



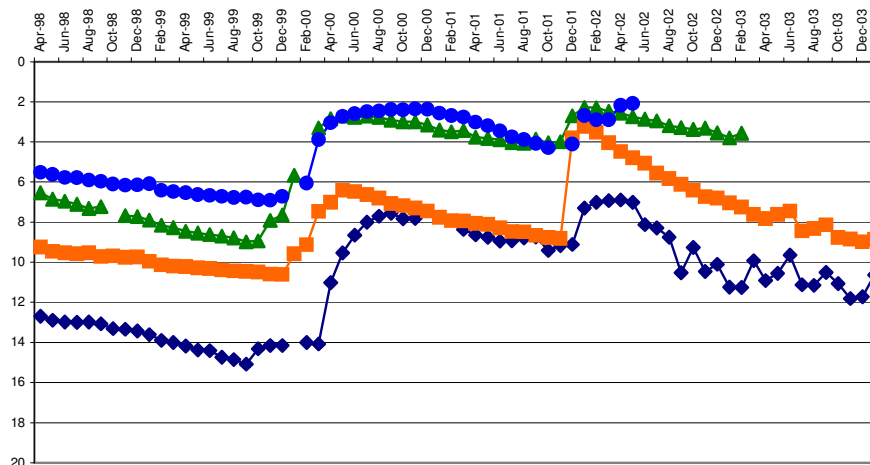
water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

LIMPOPO REGION

DIRECTORATE WATER REGULATION AND USE

STATUS REPORT ON MONITORING & GROUNDWATER LEVEL TRENDS MAY 2009 – MAY 2010



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MARCH 2010**

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1) EXECUTIVE SUMMARY

Groundwater levels

Water level values for 1 May 2009 (corresponding time last year), 1 February 2010 (Midway of the past wet season) and 1 May 2010 (End of the past wet season) were used for comparison in this report.

There are still 165 reference monitoring stations distributed across Limpopo. 148 were visited and data collected during May 2010. 11 stations were inaccessible due to extreme wet conditions, 2 has caved in and have to be re-drilled. 6 stations were found to be damaged or equipped with pumps and data could not be retrieved. 4 Stations could not be accessed in time for the data to be used in this report. The 34 stations in the Kruger National Park were also visited and the data collected. The 30 Special purpose monitoring stations (Projects) will be visited in June and data downloaded (**MAPS 1 & 2**)

Only the data for stations on the permanent reference network located outside the Kruger Park is used for reporting.

- Active stations = 165
- Stations visited and included in this report = 148.
- Stations inaccessible due to wet conditions = 11
- Other access problems = 6
- Visited stations in A2 drainage not included in this report = 2

Comparison of water levels with the previous quarter: (February 2010 to May 2010)

Stations with data for the whole period available = 141/148 (95.3%) of stations visited)

	No of stations	% of stations With data	Average
Water level down more than 1 m	3	2.1%	
Water level down less than 1m	47	33.3%	-0.14m
Water levels up more than 1m	17	12.1%	2.3m
Water levels up less than 1m	72	51.1%	0.35m
No difference in water level	2	1.4	
Total	141	100%	

The table above reflects the situation from midway to the end of the past wet season. A rise in water levels is indicated at 89 stations (63.1% of stations) indicating some late recharge at these stations. The overall average is 0.7m. At the other 52 stations (36.9%), water levels are declining with an average of around 30cm overall.

Comparison of water levels with the corresponding time last year: (May 2009 to May 2010)

Stations with data for the whole period available = 136/141 (96.5% of stations visited)

	No of stations	% of stations	Average
Water level down more than 1 m	7	5.1%	-2.17m
Water level down less than 1m	50	36.8%	-0.44m
Water levels up more than 1m	29	21.3%	3.2m
Water levels up less than 1m	50	36.8%	0.42
No difference in water level			
Total	136	100%	

The February 2010 report noted that water levels at the greater amount of stations were still lower than last year. As indicated by the first table, there was reasonable good recharge in some areas during the last part of the wet season with 63% of stations indicating higher water levels in May than was the case in February. Comparing current levels to the corresponding time last year, 57 stations (41.9%) indicate lower water levels while 79 stations (58.1%) indicate higher water levels.

Good rains were received over a large part of the Province at the end of April 2010 and even into May. The positive affect on groundwater levels by this precipitation can be seen in the change in water level status from February to May. Due to the time lapse sometimes between precipitation and actual recharge of the aquifers, some recharge may still be taking place.

The amount of stations indicating lower or higher water levels are not necessarily a true reflection of the situation all over. Some areas may have a concentration of higher levels while lower water levels may be concentrated in another area.

The fluctuation in water levels from February 2010 to May 2010 is depicted on MAP 4. It is clear that the stations with water levels rising after the good rains in the latter part of the wet season are mostly concentrated in the eastern part of the Province.

Map 5 compare the current levels with last year and illustrates the fluctuations from May 2009 to May 2010. As above, the higher water levels are mostly in the eastern part of the province with a small area to the north east marked by a concentration of lower water levels, which has become characteristic of this area.

An Attempt to group and delineate concentrations of stations with similar water level trends is depicted on (**Map 6**)

Blue hatching indicate areas with higher water levels with red hatching for lower water levels. The results for the Kruger National Park were included for this map.

To get a clearer perspective on the current situation, a view on past water level trends and levels is needed. For this purpose 2 graphs used previously were updated and included as **GRAPHS 48 & 49**. The graphs illustrate the current water level situation in relation to the past 20 years. From the graphs it is clear that the current situation represent a very healthy state in general. The good correlations found in water level behaviour over large areas in the short-term indicate that it can confidently be extrapolated for past scenarios in areas with no long-term data.

Deviations from the general state of affairs will be locally present in some areas depending on the scale and patterns in abstraction practices. This is illustrated by **GRAPH 50**, from the graph it can be seen that the water level has been seriously impacted by continuous abstraction. Although a rise of $\pm 3\text{m}$ occurred since January 2010, the current level still correspond with that at the end of the drought in 1995. Whatever the current condition of aquifers, the need to carefully manage the resource will always be absolutely imperative and can not be negotiated.

2) STATUS OF MONITORING NETWORK

4 New stations were recently equipped and the Limpopo Province's Groundwater Level Monitoring Network now consists of 203 active monitoring stations, including 34 in the KNP. 2 Caved in boreholes still have to be re-drilled, 1 new borehole is already drilled and have to be equipped, 12 new boreholes are currently planned to be drilled additionally to fill gaps in the existing network and 7 existing boreholes are targeted for possible inclusion in the network during the next quarter. (**Maps 1 & 2**)

Upgrading of existing stations and delivering of concrete outer rings to stations continues and construction of the concrete structures were completed at 28 stations.

Regional and Head Office jointly service a total of 55 stations for the National Groundwater Quality Program in the Limpopo Province which is sampled bi-annually. Sampling to verify the suitability of selected sites for extension of the National Groundwater Quality Monitoring was done at 138 boreholes. 50% of analysis results were received from the laboratory (**Map 3**)

3) DATA COLLECTION, EVALUATION AND REPORTING

Data was collected during May 2010. The water level used for 1 May 2010 represents the end of the past wet season. Comparisons were drawn between 1 May 2009, (Corresponding period the previous year) 1 February 2010 (Midway of the wet season) and 1 May 2010 (Current situation, end of the wet season) (**Maps 4 & 5**)

4) LIMPOPO WATER MANAGEMENT AREA.

The area consists of secondary drainage areas A4, A5, A6, A7 and A8.

4.1 A4 Drainage Area. (Matlabas, Mokolo Rivers)

Relatively stable water levels over the past year (**GRAPH 1**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

An equal number of stations, 6 each, indicate lower or higher water levels. Average overall rise of 0.58m (**GRAPH 2**)

Past year; May 2009 to May 2010

6 of the 9 Stations with data indicate lower levels over the past year (**GRAPHS 3 &4**)

4.2 A5 Drainage Area. (Lephalale River)

Slow decline in groundwater levels continues (**GRAPH 5**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

An equal number of stations, 3 each, indicate lower or higher water levels. The water level at 1 station has reached ground level (**GRAPH 6**)

Past year; May 2009 to May 2010

6 Stations have data for the year with 4 indicating lower levels (**GRAPHS 7 & 8**)

4.3 A6 Drainage Area. (Nile, Sterk, Mogalakwena & Dorps Rivers)

Widely different magnitudes of response since the start of the wet season (**GRAPH 9**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

Data is available for 25 stations. 11 Stations (44. %) indicate lower and 14 stations (56%) higher water levels. Overall an average slight rise of 0.24m was recorded (**GRAPHS 10 & 12**)

Past year; May 2009 to May 2010

Data is available for 24 stations of which 12 Stations (50%) indicate lower water levels than last year and the other 12 stations a rise in water levels. An overall rise of 0.24m was recorded over the past year. (**GRAPH 11 & 12**)

Current average water levels are below the long-term average values but *due to the extension of the network into areas characterized by deeper water levels the average values are distorted and can not be realistically compared until long-term data is available for all. This graph will in future reports be removed.*(**GRAPH 13**)

4.4 A7 Drainage Area. (Sand, Blood, Diep, Hout, Dwars & Brak Rivers)

Trends vary from stable to some indications of recharge over the past the wet season (**GRAPH 14**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

Data for 35 stations is available. 11 Stations (31.4%) indicate lower, with 24 stations (68.6%) indicating higher water levels. Overall a rise of 0.30m was recorded over the last quarter (**GRAPHS 15&17**).

Past year; May 2009 to May 2010

Data is available for 37 stations, 12 (32.4%) Indicate lower water levels, average -0.97m. 25 Stations (67.6%) indicate higher water levels, average 1.21m. Overall a rise of 0.85m was recorded for the period (**GRAPHS 16&17**).

Current average water levels are above the long-term average but *as with A6, due to the extension of the network into areas characterized by deeper water levels the average values are distorted and can not be realistically compared until long-term data is available for all. This graph will in future reports be removed* (**GRAPH 18**).

4.5 A8 Drainage Area ((Nwanedzi, Nzhelele Rivers)

Fluctuations in water levels are small but indications of recharge can be noted at some (**GRAPH 19**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

6 Stations with data for the period indicate higher water levels, average 0.23m while 3 stations indicate lower water levels (**GRAPHS 20 & 22**).

Past year; May 2009 to May 2010

8 Stations indicate higher, average 0.46m, and 1 lower a water level (**GRAPHS 21 & 22**).

5) LEVHUVHU-LETABA WATER MANAGEMENT AREA.

The area consists of secondary drainage areas A9, B8 & B9.

5.1 A9 Drainage Area. (Mutale, Levhuvhu Rivers)

Relatively stable water levels with some recharge at 1 or 2 stations can be noted (**GRAPH 23**).

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

Data is available for all stations, 10 of which indicate lower water levels and 8 higher (**GRAPHS 24 & 26**).

Past year; May 2009 to May 2010

12 stations indicate declining water levels for the past year and 6 stations indicate higher water levels (**GRAPHS 25&26**).

Overall an average decline of -0.24m was recorded over the area the past year.

5.2 B8 Drainage Area. (Groot, Middel & Klein Letaba Rivers)

Groundwater levels generally stable with little fluctuation the past year, (**GRAPH 27**).

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

Data is available for 13 stations with 3 indicating lower water levels, and 10 higher (**GRAPHS 28 & 30**)

Past year; May 2009 to May 2010

4 Stations indicate lower water levels, average -0.43m with 10 indicating higher levels, average 0.44m, overall a rise of 0.19m was recorded (**GRAPHS 29& 30**)

5.3 B9 Drainage Area. (Shingwidzi, Mphongolo Rivers)

Some rise in water level at 1 of the 3 stations (**GRAPH 31**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season) (**GRAPHS 32 & 34**)

Past year; May 2009 to May 2010

As above, 2 stations indicate a decline in water level and 1 rising (**GRAPHS 33 & 34**)

6) OLIFANTS WATER MANAGEMENT AREA.

The part of this Water Management Area within the Limpopo Province mostly consists of the B3, B5 & B7 secondary drainage areas.

6.1 B3 Drainage Area. (Elands, Gotwane Rivers (Springbok flats area))

The water levels at Tuinplaas & Settlers rose considerably over the past year (**GRAPH 35**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

All 3 stations indicate higher levels, average 1.99m (**GRAPH 36**)

Past year; May 2009 to May 2010

All 3 stations indicate higher water levels (**GRAPH 37**)

The water levels at Settlers and Tuinplaas are well above the worst recorded (**GRAPH 38**)

6.2 B5 Drainage Area. (Olifants, Nkumpi Rivers)

Various magnitudes of recharge evident (**GRAPH 39**)

Comparison with previous levels:

Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

6 Stations indicate higher water levels. The water level at B5Byzonderheid does not reflect natural conditions while the large rise at B5Modderfontein is a true reflection of recharge in the dolomite area. (**GRAPHS 40 & 42**)

Past year; May 2009 to May 2010

All stations indicate higher water levels than the same time last year **GRAPHS 41 & 42**)

Current average water levels compare very favorable with long-term average and the lowest average recorded at stations with long-term data (**GRAPH 43**)

6.3 B7 Drainage Area (Olifants, Selati, Klaserie, Makhutswi Rivers)

Relative stable water levels with some recharge (**GRAPH 44**)

Comparison with previous levels:

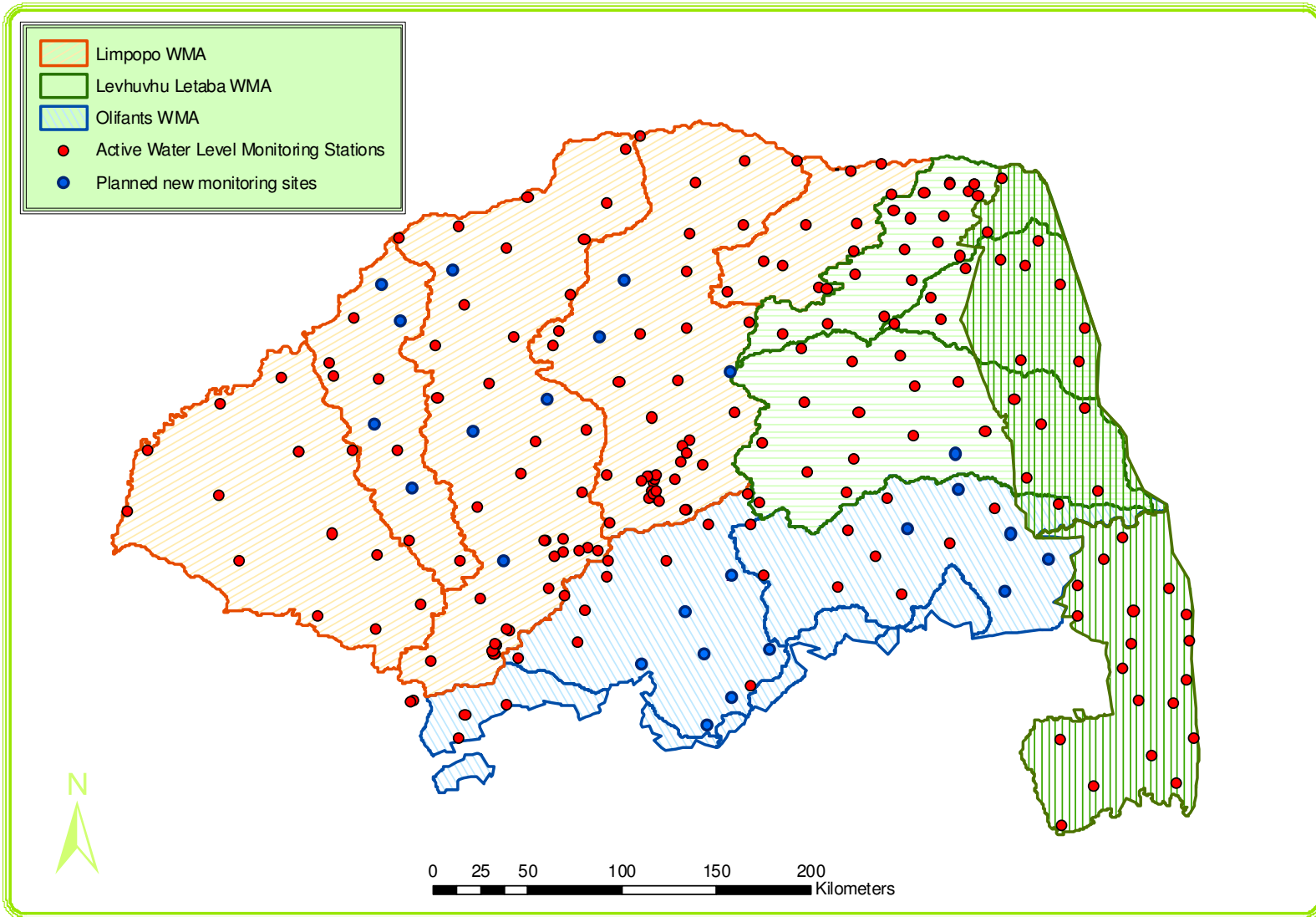
Last quarter; February 2010 to May 2010 (Midway to end of the wet season)

All 8 stations with data indicate higher water levels (**GRAPHS 45 & 47**)

Past year; May 2009 to May 2010

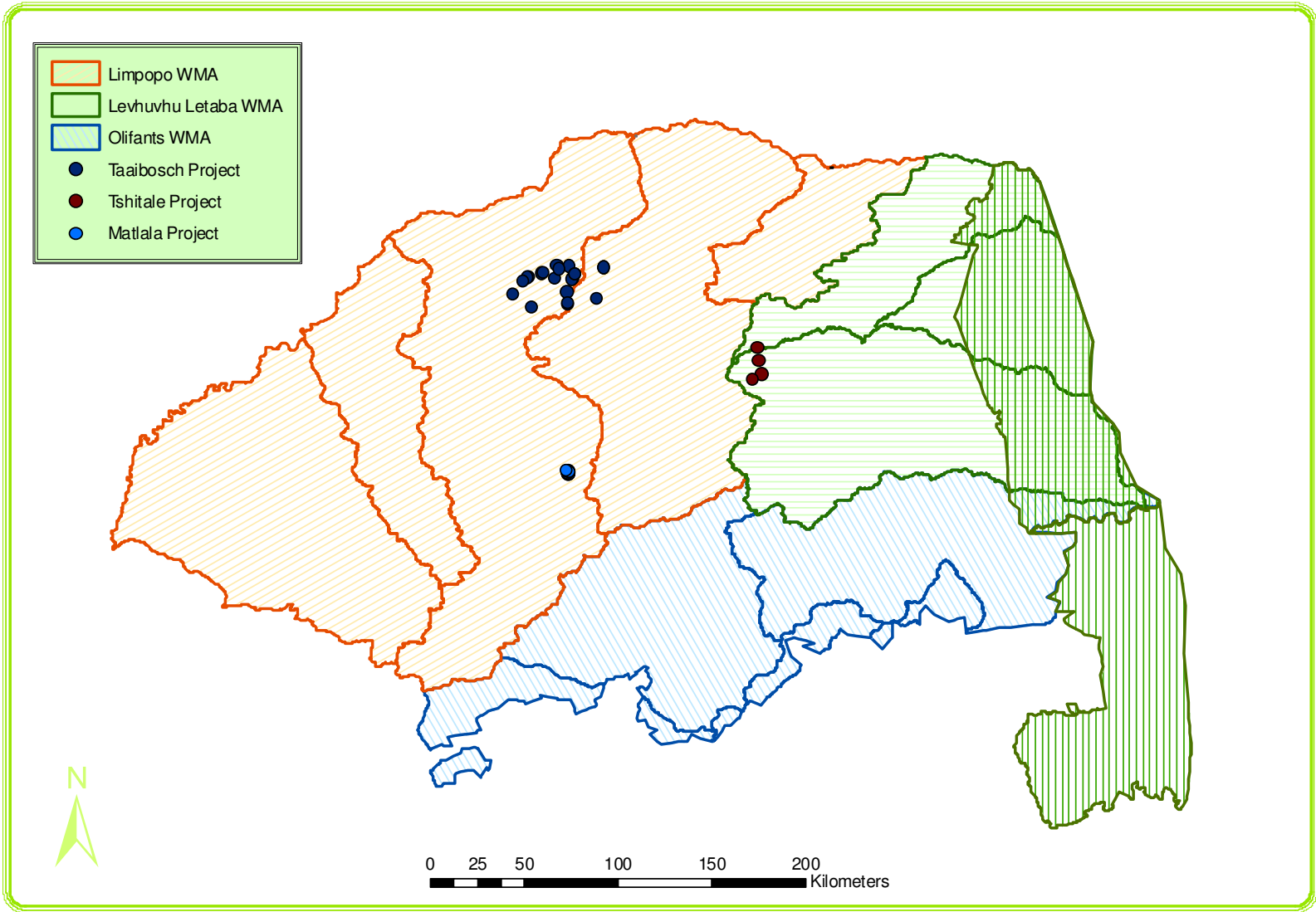
2 Stations indicate higher water levels and 4 lower (**GRAPHS 46 & 47**).

POSITIONS OF ACTIVE AND PLANNED GROUNDWATER LEVEL MONITORING STATIONS



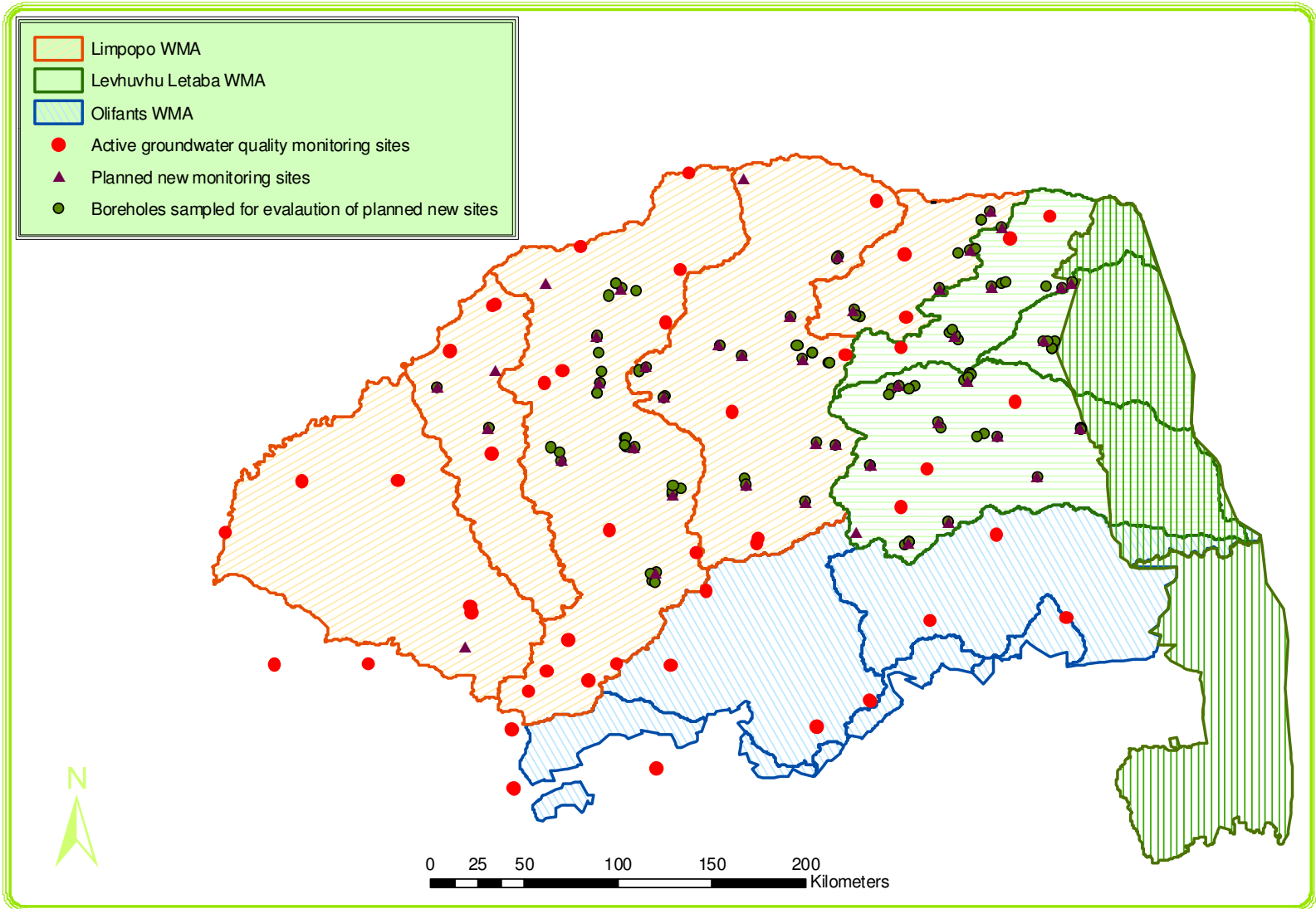
MAP 1

POSITIONS OF GROUNDWATER PROJECT WATER LEVEL MONITORING STATIONS



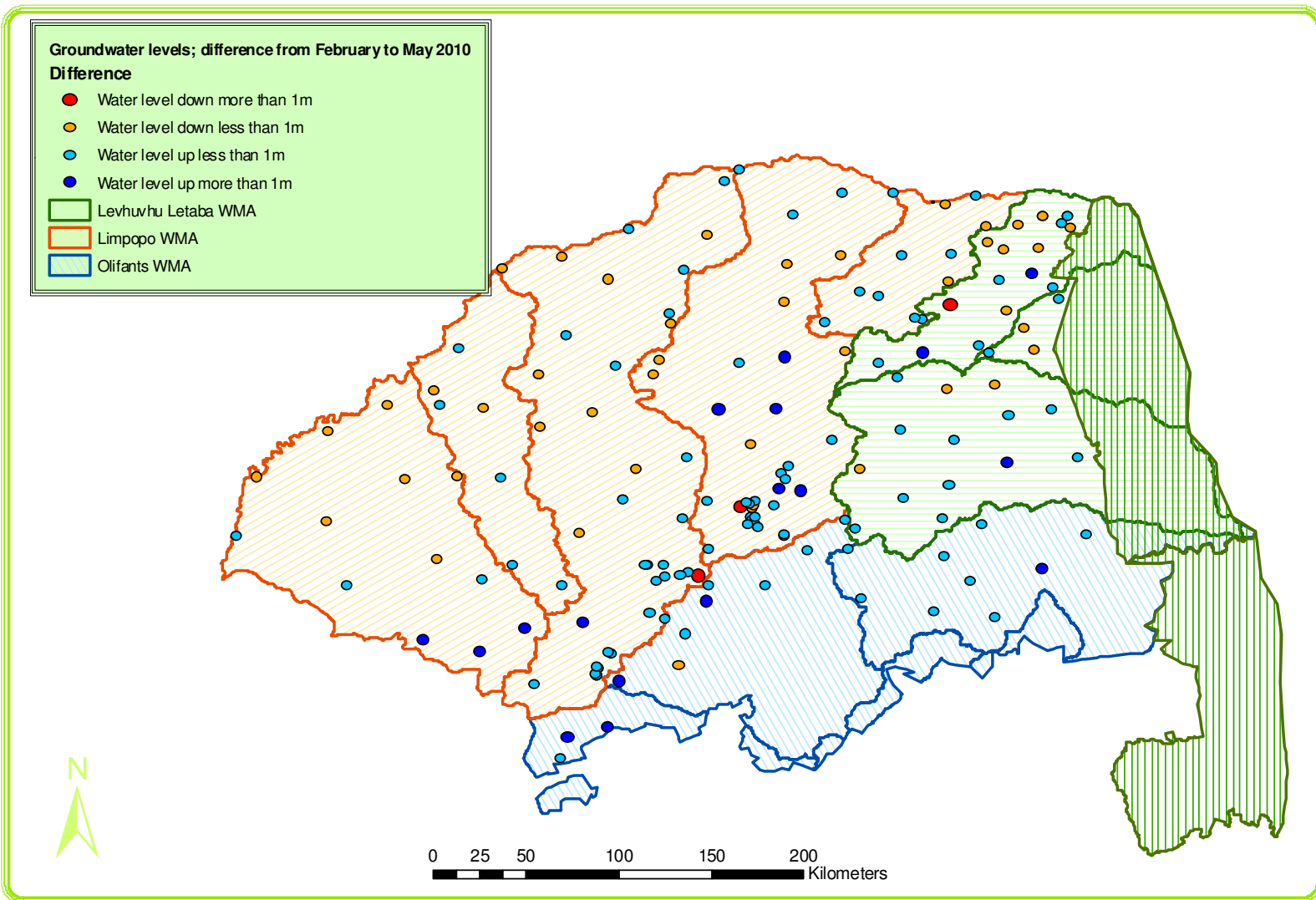
MAP 2

POSITIONS OF GROUNDWATER QUALITY MONITORING STATIONS AND POSSIBLE NEW SITES BEING INVESTIGATED TO EXTEND THE NETWORK



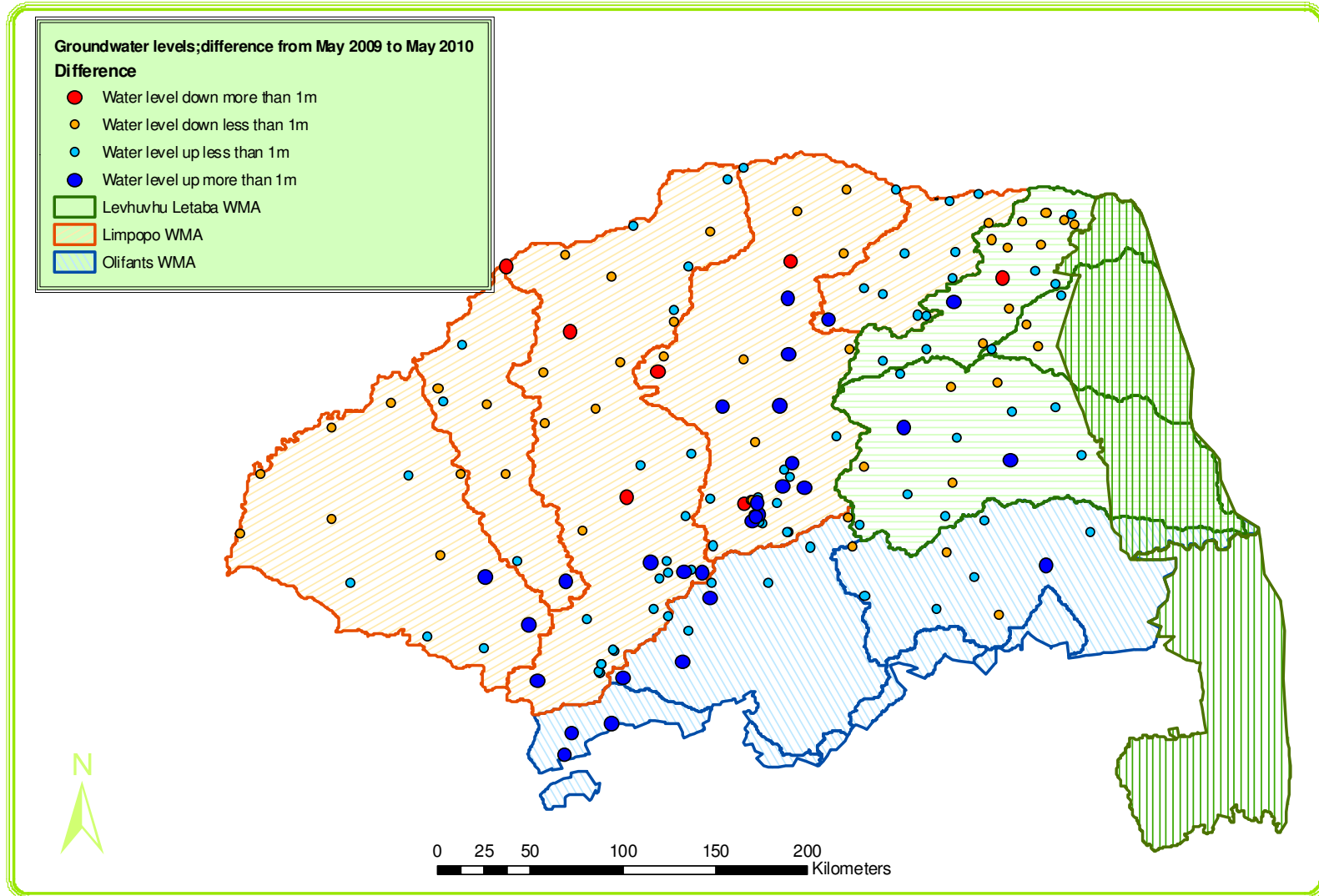
MAP 3

Fluctuations in groundwater levels, February to May 2010
(Halfway to the end of the rainy season)



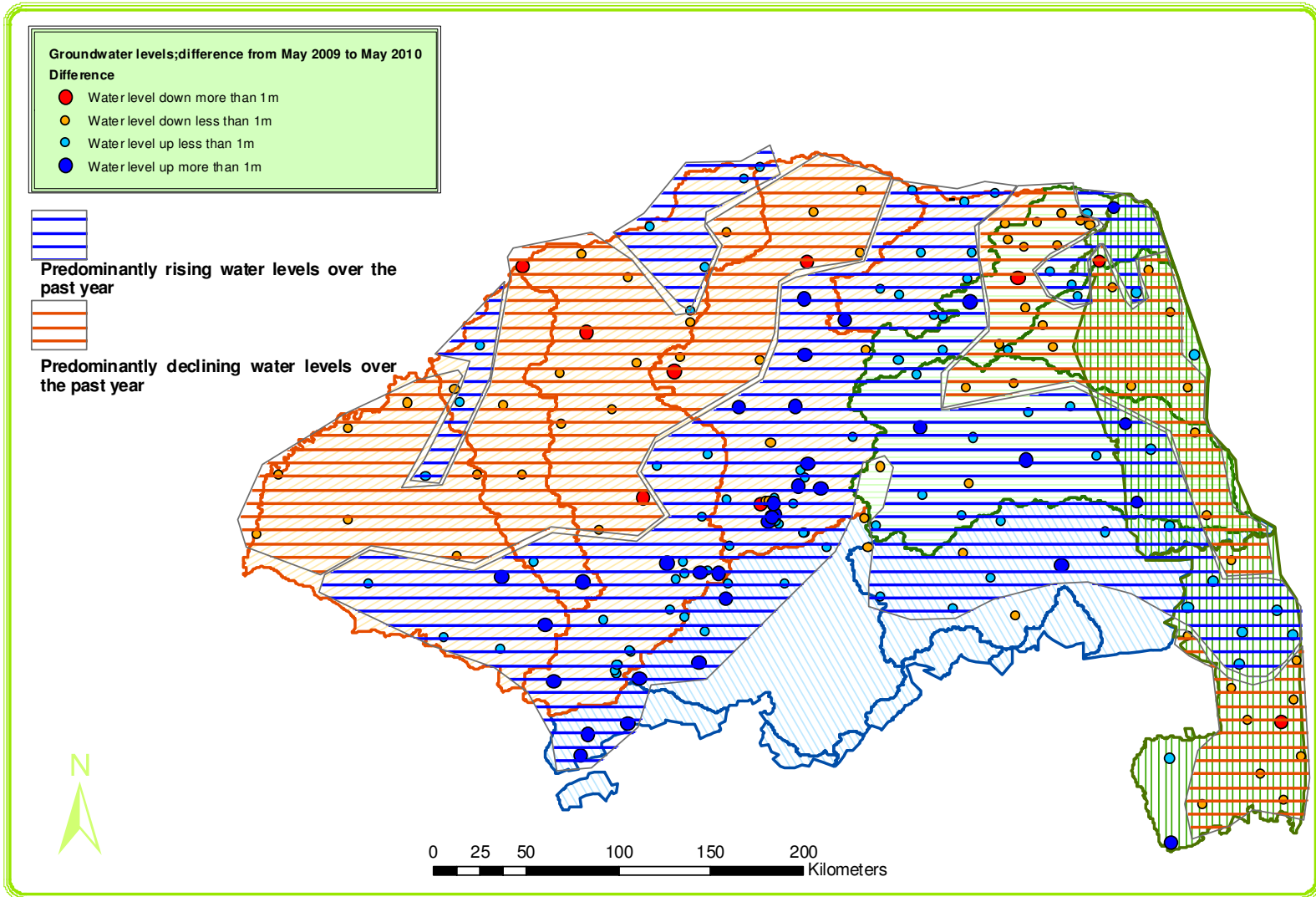
MAP 4

Fluctuations in groundwater levels, May 2009 to May 2010



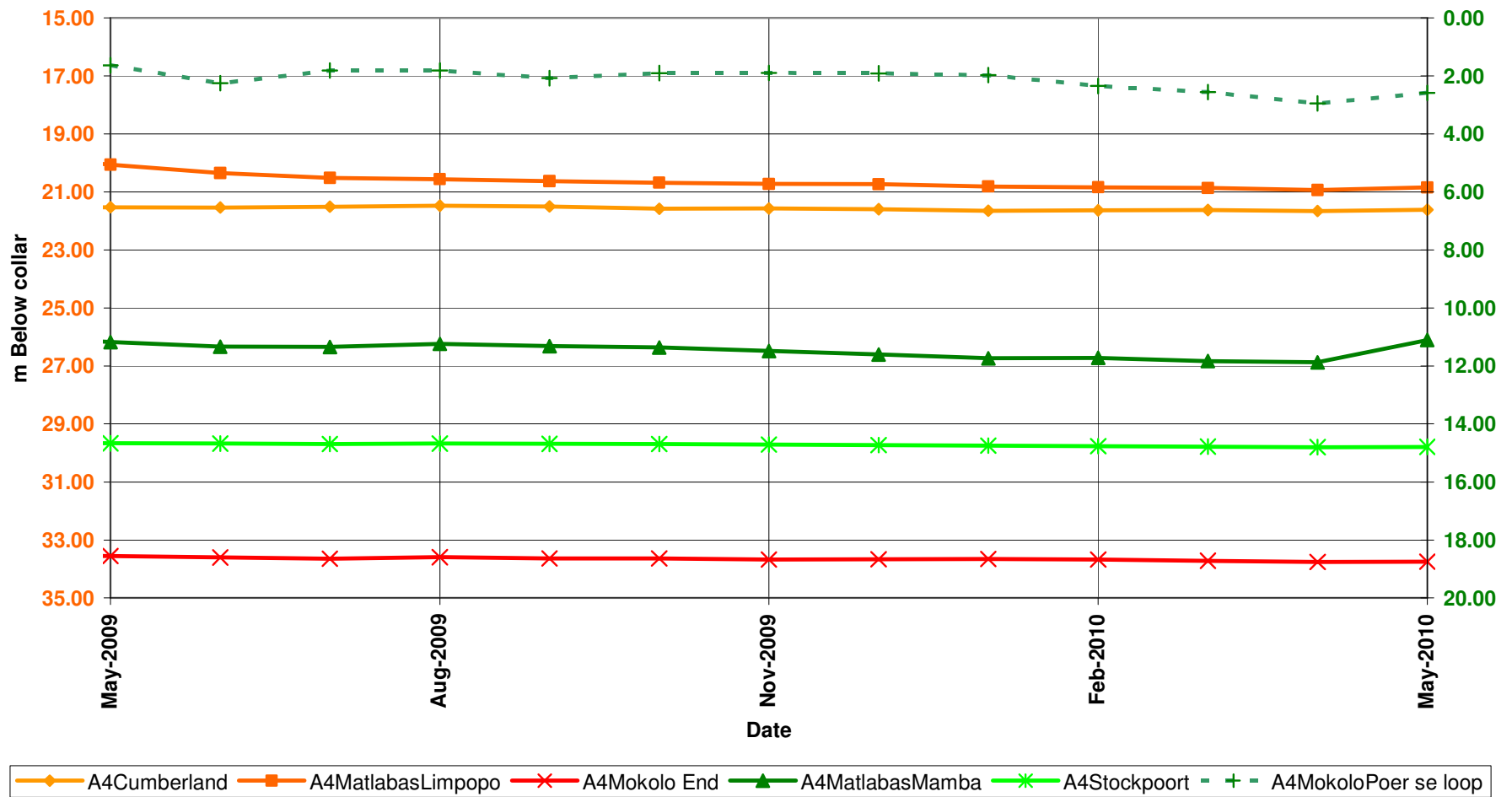
MAP 5

Patterns in groundwater level behaviour, May 2009 to May 2010



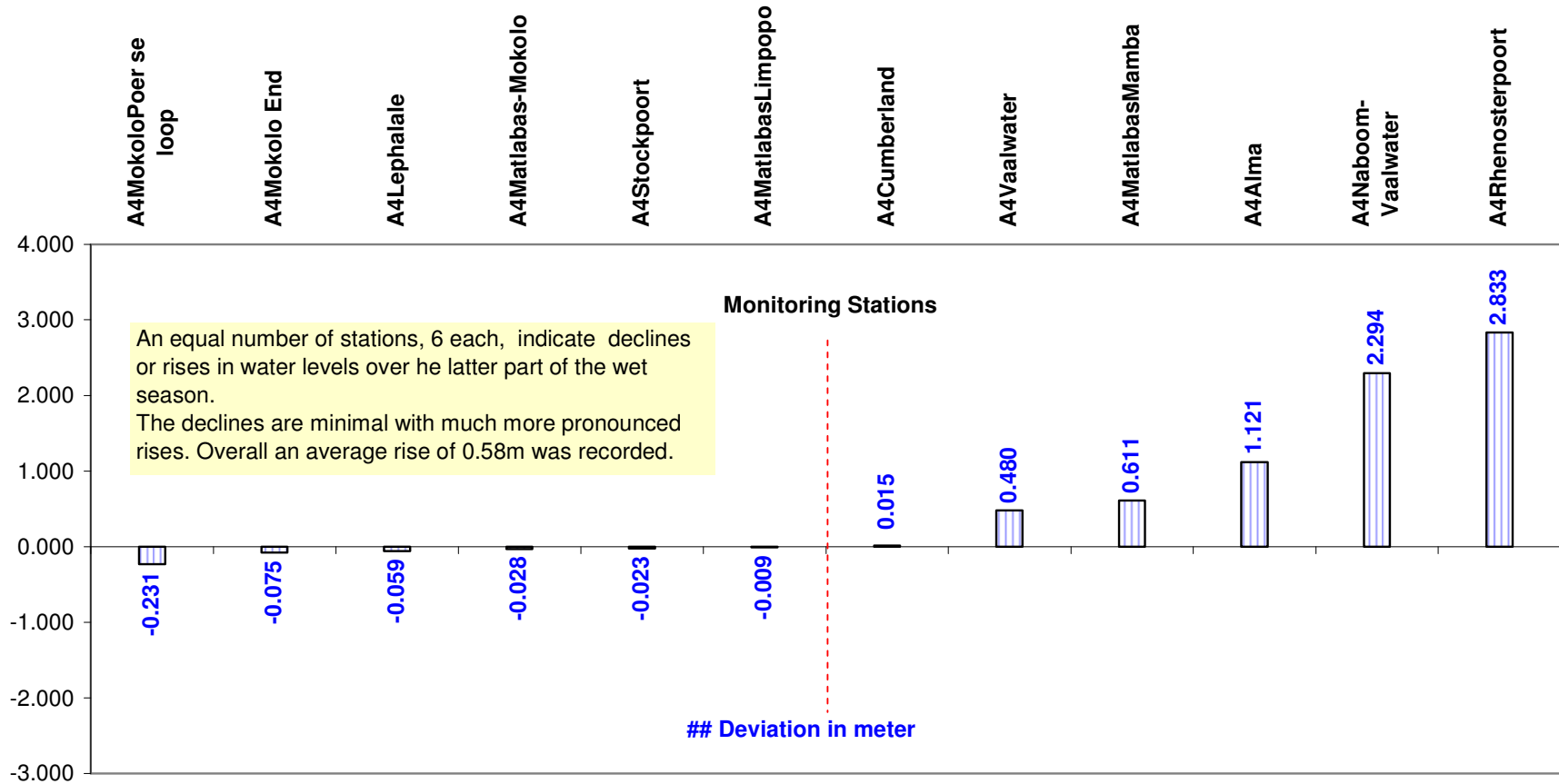
MAP 6

**Water level trend of some stations in A4 drainage:
1 May 2009 to 1 May 2010**



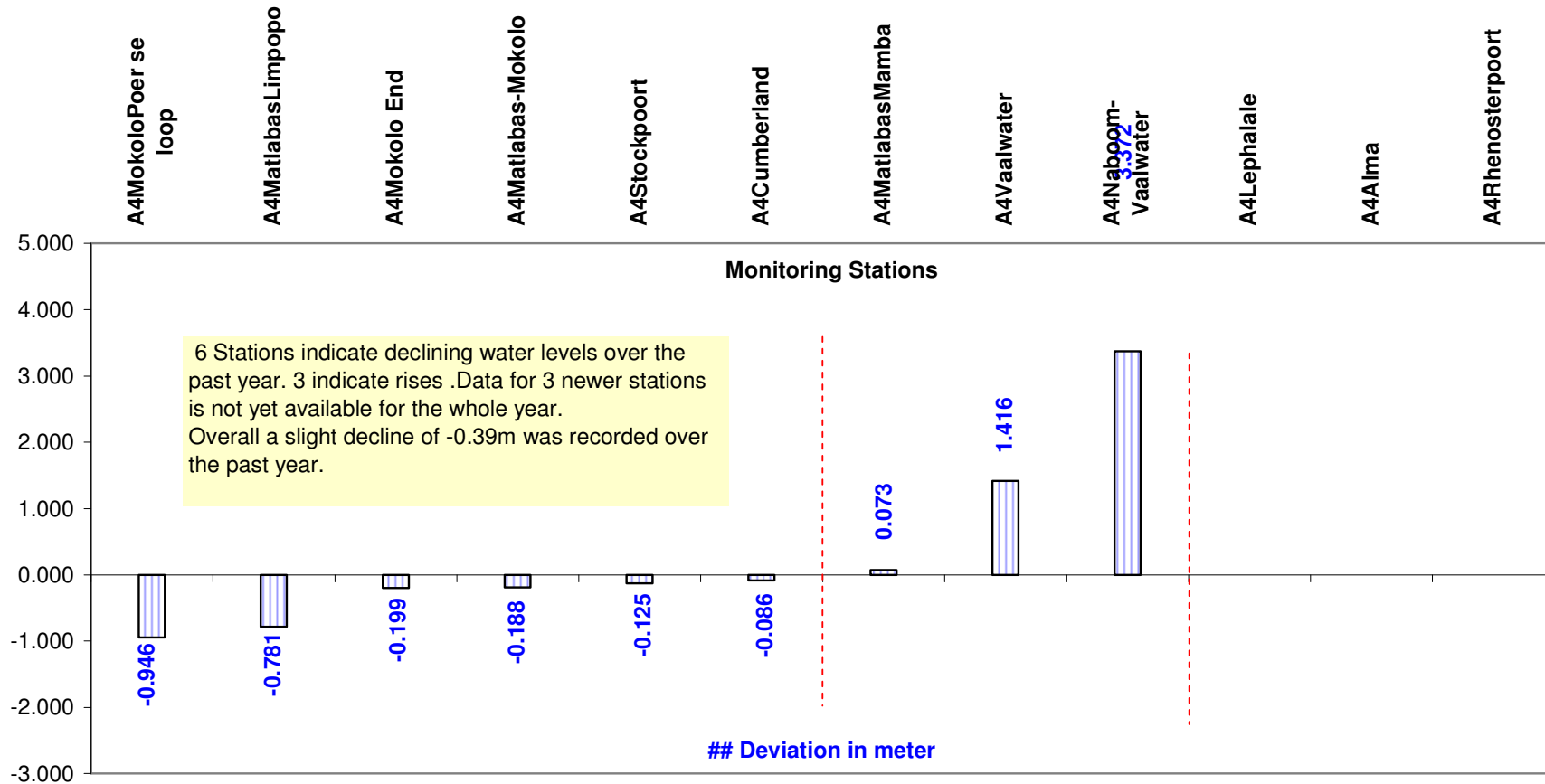
GRAPH 1

A4 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



GRAPH 2

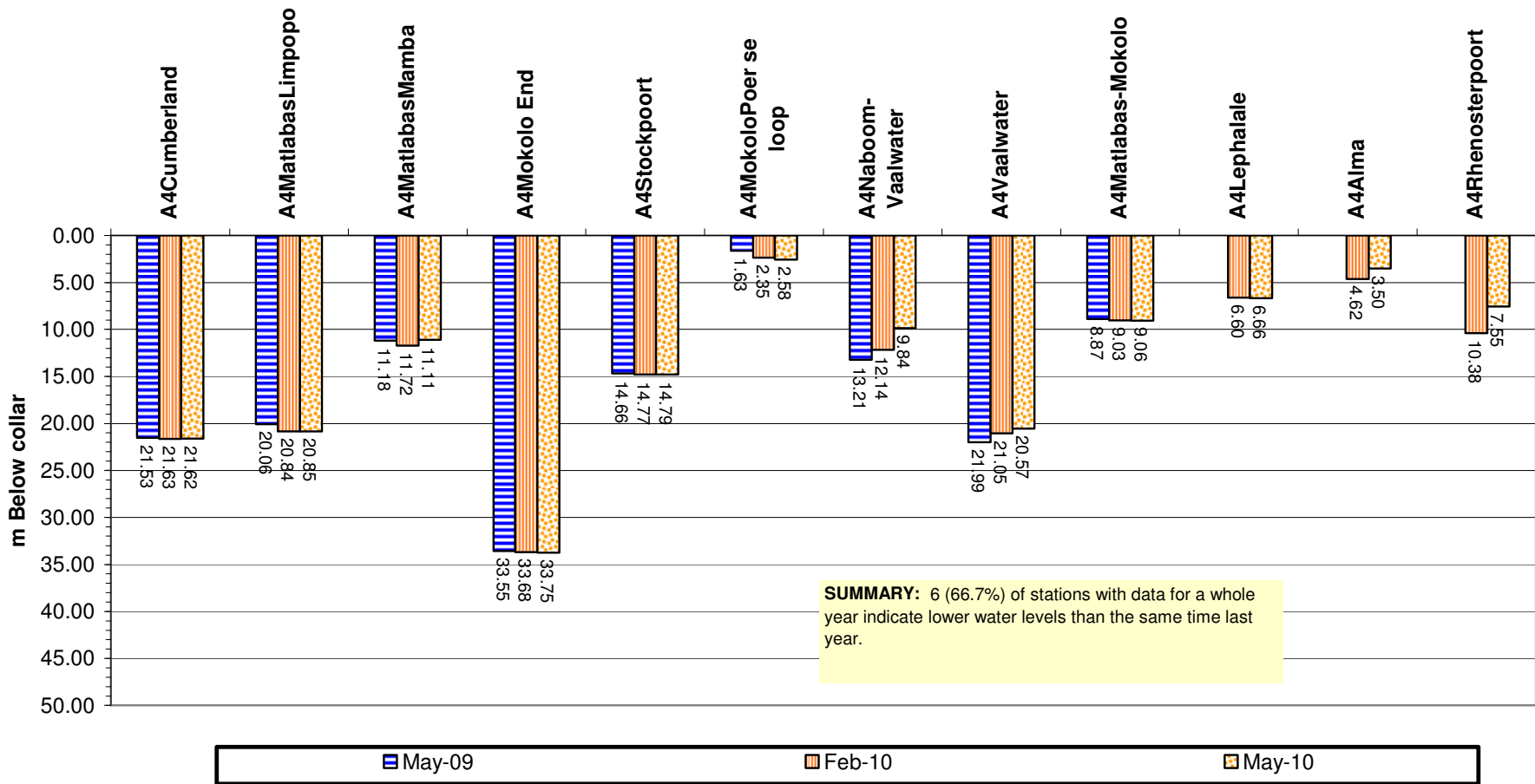
A4 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



GRAPH 3

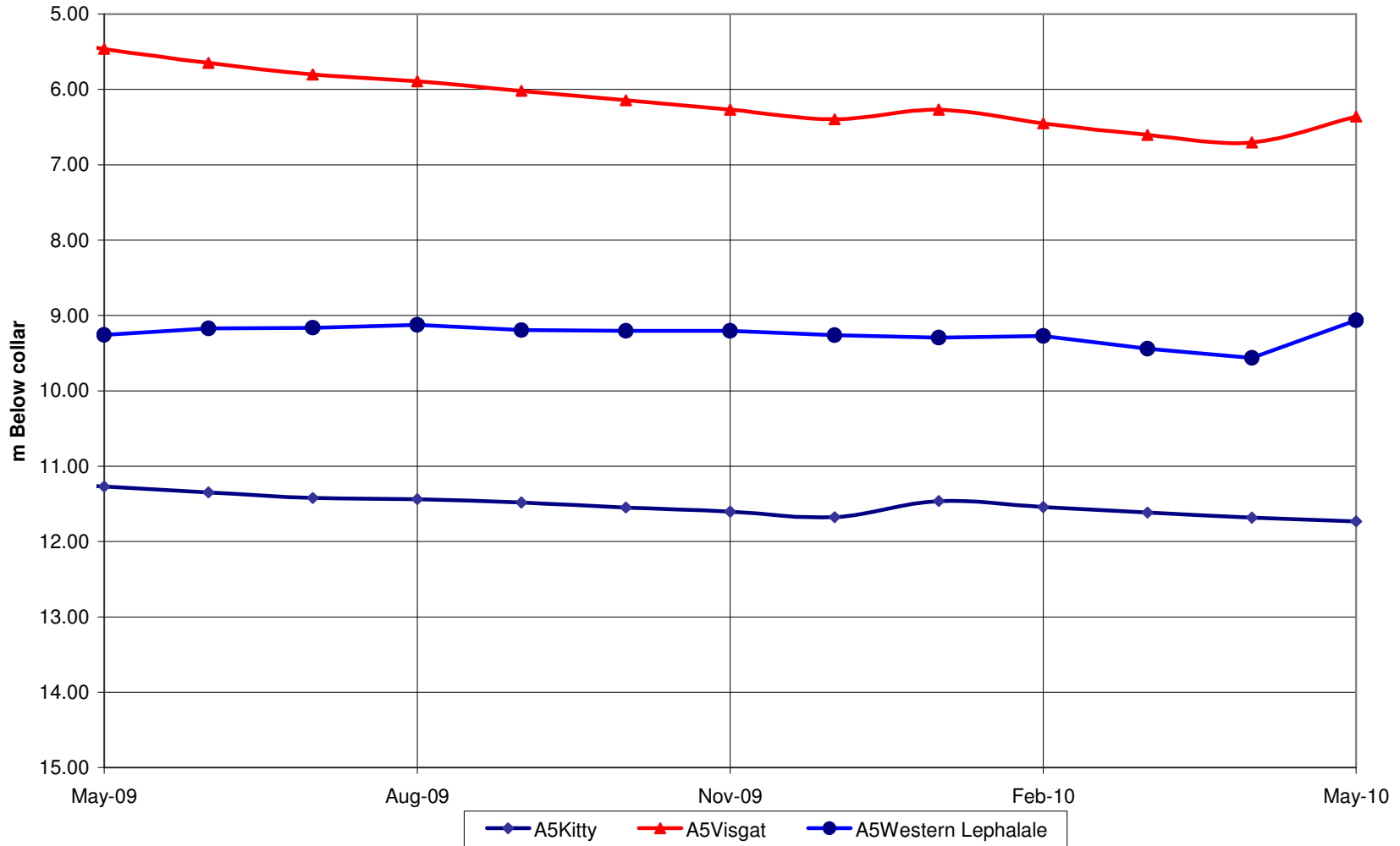
A4 DRAINAGE AREA
Comparison between water levels: 1 May 2009,
1 February 2010 and 1 May 2010

Monitoring Stations



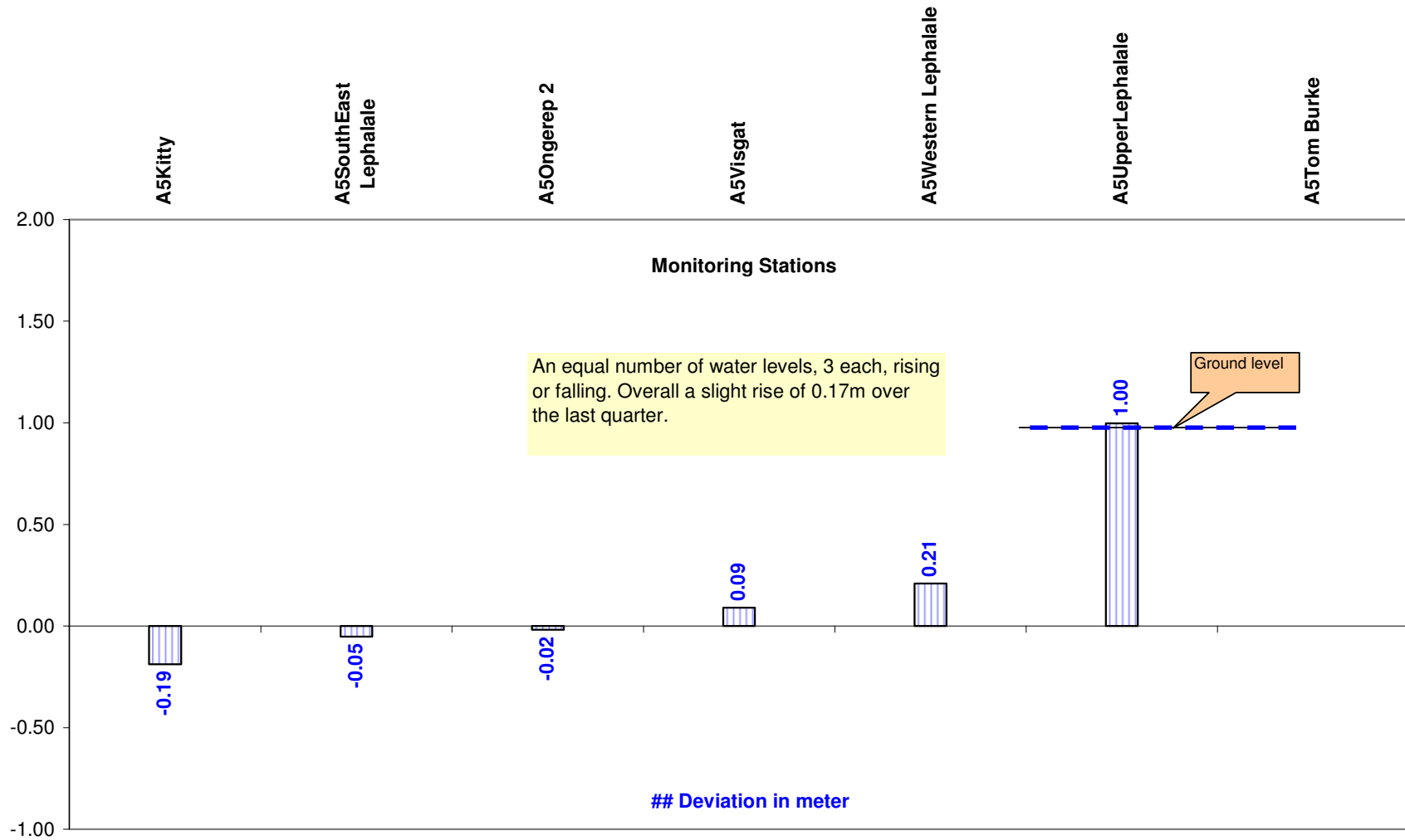
GRAPH 4

Comparison of water level trends at some stations in A5 drainage: 1 May 2009 to 1 May 2010



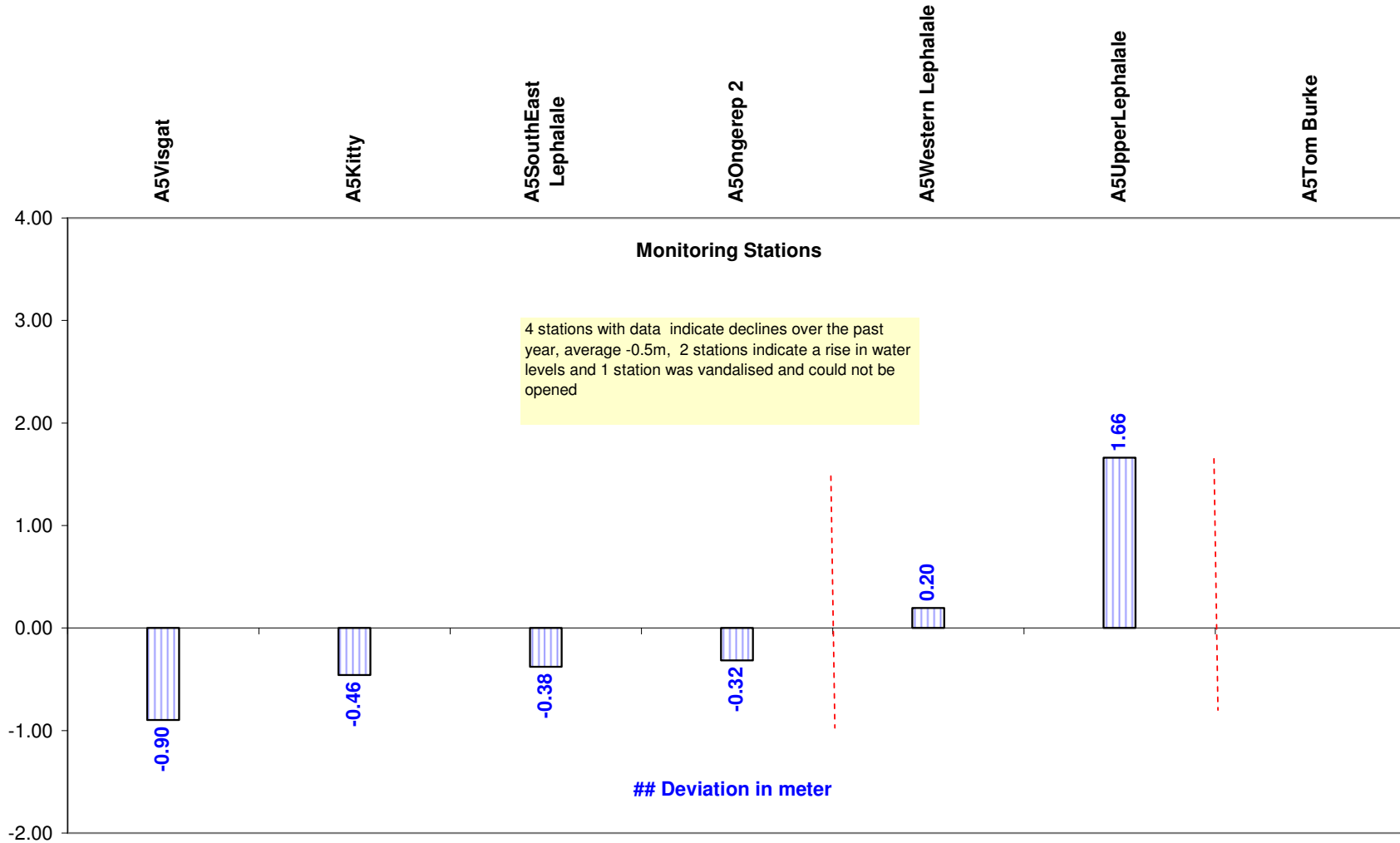
GRAPH 5

A5 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



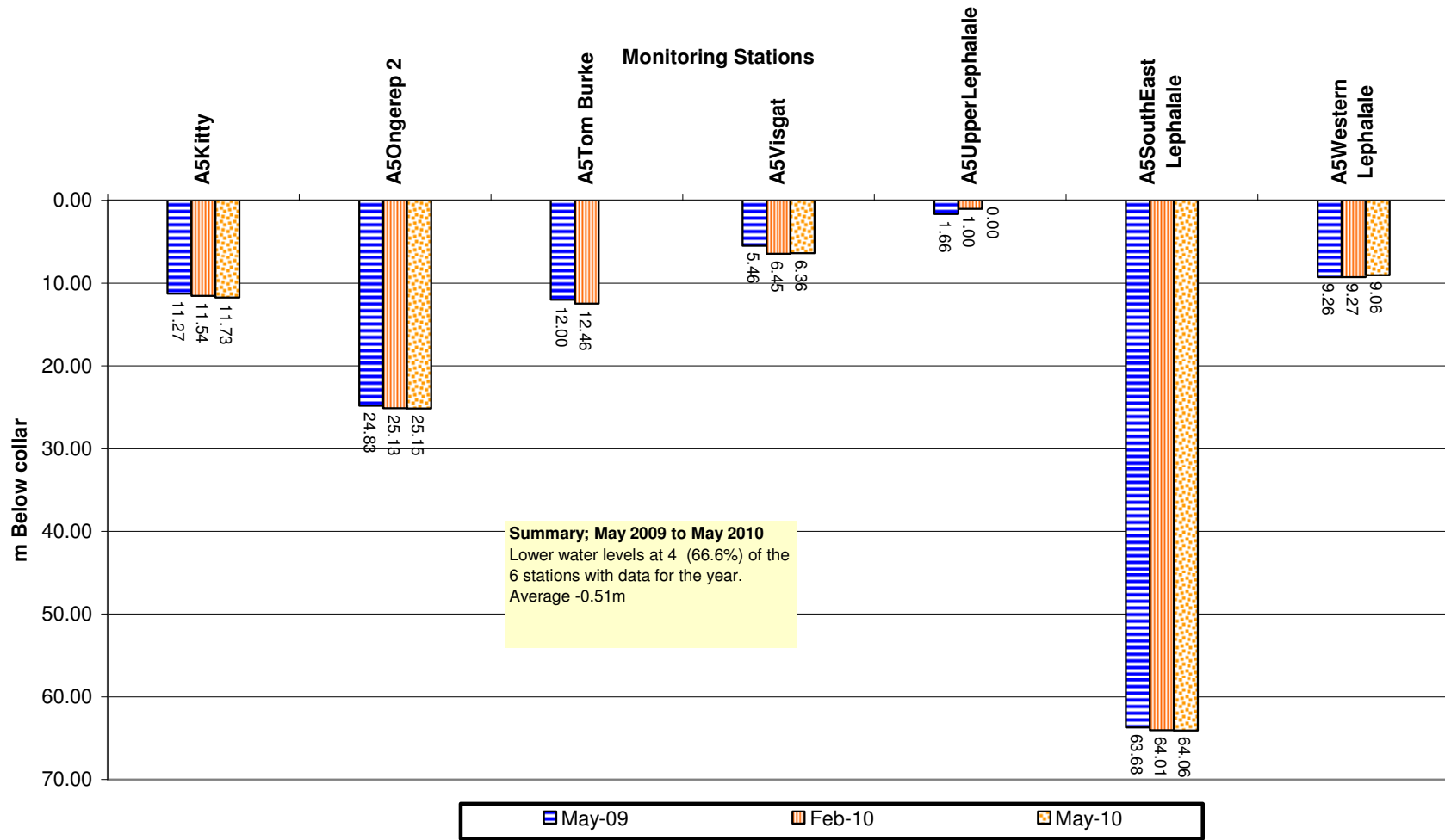
GRAPH 6

A5 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



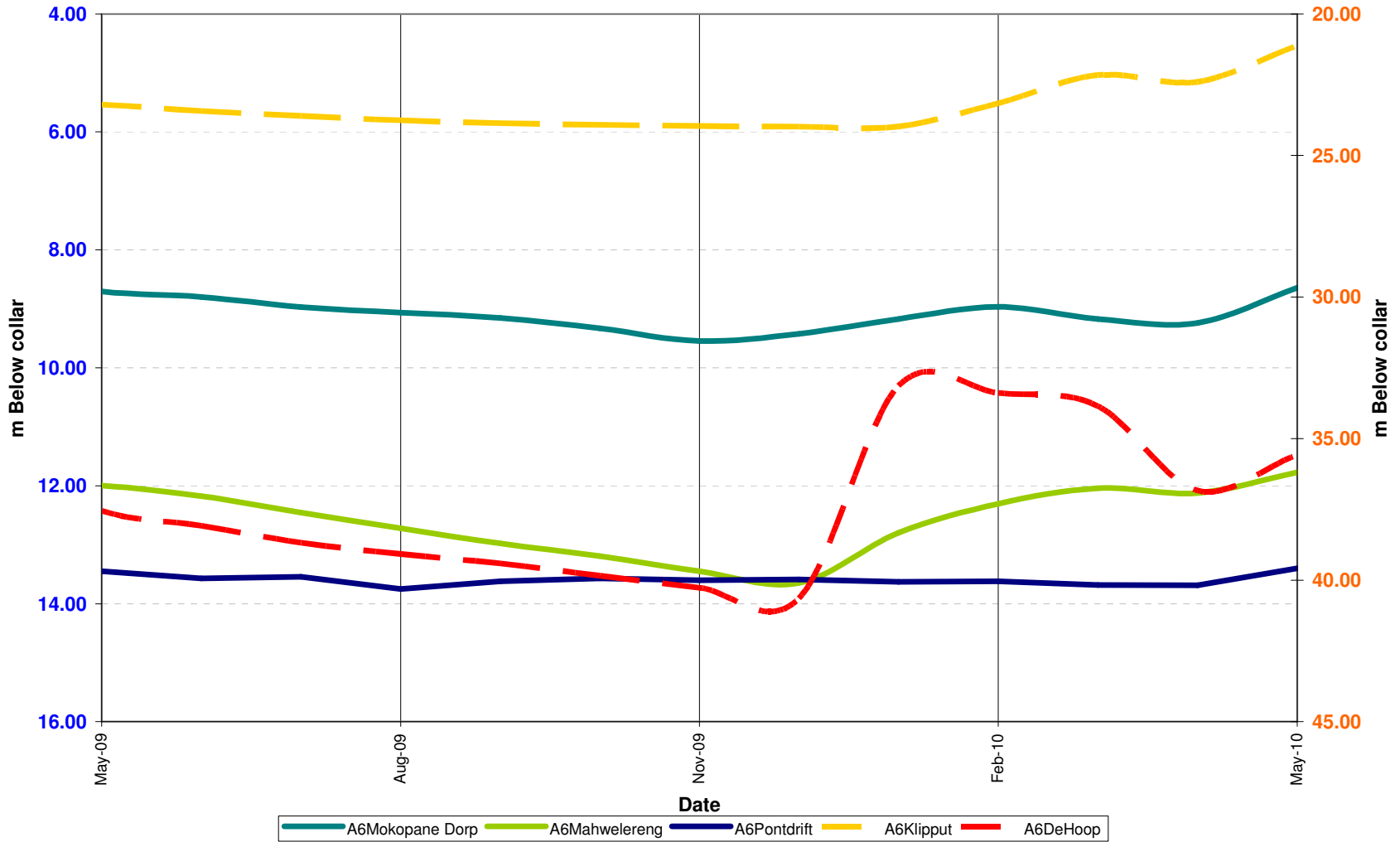
GRAPH 7

A5 DRAINAGE AREA
Comparison between water level depths : 1 May 2009,
1 February 2010 and 1 May 2010



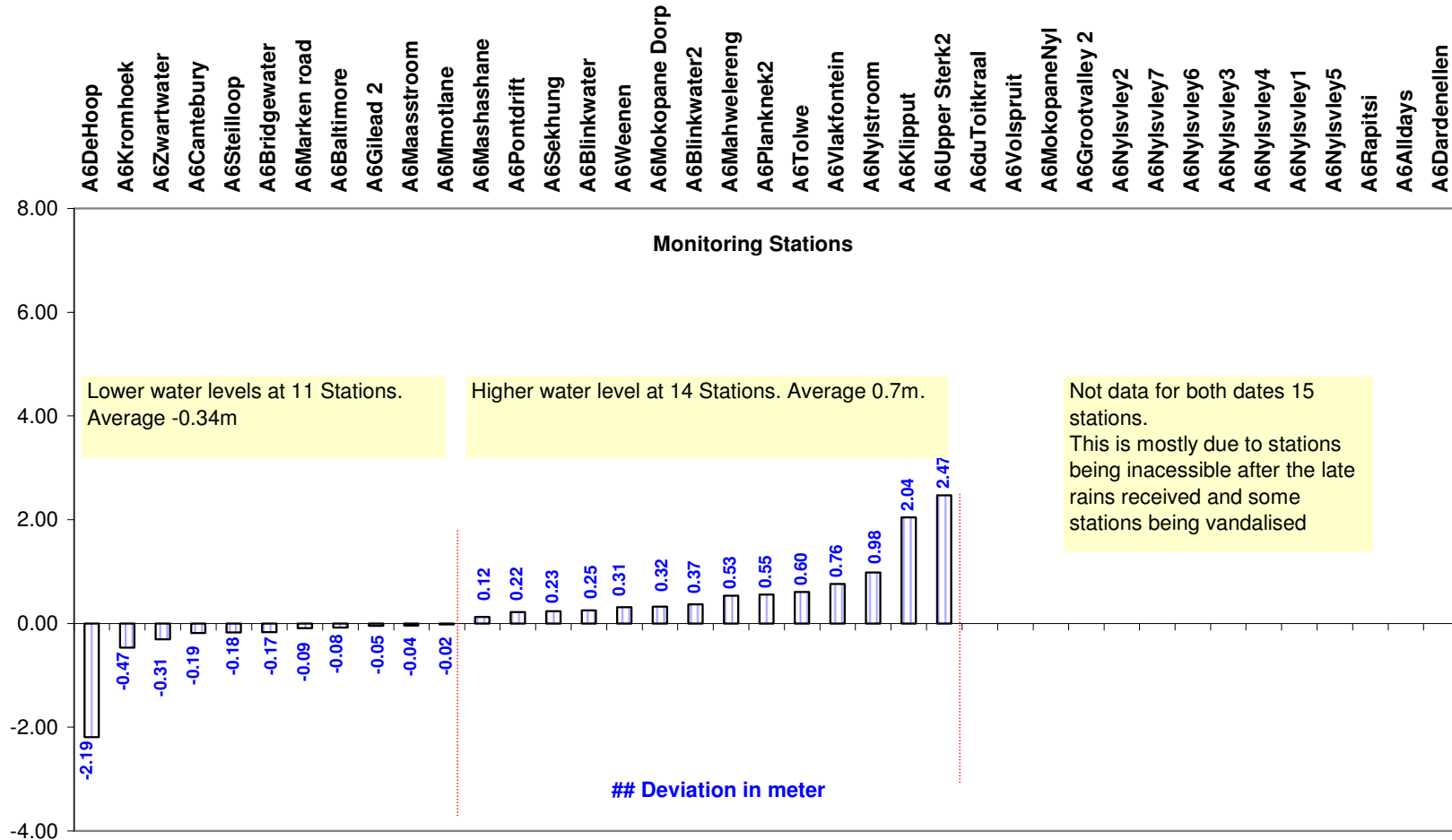
GRAPH 8

Comparison of water level trends at some stations in A6 drainage: 1 May 2009 to 1 May 2010



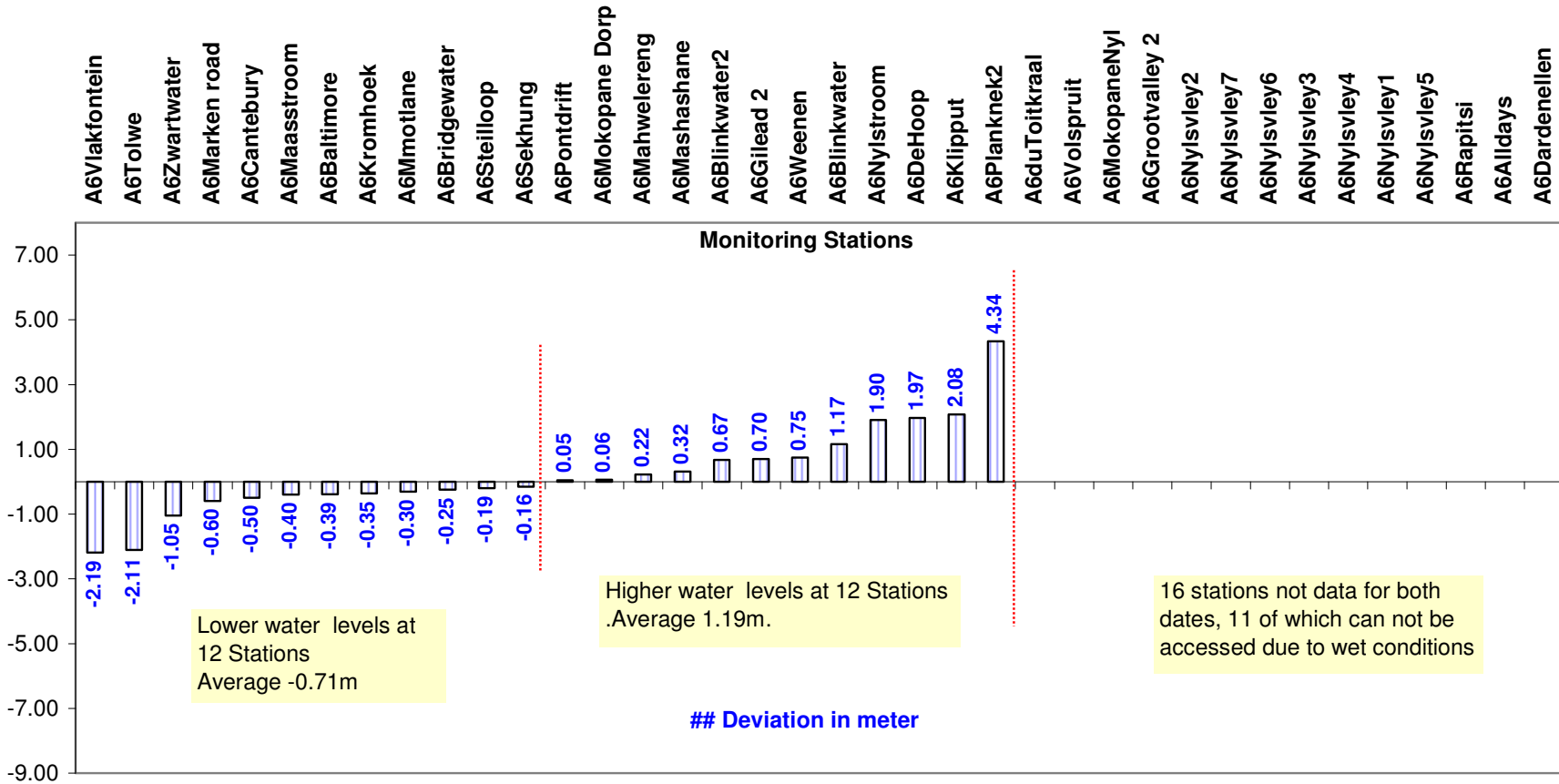
GRAPH 9

A6 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



GRAPH 10

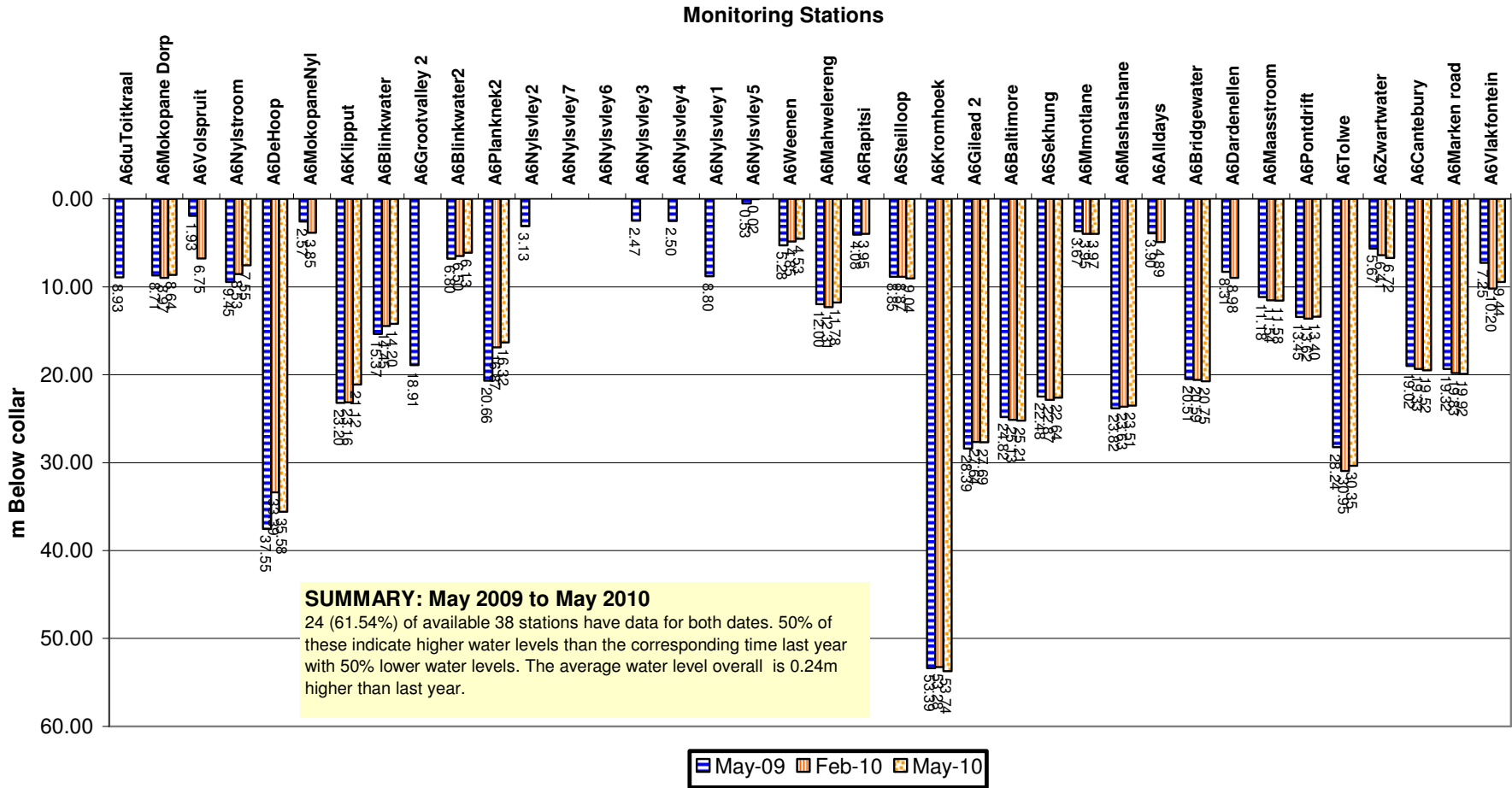
A6 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



GRAPH 11

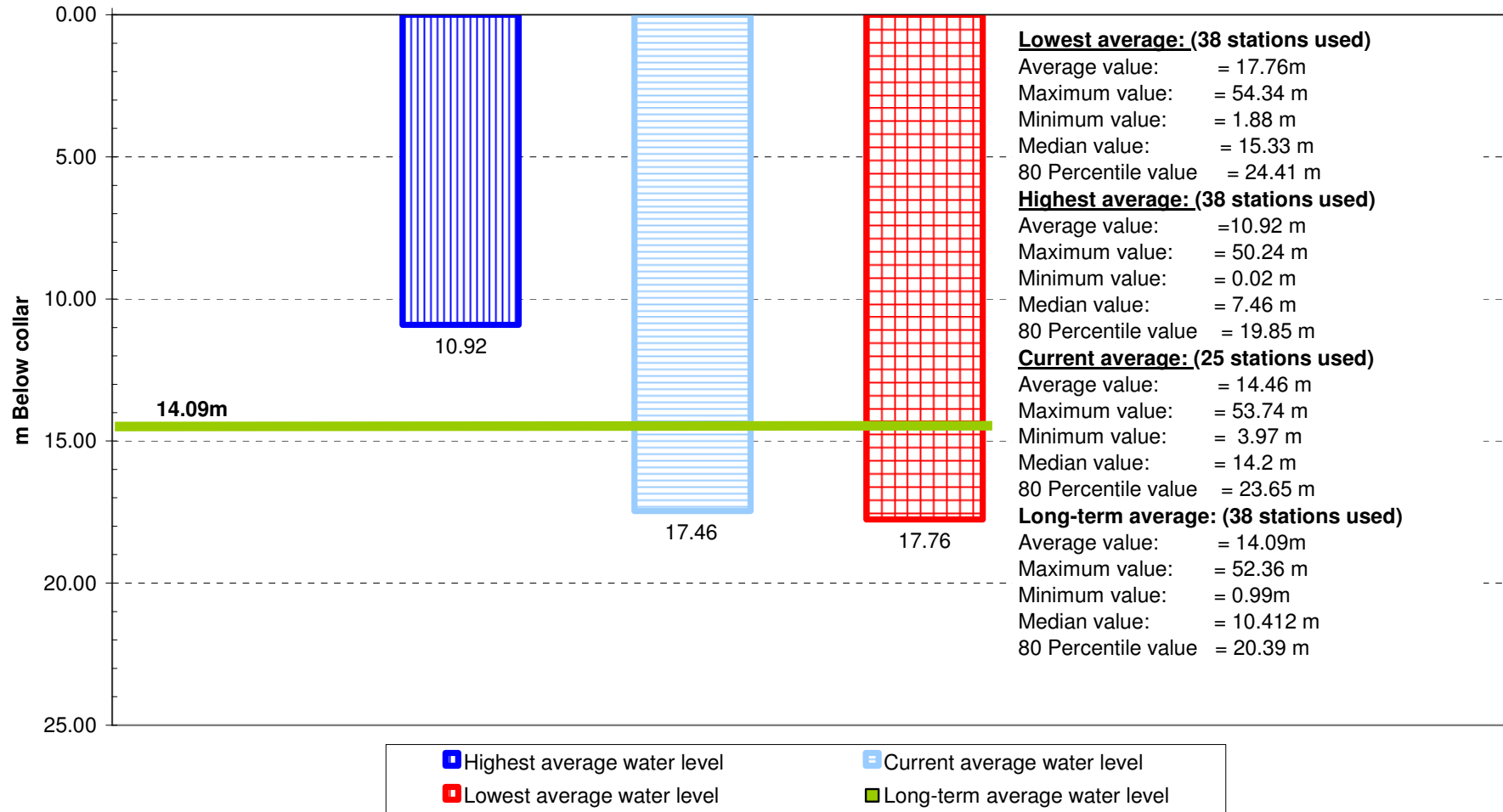
A6 DRAINAGE AREA

Comparison between water level depths: 1 May 2009, 1 February 2010, and 1 May 2010



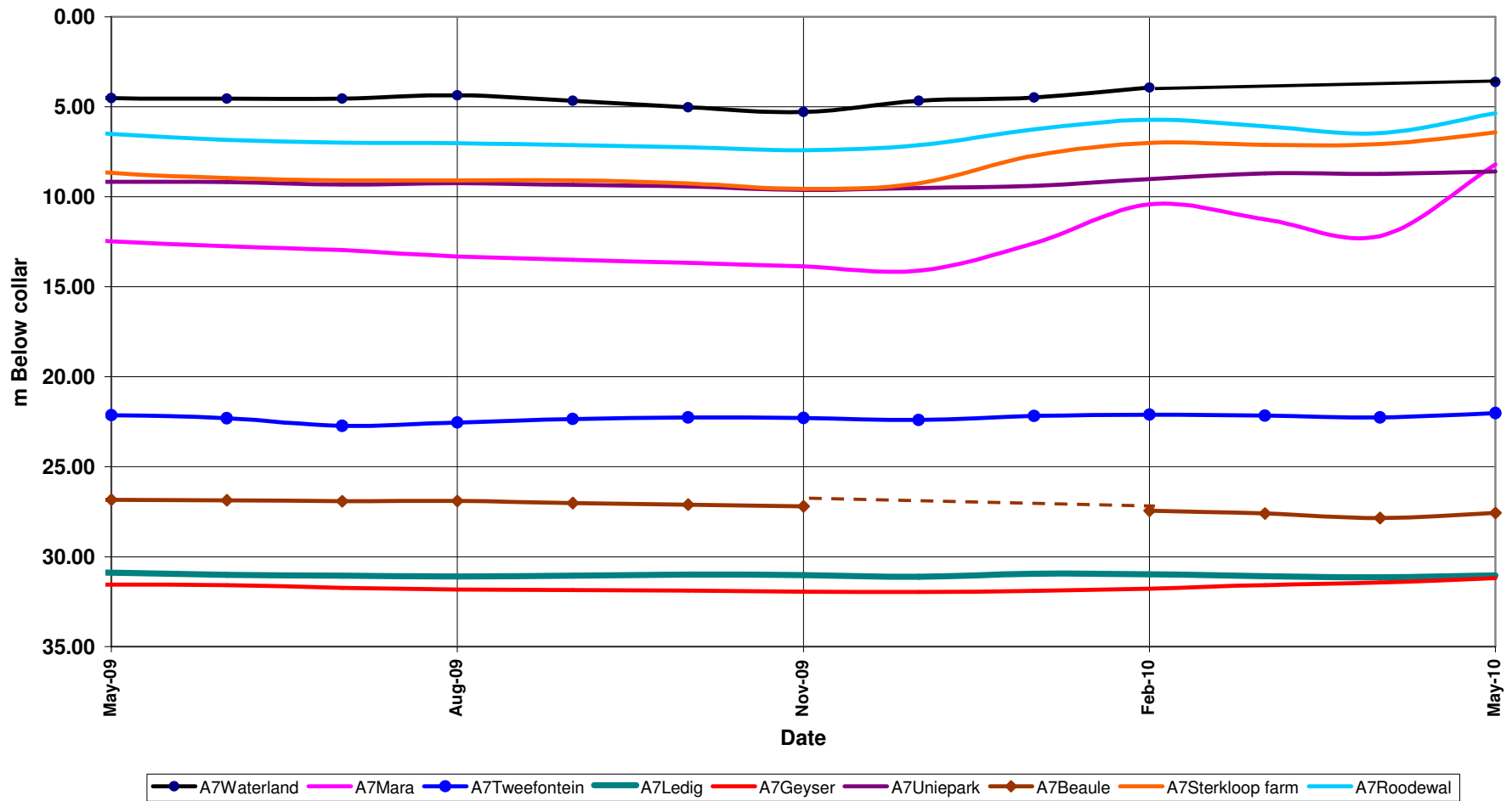
GRAPH 12

A6 DRAINAGE AREA
Comparison of average current water level depths with highest, lowest & long-term average water level depths recorded



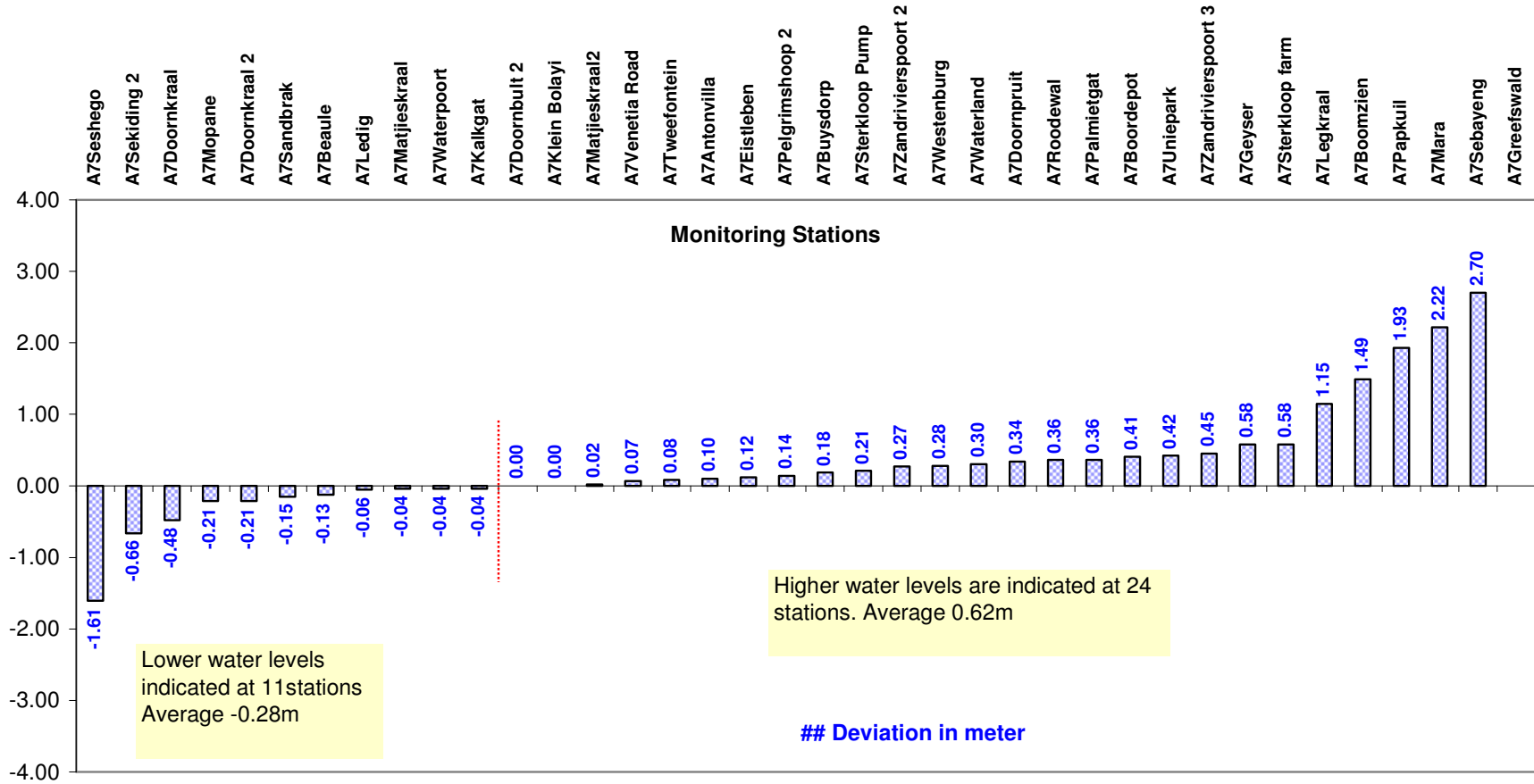
GRAPH 13

Comparison of water level trends at some stations in A7 drainage:
1 May 2009 to 1 May 2010



GRAPH 14

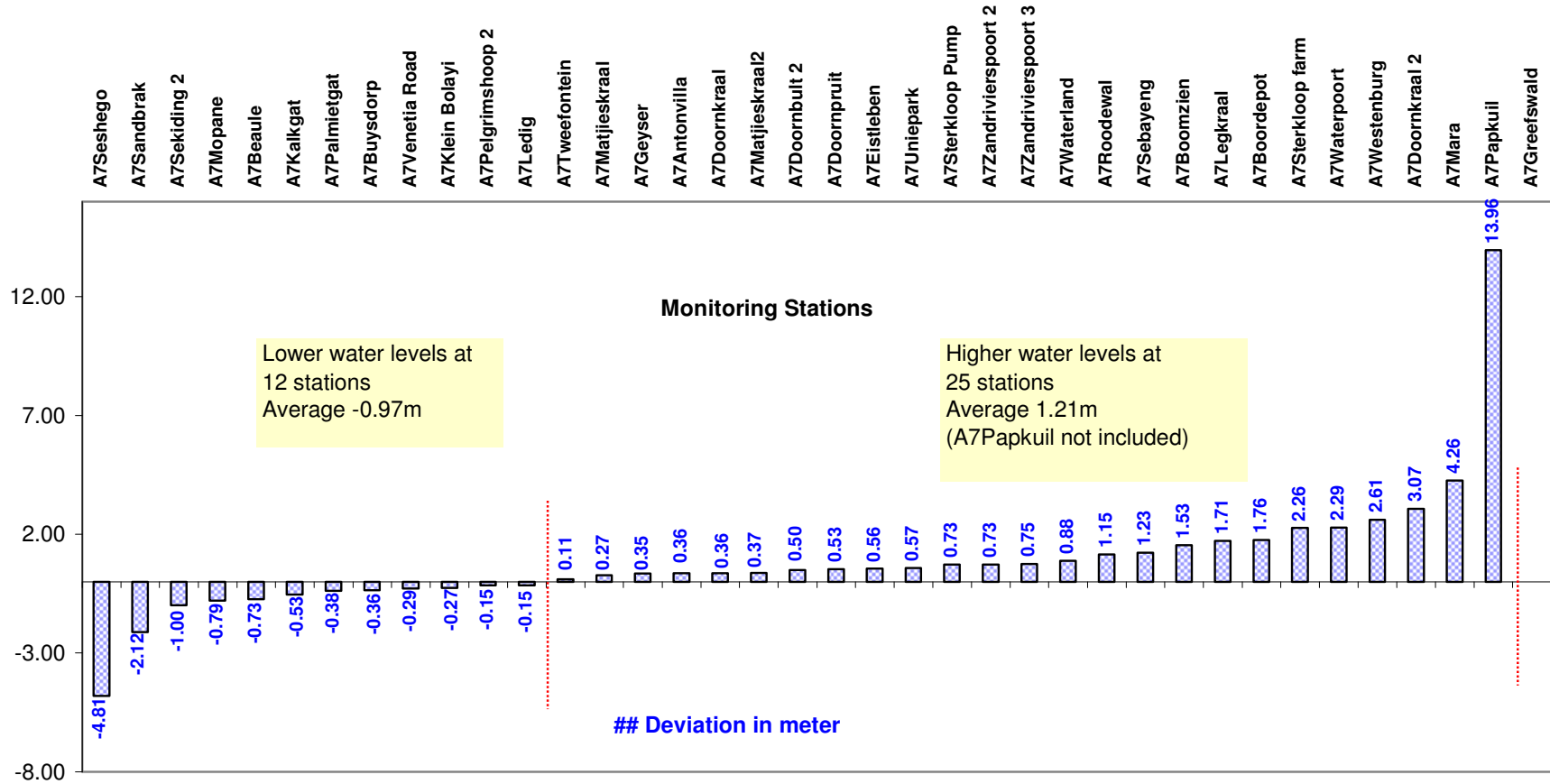
A7 DRAINAGE AREA
Deviation of water level depths: 1 February 2010
to 1 May 2010



GRAPH 15

A7 DRAINAGE AREA

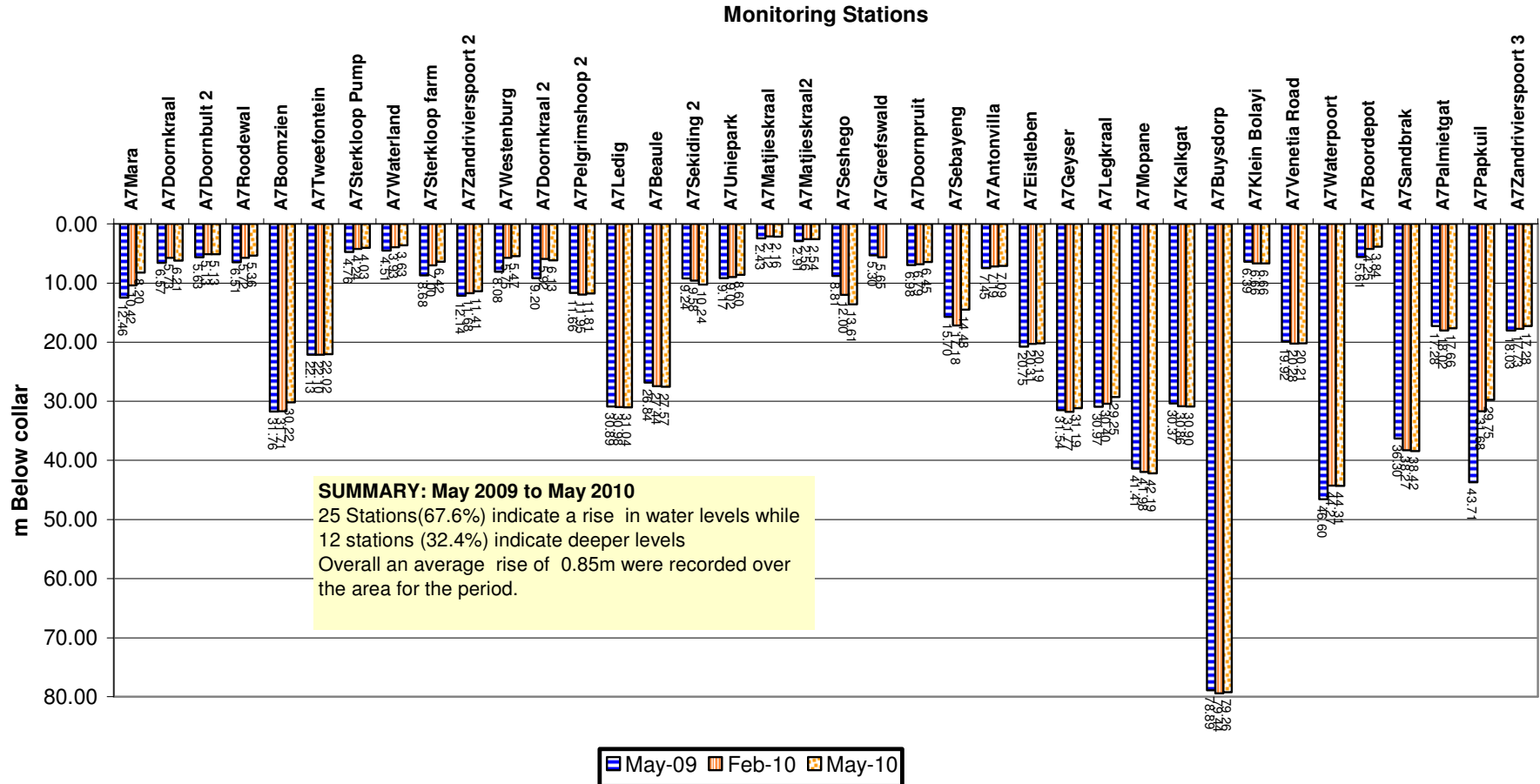
Deviation of water level depths: 1 May 2009 to 1 May 2010



GRAPH 16

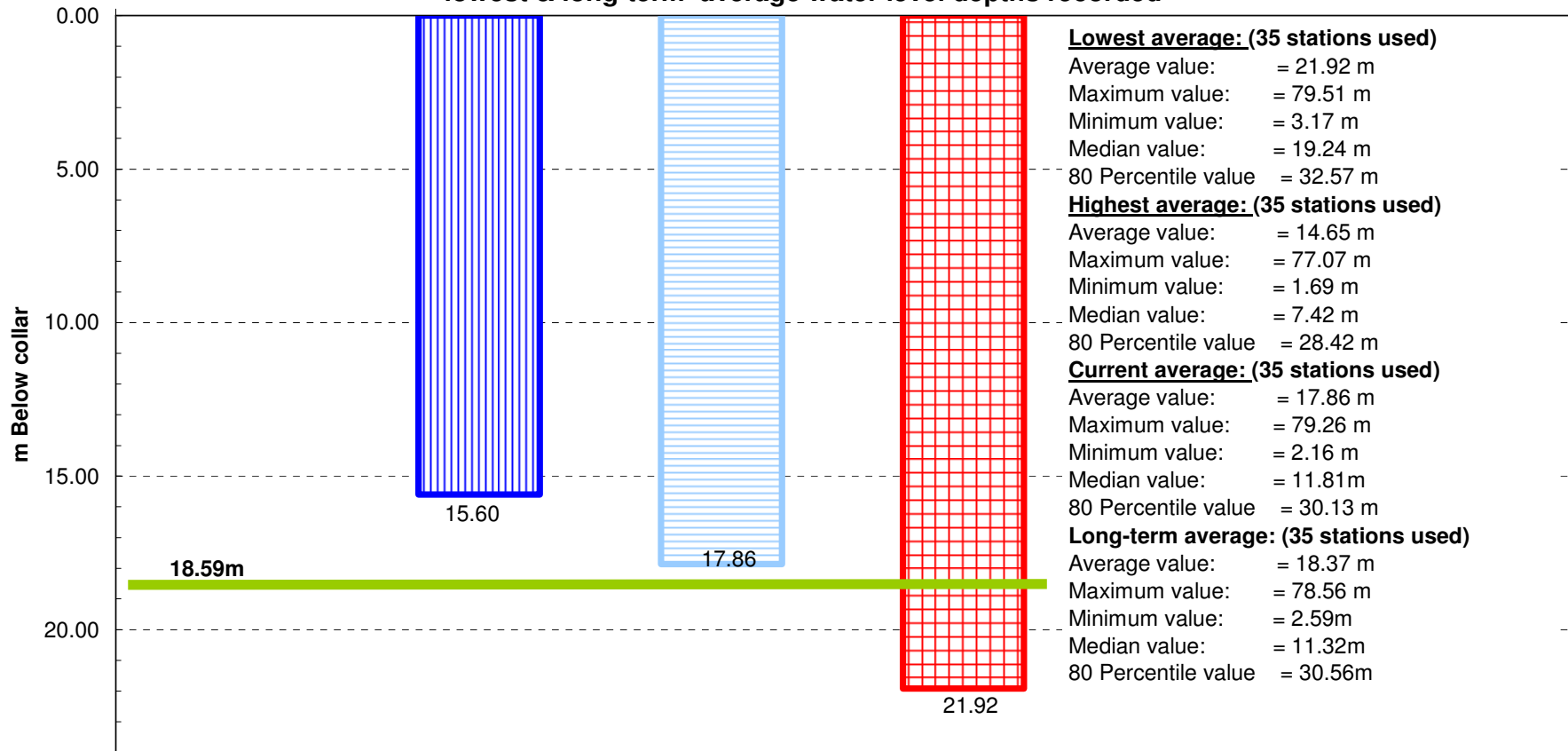
A7 DRAINAGE AREA

Comparison between water level depths: 1 May 2009, 1 February 2010 and 1 May 2010



GRAPH 17

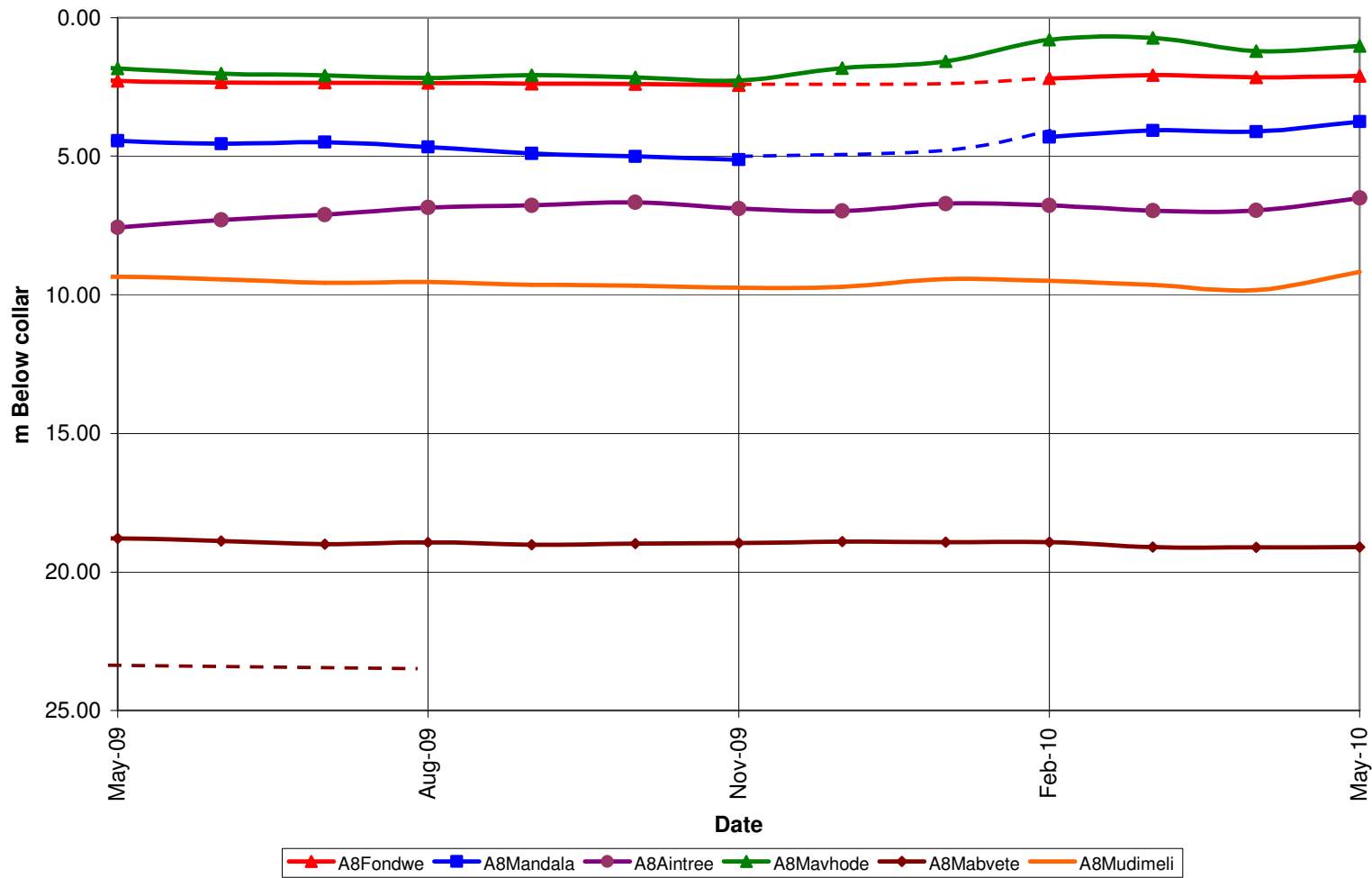
A7 DRAINAGE AREA
Comparison of average current water level depth with highest, lowest & long-term average water level depths recorded



■ Highest average water level ■ Current Average water level
■ Lowest average water level ■ Long-term average water level

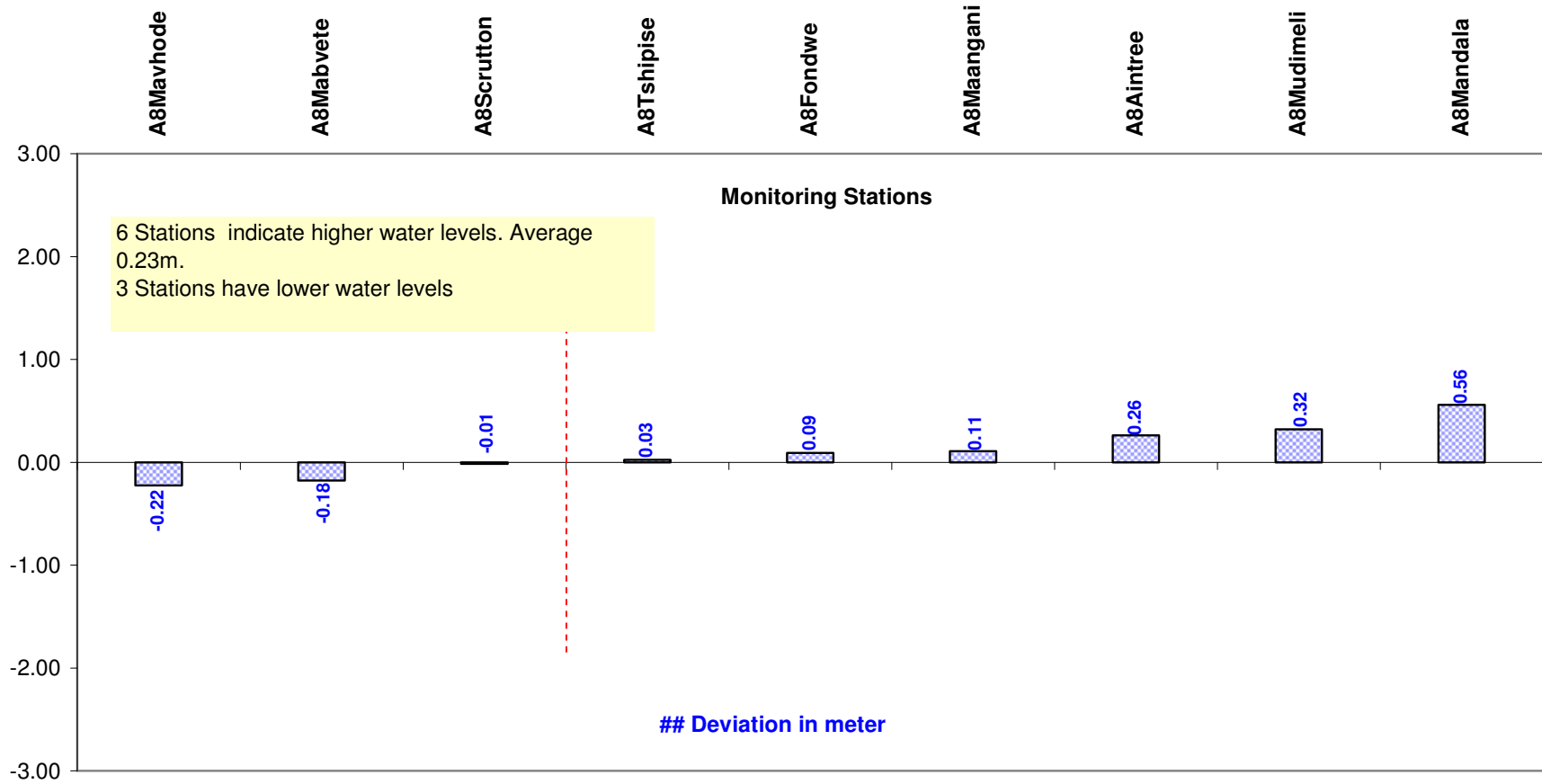
GRAPH 18

Comparison of water level trends at some stations in A8 drainage:
1 May 2009 to 1 May 2010



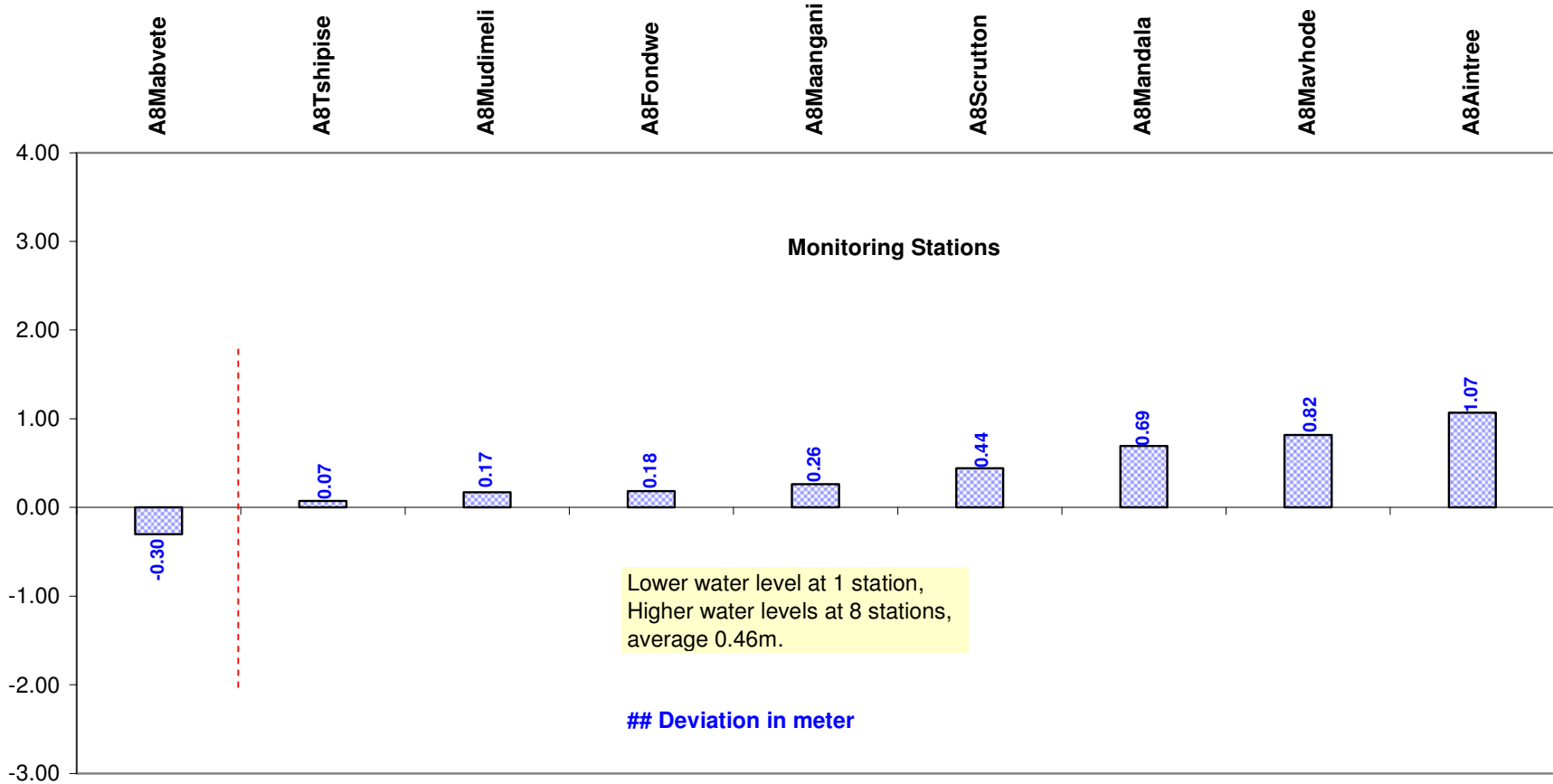
GRAPH 19

A8 DRAINAGE AREA
Deviation of water level depths: 1 February 2010 to 1 May 2010



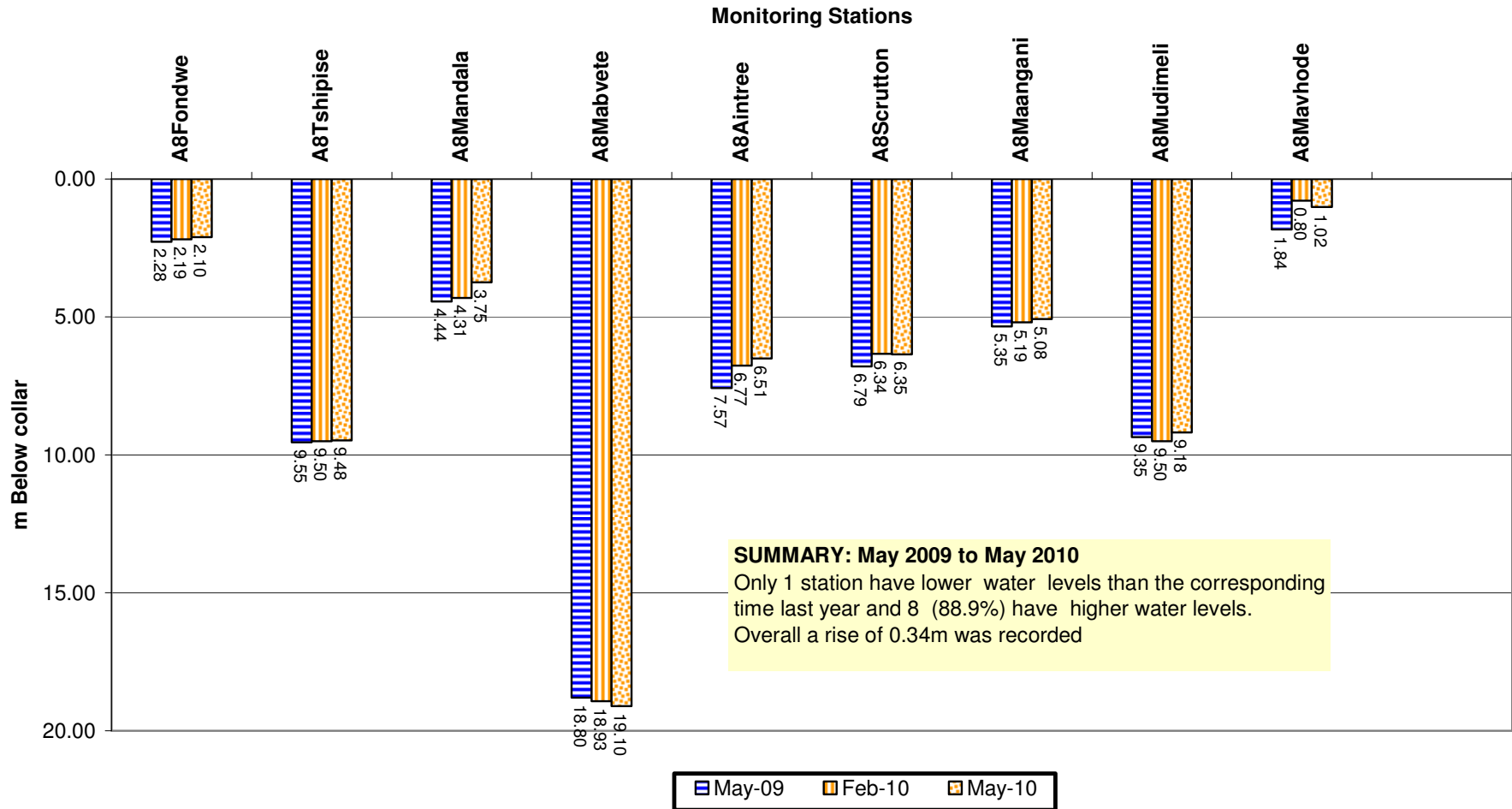
GRAPH 20

A8 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



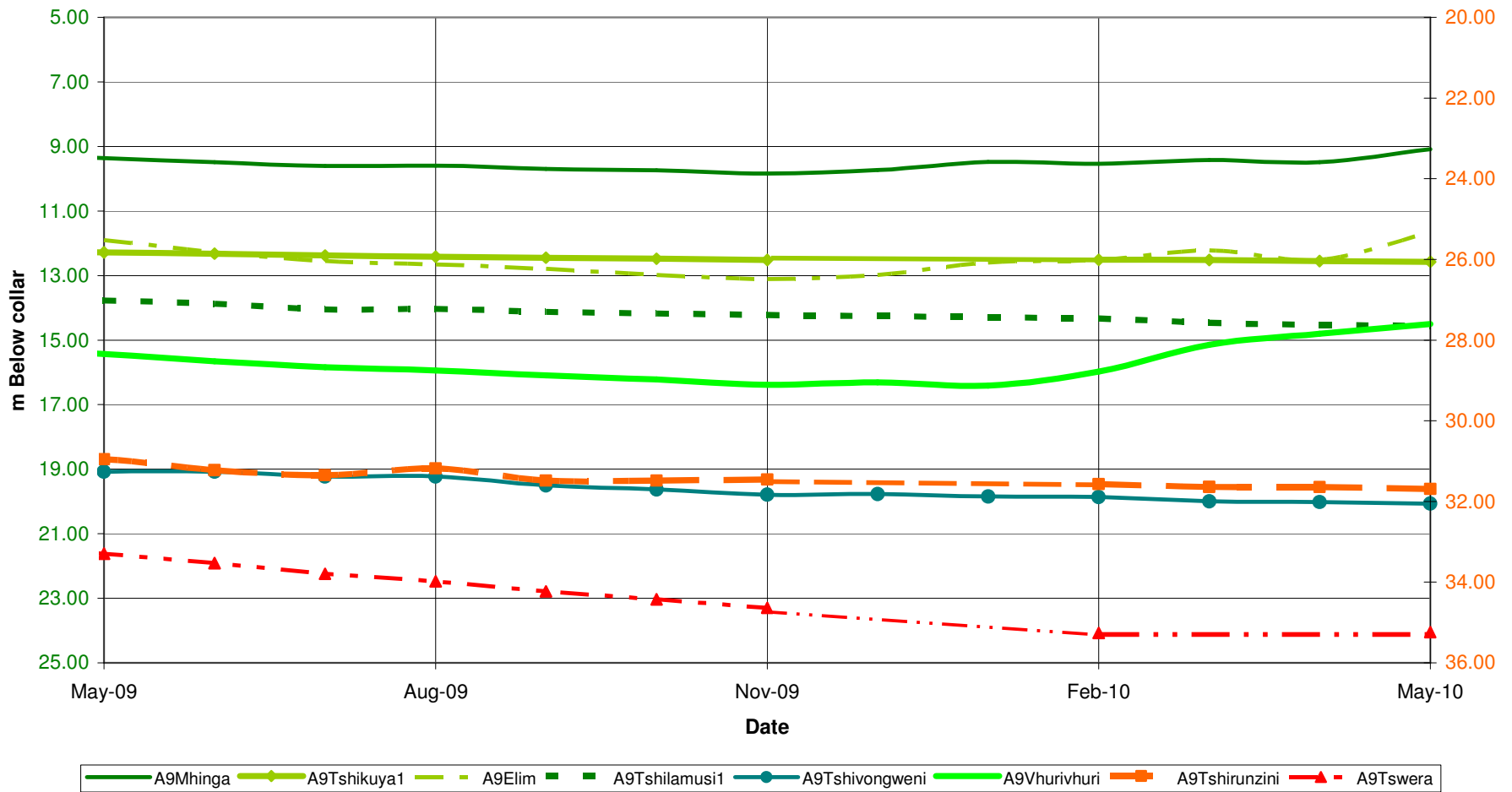
GRAPH 21

A8 DRAINAGE AREA
Comparison between water level depths: 1 May 2009,
1 February 2010 and 1 May 2010



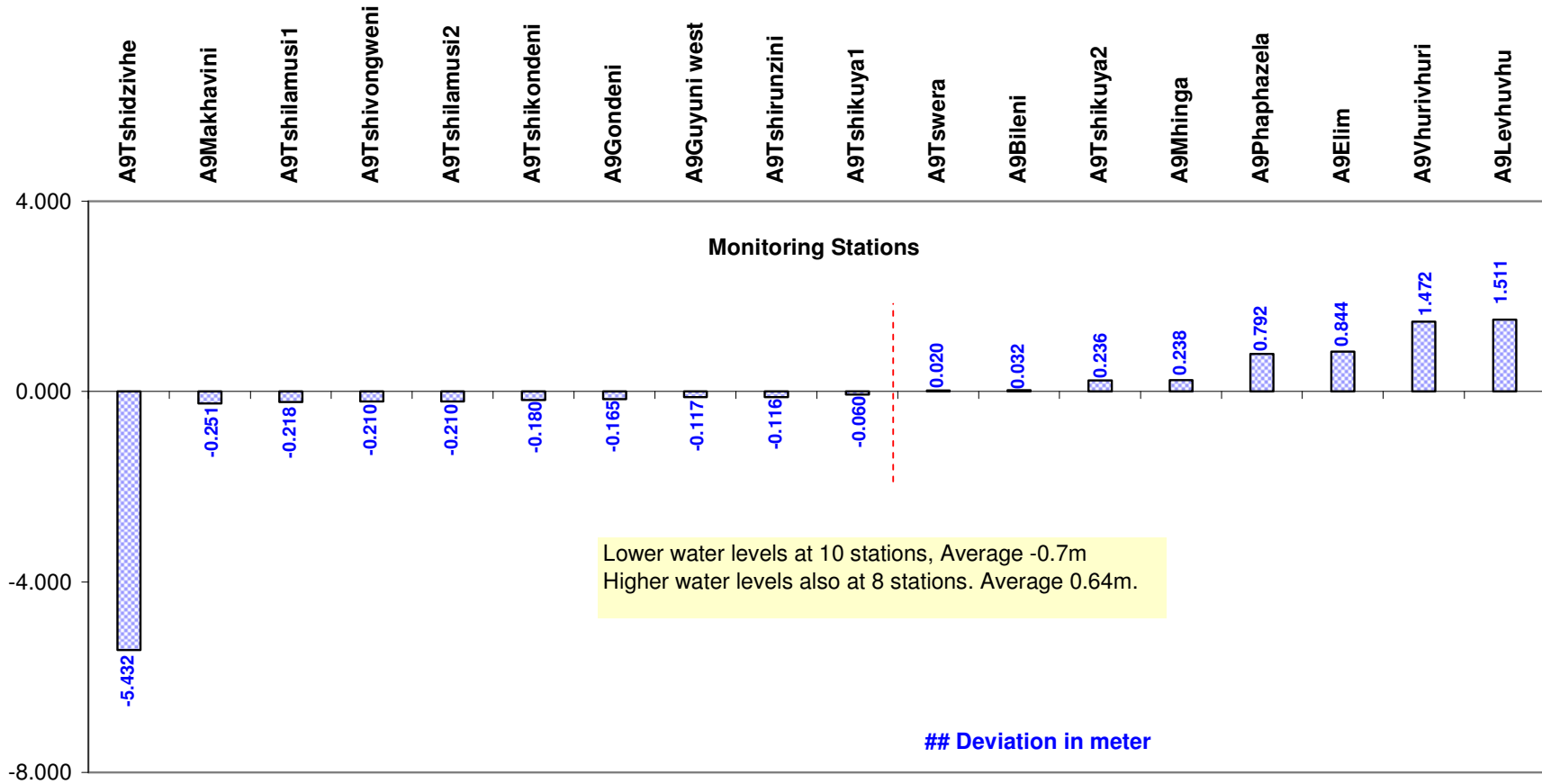
GRAPH 22

**Comparison of water level trends at some stations in A9 drainage :
1 May 2009 to 1 May 2010**



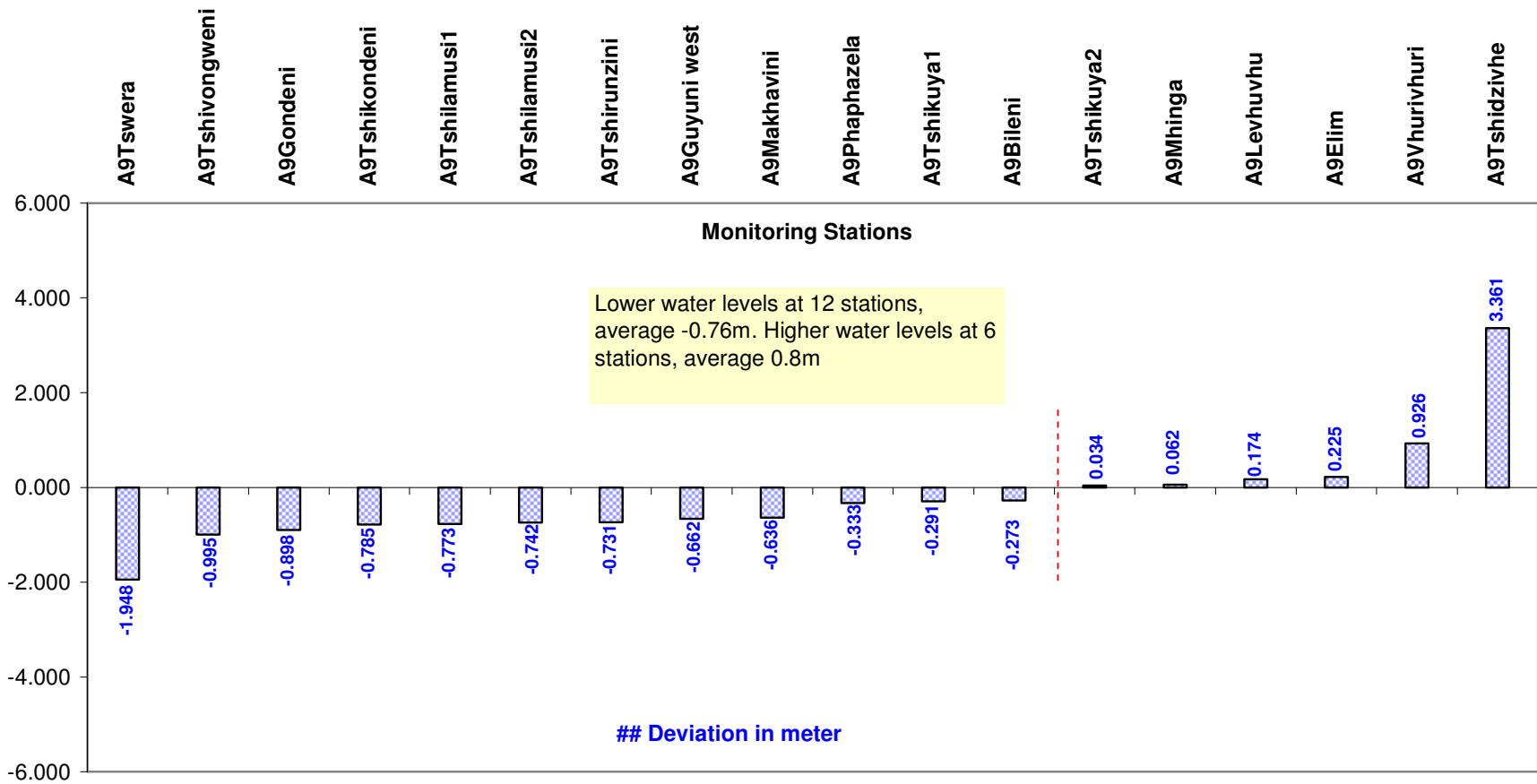
GRAPH 23

A9 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



GRAPH 24

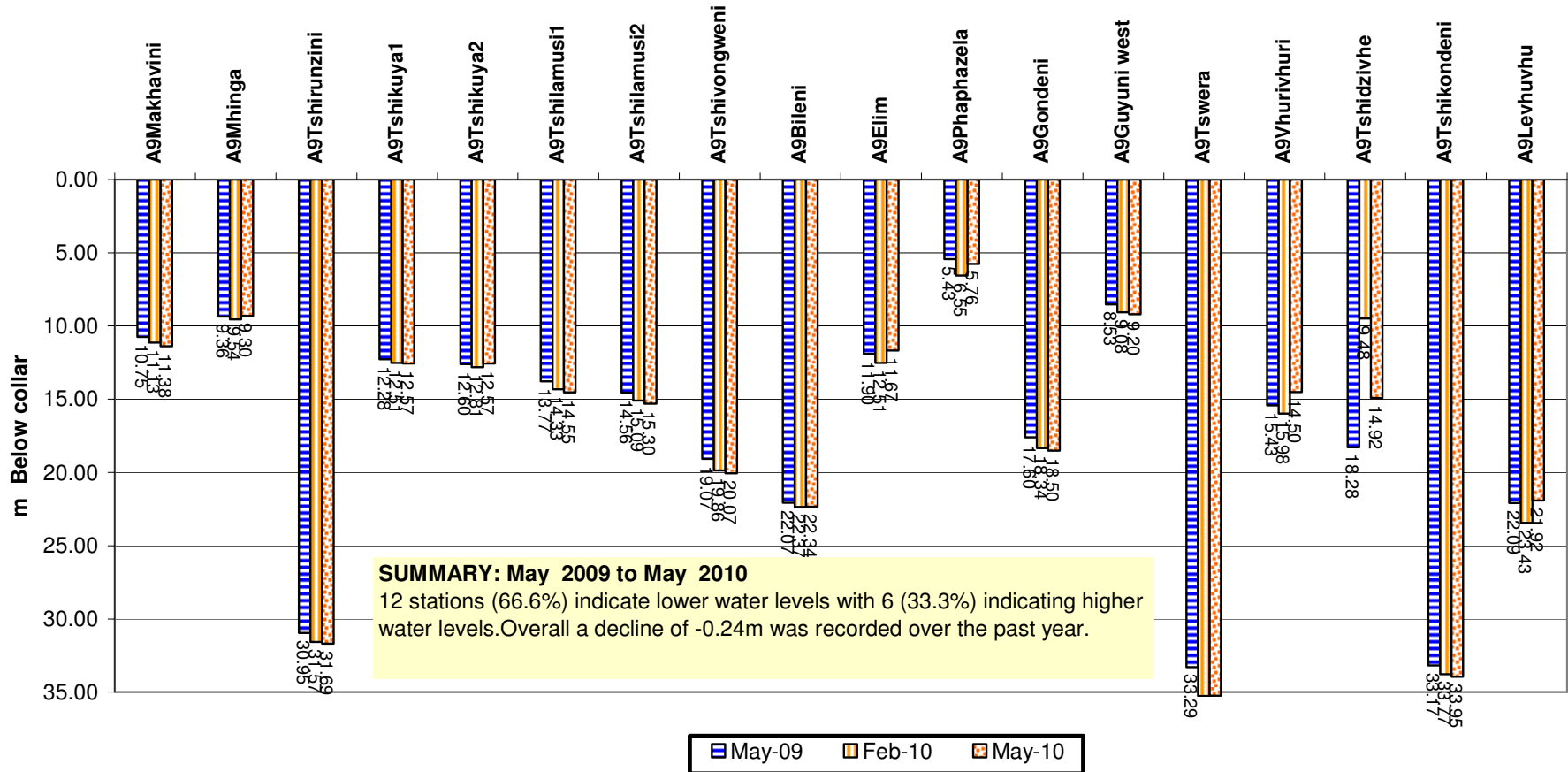
A9 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



GRAPH 25

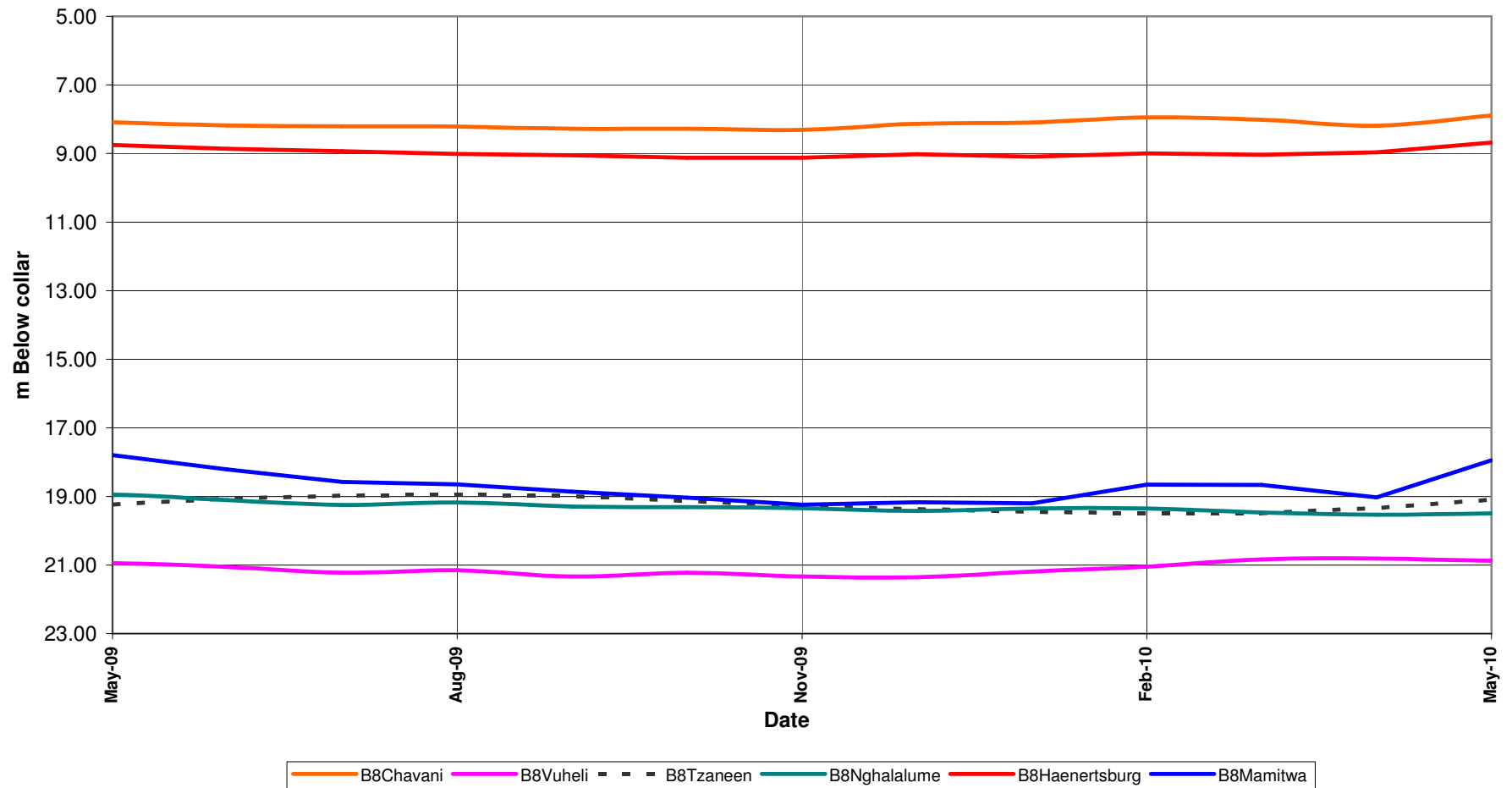
A9 DRAINAGE AREA
Comparison between water level depths: 1 May 2009,
1 February 2010 and 1 May 2010

Monitoring Stations



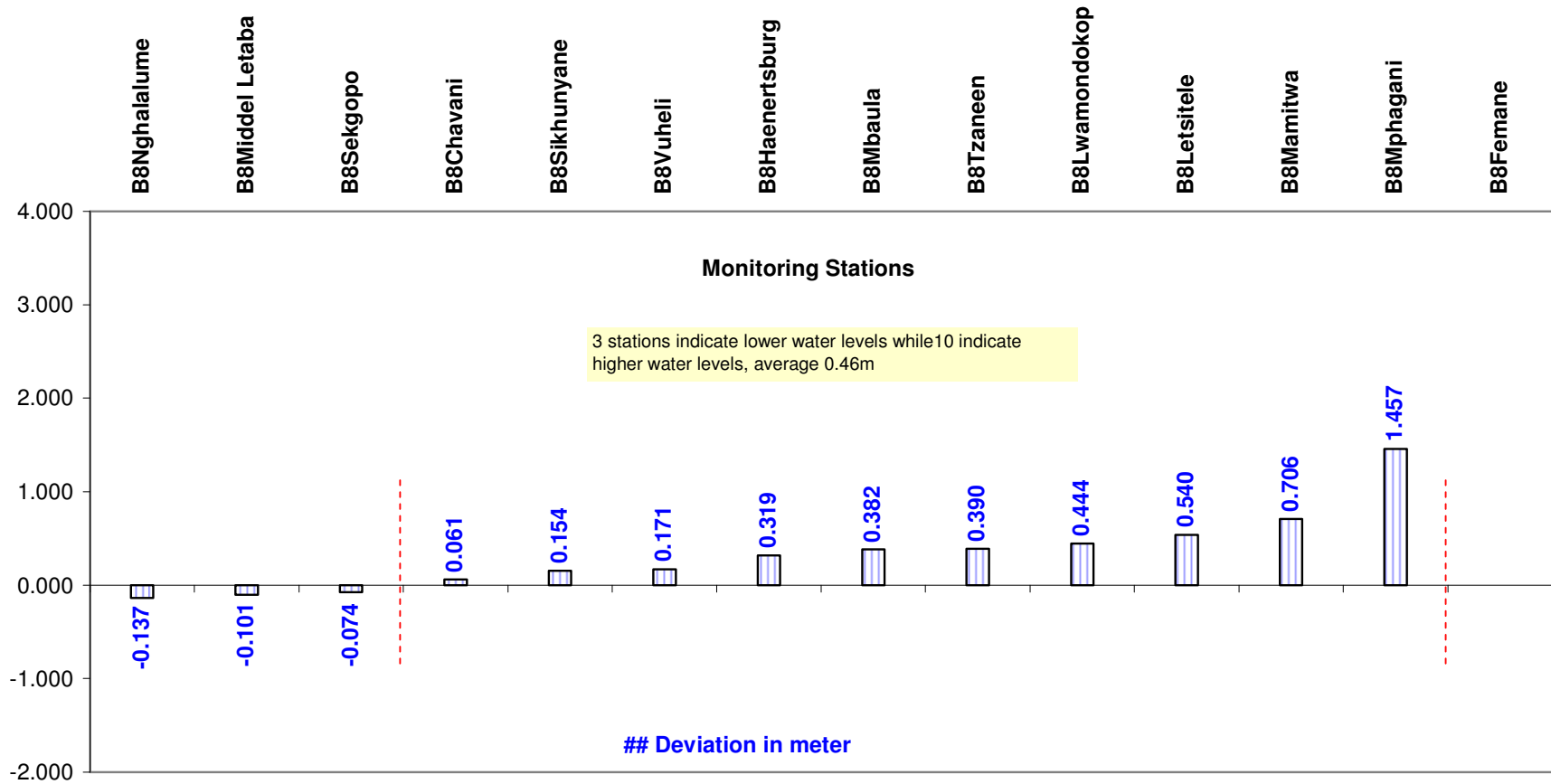
GRAPH 26

Comparison of water level trends at some stations in B8 drainage:
1 May 2009 to 1 May 2010



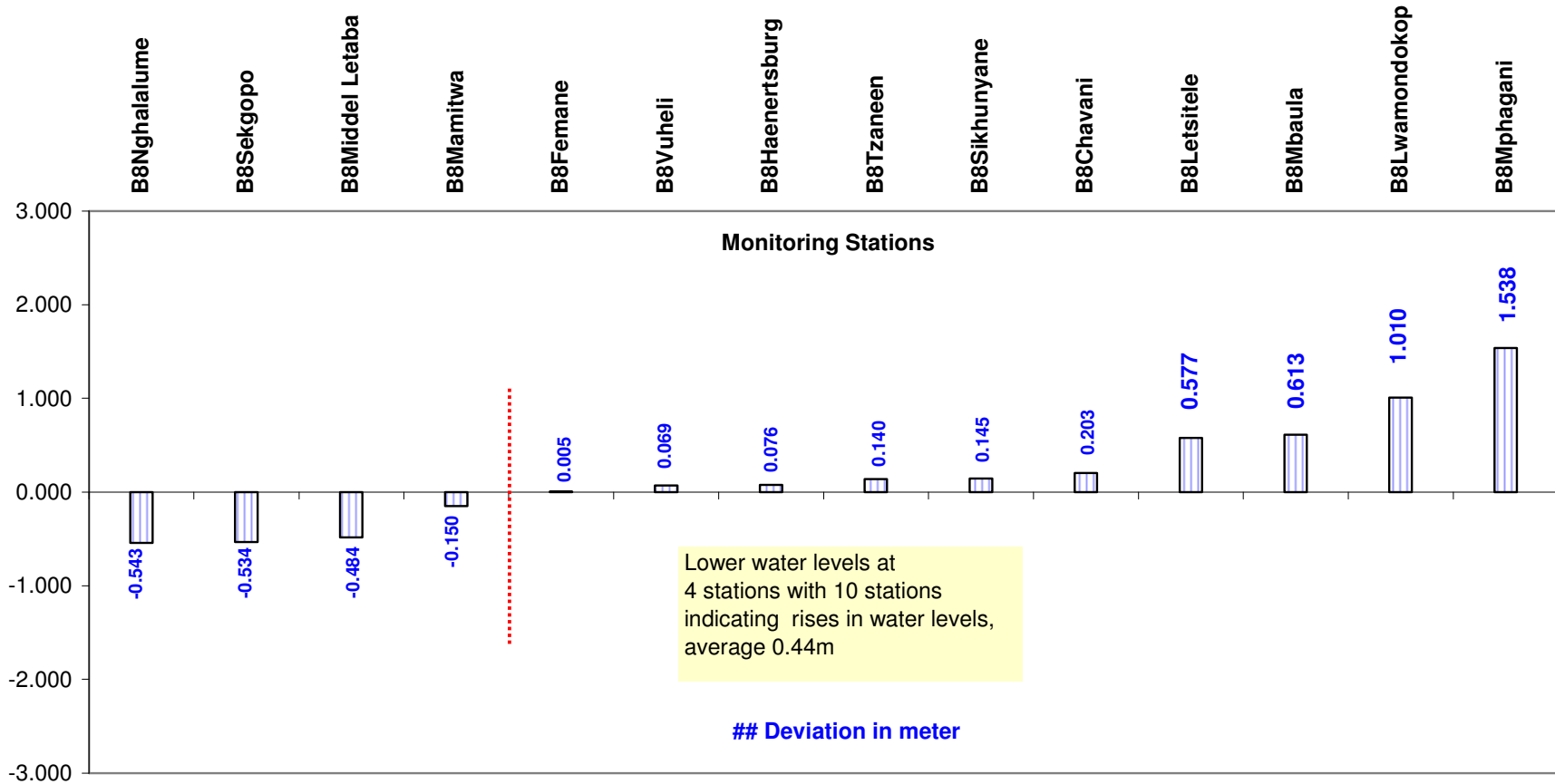
GRAPH 27

B8 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



GRAPH 28

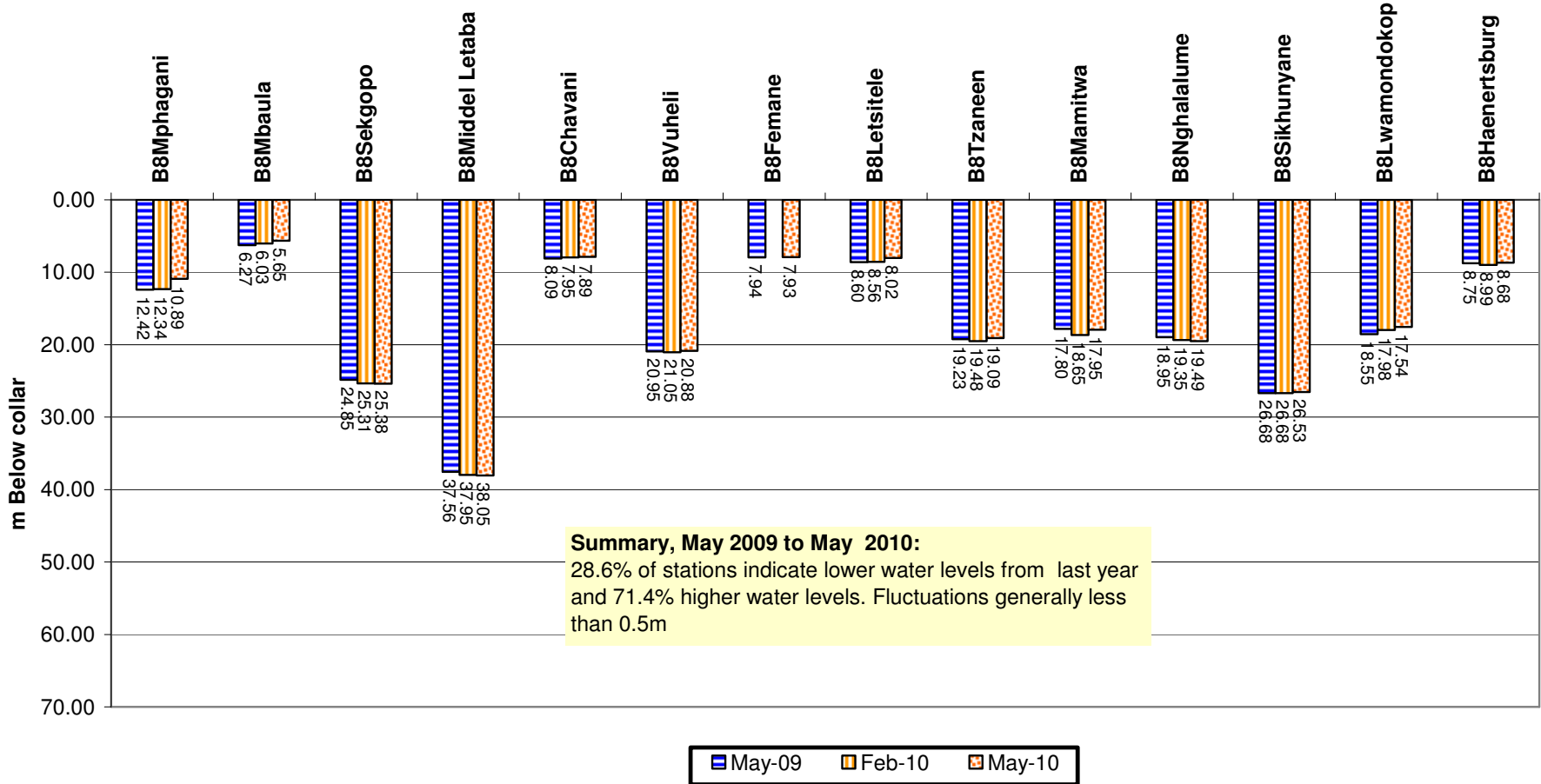
B8 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



GRAPH 29

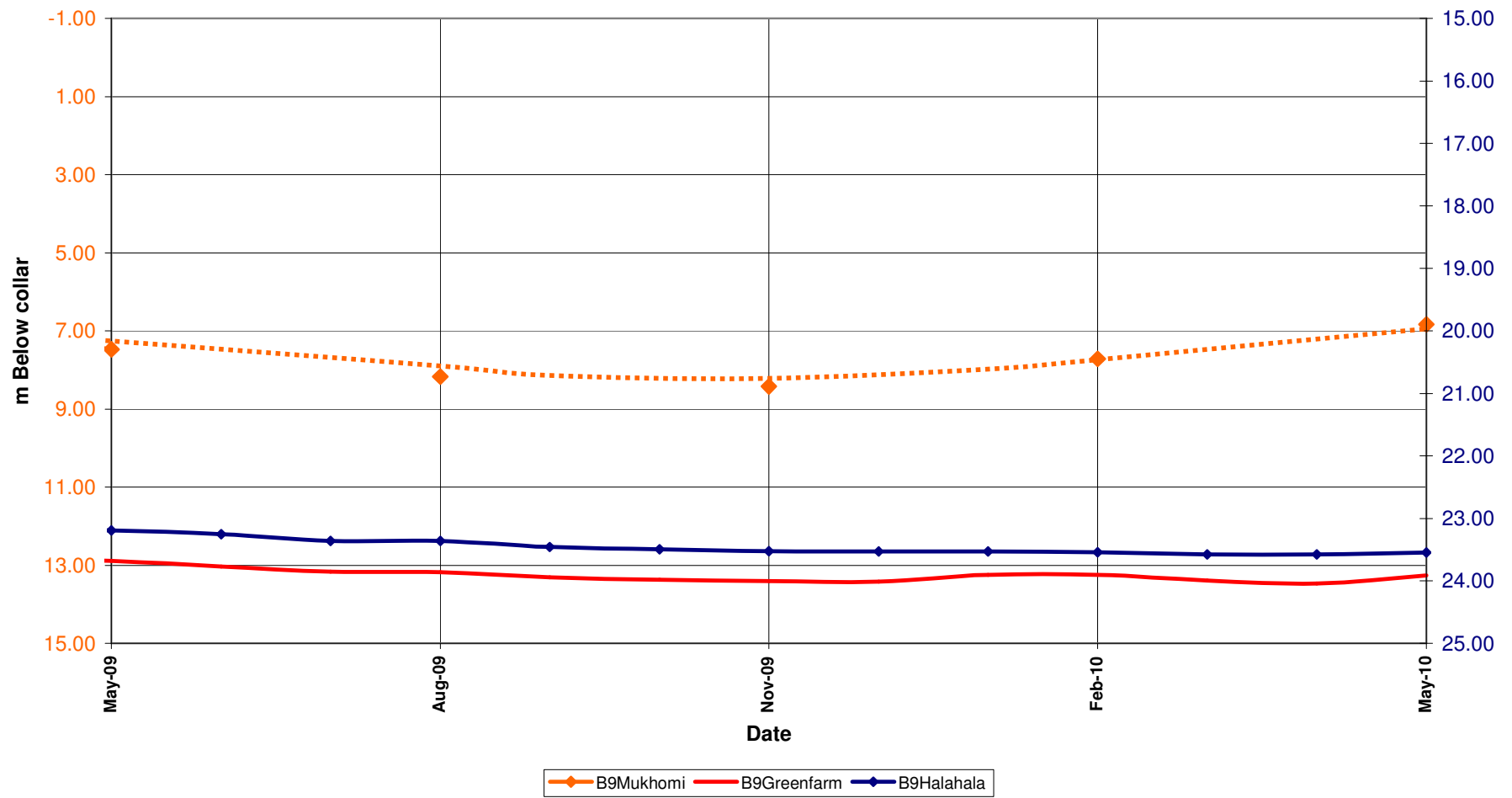
B8 DRAINAGE AREA
Comparison between water level depths: 1 May 2009,
1 February 2010 and 1 May 2010

Monitoring Stations



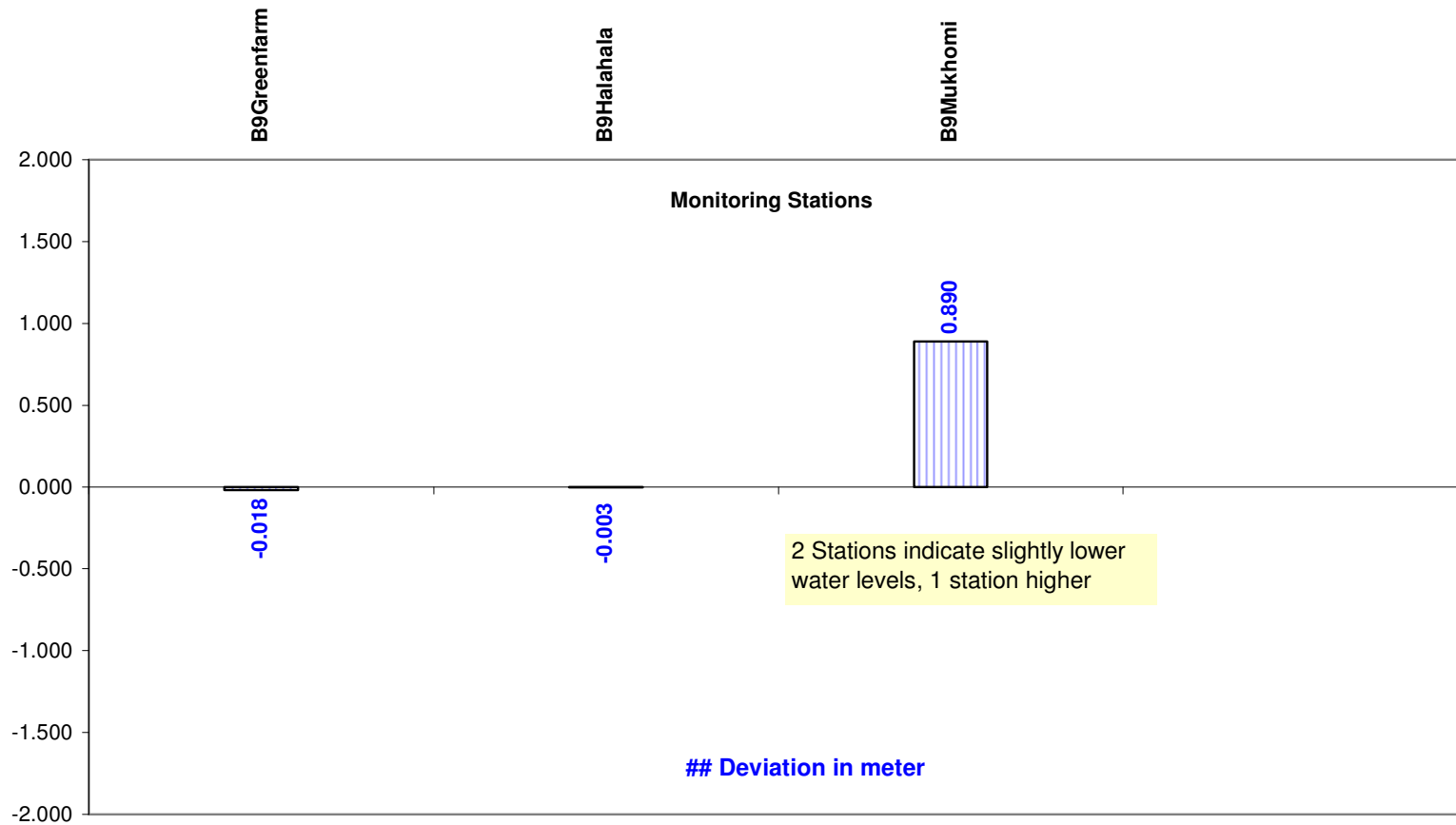
GRAPH 30

**Comparison of water level trends of stations in B9 drainage:
1 May 2009 to 1 May 2010**



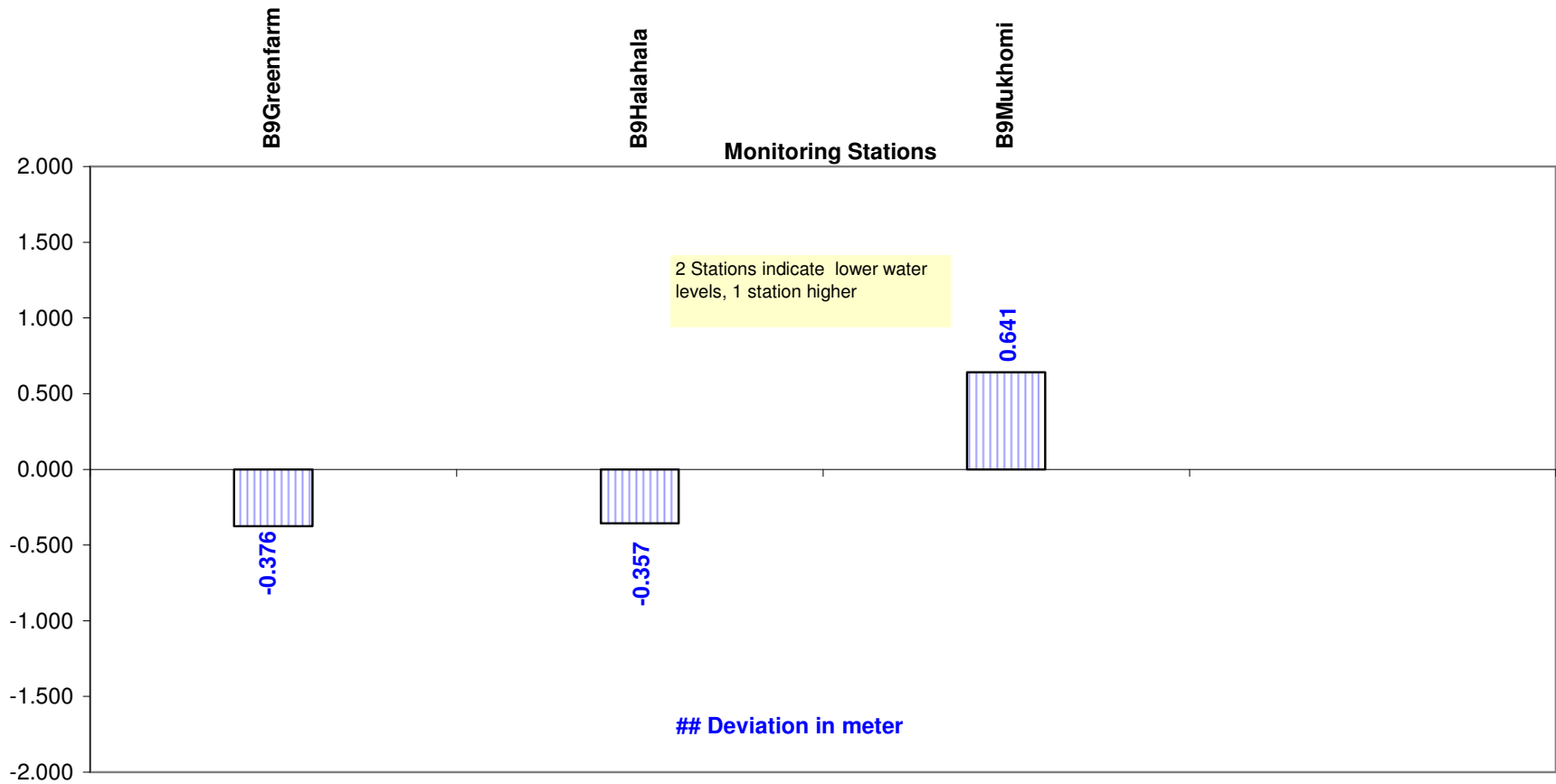
GRAPH 31

B9 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



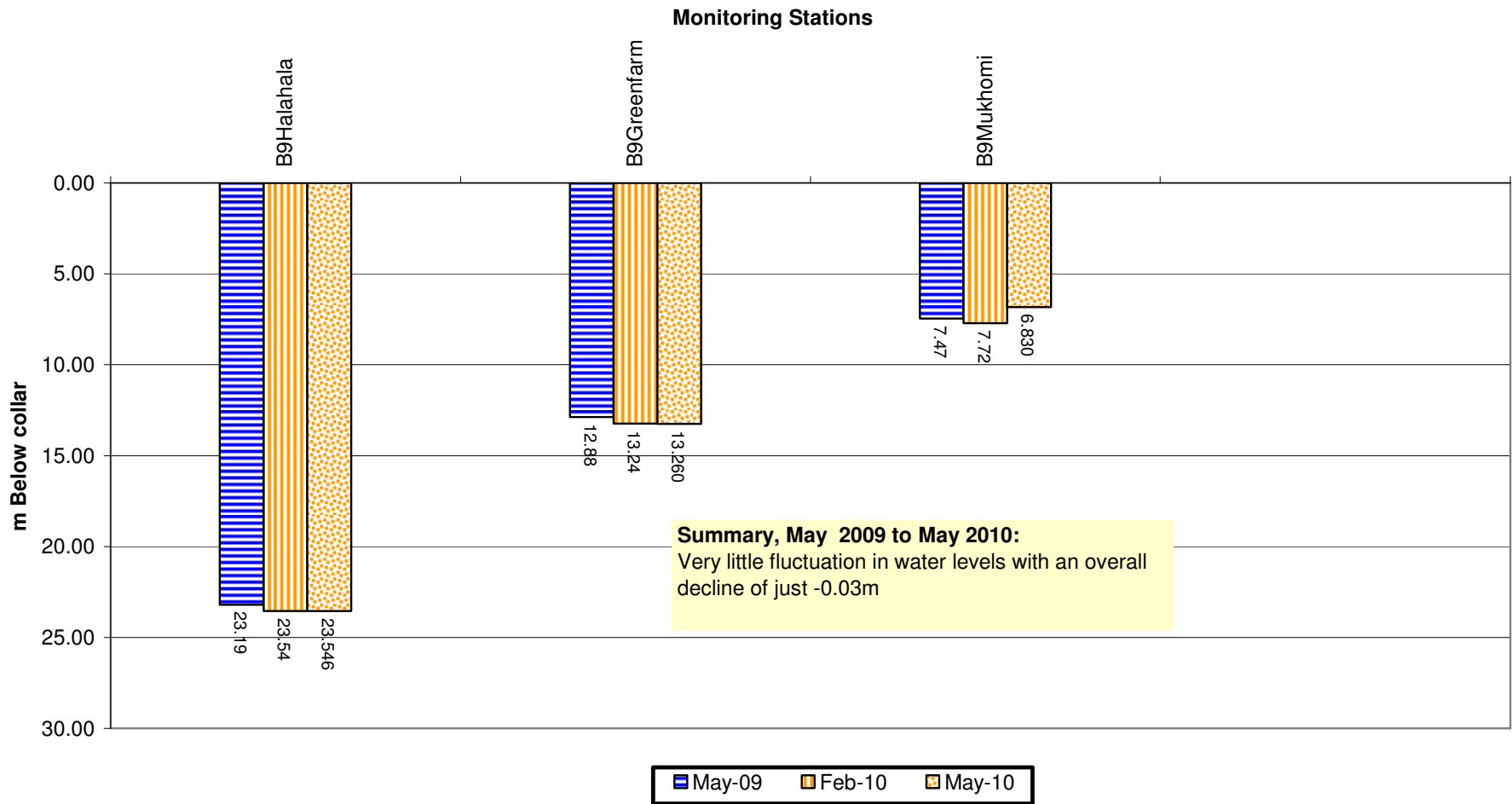
GRAPH 32

B9 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



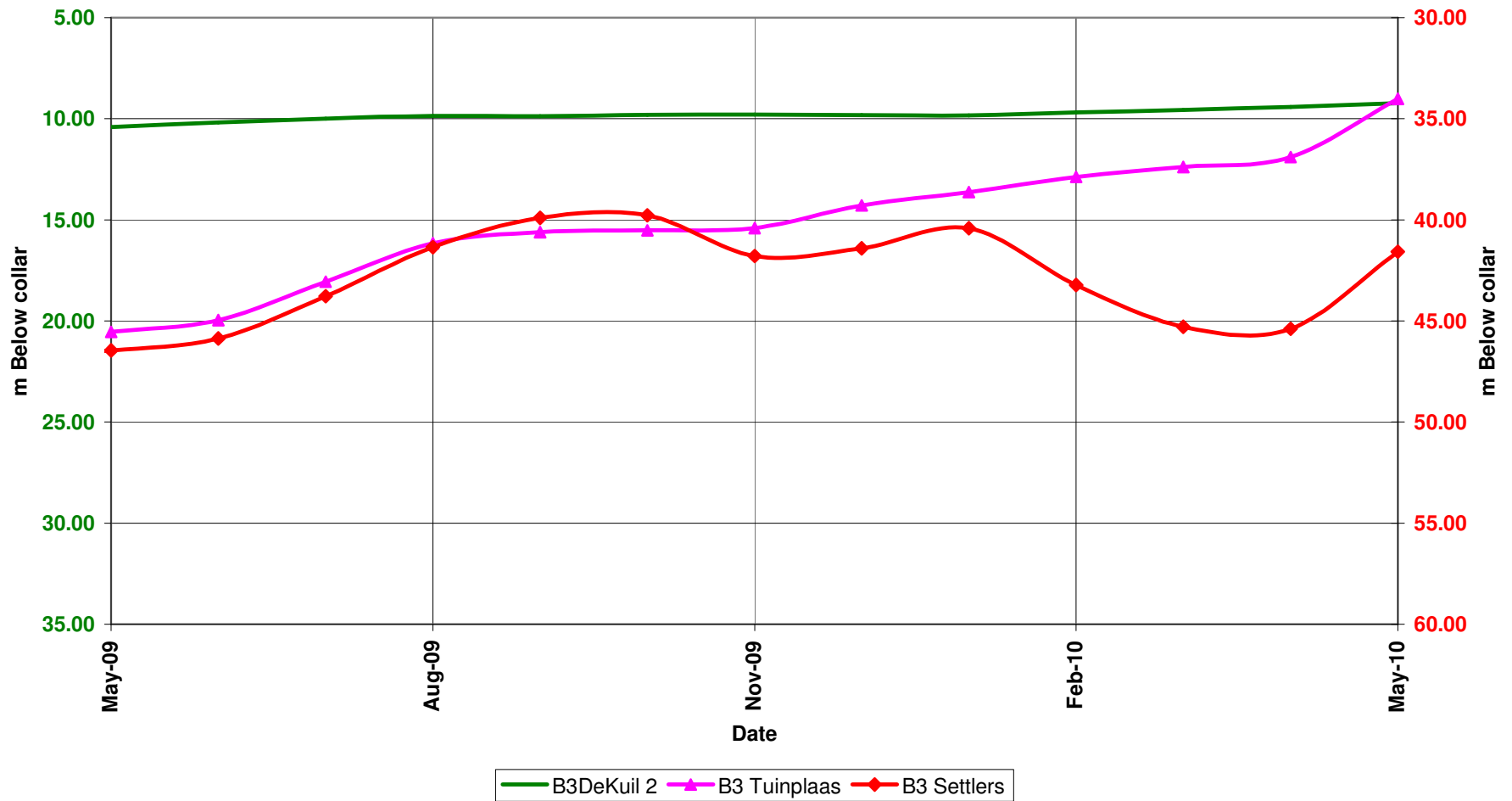
GRAPH 33

B9 DRAINAGE AREA
Comparison between water level depths: 1 May 2009,
1 February 2010 and 1 May 2010



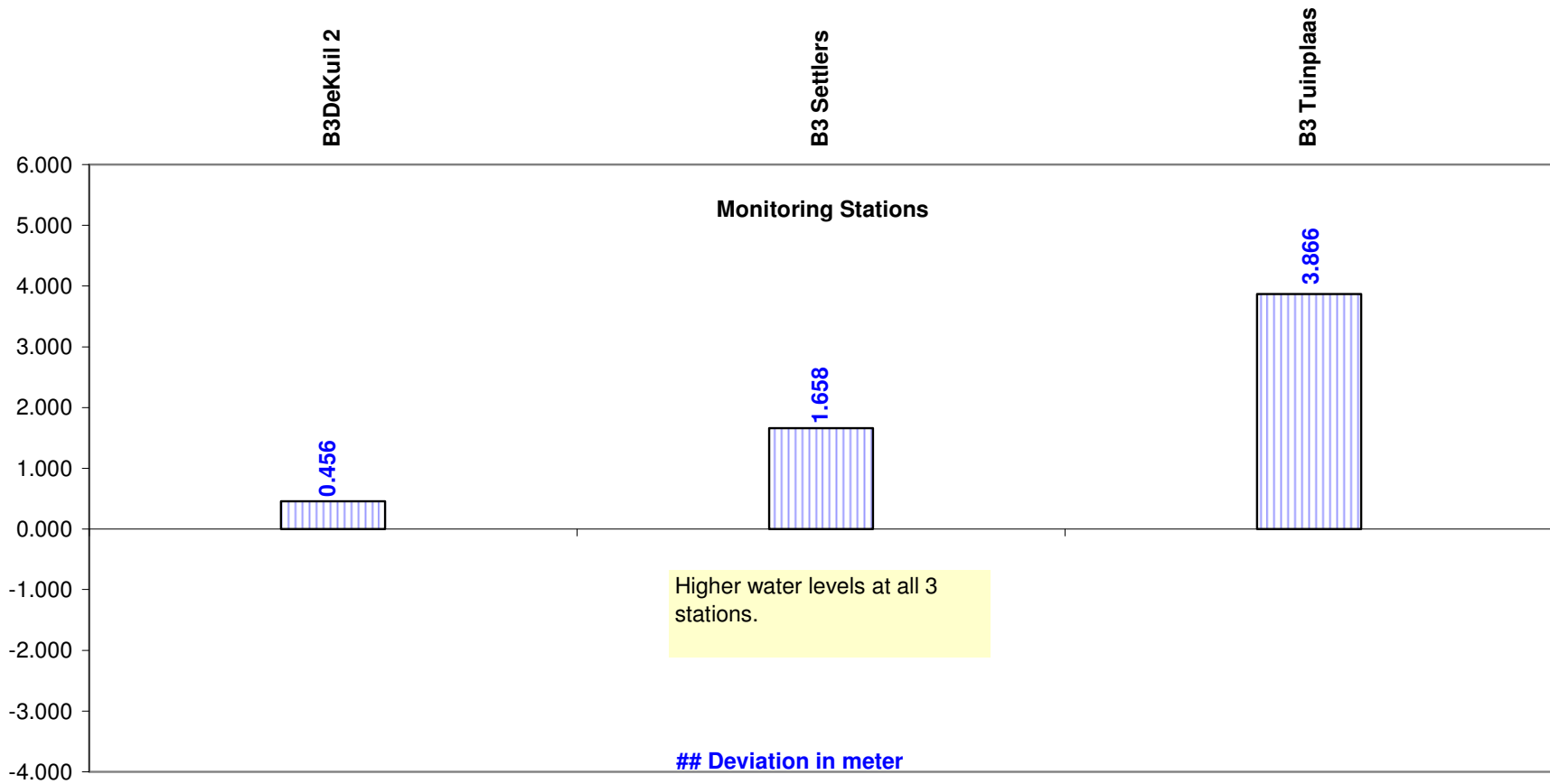
GRAPH 34

Comparison of water level trends at stations in B3 drainage:
1 May 2009 to 1 May 2010



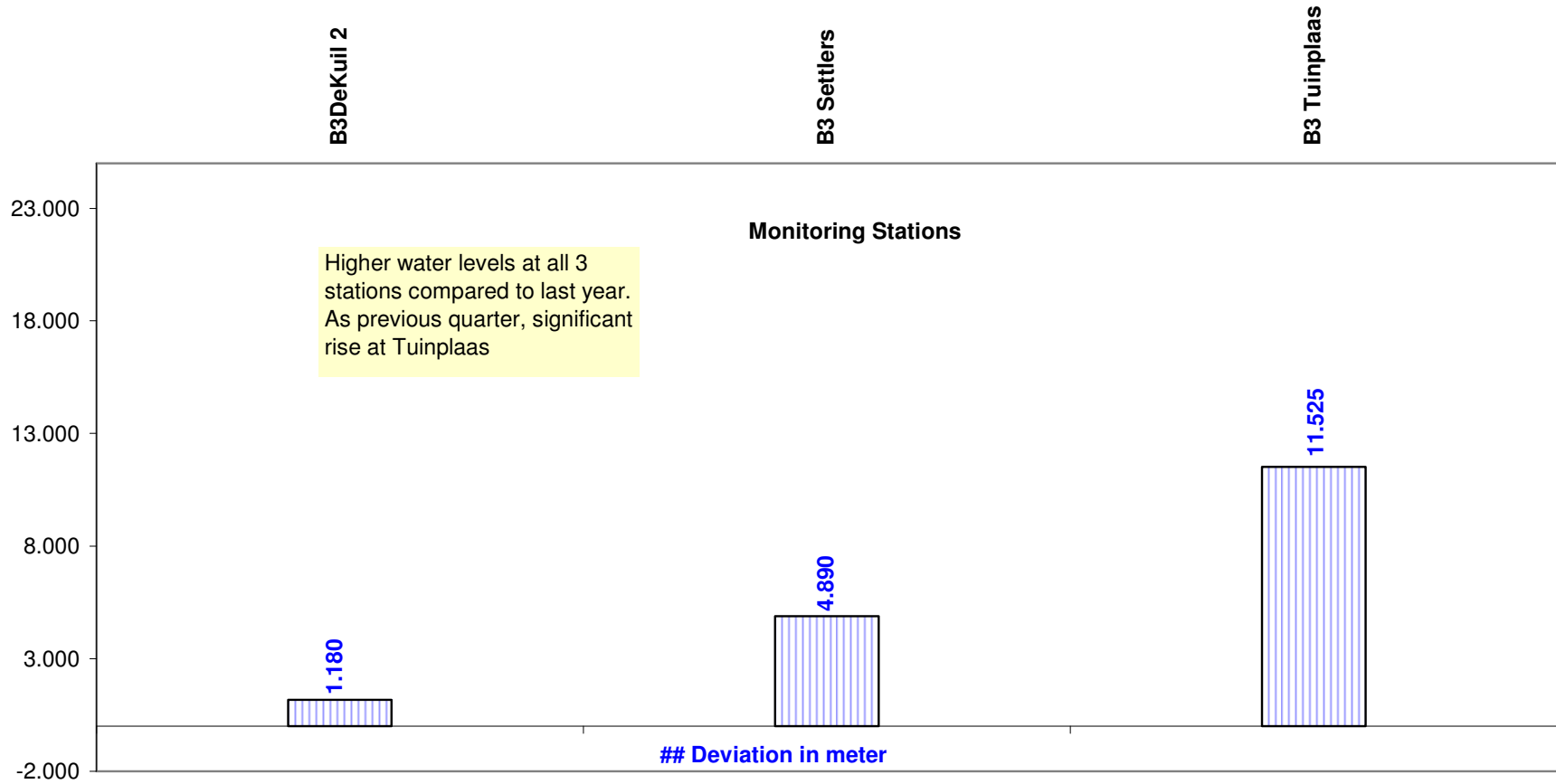
GRAPH 35

B3 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



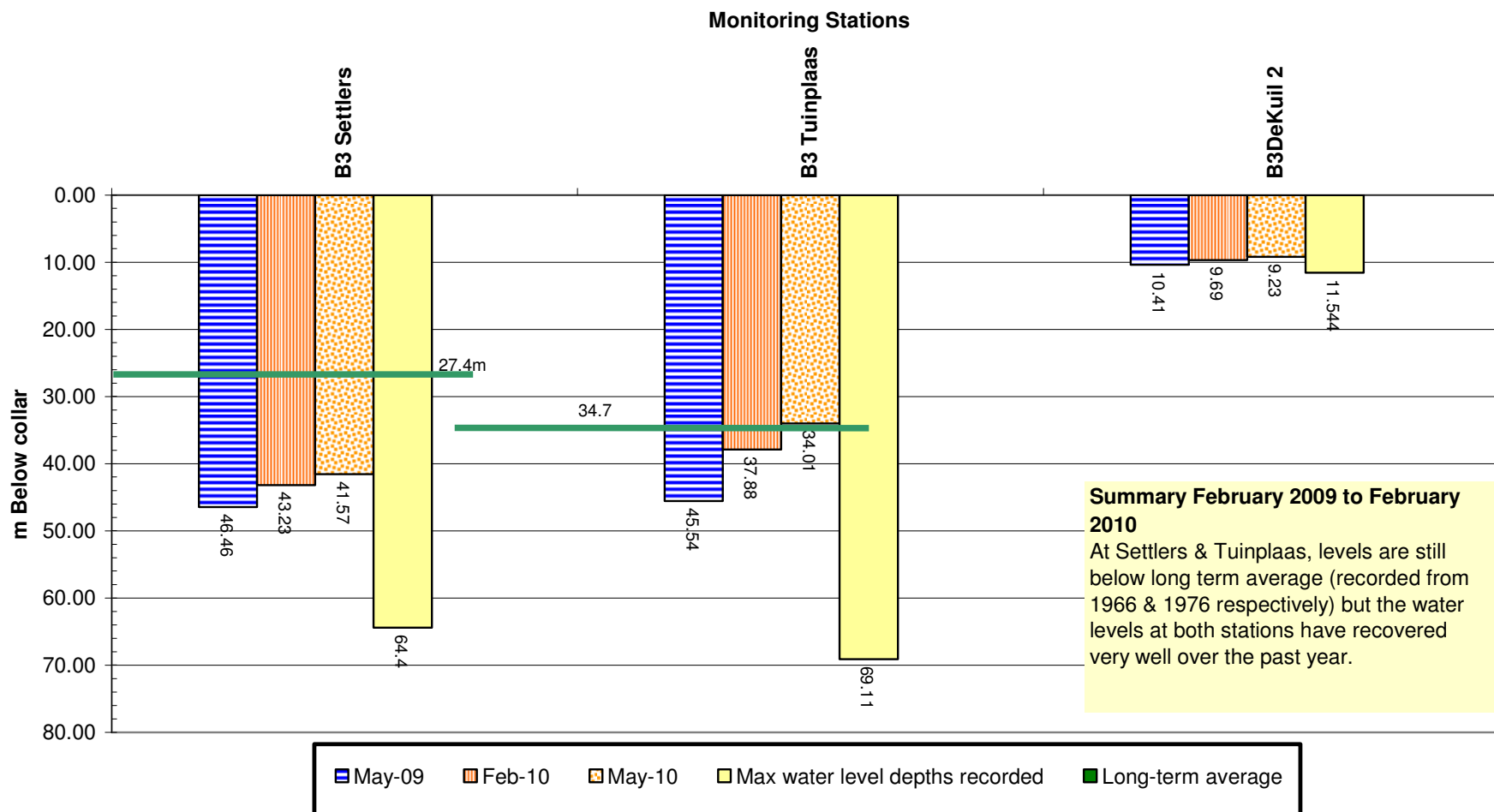
GRAPH 36

B3 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



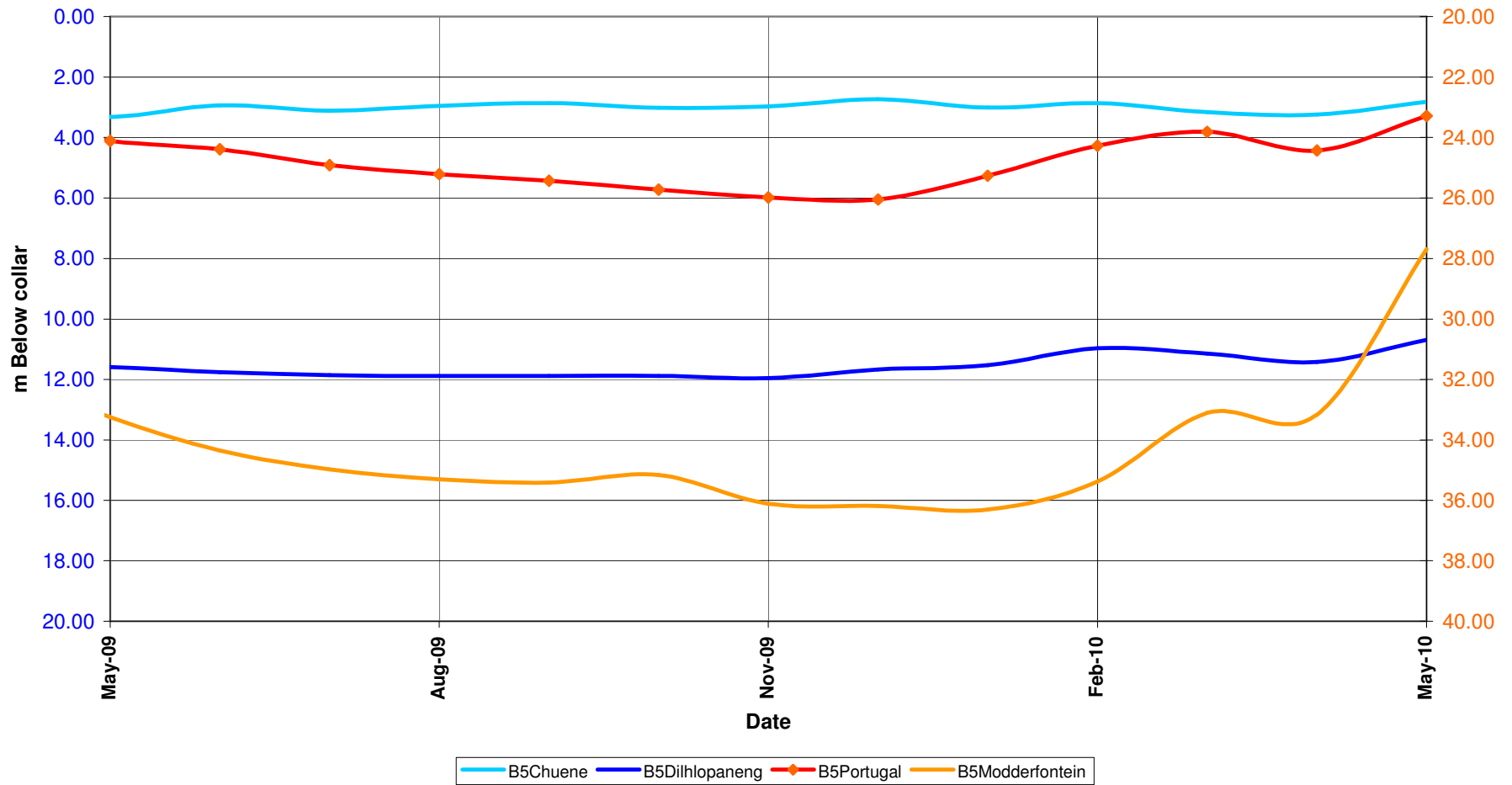
GRAPH 37

B3 DRAINAGE AREA
Comparison between water level depths: 1 May 2009
1 February 2010, 1 May 2010 and maximum depths recorded



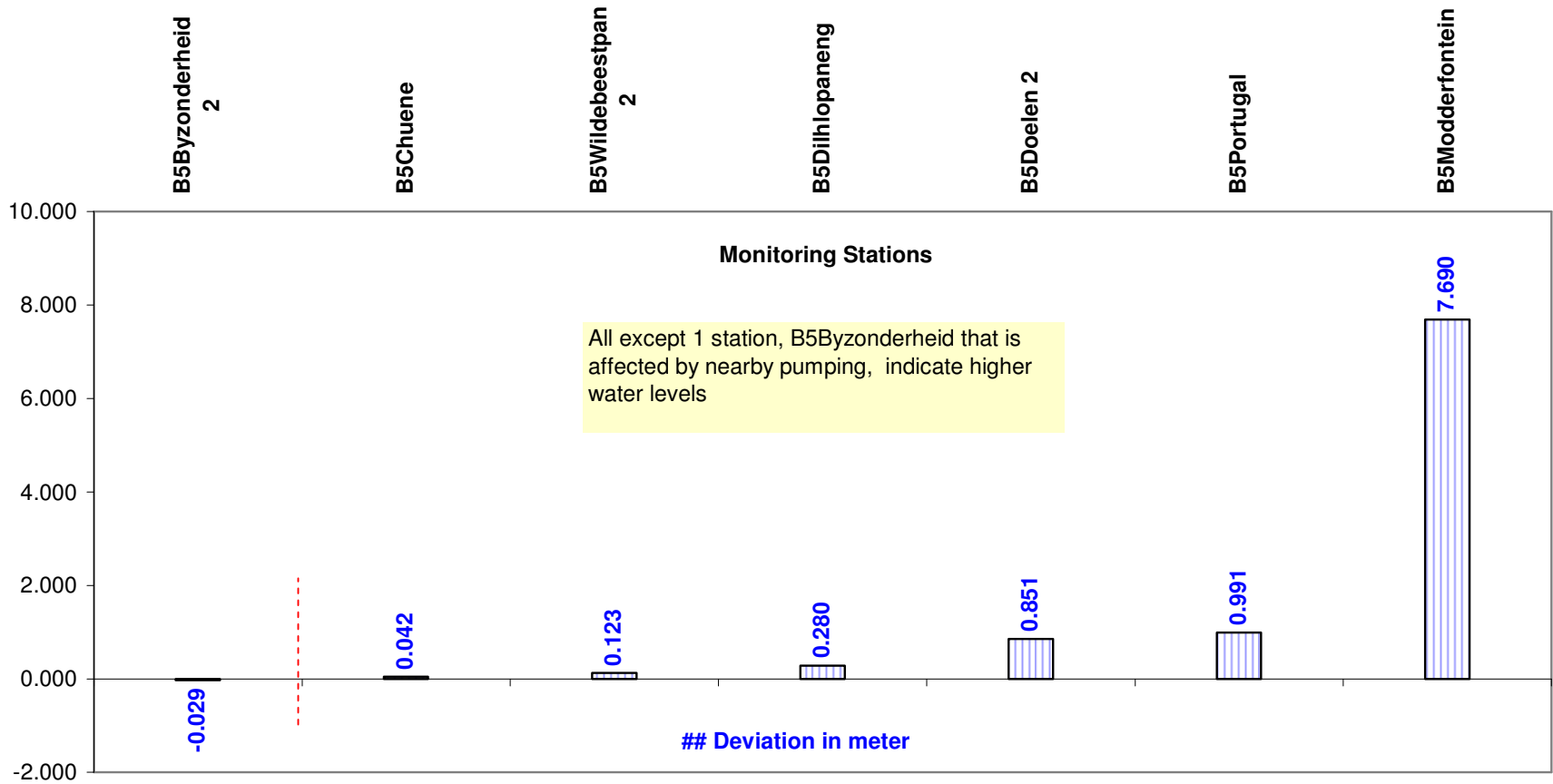
GRAPH 38

Comparison of water level trends at stations in B5 drainage:
1 May 2009 to 1 May 2010



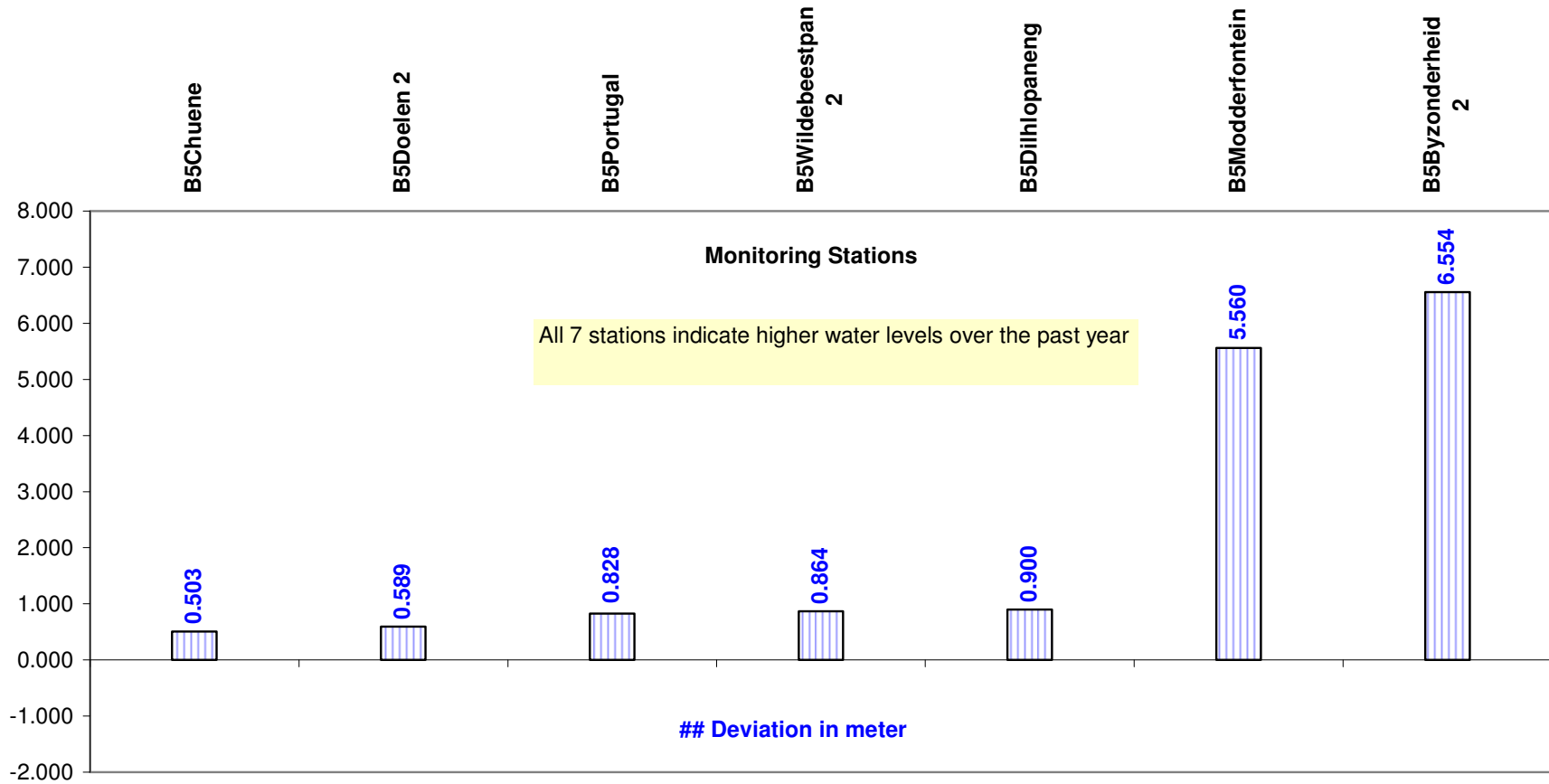
GRAPH 39

B5 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



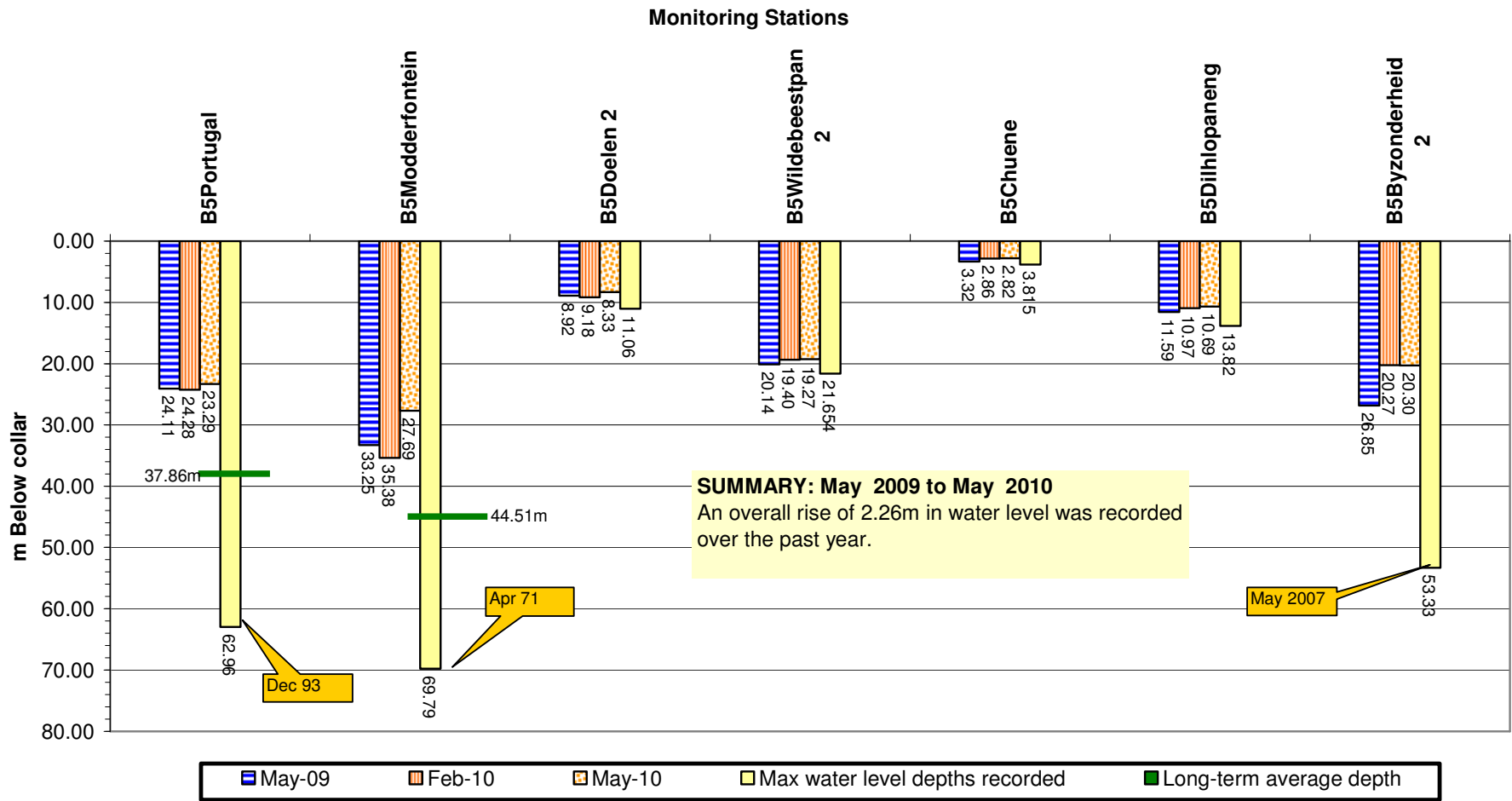
GRAPH 40

B5 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



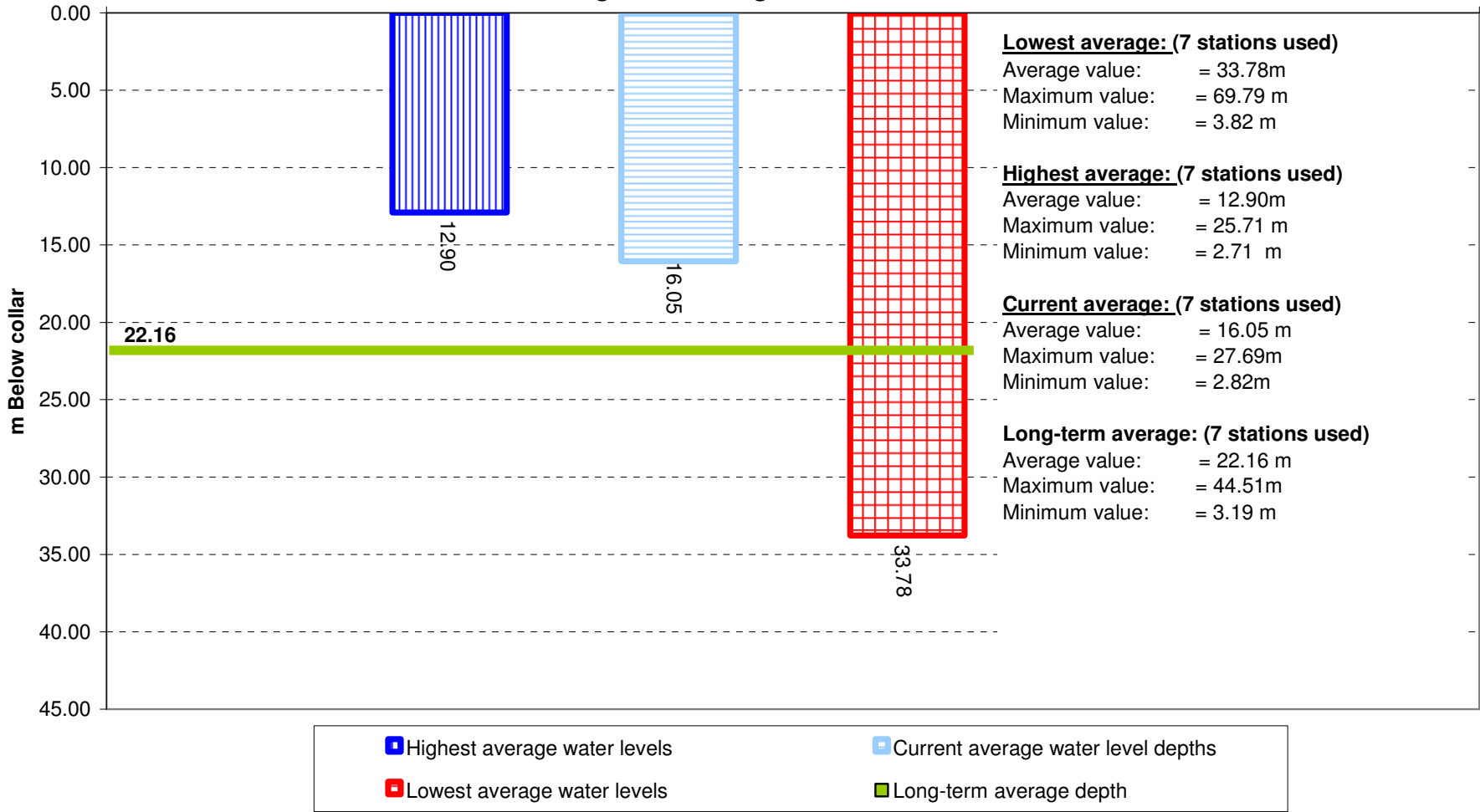
GRAPH 41

B5 DRAINAGE AREA
Comparison between water level depths: 1 May 2009,
1 February 2010, 1 May 2010 and maximum depths recorded



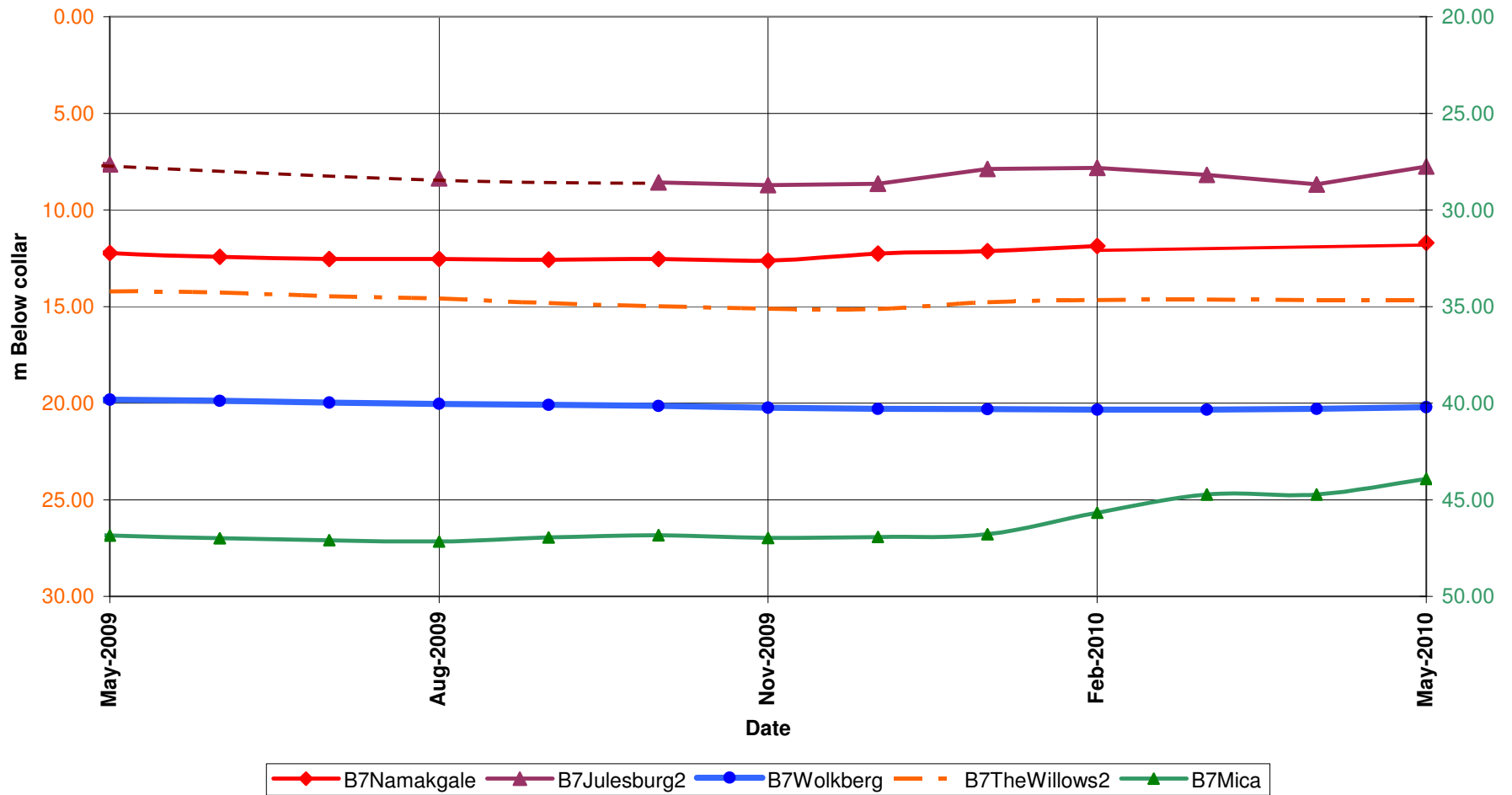
GRAPH 42

B5 DRAINAGE AREA
Comparison of average current water level with highest, lowest & long-term average water levels recorded



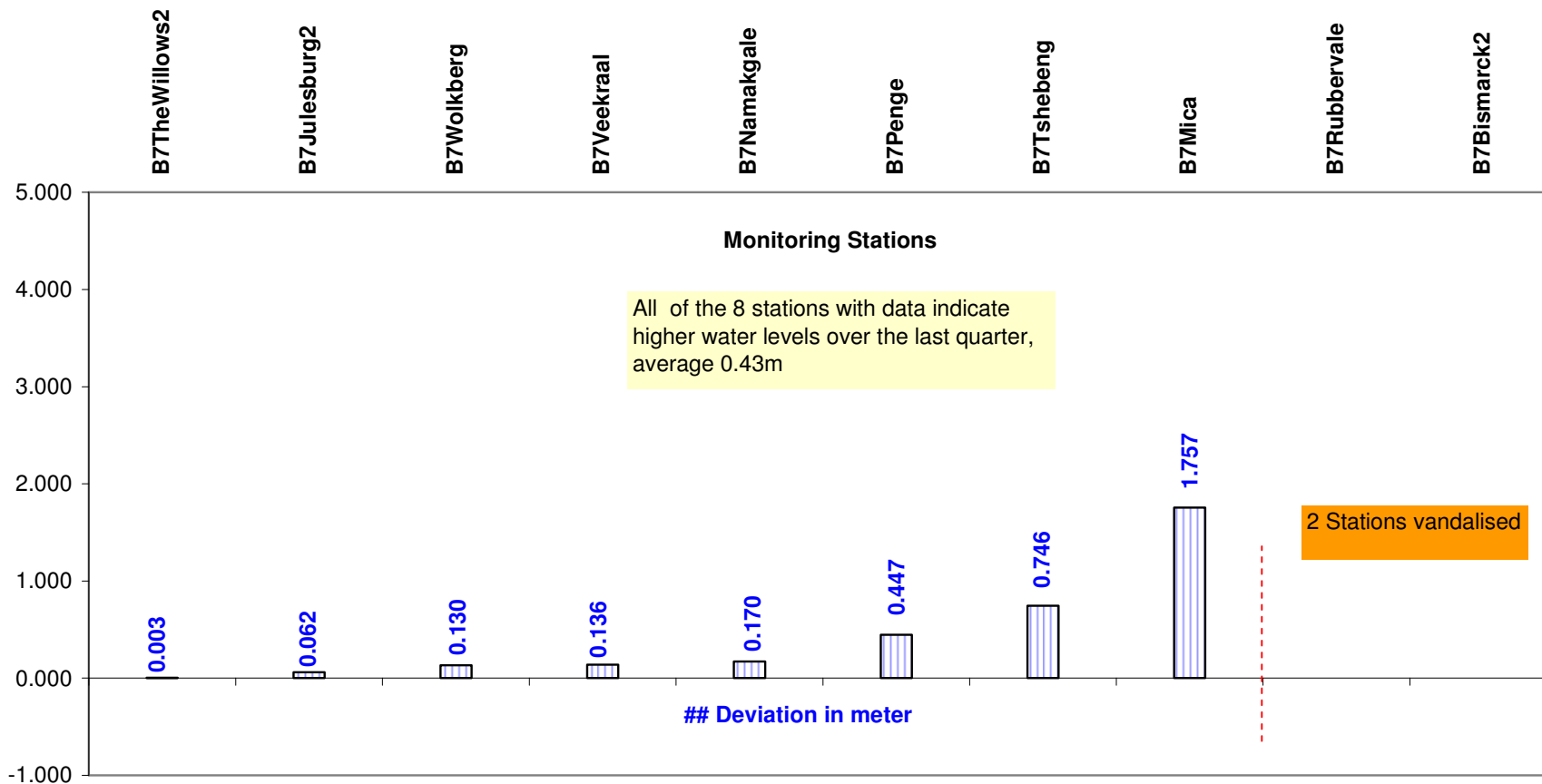
GRAPH 43

Water level trend of some stations in B7 drainage:
1 May 2009 to 1 May 2010



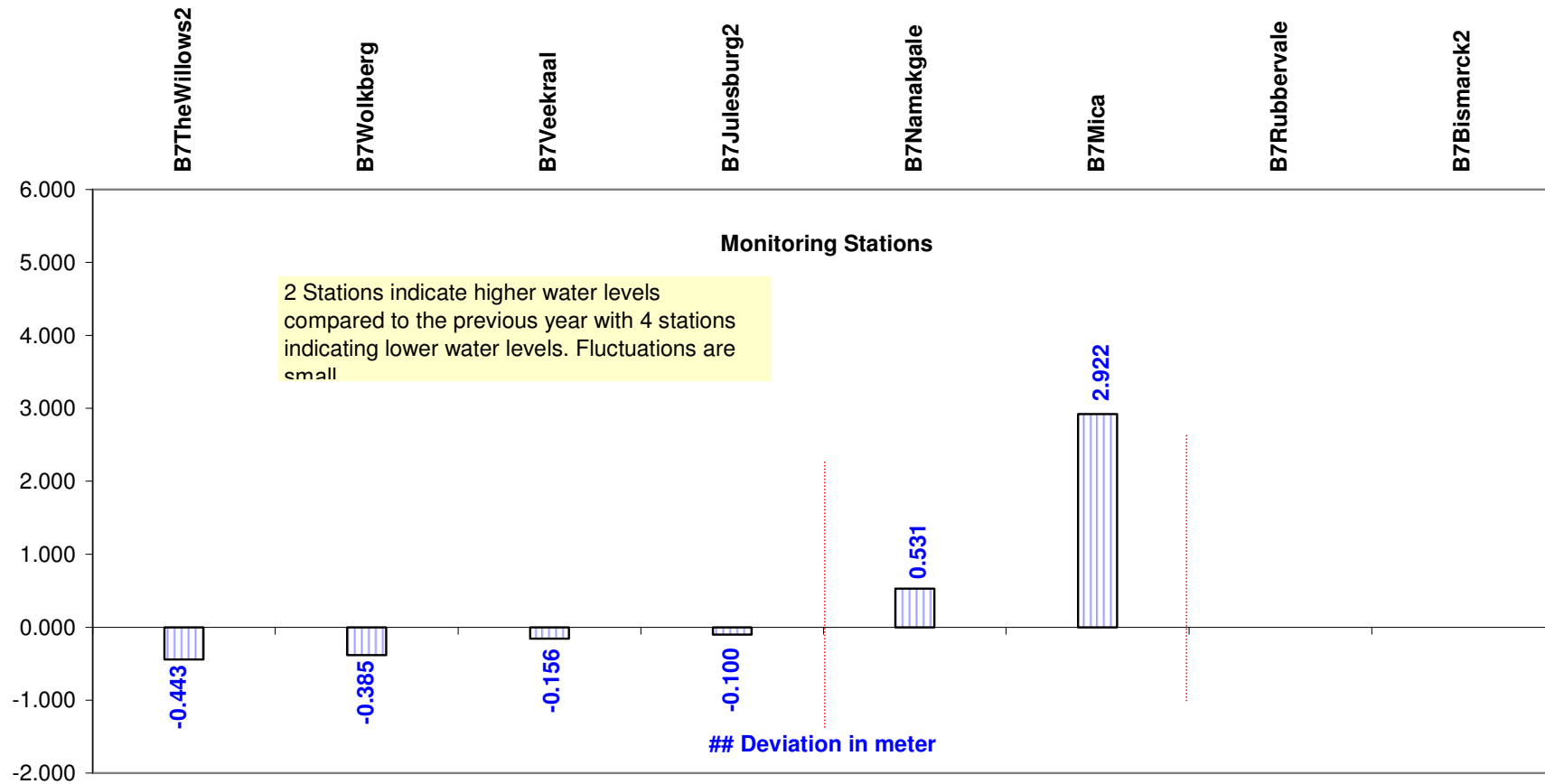
GRAPH 44

B7 DRAINAGE AREA
Deviation of water levels: 1 February 2010 to 1 May 2010



GRAPH 45

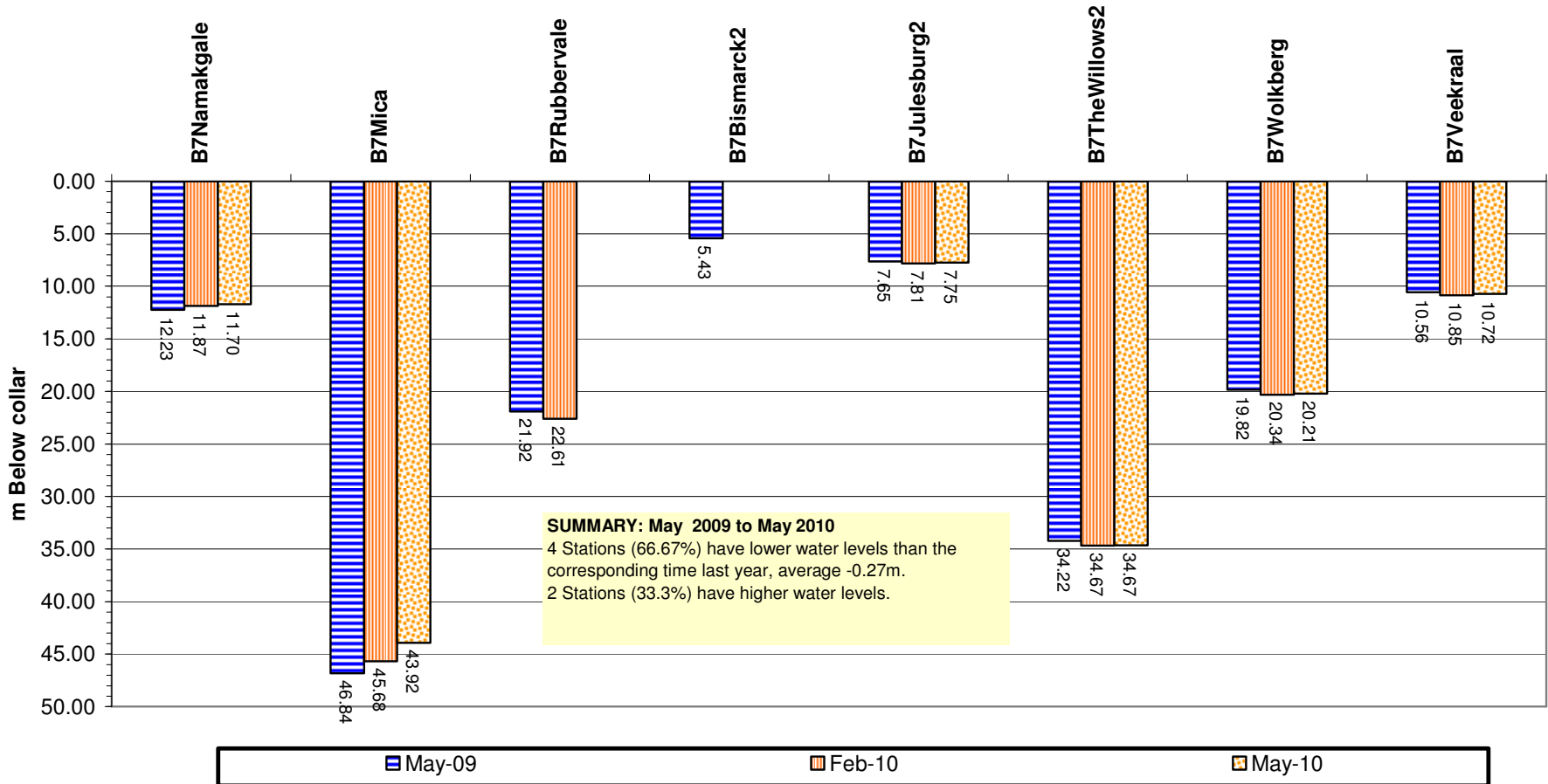
B7 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 May 2010



GRAPH 46

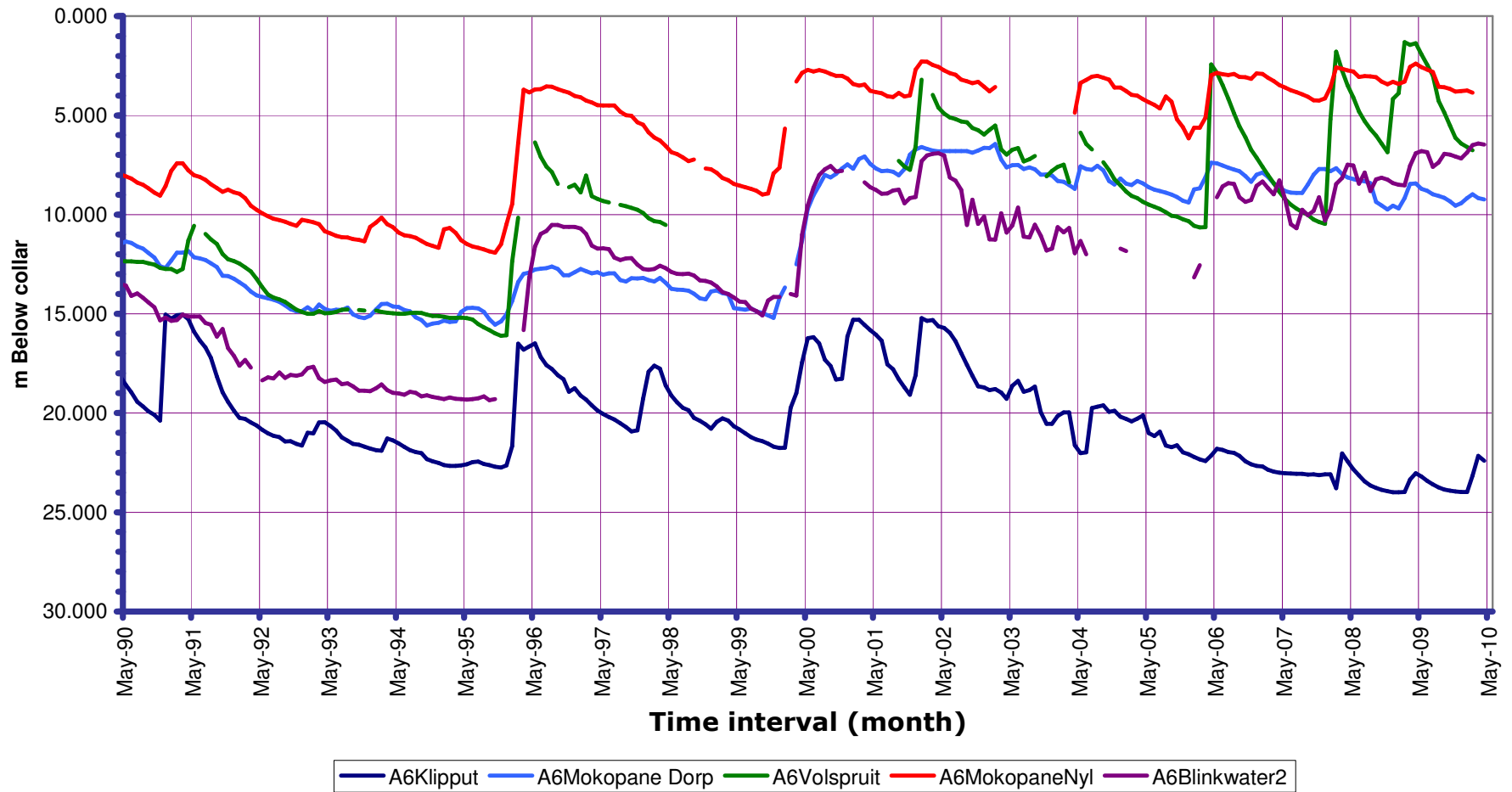
B7 DRAINAGE AREA
Comparison between water levels: 1 May 2009,
1 February 2010 and 1 May 2010

Monitoring Stations



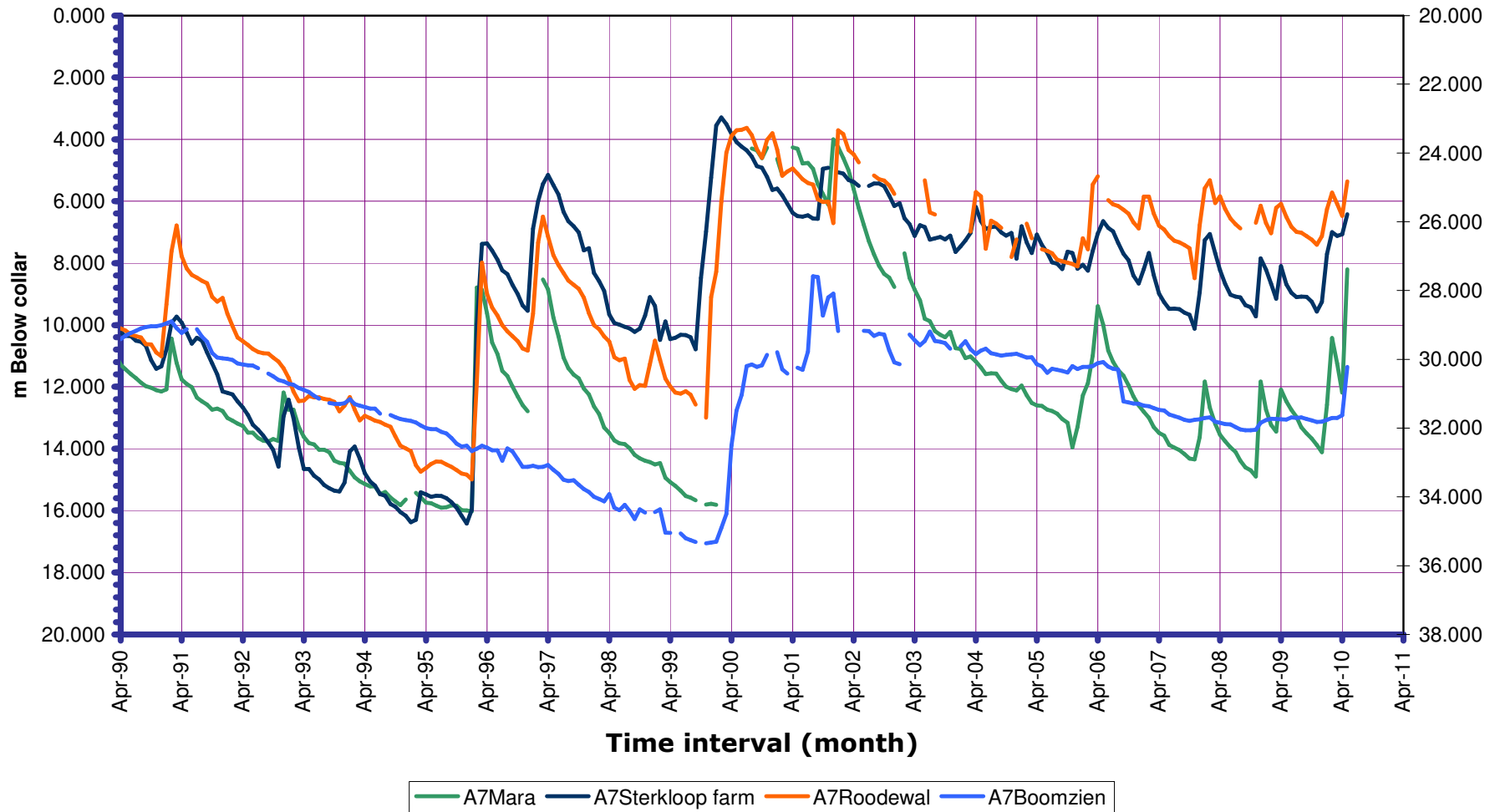
GRAPH 47

20 Year groundwater level trends at some stations in the A6 drainage



GRAPH 48

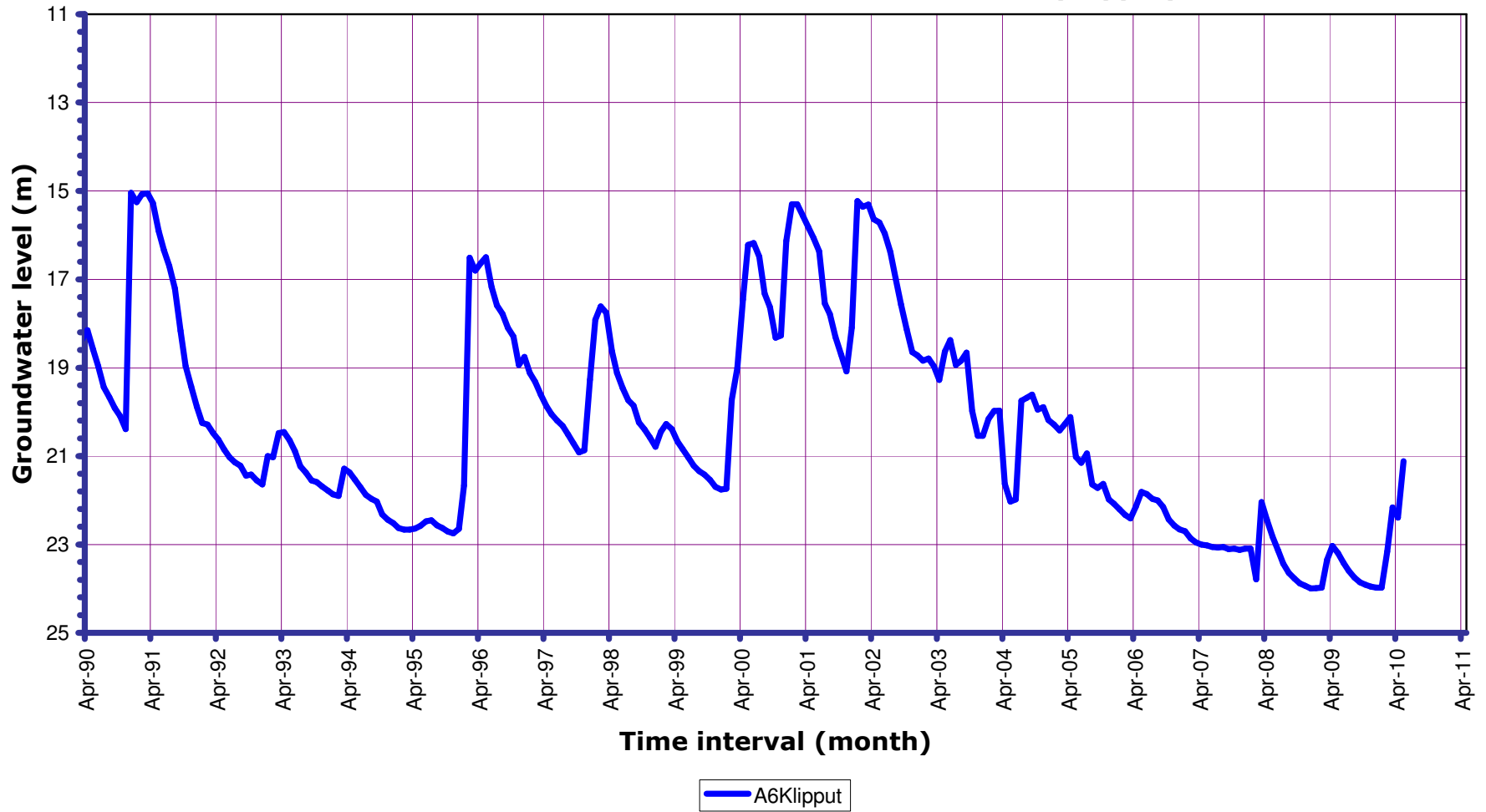
20 Year groundwater level trends at some stations in the A7 drainage



GRAPH 49

A6 Drainage

Groundwater level time serie of station A6N082 (Klipput)



GRAPH 50