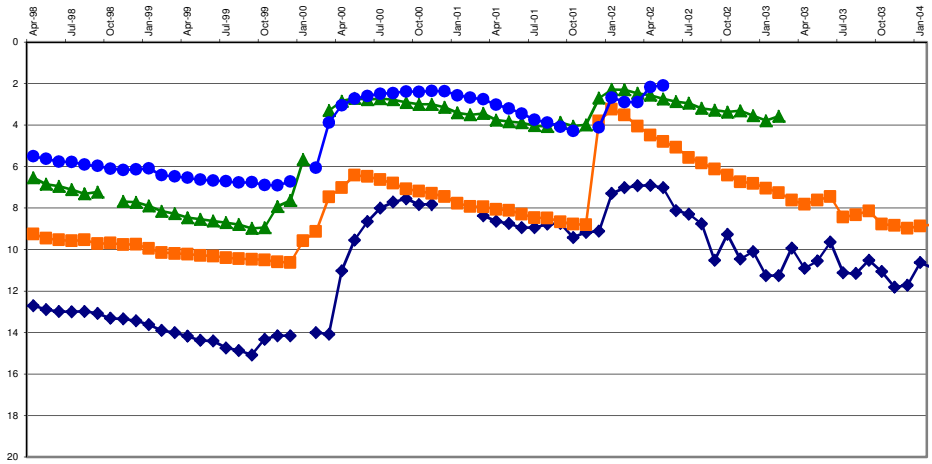
LIMPOPO REGION

DIRECTORATE
WATER REGULATION AND USE

STATUS REPORT ON
GROUNDWATER LEVELS & TRENDS
1 AUGUST 2011 – 1 AUGUST 2012



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SEPTEMBER 2012

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SUMMARY

The past rainy season did not result in any significant recharge of groundwater except in the Mica area. Groundwater levels continue to decline slowly. 85.8% of the monitoring stations indicate lower groundwater levels than the same time last year. Long-term data available however indicate no need for immediate concern as cycles of declining/rising trends of medium to long-term are natural and current levels are generally above the worst recorded. Impacts by abstraction however leads to local deviations in the trend and cannot always be detected by the current monitoring network which gives an indication of the general situation over a large area. A few areas characterized by a deviation from the general trend in groundwater levels have been identified and closer monitoring is being implemented or planned for some.

Periods of drought or recharge cannot be predicted and it is impossible to forecast what will happen in the future. This highlights the need for sound aquifer characterisation and management.

1. BACKGROUND

Data and information on total rainfall, percentage of normal, percentage of long-term mean, shorter and long-term groundwater level trends are presented and discussed.

The distribution of Limpopo's groundwater level monitoring stations from which water level data was obtained is depicted by (FIGURE1)

Groundwater level data was collected during August 2012. All water level values used are that on the 1st of each month in question and taken at 12H00 in the case of logger data. Where logger data is not available the hand measurement taken during the site visit is used.

174 Of the 185 stations visited have water level data available for the past season and 169 for the whole year.

2. RAINFALL

2.1 TOTAL RAINFALL; OCTOBER 2011 TO JULY 2012 (MAP 2)

The total rainfall received for the past rainy season is presented in MAP1. In the May report it was noted that less than 250mm of rain was recorded over the bigger part of the Province for the first part of the rainy season. It can now be noted that only a few stations located mostly in the Tzaneen and Thoyandou areas and a few adjoining Mpumalanga in the south east, recorded more than 500mm for the whole season.

2.2 TOTAL LATE SEASON RAINFALL; MAY TO JULY 2012 (MAP 3)

The map depicts the rainfall over the last part of the rainy season and unfortunately illustrates a very dry late season. Only 4 stations recorded more than 10mm for this period with the highest rainfall recorded at a single station (Tshivase) being 19mm.

2.3 PERCENTAGE OF NORMAL PRECIPITATION; OCTOBER 2011 TO JULY 2012 (MAP 4)

The map, compiled by the SAWS, indicates that virtually the whole of Limpopo received below normal rainfall the past season. Above normal rainfall was only recorded at one locality in the Soutpansberg north west of Thoyandou.

2.4 PERCENTAGE OF NORMAL PRECIPITATION THE PREVIOUS SEASON; OCTOBER 2010 TO JULY 2011 (MAP 5)

The map compiled by the South African Weather Services, depicts the previous wet season. Normal to below normal rainfall was received over the western part of the Province with a little above normal in the east. The map is included to indicate the fact that the previous season was not a very good one and comparison with that of the past season (MAP 4) show a further decline in recorded rainfall this year.

2.5 TOTAL RAINFALL; PERCENTAGE OF LONG-TERM MEAN; 1 APRIL 2011 TO JULY 2012 (MAP 6)

MAP 6 by the Agricultural Research Council and the South African Weather Services clearly indicate the fact that the northern part of South Africa, and especially the Limpopo Province, received well below the long-term mean of rainfall the past year. Limpopo Province generally received less than 25% of the long-term mean.

2.6 SEASONAL RAINFALL; PERCENTAGE OF NORMAL SINCE 2006 (MAP 7)

The group of maps presented as MAP 7 illustrates the seasonal rainfall over South Africa in percentage of the normal for the last 6 years. Varying seasonal and spatial rainfall patterns is clearly defined. No area in Limpopo received exceptional "above normal" rainfall, such as would be required for a major groundwater recharge event, the past 6 years. It can also be seen that the past year was not a good rainfall year, not only in Limpopo, but for most of South Africa.

2.7 LATE SEASON RAINFALL;TREND OVER THE PAST 3 YEARS (GRAPH 1)

Although some areas of Limpopo did receive slightly above normal seasonal rainfall the previous 2 seasons, a noticeable decline in the late-season rainfall can be seen. This pattern is clearly notable in GRAPH 1. The general rainfall trend of normal to below normal is much more pronounce in the late season

3. GROUNDWATER LEVELS

As discussed above, rainfall was generally low for the past season and groundwater level trend, as can be expected, indicating a general decline. A slow declining trend has in fact been noted for some years now. The decline is however slow and considered a normal medium to long-term cycle.

3.1. GROUNDWATER LEVEL BEHAVIOUR; MAY TO AUGUST 2012 (MAP 8)

A declining trend is normal for groundwater levels over the dry season and is clear from MAP 7 that the majority of stations indicate a decline since May. Of the boreholes indicating a rise in water levels, only very few like B7Mica, A8Mavhode and A6Upper Sterk River represent a real rise, the rest, for example, A6Kromhoek and A7 Waterpoort are all boreholes affected by nearby abstraction and the starting level for May is most probably a pumping level.

173 Of the stations visited have data for both May and August, of these; 143 (82.65%) indicate a decline in groundwater level with the average being -0.5m. Of the 30 indicating a rise in groundwater level 16 are considered to be real natural rises. The average rise of 15 of these is only 16cm while at B7 Mica, that experienced severe flooding in the area in January 2012, a rise in groundwater level of 1.7m was recorded.

3.2 GROUNDWATER LEVEL BEHAVIOUR; AUGUST 2011 TO AUGUST 2012 (MAP 9)

As indicated by MAP 9, higher groundwater levels than those of the same time last year do occur at some stations but the rises are mostly very small. As noted above, some stations are affected by nearby pumping and do not represent a true rise. 169 Stations have data for the whole year. 145 (85.8%) Of these have lower groundwater levels with an average decline of 1.2m, while the 21 stations (12.4%) considered giving a true reflection of the trend rose by an average of only 23cm

4. CURRENT GROUNDWATER LEVEL TRENDS; SOME EXAMPLES

4.1 GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A4 DRAINAGE: (GRAPH 2)

The impact on groundwater in the A4 drainage is generally low due to groundwater use being predominantly restricted to game and cattle farming. Groundwater levels in this drainage, in opposite to the rest of the Province; indicate a stable situation to even slightly rising trends.

4.1 GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A9 DRAINAGE: (GRAPH 3)

Community water supply in this densely populated drainage is the major part of groundwater use and impacts is notable. The general ground water level trend displayed is considered a good indication of that of the rest of Limpopo excluding the A4 discussed above.

The declining trend mentioned in (3) above can clearly be seen in GRAPH 3. A faster rate of decline has been noted in the Tswera area for some time now and the reason for this is not quite clear. A local monitoring project to investigate possible causes and extend of the trend is going to be implemented around Tswera soon with some boreholes drilled for this purpose already completed.

5 SHORT AND LONG-TERM PERSPECTIVES (GRAPHS 4-5)

- GRAPH 4: The groundwater level time series graph of stations A6MokopaneDorp and A6Blinkwater 2 is considered to reflect the general long-term trend displayed by most stations having long-term data. There is a good correlation in the trends displayed by the two stations despite the pumping effects clearly indicated by that of A6Blinkwater 2 until mid-2008 which also account for the more pronounced drop in water level during the period of drought from 1980 to the mid-90 as well as after the recharge period. The land use and abstraction pattern changed by then and the recovery can also be seen. Both trends indicate that the current situation, despite the declining trend, is still no reason for immediate concern
- GRAPH 5: As with the previous graph, the effect of the drought can be clearly seen and again more pronounced for A7Sterkloop Pump station that is affected by nearby abstraction. The trends at all three indicate that the current water levels are not a reason for immediate concern.

6 LOCAL IMPACTS ON GROUNDWATER LEVELS (GRAPH 9)

The trend at station A6Kromhoek is again used to illustrate the effect of abstraction that can be clearly seen since October 2010. Although there is some change in the rate of decline lately, and even a slight rise since May2012, the exact reason is not known but is most probably due to less abstraction for irrigation purposes during the winter months.

The monitoring station used is located in the area of abstraction but neither in the Municipal well field nor near any of the boreholes used for irrigation but still clearly indicate the impact on the area as a whole. If the abstractors do not monitor and manage the resource, it is impossible to predict how long the abstraction can be sustained.

7 IMPORTANCE OF GROUNDWATER MANAGEMENT

It was noted in the previous report (June 2012) that the current general decline in groundwater levels is considered part of a natural longer term cycle between major recharge events and it is still considered to be. Current groundwater levels, where historic data is available, are still well above the worst recorded.

That being the said, it must however be noted that in chapter 2 above “RAINFALL” it was illustrated that rainfall has been somewhat disappointing for some time now. A good recharge season is needed and unfortunately the past season did not meet that criterion. The decline in rainfall and water levels may be part of a normal drier cycle but how long it may last and how severe the decline in rainfall may become cannot be predicted. With factors such as climate change, El Niño and El Nina complicating the already complex systems controlling weather and climate, weather has become very unpredictable and extreme variations from very dry to very wet is common.

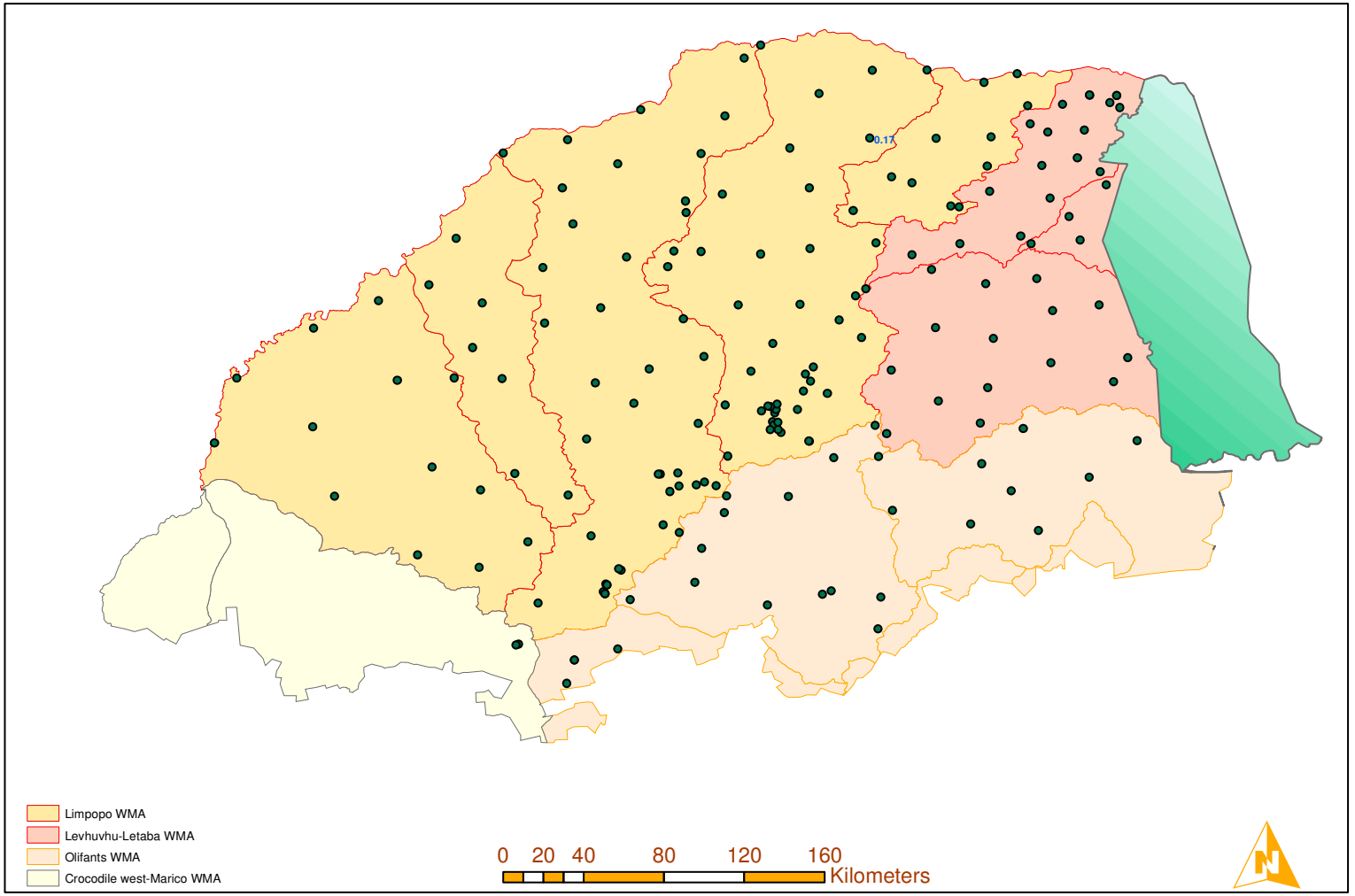
The extreme importance of sound aquifer management cannot be over emphasized. A lack thereof can result in unexpected aquifer failure with disastrous consequences in some instances, especially with community water supplies.

8 ACKNOWLEDGEMENTS

7.1. info@weathersa.co.zahttp://www.weathersa.co.za/

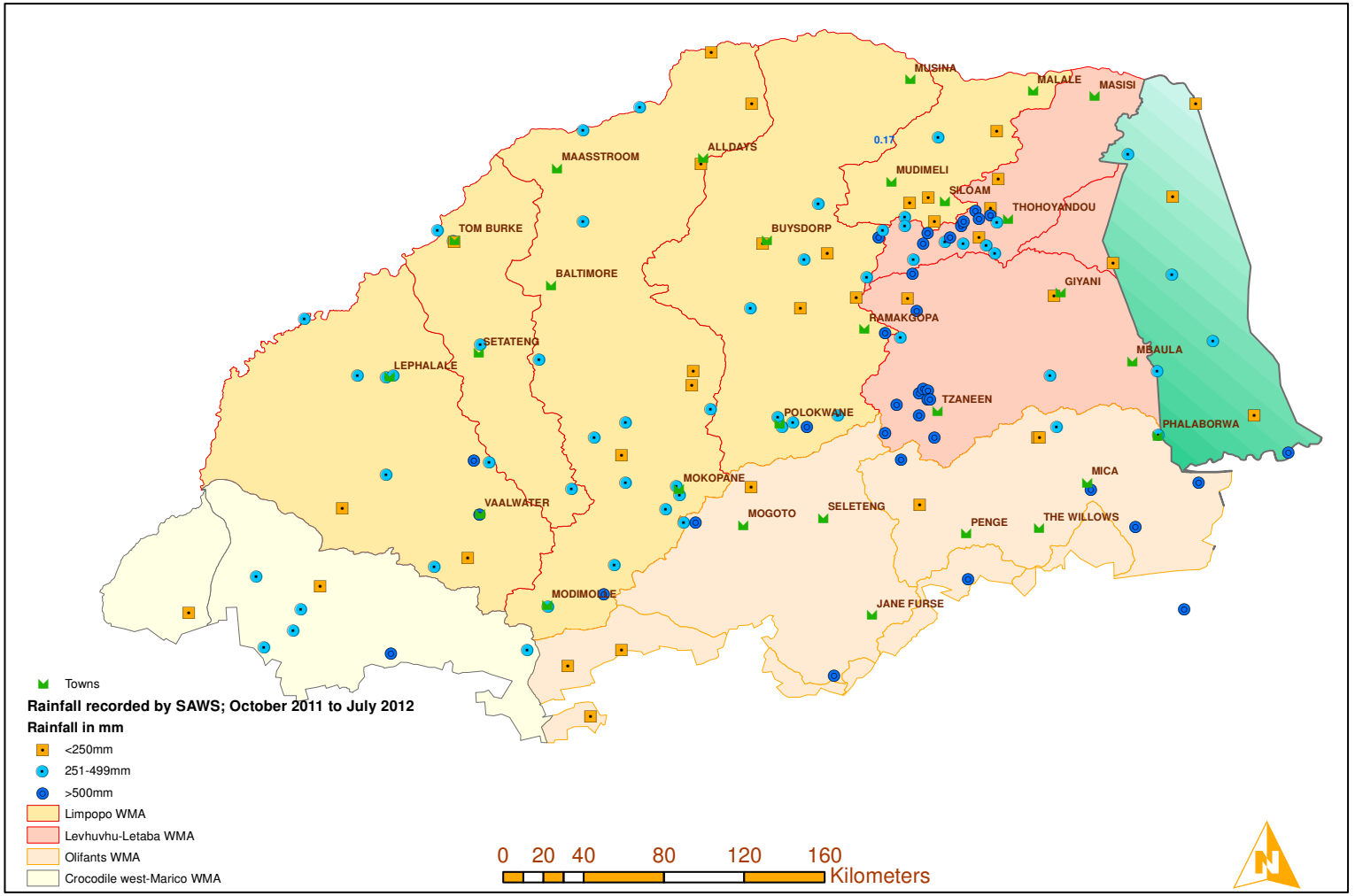
(Rainfall data for Limpopo Province as well as maps 4-6)

LIMPOPO GROUNDWATER MONITORING; DISTRIBUTION OF MONITORING STATIONS



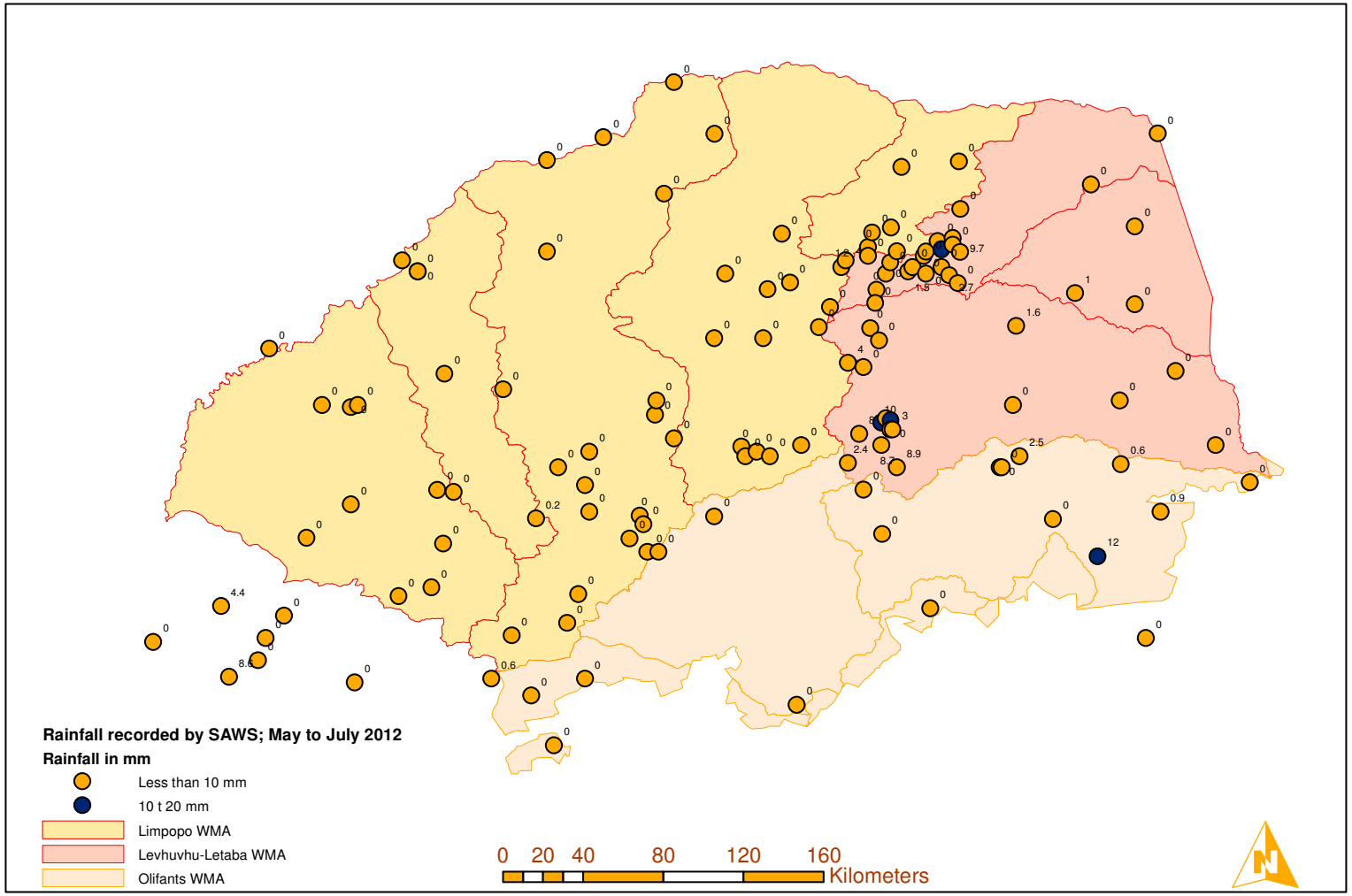
MAP 1

RAINFALL RECORDED BY THE SOUTH AFRICAN WEATHER SERVICES; OCTOBER 2011 TO JULY 2012

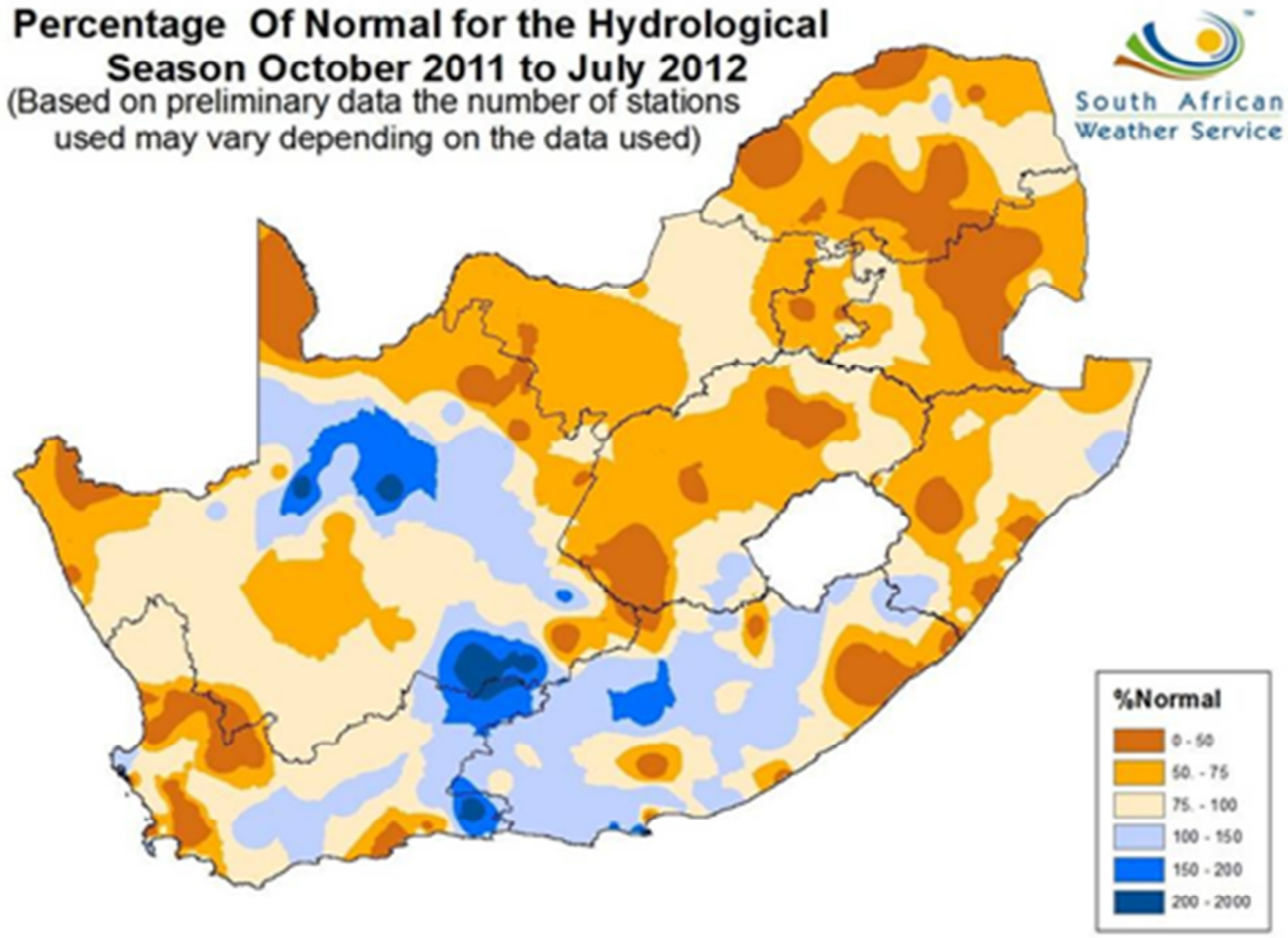


MAP 2

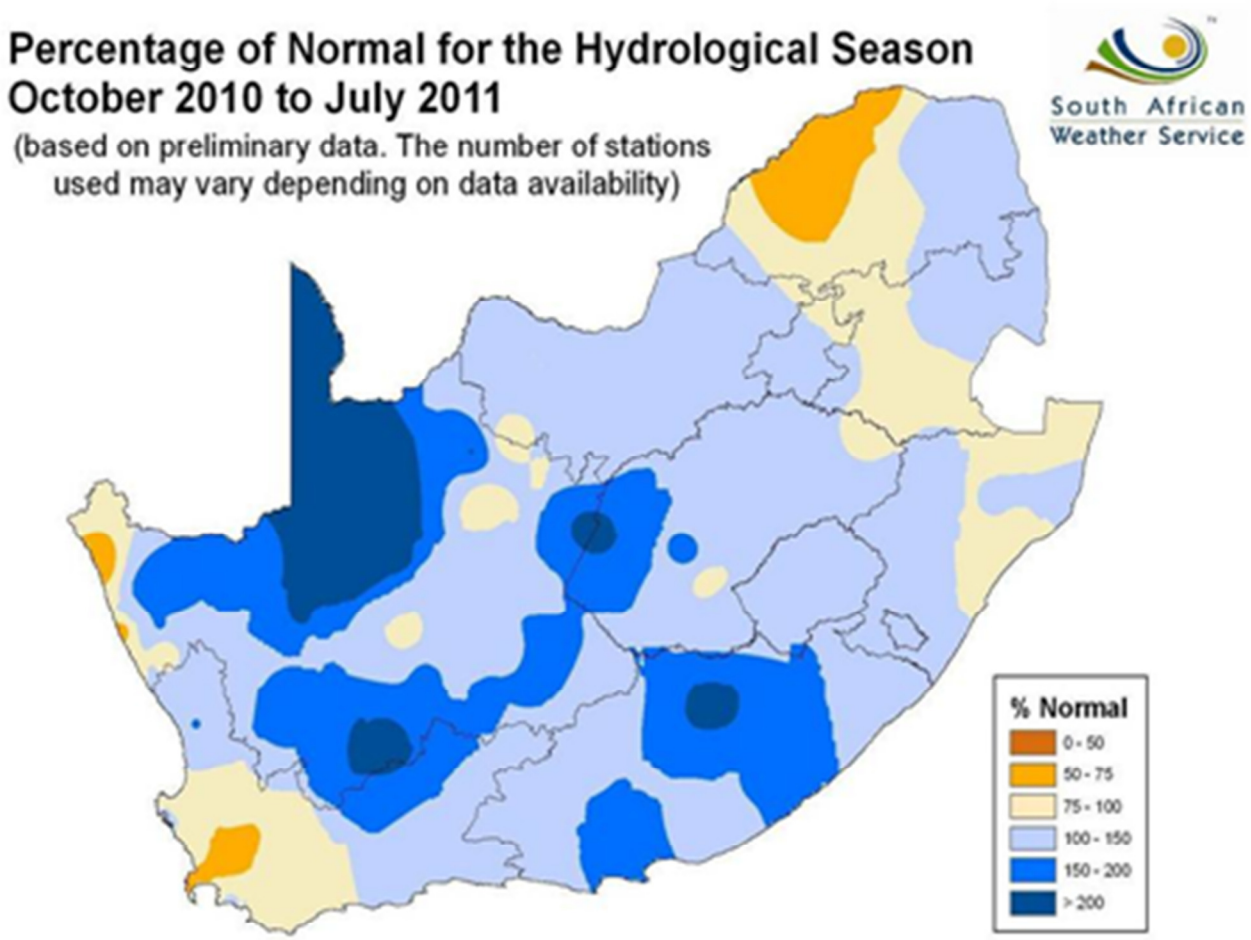
RAINFALL RECORDED BY THE SOUTH AFRICAN WEATHER SERVICES; MAY TO JULY 2012



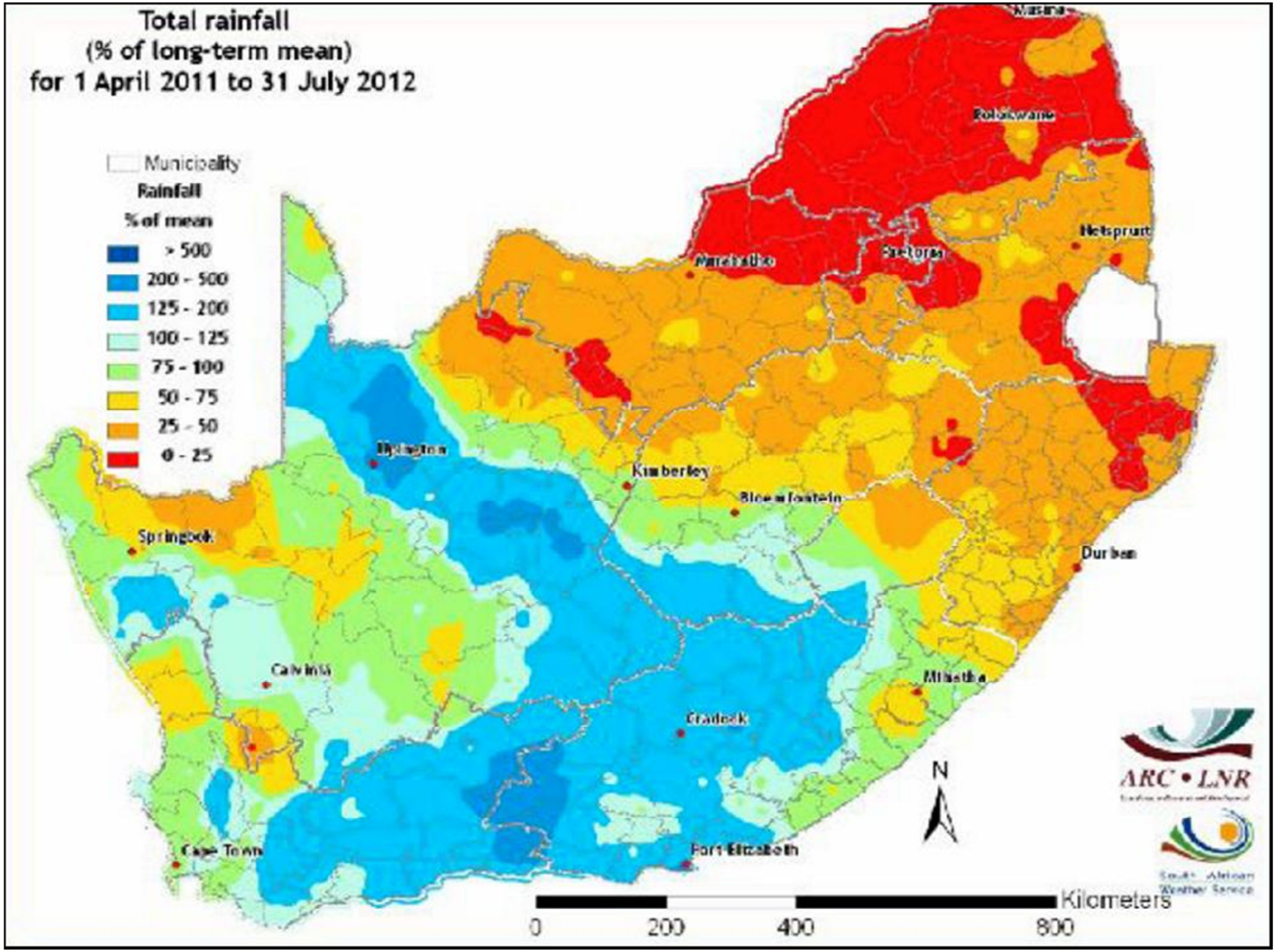
MAP 3


Percentage Of Normal for the Hydrological Season October 2011 to July 2012
(Based on preliminary data the number of stations used may vary depending on the data used)
South African Weather Service
%Normal
0 - 50
50. - 75
75. - 100
100 - 150
150 - 200
200 - 2000

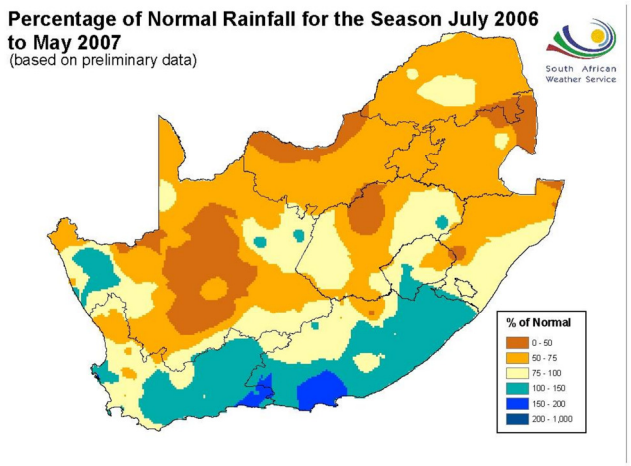
MAP 4

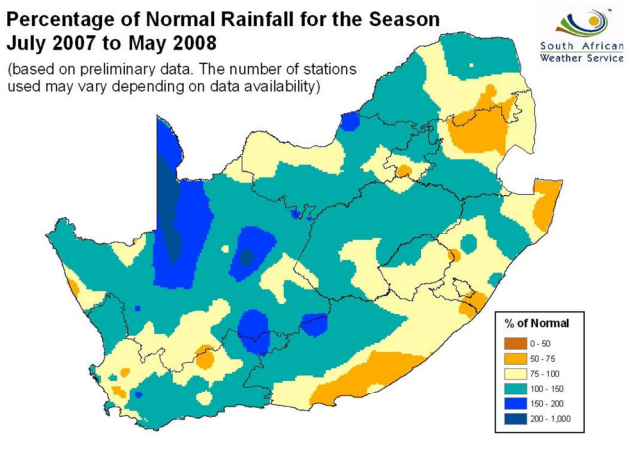

Percentage of Normal for the Hydrological Season
October 2010 to July 2011
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
> 200

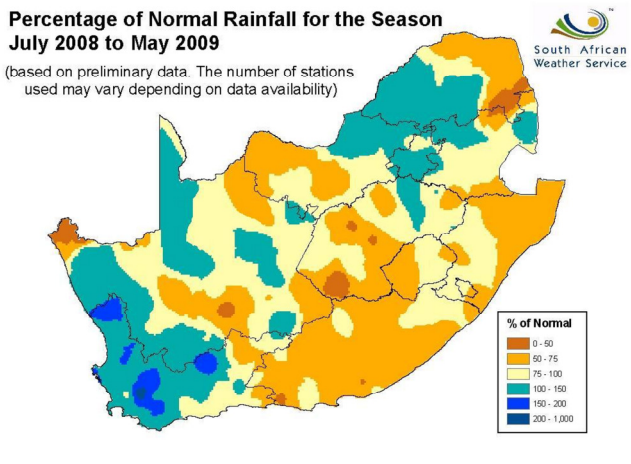
MAP 5

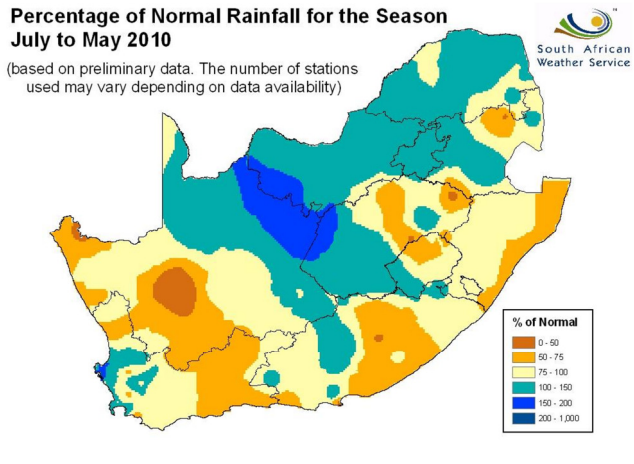

Total rainfall
(% of long-term mean)
for 1 April 2011 to 31 July 2012
Municipality
Rainfall
% of mean
> 500
200 - 500
125 - 200
100 - 125
75 - 100
50 - 75
25 - 50
0 - 25
Musina
Polokwane
Nelspruit
Kimberley
Springbok
Durban
Cape Town
Port Elizabeth
N
ARC • LNR
0
200
400
800
Kilometers

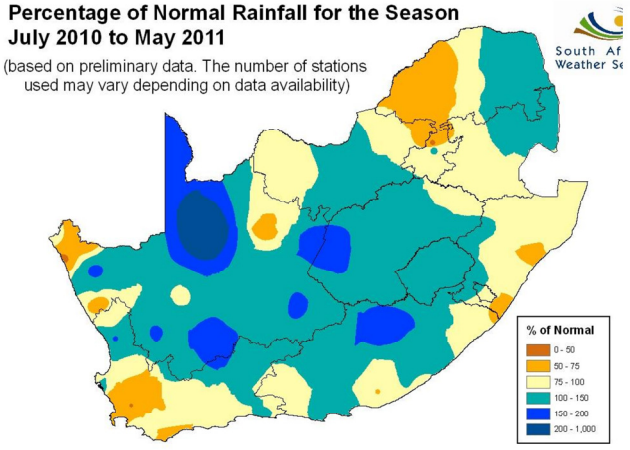
MAP 6

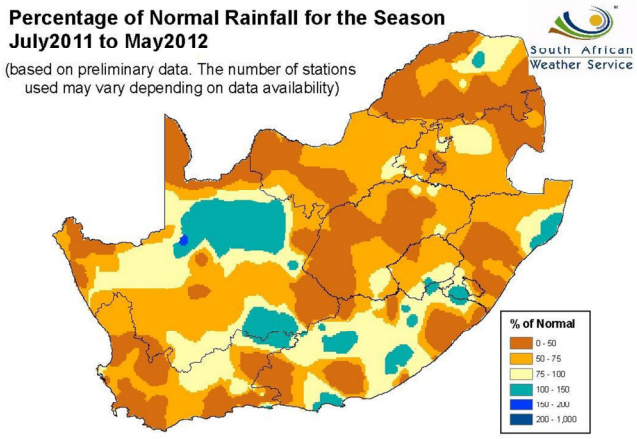

Percentage of Normal Rainfall for the Season July 2006 to May 2007
(based on preliminary data)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000


Percentage of Normal Rainfall for the Season July 2007 to May 2008
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000


Percentage of Normal Rainfall for the Season July 2008 to May 2009
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000

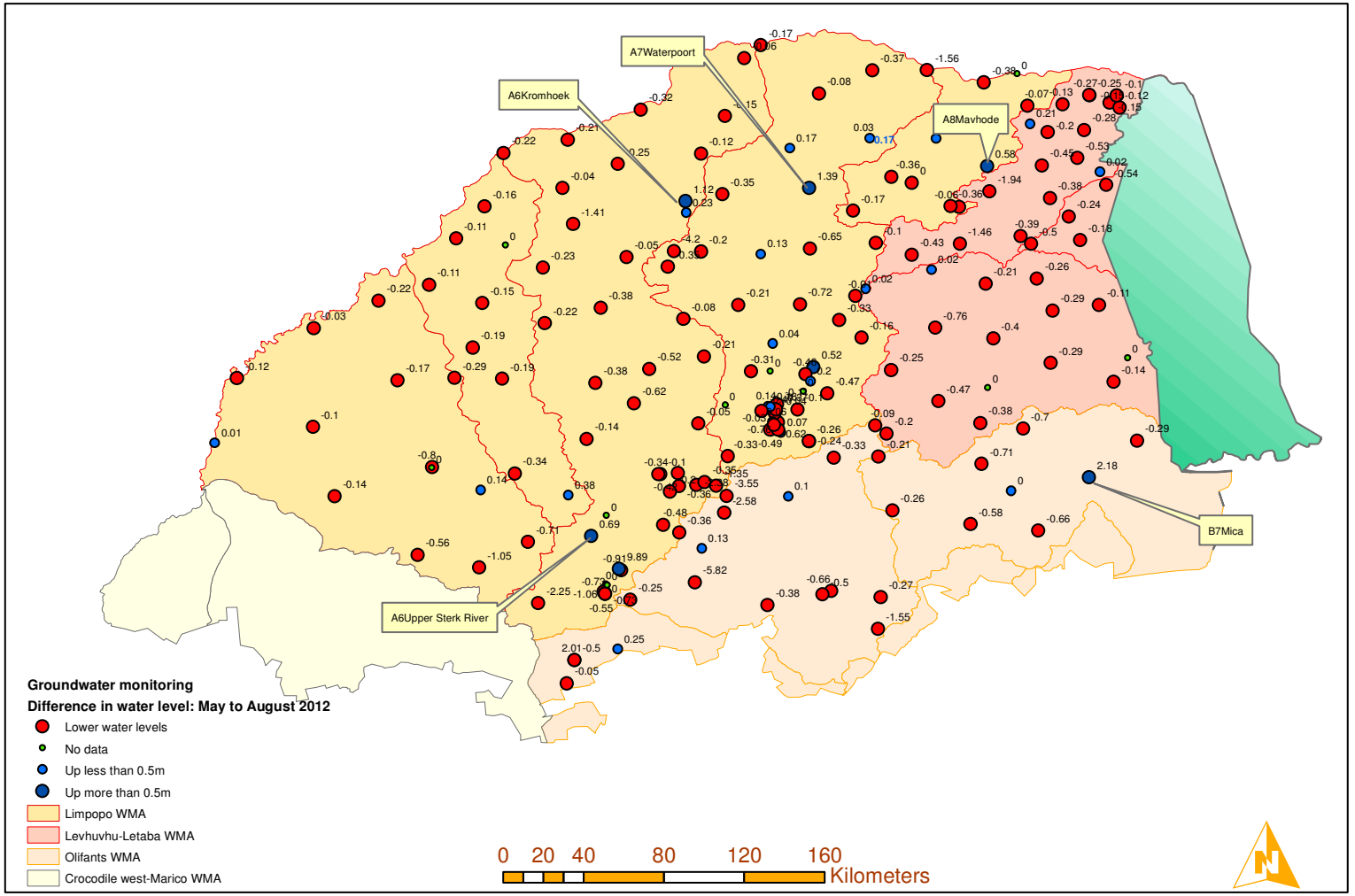

Percentage of Normal Rainfall for the Season July to May 2010
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000


Percentage of Normal Rainfall for the Season July 2010 to May 2011
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000


Percentage of Normal Rainfall for the Season July2011 to May2012
(based on preliminary data. The number of stations used may vary depending on data availability)
South African Weather Service
% of Normal
0 - 50
50 - 75
75 - 100
100 - 150
150 - 200
200 - 1,000

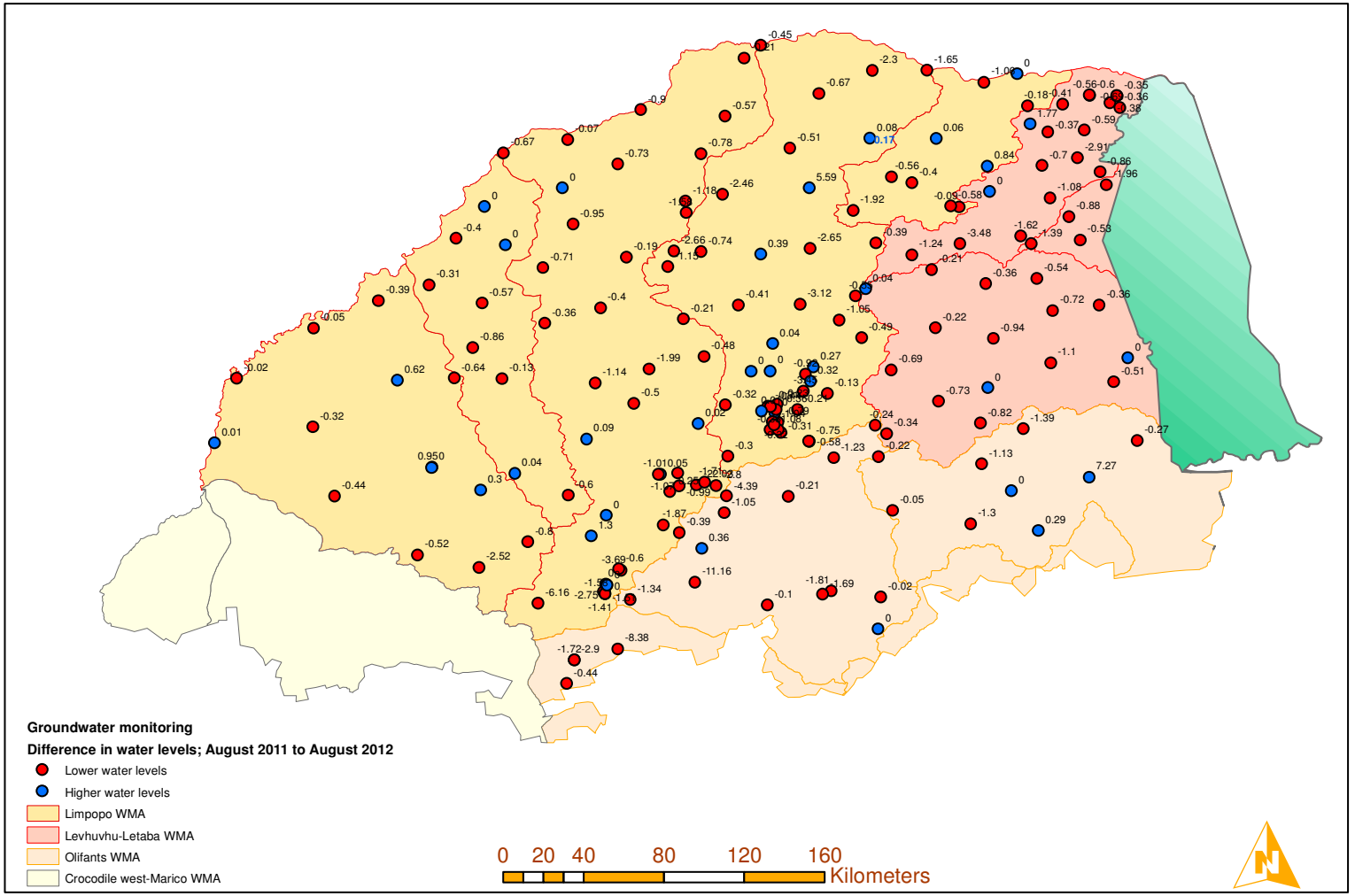
MAP 7

LIMPOPO GROUNDWATER LEVEL MONITORING; DIFFERENCE IN GROUNWATER LEVELS FROM MAY TO AUGUST 2012

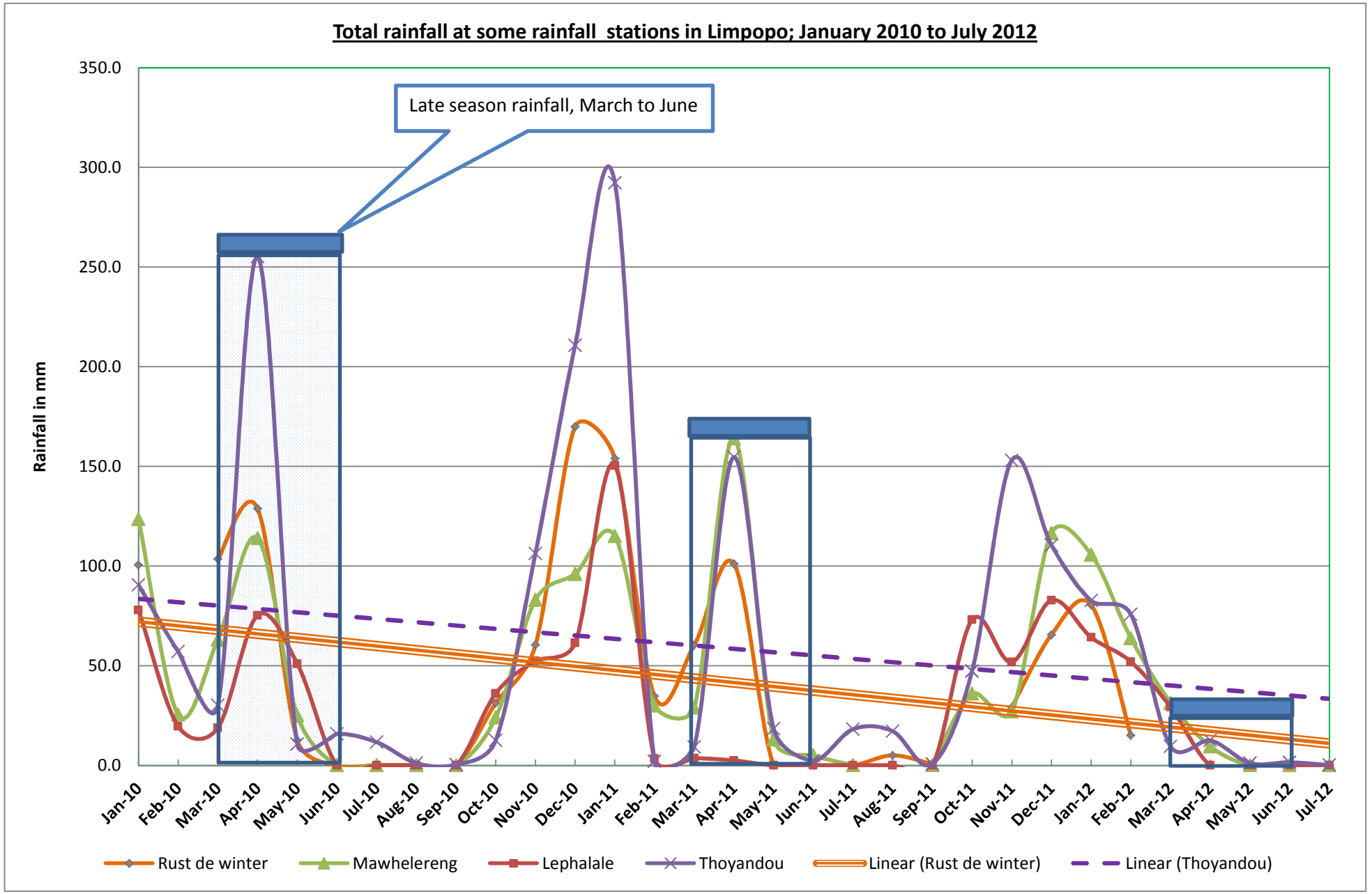


MAP 8

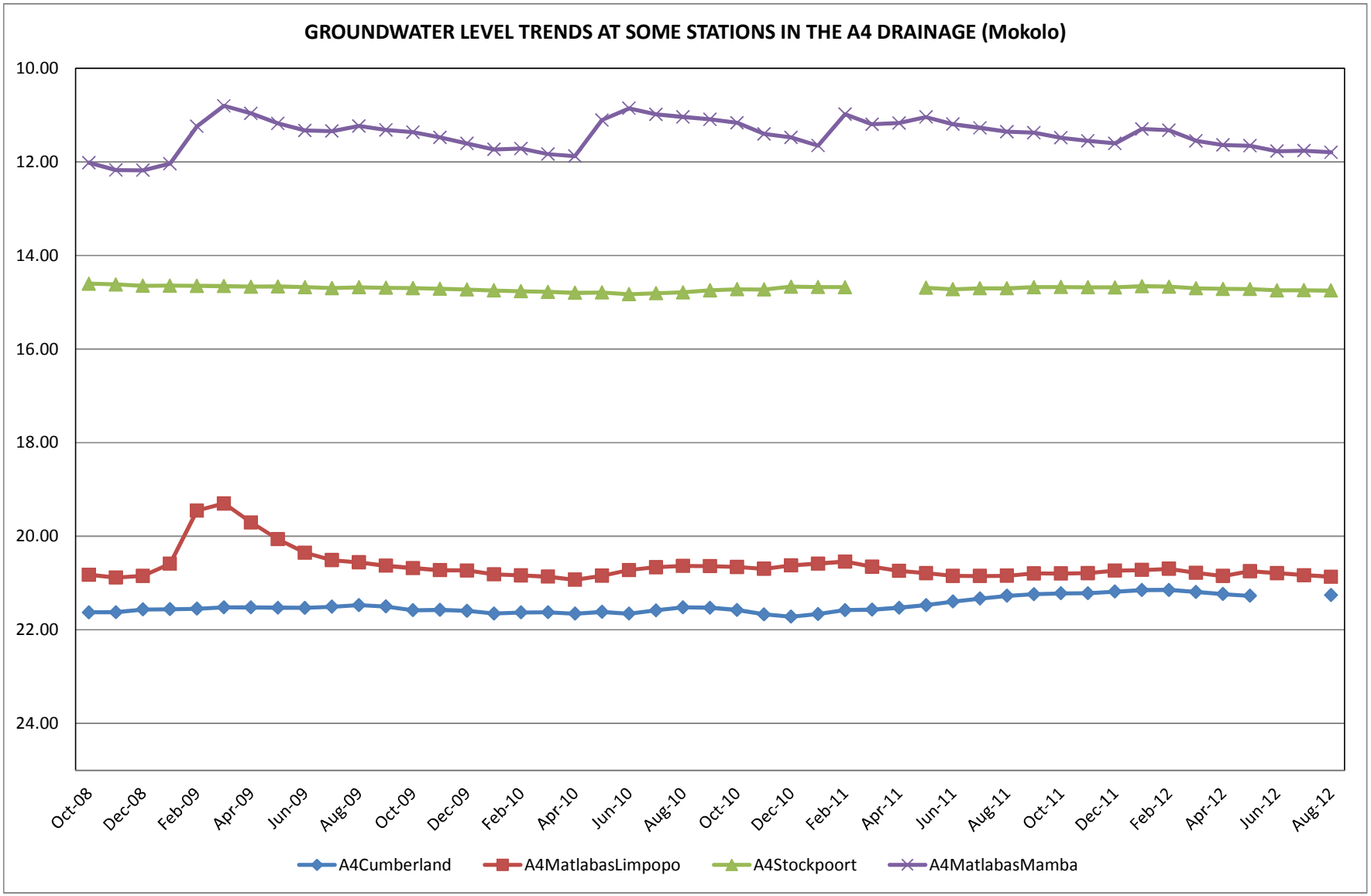
LIMPOPO GROUNDWATER MONITORING; DIFFERENCE IN GROUNDWATER LEVELS, AUGUST 2011 TO AUGUST 2012



MAP 9

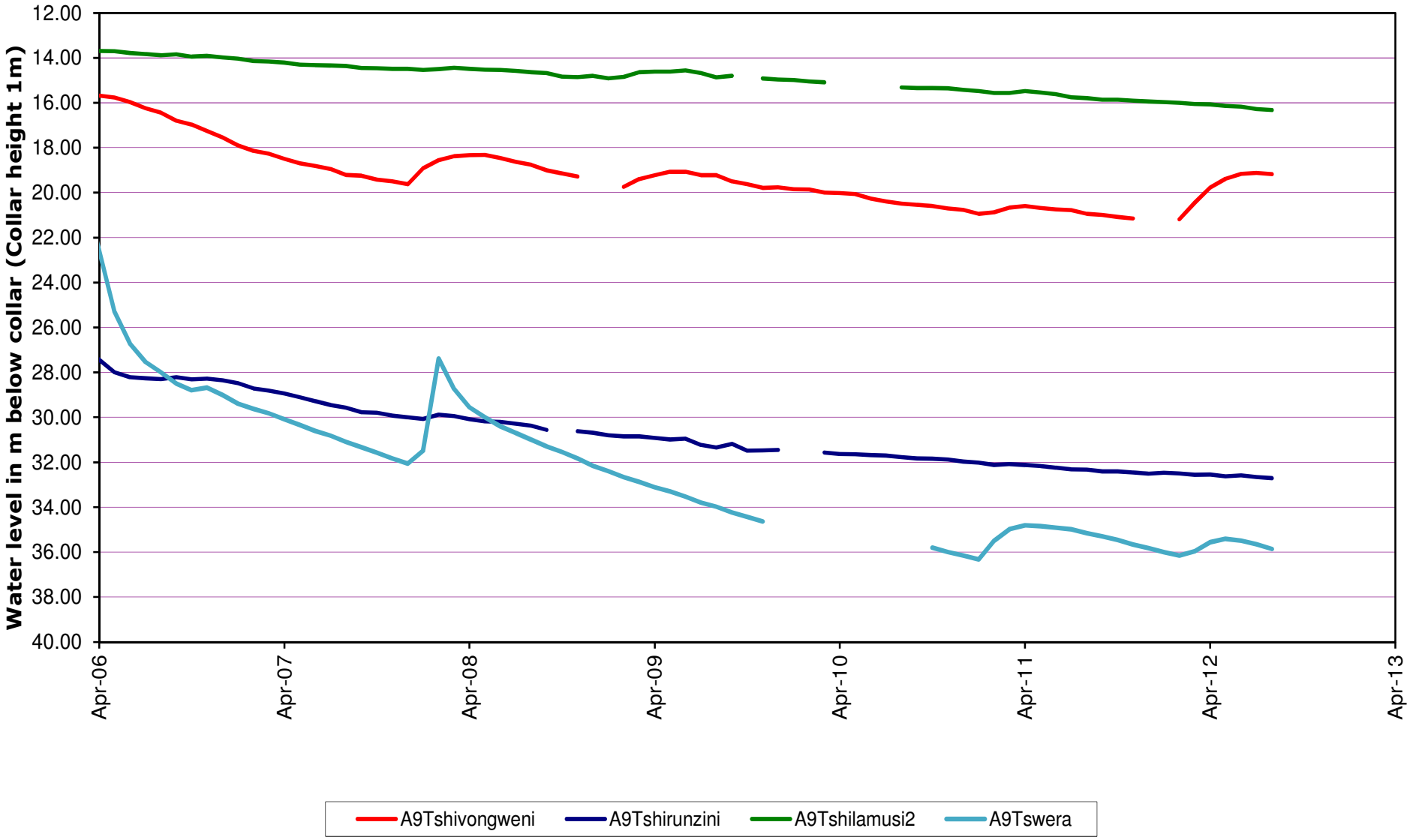

Total rainfall at some rainfall stations in Limpopo; January 2010 to July 2012
Late season rainfall, March to June
Rainfall in mm
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Jul-12
Rust de winter
Mawhelereng
Lephalale
Thoyandou
Linear (Rust de winter)
Linear (Thoyandou)

GRAPH 1

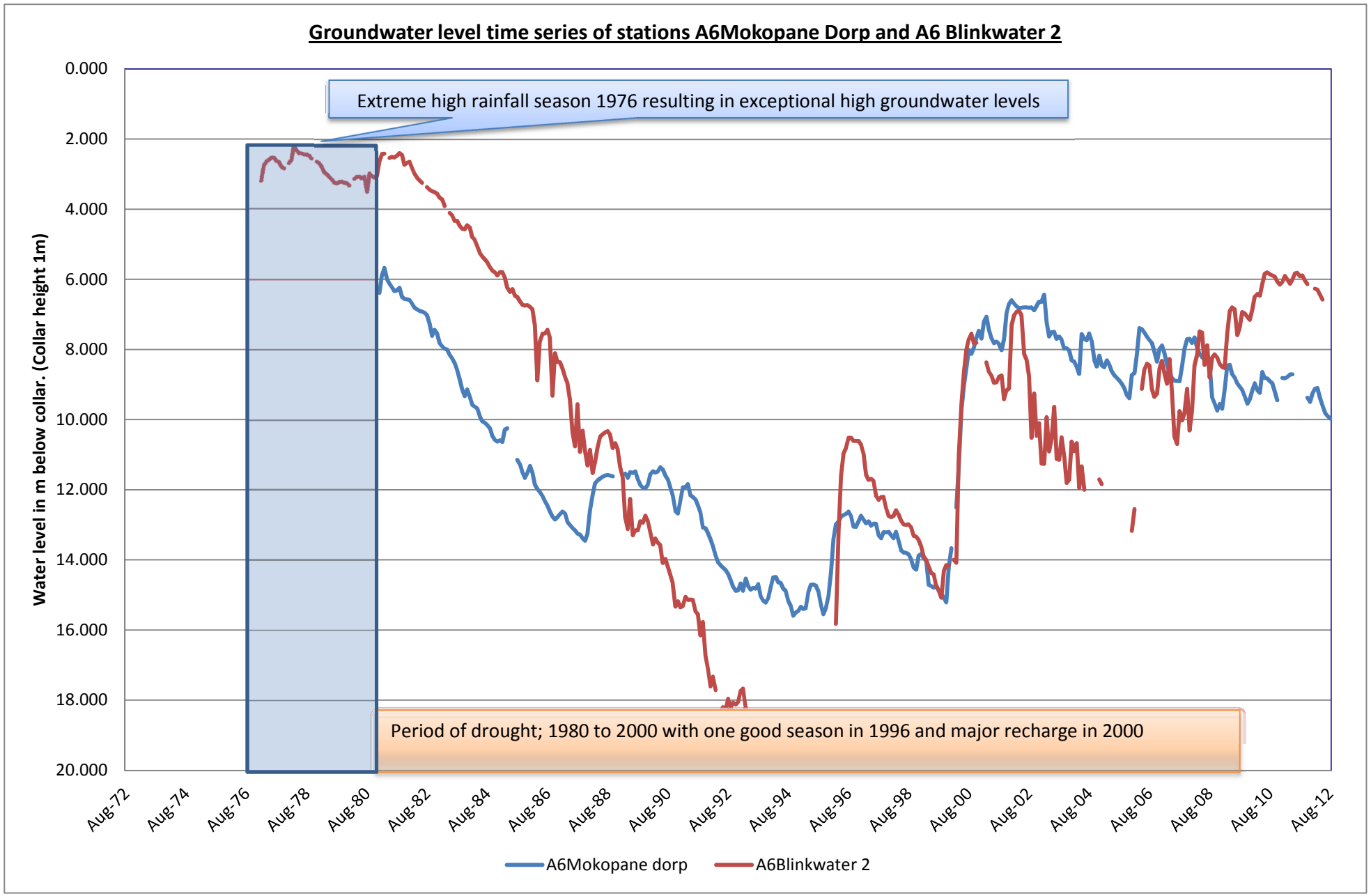

GROUNDWATER LEVEL TRENDS AT SOME STATIONS IN THE A4 DRAINAGE (Mokolo)
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
A4Cumberland
A4MatlabasLimpopo
A4Stockpoort
A4MatlabasMamba

GRAPH 2

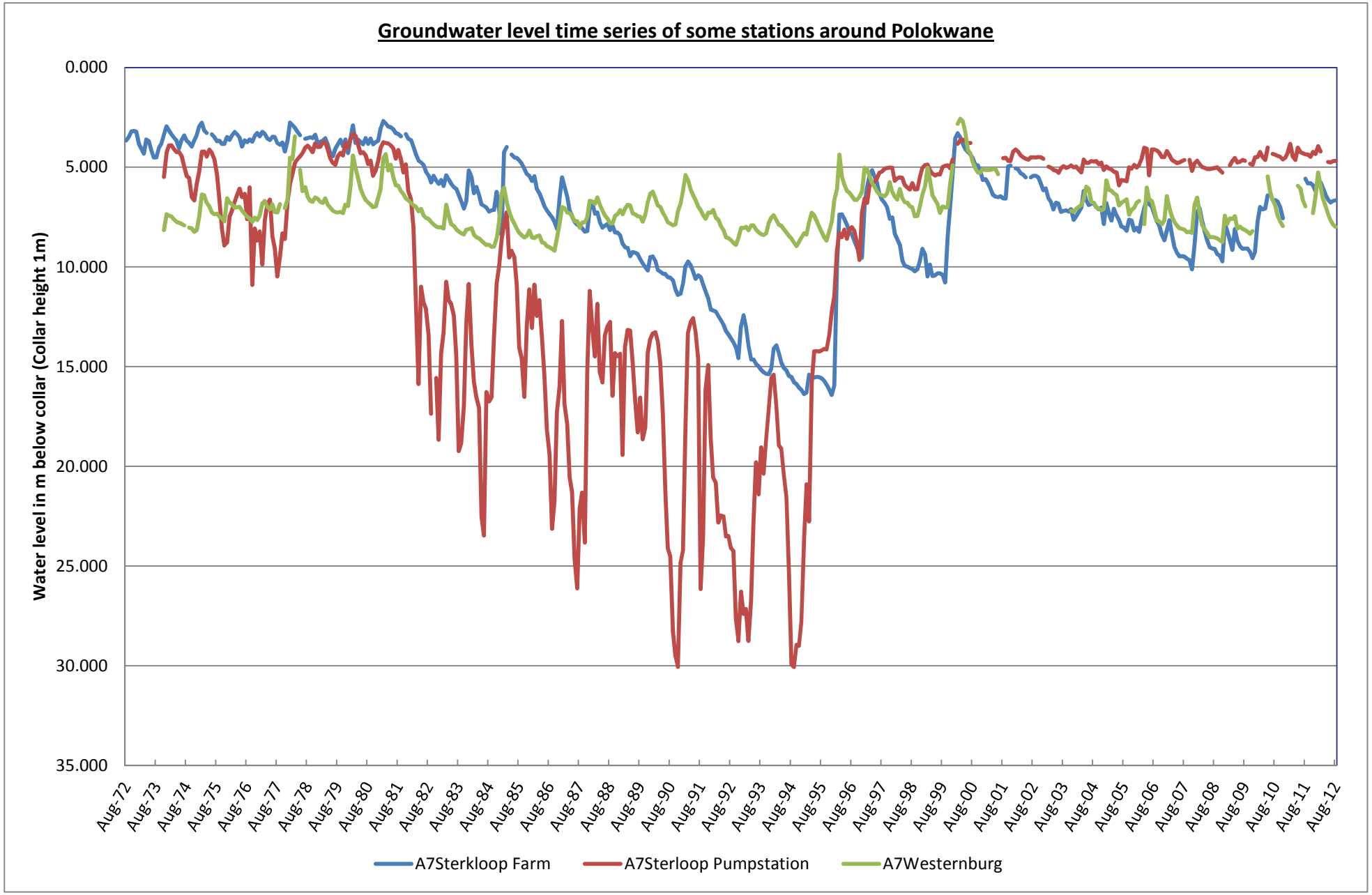
A9 Drainage
Groundwater level time series of stations
A9Tshivongweni , A9Tshirunzini, A9Tswera & A9Tshilamusi 2



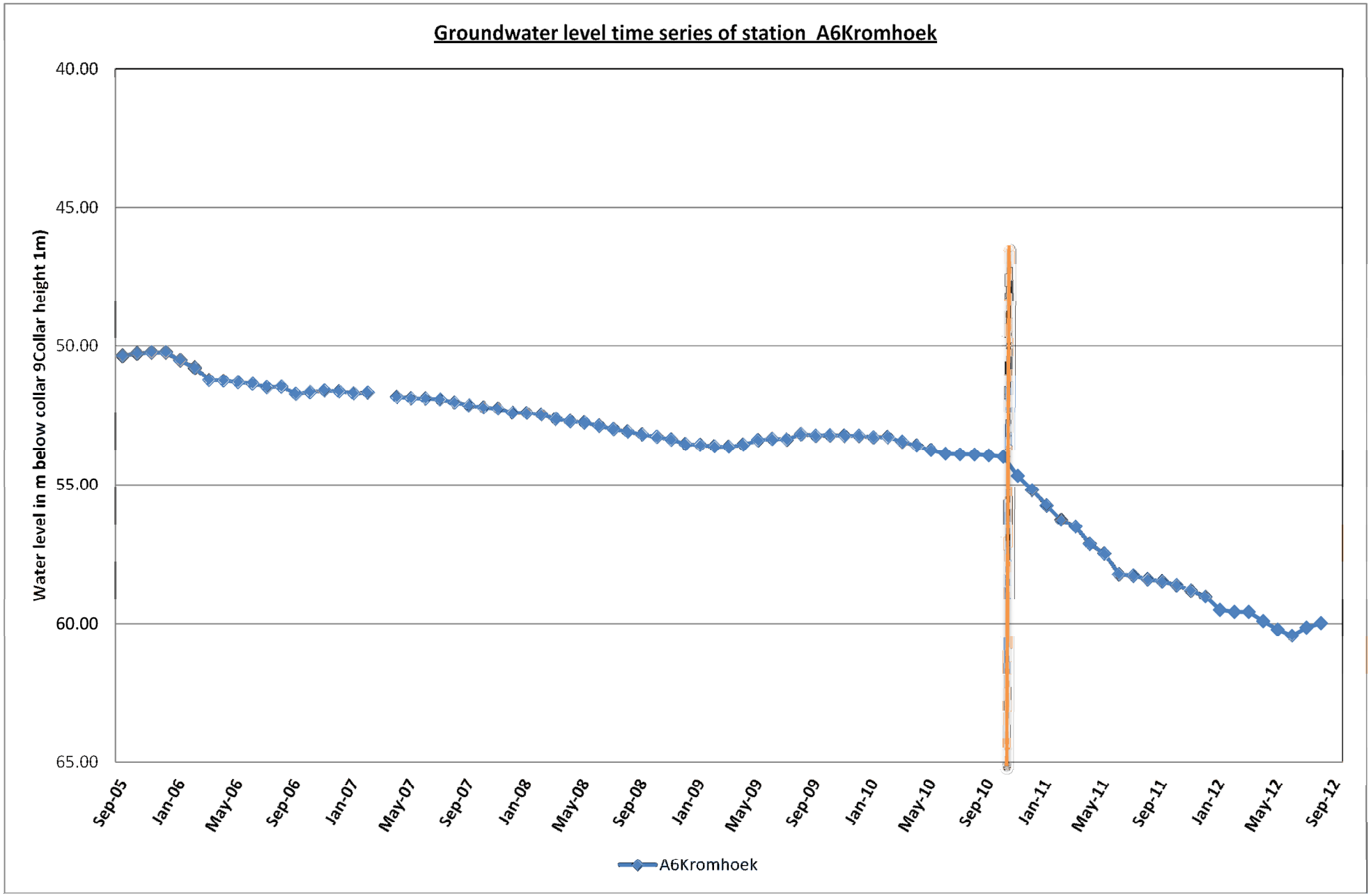
GRAPH 3


Groundwater level time series of stations A6Mokopane Dorp and A6 Blinkwater 2
Extreme high rainfall season 1976 resulting in exceptional high groundwater levels
Period of drought; 1980 to 2000 with one good season in 1996 and major recharge in 2000
Water level in m below collar. (Collar height 1m)
0.000
2.000
4.000
6.000
8.000
10.000
12.000
14.000
16.000
18.000
20.000
Aug-72
Aug-74
Aug-76
Aug-78
Aug-80
Aug-82
Aug-84
Aug-86
Aug-88
Aug-90
Aug-92
Aug-94
Aug-96
Aug-98
Aug-00
Aug-02
Aug-04
Aug-06
Aug-08
Aug-10
Aug-12
A6Mokopane dorp
A6Blinkwater 2

GRAPH 4


Groundwater level time series of some stations around Polokwane
Water level in m below collar (Collar height 1m)
0.000
5.000
10.000
15.000
20.000
25.000
30.000
35.000
Aug-72
Aug-73
Aug-74
Aug-75
Aug-76
Aug-77
Aug-78
Aug-79
Aug-80
Aug-81
Aug-82
Aug-83
Aug-84
Aug-85
Aug-86
Aug-87
Aug-88
Aug-89
Aug-90
Aug-91
Aug-92
Aug-93
Aug-94
Aug-95
Aug-96
Aug-97
Aug-98
Aug-99
Aug-00
Aug-01
Aug-02
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
A7Sterkloop Farm
A7Sterloop Pumpstation
A7Westernburg

GRAPH 5


Groundwater level time series of station A6Kromhoek
Water level in m below collar 9Collar height 1m)
40.00
45.00
50.00
55.00
60.00
65.00
Sep-05
Jan-06
May-06
Sep-06
Jan-07
May-07
Sep-07
Jan-08
May-08
Sep-08
Jan-09
May-09
Sep-09
Jan-10
May-10
Sep-10
Jan-11
May-11
Sep-11
Jan-12
May-12
Sep-12
A6Kromhoek

GRAPH 6