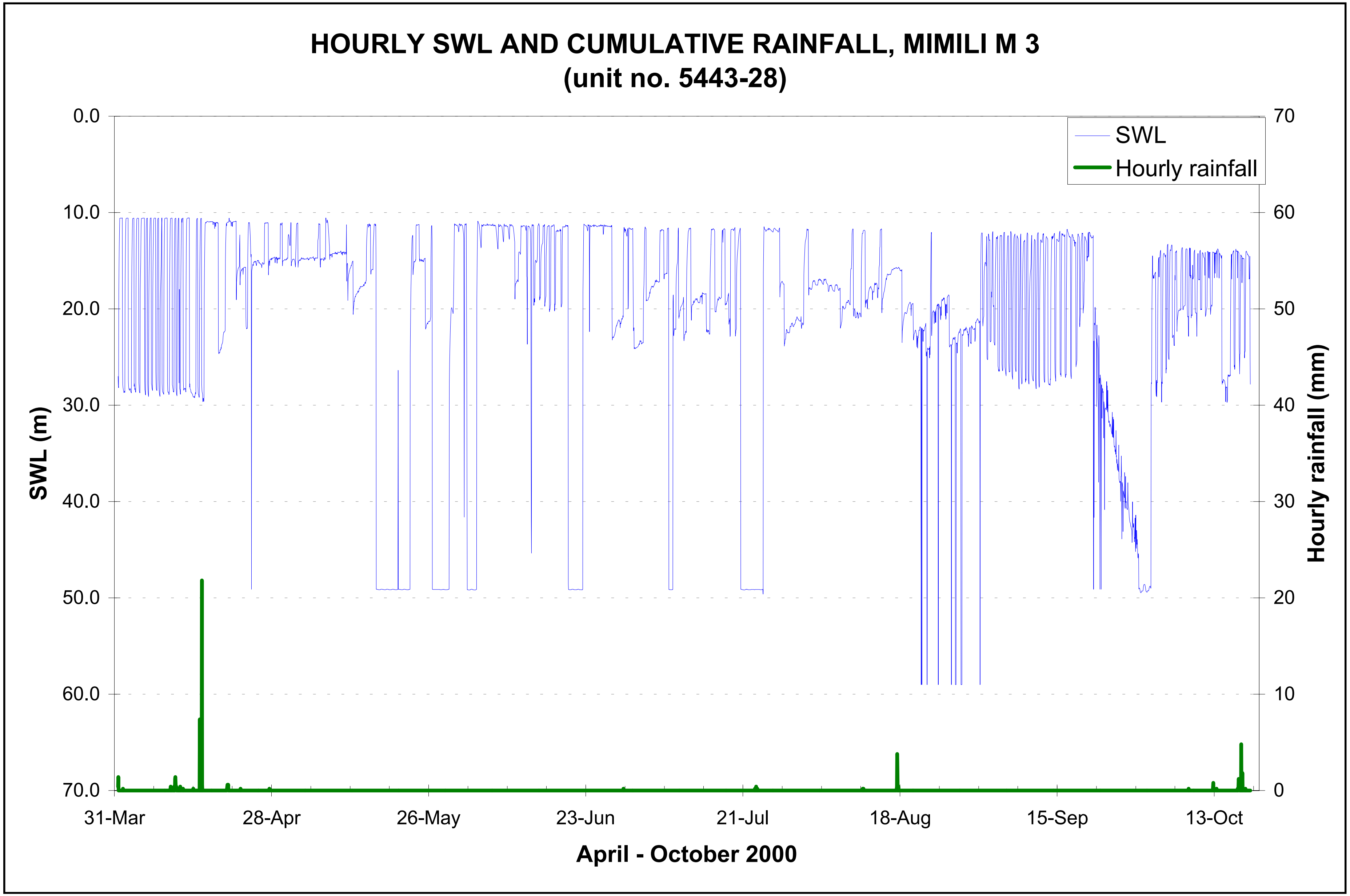

HOURLY SWL AND PUMP RATE, MIMILI M 3
(unit no. 5443-28)
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 2.4



HOURLY SWL AND CUMULATIVE RAINFALL, MIMILI M 3
(unit no. 5443-28)
SWL
Hourly rainfall
SWL (m)
Hourly rainfall (mm)
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
70
60
50
40
30
20
10
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 2.5

3 Fregon

OVERVIEW

Water production data for the community at Fregon is summarised in Table 3.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Of the wells in the region, FRG 14 is again the major supplier of water to the community (errors in the flow rate for FRG 1 and the lack of data for FRG E4 do not change the basic ratio; Fig. 3.1). The other three wells combined appear capable of supplying similar quantities to FRG 14 and the data suggests there is an adequate backup for the water supply at these levels of consumption (Fig. 3.2). The aquifer(s) show no sign of long-term stress or dewatering.

Total rainfall for April to October 2000 was 43.4 mm; no significant rainfall events were recorded.

Table 3.1 Water production at Fregon, 1998–2000

Well	Production (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
FRG 1	8 583.0	11 676.0	5 139.0	**2 515.0**
FRG E4	7 528.9	9 803.7	5 841.2	**4.3**
FRG 7	14 178.0	4 845.9	8 600.9	**4 237.5**
FRG 14	18 325.0	7 430.9	13 199.0	**22 752.0**
Total	**48 616.9**	**33 756.5**	**32 780.1**	**29 508.8**

FRG 1

FRG 1 was used rarely until the end of this monitoring period, when it was pumped fairly heavily. The water level gradually rose by 0.2 m over the five-month rest period, but then dropped by 0.7 m when pumping commenced in September and October 2000 (Fig. 3.3). A manual SWL reading could not be taken at the time of download so possible corrections to the logger SWL datum are not known.

This well is slow to recover after pumping. Variations in the non-pumping water level are likely to be the result of the drawdown cone from pumping rather than any long-term drop in the water level of the aquifer. The pumping rate in September is inaccurate, and should be about 1.5 L/s rather than the 0.26 L/s shown (Fig. 3.3). There is little variation in water level over the five and a half years of monitoring, and no indication of recharge.

FRG E4

A faulty memory module prevented downloading of data for FRG E4.

FRG 7

Results for FRG 7 this monitoring period are similar to those for FRG 1, with the well being pumped only in late September and October 2000 (Fig. 3.4). The water level again rose slightly while the well was being rested, then dropped during subsequent heavy pumping. FRG7 has a higher yield than FRG 1 and recovers at a faster rate.

FRG 14

Water levels in FGR 14 have not been verified by manual measurement since October 1999. Since the well is a major water source for the community at Fregon it is becoming urgent that the SWL be ascertained and that a conduit system is installed to permit regular manual verification. Available data suggests that the water level is not varying much, and there is no evidence of recharge from the recent rainfall events (Figs 3.5–3.6).

Water levels for this monitoring period are nearly a meter lower than the previous period. The offset occurred on the 31 March 2000, which highlights the need to obtain a manual SWL reading.

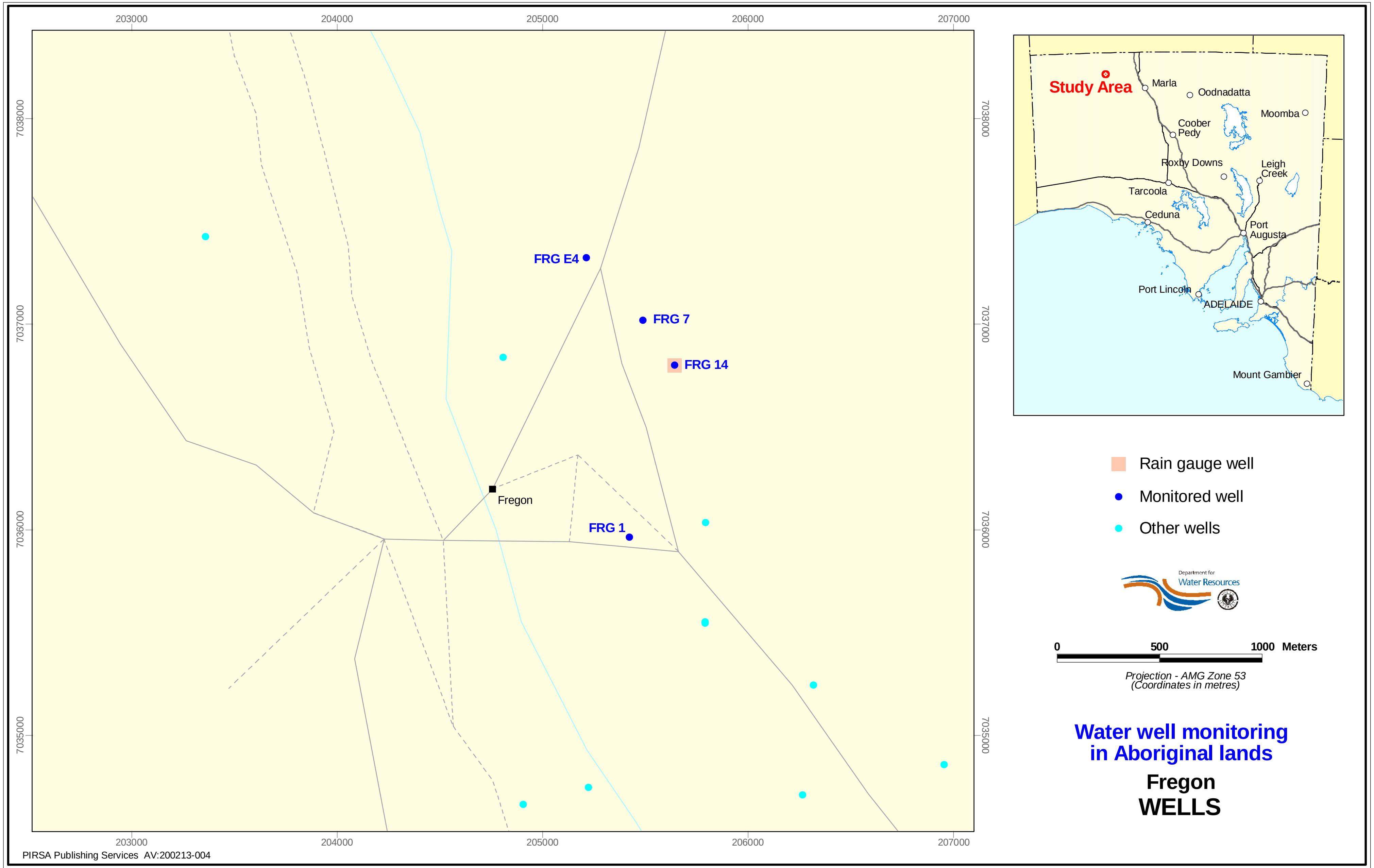
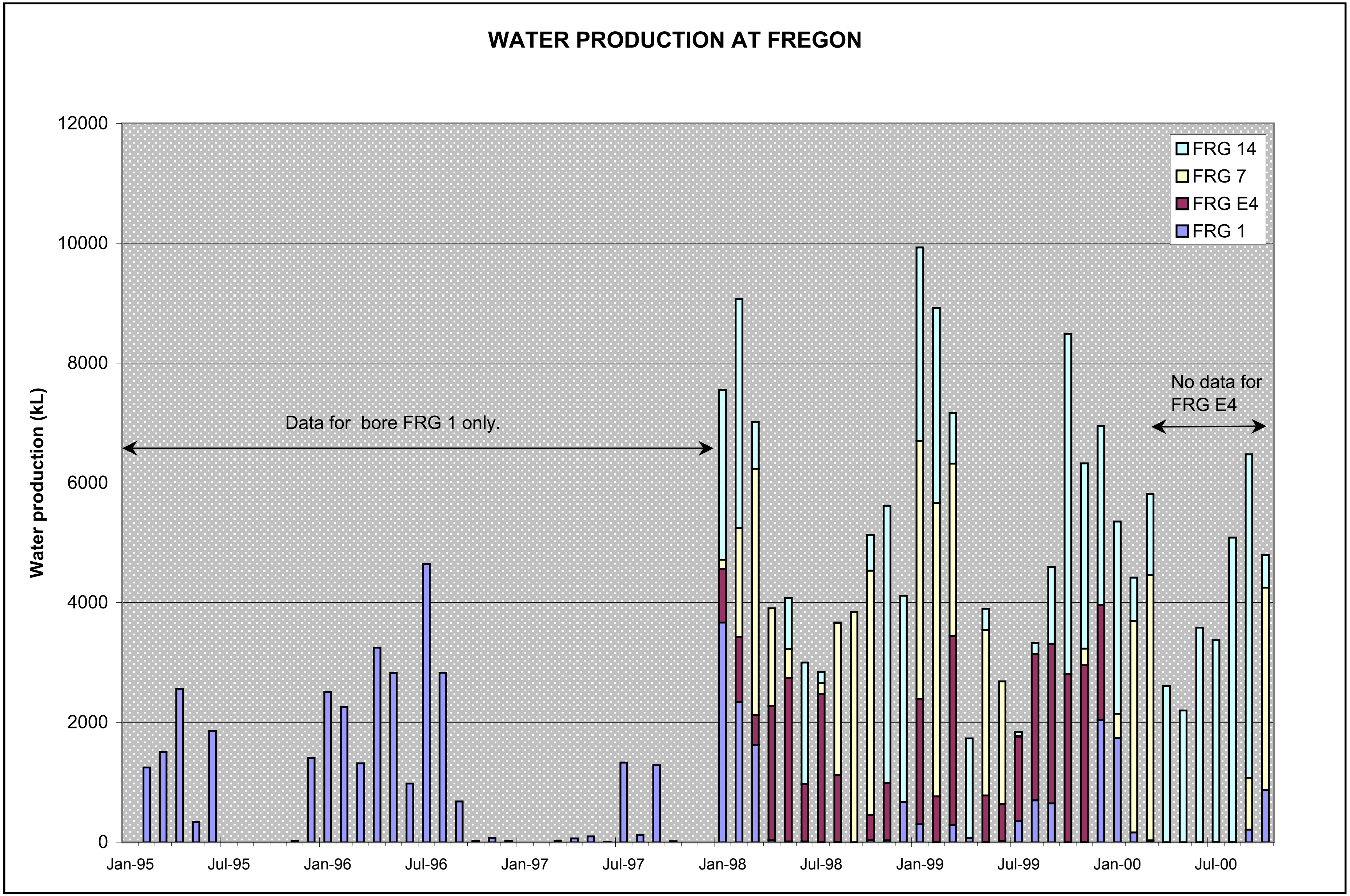

203000
204000
205000
206000
207000
7038000
7037000
7036000
7035000
FRG E4
FRG 7
FRG 14
Fregon
FRG 1
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
500
1000 Meters
Projection - AMG Zone 53
(Coordinates in metres)
Water well monitoring
in Aboriginal lands
Fregon
WELLS
PIRSA Publishing Services AV:200213-004

Figure 3.1



WATER PRODUCTION AT FREGON
Water production (kL)
12000
10000
8000
6000
4000
2000
0
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
FRG 14
FRG 7
FRG E4
FRG 1
Data for bore FRG 1 only.
No data for FRG E4

Figure 3.2

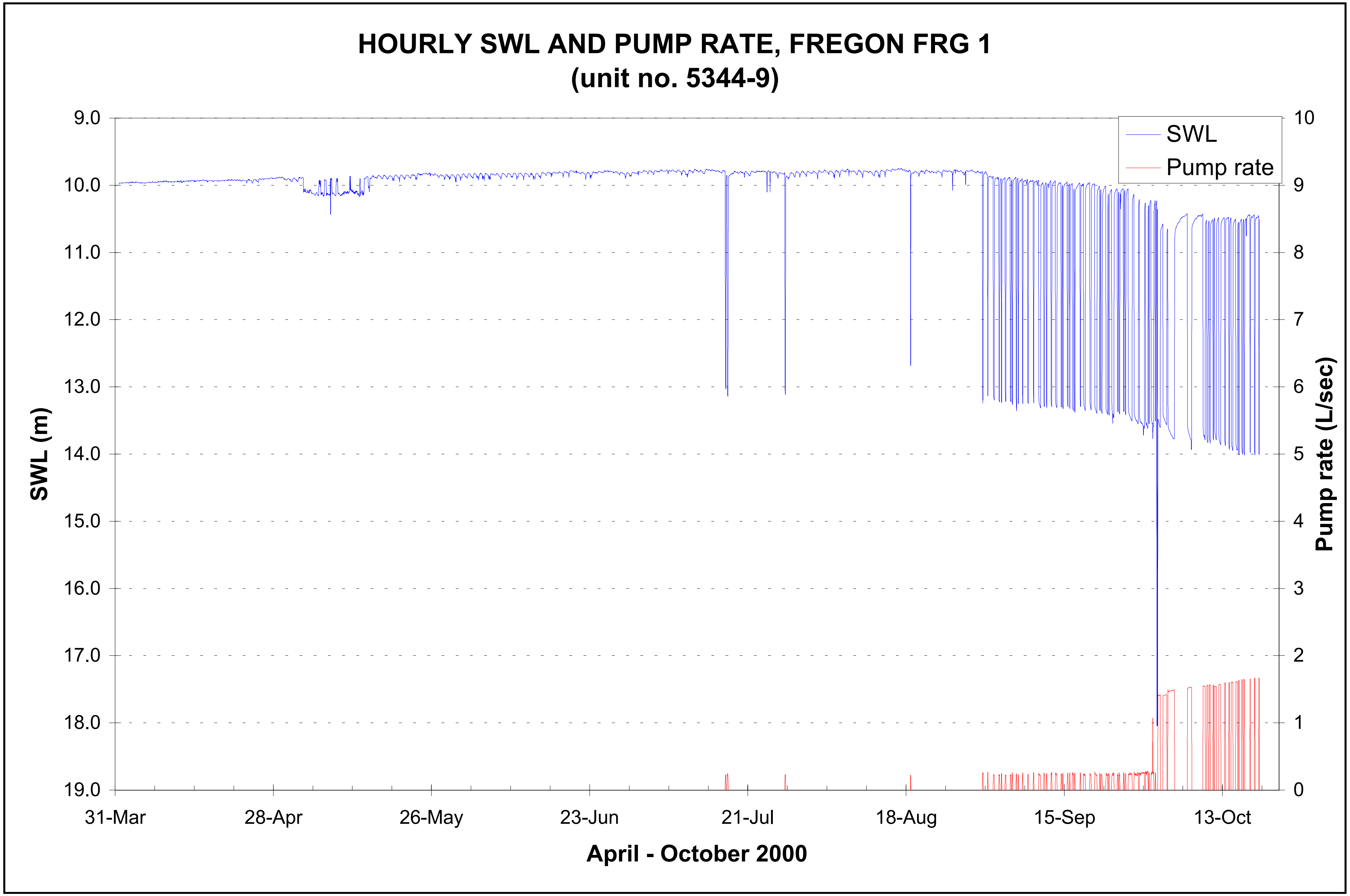

HOURLY SWL AND PUMP RATE, FREGON FRG 1
(unit no. 5344-9)
SWL
Pump rate
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
SWL (m)
10
9
8
7
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 3.3

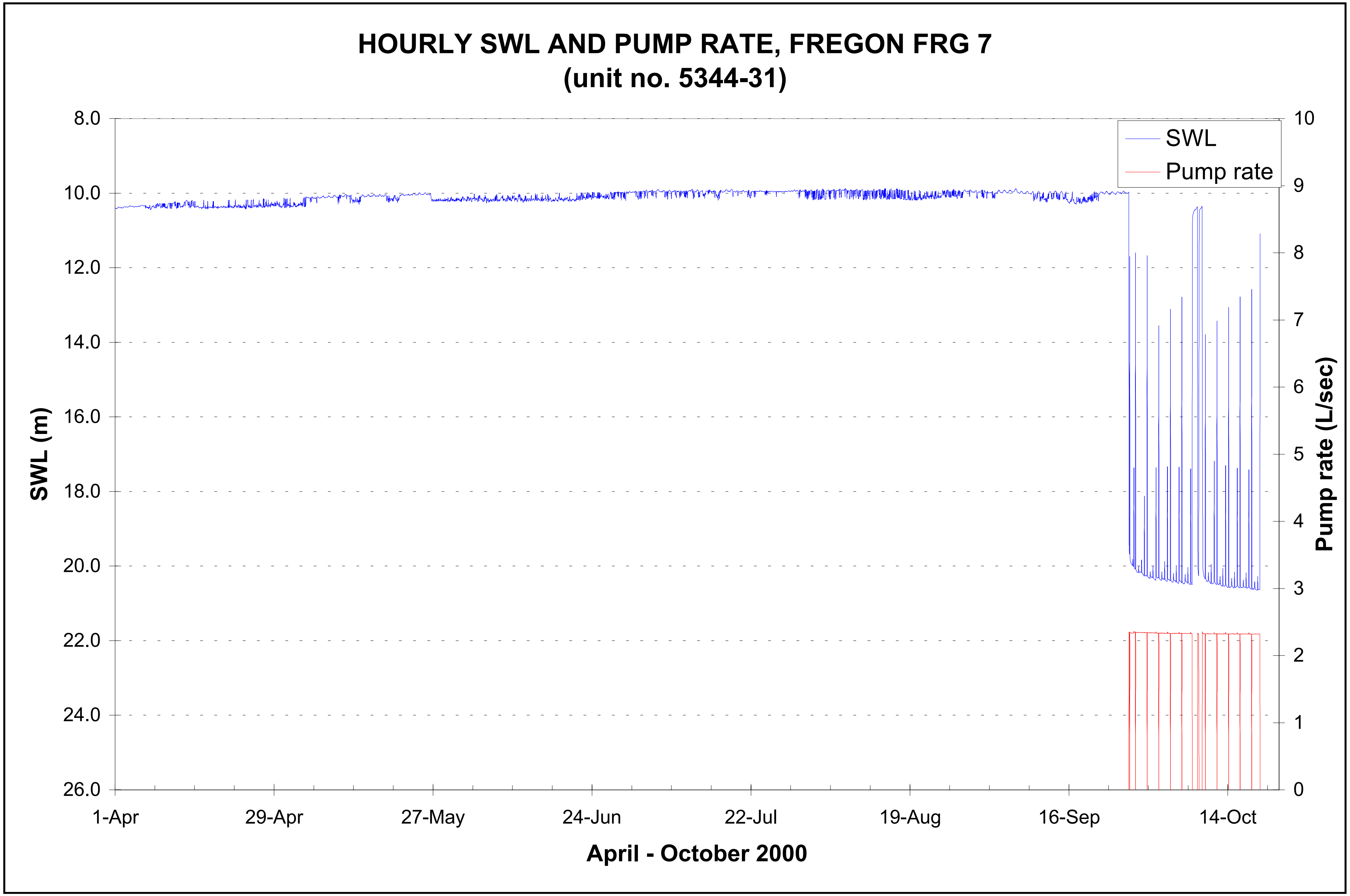

HOURLY SWL AND PUMP RATE, FREGON FRG 7
(unit no. 5344-31)
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
10
9
8
7
6
5
4
3
2
1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 3.4

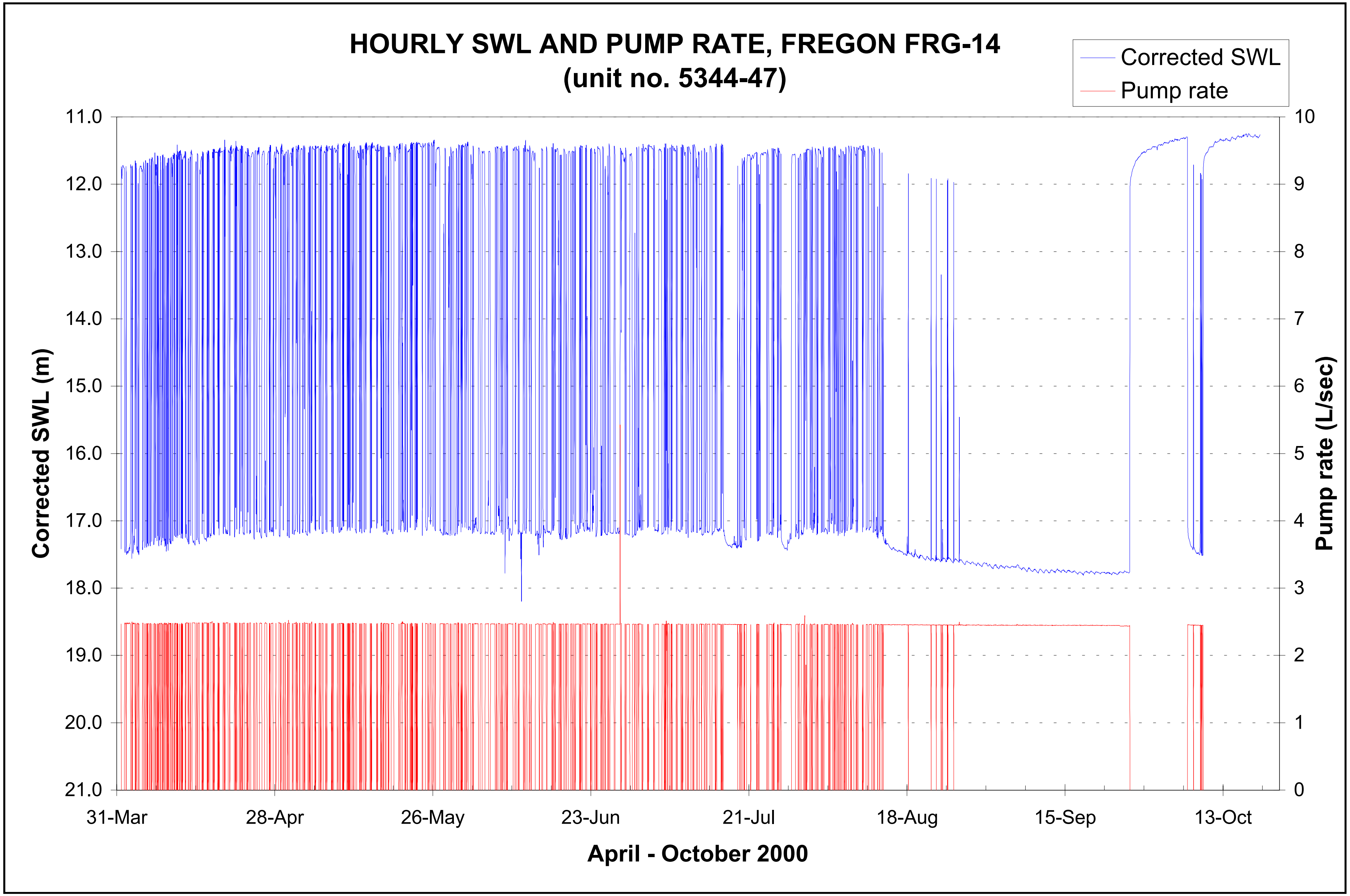

HOURLY SWL AND PUMP RATE, FREGON FRG-14
(unit no. 5344-47)
Corrected SWL
Pump rate
Corrected SWL (m)
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
Pump rate (L/sec)
10
9
8
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 3.5

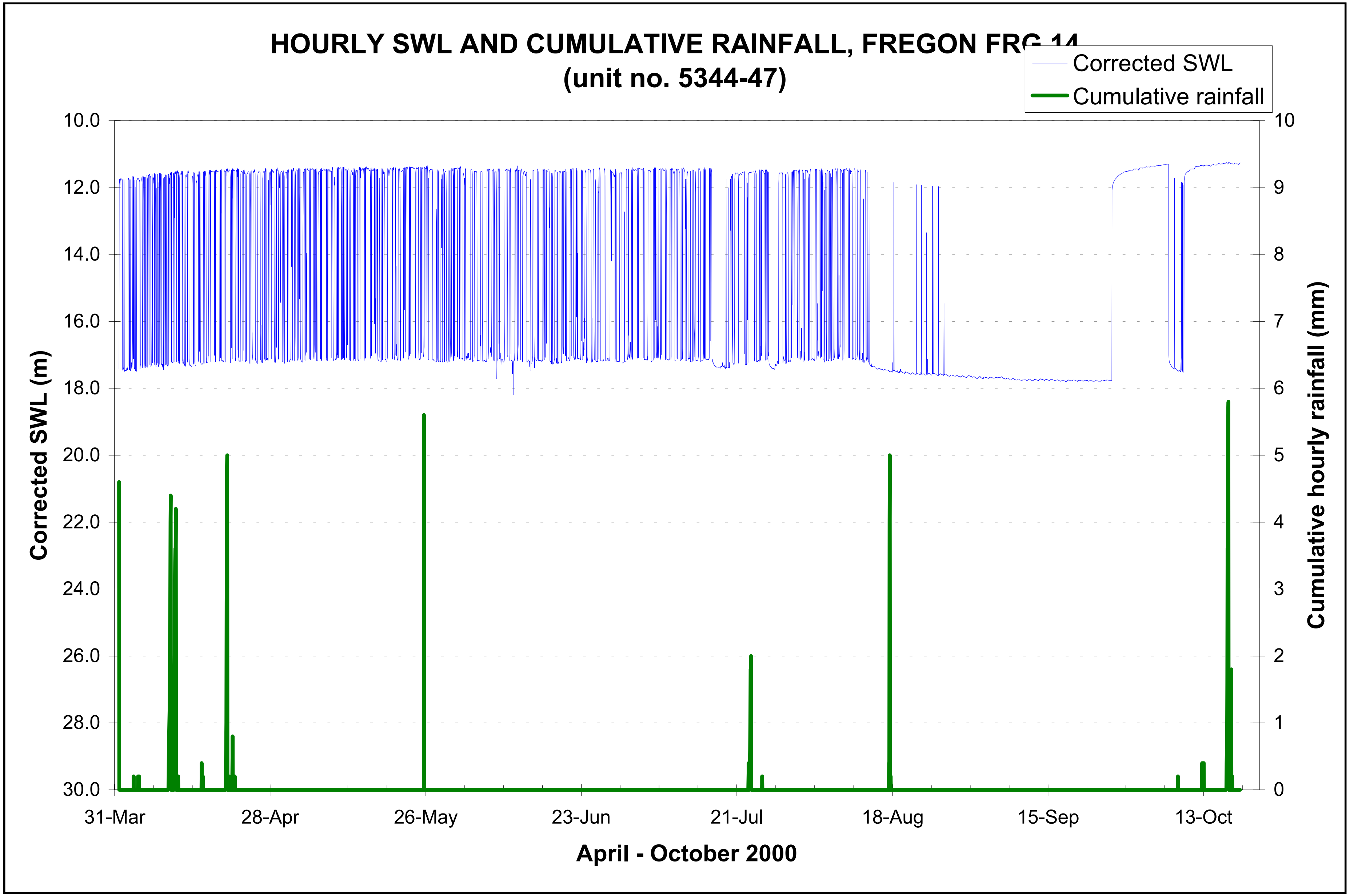

HOURLY SWL AND CUMULATIVE RAINFALL, FREGON FRG 14
(unit no. 5344-47)
Corrected SWL
Cumulative rainfall
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
Corrected SWL (m)
10
9
8
7
6
5
4
3
2
1
0
Cumulative hourly rainfall (mm)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 3.6

4 Kenmore Park

OVERVIEW

Water production data for the community at Kenmore Park is summarised in Table 4.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Both wells in the Kenmore Park region (Fig. 4.1) experienced SWL unit malfunction, however, some of the data can be utilised. The wells coped with the level of water withdrawal (less than in 1999; Fig. 4.2).

Total rainfall for April to October 2000 was 65.2 mm. A number of small rainfall events, up to 5 mm, occurred throughout the period.

Table 4.1 Water production at Kenmore Park, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
KP 6	10 529.0	4 767.0	6 405.0	**1 773.0**
KP 7	978.1	798.6	584.6	**3 413.0**
Total	**11 507.1**	**5 565.6**	**6 989.6**	**5 186.0**

KP 6

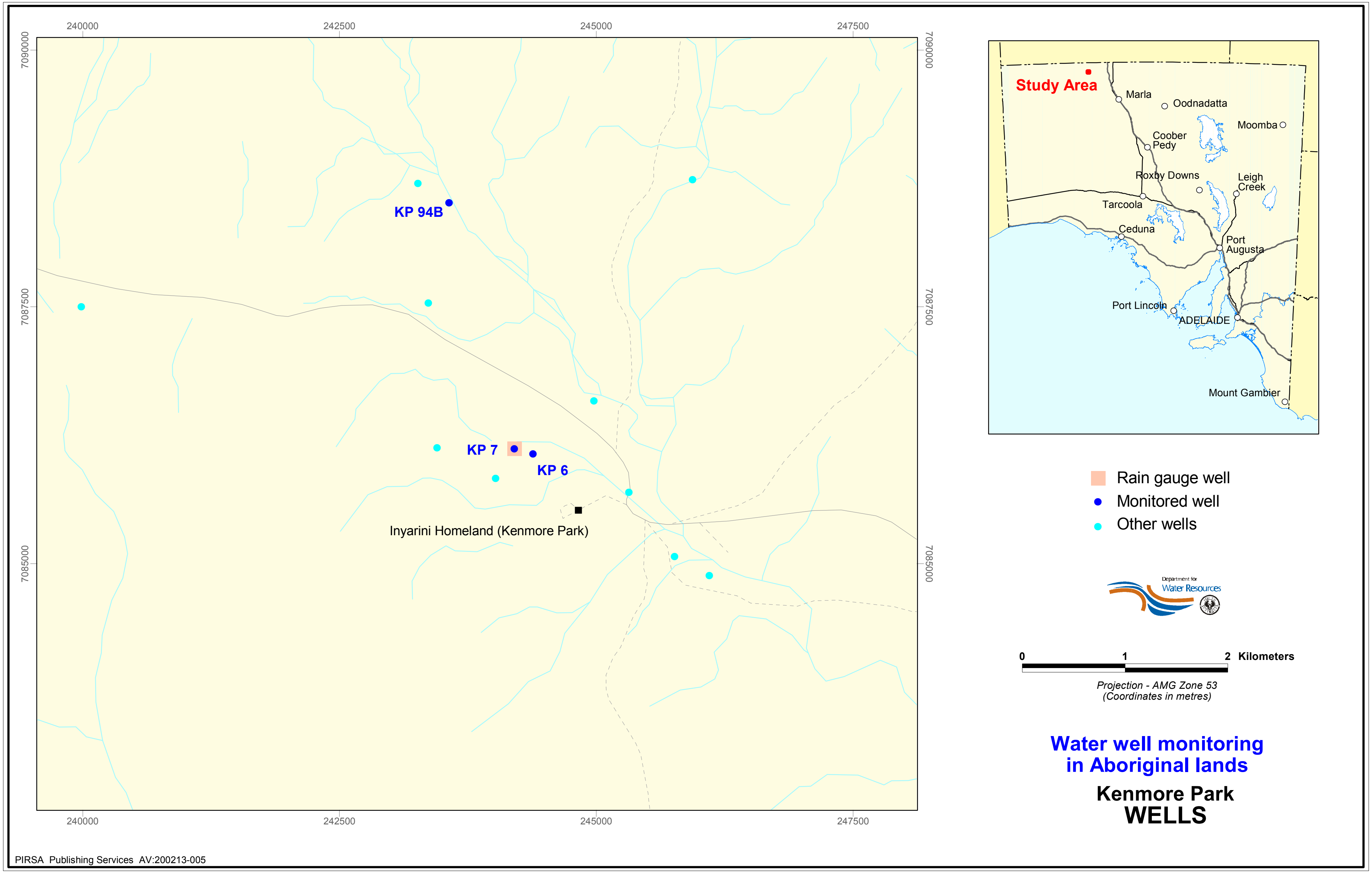
The SWL measurement unit in KP 6 failed temporarily in May 2000 then completely in late June, and the water level data is not reliable. However, the final manual measurement water level of 9.93 m, suggests that the water level is being maintained (10.3 m last period, October 1999 to April 2000), showing no recharge effects or aquifer depletion.

Water production was 60% lower than the previous period and an even smaller proportion of that of earlier years. It is not clear if the intermittent use of KP 6 is due to the fact that the well struggles to produce its own supply (Fig. 4.3). The well was pumped at the start of the period and, towards the end of the period, it was pumped for 40 hours at 0.67 L/s when the SWL unit failed.

KP 7

The SWL probe in KP 7 failed in early May 2000 causing anomalies in the readings for the monitoring period. The manual SWL reading taken in October 2000 shows that the watertable was constant for the period at 11.09 m, compared with 11.1 m prior to the failure of the probe. Overall the SWL has remained consistent at about 11 m since 1997.

It is likely that the rise in SWL mentioned in the previous report can be attributed to recharge in March 2000, however the rise did not continue into April (Fig. 4.4). This well was pumped harder during this period (16 kL/d) than at any time since 1997; an average increase of about 80% (Fig. 4.5).



240000
242500
245000
247500
7090000
7087500
7085000
KP 94B
KP 7
KP 6
Inyarini Homeland (Kenmore Park)
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
1
2 Kilometers
Projection - AMG Zone 53
(Coordinates in metres)
Water well monitoring in Aboriginal lands
Kenmore Park
WELLS
PIRSA Publishing Services AV:200213-005

Figure 4.1

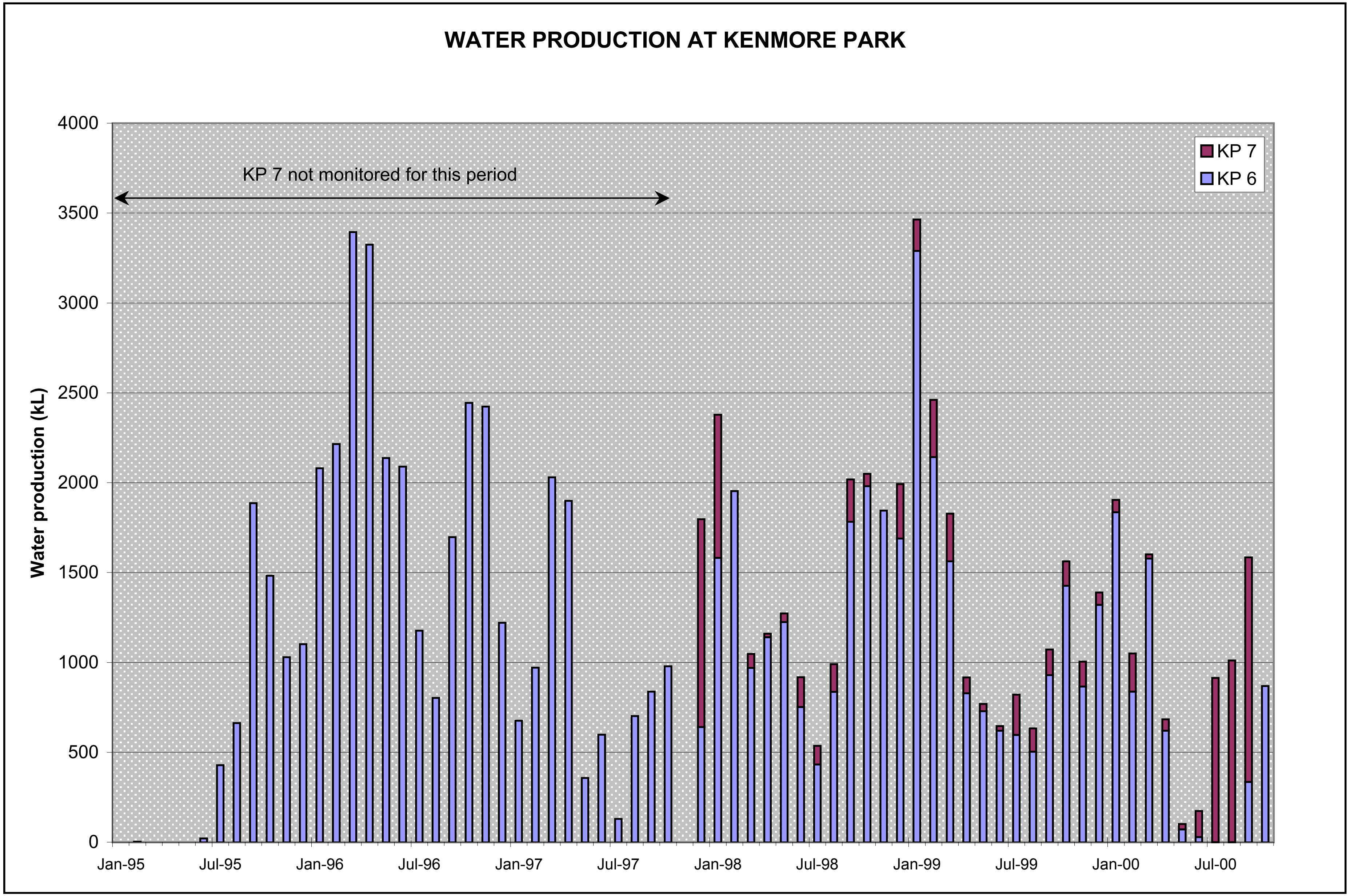
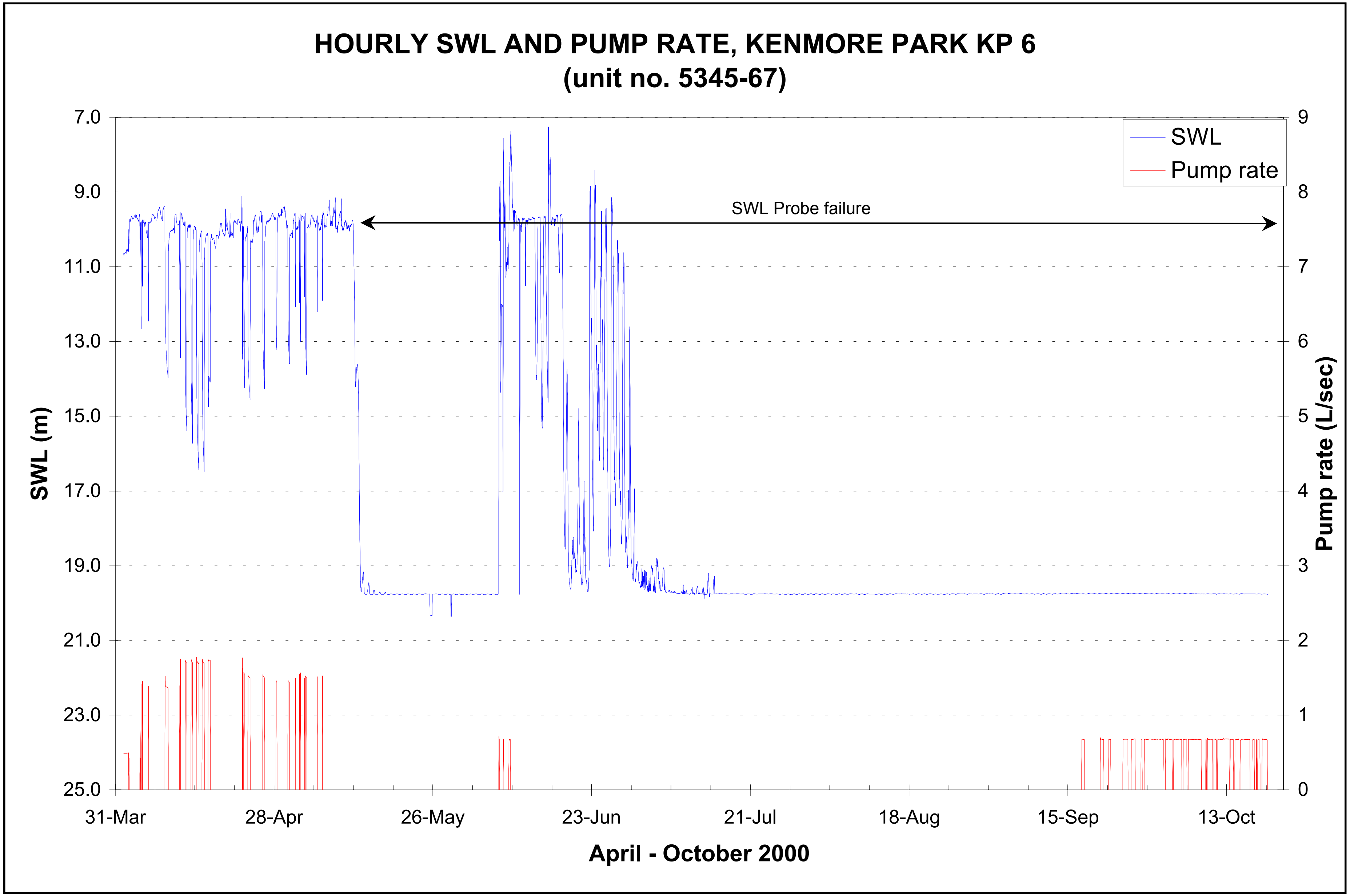
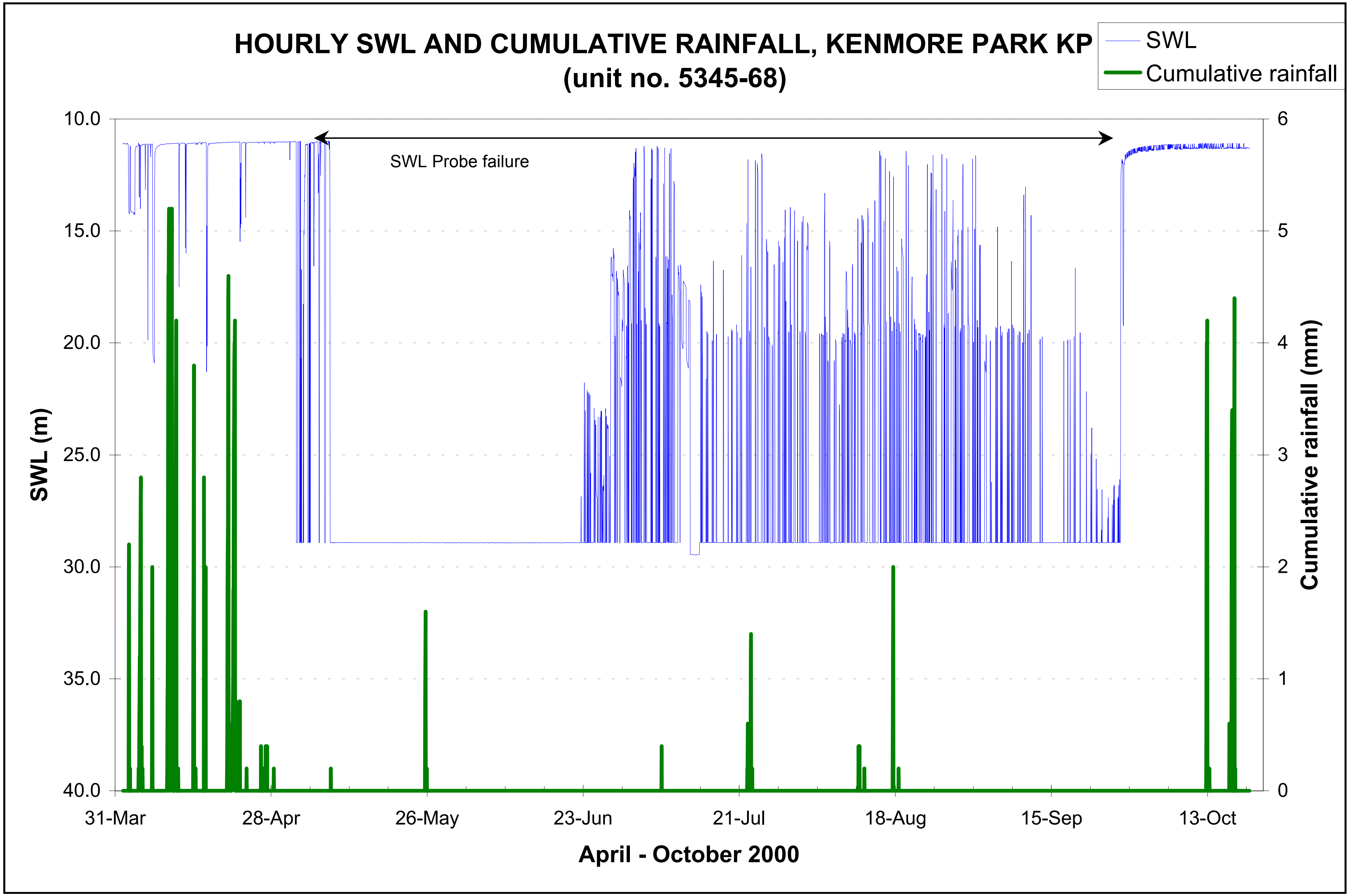

WATER PRODUCTION AT KENMORE PARK
KP 7
KP 6
KP 7 not monitored for this period
4000
3500
3000
2500
2000
1500
1000
500
0
Water production (kL)
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00

Figure 4.2



HOURLY SWL AND PUMP RATE, KENMORE PARK KP 6
(unit no. 5345-67)
SWL (m)
7.0
9.0
11.0
13.0
15.0
17.0
19.0
21.0
23.0
25.0
Pump rate (L/sec)
9
8
7
6
5
4
3
2
1
0
SWL
Pump rate
SWL Probe failure
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 4.3



HOURLY SWL AND CUMULATIVE RAINFALL, KENMORE PARK KP
(unit no. 5345-68)
SWL
Cumulative rainfall
SWL Probe failure
SWL (m)
Cumulative rainfall (mm)
10.0
15.0
20.0
25.0
30.0
35.0
40.0
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 4.4

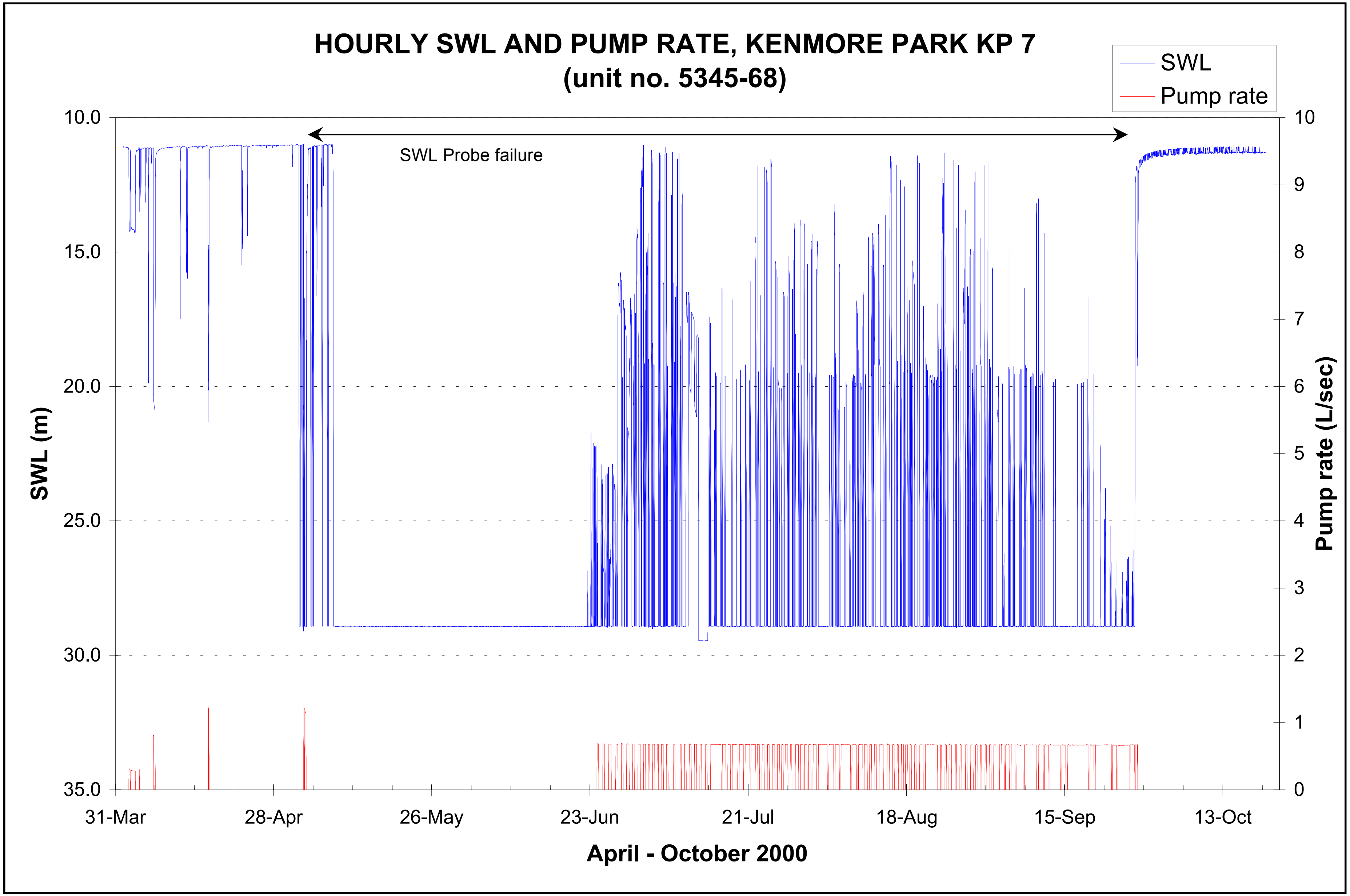

HOURLY SWL AND PUMP RATE, KENMORE PARK KP 7
(unit no. 5345-68)
SWL
Pump rate
SWL Probe failure
10.0
15.0
20.0
25.0
30.0
35.0
SWL (m)
10
9
8
7
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 4.5

5 Pukatja

OVERVIEW

Water production data for the community at Pukatja (formerly Ernabella) is summarised in Table 5.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Fig. 5.1. Current extraction rates at wells E 42 and E 45 could see water levels return to pre-February 2000 levels within 12 to 24 months. Rises in SWL have continued in some wells resulting from the rainfall events in February 2000, however, the extent has been varied, particularly in those wells north of the community. Water extraction has settled to about 5 to 7 ML/month, coming mainly from E 12, E 45 and E 97L (Fig. 5.2).

During the month of April 2000, 68 mm of rain fell. Total rainfall for April to October 2000 was 102.8 mm.

Table 5.1 Water production at Pukatja, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
E 1	–	–	–	**–**
E 12	18 280.0	16 193.0	4 801.9	**16 802.3**
E 42	638.4	1 563.2	2 395.0	**2 726.7**
E 44	–	7.2	0.2	**0.1**
E 45	9 802.0	8 205.0	9 346.3	**10 579.0**
E 45	–	18 007.0†	27 353.3†	**–**
E 97B	–*	19 310.0	6 899.6	**1 913.9**
E 97L	–*	7 200.5	9 680.5	**7 009.9**
Total	**28 720.4**	**(62 280.9) 52 478.9‡**	**(51 130.5) 31 123.5‡**	**39 031.9**

* Monitoring equipment was not installed.
† Value represents total accumulated production; not monitoring period only.
‡ Total value has been adjusted to represent monitoring period only.

E 1

E 1 is no longer pumped or monitored. In the absence of pumping, the water level steadily dropped, but recovered with a rise in 2000 from 8.7 m to 8.2 m. This is within 0.2 m of the highest level recorded, which was in 1997.

E 12

E 12 was pumped continuously during this monitoring period, at just over 1 L/s, providing 43% of the communities water supply (Fig. 5.3). At the start of the period, the SWL probe became faulty and the data is unreliable and there is no check on the well response to pumping. Following the rise in the watertable last period (October 1999 to April 2000), where the water level was 7.76 m, the water level at the end of this period was 8.5 m, showing a decline of 0.74 m. The drop is most likely due to pumping, however, all conclusions based on SWL data are tentative (except for the April 2000 recharge).

E 42

E 42 was pumped continually (except for rest periods in June and July 2000) at rates of 0.16 to 0.21 L/s, providing only 7% of the community's water supply.

Recharge resulting from the February 2000 rainfall events appears to have finished with the water level declining to a level of 9.9 m by mid October 2000; a fall of 0.6 m (Fig. 5.4). The water level dropped steadily during pumping, but recovered to a level of 9.3 m when not pumped (Fig. 5.5). Water levels were not as sensitive to small variations in pumping rates as levels were during the previous period (October 1999 to April 2000), suggesting that the upper fractures of the production zone have been recharged.

The rain gauge indicated that 68.6 mm fell during April 2000, however, unlike the February 2000 rains, there was no noticeable effect on the watertable. This could suggest that the rains were of insufficient intensity to further recharge the aquifer.

While water levels in the aquifer are higher than the pre-February rain levels, if no further recharge occurs and production levels remain the same (0.2 L/s), at the current rate of decline, the SWL would return to the pre-rainfall levels in 18 months to two years.

E 44

Similar to the previous two monitoring periods (April 1999 to April 2000), E 44 was not pumped, however, there are significant spikes in the water level readings. The SWL probe appeared to be functioning and a difference of only 0.013 m existed between the logger and actual SWL in October 2000 (Fig. 5.6). The cause of the spikes is still unknown.

E 44 has not been pumped significantly since October 1998, yet the SWL has been steadily declining. Following the rains in February and April 2000, the decline was abated, with the SWL rising to a maximum of 12.2 m in July 2000, before continuing its downward trend to a current level of 12.36 m. This is still below its level of 11.5 m in 1998, which suggests the recharge has been relatively insignificant.

E 45

E 45 was pumped continuously over most of the period at a rate of 0.77 L/s, with two rest periods in June to July 2000, providing 27% of the communities water supply. The water level had been falling steadily and the trend was reversed, and the water level continued to rise up to July 2000. The April 2000 rainfall events, recorded at E 42, appear to have had little impact on the recovery of the SWL. Given the intensity of the February 2000 rains it is difficult to assess the impact of the rainfalls.

The non-pumping level in E 45 is uncertain because of continual pumping (Fig. 5.7). When the pump is switched off, the level recovers slowly, requiring at least two weeks to reach its non-pumping level. The non-pumping level in July 2000 had risen to about 11.7 m, slightly above that in 1999 but still below the 1995 level of 9.7 m. The well would have to be rested for about a month to ascertain the current non-pumping level.

Sustained pumping over the period July to October 2000 caused the pumping water level to decline at a rate similar to that prior to the February 2000 rains. The current pumped water level, 14.6 m, is only 0.9 m above that of early February. At the current rate of decline, and if no further recharge occurred and production levels remained the same, the water level could return to pre-February levels in 12–15 months.

E 97B

E 97B was not extensively pumped during this monitoring period (Fig. 5.8). A defective SWL unit limits the information on the aquifer behaviour. The water level has evidently dropped from a high of 12.3 m in February to about 13.6 m in July. This compares favourably with the level of 13.55 m at the time of drilling but a longer history and reliable data will be needed before confident predictions of sustainability can be made.

E 97L

The SWL unit in E 97L was defective at the end of the monitoring period, but valid data was collected up to late September 2000 (Fig. 5.9). The non-pumping water level has risen from 16 m before recharge in February, to 15 m in August 2000. This is slightly below the level at the time of drilling in 1997.

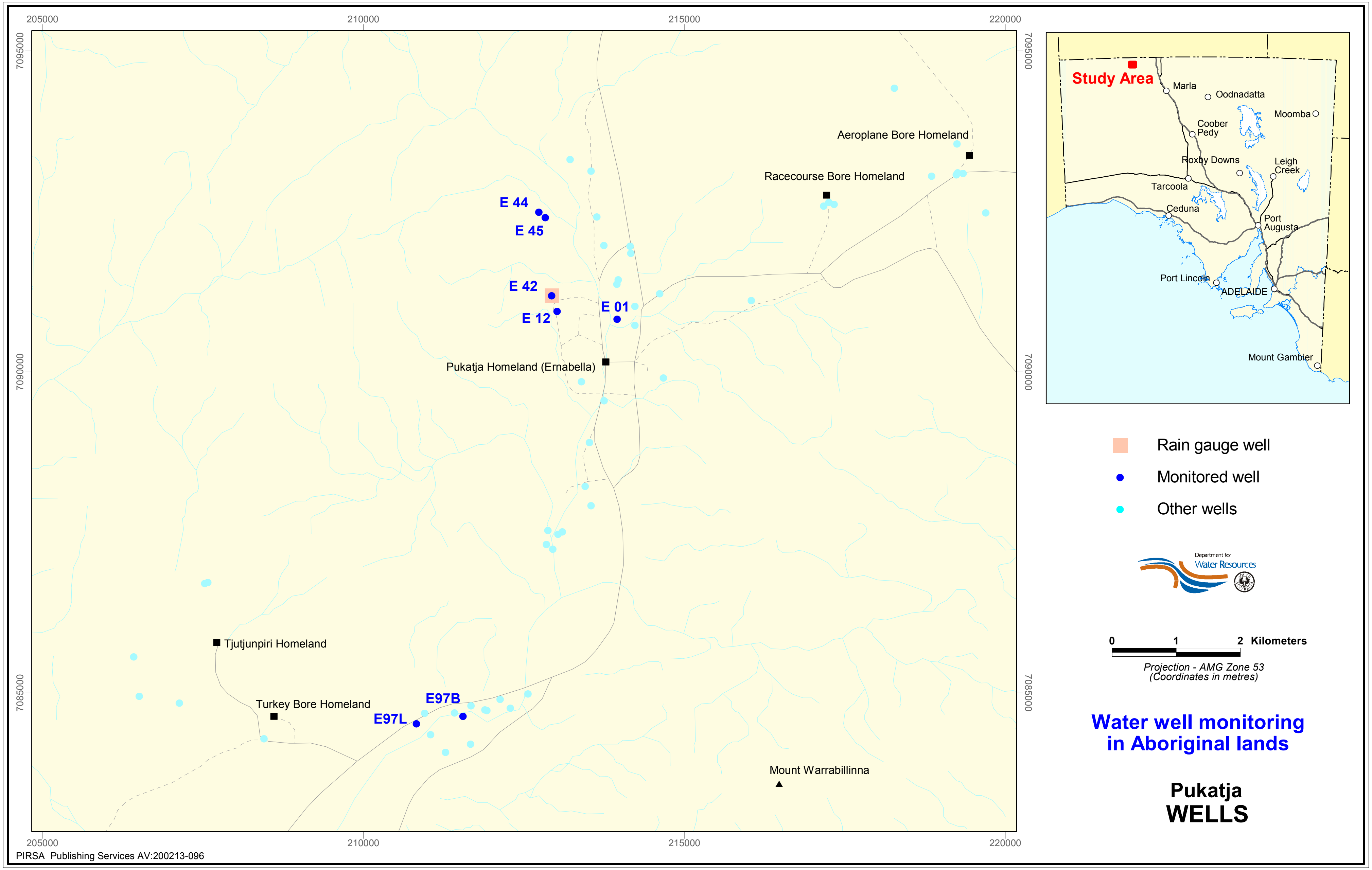
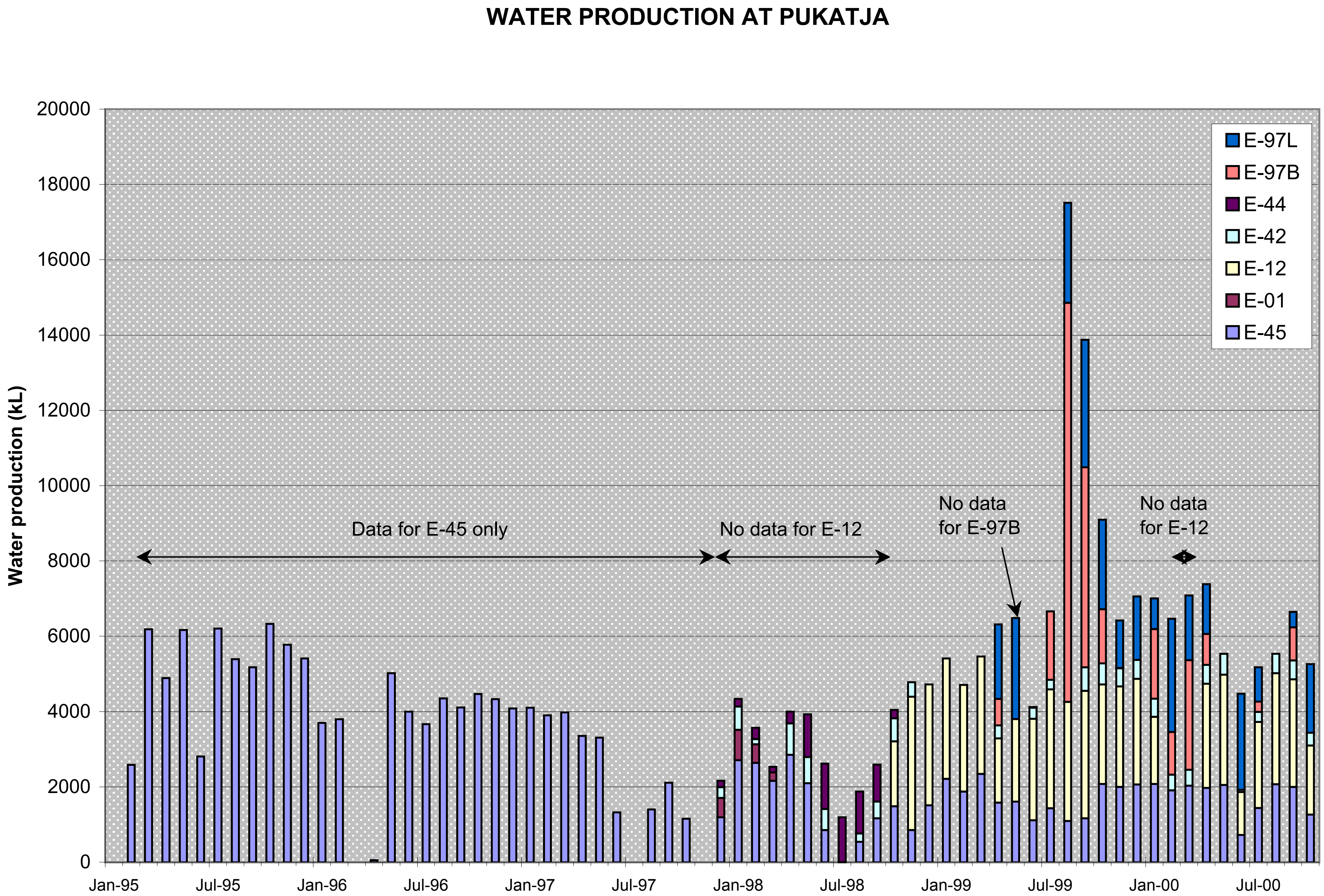

205000
210000
215000
220000
7095000
7090000
7085000
Aeroplane Bore Homeland
Racecourse Bore Homeland
E 44
E 45
E 42
E 01
E 12
Pukatja Homeland (Ernabella)
Tjutjunpiri Homeland
Turkey Bore Homeland
E97B
E97L
Mount Warrabillinna
PIRSA Publishing Services AV:200213-096
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
1
2 Kilometers
Projection - AMG Zone 53
(Coordinates in metres)
Water well monitoring in Aboriginal lands
Pukatja
WELLS

Figure 5.1



WATER PRODUCTION AT PUKATJA
Water production (kL)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Jan-95
Jul-95
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
E-97L
E-97B
E-44
E-42
E-12
E-01
E-45
Data for E-45 only
No data for E-12
No data
for E-97B
No data
for E-12

Figure 5.2

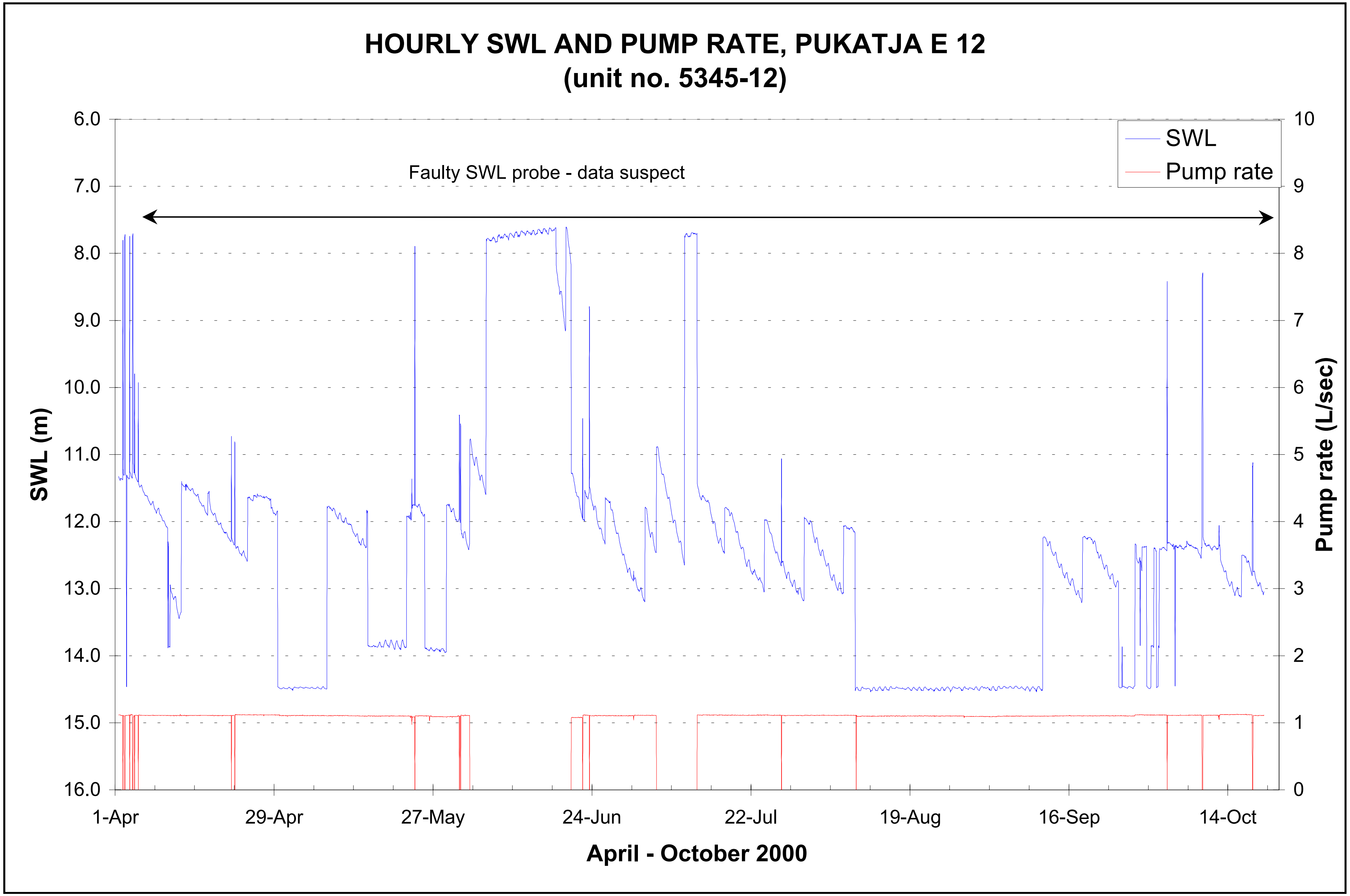

HOURLY SWL AND PUMP RATE, PUKATJA E 12
(unit no. 5345-12)
Faulty SWL probe - data suspect
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
10
9
8
7
6
5
4
3
2
1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 5.3

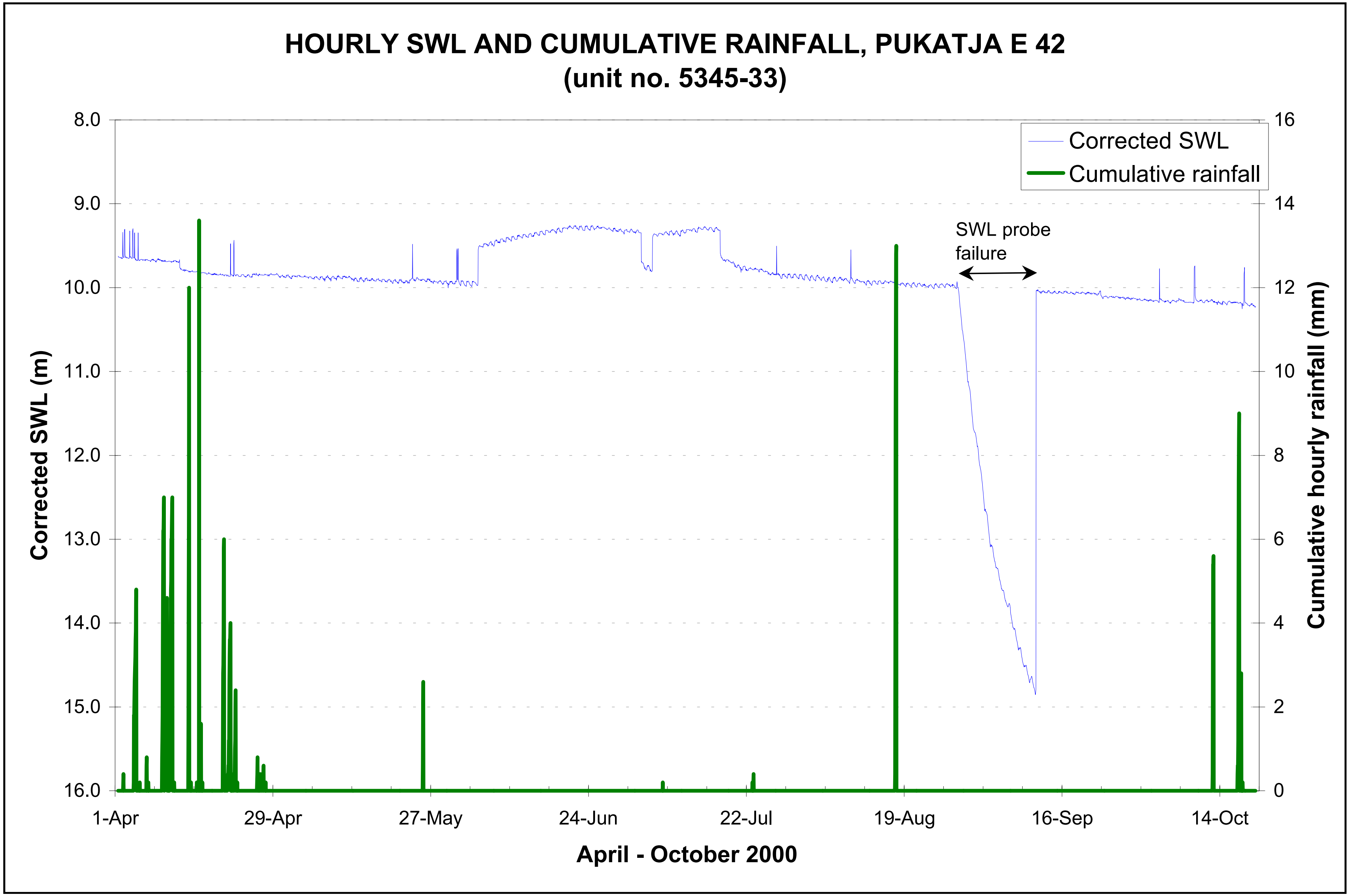
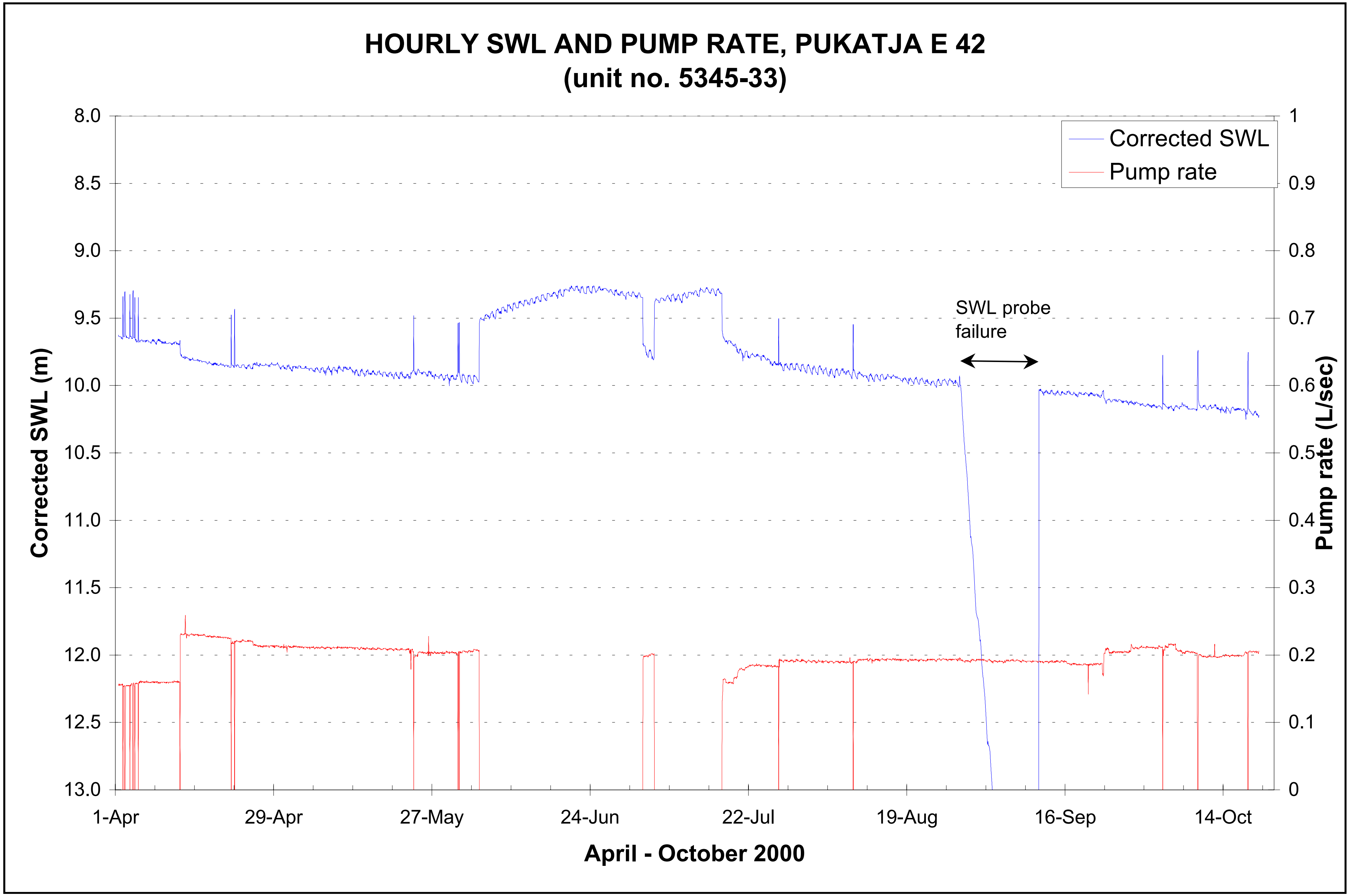

HOURLY SWL AND CUMULATIVE RAINFALL, PUKATJA E 42
(unit no. 5345-33)
Corrected SWL
Cumulative rainfall
SWL probe failure
Corrected SWL (m)
Cumulative hourly rainfall (mm)
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
16
14
12
10
8
6
4
2
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 5.4



HOURLY SWL AND PUMP RATE, PUKATJA E 42
(unit no. 5345-33)
Corrected SWL
Pump rate
SWL probe failure
Corrected SWL (m)
Pump rate (L/sec)
8.0
8.5
9.0
9.5
10.0
10.5
11.0
11.5
12.0
12.5
13.0
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 5.5

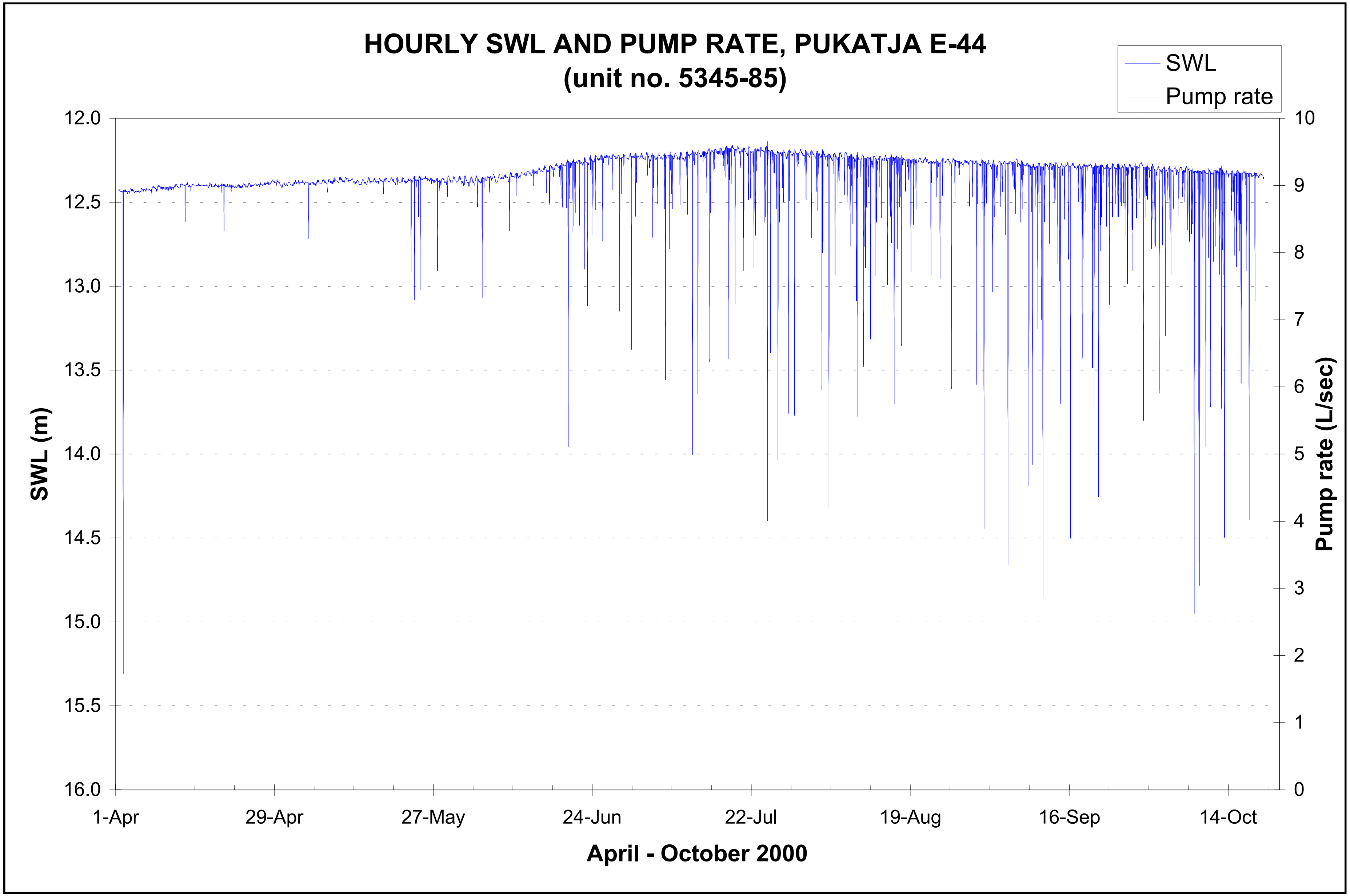

HOURLY SWL AND PUMP RATE, PUKATJA E-44
(unit no. 5345-85)
SWL
Pump rate
SWL (m)
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
Pump rate (L/sec)
10
9
8
7
6
5
4
3
2
1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 5.6

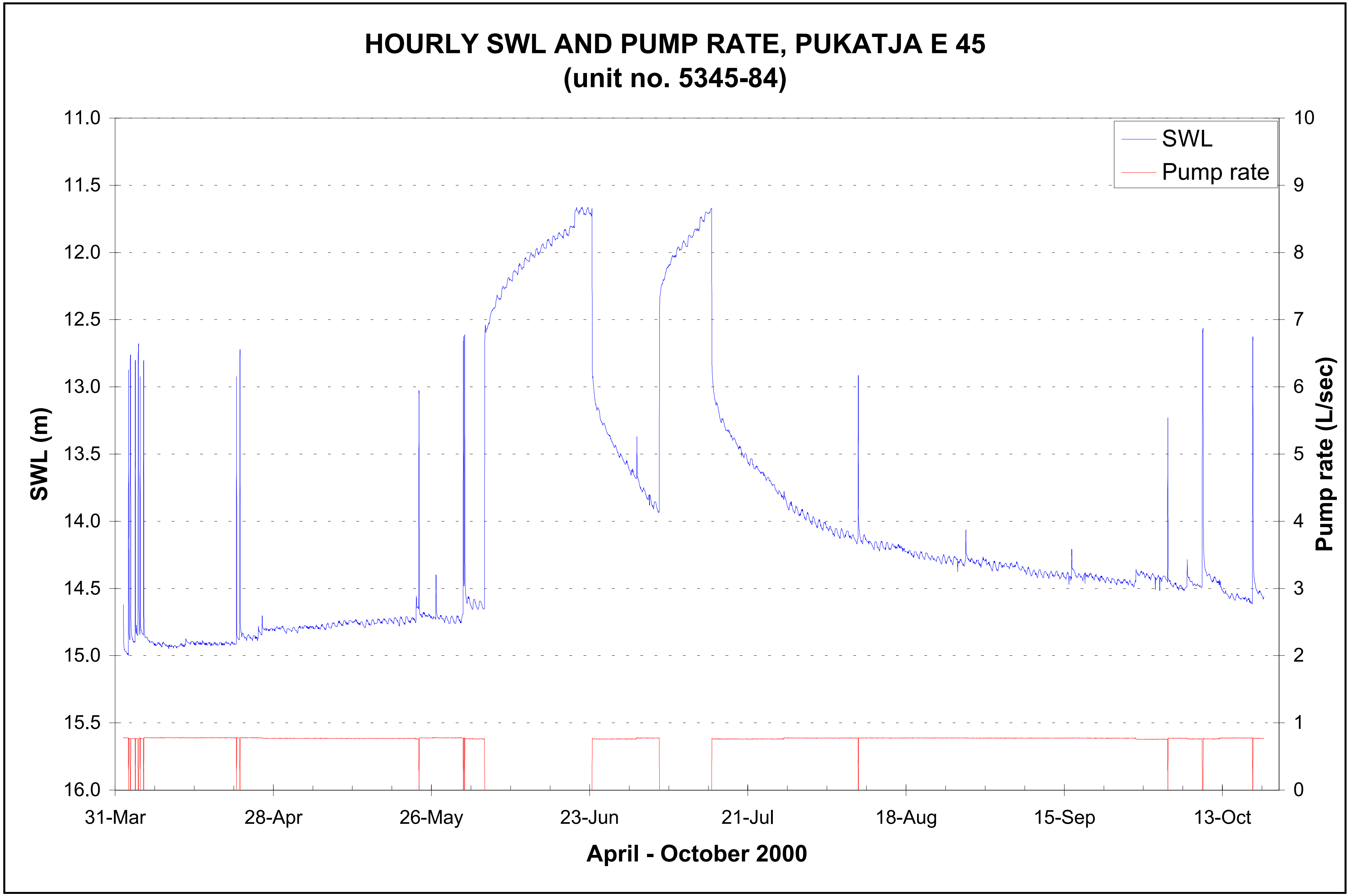

HOURLY SWL AND PUMP RATE, PUKATJA E 45
(unit no. 5345-84)
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
11.0
11.5
12.0
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
10
9
8
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 5.7

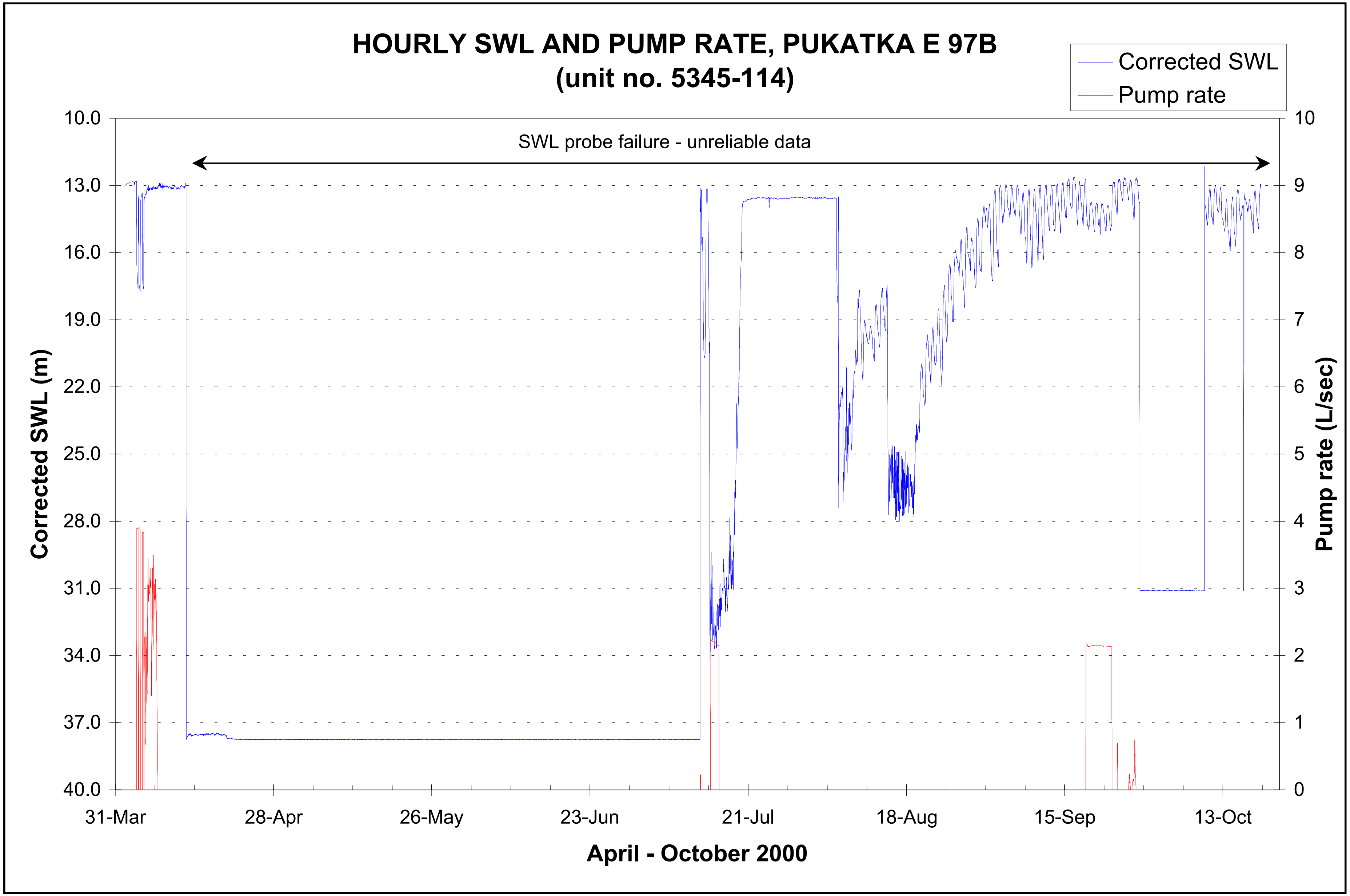

HOURLY SWL AND PUMP RATE, PUKATKA E 97B
(unit no. 5345-114)
Corrected SWL
Pump rate
SWL probe failure - unreliable data
10.0
13.0
16.0
19.0
22.0
25.0
28.0
31.0
34.0
37.0
40.0
Corrected SWL (m)
10
9
8
7
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 5.8

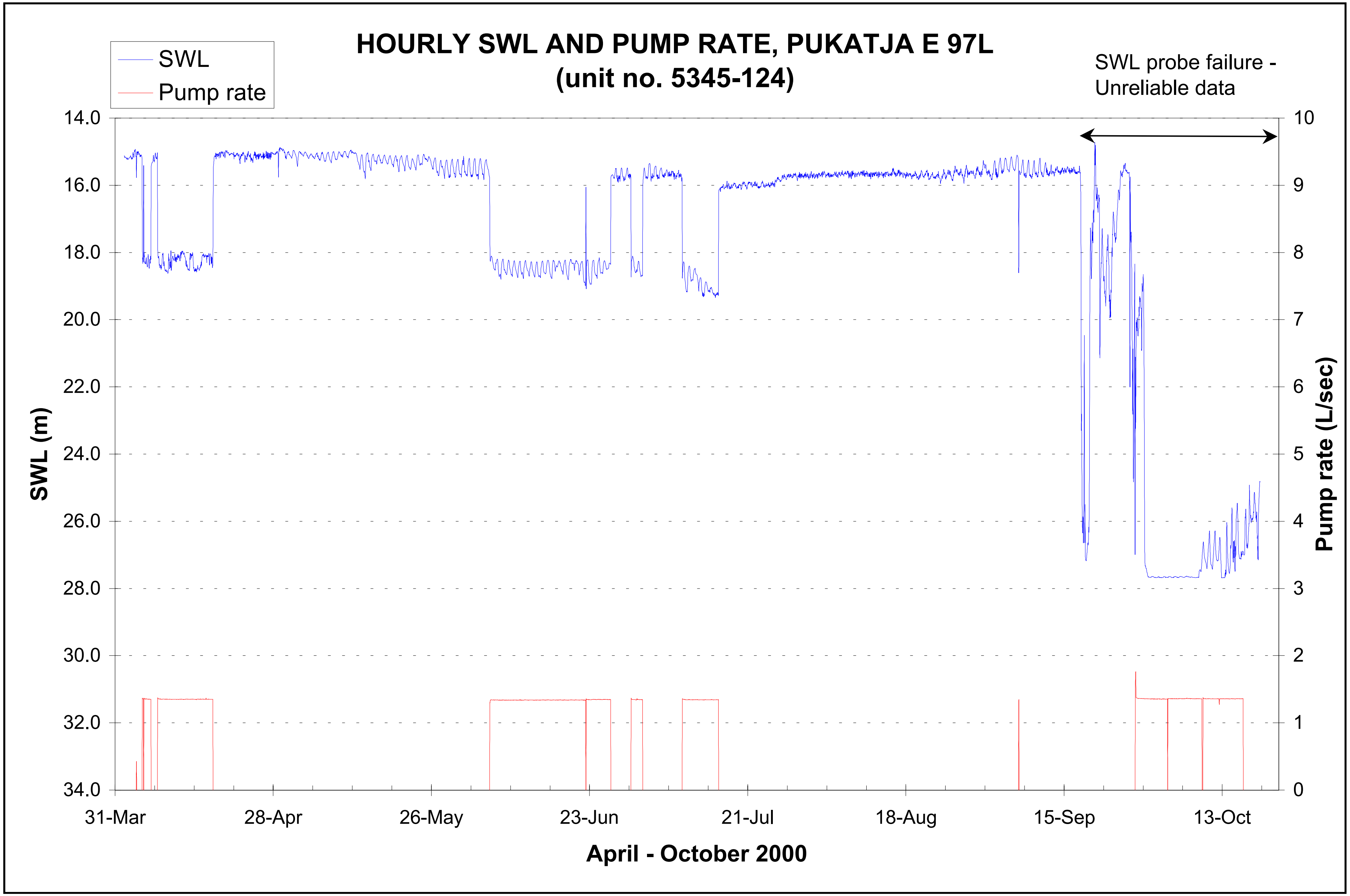

HOURLY SWL AND PUMP RATE, PUKATJA E 97L
(unit no. 5345-124)
SWL
Pump rate
SWL probe failure -
Unreliable data
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
SWL (m)
10
9
8
7
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 5.9

6 Amata

OVERVIEW

Water production data for the community at Amata is summarised in Table 6.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Figure 6.1. Recharge is the most clear and dramatic of all monitored communities. Rainfall events in February 2000 have contributed to all three wells showing an ongoing rise in SWL throughout the monitoring period, and current data suggests this is likely to continue (Fig. 6.2). A total rise of 3–4 m is relatively consistent for all wells. Results confirm the conclusions of an earlier report (Dodds and Sampson, 2000), in which it is suggested only a drought of 30 or more years would result in aquifer failure.

There is no rainfall data for the current period because of power failure at well A 15. While water production is lower than previous periods, it is consistent with the same period last year (April to October 1999).

Table 6.1 Water production at Amata, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
A 15	16 300.0	12 853.0	14 251.0	–
A 17	9 685.1	8 150.7	7 647.0	**11 030.0**
A 26	1 361.2	–	8 602.2	**10 400.0**
Total	**27 346.3**	**21 003.6***	**30 500.0**	**21 430.0†**

* A 26 value is missing from total.
† A 15 value is missing from total.

A 15

There is no data for A 15 because of power failure. However, a SWL manual measurement indicates that the water level rose a further 2.1 m between April and October 2000, rising above the water level in 1995 and within 1.7 m of the water level in 1987. Since there is no power at the site, no water was extracted, which suggests a rise in water level above that resulting from recharge.

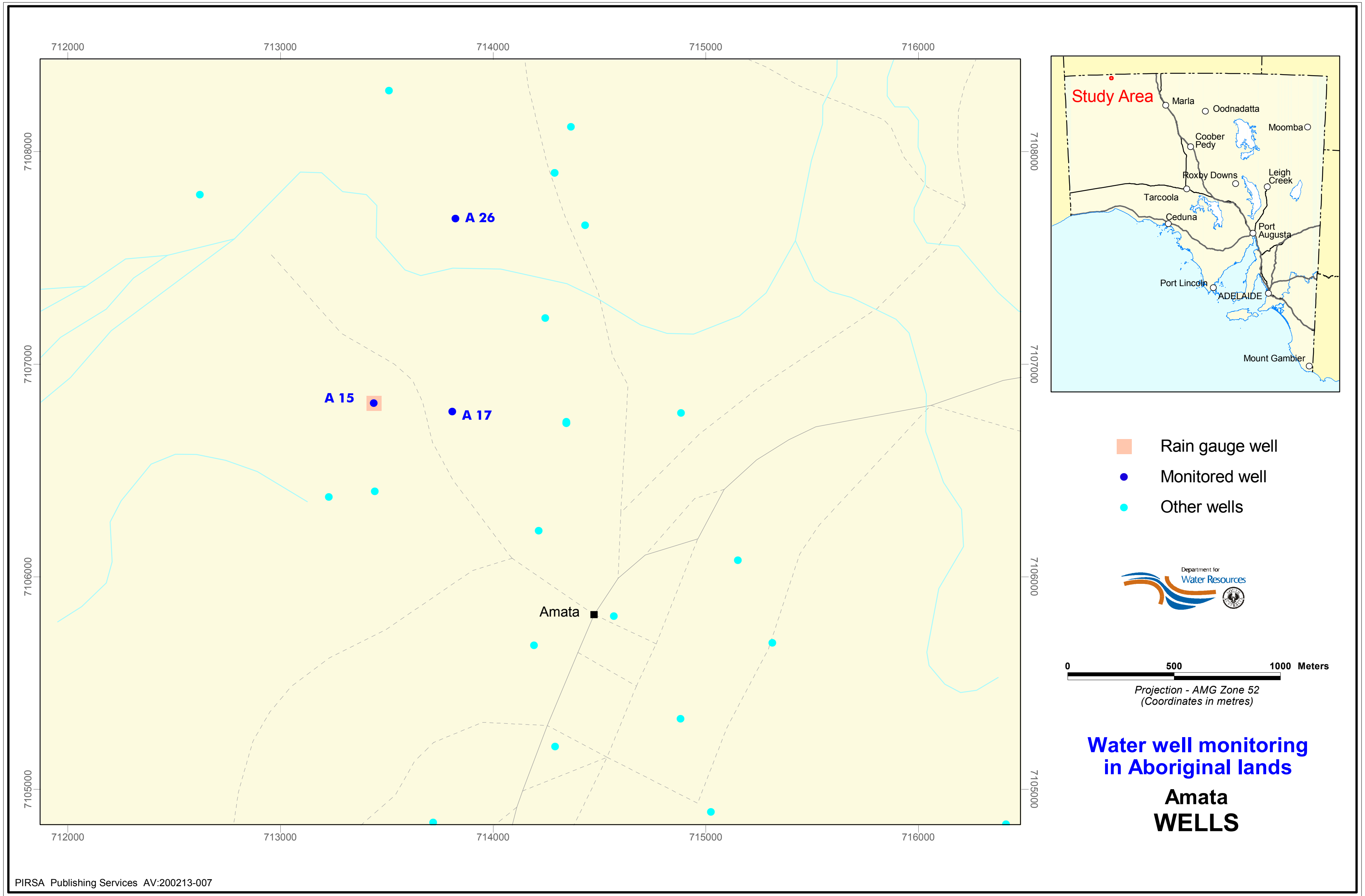
A 17

In A 17 the SWL continued to rise throughout this period, despite a 37% increase in water extraction. Recharge of the aquifer continued following rains earlier in the year. The water level has risen 3.7 m since the rains in February 2000 and appears to still be rising. The well is within 3 m of the water level at the time of drilling in 1990.

Downward spikes in the SWL record indicate momentary instrument error, which became continuous over the period 18 September to 10 October 2000. A difference of 0.141 m was recorded between the logger and the actual SWL at the time of download, which was applied as a constant drift over the period. Water production remained constant over the period (Fig. 6.3).

A 26

The SWL in A 26 continued to rise over this monitoring period, similar to A 17 and despite a 21% increase in water withdrawal (Fig. 6.4). Since the rains in February 2000, the total rise was 2.9 m from 16.5 m to 13.6 m, but the water level is still 3 m below the tentative level of 10.6 m measured when the well was drilled in 1966. A minimal correction was required to the water level datum in the logger.



712000
713000
714000
715000
716000
7108000
7107000
7106000
7105000
A 26
A 15
A 17
Amata
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
500
1000
Meters
Projection - AMG Zone 52
(Coordinates in metres)
Water well monitoring in Aboriginal lands
Amata
WELLS
PIRSA Publishing Services AV:200213-007

Figure 6.1

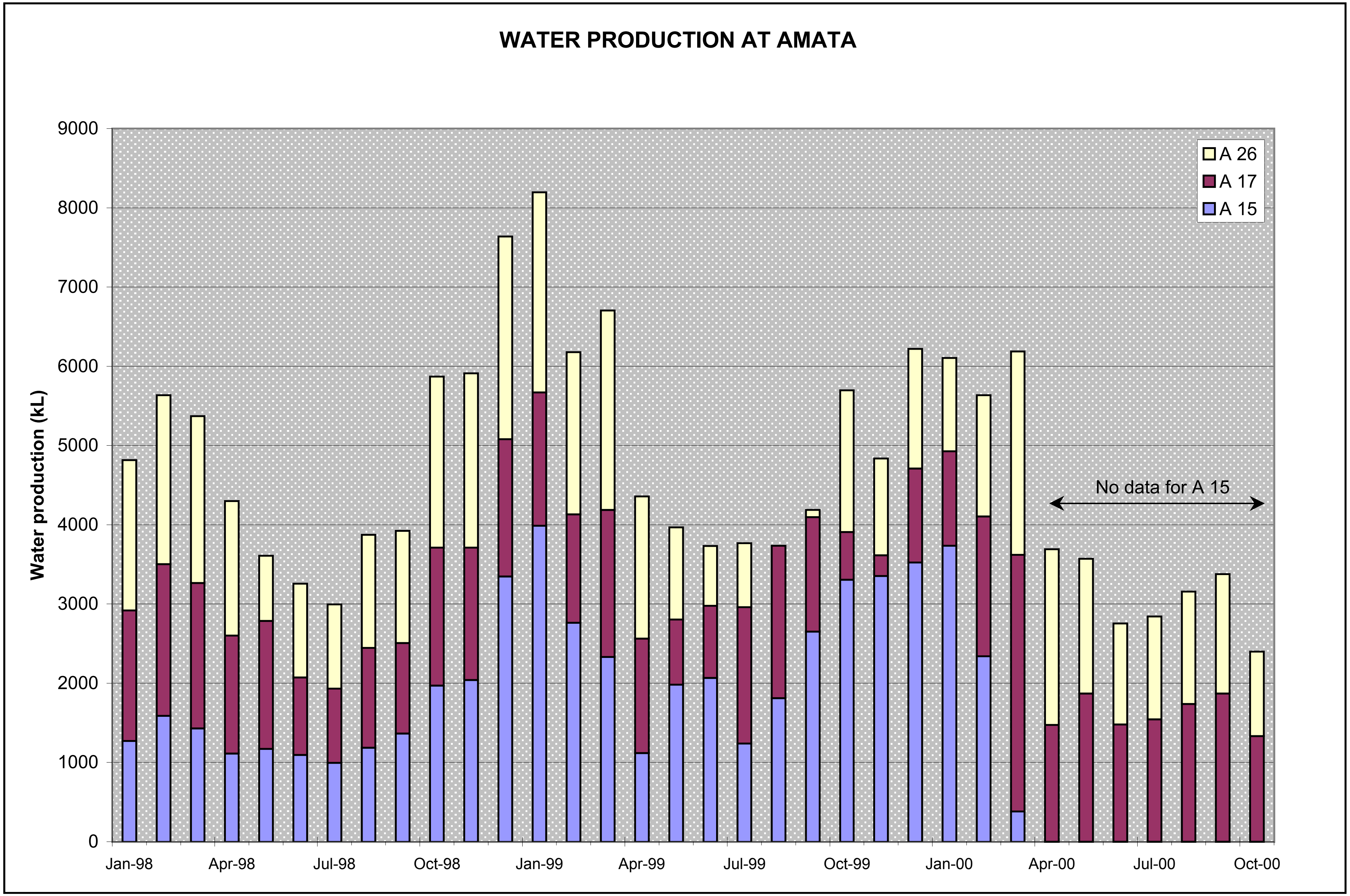
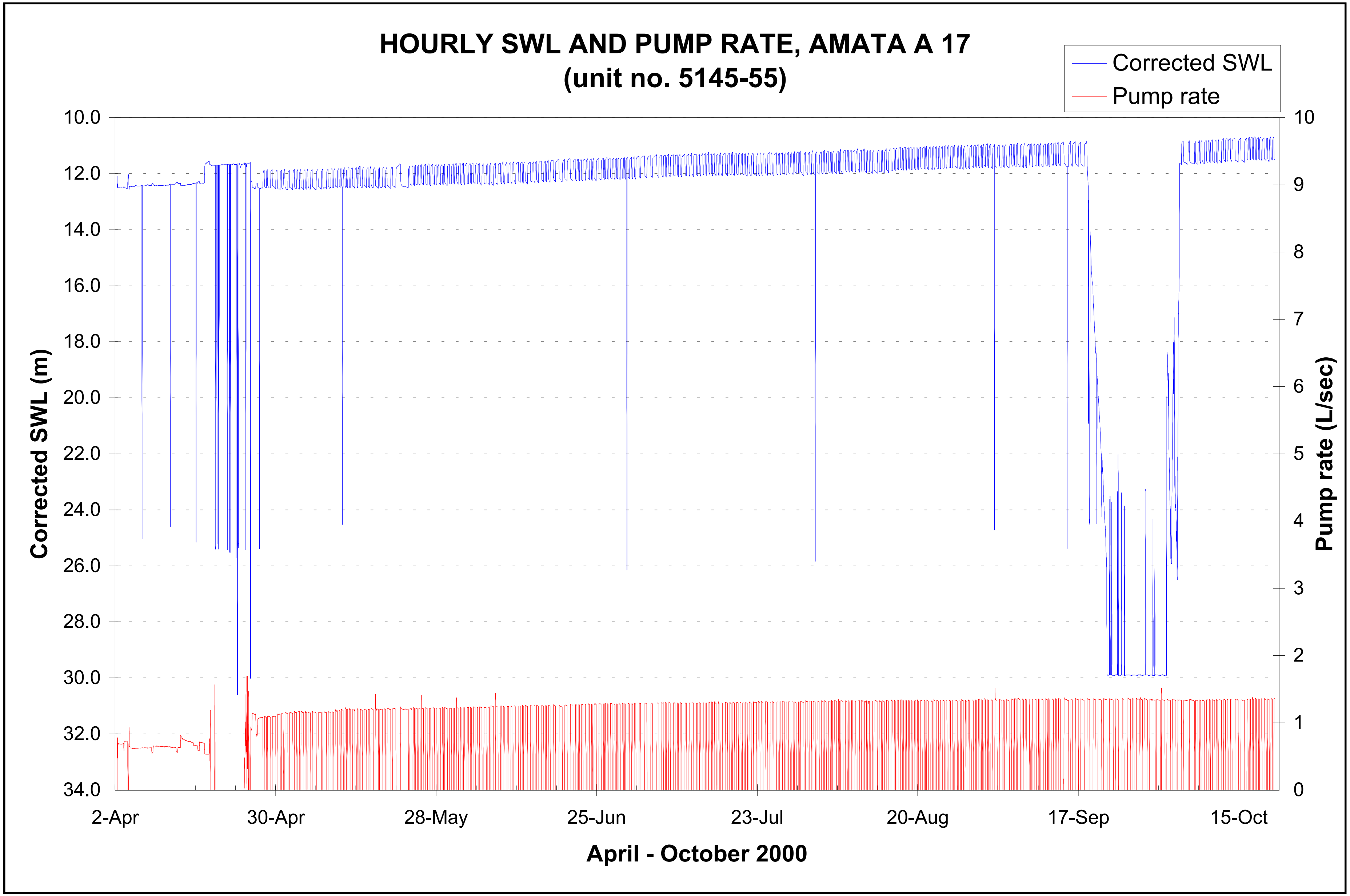

WATER PRODUCTION AT AMATA
Water production (kL)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
A 26
A 17
A 15
No data for A 15
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00

Figure 6.2



HOURLY SWL AND PUMP RATE, AMATA A 17
(unit no. 5145-55)
Corrected SWL
Pump rate
Corrected SWL (m)
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
Pump rate (L/sec)
10
9
8
7
6
5
4
3
2
1
0
2-Apr
30-Apr
28-May
25-Jun
23-Jul
20-Aug
17-Sep
15-Oct
April - October 2000

Figure 6.3

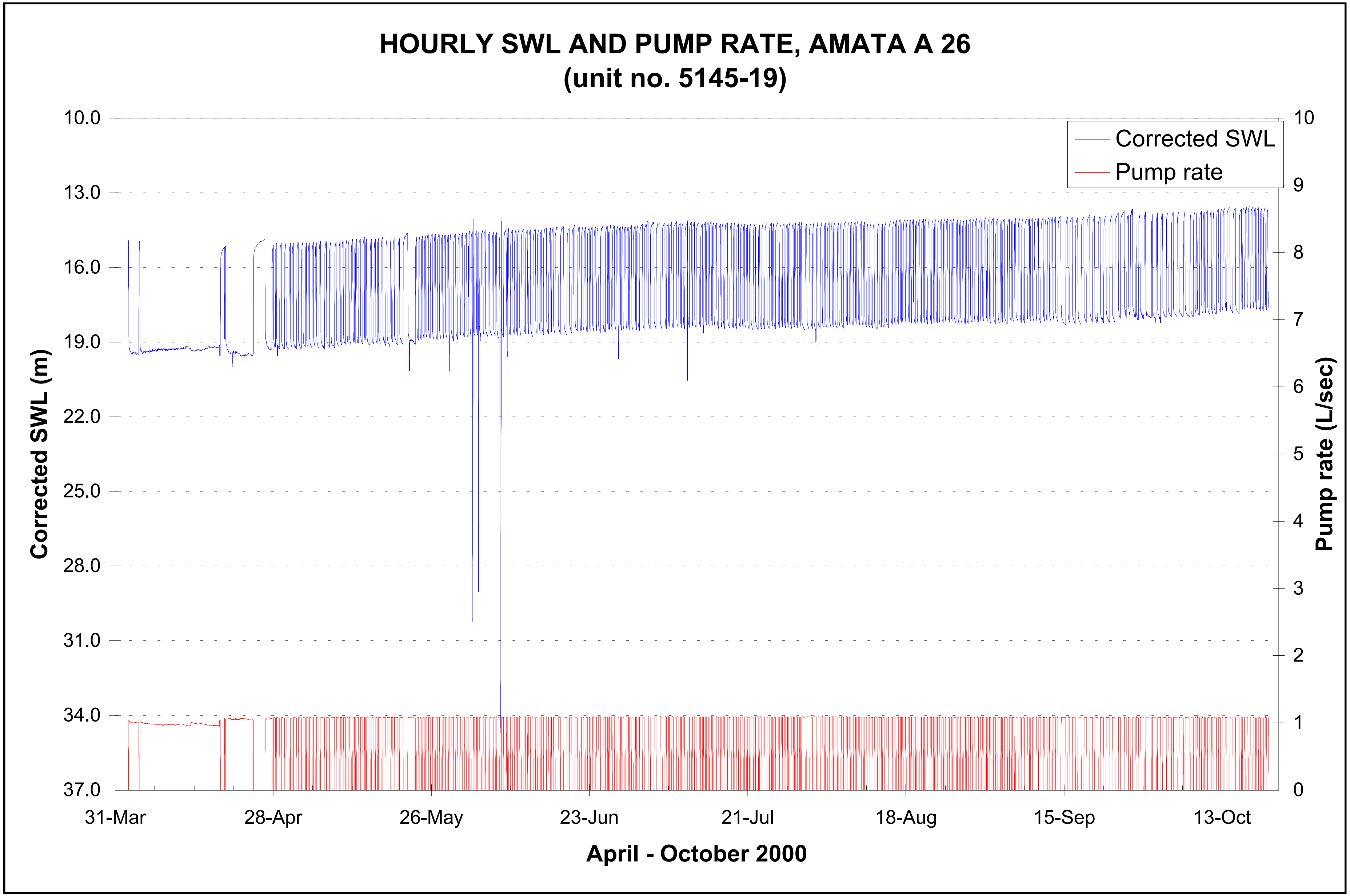

HOURLY SWL AND PUMP RATE, AMATA A 26
(unit no. 5145-19)
Corrected SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
10.0
13.0
16.0
19.0
22.0
25.0
28.0
31.0
34.0
37.0
10
9
8
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 6.4

7 Kalka

OVERVIEW

Water production data for the community at Kalka is summarised in Table 7.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Figure 7.1. Total rainfall for the period April to October 2000 was 117.2 mm. Kalka, unlike communities further east, had no rainfall events sufficient to induce immediate aquifer recharge. Previously, rainfalls of 20–25 mm have been insufficient for this purpose. Water levels have not lowered to any appreciable extent.

The water consumption was much lower than in previous periods (Fig. 7.2) and most water is still produced from KA 3 (72%).

Table 7.1 Water production at Kalka, 1998–2000

Well	Production (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
KA 1	928.9	676.3	21.9	**342.4**
KA 2	1 733.8	1 216.2	1 214.4	**656.5**
KA 3	6 310.3	4 710.7	4 503.9	**2 677.0**
Total	**8 973.0**	**6 603.2**	**5 740.2**	**3 675.9**

KA 1

In KA 1 the water level has declined marginally over the monitoring period, and has varied little over two years of monitoring. Since April 1998 the water level has declined by only 0.15 m. Water extraction is still low (Fig. 7.3).

KA 2

In KA 2 a difference of 1.24 m was recorded at the time of download between the logger and actual SWL. Slight shifts appear in the SWL data, but no obvious cause is evident. The SWL correction has been applied as a constant drift over the duration of the monitoring period. Due to the magnitude of the correction few conclusions can be made of the SWL data (Fig. 7.4). Overall the water level has not dropped since 1998. Water extraction is approximately half that of previous periods.

KA 3

In KA 3 changing extraction rates resulted in the SWL measurements varying slightly, but the SWL shows no long-term change. For most of the monitoring period, there was an overshoot of just under 0.5 m when the pump switched off, but this ceased at the end of September 2000 (Fig. 7.5). During intensive pumping at the end of the period the water level fell 0.1 m. The SWL is now 0.4 m below the level recorded in 1998. Hourly rainfall for the period can be seen in Figure 7.6.

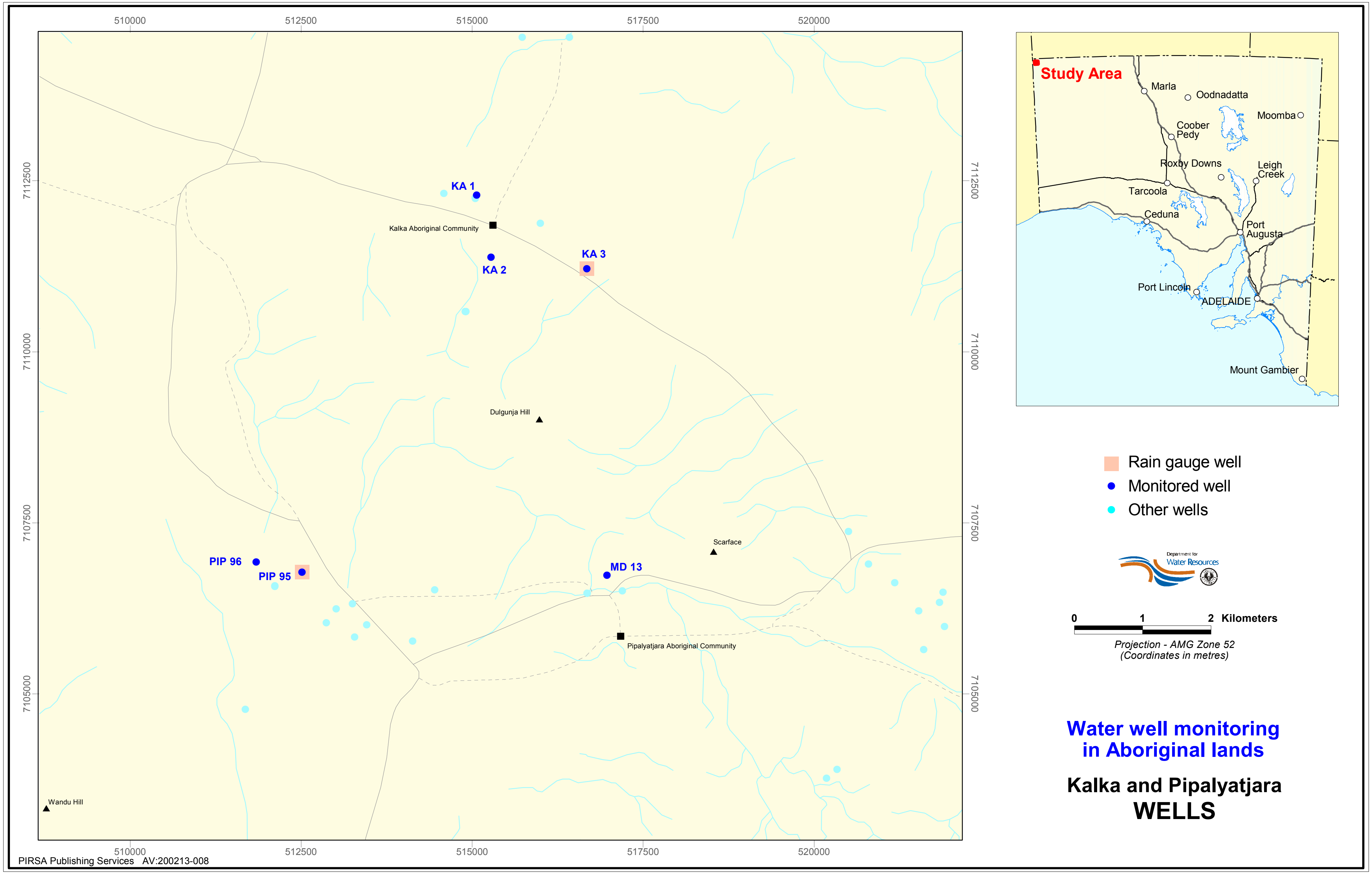

Water well monitoring
in Aboriginal lands
Kalka and Pipalyatjara
WELLS
Rain gauge well
Monitored well
Other wells
Department for Water Resources
0
1
2
Kilometers
Projection - AMG Zone 52
(Coordinates in metres)
Study Area
Marla
Oodnadatta
Moomba
Coober Pedy
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
KA 1
KA 2
KA 3
Kalka Aboriginal Community
Dulgunja Hill
PIP 96
PIP 95
MD 13
Scarface
Pipalyatjara Aboriginal Community
Wandu Hill
510000
512500
515000
517500
520000
7112500
7110000
7107500
7105000
PIRSA Publishing Services AV:200213-008

Figure 7.1

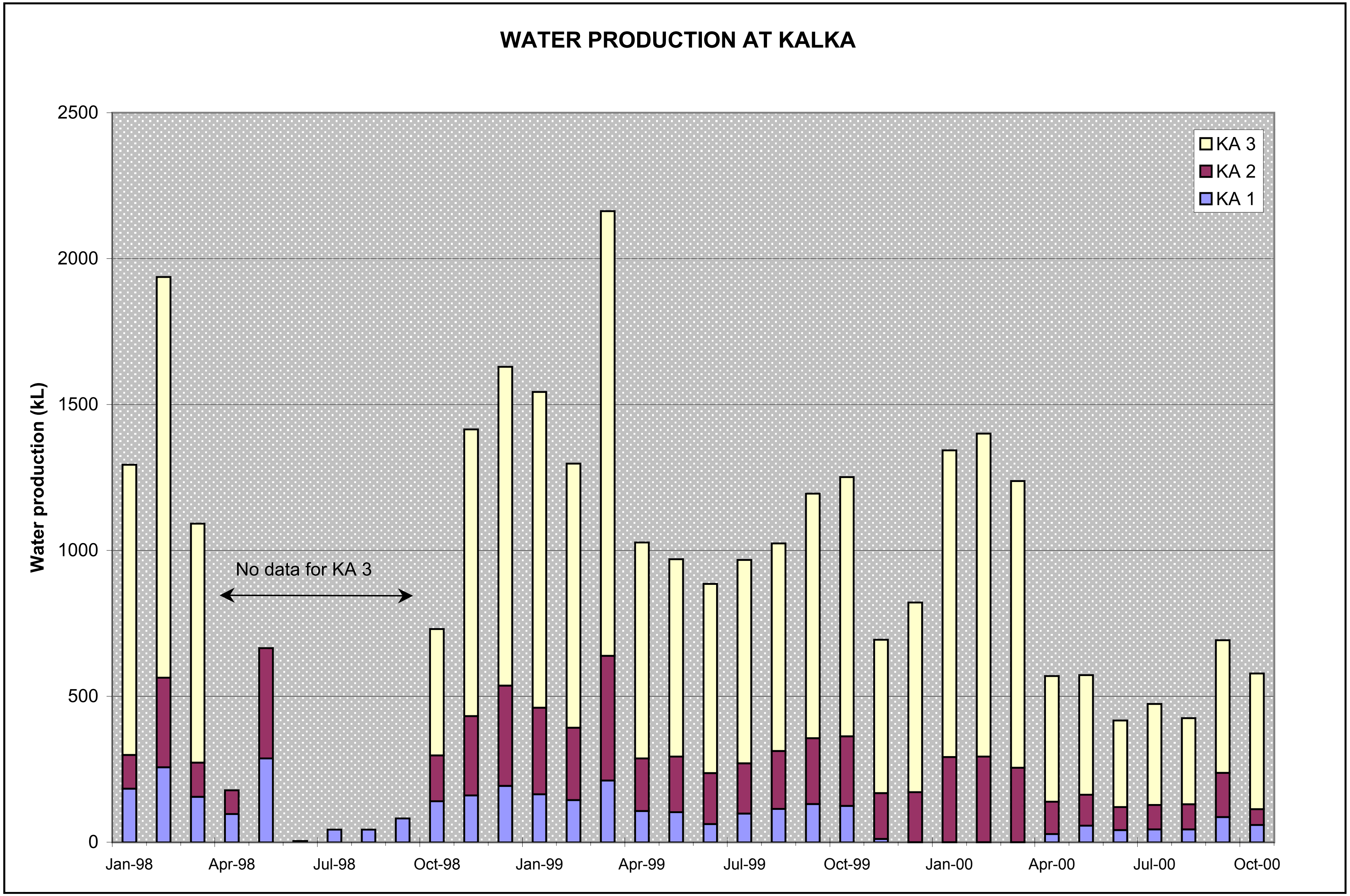

WATER PRODUCTION AT KALKA
Water production (kL)
2500
2000
1500
1000
500
0
KA 3
KA 2
KA 1
No data for KA 3
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00

Figure 7.2

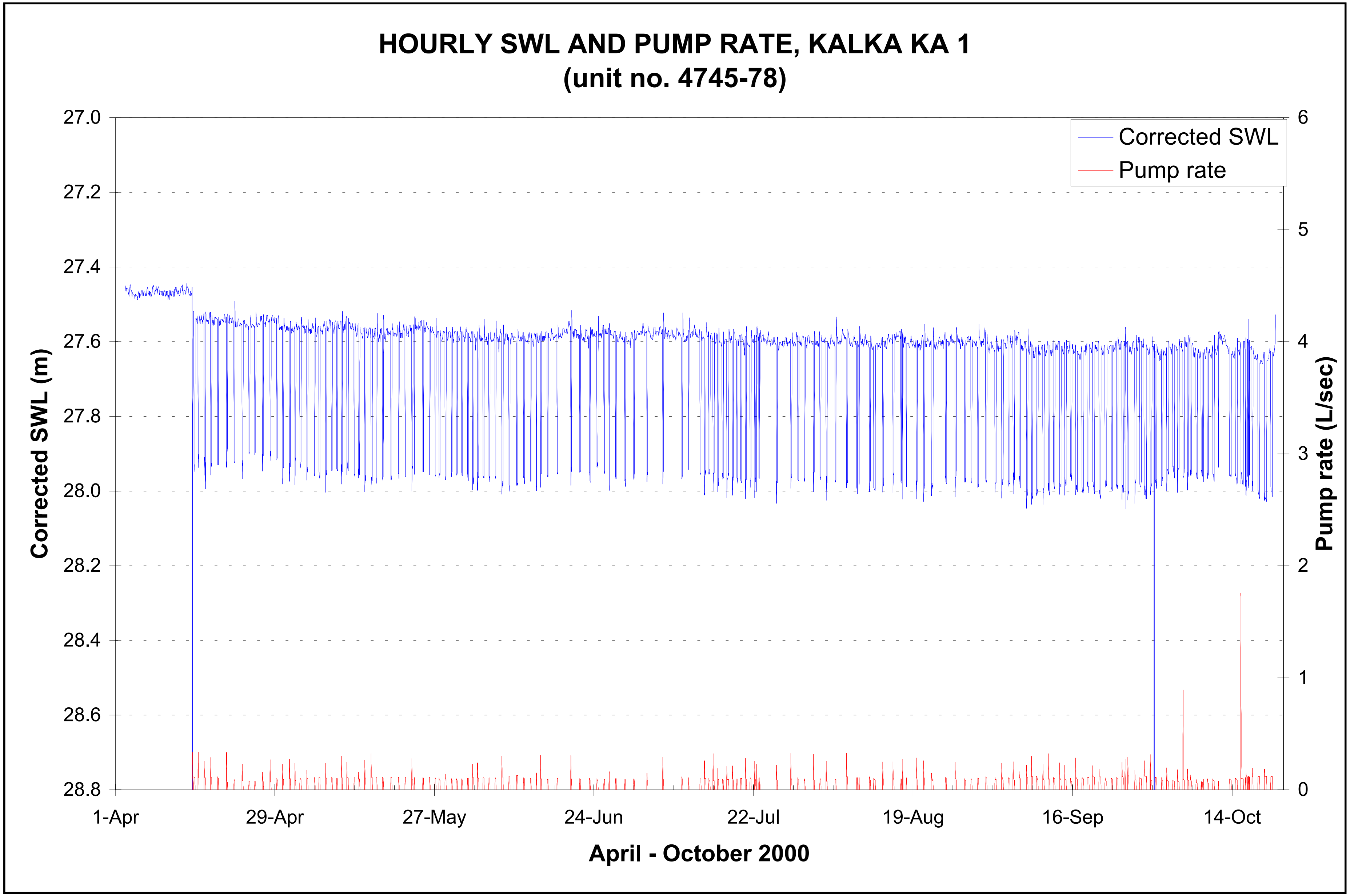
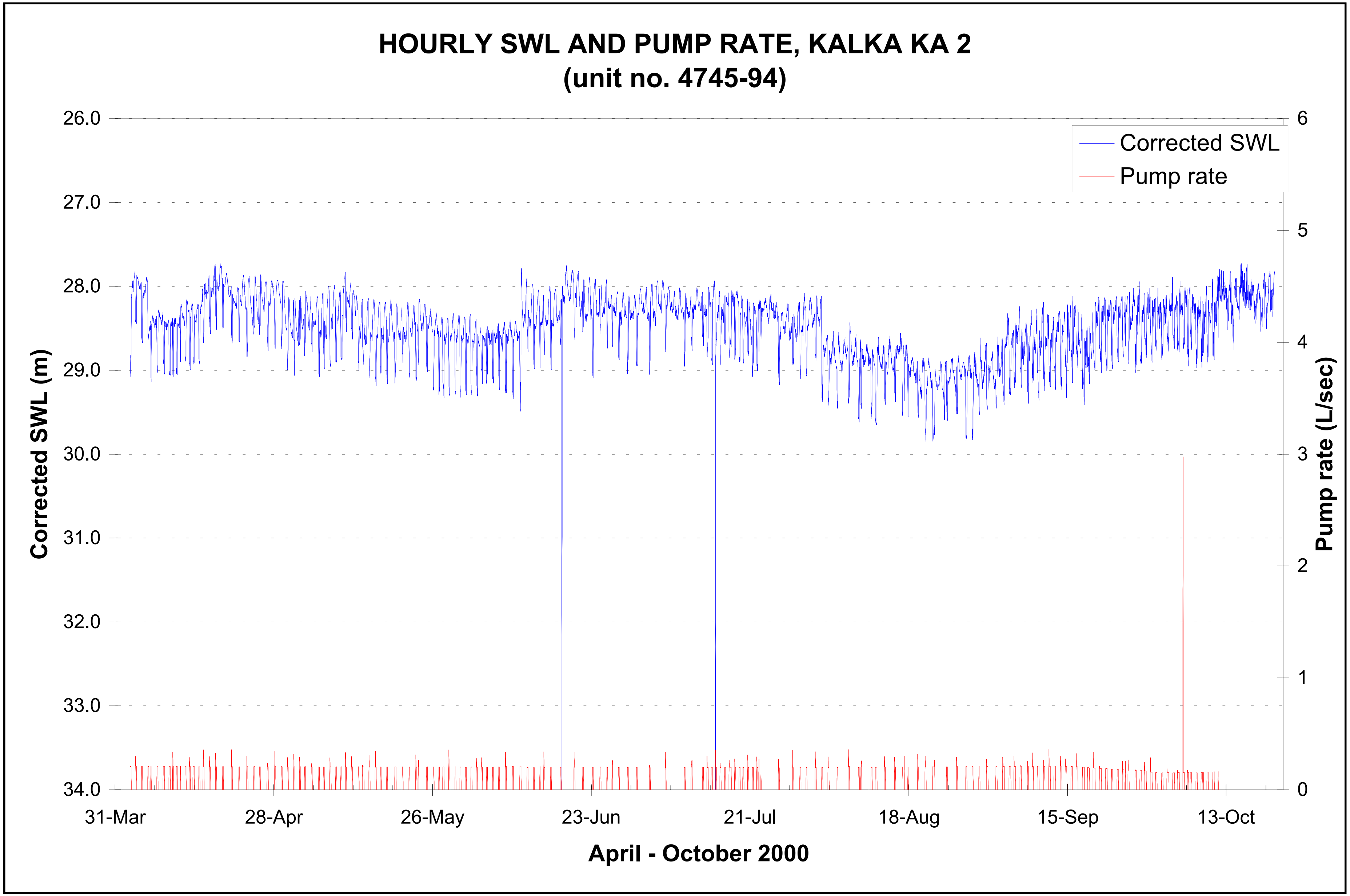
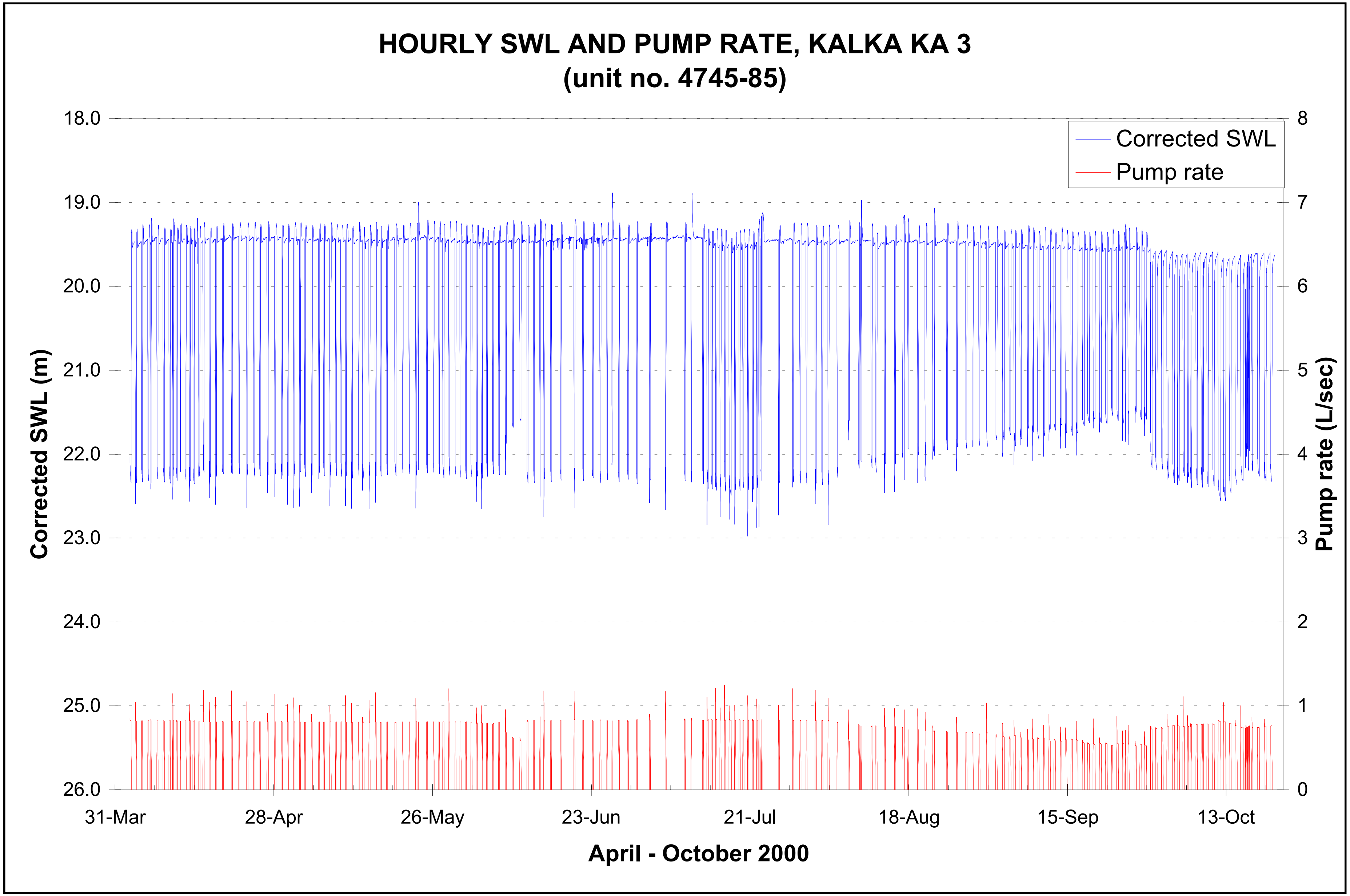

HOURLY SWL AND PUMP RATE, KALKA KA 1
(unit no. 4745-78)
Corrected SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
27.0
27.2
27.4
27.6
27.8
28.0
28.2
28.4
28.6
28.8
6
5
4
3
2
1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 7.3



HOURLY SWL AND PUMP RATE, KALKA KA 2
(unit no. 4745-94)
Corrected SWL
Pump rate
26.0
27.0
28.0
29.0
30.0
31.0
32.0
33.0
34.0
Corrected SWL (m)
6
5
4
3
2
1
0
Pump rate (L/sec)
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 7.4



HOURLY SWL AND PUMP RATE, KALKA KA 3
(unit no. 4745-85)
Corrected SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
8
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 7.5

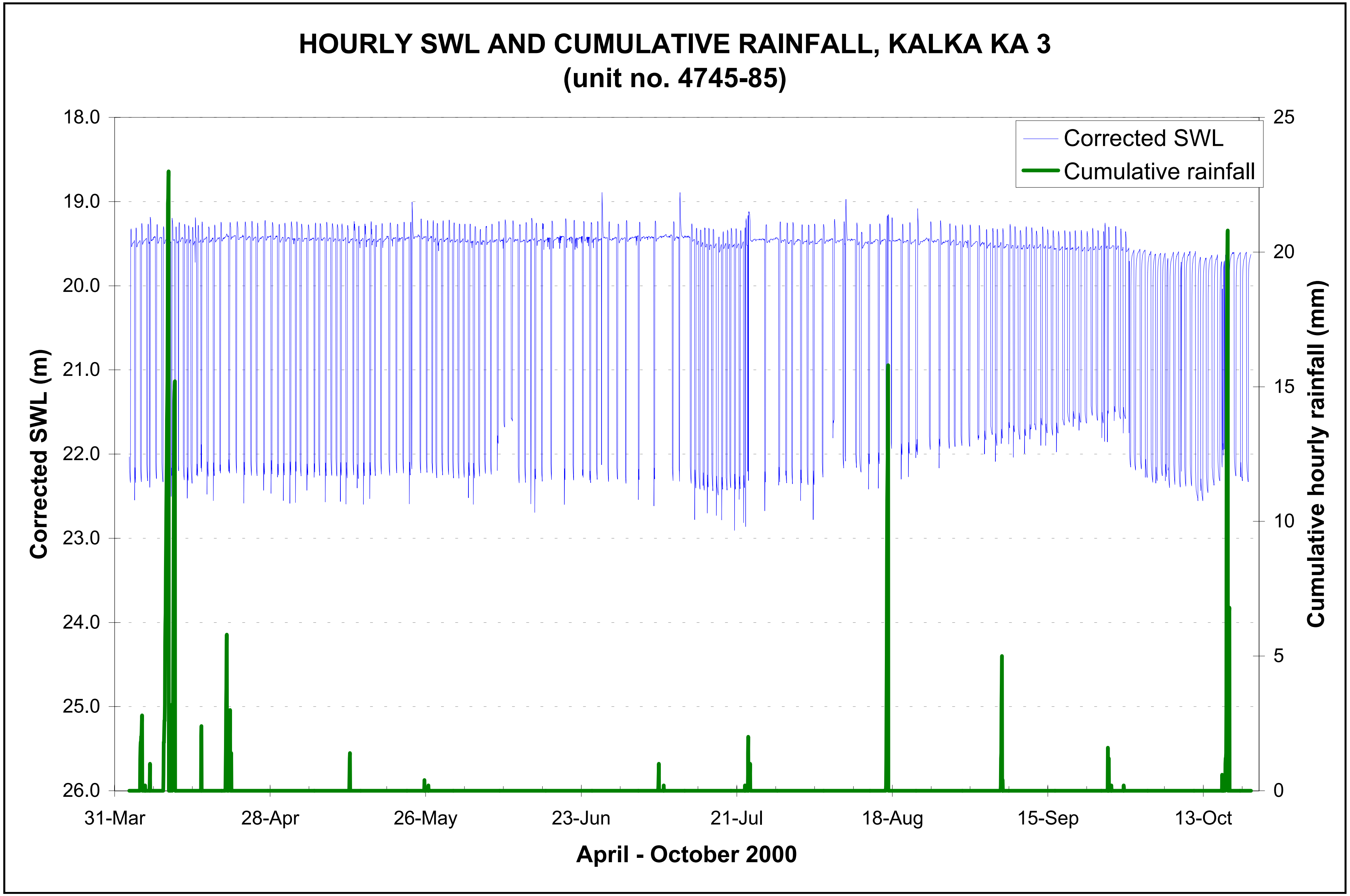

HOURLY SWL AND CUMULATIVE RAINFALL, KALKA KA 3
(unit no. 4745-85)
Corrected SWL
Cumulative rainfall
Corrected SWL (m)
Cumulative hourly rainfall (mm)
18.0
19.0
20.0
21.0
22.0
23.0
24.0
25.0
26.0
25
20
15
10
5
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 7.6

8 Pipalyatjara

OVERVIEW

Water production data for the community at Pipalyatjara is summarised in Table 8.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Figure 7.1. The SWL has remained unchanged over two years of monitoring. There have been eight rainfall events of 30 mm or more, but no obvious recharge effect. It is possible that recharge occurs over many months after a rainfall event, with the effect on the water level being compensated by pumping. The rate of water extraction is similar to that for the previous period (October 1999 to April 2000) and the amount extracted is evenly divided between the two main wells (Fig. 8.1).

Table 8.1 Water production at Pipalyatjara, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
PIP 95	9 903.0	8 335.3	6 757.0	**4 342.8**
PIP 96	6 564.1	8 475.1	2 840.8	**5 009.9**
MD 13*	–	–	–	–
Total	**16 467.1**	**16 810.4**	**9 597.8**	**9 352.7**

* There was no constant level of water production for well MD 13 and no volume readings are available. The well was pumped for 577.61 hours in Apr.– Oct. 1999, 8.28 hours in Oct.1999 – Apr. 2000 and 32.71 hours in Apr. – Oct. 2000.

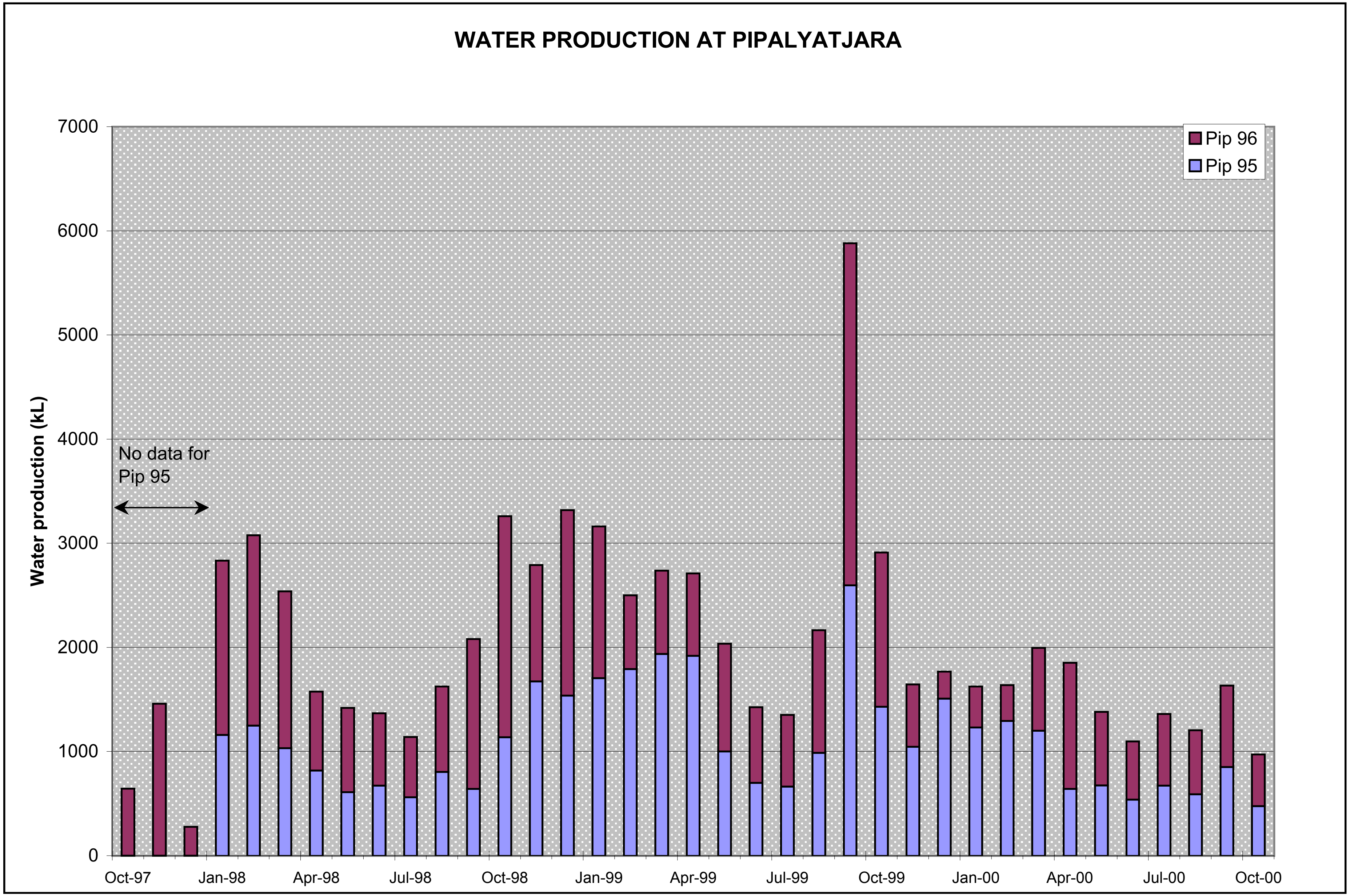
PIP 95

At the time of download in PIP 95, a difference of 0.2 m existed between the logger and actual water level. The correction has been applied to the logger water levels as a gradual drift over the monitoring period. The SWL has risen 0.3 m over the monitoring period which is consistent with trends over the last two years.

There was no sign of depletion of the aquifer during the monitoring period. Cumulative hourly rainfall is shown in Figure 8.2. Production from the well during this period fell by 35% from the previous six months (Fig. 8.3), which suggests that the drop in production accounts for the rise in SWL.

PIP 96

In PIP 96 a difference of 0.107 m existed between the logger and the actual water level at the time of download. This correction was applied as a constant to all readings after a shift in the data on 29 September 2000. Allowing for adjustments, SWL has remained constant over the monitoring period. Over the last two years, the water level has dropped by 0.2 m. Production from the well increased by 76% over the previous six months (Fig. 8.4). There is no sign of depletion of the aquifer.



WATER PRODUCTION AT PIPALYATJARA
Water production (kL)
7000
6000
5000
4000
3000
2000
1000
0
No data for
Pip 95
Pip 96
Pip 95
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00

Figure 8.1

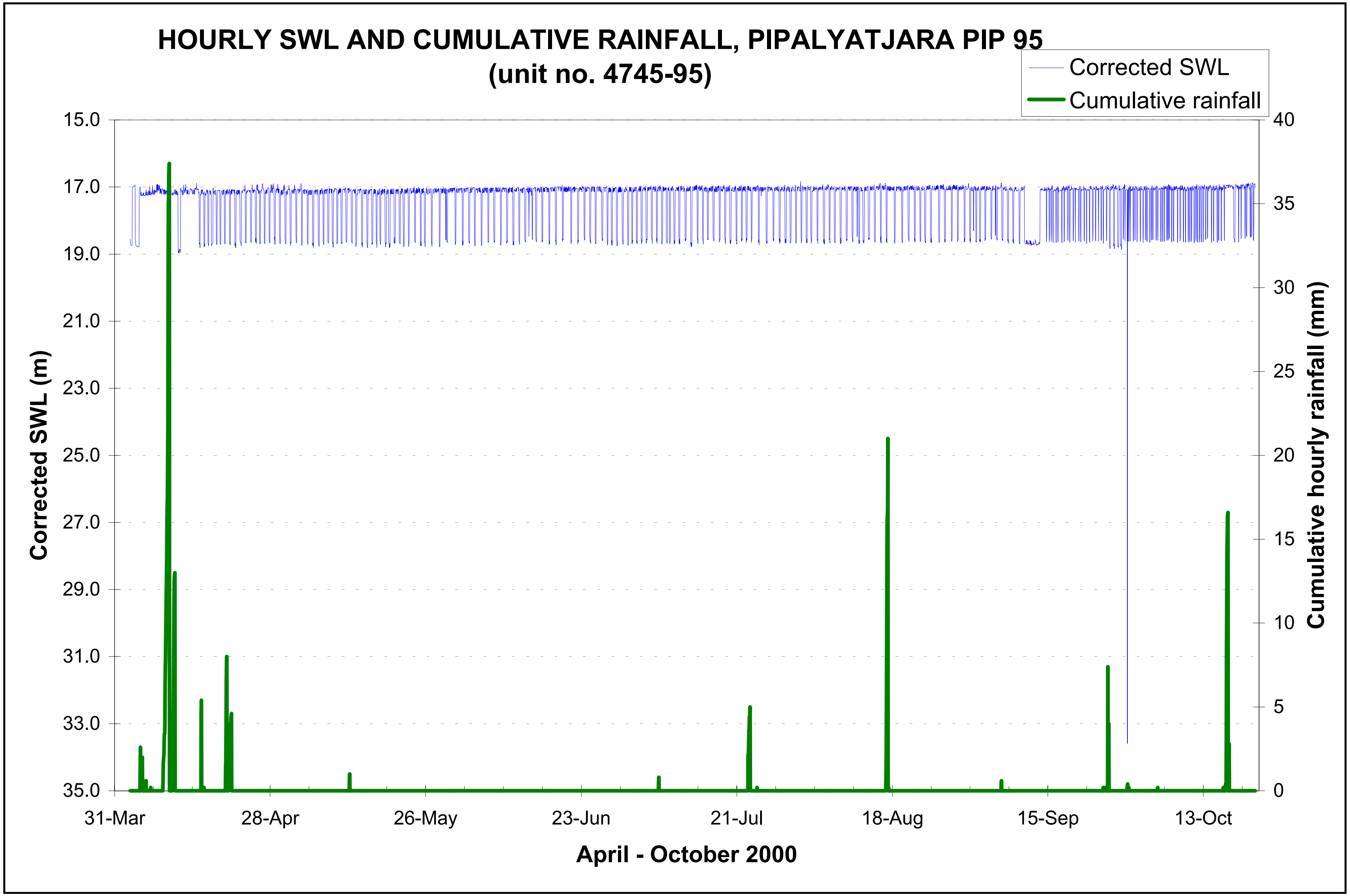

HOURLY SWL AND CUMULATIVE RAINFALL, PIPALYATJARA PIP 95
(unit no. 4745-95)
Corrected SWL
Cumulative rainfall
Corrected SWL (m)
Cumulative hourly rainfall (mm)
15.0
17.0
19.0
21.0
23.0
25.0
27.0
29.0
31.0
33.0
35.0
40
35
30
25
20
15
10
5
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 8.2

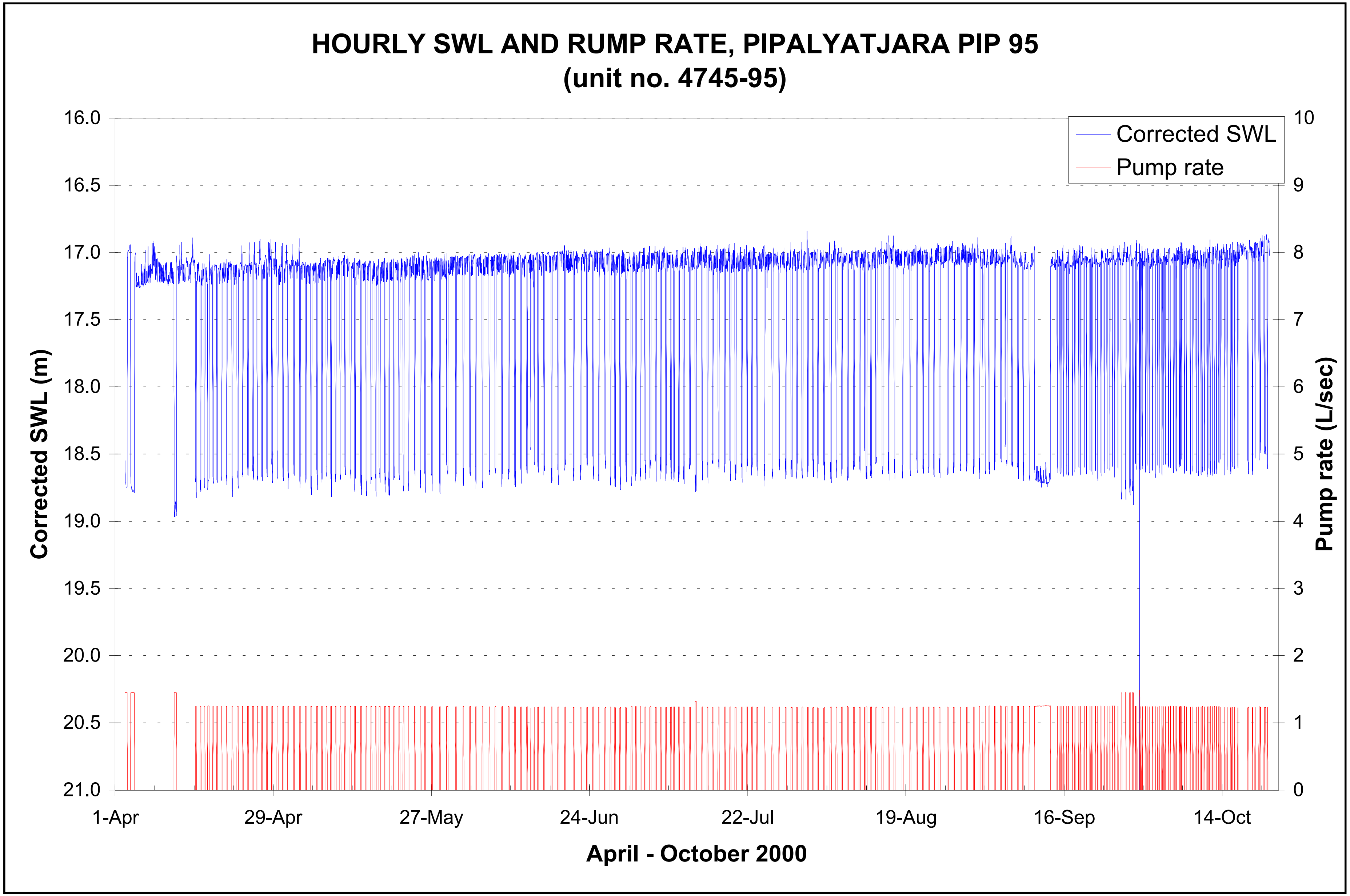

HOURLY SWL AND RUMP RATE, PIPALYATJARA PIP 95
(unit no. 4745-95)
Corrected SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
20.5
21.0
10
9
8
7
6
5
4
3
2
1
0
1-Apr
29-Apr
27-May
24-Jun
22-Jul
19-Aug
16-Sep
14-Oct
April - October 2000

Figure 8.3

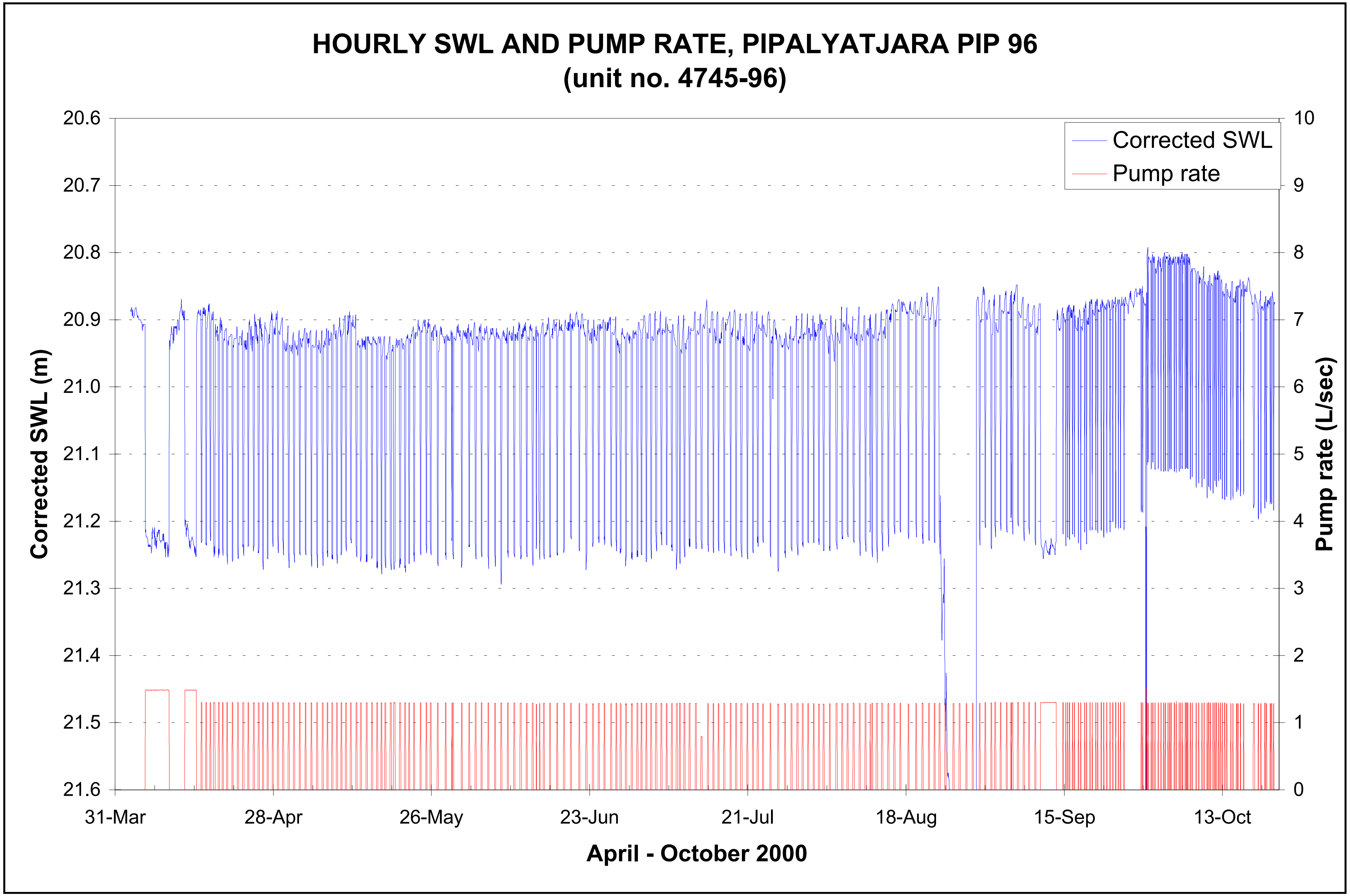

HOURLY SWL AND PUMP RATE, PIPALYATJARA PIP 96
(unit no. 4745-96)
Corrected SWL
Pump rate
Corrected SWL (m)
Pump rate (L/sec)
20.6
20.7
20.8
20.9
21.0
21.1
21.2
21.3
21.4
21.5
21.6
10
9
8
7
6
5
4
3
2
1
0
31-Mar
28-Apr
26-May
23-Jun
21-Jul
18-Aug
15-Sep
13-Oct
April - October 2000

Figure 8.4

ABORIGINAL LANDS TRUST LANDS

9 Nepabunna

OVERVIEW

Water production data for the community at Nepabunna is summarised in Table 9.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Figure 9.1. Despite a recent rise in SWL for N 101 and a similar level as the previous period for N 149, both wells have produced less water (Fig. 9.2) and show signs of decreasing production capacity. However, the decrease is slight and the level of production capacity will be clearer after a further period of data acquisition. The wells were constructed in the early 1980s and maintenance may be required.

Rainfall events in April 2000 totalled 20 mm and 8 mm respectively and smaller events followed over the rest of the monitoring period. Total rainfall for the April to October 2000 was 83 mm and no immediate recharge to the watertable was evident.

Table 9.1 Water production at Nepabunna, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
N 101	–	–	6 126.3	**5 937.8**
N 149	–	–	6 846.7	**6 682.2**
Total	**–**	**–**	**12 973.0***	**12 620.0**

* Monitoring equipment was not installed until late November 1999; production figures are for four months only.

N 101

In N 101 the increase in SWL, commencing in the previous monitoring period, continued with the SWL peaking at 40.8 m in May 2000 before falling to 41.5 m in September 2000. The peak of 39 m suggests there was a faulty water level probe, which has been replaced. Over the latter half of the monitoring period, the water level probe shows an increase in the amount of noisy data during lengthy pumping and non-pumping periods. Variations of up to 1 m occur in the readings. The cause is not understood, but should become clearer with the acquisition of more data.

The pumping rate for N 101 has declined steadily over the monitoring period, from 0.69 L/s in April 2000 to 0.47 L/s in September 2000 (Fig. 9.3). Since monitoring commenced in December 1999, the pumping rate declined from 0.92 to 0.47 L/s. The changes in pumping rates coincide with the shifts in the pumping water levels (reduction in well loss component). At this stage it is not clear whether the reduction in pumping rate is due to the well's performance, pump efficiency or both.

Water was extracted at up to 67 kL/d, but monthly withdrawals decreased from 1222 kL in April 2000 to 891 kL in September 2000.

N 149

In N 149 the SWL rose marginally to 52.9 m, recovering the 0.5 m drop that occurred during the period of extensive pumping February to March 1999. The water level is similar to the level it was at the start of monitoring in December 1999. The water level probe failed in July and has been replaced.

The pump rate for N 149 continued to decline, from 0.8 to 0.7 L/s. Pumping rates for the well were 0.97 L/s in December 1999. The water level has fallen consistently throughout the period to 58 m when the pump is operating (Fig. 9.4), despite the decrease in pump rate that would normally be expected to result in a lower well loss component, indicating a gradual decrease in the production capacity of the well. The well was drilled and constructed in 1983 and may need to be cleaned.

Cumulative hourly rainfall for the period is shown in Figure 9.5.

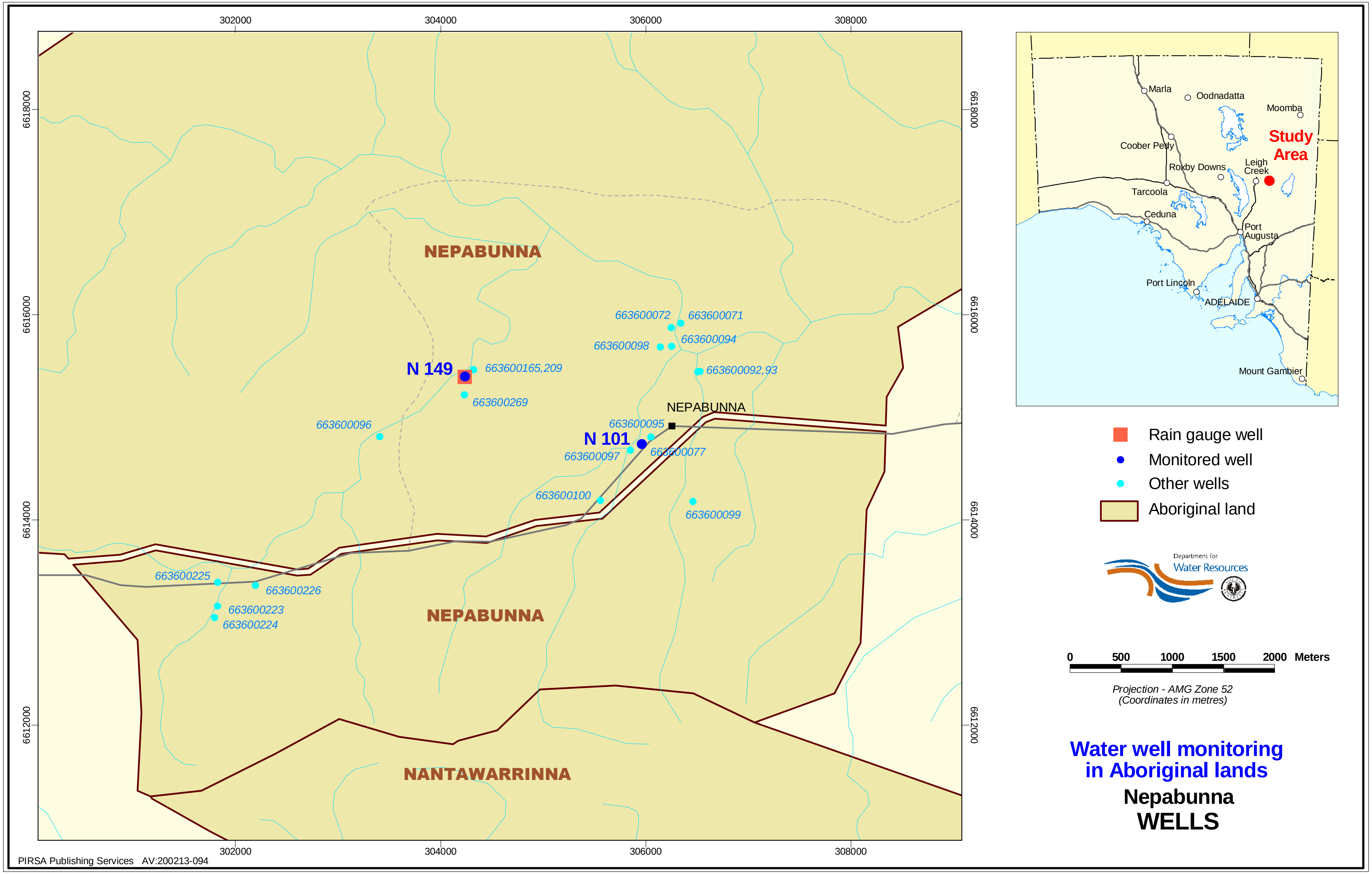

302000
304000
306000
308000
6618000
6616000
6614000
6612000
NEPABUNNA
NEPABUNNA
NANTAWARRINNA
NEPABUNNA
N 149
N 101
663600072
663600071
663600094
663600098
663600165,209
663600092,93
663600269
663600096
663600095
663600097
663600077
663600100
663600099
663600225
663600226
663600223
663600224
Marla
Oodnadatta
Moomba
Coober Pedy
Study Area
Roxby Downs
Leigh Creek
Tarcoola
Ceduna
Port Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Rain gauge well
Monitored well
Other wells
Aboriginal land
Department for Water Resources
0 500 1000 1500 2000 Meters
Projection - AMG Zone 52
(Coordinates in metres)
Water well monitoring
in Aboriginal lands
Nepabunna
WELLS
PIRSA Publishing Services AV:200213-094

Figure 9.1

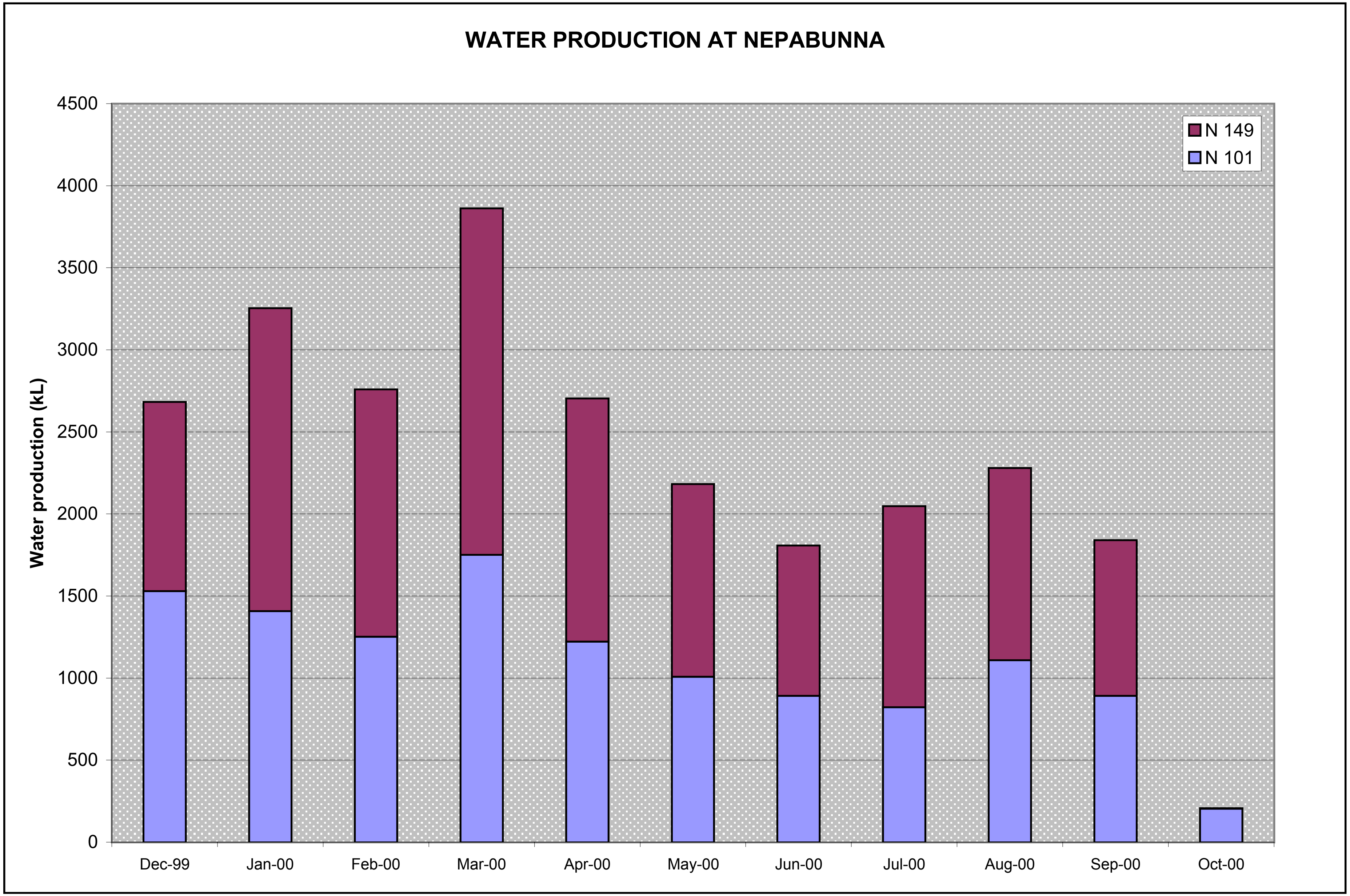

WATER PRODUCTION AT NEPABUNNA
Water production (kL)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00
Oct-00
N 149
N 101

Figure 9.2

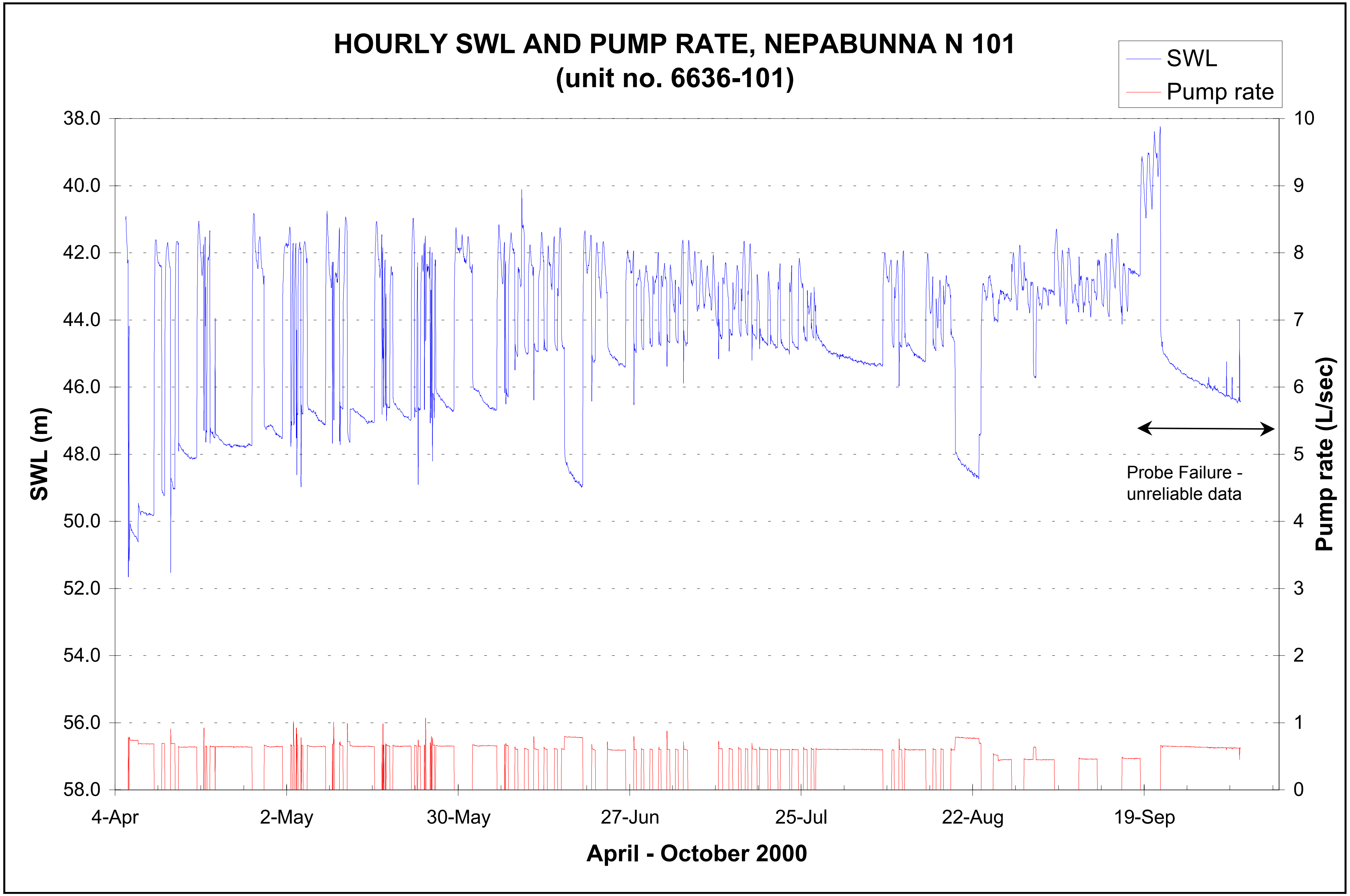
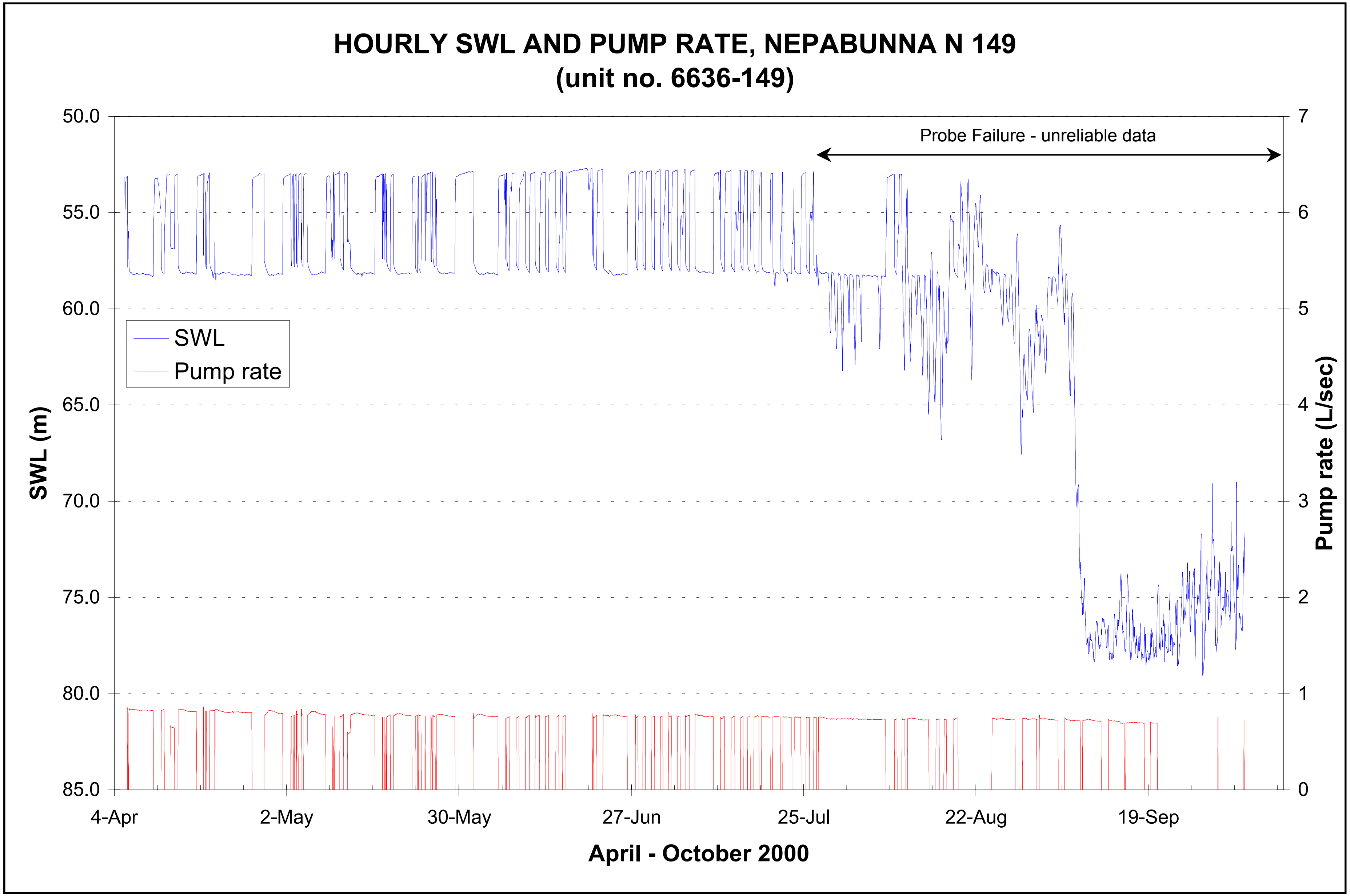

HOURLY SWL AND PUMP RATE, NEPABUNNA N 101
(unit no. 6636-101)
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
38.0
40.0
42.0
44.0
46.0
48.0
50.0
52.0
54.0
56.0
58.0
10
9
8
7
6
5
4
3
2
1
0
4-Apr
2-May
30-May
27-Jun
25-Jul
22-Aug
19-Sep
April - October 2000
Probe Failure -
unreliable data

Figure 9.3



HOURLY SWL AND PUMP RATE, NEPABUNNA N 149
(unit no. 6636-149)
Probe Failure - unreliable data
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
7
6
5
4
3
2
1
0
4-Apr
2-May
30-May
27-Jun
25-Jul
22-Aug
19-Sep
April - October 2000

Figure 9.4

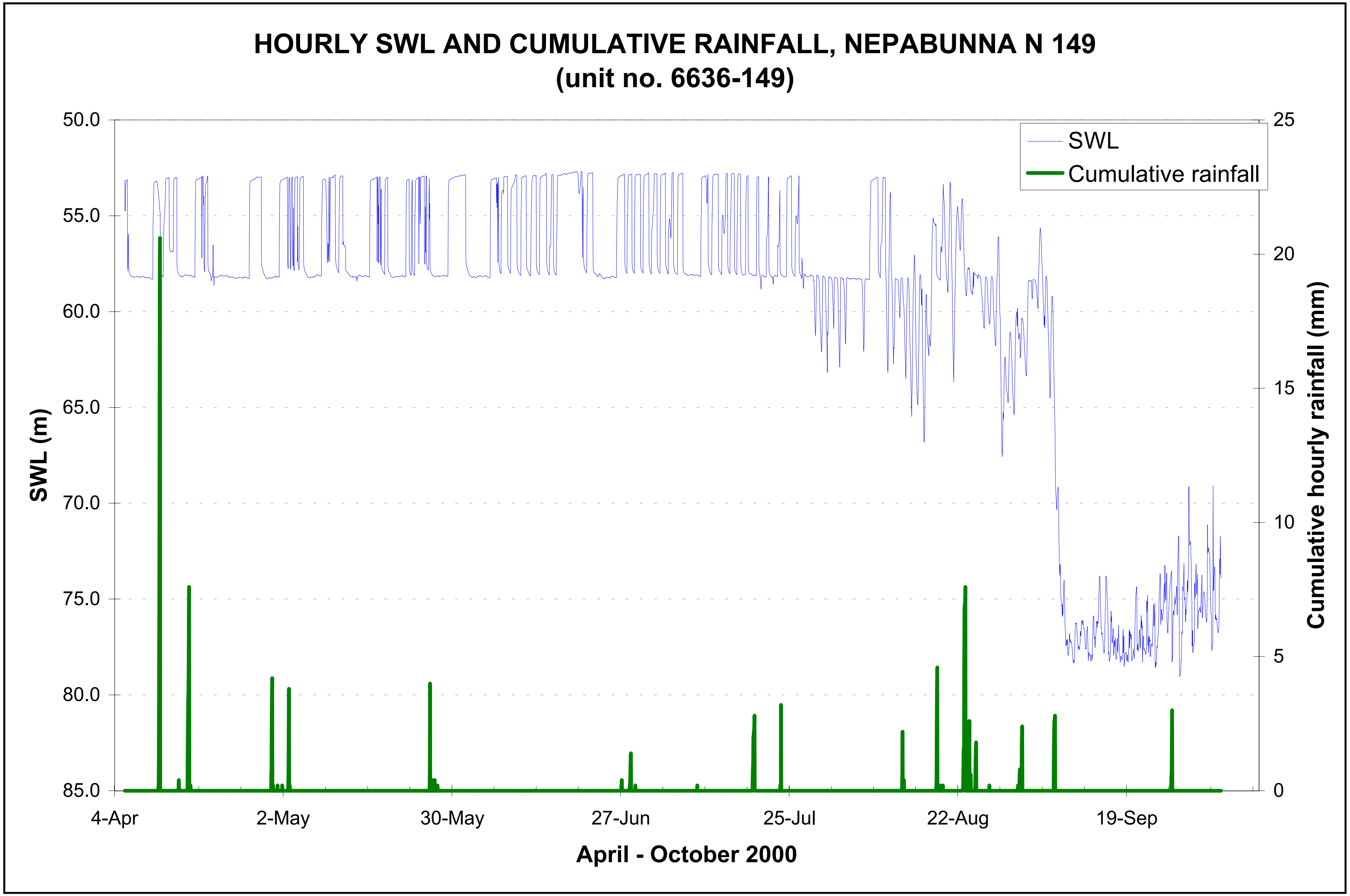

HOURLY SWL AND CUMULATIVE RAINFALL, NEPABUNNA N 149
(unit no. 6636-149)
SWL
Cumulative rainfall
50.0
55.0
60.0
65.0
70.0
75.0
80.0
85.0
SWL (m)
25
20
15
10
5
0
Cumulative hourly rainfall (mm)
4-Apr
2-May
30-May
27-Jun
25-Jul
22-Aug
19-Sep
April - October 2000

Figure 9.5

10 Yalata

OVERVIEW

Water production data for the community at Indulkana is summarised in Table 10.1 for the latest four well monitoring periods, covering October 1998 to October 2000. Wells are located in Figure 10.1. Water extraction has been fairly consistent between 4000 and 5000 kL/m., with production for April 2000 peaking at 6200 kL.

Approximately 95% of the community's water is produced from YT 3 (Fig. 10.2). Neither well shows any sign of stress.

Table 10.1 Water production at Yalata, 1998–2000

Well	**Production** (kL)			
	Oct. 1998 – Apr. 1999	*Apr.– Oct. 1999*	*Oct. 1999 – Apr. 2000*	*Apr.– Oct. 2000*
YT 2	–	–	1 268.9	**1 901.0**
YT 3	–	–	16 041.0	**27 026.0**
Total	**–**	**–**	**17 309.9***	**28 927.0**

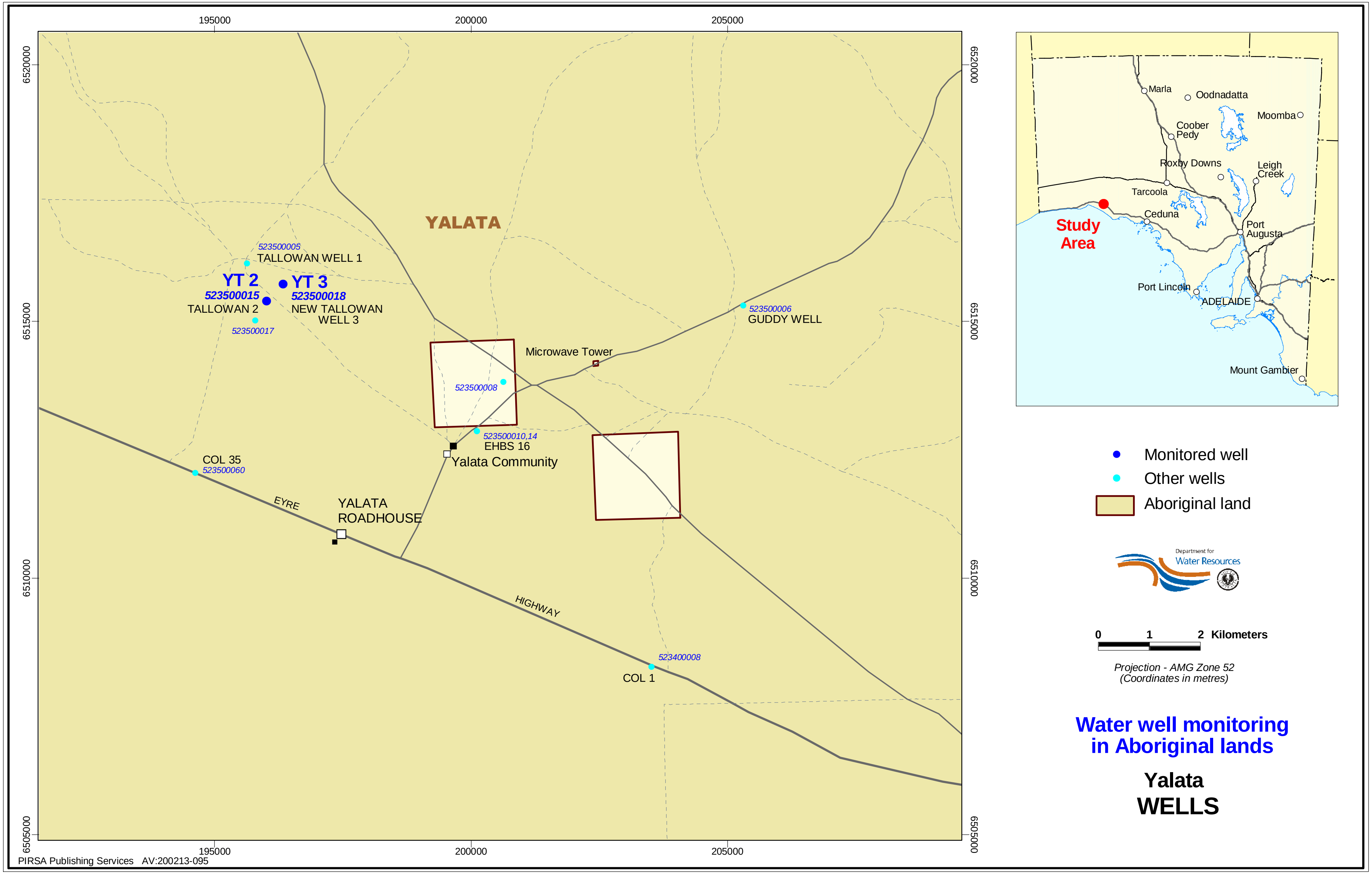
* Monitoring equipment was not installed until late November 1999; production figures are for four months only.

YT 2

YT 2 was pumped occasionally (up to six days continuously) at about 1.5 L/s, with the non-pumping SWL remaining at about 60 m (Fig. 10.3). There are no indications of stress in the well at these pumping levels. This bore was not used after early June 2000.

YT 3

YT 3 has been pumped continuously over the period at a rate increasing from 1.8 to 2 L/s, resulting in an output of up to 169 kL/d. The decline in the pumping SWL, from 62.8 to 63.2 m, can be attributed to the increase in pumping rate (Fig. 10.4). However, there is no sign of stress to the aquifer. The non-pumping water level remained constant at approximately 59.6 m over the duration of the monitoring period.



195000
200000
205000
6520000
6515000
6510000
6505000
YALATA
523500005
TALLOWAN WELL 1
YT 2
523500015
TALLOWAN 2
523500017
YT 3
523500018
NEW TALLOWAN
WELL 3
523500006
GUDDY WELL
Microwave Tower
523500008
523500010,14
EHBS 16
Yalata Community
COL 35
523500060
EYRE
YALATA
ROADHOUSE
HIGHWAY
523400008
COL 1
Marla
Oodnadatta
Moomba
Coober
Pedy
Roxby Downs
Leigh
Creek
Tarcoola
Ceduna
Study
Area
Port
Augusta
Port Lincoln
ADELAIDE
Mount Gambier
Monitored well
Other wells
Aboriginal land
Department for
Water Resources
0
1
2 Kilometers
Projection - AMG Zone 52
(Coordinates in metres)
Water well monitoring
in Aboriginal lands
Yalata
WELLS
PIRSA Publishing Services AV:200213-095

Figure 10.1

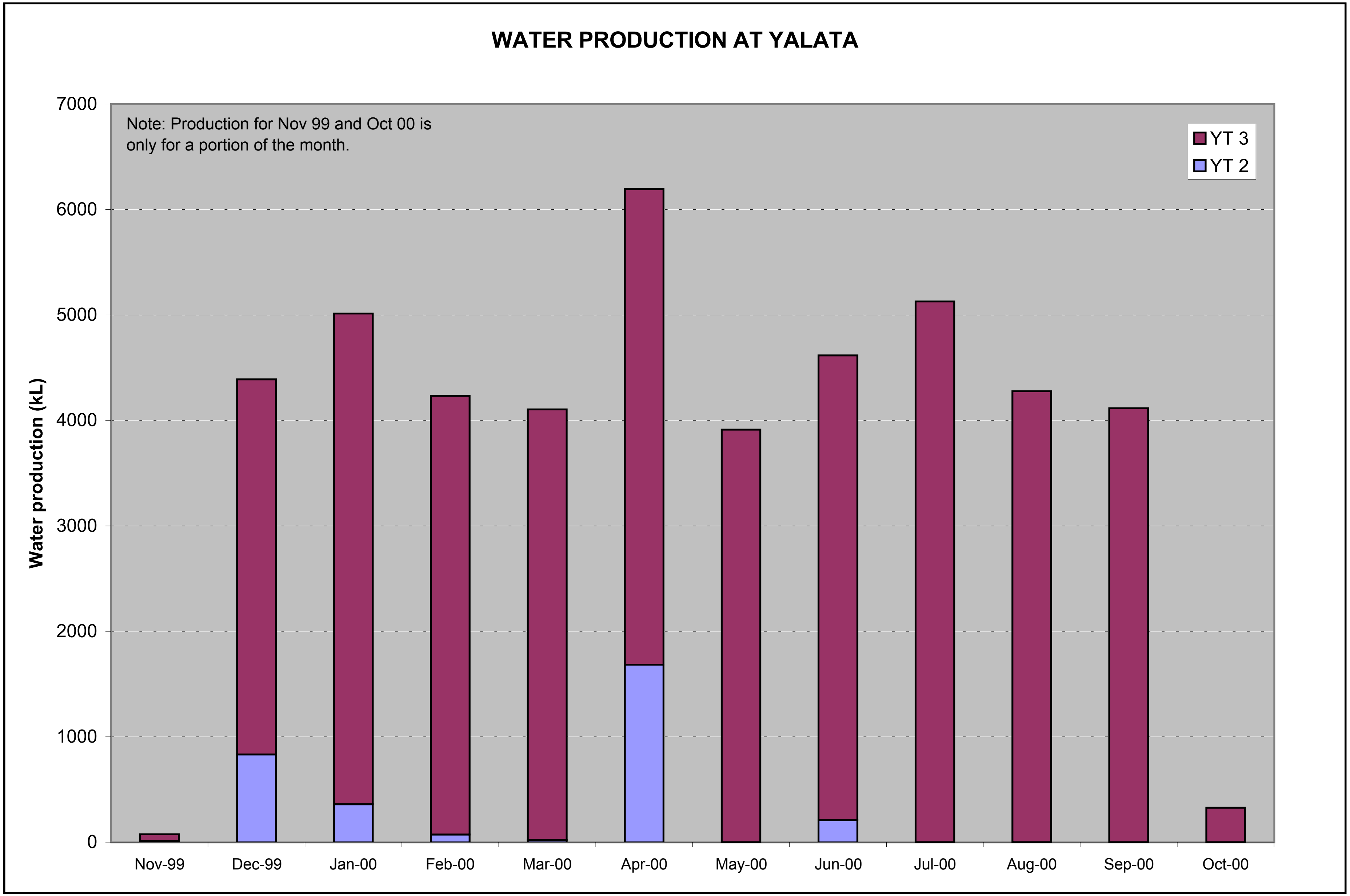
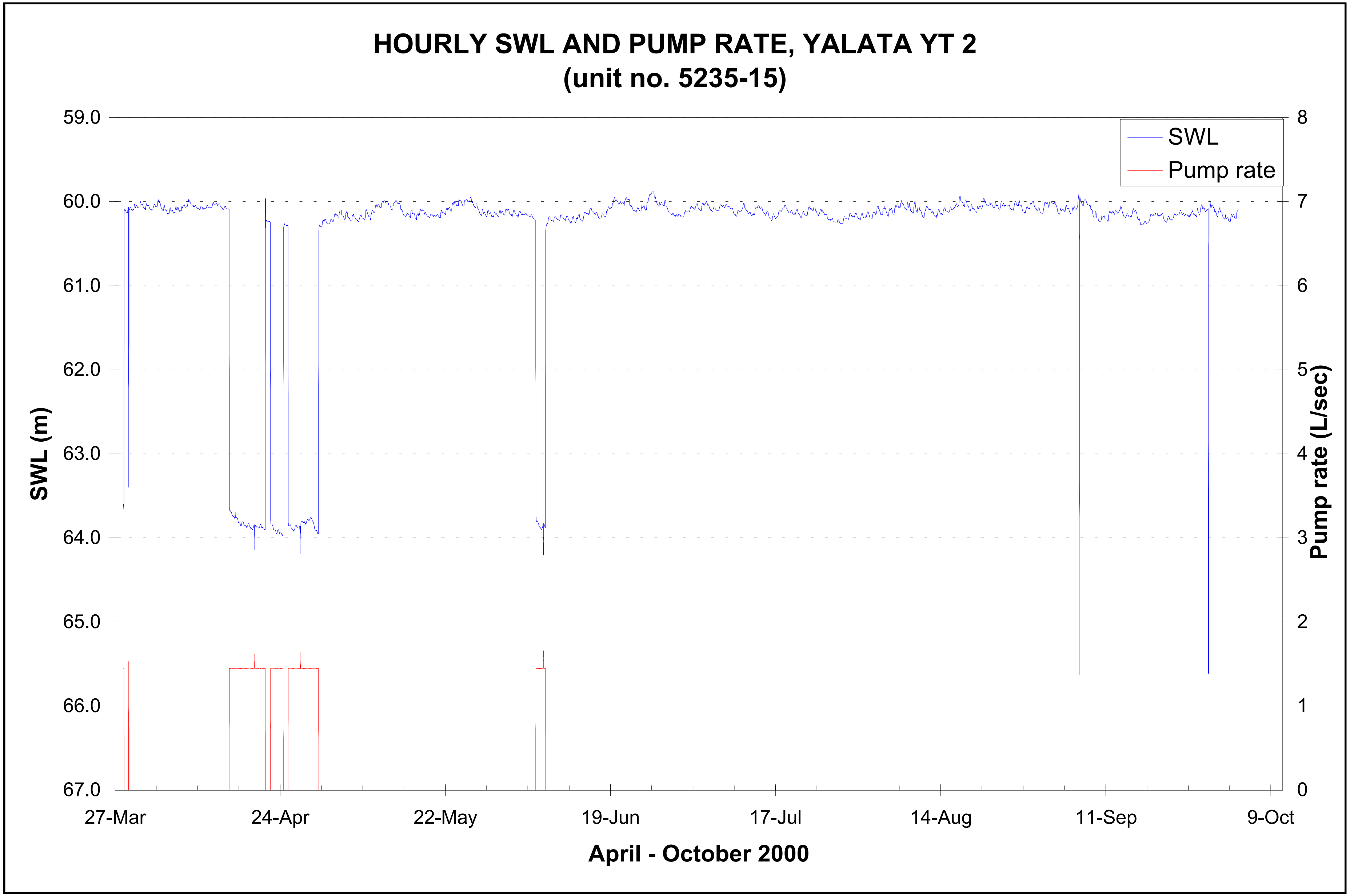

WATER PRODUCTION AT YALATA
Note: Production for Nov 99 and Oct 00 is only for a portion of the month.
YT 3
YT 2
Water production (kL)
7000
6000
5000
4000
3000
2000
1000
0
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00
Oct-00

Figure 10.2



HOURLY SWL AND PUMP RATE, YALATA YT 2
(unit no. 5235-15)
SWL (m)
59.0
60.0
61.0
62.0
63.0
64.0
65.0
66.0
67.0
Pump rate (L/sec)
8
7
6
5
4
3
2
1
0
SWL
Pump rate
27-Mar
24-Apr
22-May
19-Jun
17-Jul
14-Aug
11-Sep
9-Oct
April - October 2000

Figure 10.3

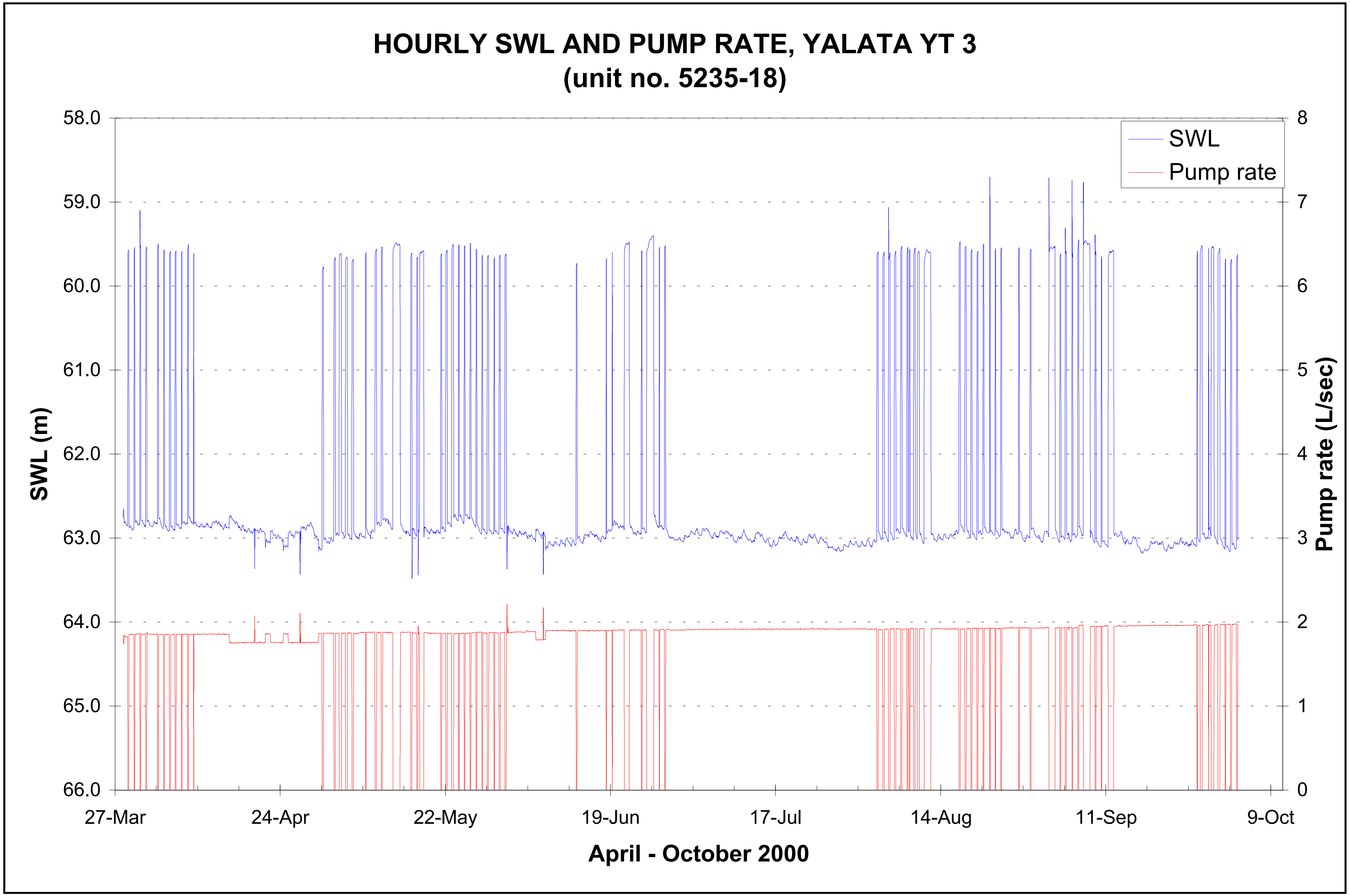

HOURLY SWL AND PUMP RATE, YALATA YT 3
(unit no. 5235-18)
SWL
Pump rate
SWL (m)
Pump rate (L/sec)
58.0
59.0
60.0
61.0
62.0
63.0
64.0
65.0
66.0
8
7
6
5
4
3
2
1
0
27-Mar
24-Apr
22-May
19-Jun
17-Jul
14-Aug
11-Sep
9-Oct
April - October 2000

Figure 10.4

APPENDIXES

1 OPERATIONS REPORT ON WATER WELL MONITORING IN ABORIGINAL LANDS FOR THE PERIOD APRIL TO OCTOBER 2000

To: R. Martin, M. Goodchild, S. Dodds, L. Sampson.
From: B. Traeger
Date: 31 October 2000
Subject: Aboriginal lands data loggers.

Pitjantjatjara lands

INDULKANA

Well monitoring results for the period April–October 2000, Indulkana

Observation well	**Standing water level** *Actual*	*Logger*	**Flow rate** (L/s)	**Accumulated flow** (m^3)
IMB 19	16.460	16.752	0.130	125.199
IMB 19A	26.795	26.810	0.548	512.368
IMB 25	9.940	25.355	0.585	1.508
IMB 26	0.135	0.135	0.085	0.265
IMB 27	9.520	9.400	not available	0.178
IR 1	38.990			46 743.000
IR 2	55.975	56.247	0.830	4 970.560

Notes
Accumulated flow for all Indulkana bores was from 30 March 2000 to 18 October 2000.
Rain gauge reading at IMB 19 was 83.6 mm for the same period.

IMB 19 Data logger downloaded and memory cleared. A substantial correction of 0.292 m was made to the SWL datum, due to the difficulties of obtaining actual SWL at this bore. The logger was re-started with the new datum.

IMB 19A Data logger was downloaded and memory cleared and flow totaliser reset. The data indicates the 2100P failed during the logging period but subsequently recovered, however, the 2100P battery was not holding charge and was replaced. The logger was re-started with the 0.015 m correction to the SWL datum.

IMB 25 Data downloaded, cleared memory and cleared flow totaliser. The 2100P had a faulty battery which was replaced as well as the battery charger; SWL datum was reset.

IMB 26 Downloaded data and cleared memory. An air leak in the air tube joiner failed after 17 August 2000 and was replaced; reset datum and restarted logger. Download data, cleared memory and restarted with 0.120 m correction. Unable to turn on pump and the flow meter output was not checked.

IR 1 Unable to communicate with the logger, memory module was removed and was not able to download using an alternative logger. The logger S/N 311170 was replaced with S/N 311404. All inputs were calibrated and the logger restarted with a new datum.

IR 2 Data was downloaded, memory cleared, and the logger restarted with a correction of 0.272 m to the SWL datum.

MIMILI

Well monitoring results for the period April–October 2000, Mimili

Observation well	Standing water level		Flow rate	Accumulated flow (m^3)
	Actual	*Logger*	(L/s)	
M 1	22.760	22.713	1.573	6591.89
M 3	11.170	11.136	1.144	6304.00

Notes
Accumulated flow for all Mimili bores was from 31 March 2000 to 19 October 2000.
Rain gauge reading at M 3 was 64.2 mm for the same period.

M 1 The bore was pumping on arrival, was isolated and allowed to recover. The logger was downloaded, memory cleared and flow totaliser reset. There was a significant period of invalid data but the 2100P seems to have recovered. The logger was restarted with a correction 0.047 m to the SWL datum.

M 3 The bore was pumping on arrival, and was isolated and allowed to recover. The logger was downloaded, memory cleared, flow totaliser reset and the rain gauge accumulator reset. Data indicates that the 2100P failed at various stages during the logging period and was replaced. The logger was restarted with a correction of 0.034 m to the SWL datum.

FREGON

Well monitoring results for the period April–October 2000, Fregon

Observation well	Standing water level		Flow rate	Accumulated flow (m^3)
	Actual	*Logger*	(L/s)	
FRG 1	not available	10.504	1.710	2 515.00
FRG E4	9.740	9.543	1.833	4.31
FRG 7	10.960	10.873	2.365	4 237.50
FRG 14	not available	27.070	2.477	22 752.00

Notes
Accumulated flow for all Fregon bores was from 31 March 2000 to 19 October 2000.
Rain gauge reading at FRG 14 was 43.4 mm for the same period.

FRG 1 Although a conduit has been installed at this site to enable a SWL to be measured, the conduit was blocked with tree roots (evident on the water level probe) and needs to blown out with air to clear the blockage. Unable to read SWL. Data downloaded, cleared memory, and restarted logger; no corrections.

FRG E4 Data was unable to be downloaded due to a faulty memory module, it has been returned to Mindata for repair and to see if they can retrieve the data.
A replacement memory module was installed, the data logger was re-initialised, and the flow totaliser reset and the logger restarted with a correction to the SWL datum of 0.197 m.

FRG 7 Data was downloaded, memory cleared, flow totaliser reset and the logger restarted with a correction to the SWL datum of 0.087 m.

FRG 14 Data was downloaded, memory cleared, flow totaliser reset and rain gauge accumulator reset. Unable to obtain SWL due to tree roots, therefore the logger was started without being able to set a true SWL datum.

KENMORE PARK

Well monitoring results for the period April–October 2000, Kenmore Park

Observation well	Standing water level		Flow rate	Accumulated flow (m^3)
	Actual	*Logger*	(L/s)	
KP 6	9.930	9.930	0.687	1 773.00
KP 7	11.090	11.263	0.692	3 412.99
KP 94B	9.210	–	–	–

Notes
Accumulated flow for all Kenmore Park bores was for the period 1 April 2000 to 20 October 2000.
Rain gauge reading at KP 7 was 65.2 mm.

KP 7 Data was downloaded, memory cleared, flow totaliser reset and rainfall accumulator reset. The logger was restarted with a correction to the SWL datum of 0.173 m.

KP 6 Data downloaded, memory cleared, and flow totaliser reset. The 2100P was faulty, giving negative readings. A new unit was installed, S/N 212119, the logger was restarted and a new SWL datum set.

KP 94B 1540.52 hours at 20 October 2000, 844.75 hours at 1 April 2000 and 695.77 hours total use.

PUKATJA

Well monitoring results for the period April–October 2000, Pukatja

Well	Standing water level		Flow rate	Accumulated flow (m^3)
	Actual	*Logger*	(L/s)	
E 01	8.185	not available	not available	nil
E 12	8.490	8.423	1.120	6 802.33
E 42	9.870	9.834	0.210	2 726.70
E 44	12.360	12.347	0.200	0.12
E 45	12.725	12.694	0.780	10 579.00
E 97B	13.335	19.984	3.750	1 913.85
E 97L	14.875	14.870	1.400	7 009.82

Notes
Accumulated flow for all other Ernabella bores was from 1 April 2000 to 20 October 2000.
Rain gauge reading at E 42 was 102.8 mm.

E 01 SWL measured.

E 12 Data downloaded, cleared memory and reset flow totaliser. The 2100P transducer was faulty, latching to display 4–20 m after data logger access, the unit was replaced with S/N 212118. The data logger was restarted with a correction to the SWL datum of 0.067 m.

E 42 Data downloaded, cleared memory and reset flow totaliser. Data indicated an anomaly in the SWL during August and September. The 2100P battery was faulty with very low capacity and was replaced. The logger was restarted with a correction to the SWL datum of 0.036 m.

E 44 Data downloaded, cleared memory and reset flow totaliser. The logger was restarted with no corrections.

E 45 Data downloaded, cleared memory and reset flow totaliser. Pump was running on arrival but was isolated and the bore allowed to recover before restarting the logger with a corrected SWL datum of 0.031 m

E 97B Data downloaded, cleared memory and reset flow totaliser. Data shows two major pump failures from the 12 April to 13 July and 28 September to 9 October. The logger was restarted and the SWL datum reset.

E 97L Data downloaded, cleared memory and reset flow totaliser. Data showed evidence of a faulty check valve in the 2100P which was replaced with S/N 212117. The logger was restarted and the SWL datum reset.

AMATA

Well monitoring results for the period April–October 2000, Amata

Well	Standing water level		Flow rate	Accumulated
	Actual	*Logger*	(L/s)	**flow** (m^3)
A 15	10.310	not available	not available	not available
A 17	10.792	10.933	1.378	11 030.00
A 26	14.100	14.059	1.090	10 400.00

Notes
Accumulated flow for Amata bores was from 2 April 2000 to 21 October 2000.
Rain gauge reading at A 15 was not available.

A 15 Power to this site has not been restored and has been out of commission since before the download trip in April 2000. The logger had failed and stopped logging due to flat batteries, some data was downloaded from the memory module. Both the batteries in the data logger and the 2100P battery were faulty and were removed from site, and the site left equipped but disabled. The wiring for the rain gauge at the top of the tripod had been damaged by birds and was repaired and additional protection installed.

A 17 Data downloaded, cleared memory and reset flow totaliser. An area of inaccurate data for the period 18 September to 10 October 2000 was noted. The logger was restarted with a correction to the SWL datum of 0.141 m.

A 26 Data downloaded, cleared memory and reset flow totaliser. Restarted logger with a correction of 0.041 m to the SWL datum.

KALKA

Well monitoring results for the period April–October 2000, Kalka

Observation	Standing water level		Flow rate	Accumulated
well	*Actual*	*Logger*	(L/s)	**flow** (m^3)
KA 1	27.580	27.487	0.112	342.43
KA 2	28.090	29.331	0.154	656.48
KA 3	19.620	19.561	1.010	26 76.999

Notes
Accumulated flow for all Kalka bores was from 2 April 2000 to 21 October 2000.
Rain gauge reading at KA 3 was 117.2 mm for the same period.

KA 1 Data downloaded, cleared memory and reset flow totaliser. Restarted logger with a correction of 0.093 m to the SWL datum.

KA 2 Data downloaded, cleared memory and reset flow totaliser. The logger was restarted with a correction to the SWL datum of 1.241 m. No explanation is apparent for the large correction. The pump circuit breaker was found off, the breaker reset and the pump started, however, this could suggest a problem down hole or a faulty breaker.

KA 3 Data downloaded, cleared memory and reset flow totaliser. Restarted logger with a correction of 0.059 m to the SWL datum.

PIPALYATJARA

Well monitoring results for the period April–October 2000, Pipalyatjara

Observation well	**Standing water level** *Actual*	*Logger*	**Flow rate** (L/s)	**Accumulated flow** (m^3)
PIP 95	16.945	17.168	1.432	4 342.80
PIP 96	20.870	20.977	1.483	5 009.88
MD 13	14.440	–	–	–

Notes
Accumulated flow for all Pipalyatjara bores was from 2 April 2000 to 22 October 2000.
Rain gauge reading at PMB 95 was 135.8 mm.

PIP 95 Data downloaded, cleared memory and reset flow totaliser. Restart logger with a correction of 0.213 m to the SWL datum

PIP 96 Data downloaded, cleared memory and reset flow totaliser. The logger was restarted with a correction to the SWL datum of 0.107 m. This anomaly in the SWL data reading may be caused by battery problems. B. Hewitson replaced the 2100P battery on 30 September.

MD 13 SWL was measured and a note of hours run meter read, 9770.98 hours at 2 April 2000, 9803.69 hours at 22 October 2000 and 32.71 hours total use.

Aboriginal Lands Trust lands

NEPABUNNA

Well monitoring results for the period April–October 2000, Nepabunna

Observation well	**Standing water level** *Actual*	*Logger*	**Flow rate** (L/s)	**Accumulated flow** (m^3)
N 101	39.975	not available	0.622	5 937.787
N 149	52.705	52.695	0.724	6 682.154

Notes
Accumulated flow for all Nepabunna bores was from 5 April 2000 to 4 October 2000.
Rain gauge reading at N149 was 83.6 mm.

N 101 Data downloaded, memory cleared and flow totaliser reset. The 2100P was replaced with a modified unit S/N 210435. The logger was restarted with a new SWL datum.

N 149 Data downloaded, memory cleared and flow totaliser reset. The 2100P was replaced with a modified unit S/N 210493. The logger was restarted with a new SWL datum. Note, the rain gauge accumulator was not reset.

YALATA

Well monitoring results for the period April–October 2000, Yalata

Observation well	Standing water level *Actual*	*Logger*	Flow rate (L/s)	Accumulated flow (m^3)
YMB T2	60.118	N/A	N/A	1 900.957
YMB T3	59.940	59.943	1.971	2 7026.0

Notes
Accumulated flow for all Yalata bores was from 28 March 2000 to 3 October 2000.

YMB T2 Data was downloaded, memory cleared and flow totaliser reset. The 2100P was replaced with a modified unit S/N 212133. The logger was restarted with a new SWL datum. The flow meter could not be checked because the pump and motor had been removed. The main switch was left isolated, isolated the control switch and turned the main switch on to maintain power to the battery charger.

YMB T3 Data was downloaded, memory cleared and flow totaliser reset. The 2100P was replaced with a modified unit S/N 212134. The logger was restarted with a new SWL datum.

Conclusions and observations

After discussion with Mr P. Hogan of Mindata, he recommended that consideration be given to modifying the agency's spare 2100P transducers. Mindata have been undertaking tests to improve the reliability of the 2100P transducers which had problems with the check valve being damaged by either condensation from the compressor or by airborne material trapped in the set of the check valve. The recommended modification was to install a condensate trap and filter between the compressor and the check valve to collect any condensate and filter the air before the check valve. In addition to the modification, the replacement of the check valve, it was suggested the transducer be completely recalibrated.

The modifications were suggested in response to recurring problems observed in the field. Spare units were sent to Mindata for modification. Units at Yalata and Nepabunna were still under warranty and Mindata agreed to modify those units at a reduced cost. The download trip was therefore undertaken in two parts: the first to install the modified spares at Yalata and Nepabunna, units retrieved from the sites were in turn modified then the second part of the trip to the Pitjantjatjara lands replaced the transducers.

The download trips were successful and all sites were downloaded (with the exception of IR 1 and FRG E4), and data was retrieved for the period April 2000 to October 2000.

The monitoring equipment is operating reliably but there was an increase in the number of sites with battery failures and 2100P failures, reinforcing the need to modify the 2100P transducers.

Equipment failures resulted in lost data at the following sites:

- Indulkana 26 required the replacement of an airline joiner which failed. There was staining of mud on the airline which may have been due to local flooding or water leak from pipe work.
- Indulkana 25 required a replacement 2100P battery and battery charger.

- Indulkana 19A required a replacement of 2100P battery.
- Indulkana IR 1 data logger failed for a second time and was replaced.
- Mimili 3 had the 2100P transducer replaced, as there were signs of leaking check valve.
- Fregon E4 was unable to be downloaded resulting from a faulty memory module.
- Ernabella E 97L required replacement of a faulty 2100P transducer.
- Ernabella E 42 required replacement of a faulty 2100P battery.
- Ernabella E 12 required replacement of a faulty 2100P transducer.
- Kenmore Park K P6 required replacement of a faulty 2100P transducer, 2100P battery and faulty battery charger.
- Amata A 17 required replacement of a faulty 2100P transducer due to errors in data.

All five spare 2100P transducers were used to replace faulty units or units with the greatest number of anomalies in the data. In addition, anomalies were observed at four sites, which are likely to totally fail during the next six months. These sites are: Mimili 1, Kenmore Park 7, Ernabella 97B and Indulkana 19A. I recommended the units, once repaired, and the transducers at these sites are replaced with one of the transducers from another site with evidence of significant condensation, e.g. Indulkana 26 or 25.

The sites at Indulkana Range 1 and 2 still have problems regarding the reliability of the flow meters. When the pump was turned off, the flow meters were still powered and the trickle of water returning to the bore through the flow tube resulted in anomalous readings, potentially affecting flow totaliser. This fault has been overcome by the installation of the current monitoring relay at each site, which isolates the flow meter when there is no pump load. The relay used is a Crouzet type DIRT 2 240 volt from NHP Electrical Engineering Adelaide. Circuit diagrams on site were modified to show the installation.

At some sites it is still difficult or impossible to measure the actual SWL, although two sites (KA 1 and FRG 1) have been fitted with a conduit to overcome this problem. At Fregon 1, the conduit was blocked by tree roots entering the conduit at the time of installation. The problem should be rectified by blowing the conduit clear with an air compressor. Other sites which still require this modification include Indulkana 19 and Fregon 14.

2 WATER WELLS AND EQUIPMENT IN ABORIGINAL LANDS

Area	Observation well	Unit number	Depth (m)	Latitude (S) GDA 94	Longitude GDA 94	Date of installation *Flow meter*	Date of installation *SWL transducer and logger*	Logger format	Comments
Pitjantjatjara lands									
Indulkana	IMB 19	5544-101	68.0	26.9848	133.2898	Dec. 1997	Dec. 1997	2	rain gauge
	IMB 19A	5544-132	79.0	26.9860	133.2927	Dec. 1997	Dec. 1997	2	
	IMB 25	5544-157	30.0	26.9903	133.2930	pre-1997	pre-1997	2	
	IMB 26	5544-158	48.0	26.9863	133.2870	Dec. 1997	Dec. 1997	2	
	IMB 27	5544-159	40.0	26.9837	133.2762	Dec. 1997	Dec. 1997	2	not monitored until April 2000
	IR 1	5544-172	72.0	26.9880	133.2811	Oct. 1999	Oct. 1999	2	
	IR 2	5544-169	90.7	26.9892	133.2764	Oct. 1999	Oct. 1999	2	
	IR 3	5544-170		26.9921	133.2729				not monitored
Mimili	M 1	5443-25	35.0	27.0235	132.6733	Jan. 1998	Jan. 1998	2	
	M 3	5443-28	60.0	27.1422	132.6925	pre-1997	pre-1997	2	transducer replaced Dec. 1997 rain gauge
Fregon	FRG 01	5344-09	18.6	26.7668	132.0378	pre-1997	pre-1997	2	transducer replaced Dec. 1997
	FRG 07	5344-31	48.0	26.7573	132.0387	Jan. 1998	Jan. 1998	2	
	FRG 14	5344-47	30.0	26.7593	132.0402	Jan. 1998	Jan. 1998	2	rain gauge
	FRG E4	5344-19	35.0	26.7545	132.0360	Jan. 1998	Jan. 1998	2	
Kenmore Park	KP 6	5345-67	30.0	26.3225	132.4393	pre-1997	pre-1997	2	
	KP 7	5345-68	36.0	26.3220	132.4375	Dec. 1997	Dec. 1997	2	rain gauge
	KP 94B	5345-98	30.0	26.3007	132.4242				pump hours recorded
Pukatja	E 01	5345-06	18.3	26.2738	132.1358	Dec. 1997	Dec. 1997	2	
	E 12	5345-12	22.9	26.2725	132.1265	Dec. 1997	Oct. 1998	2	
	E 42	5345-33	21.0	26.2703	132.1257	Dec. 1997	Dec. 1997	2	rain gauge
	E 44	5345-85	16.5	26.2585	132.1240	Dec. 1997	Dec. 1997	2	
	E 45	5345-84	30.0	26.2593	132.1250	pre-1997	pre-1997	2	transducer replaced Dec. 1997
	E 97B	5345-114	42.5	26.3291	132.1104	Apr. 1998	Apr. 1998	2	
	E 97L	5345-124	31.0	26.3300	132.1031	Apr. 1998	Apr. 1998	2	

Area	Observation well	Unit number	Depth (m)	Latitude (S) GDA 94	Longitude	Date of installation *Flow meter*	*SWL transducer and logger*	Logger format	Comments
Amata	A 15	5145-55	35.8	26.1422	131.1350	pre-1997	pre-1997	1	rain gauge
	A 17	5145-84	34.5	26.1425	131.1387	Jan. 1998	Jan. 1998	2	
	A 26	5145-19	39.0	26.1343	131.1387	Jan. 1998	Jan. 1998	2	
Kalka	KA 1	4745-78	40.5	26.1085	129.1507	Jan. 1998	Jan. 1998	2	
	KA 2	4745-94	60.0	26.1167	129.1528	Jan. 1998	Jan. 1998	2	
	KA 3	4745-85	40.0	26.1182	129.1668	Jan. 1998	Jan. 1998	2	rain gauge
Pipalyatjara	PIP 95	4745-95	36.8			Jan. 1998	Jan. 1998	2	rain gauge
	PIP 96	4745-96	36.8			pre-1997	pre-1997	2	
	MD 13	4745-92	43.0	26.1587	129.1698	Jan. 1998	none		rarely used, run for 31 hours Mar. – Oct. 1998
Other lands									
Nepabunna	N 101	6636-101	64.0	30.5842	138.9764	Dec. 1999	Dec. 1999	2	
	N 149	6636-149	120.0	30.5780	138.9585	Dec. 1999	Dec. 1999	2	rain gauge
Yalata	YT 2	5235-15	72.0	31.4564	131.8012	Dec. 1999	Dec. 1999	2	
	YT 3	5235-18	73.0	31.4534	131.8047	Dec. 1999	Dec. 1999	2	

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