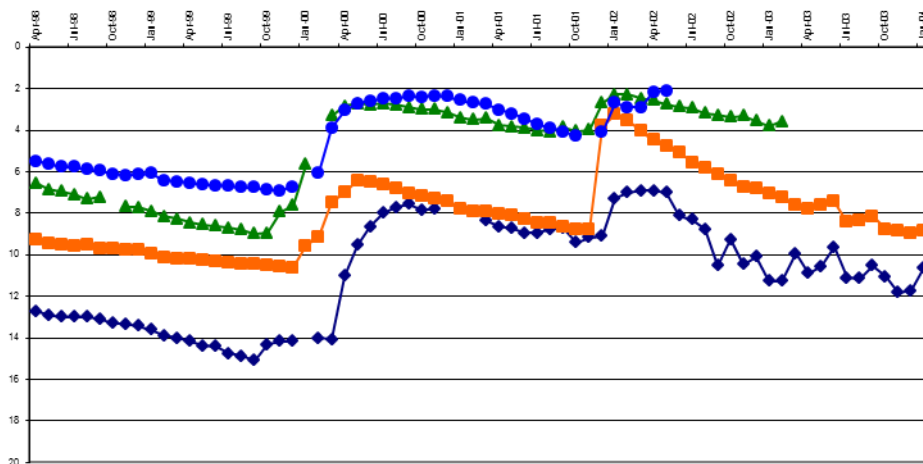


LIMPOPO REGION

QUARTERLY STATUS REPORT ON GROUNDWATER LEVEL TRENDS



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SUMMARY

Normal decline of groundwater levels into the dry season is the general trend at the majority of monitoring stations. The decline is mostly less than 0.4m since 1 April 2014. A number of stations indicating declining levels in excess of that are actually displaying abnormal high levels stabilizing after good recharge in March 2014. 67% of groundwater levels monitored are currently higher than the same period last year.

The general groundwater level status in Limpopo is regarded as good. Comparison with historical levels where available, indicates that the current levels are well above the level of concern.

Local deviations from the general trend are always present. The area affected can vary considerable depending on whether the impact is from over abstraction from a single borehole or more, or the combined effect of abstraction in an area. The only way to know if a resource is utilised in a sustainable manner is professional resource development, monitoring and resource management. Unfortunately this is seldom the case.

1. BACKGROUND

Quarterly reporting on groundwater level trends is based on the four financial quarters of the year and data collection was previously done to fall within these quarters to provide one report per quarter as per business plan.

The status reports will still be compiled per financial quarter but from this report and henceforth the quarterly dates used for data analysis will coincide with the quarters of the hydrological year

Comparison is also made with the current groundwater level status compared to the corresponding time the previous year.

The distribution of the monitoring network is illustrated by MAP 1.

A number of specific monitoring stations on different projects are monitored and the results are reported at the conclusion of each project.

Due to periodic extreme wet conditions all stations are not always accessible, which result in data not available. For this report the main reason for data gaps is however the lack of replacements for old or defect instruments during the previous data collection event.

Electronic groundwater level data for this report was collected during July and August 2014. The quarter discussed is from 1 April to 30 June 2014 and represent the 3rd quarter of the hydrological year.

2. GROUNDWATER LEVELS

2.1 DIFFERENCE IN GROUNDWATER LEVELS; APRIL TO JUNE 2014.

April to June 2014

Total	188	Stations

With data	153	Stations	81.4%
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Water level			Average(m)	%
Down	107	Stations	-0.8	69.93%
Up	44	Stations	0.51	28.76%
Na change	2	Stations		1.31%
No Data	35	Stations		100.00%

The data represent the 3rd quarter of the hydrological year which is also the first half of the dry season. As can be expected water levels has generally started to decline again after the recharge season with 107 (69.9%) of 153 stations with continuous data available indicating a decline. The average decline is 0.8m for the 107 stations. This figure can be misleading because a large number of water levels indicating significant decline is actually abnormal high water levels returning to stable conditions after very good recharge in March 2014. GRAPH 1 illustrates this clearly. In this case, as with a number of others, is the current groundwater level still well above the the average level before the recharge event.

The distribution of stations with higher or lower groundwater levels from April to June is shown on MAP 2.

2.1 DIFFERENCE IN GROUNDWATER LEVELS; JUNE 2013 TO JUNE 2014

June 2013 to June 2014

Total	188	Stations

With data	161	Stations	85.6%
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Water level			Average(m)	%
Down	53	Stations	0.4	32.92%
Up	108	Stations	1.28	67.08%
Na change	0	Stations		0.00%
No Data	27	Stations		100.00%

Comparison of groundwater levels as on 30 June 2014 with that of the corresponding date last year indicate that 67% of the stations have higher water levels. Lower groundwater levels are present at 32.9% of the stations but is generally not significantly so. Groundwater levels are controlled and influenced by a large number of factors which are not always clear. Declining water levels may be part of a normal trend or response and not necessarily always a reason for concern.

The distribution of stations with higher or lower groundwater levels from June 2013 to June 2014 is shown on MAP 3. Some areas outlined are discussed below.

3. LOWER GROUNDWATER LEVELS JUNE 2013 TO JUNE 2014; SOME EXAMPLES

A decline in groundwater level may be due to any one, or combined, factors such as variable rainfall distribution, recharge, abstraction patterns, land use, topography etc. Natural cycles of different duration, short, medium to long-term also occur.

Distribution of stations used in the examples is illustrated on MAP 4.

3.1 GROUNDWATER LEVEL TRENDS EXAMPLE 1 (GRAPH 2)

The groundwater levels at A5 Kitty and A6 Zwartwater is respectively only 7 and 20 cm lower than last year. Some seasonal fluctuations are indicated at both but not every season. A slow declining trend is displayed by A5 Kitty since 2007 when monitoring started at this station and is considered part of a normal long-term trend while the level at A6 Zwartwater is slightly rising. The decline since last year is of no significance.

3.2 GROUNDWATER LEVEL TRENDS EXAMPLE 2 (GRAPH 3)

A stable condition at both stations with a few very slight fluctuations from seasonal recharge is displayed. The underlying trend is a slightly rising one, the past year's decline has no real impact and of no concern.

3.3 GROUNDWATER LEVEL TRENDS EXAMPLE 3 (GRAPH 4)

Two totally different trends are displayed in this graph. The groundwater level at B8 Tzaneen has been rising steadily with clear indications of seasonal recharge and the slight decline since last year is insignificant. The situation at B8Sekgopo is quite different where a steady decline with no real recharge is displayed and the

past year's decline is 0.6m. The decline over the graph period is 5.3m which is considered to be very significant.

4. DIFFERENT RESPONSE OF GROUNDWATER LEVELS TO RAINFALL.

Distribution of stations used in the examples is illustrated on MAP 4.

4.1 A4 RHENOSTERPOORT

This monitoring station is located in the recharge area of the A drainage and the graph indicate that the delay between rainfall and recharge is not long with the impact of the high rainfall incident in March 2014 reaching its peak in groundwater by April where after it started to decline again into the dry season. The water level at this station after the rainfall season normally stabilizes at between 10 and 11m over the past 4 years.

4.2 A5 WESTERN LEPHALALE

The station is also located in a recharge area. Rainfall intensity and volume is important to affect recharge and the graph indicates that the lower rainfall in October and November 2013 did not have real impact on the groundwater level. The high rainfall incidents in December 2013 and March 2014 had a notable impact on the groundwater level. Recharge tends to be taking place 2 to 3 months after the rainfall episode with the groundwater level still slightly rising in June 2014.

4.3 A6 PONTDRIFT

The trend displayed by this graph is difficult to explain. The sudden rise after the exceptional high rainfall in January 2013 is not surprising but it is interesting to note that the groundwater level did not decline again thereafter but in fact slowly kept rising over the whole year. A slight decline by April 2014 was reversed by May 2014 probably due to the rainfall received in March 2014 reaching the groundwater table. A lack of long-term data in the area impedes a clear explanation. The pre 2013 groundwater level might be abnormally low and recovered after the high rainfall event; there was considerable river flow after the rains and recharge from alluvial river aquifer may slowly percolate to the fractured aquifer in which the borehole was drilled, a long delay may exist before all recharge reach the aquifer. Long-term monitoring would be required to facilitate analysis of such and many other questions.

5. IMPORTANCE OF GROUNDWATER MANAGEMENT

Graph 8 illustrates the effect of continued abstraction over time on groundwater level of monitoring station B5 Byzonderheid. The effect of nearby pumping by the municipality can be noted from the start in June 2008 with the water level mostly ranging between 20-25 m until June 2012. After that the fluctuations became more prominent and the level declined with the average between 25 to 30m for a while. Since October 2013 the decline, and especially since February 2014, is rapid. The water strike depth of the monitoring borehole is at 47m and is considered as the critical level of drawdown in any borehole. Currently the water level is at 45m.

The depth of the production borehole and the water strike depth(s) are not known but if drawdown continues as currently is the case, problems with sustainability will arise.

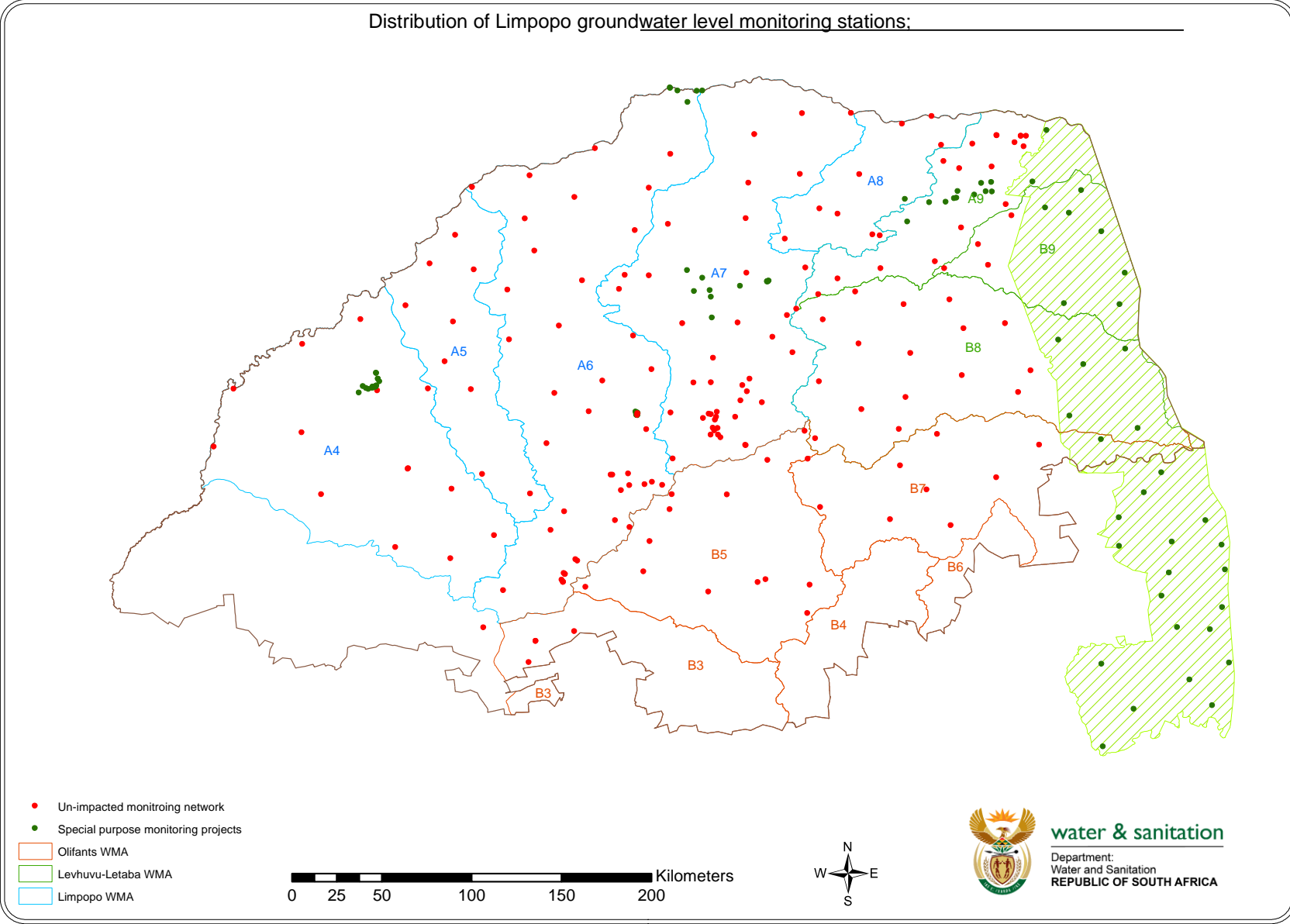
If such a situation is not monitored to enable sound resource management decisions the source will eventually fail.

6. ACKNOWLEDGEMENT

info@weathersa.co.za<http://www.weathersa.co.za/>

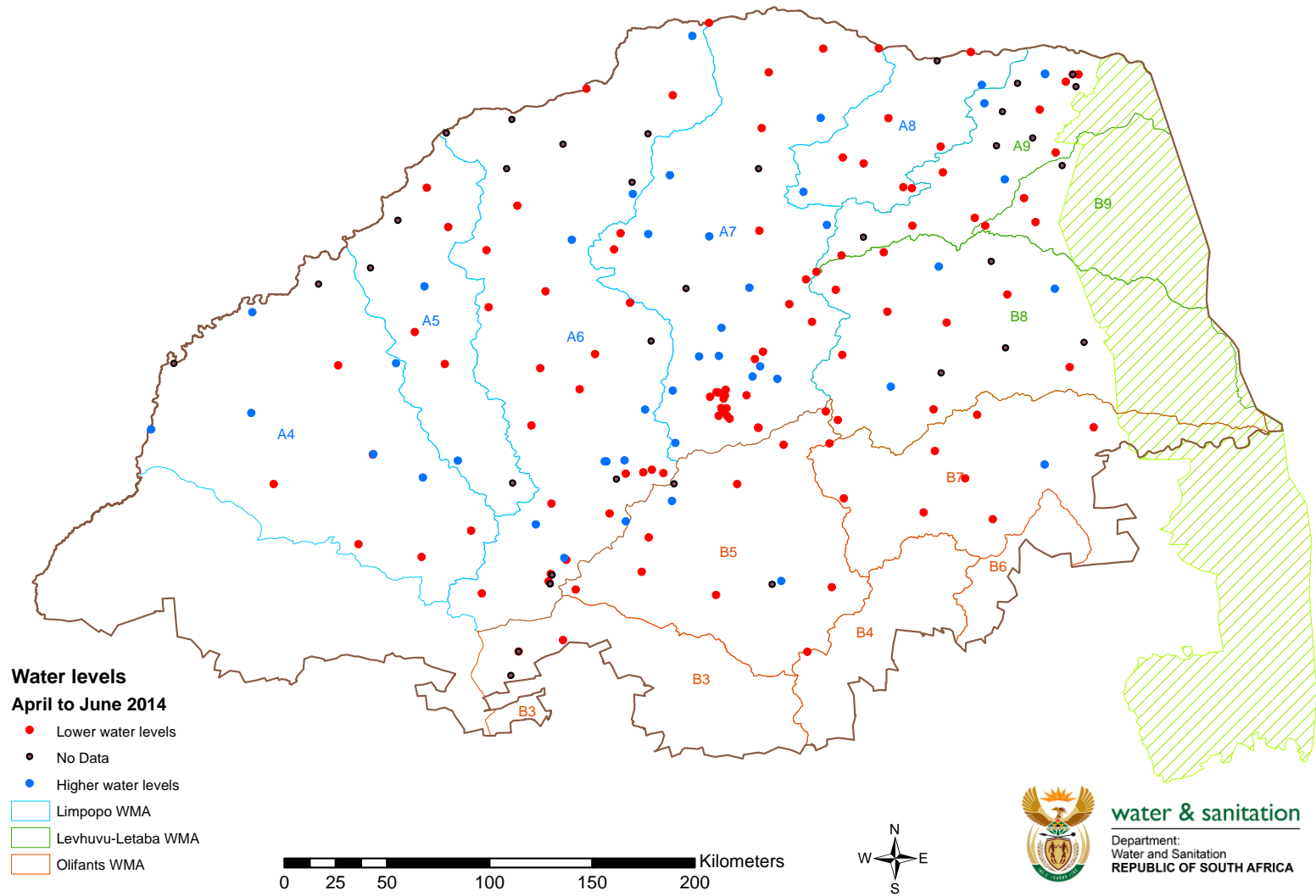
(Rainfall data for Limpopo Province)

Distribution of Limpopo groundwater level monitoring stations:



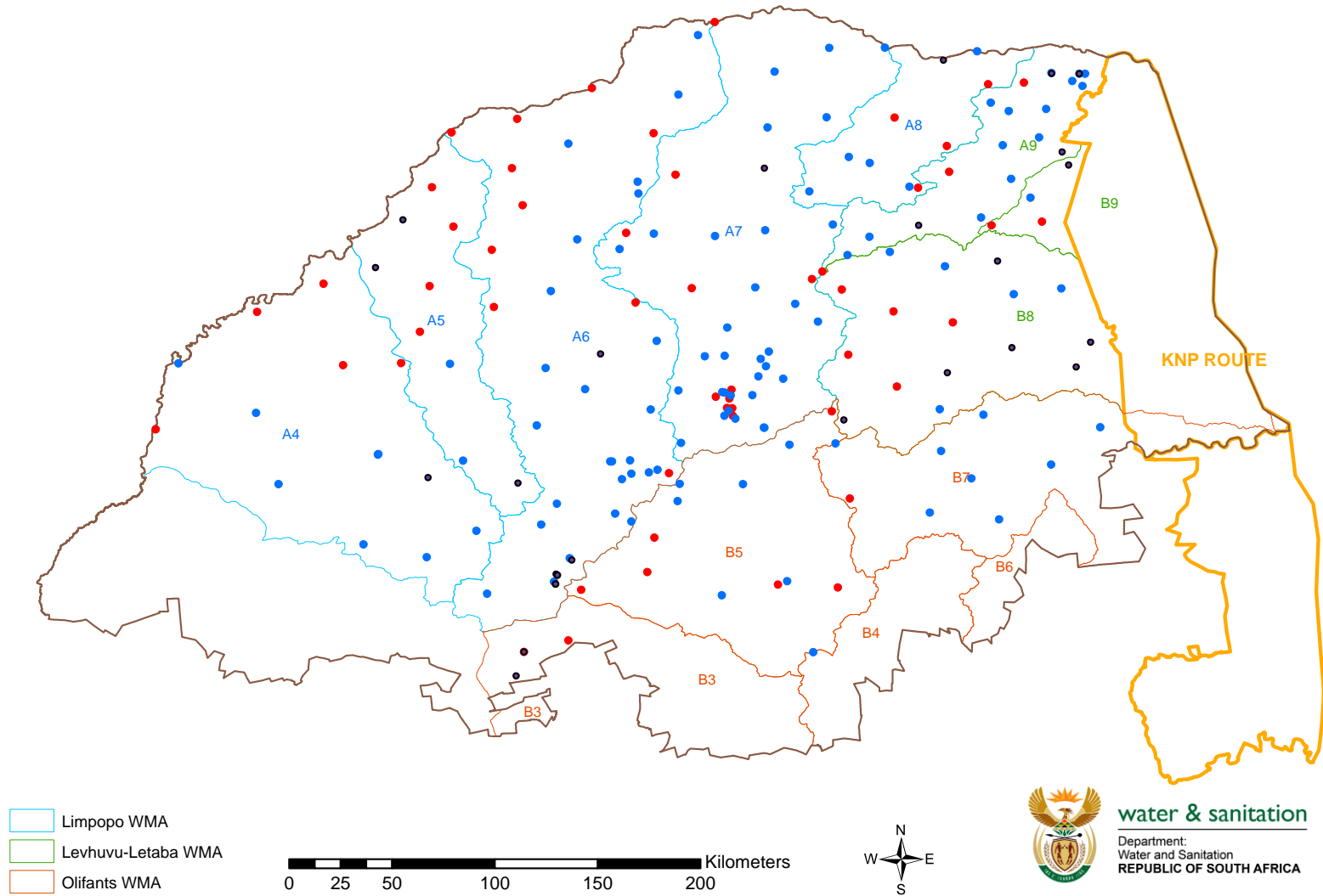
MAP 1

Distribution of higher and lower groundwater levels:
1 April to 30 June 2014



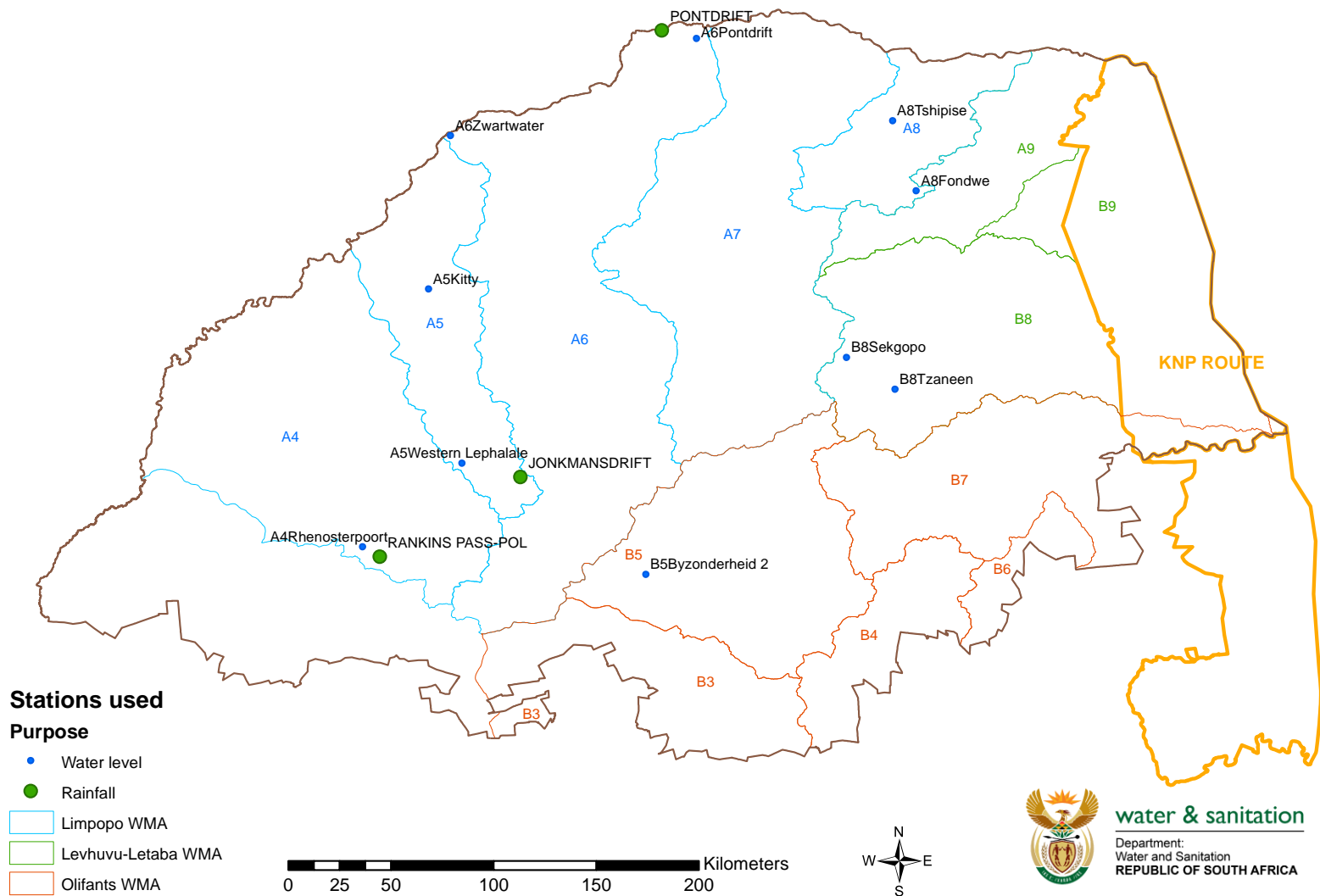
MAP 2
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Distribution of higher and lower groundwater levels:
June 2013 to June 2014



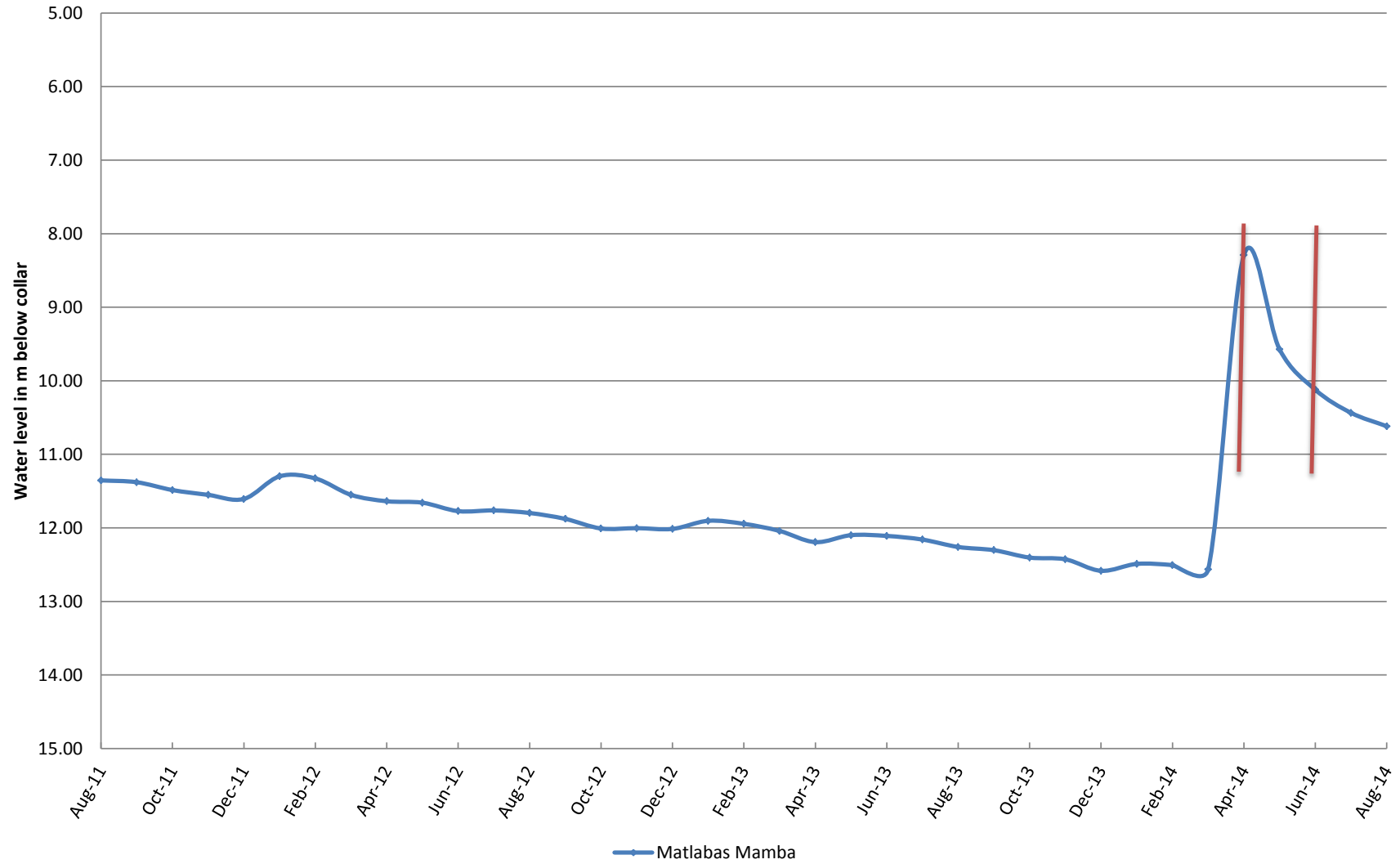
MAP 3
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Distribution of stations used for examples



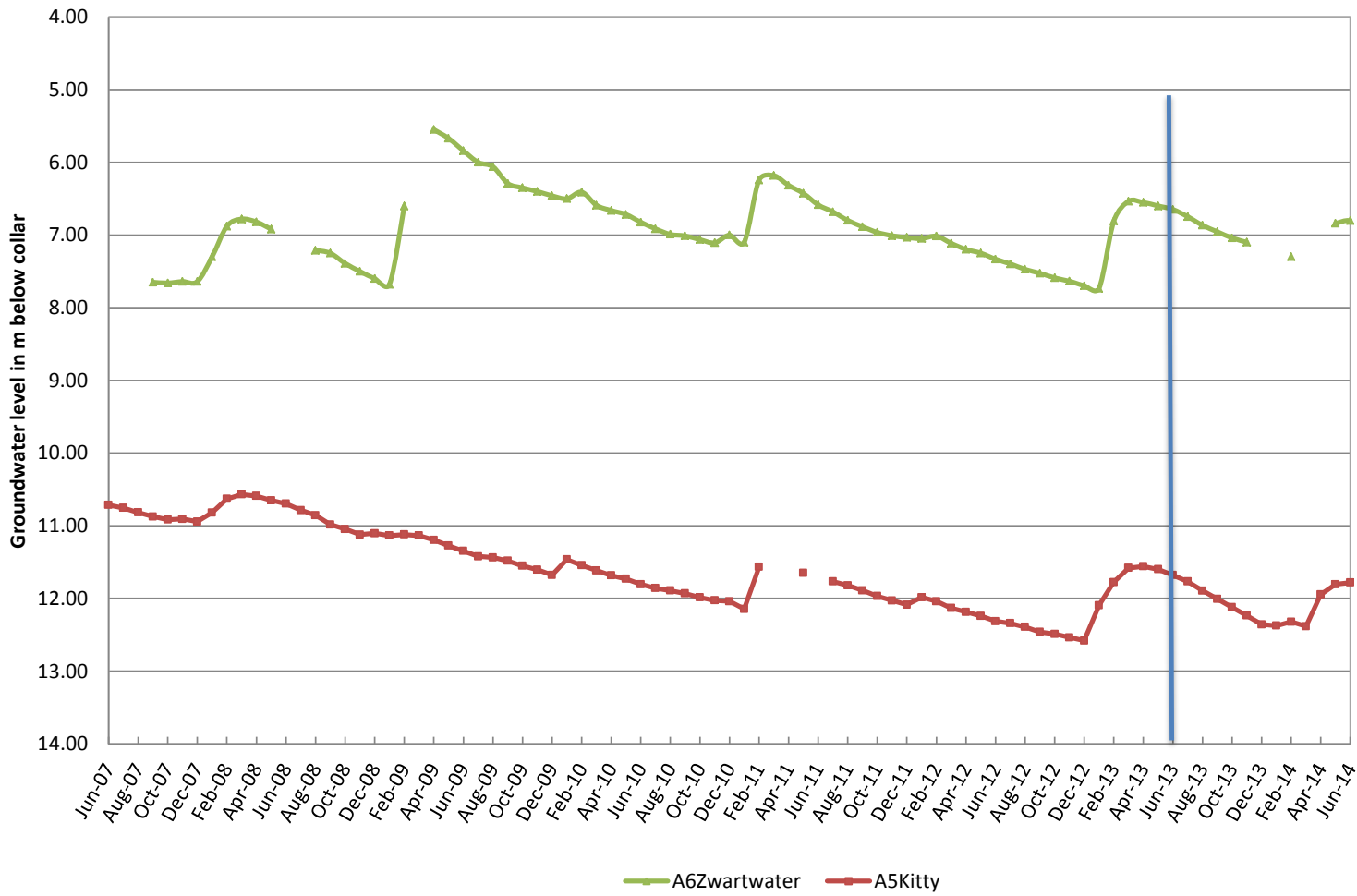
MAP 4
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GROUNDWATER LEVEL TIME SERIES OF STATION A 4 MATLABAS MAMBA



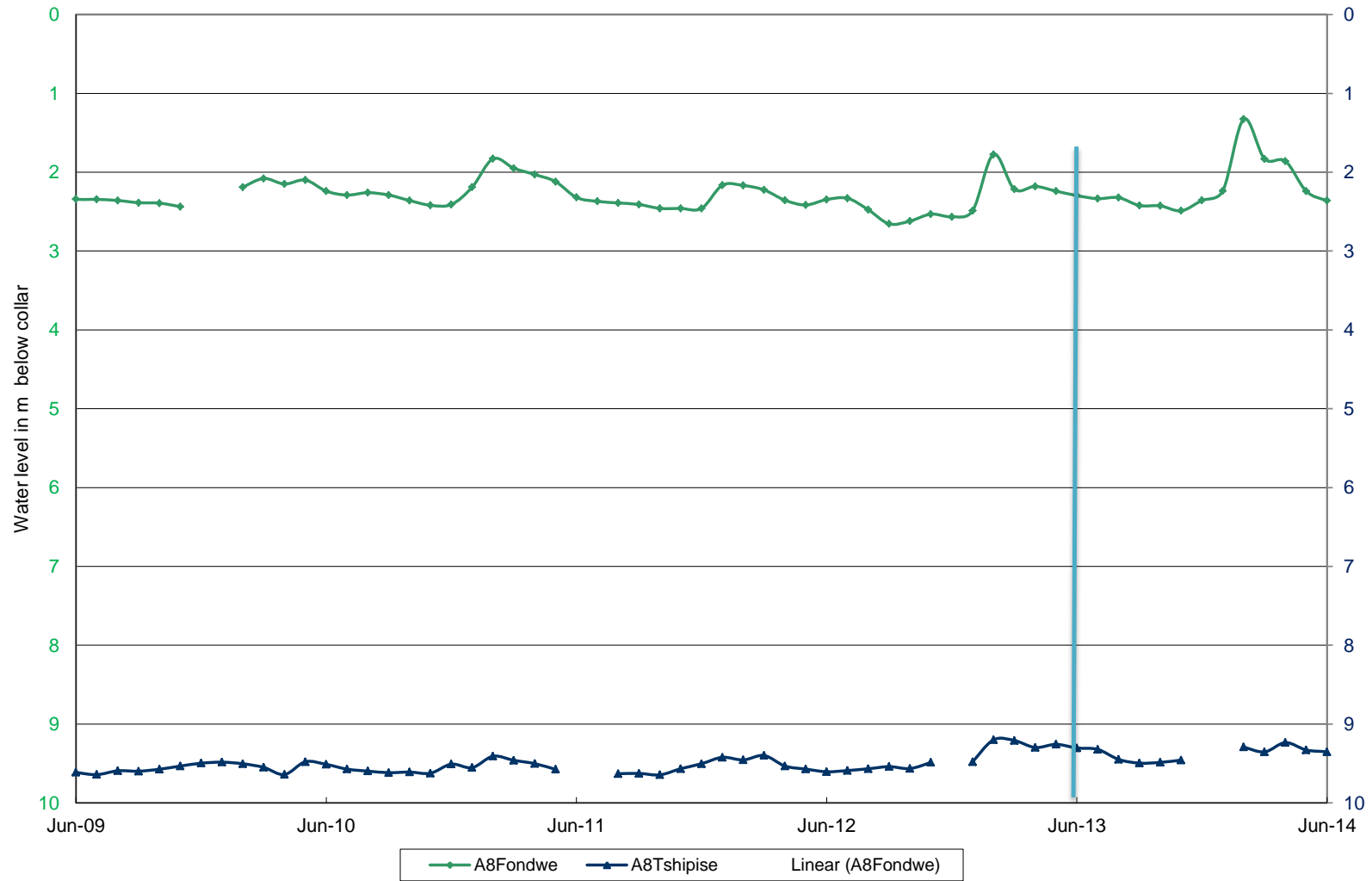
GRAPH 1

GROUNDWATER LEVEL TRENDS EXAMPLE 1



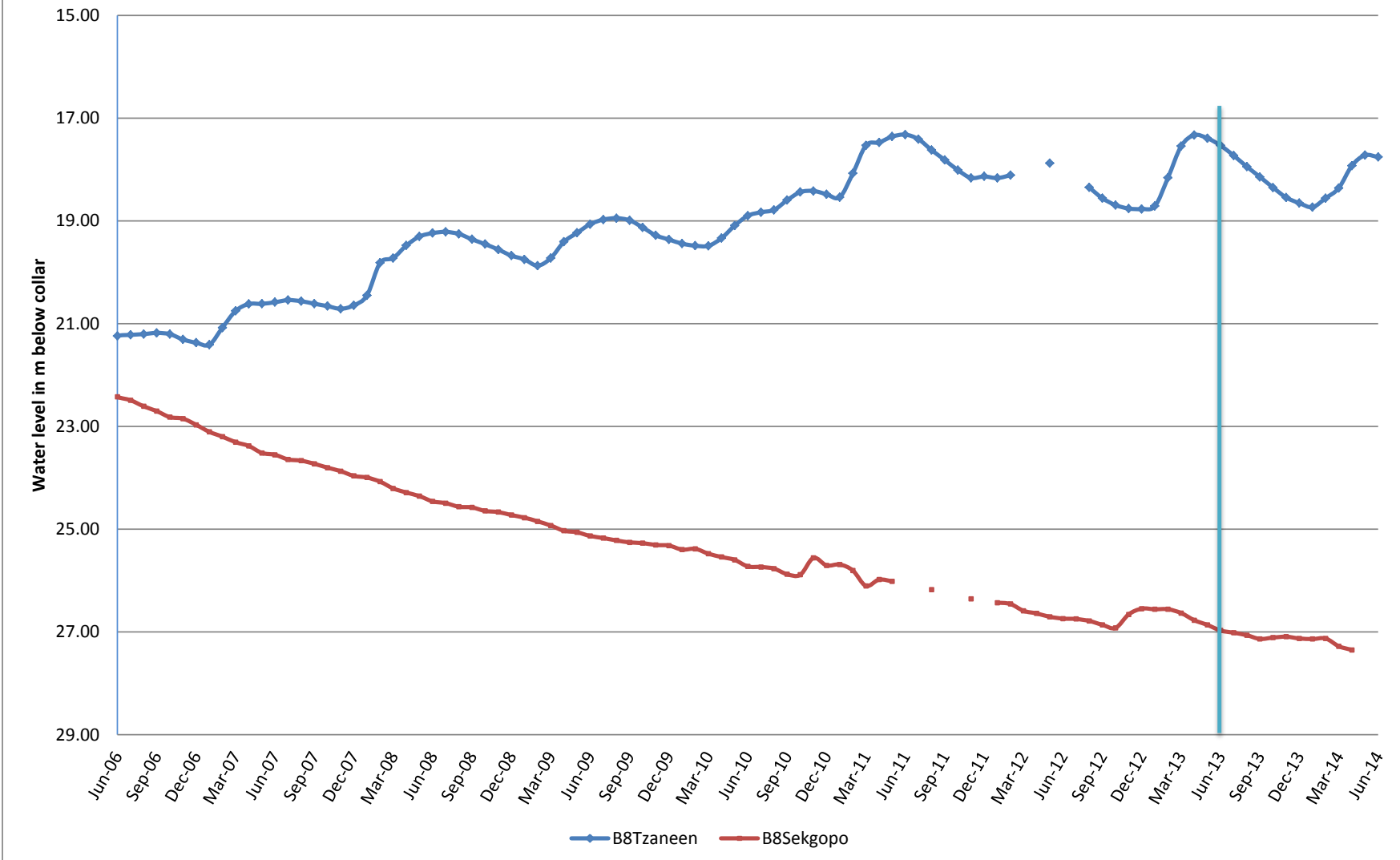
GRAPH 2

GROUNDWATER LEVEL TRENDS EXAMPLE 2



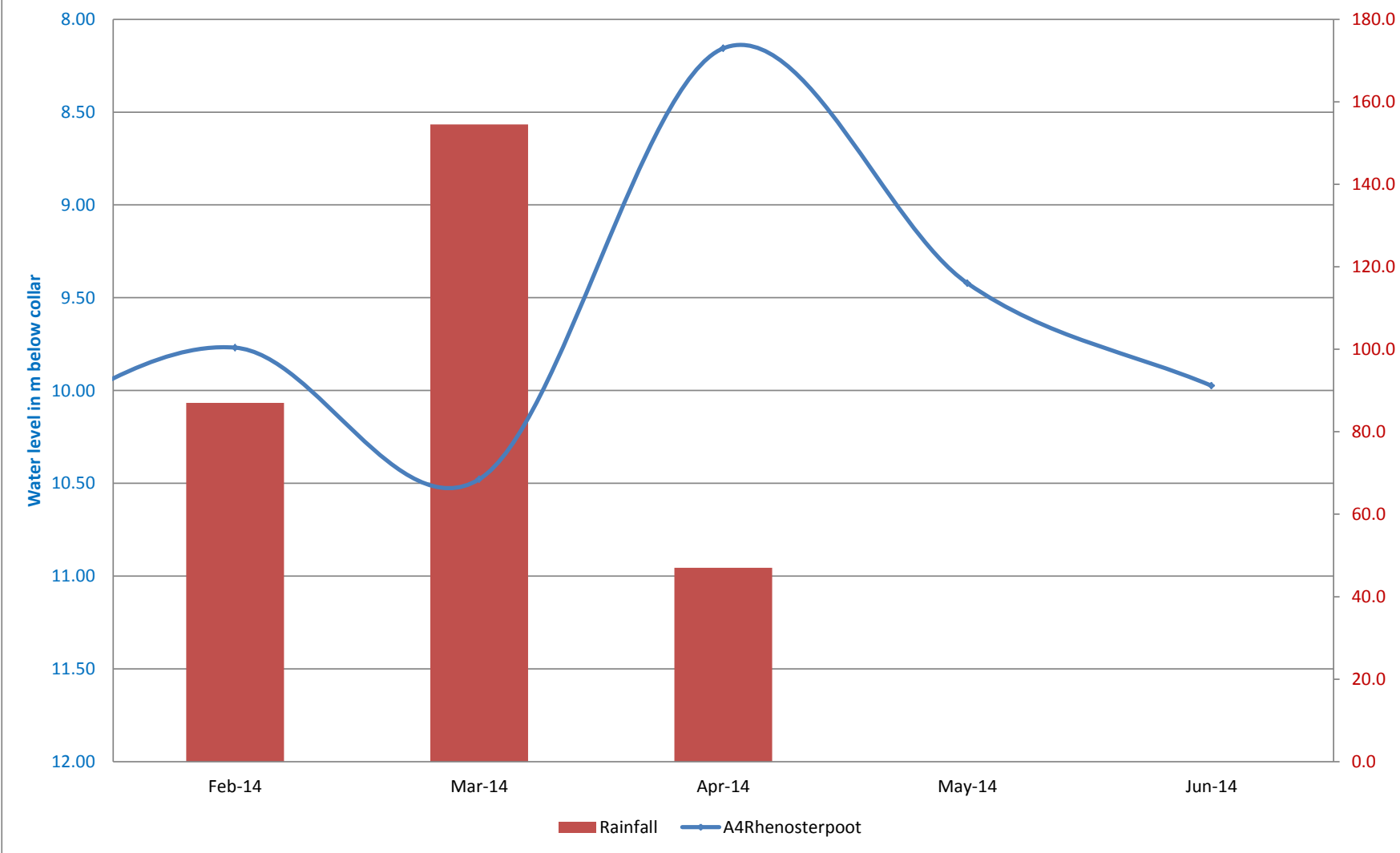
GRAPH 3

GROUNDWATER LEVEL TRENDS EXAMPLE 3

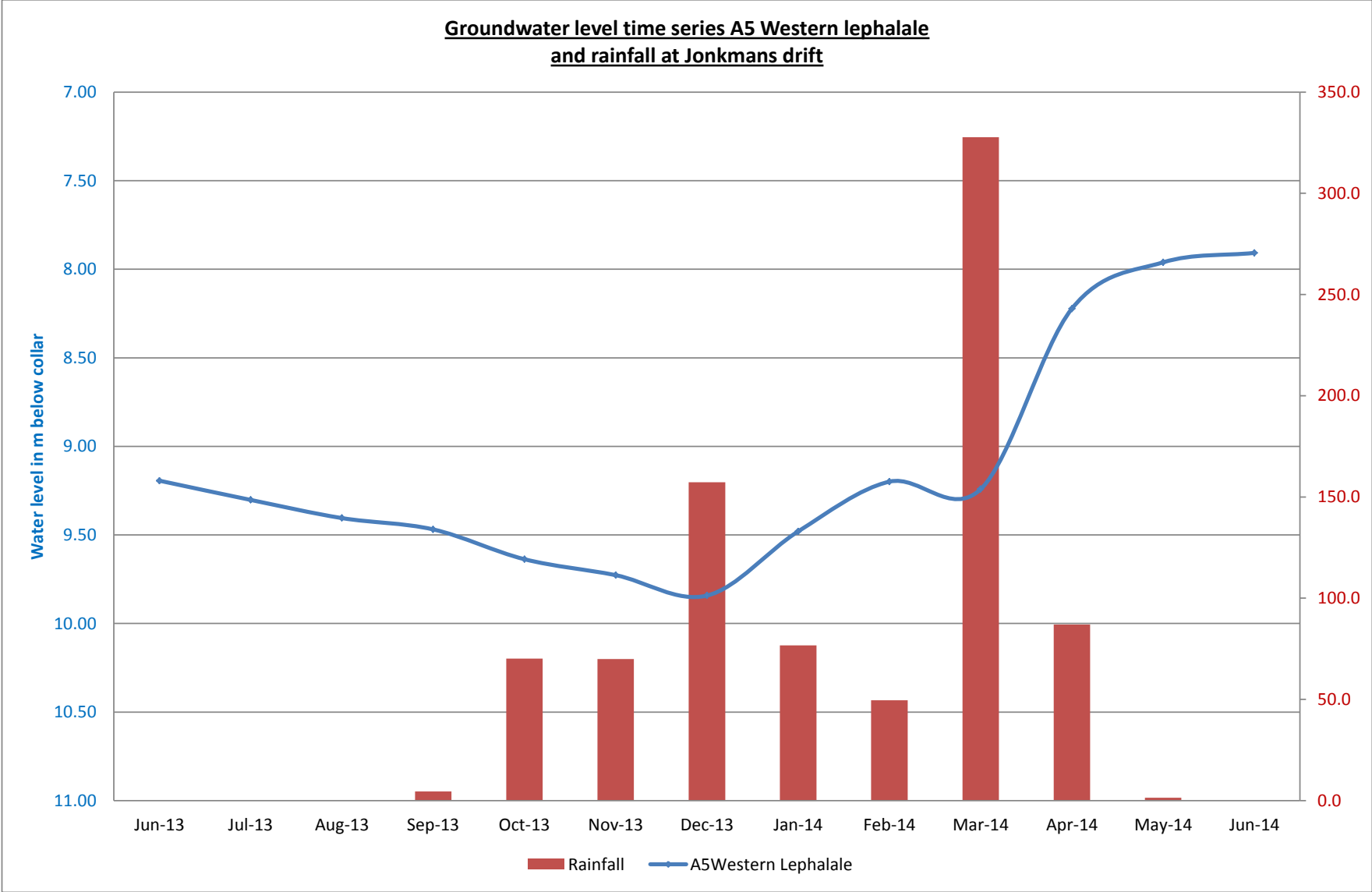


GRAPH 4

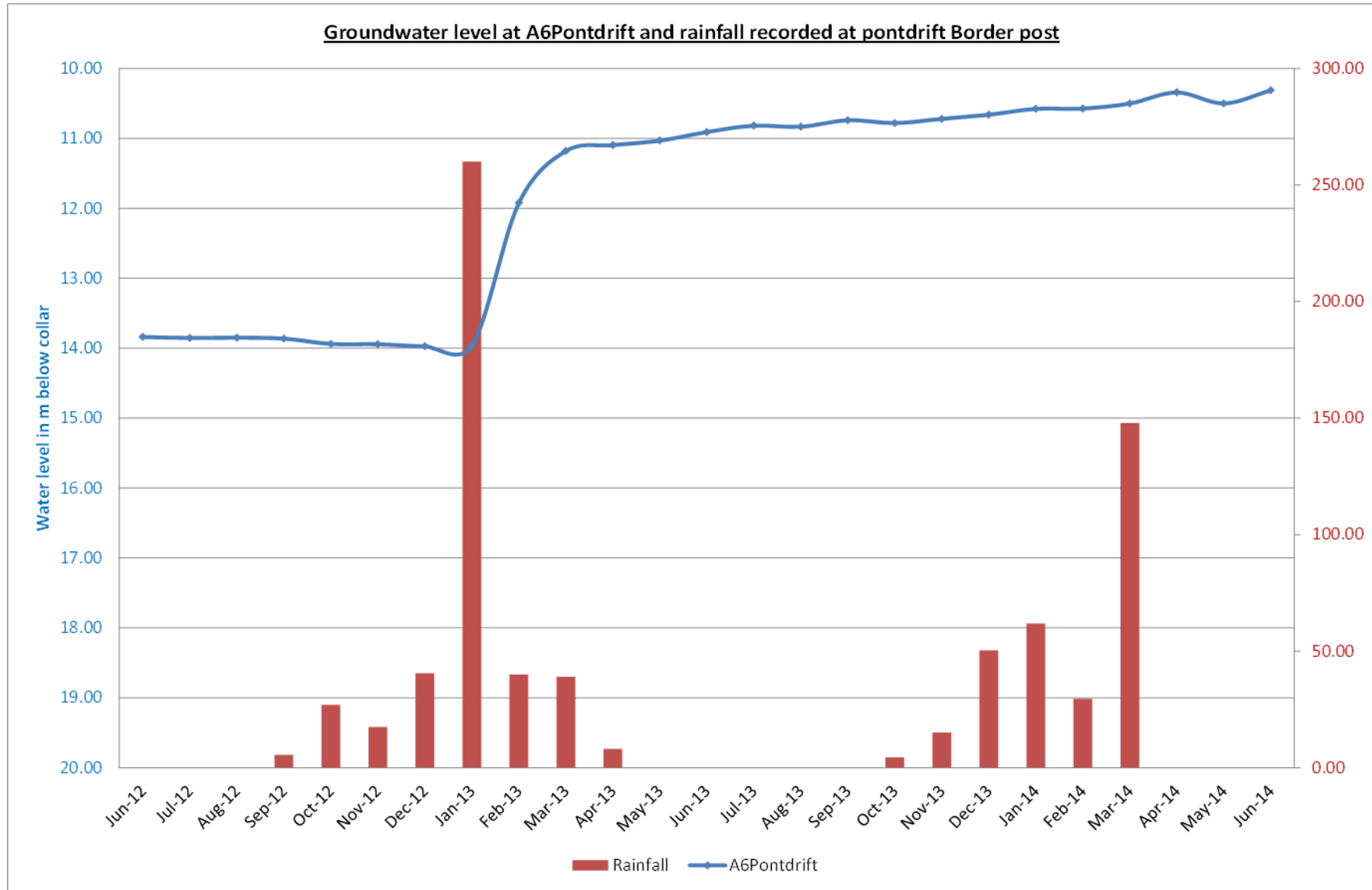
Groundwater level time series A4Rhenosterpoort and rainfall recorded at Rankinss Pass Police Station



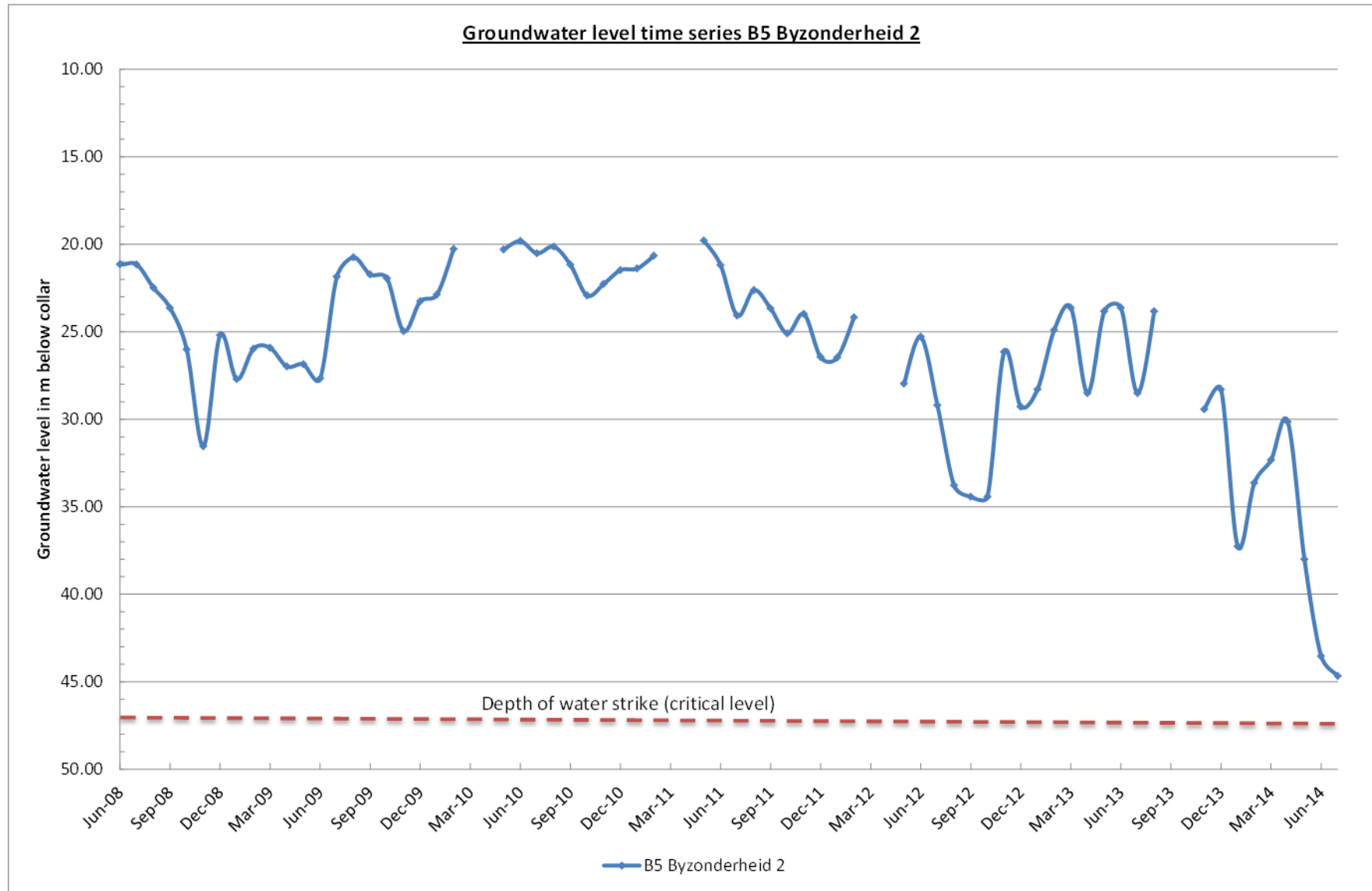
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GRAPH 6



GRAPH 7
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GRAPH 8
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