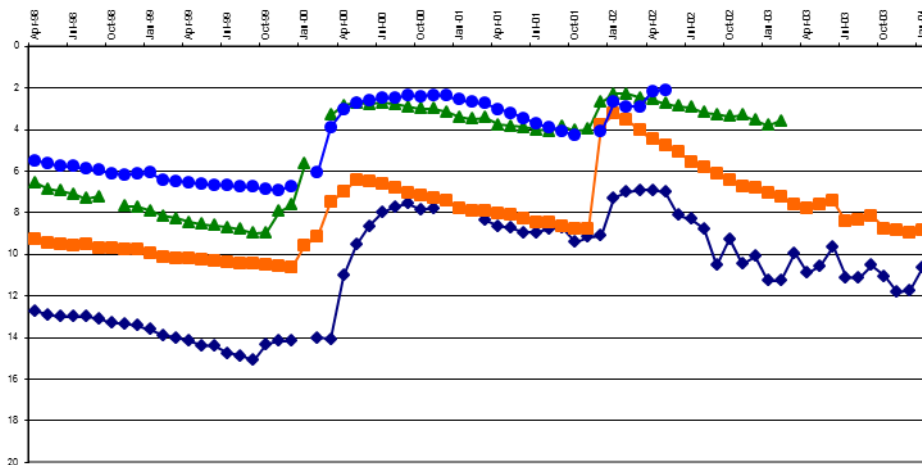


# LIMPOPO REGION

## QUARTERLY STATUS REPORT ON GROUNDWATER LEVEL TRENDS



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## SUMMARY

The current groundwater status is that at the end of the wet season during which most of the Province received lower than normal rainfall. 40 % of stations have higher water levels than at the start of the wet season. Whilst 64% of stations at the end of the previous quarter had higher water levels than last year, the figure is currently 21.5%. Despite this the current status of the resource with regard to quantity is generally considered good compared to available historical data. The majority of groundwater levels represent relative stable conditions fluctuating seasonally around a mean with an underlying slow declining trend present at a number of stations. The decline is considered a normal longer-term cycle and not a reason of concern at this stage. The low rainfall the past wet season resulted in very few indications of recharge and this may have an effect in time. Comparison of current levels with historical lows indicates that a dry period can be overcome for a period of time in most areas. The northern part of the B8 drainage area drained by the Koedoes, Middel and Klein Letaba rivers is considered to be vulnerable to a dry period due to constantly steeper declining groundwater levels than noted elsewhere

Negative impact on groundwater levels due to over abstraction and a lack of resource management do occur in a few localities. Without proper resource management failure of the resource cannot be foreseen resulting in unexpected crisis situations arising.

## 1. BACKGROUND

Data is collected on a quarterly basis from 190 monitoring stations, processed and analysed to evaluate the status of groundwater in the Province. April represents the end of the wet season and comparison is drawn between the situation at the start and end of the season. Comparison is also made with the corresponding time the previous year as well as some long-term trends to provide a better perspective.

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

For various reasons all stations are not always accessible, which result in data not available. The main reason for current data gaps is however the lack of replacement instruments for old or defect instruments.

## 2. GROUNDWATER LEVELS

### 2.1.1. DIFFERENCE IN GROUNDWATER LEVELS; OCTOBER 2014 TO APRIL 2015.

October 2014 to April 2015

Total	190	Stations

With data	153	Stations	80.5%
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Water level			Average(m)	%
Down	92	Stations	-0.55	60.13%
Up	61	Stations	0.98	39.87%
Na change	0	Stations		0.00%
No Data	37	Stations		100.00%

The period from October 2014 to April 2015 represents the past wet season. Only 39.9% of the 153 monitoring stations with data for both dates have higher groundwater levels at the end of the wet season, giving an indication of the limited recharge this past season.

The distribution of stations with higher or lower groundwater levels from October 2014 to April 2015 is shown on MAP 2.

### 2.1.2. DIFFERENCE IN GROUNDWATER LEVELS; APRIL 2014 TO APRIL 2015

April 2014 to April 2015

Total	190	Stations

With data	149	Stations	78.4%
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Water level			Average(m)	%
Down	117	Stations	1.31	78.52%
Up	32	Stations	1.36	21.48%
Na change	0	Stations		0.00%
No Data	41	Stations		100.00%

The effect of the limited recharge this season is also apparent in the groundwater levels compared to the corresponding time last year with 21.5% still indicating higher groundwater levels and 78.5% with lower groundwater levels.

The distribution of stations with higher or lower groundwater levels from April 2014 to April 2015 is shown on MAP 3.

### **3. RAINFALL**

The percentage of normal rainfall for the period July 2014 to April 2015 is indicated on MAP 4 compiled by the South African Weather services. Below normal rainfall was recorded over most of the Limpopo Province. Only the lower reaches of the A6 and A5 drainage areas received normal to slightly above normal rainfall while a large area in the north eastern part of Limpopo received below 75% of normal rainfall.

### **4. TYPICAL GROUNDWATER LEVEL TRENDS IN THE DIFFERENT SECONDARY DRAINAGE AREAS OVER SOME YEARS**

Groundwater levels are subject to a large number of factors that can influence the trends displayed, sometimes over short distances. The underlying natural trend can however often be recognized. The different trends displayed by the monitoring stations in each secondary drainage area were analyzed and the predominant general trend for the drainage area identified as typical for the specific drainage currently.

Extension of the monitoring network was undertaken from 2005 to 2010. The majority of monitoring stations thus have data for the past 5 to 10 years as indicated on the graphs.

The positions of monitoring stations used for the graphs are indicated on MAP5.

#### **4.1. DRAINAGE A4 (GRAPH 1)**

Groundwater levels in this drainage were generally stable with little seasonal fluctuations over the past 5 years. A slight declining trend is displayed at some stations with the most pronounced being at A4Mokolo-End where the decline was less than 2 meters over 5 years. Good recharge occurred in the Matlabas River drainage the previous wet season.

#### **4.2. DRAINAGE A5 (GRAPH 2)**

Similar trends as noted for the A4 drainage is displayed by this graph. Seasonal fluctuations are small but more notable here. The declining trend can also be recognized with just over 2 meter decline at A5Tom burke over 6 years.

#### **4.3. DRAINAGE A6 (GRAPH 3)**

A large number of stations are monitored in this drainage of which some have been monitored for more than 30 years. Most of the old stations are located in areas subjected to varying degrees of impact over a long period of time. Selection of the stations used in the graph attempted to represent different areas within the drainage as well as areas where little to moderate impact may exist.

Over a period of 8 years stable groundwater levels with definite seasonal fluctuations are indicated. A slight declining trend the past 5 to 6 years is present at some stations. Note the rise in groundwater level at station A6 Pontdrift in January 2013. This trend can be noted in different drainage areas at stations located near the Limpopo River.

Station A6Mokopane Dorp has monitoring data for 35 years. To provide perspective on the current situation the long-term data is discussed under point 5.1 below.

#### **4.4. DRAINAGE A7 (GRAPH 4)**

The circumstance in this drainage is the same as the above and stations were selected the same manner. The groundwater level trends over 7 years also indicate stable conditions with varying seasonal fluctuations. Station A7Sekiding 2 is located on the bank of a surface drainage and represents a very shallow aquifer and is characterized by sudden seasonal rises in water level followed by outflow thereafter. Station A7 Klein Bolayi is located near the Limpopo River and indicates the same dramatic rise in groundwater level in January 2013 as noted above.

A7Roodewal has data for 26 years and the long-term data is discussed under 5.2 below.

#### **4.5. DRAINAGE A8 (GRAPH 5)**

The 8 to 9 years available data indicates stable water levels and varying seasonal fluctuations. Good recharge the previous 2 seasons can be noted at A8Mudimeli with the groundwater level the past 2 years higher than the preceding 5. The water level started to rise a month earlier here than at the 2 stations noted above.

#### **4.6. DRAINAGE A9 (GRAPH 6)**

All groundwater levels are characterized by a steady declining trend for some years. The good recharge in the 2012 – 2013 wet season is also notable here to varying degrees. The decline continues after this event. There is unfortunately no long-term data for the drainage to compare and evaluate the current situation with.

#### **4.7. DRAINAGE B3**

There are only 3 active groundwater monitoring stations in this drainage, all have long-term data and are discussed under points 5.3 and 5.4 below.

#### **4.8. DRAINAGE B5 (GRAPH 7)**

Little seasonal fluctuations over the past 5 years and a clear slow declining trend are indicated for the drainage area.

#### **4.9. DRAINAGE B7 (GRAPH 8)**

Groundwater levels were mostly stable over the past 5 to 6 years with indications of seasonal fluctuations. The effect of the 2013-2014 wet season in this drainage can also be seen in the graph.

#### **4.10. DRAINAGE B8 (GRAPHS 9 & 10)**

Groundwater level trends in this drainage differ distinctly in the northern and southern parts. Groundwater levels in the northern part drained by the Klein, Middel Letaba and Koedoes Rivers is marked by a steady decline GRAPH 9. Some recharge is apparent in 2013 but no notable recovery in water levels took place. The reason for the sharp decline in the groundwater level at B8Sikhunyane the past 4 months is not clear but probably due to new abstraction in the area and should be investigated. This area has been noted for water shortages for some time.

The groundwater situation in the southern part drained by the Letaba River is in a much better state and stable groundwater levels with clear seasonal recharge are indicated by GRAPH 10.

#### **4.11. DRAINAGE B9 (GRAPH 11)**

There are only 3 monitoring stations in this drainage with usable time series data and all indicate a steady declining trend despite some seasonal recharge at 2 of them. The decline is about 2 meters over a 10 year period.

### **5. SOME LONG-TERM GROUNDWATER LEVEL TRENDS**

#### **5.1. GROUNDWATER LEVEL TIME SERIES OF STATION A6 MOKOPANE DORP (GRAPH 12)**

The fluctuating but stable trend over some years was already shown on GRAPH 3. Good correlation of the groundwater level trend with that displayed by some other stations was also indicated. Comparison of the current groundwater level situation to historical levels indicates a healthy status since 2000. The correlation of current trends with that of other stations with only short-term data may indicate that the same may be valid historically and the current status there is also a healthy one.

## **5.2. GROUNDWATER LEVEL TIME SERIES OF STATION A7 ROODEWAL (GRAPH 13)**

The trend displayed by the graph for A7Roodewal conveys the same picture of a healthy status since 2000. The late trend was compared with other stations in GRAPH 4 and the same deductions with regard to the current status made for GRAPH 12 above can be made for GRAPH 13.

## **5.2. LONG-TERM IMPACTED GROUNDWATER LEVEL TRENDS IN THE B3 DRAINAGE AT SETTLERS AND TUINPLAAS (GRAPH 14)**

The impact of abstraction on the groundwater levels at these 2 stations can be clearly seen on the graph. No natural underlying trend or seasonal changes can still be recognized. A decline in groundwater level in excess of 40 meters was recorded from 2001 to 2007 at B3 Tuinplaas.

## **5.3. LONG-TERM UN-IMPACTED GROUNDWATER LEVEL TRENDS IN THE B3 DRAINAGE ON THE FARM DE KUIL 028 JR (GRAPH 15)**

In contrast to the trends displayed at Settlers and Tuinplaas, the trend at De Kuil indicates a healthy status with little impact by abstraction. The effect of the drought period lasting up to 1995 is notable in the first part of the graph.

## **5.4. LONG-TERM GROUNDWATER LEVEL TREND AT STATION B5 KLIPPUT SINCE 1984 (GRAPH 16)**

The trend displayed by the graph differs completely from that indicated as typical for the drainage by GRAPH 7. The effect of abstraction, especially since 2002, is totally overshadowing the effect of an extended period of drought previously.

## **5.5. LONG-TERM GROUNDWATER LEVEL TRENDS AT 2 STATIONS IN THE B5 DRAINAGE (GRAPH 17)**

As with the situation at A6Mokopane Dorp and A7 Roodewal discussed above, the comparison with most other stations in the drainage over some years is good and the current status compared to historical levels is healthy.

## **6. IMPORTANCE OF GROUNDWATER MONITORING**

The groundwater levels shown for Tuinplaas, Settlers and Klipput clearly indicate the impact abstraction can have on groundwater. (GRAPHS 5.3 & 5.5) GRAPH 18 illustrates the effect of increased abstraction in an area already subjected to large-scale abstraction on a nearby monitoring station A6Kromhoek.

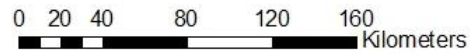
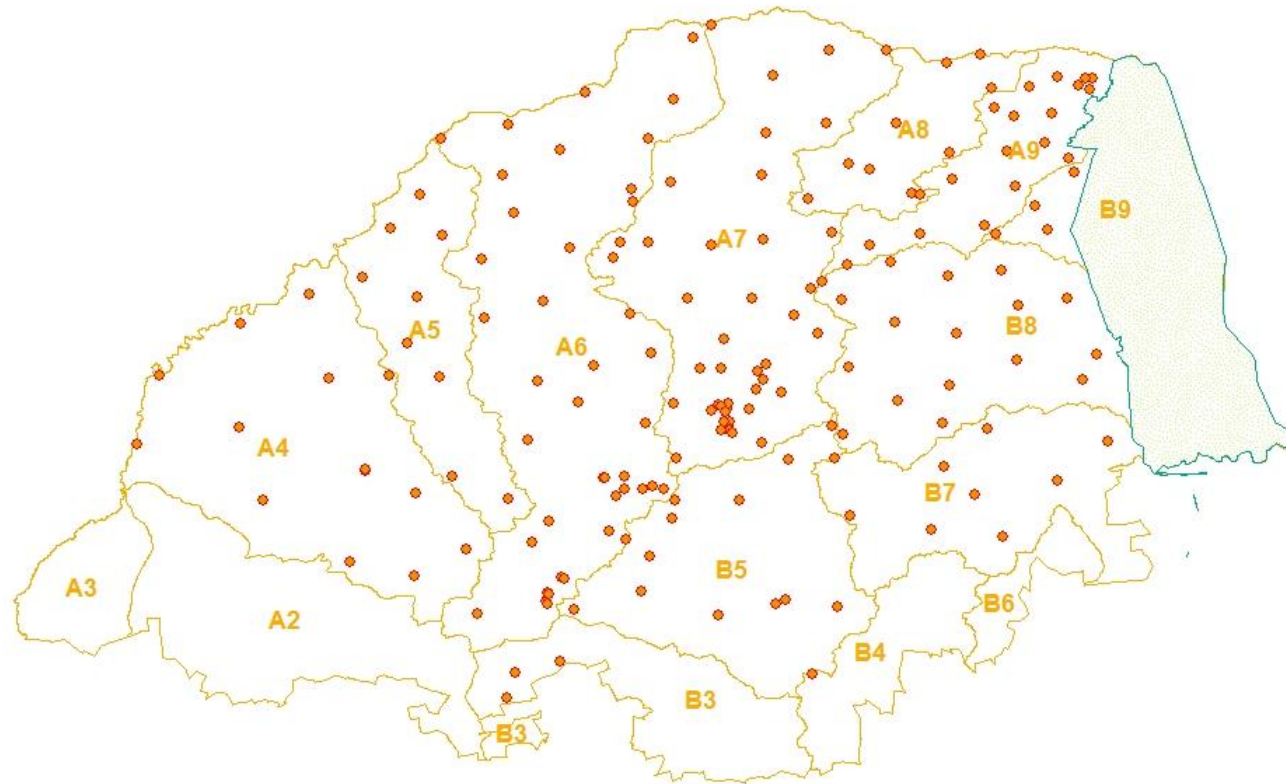
Groundwater is a hidden resource and the effect of abstraction and therefore the state of the resource cannot be visually observed. The rapid decline as displayed by graph 18 can only be recognized by water level monitoring and regular evaluation of the data. Without monitoring data will only become aware of problem when the borehole dry up and then it is too late. The result can be catastrophic to the user(s) Groundwater level monitoring is the most important tool in the management of a groundwater resource in terms of quantity.

Groundwater is one of our most valuable resources providing in the daily water needs of a vast number of people with the potential of improving the living conditions of many more.

## **7. ACKNOWLEDGEMENT**

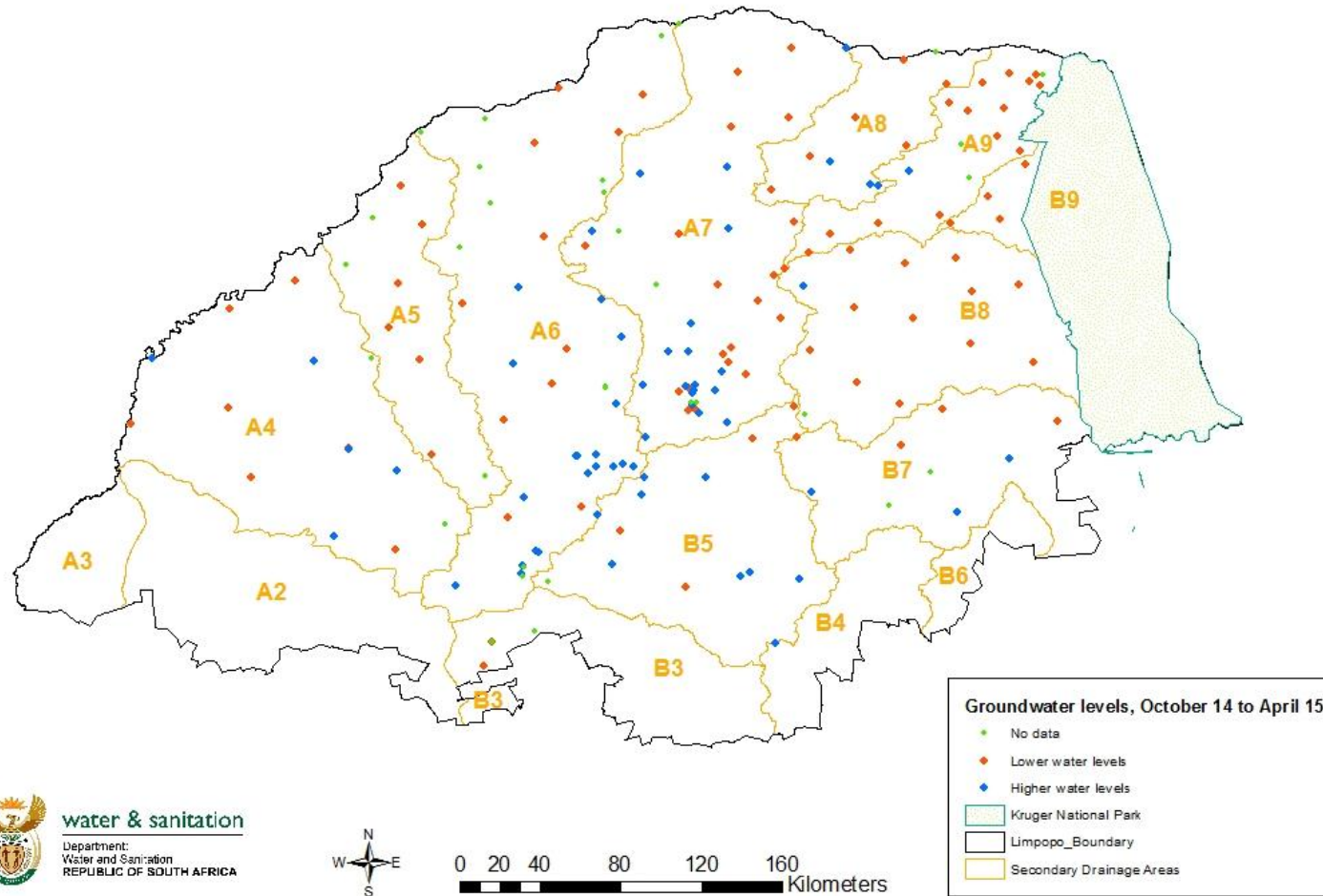
<http://www.weathersa.co.za/climate>

**Limpopo Province; Distribution of the Groundwater Level monitoring network**



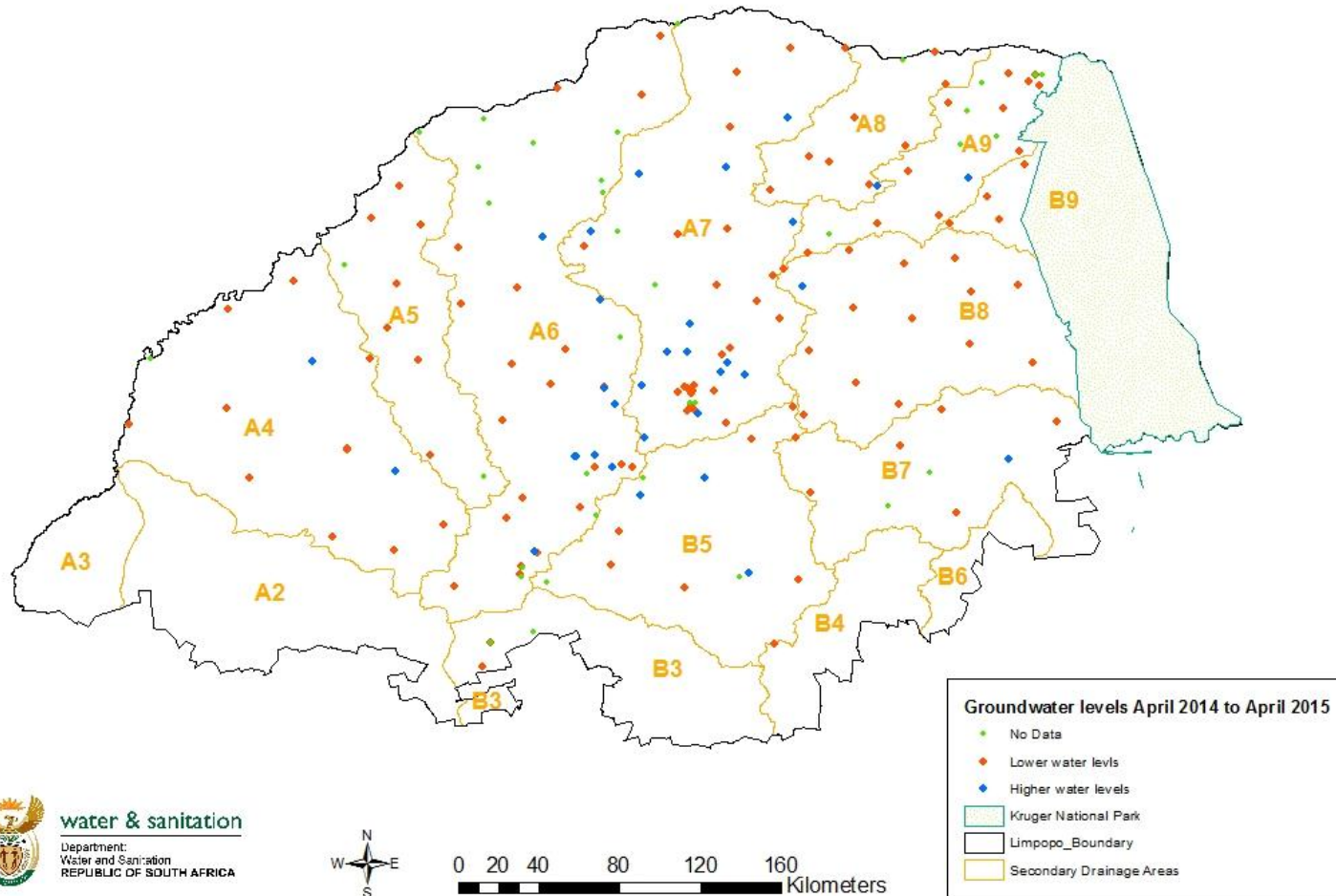
**MAP 1**

**Limpopo Province; Groundwater levels**  
**October 2014 to April 2015**



**MAP 2**  
10

**Limpopo Province; Groundwater levels**  
**April 2014 to April 2015**



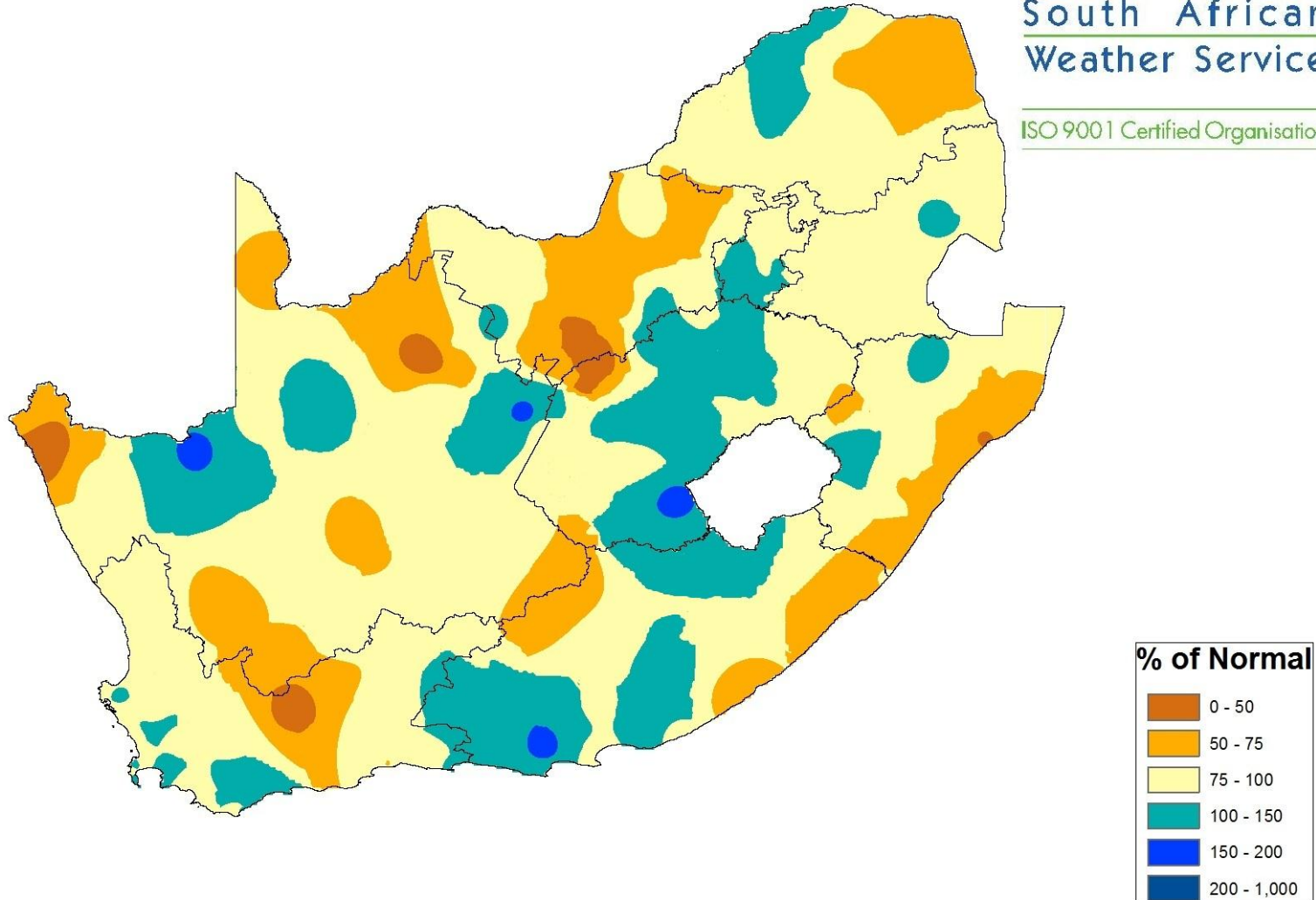
# Percentage of normal rainfall for season July 2014 - April 2015

(Based on preliminary data, Normal period 1981-2010)

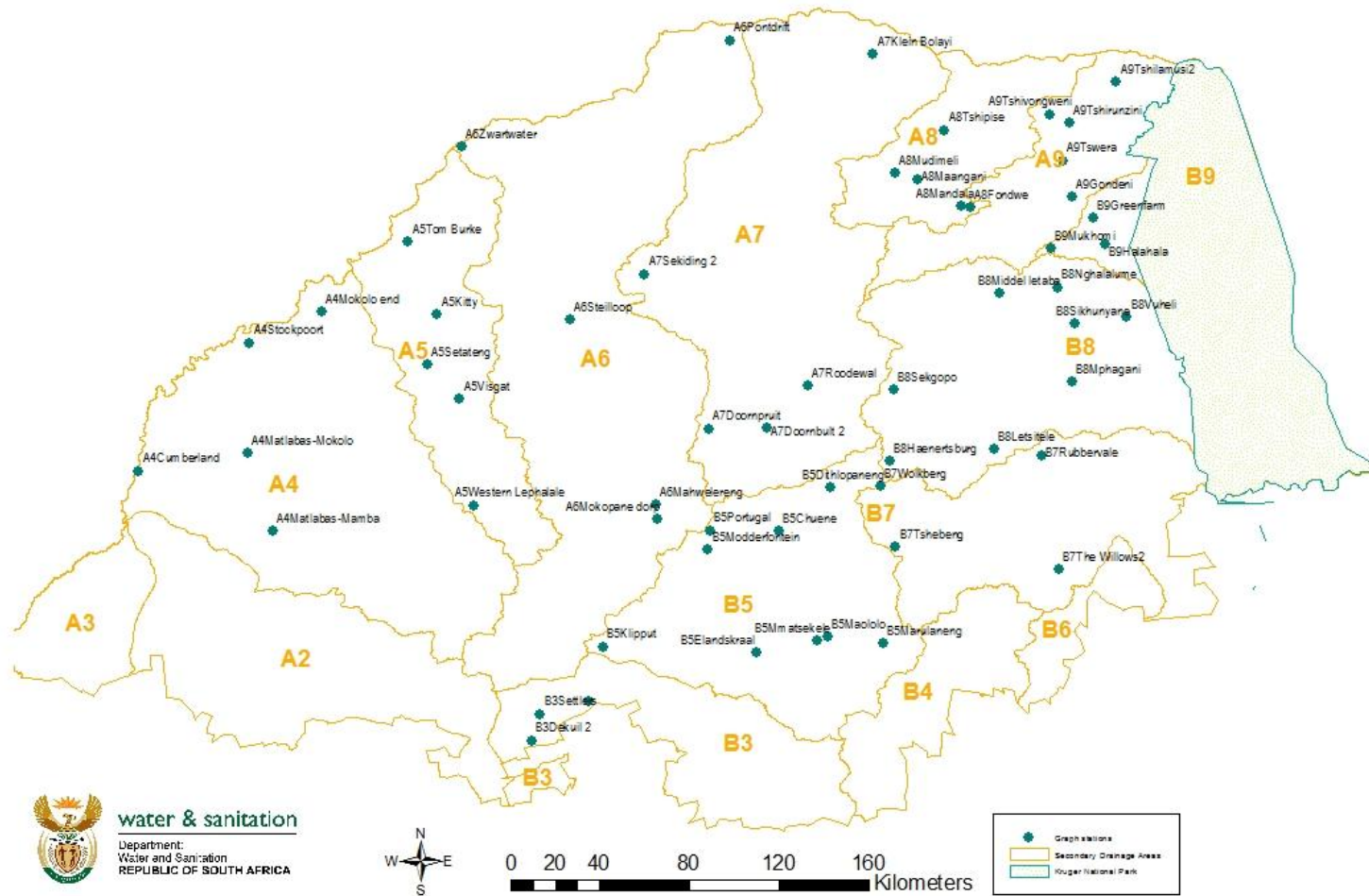


South African  
Weather Service

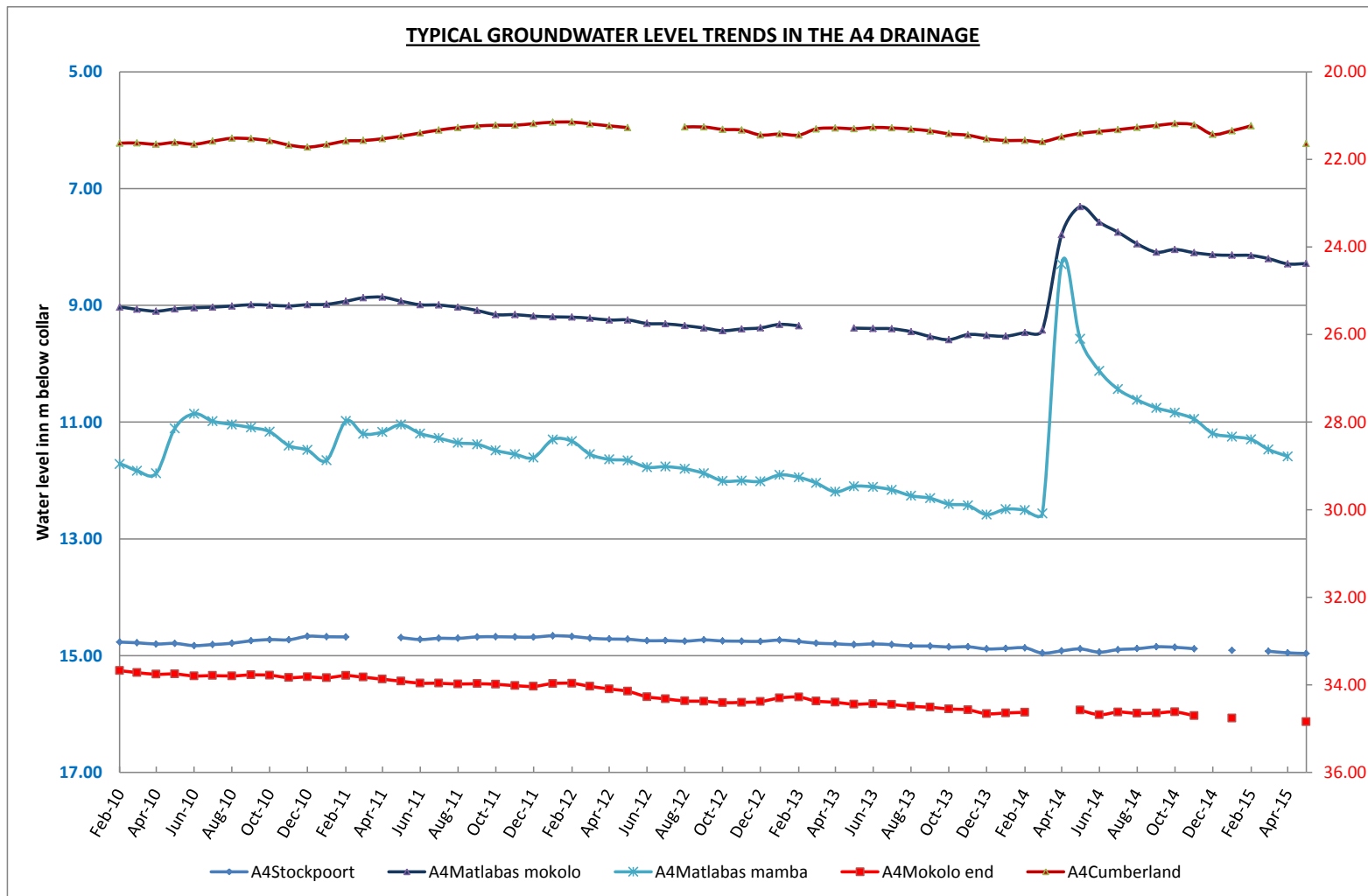
ISO 9001 Certified Organisation



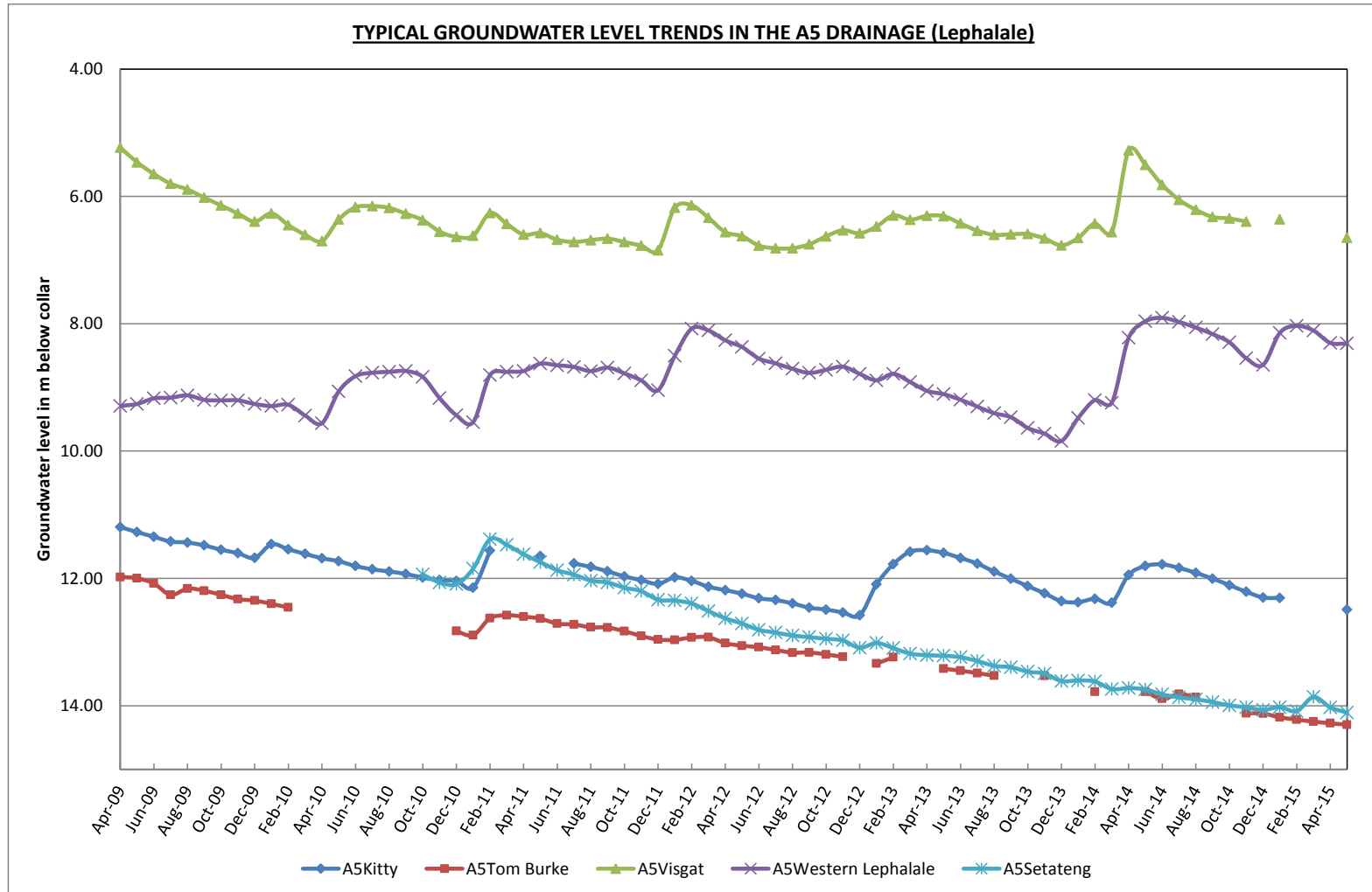
**Distribution of stations used for example graphs**



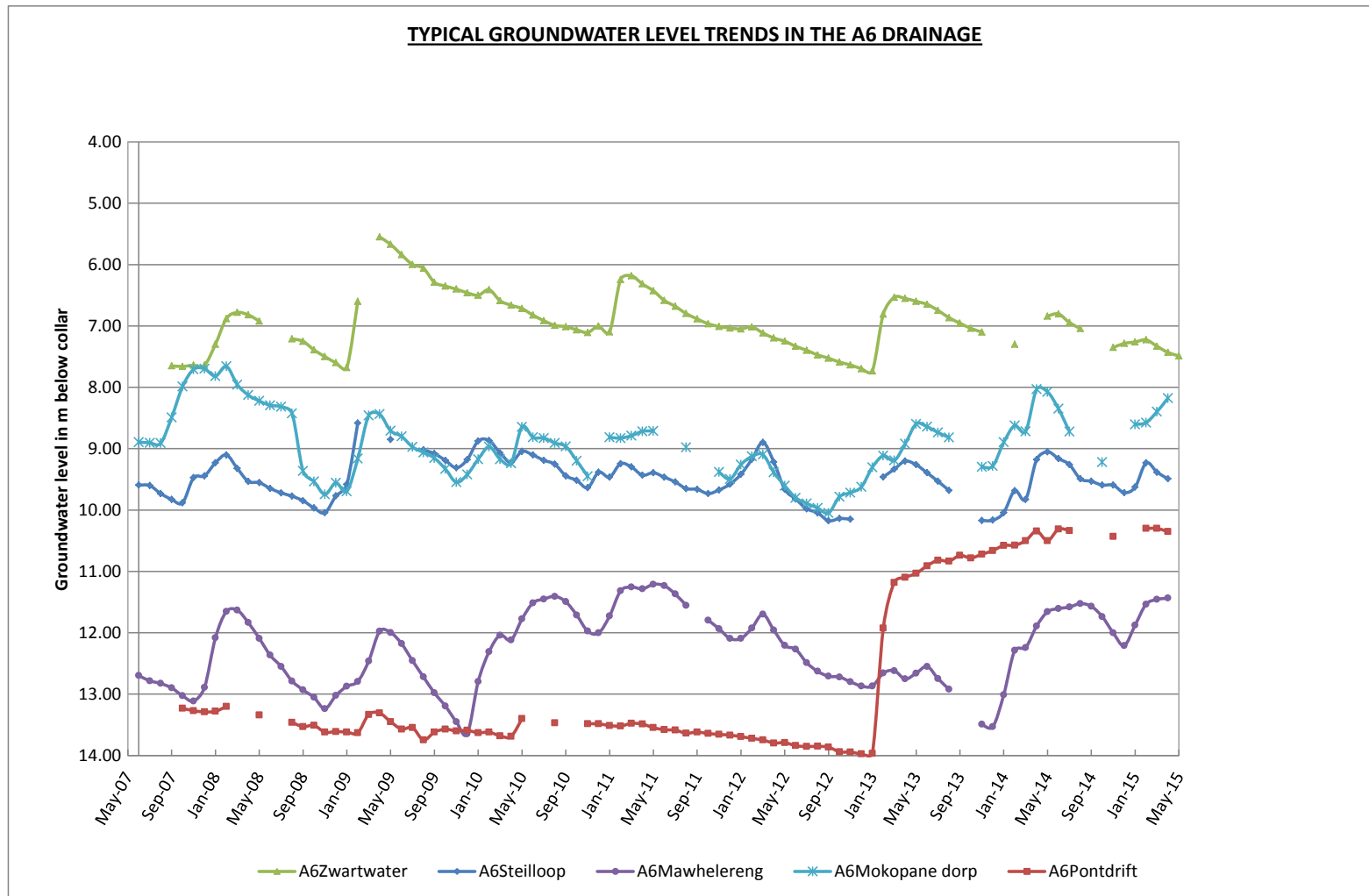
**MAP 5**  
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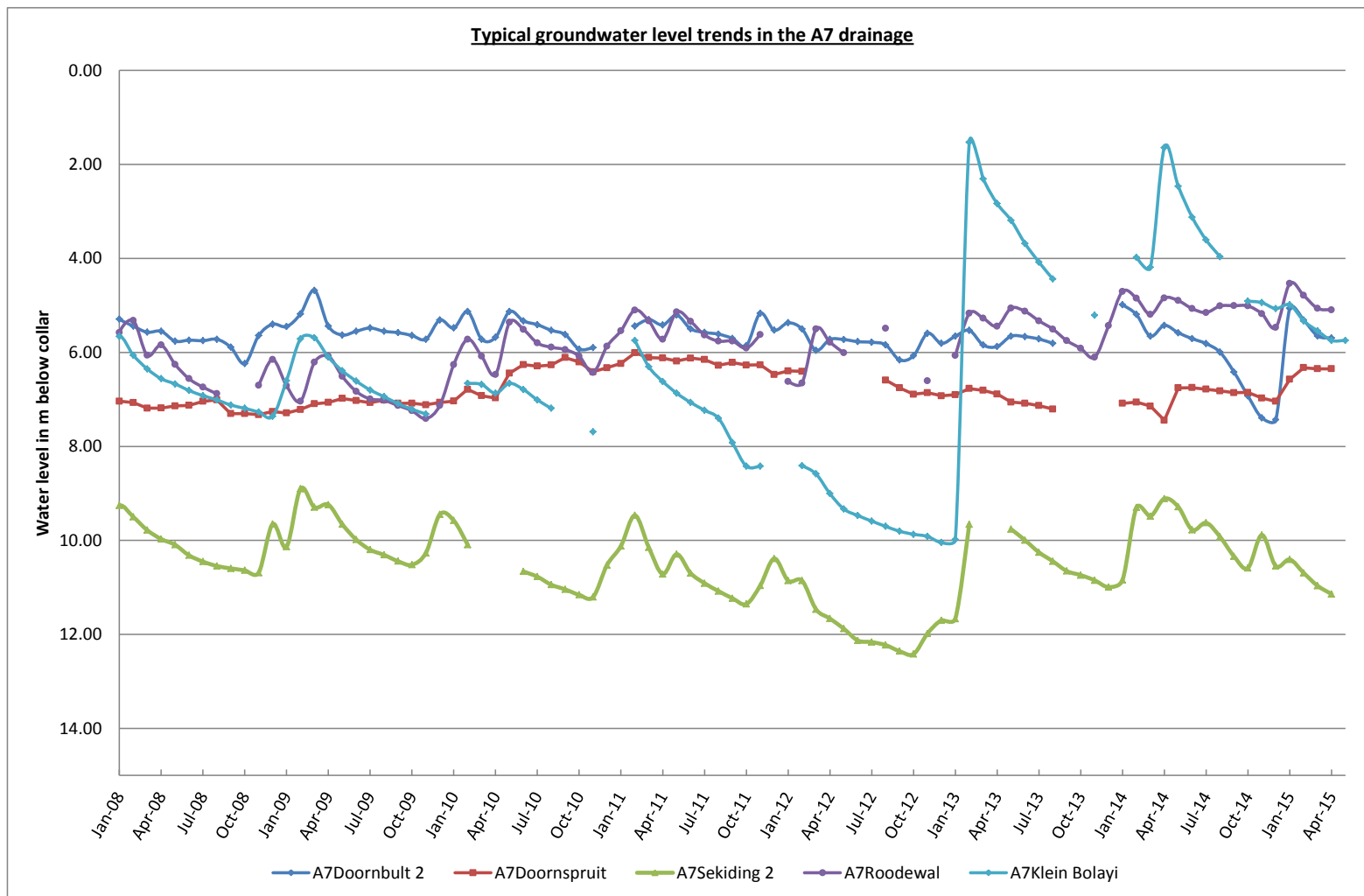
**GRAPH 1**  
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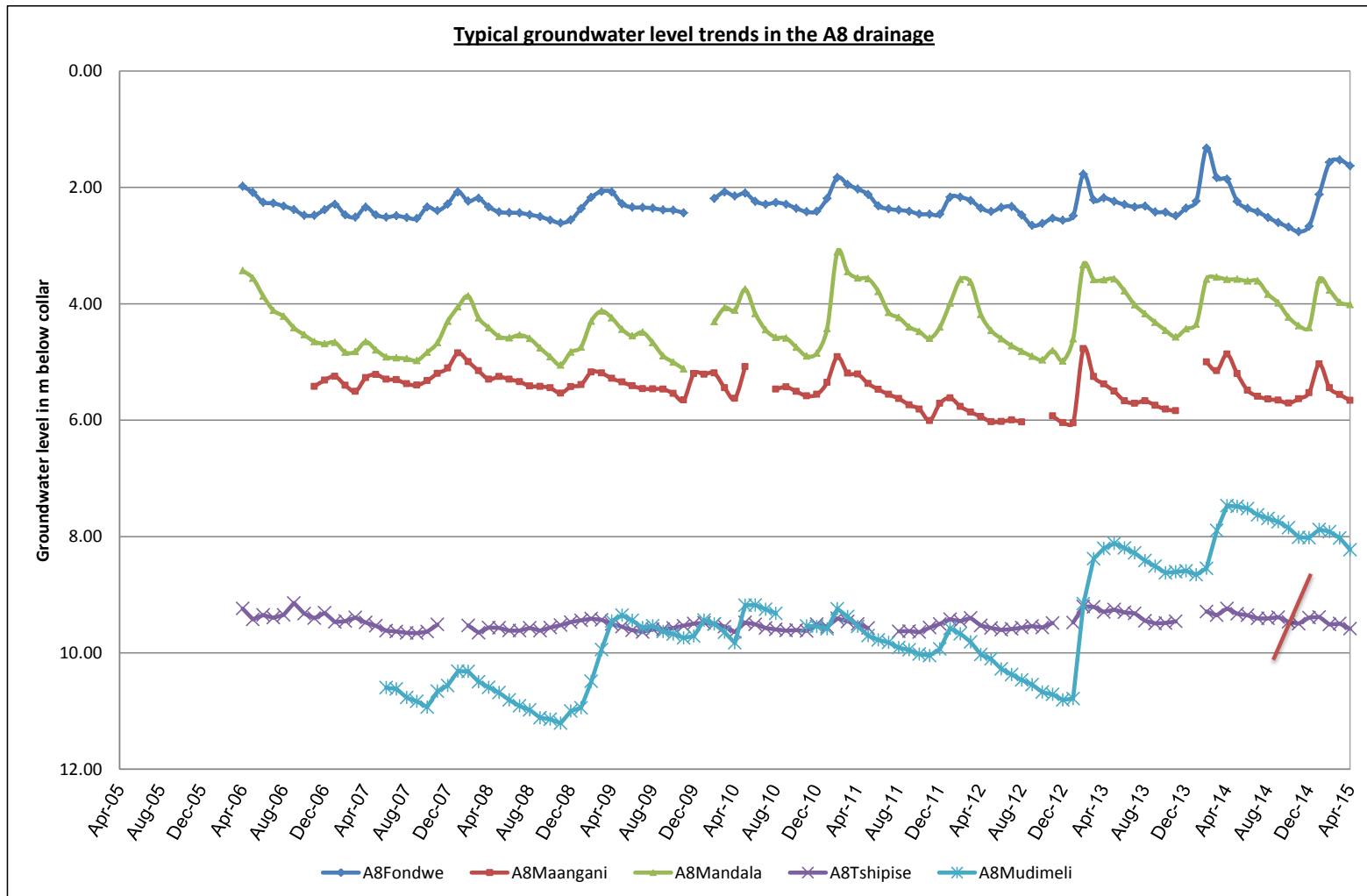
**GRAPH 2**



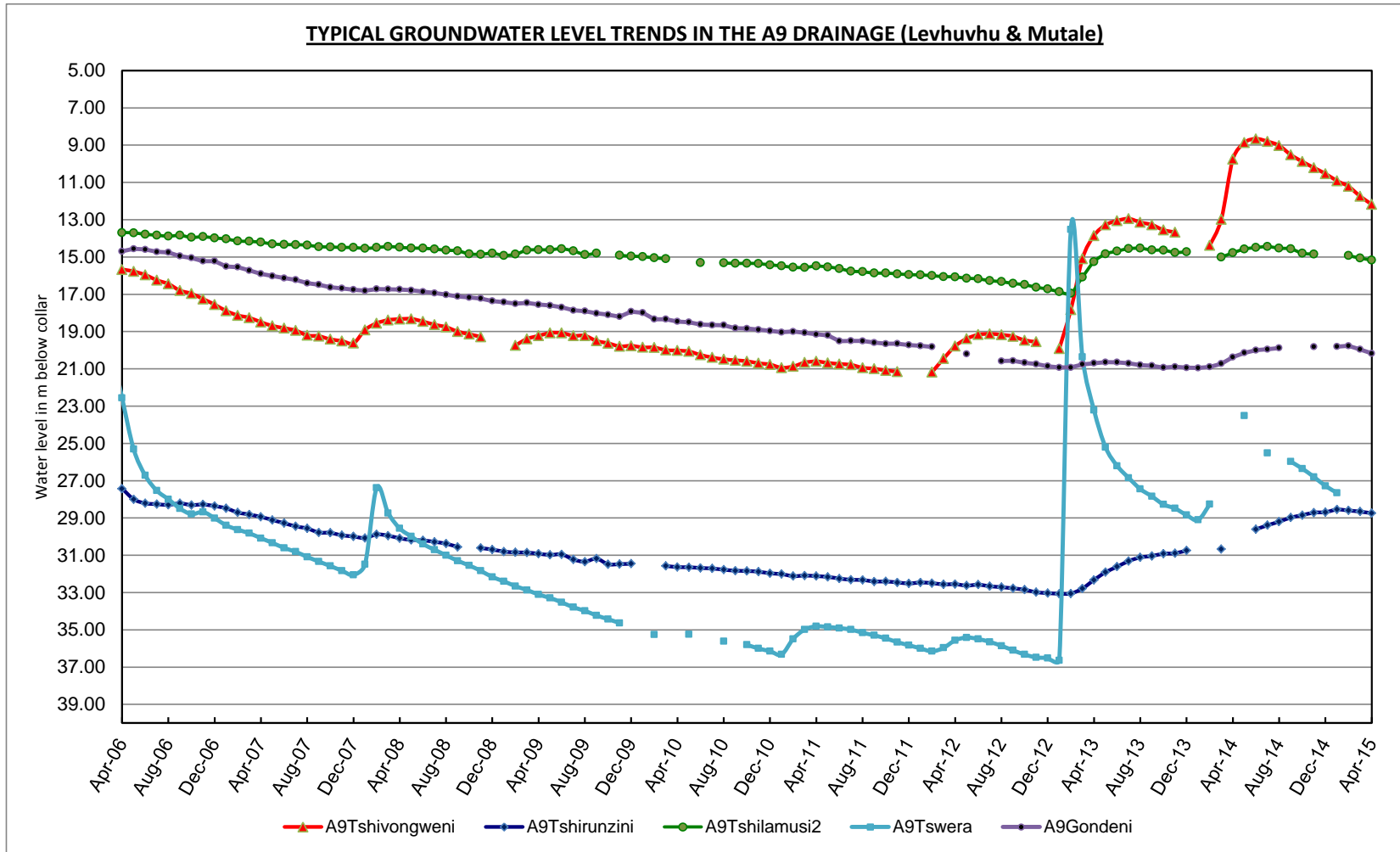
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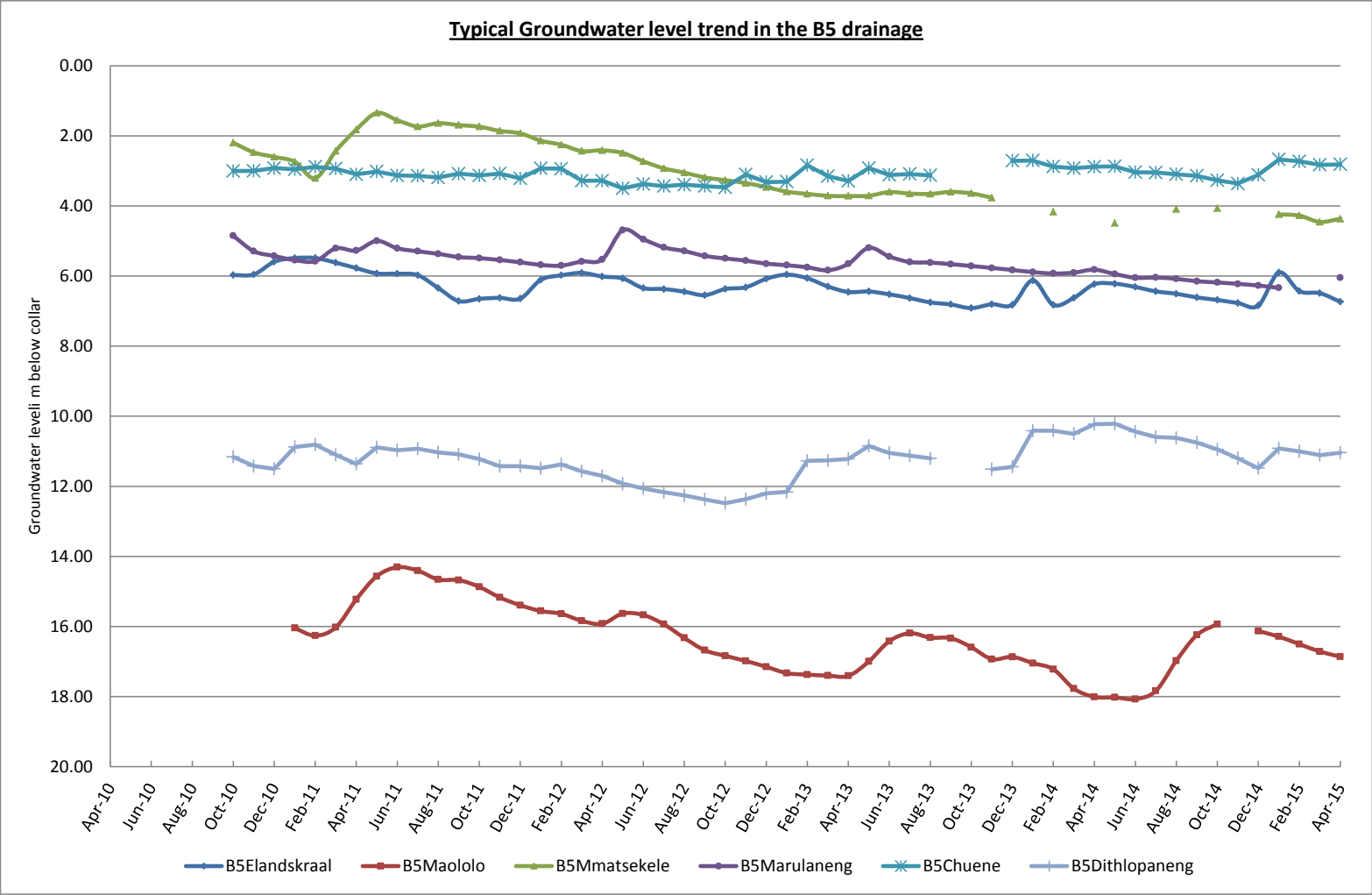
**GRAPH 4**  
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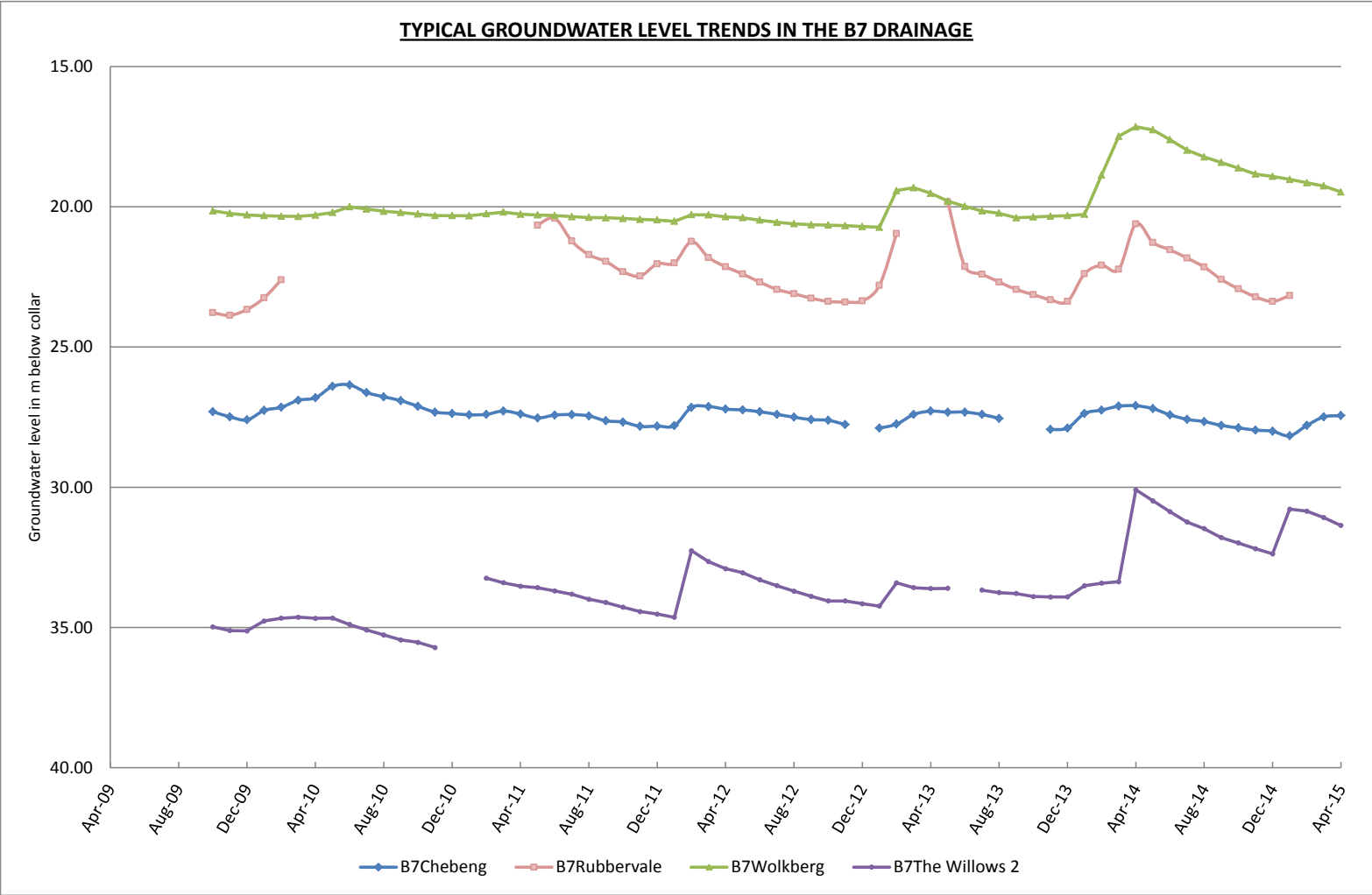
**GRAPH 5**  
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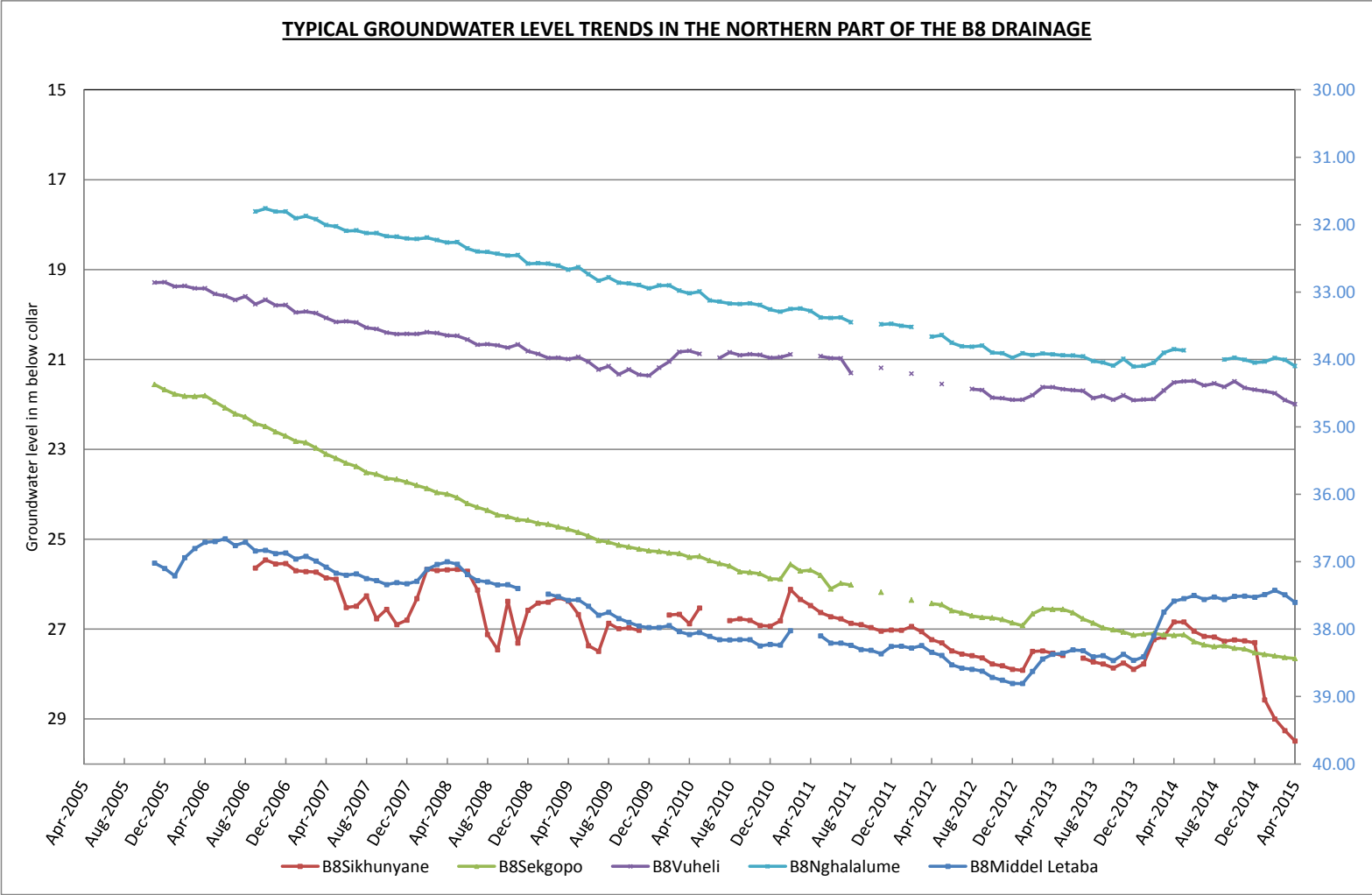
**GRAPH 6**  
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**GRAPH 7**  
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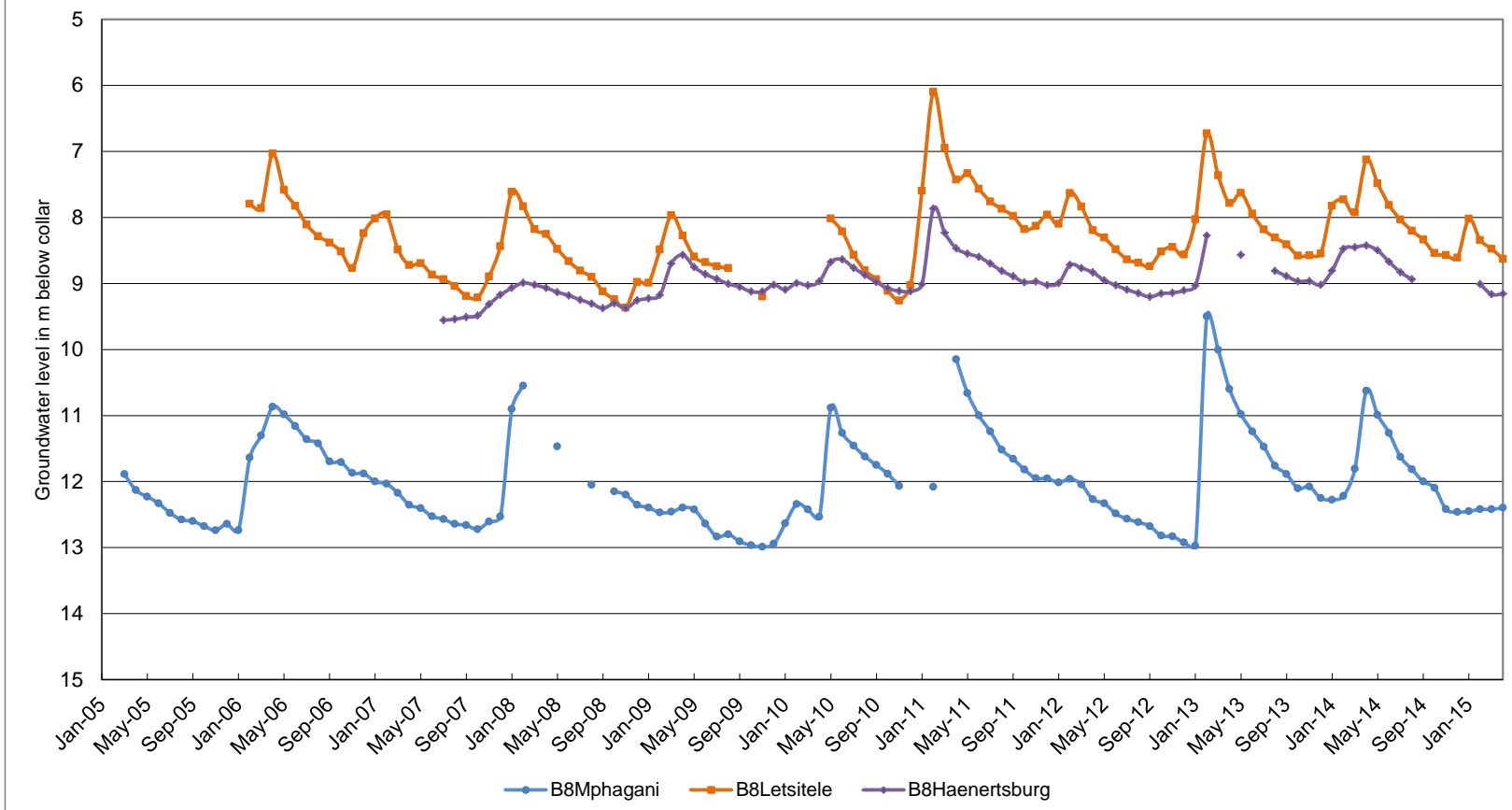


**GRAPH 8**  
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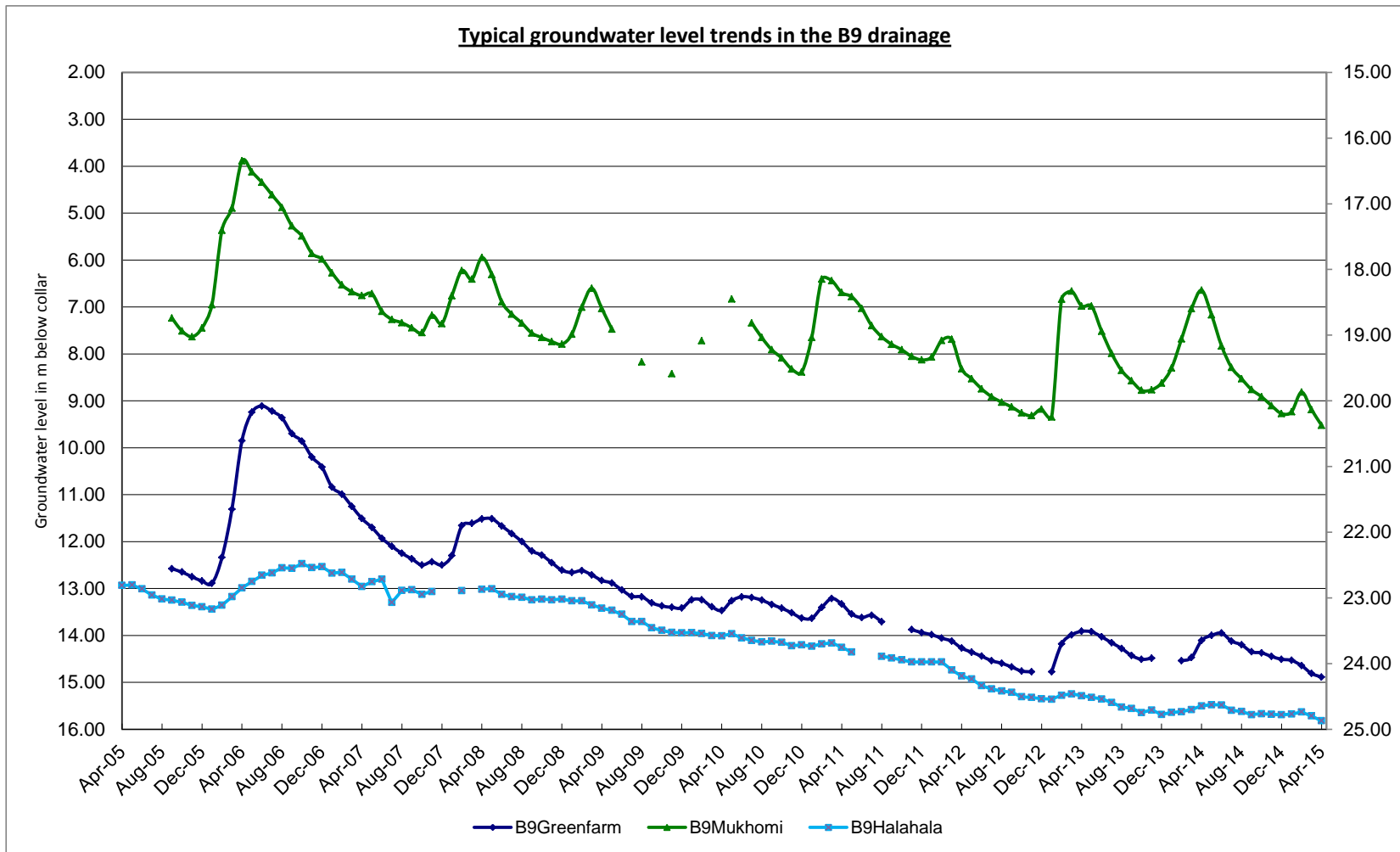


**GRAPH 9**  
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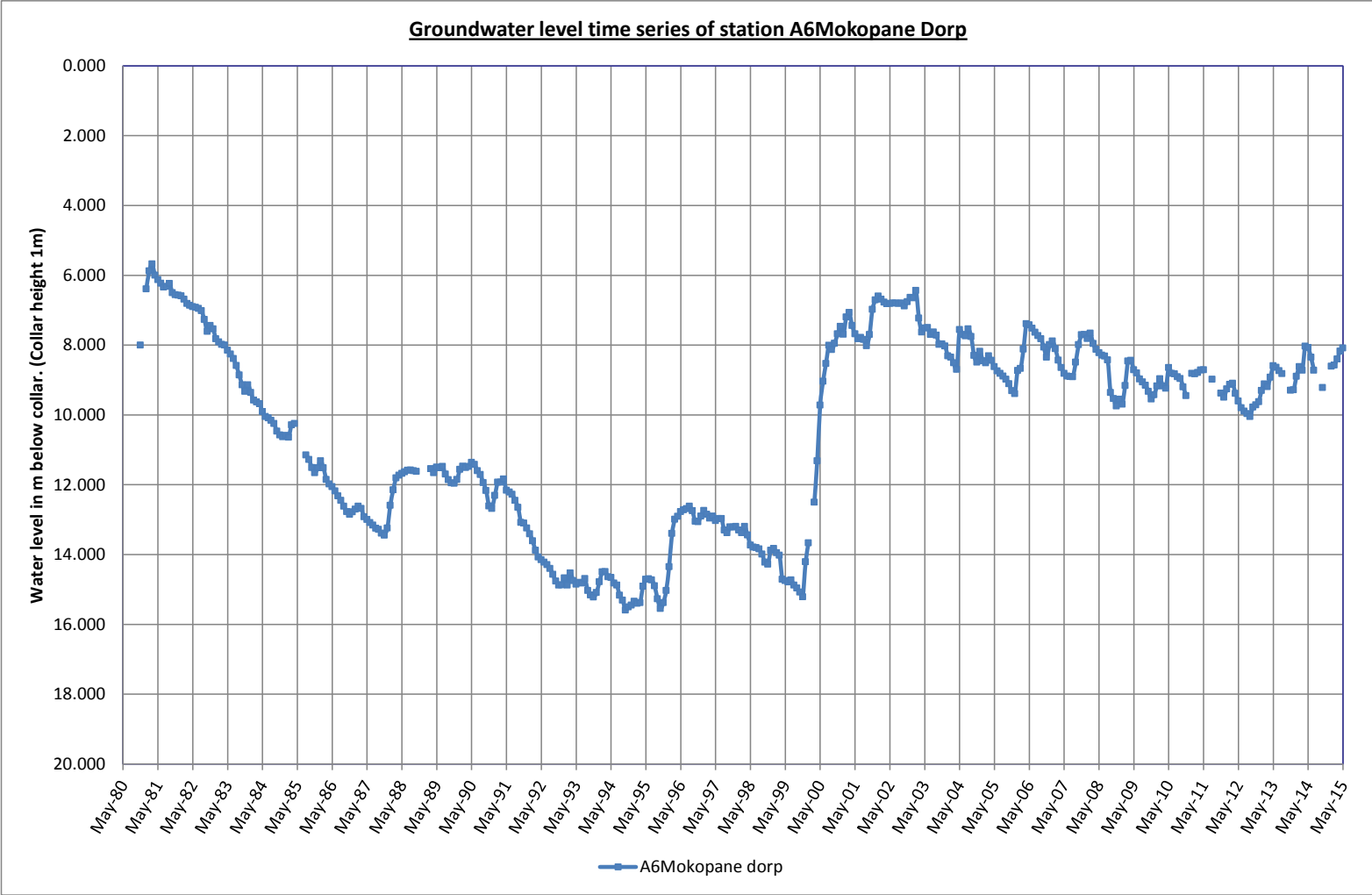
**TYPICAL GROUNDWATER LEVEL TRENDS IN THE SOUTHERN PART OF THE B8 DRAINAGE**



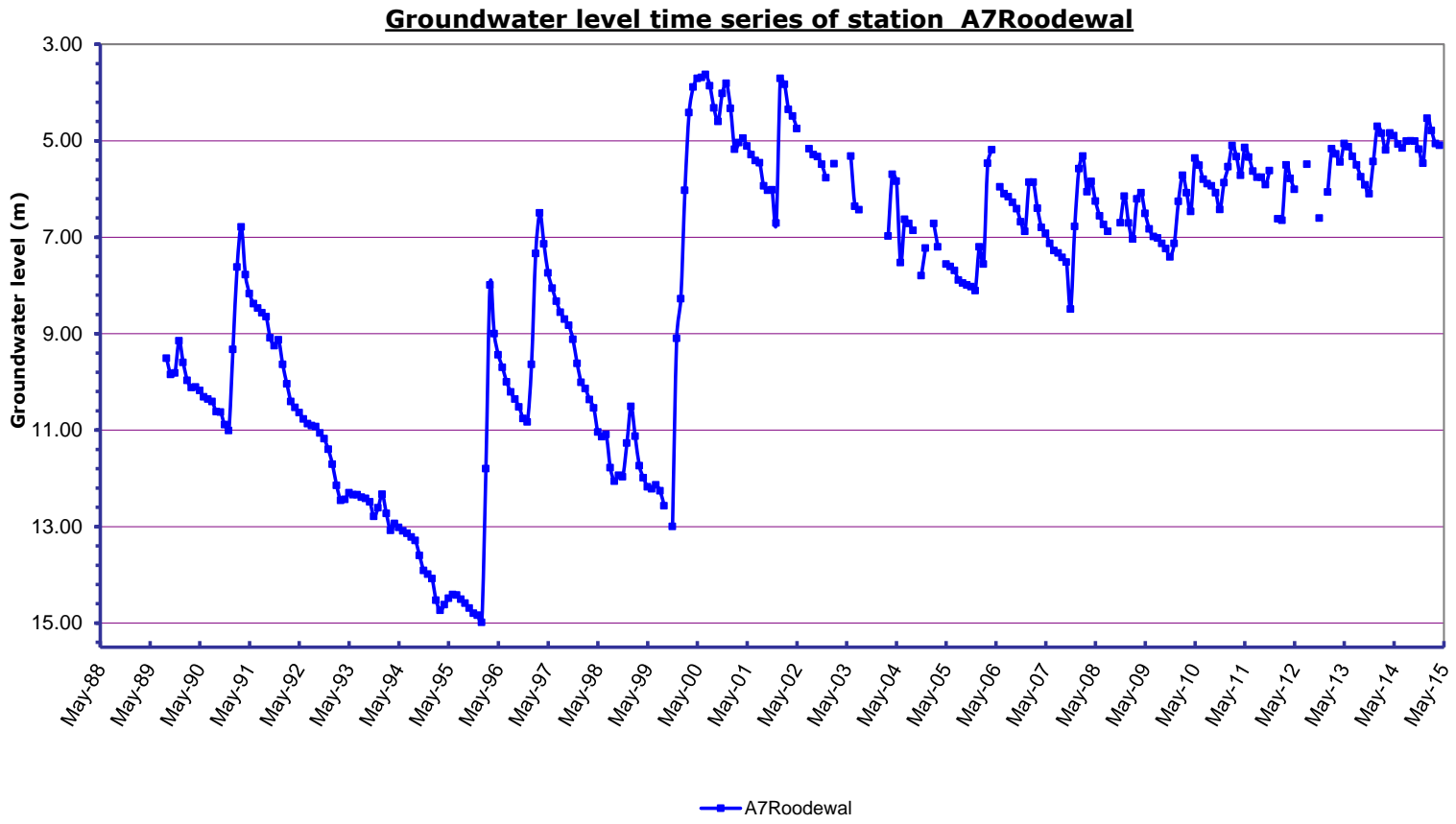
**GRAPH 10**  
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**GRAPH 11**  
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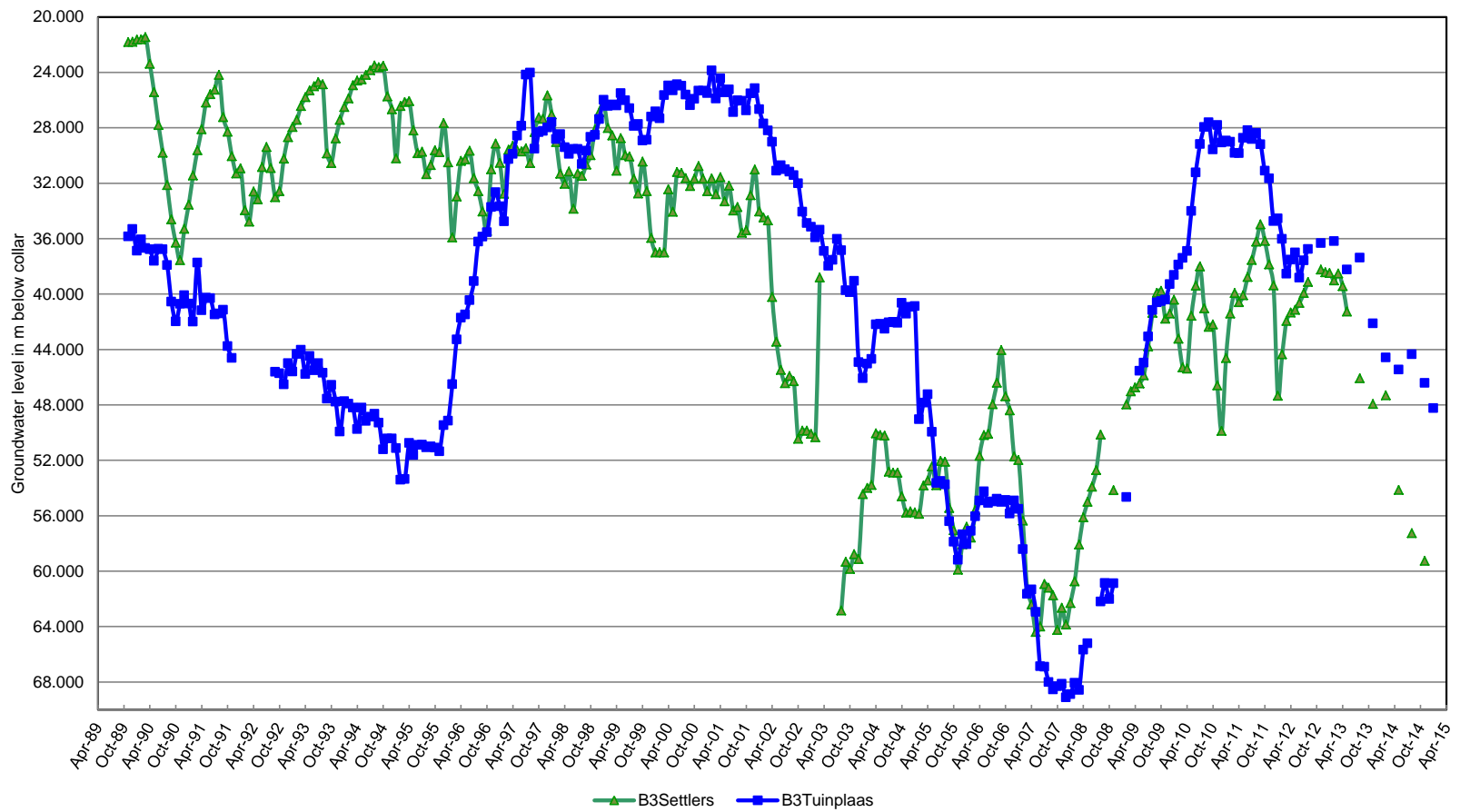


**GRAPH 12**

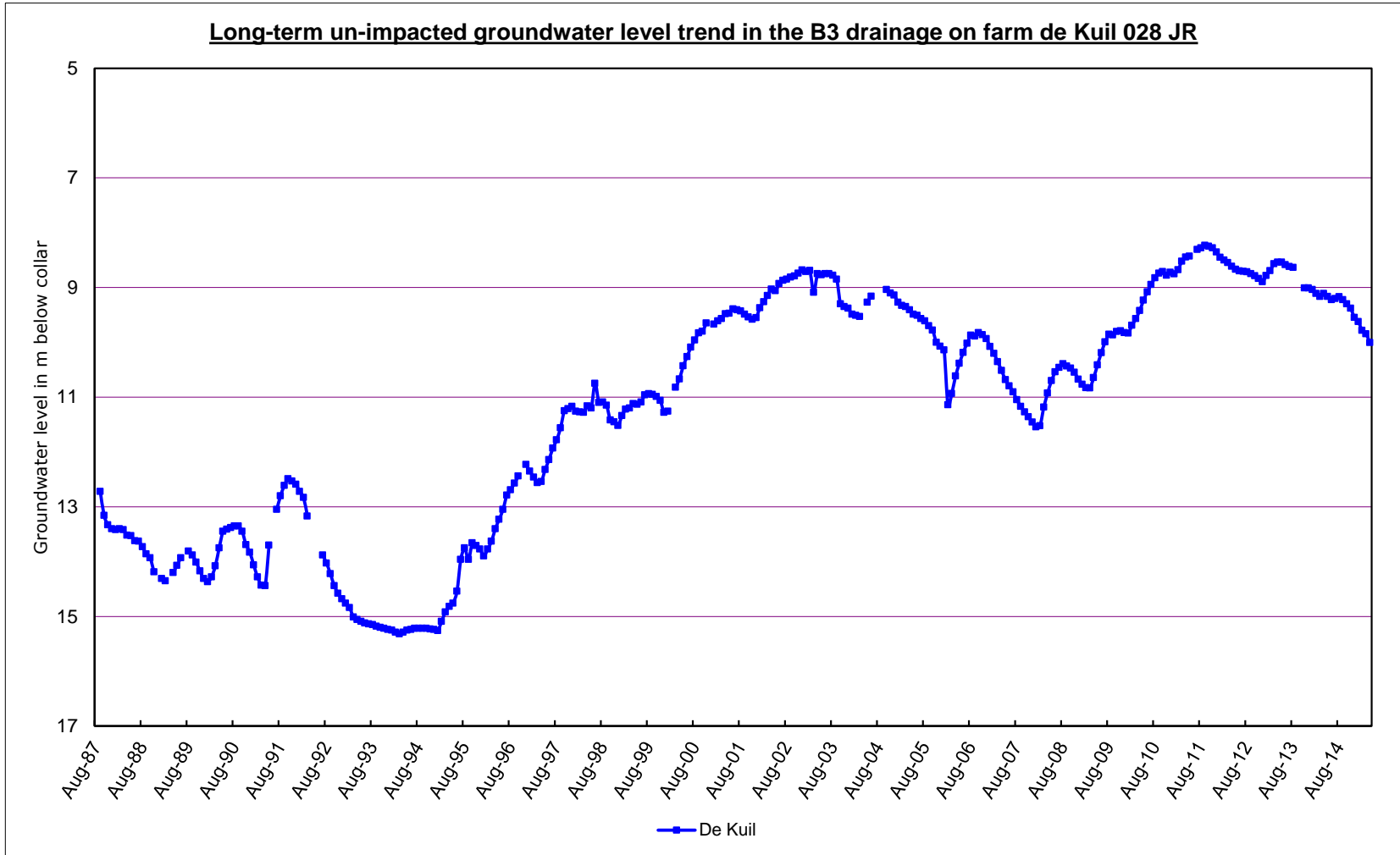


**GRAPH 13**  
26

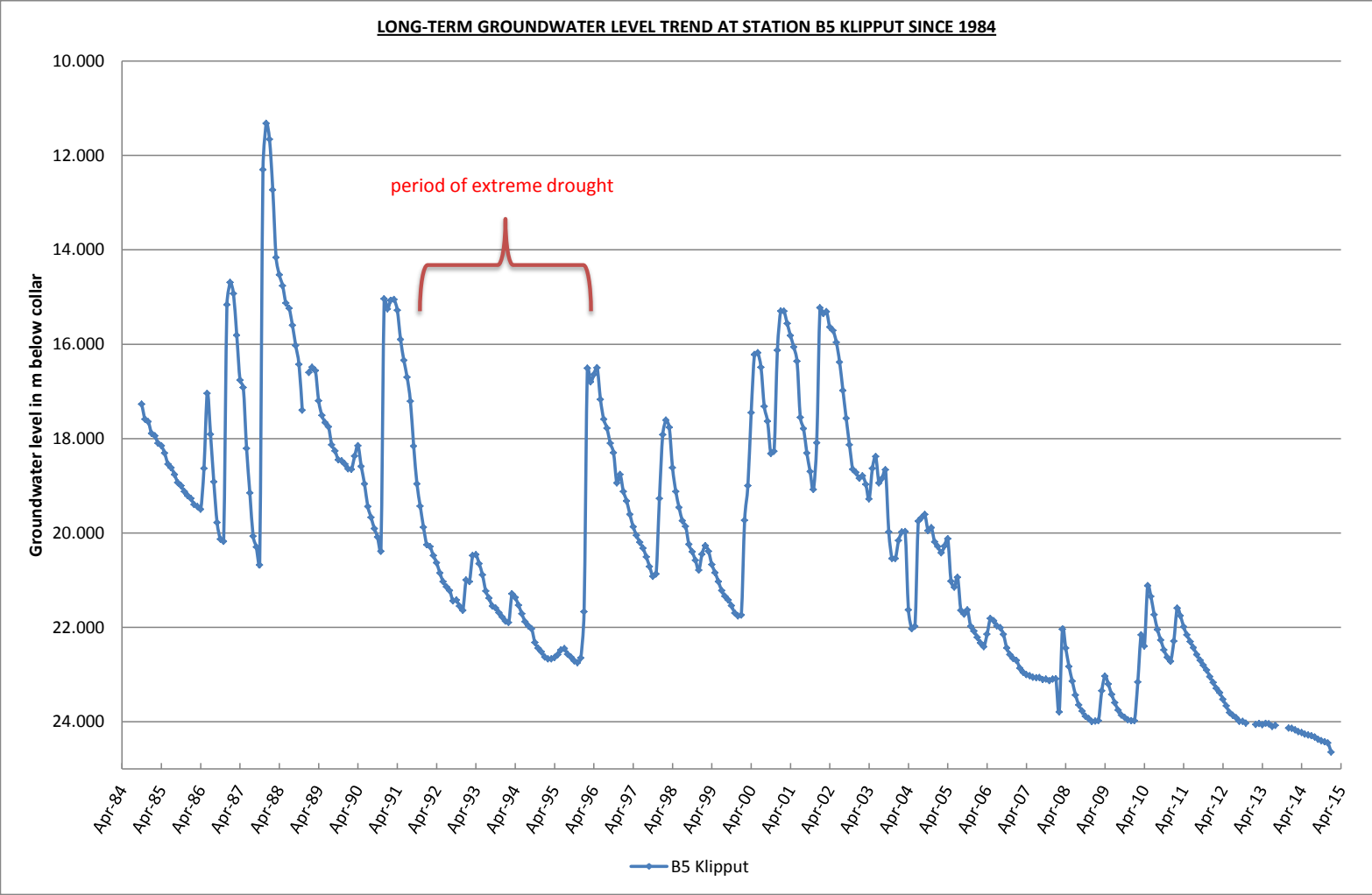
**LONG-TERM IMPACTED GROUNDWATER LEVEL TRENDS IN THE B3 DRAINAGE AT SETTLERS AND  
TUINPLAAS**



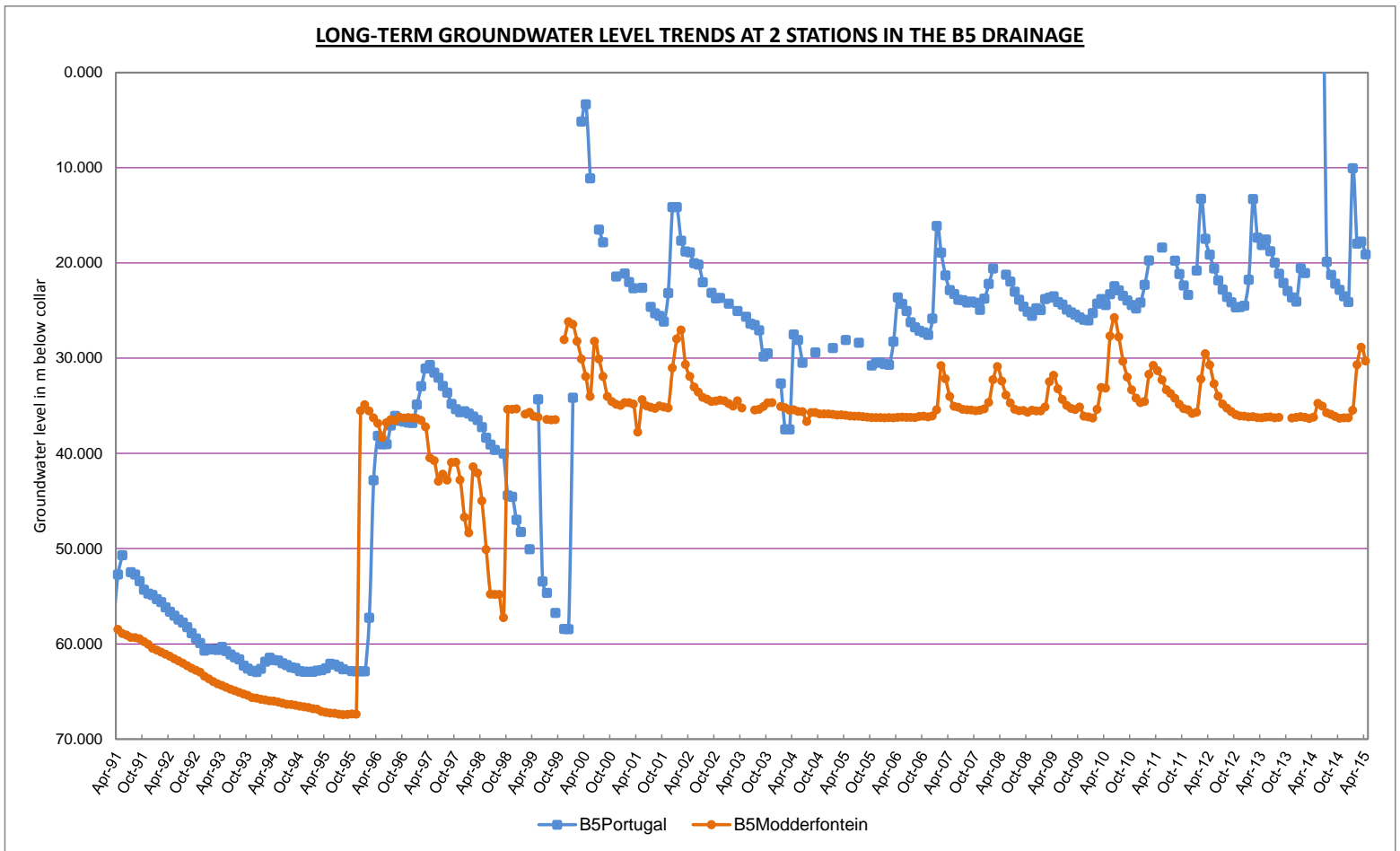
**GRAPH 14**



**GRAPH 15**

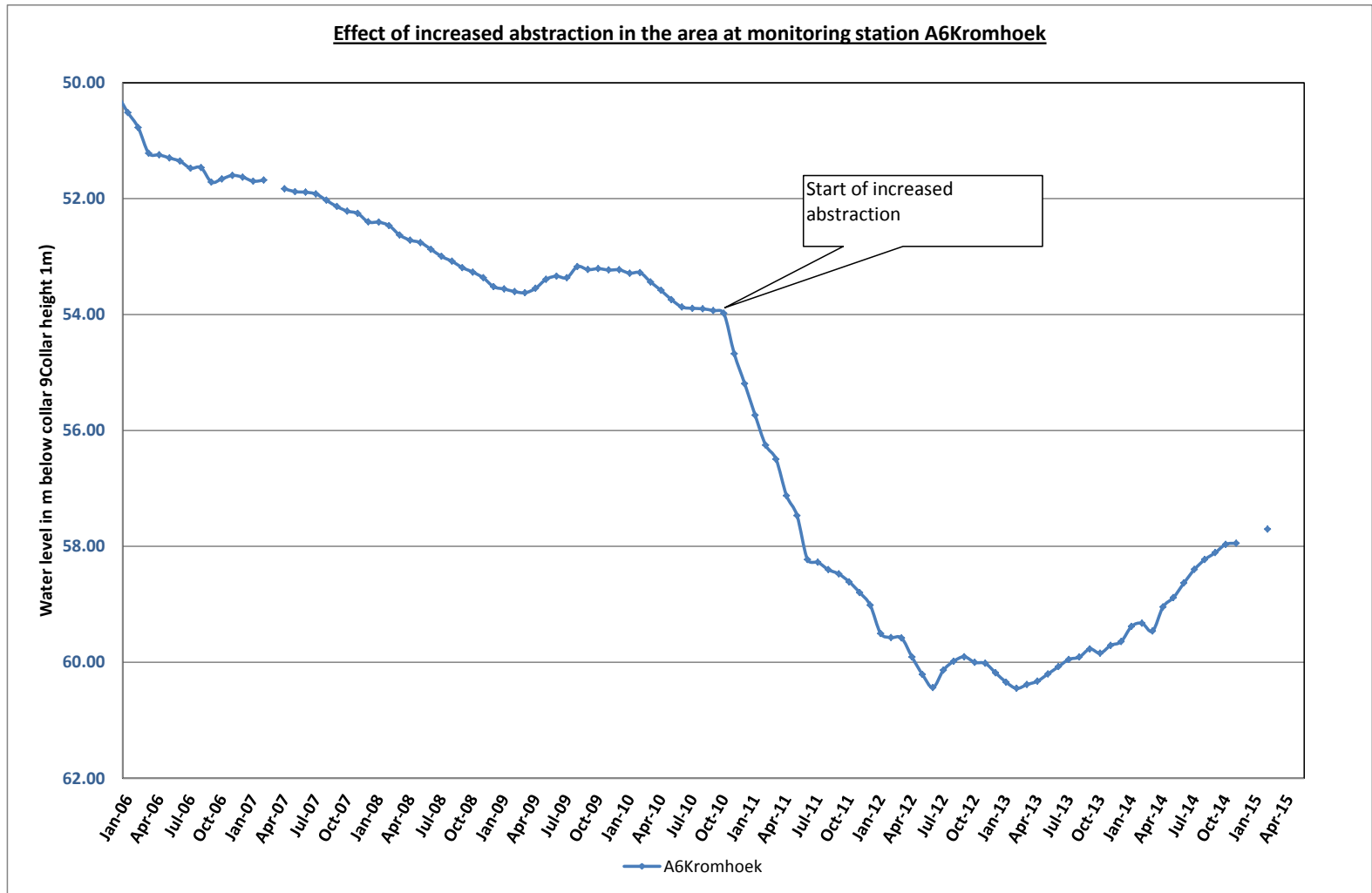


**GRAPH 16**



**GRAPH 17**  
30

**Effect of increased abstraction in the area at monitoring station A6Kromhoek**



**GRAPH 18**

