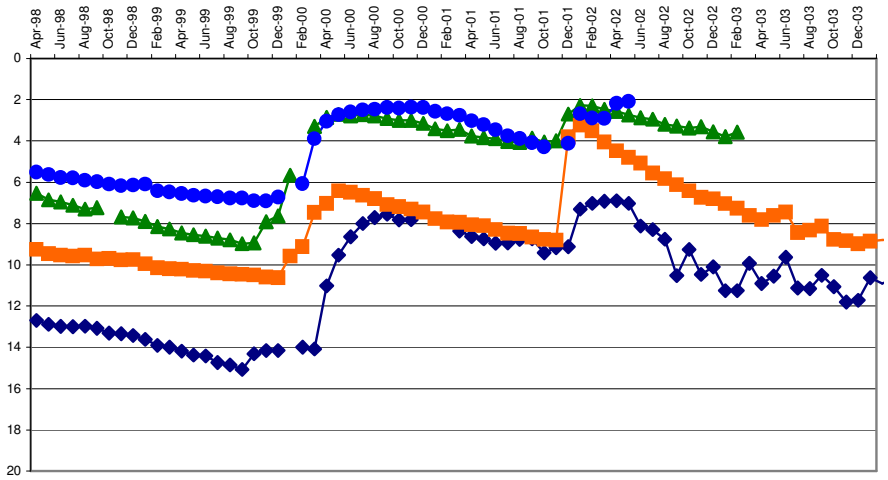
water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

LIMPOPO REGION

DIRECTORATE
WATER REGULATION AND USE

STATUS REPORT ON MONITORING & GROUNDWATER LEVEL TRENDS AUGUST 2008 – AUGUST 2009



H VERSTER
SEPTEMBER 2009

Data collection assisted by:
D A TLEANE
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1) EXECUTIVE SUMMARY

Groundwater levels

In this report comparison is drawn between water level values for 1 August 2008 (corresponding time last year), 1 May 2009 (End of the past wet season) and 1 August 2009 (Midway through the current dry season. Only stations on the permanent reference network were visited and will be discussed.

- Active stations = 161
- Stations visited and included in this report = 155.
- Stations inaccessible due to wet conditions = 2
- Other access problems = 2
- Visited stations in A2 drainage not included in this report = 2

Comparison of water levels with the previous quarter: (May to August 2009)
Stations with data for the whole period available = 146/155 (94.2% of stations visited)

	No of stations	% of stations	Average
Water level down more than 1 m	12	8.22%	-1.64
Water level down less than 1m	101	69.18%	-0.32m
Water levels up more than 1m	6	4.11%	3.23
Water levels up less than 1m	27	18.49%	0.32m
No difference in water level			
Total	**146**	**100%**	

Figures presented in the table above represent the situation from the start to midway of the current dry season. The majority of stations, as can be expected for the dry season, indicate declining water levels. 113 (77.4%) of the 146 stations with data for the period indicate lower water levels with 33 (22.6%) indicating higher water levels.

Comparison of water levels with the corresponding time last year: (August 2008 to August 2009)
Stations with data for the whole period available = 136/155 (87.74% of stations visited)

	No of stations	% of stations	Average
Water level down more than 1 m	9	6.62%	-2.4m
Water level down less than 1m	58	42.65%	-0.37m
Water levels up more than 1m	25	18.38%	3.33m
Water levels up less than 1m	42	30.88%	0.33m
No difference in water level	2	1.47%	
Total	**133**	**100%**	

Water levels at 67 stations (49.3%) are lower than the same time last year. Also at 67 stations the water levels are higher.2 Stations have the same water level. If the 2 stations, Settlers-Tuinplaas area, which recorded exceptional rises, are disregarded, the average rise is 0.04m for the remaining 134 stations.

2) STATUS OF MONITORING NETWORK

As in the previous quarter, no new stations were equipped and the Limpopo Province's Groundwater Level Monitoring Network currently still consists of 195 active monitoring stations, including 34 in the KNP. 4-5 new boreholes are planned to be equipped the next quarter as well as 1 re-drilled borehole. 2 Caved in boreholes still have to be re-drilled. **(Map 1)**

157 Stations were visited during August 2009 and the data of 155 of these were used for this report. Data for the 2 stations in the A2 drainage were not included. 4 Stations could not be accessed for various reasons.

Site preparation for the phase 2 upgrading of existing stations continued and delivering of concrete outer rings to stations was started.

Monitoring of the project stations continues (Taaibosch monitored by Head Office). **(Map 2)**

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. **(Map 3)**

Sampling to verify the suitability of selected sites for extension of the National Groundwater Quality Monitoring network is still on hold due to budget constraints.

3) DATA COLLECTION, EVALUATION AND REPORTING

Data was collected during August 2009 with the value for 1 August representing midway of the current dry season. Comparisons were drawn between 1 August 2008, (Corresponding period the previous year) 1 May 2009 (Start of the dry season) and 1 August 2009 (Current situation midway into the dry 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)

The 9 equipped stations in this drainage are fairly new with limited time series data, less than 1 year, available. 2 Additional boreholes were drilled and will be equipped. 1 Existing project borehole around the town of Lephalale has been identified for equipping.

Limited recharge is indicated at some stations but levels have stabilized or started to lower slowly since the onset of the dry season **(GRAPH 1)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
5 Of the 6 stations with data for the period indicate slightly declining water levels. **(GRAPH 2)**

4.2 A5 Drainage Area. (Lephalale River)

There are 7 active stations of which 3 are quite new. Installation of loggers at A5N0001 as well as the 3 project boreholes around it could not be done due to outside factors and is still planned.

Groundwater levels generally declining since the start of the dry season **(GRAPH 3)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
All stations with data indicate a decline, relatively small at all except 1 **(GRAPH 4)**

Past year; August 2008 to August 2009
All 4 stations with data indicate declining levels over the past year **(GRAPHS 5 & 6)**

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

There are 39 monitoring stations in this drainage. The caved-in borehole was re-drilled but still has to be equipped again.
Despite varying recharge the past season, water levels have generally started to decline again. **(GRAPH 7)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
Data for 36 stations were used. 27 Stations (75%) indicate lower and 9 stations (25%) higher water levels. Overall an average decline of -0.29m was recorded since the dry season started. **(GRAPHS 8 & 10)**

Past year; August 2008 to August 2009
Data is available for 36 stations of which 12 Stations (33.3%) indicate lower water levels than last year and 24 stations (66.7%) indicate a rise in water levels. An overall rise of 0.28m was recorded over the past year. Good recharge was mostly indicated in the Nile River catchments the past season and account for the general better situation than last year at this point **(GRAPH 9 & 10)**

Current average water levels are almost the same as the long-term average values, 3.5m higher than the maximum average recorded and midway between that and the highest average recorded **(GRAPH 11)**

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

There are 38 monitoring stations in this drainage.
Trends indicate some fluctuation in mostly the shallow water levels with stable conditions at deeper levels **(GRAPH 12)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
Data for all stations is available. 12 Stations (31.6%) indicate higher, with 26 stations (68.4%) indicating lower water levels. Overall a decline of -0.25m was recorded over this period **(GRAPHS 13&15).**

Past year; August 2008 to August 2009
Data is available for 37 stations, 12 (32.4%) Indicate lower water levels, average -0.58m. 25 Stations (67.6%) indicate higher water levels, average 0.64m. Overall a rise of 0.24m was recorded for the period **(GRAPHS 14&15)**.

Current average water levels are the same as the long-term average but 3.15m above the lowest average recorded **(GRAPH 16).**

4.5 A8 Drainage Area ((Nwanedzi, Nzhelele Rivers)

11 Stations are monitored in this area but as for the previous reports, the data for the artesian station is not considered in the report.

Water level trends vary from declining to stable to rising **(GRAPH 17)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
7 Stations have data for the period of which 5 indicate declining water levels, average -0.12 and 2 rising levels **(GRAPHS 18 & 20)**.

Past year; August 2008 to August 2009
4 Stations indicate lower and 3 higher water levels **(GRAPHS 19 & 20)**.

5) LEVHUVHU-LETABA WATER MANAGEMENT AREA.

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

5.1 A9 Drainage Area. (Mutale, Levhuvhu Rivers)

This drainage has 18 monitoring stations.

Varying trends from declining to very small rises for a short time during the past rainy season and declining again since is indicated **(GRAPH 21).**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
Data is available for all stations, 17 of which indicate lower water levels; average -0.42m (**GRAPHS 22 & 24)**.

Past year; August 2008 to August 2009
The pattern indicated for the past quarter is the same for the past year with 17 of the 18 stations indicating declining water levels over the whole year **(GRAPHS 23&24)**.

Overall an average decline of 0.69m was recorded over the area the past year.

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

14 Stations are monitored in this drainage.

Water level trends indicate relative small fluctuations over the past year **(GRAPH 25).**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
Data is available for all 14 stations. 13 Stations indicate lower water levels, average -0.32m with only 1 indicating a higher water level **(GRAPHS 26&28)**

Past year; August 2008 to August 2009
9 Stations indicate lower water levels, average -0.52m with 5 indicating higher levels, overall a decline of -0.12m was recorded(**GRAPHS 27&28)**

5.3 B9 Drainage Area. (Shingwidzi, Mphongolo Rivers)

4 Stations in this drainage but one are still blocked and have to be re-drilled.
Only 1 station has indication of recharge this season but is since declining again **(GRAPH 29)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
All 3 stations are declining **(GRAPHS 30 & 32).**

Past year; August 2008 to August 2009
All 3 stations have lower water levels than the same time last year, average -0.79m **(GRAPHS 31 & 32)**

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)

3 Stations are monitored in this area.

The water levels at B3N0001 & B3N0012 recovered very well over the past 9 months **(GRAPH 33)**

Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
All stations indicate higher levels **(GRAPH 34)**

Past year; August 2008 to August 2009
All Stations indicate higher water levels (**GRAPH 35)**

Although the water levels at B3N0001 and B3N0012, are still below long-term average, the significant rise over the past year is encouraging and levels are now well above the worst recorded (**GRAPH 36)**

6.2 B5 Drainage Area. (Olifants, Nkumpi Rivers)

7 Stations are monitored in this drainage.

Some water level fluctuations evident at all stations **(GRAPH 37)**
Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
4 Stations indicate declining water levels and 3 rising levels. The water level at B5N0055 sometimes reflects pumping effects of a nearby borehole that is sporadically used, as is the case here. **(GRAPHS 38 & 39)**

Past year; August 2008 to August 2009
Only 1 station indicate a lower water level than the same time last year **GRAPHS 39 & 40)**

Current average water levels compare very favorable with long-term average and the lowest average recorded at stations with long-term data **(GRAPH 41)**

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

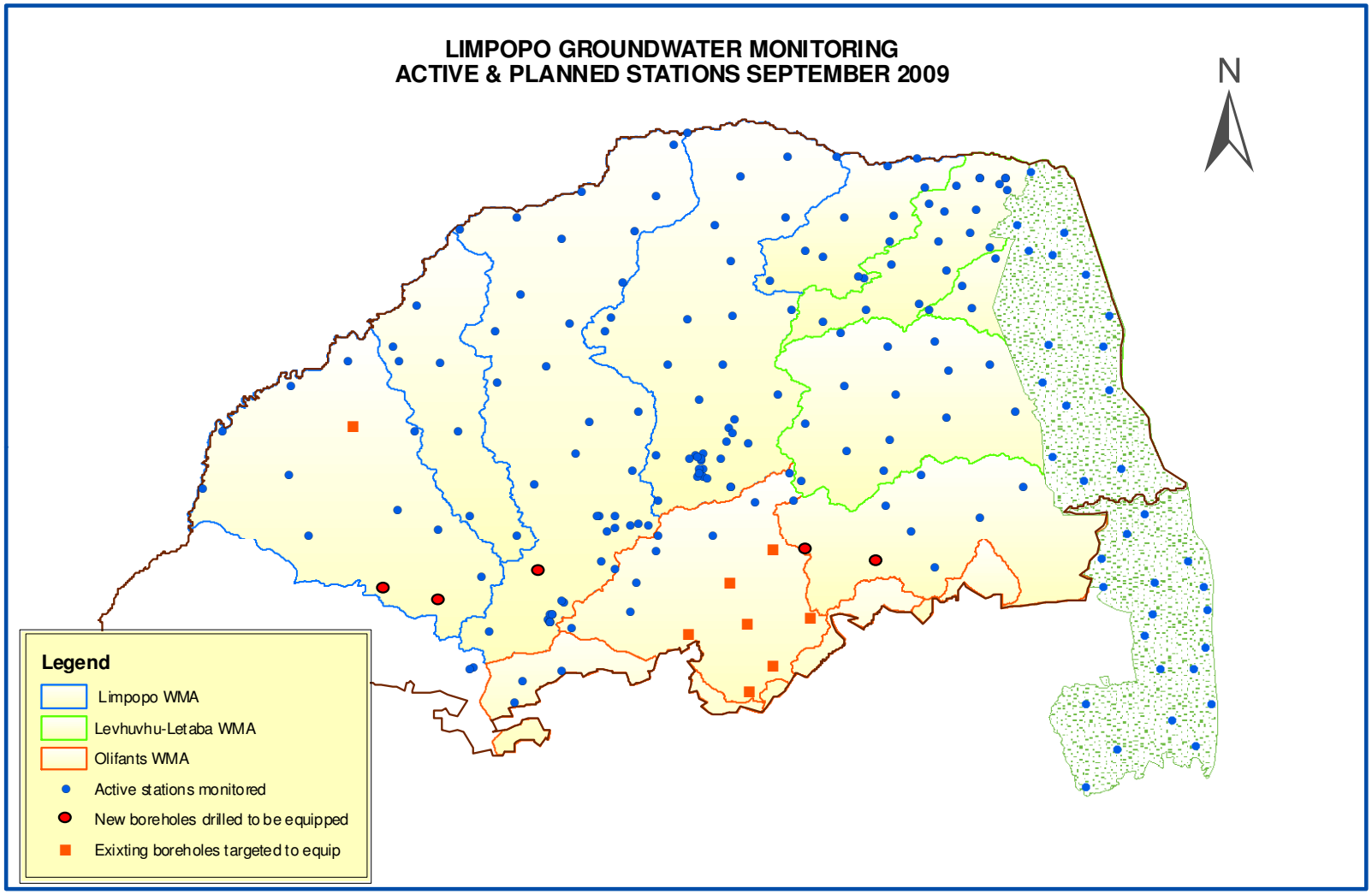
8 Stations are monitored in this drainage.

Trends generally indicate some rise the past season and declining since **(GRAPH 42)**

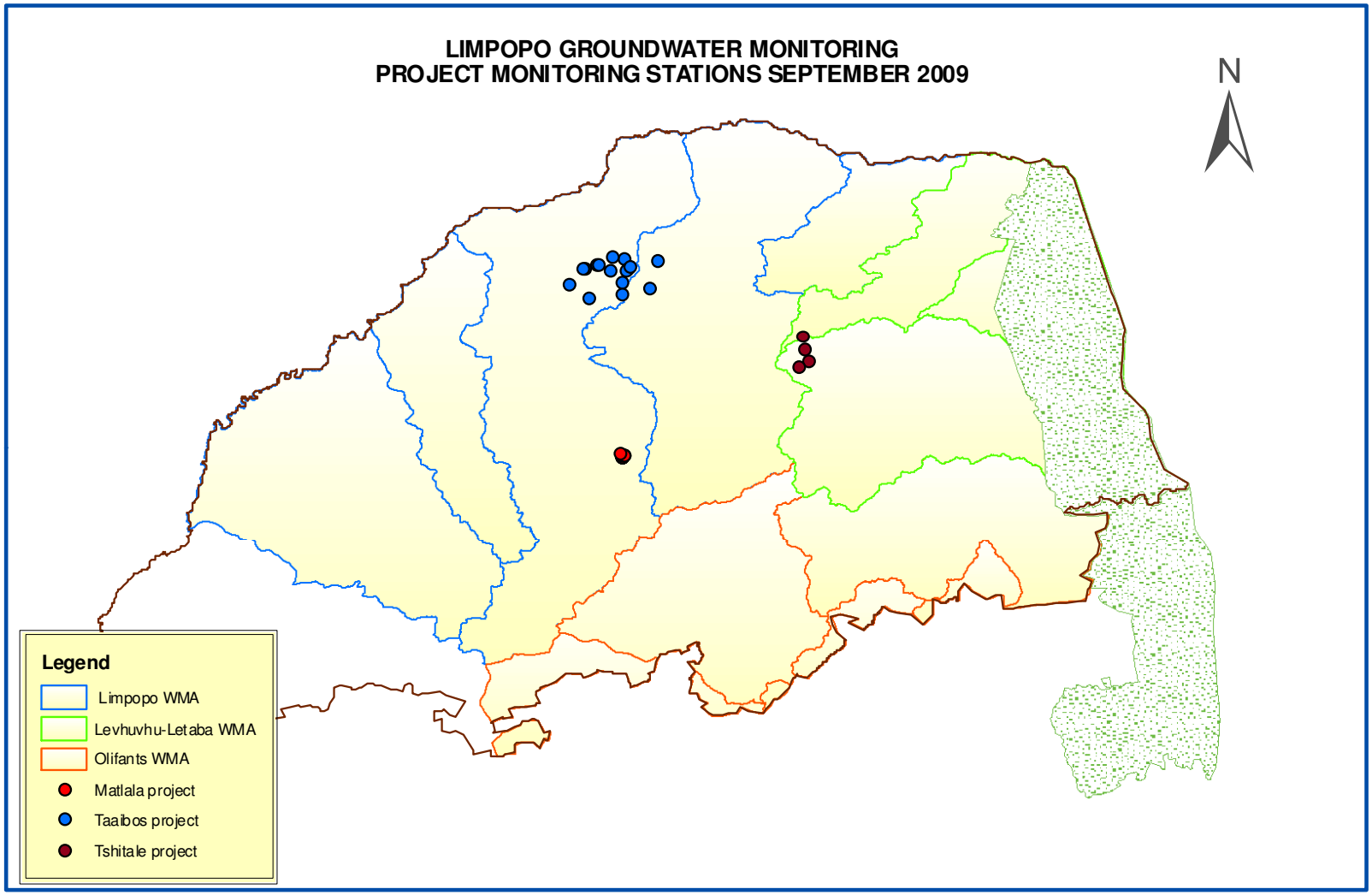
Comparison with previous levels:

Last quarter; May to August 2009 (Start to midway of the dry season)
All stations indicate lower water levels **(GRAPHS 43 & 45)**

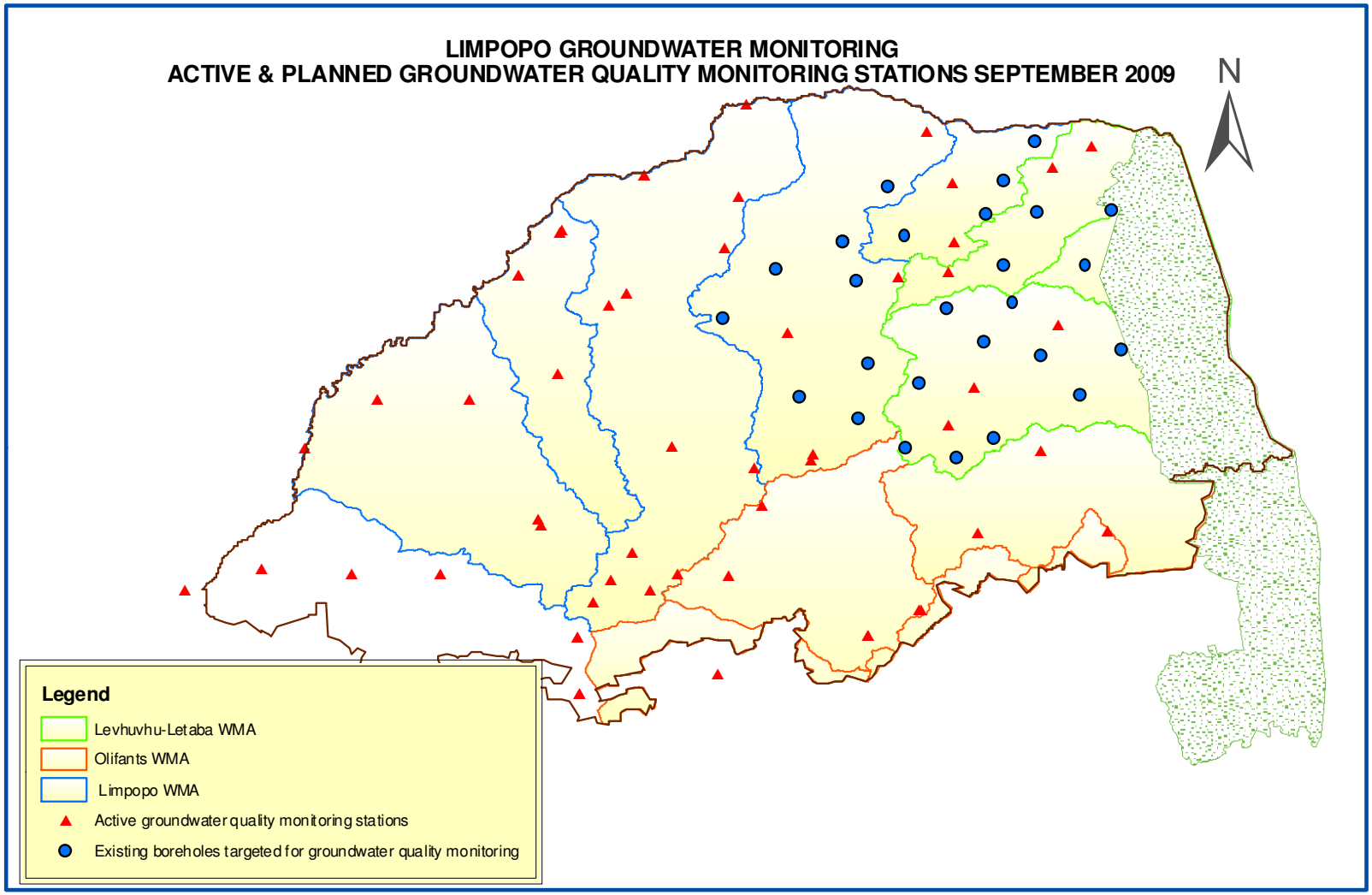
Past year; August 2008 to August 2009
Only 1 station indicates a higher water level **(GRAPHS 44 & 45)**.


LIMPOPO GROUNDWATER MONITORING
ACTIVE & PLANNED STATIONS SEPTEMBER 2009
N
Legend
Limpopo WMA
Levhuvhu-Letaba WMA
Olifants WMA
Active stations monitored
New boreholes drilled to be equipped
Exixting boreholes targeted to equip

MAP 1

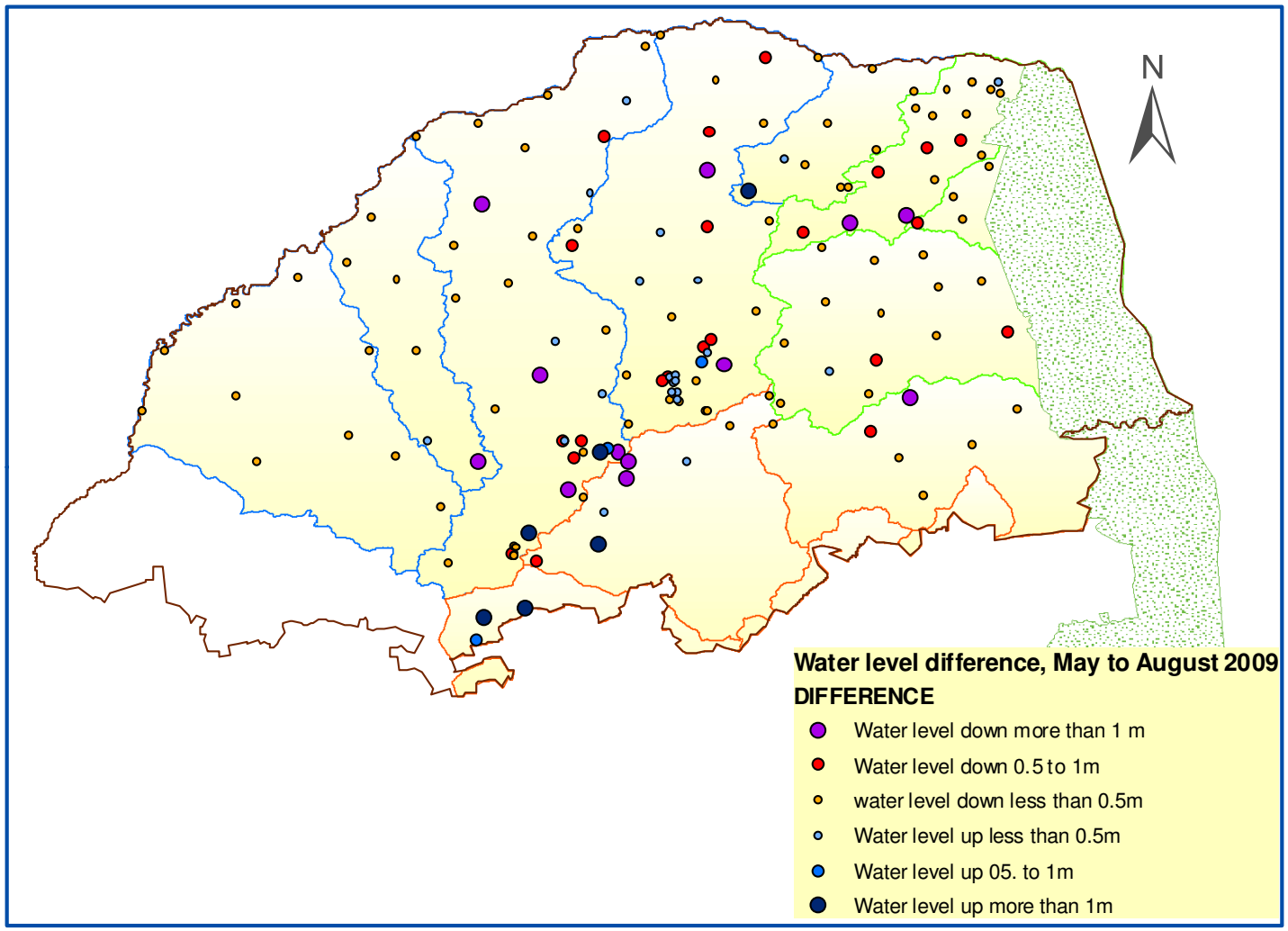

LIMPOPO GROUNDWATER MONITORING
PROJECT MONITORING STATIONS SEPTEMBER 2009
N
Legend
Limpopo WMA
Levhuvhu-Letaba WMA
Olifants WMA
Matlala project
Taaibos project
Tshitale project

MAP 2


LIMPOPO GROUNDWATER MONITORING
ACTIVE & PLANNED GROUNDWATER QUALITY MONITORING STATIONS SEPTEMBER 2009
N
Legend
Levhuvhu-Letaba WMA
Olifants WMA
Limpopo WMA
Active groundwater quality monitoring stations
Existing boreholes targeted for groundwater quality monitoring

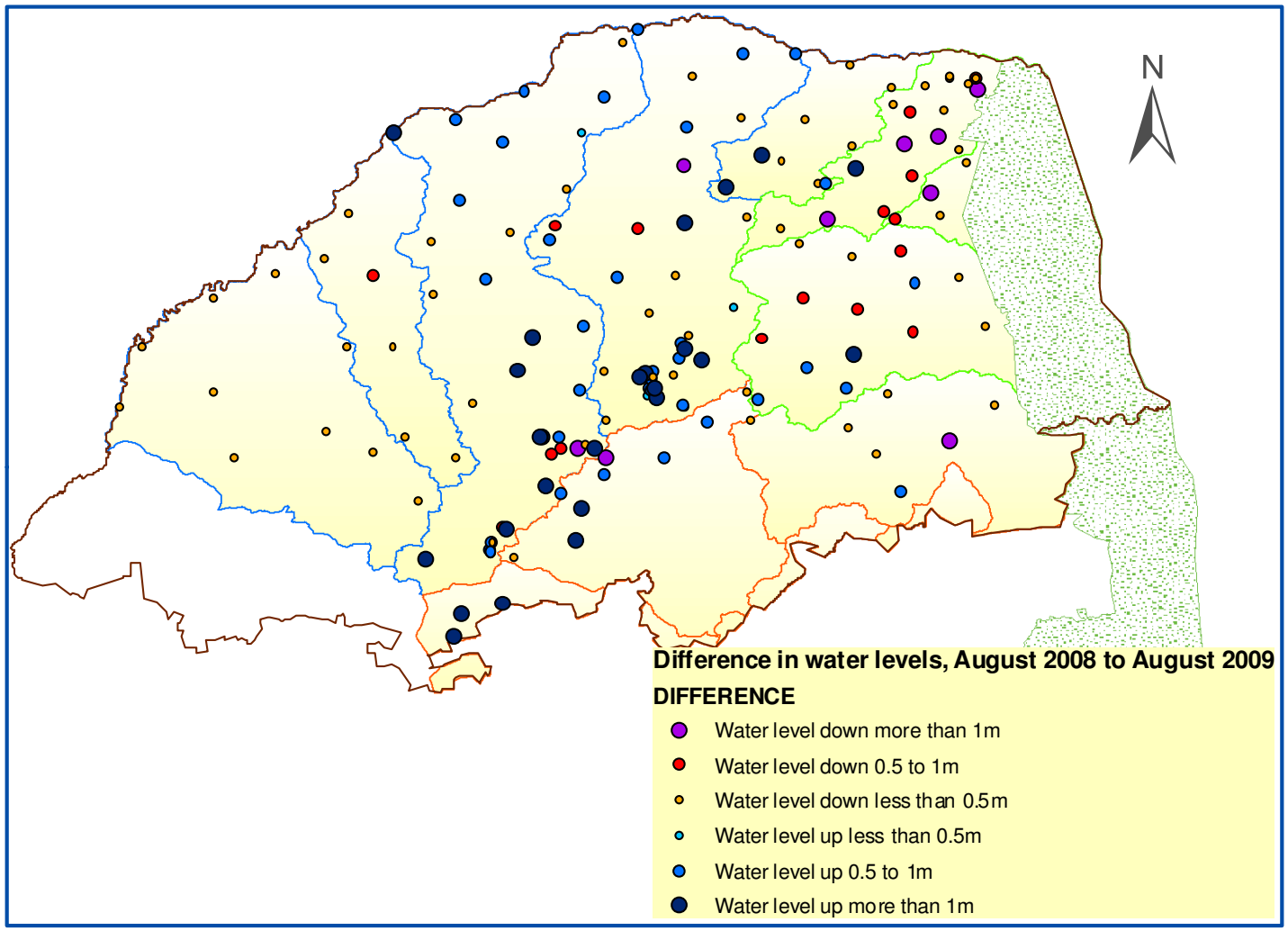
MAP 3

WATER LEVEL DIFFERENCE; MAY 2009 TO AUGUST 2009

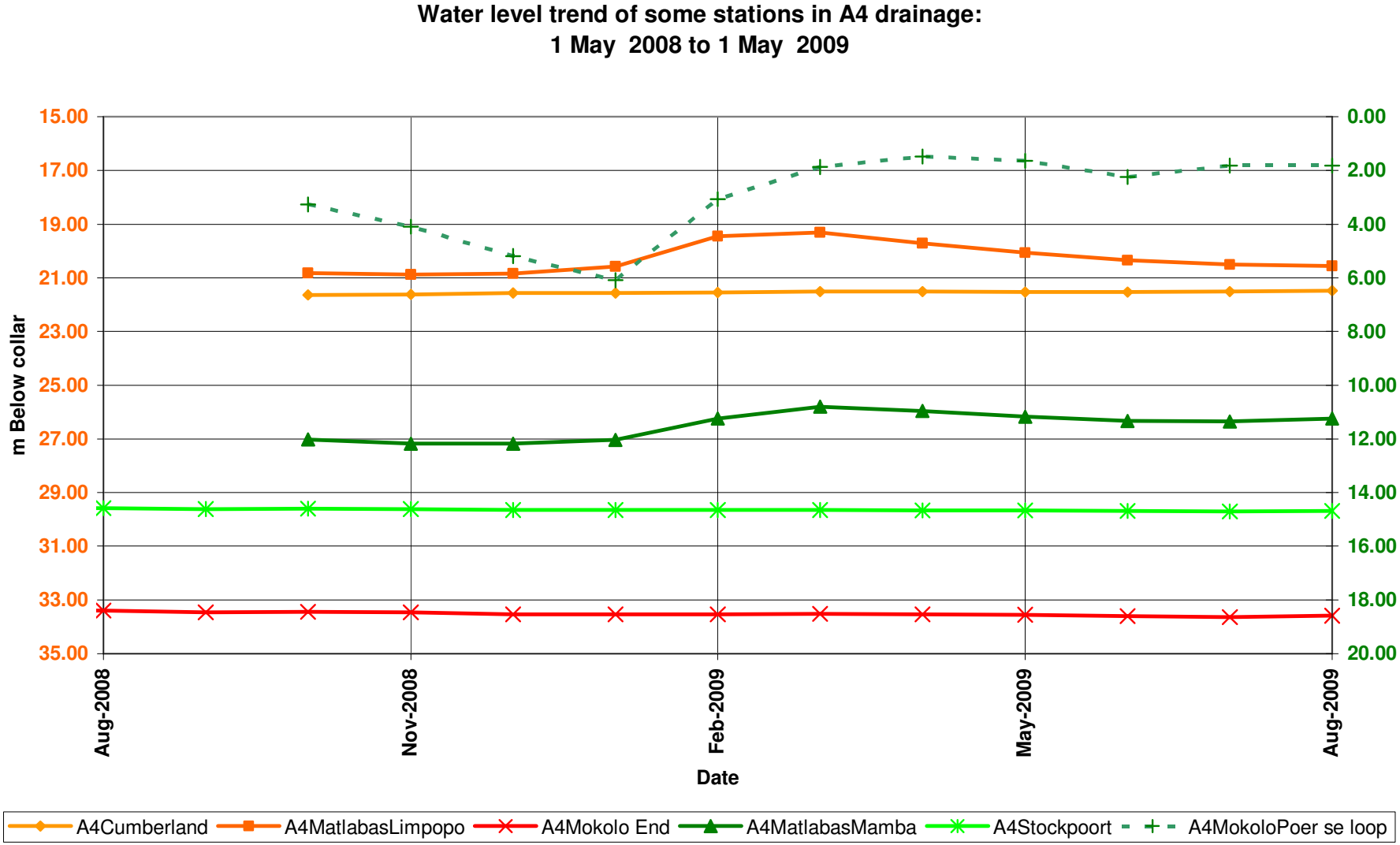


MAP 4

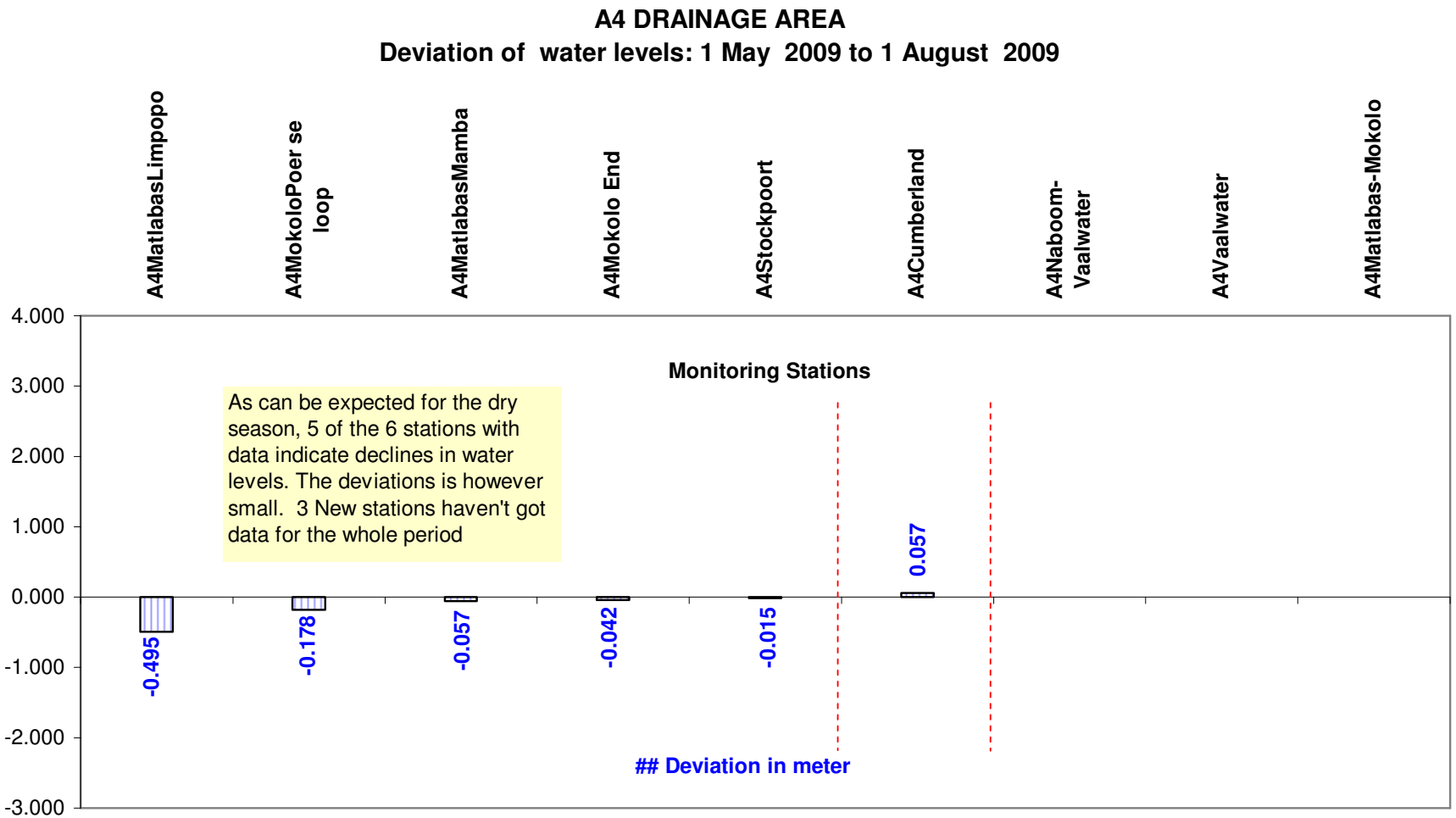
WATER LEVEL DIFFERENCE; MAY 2009 TO AUGUST 2009



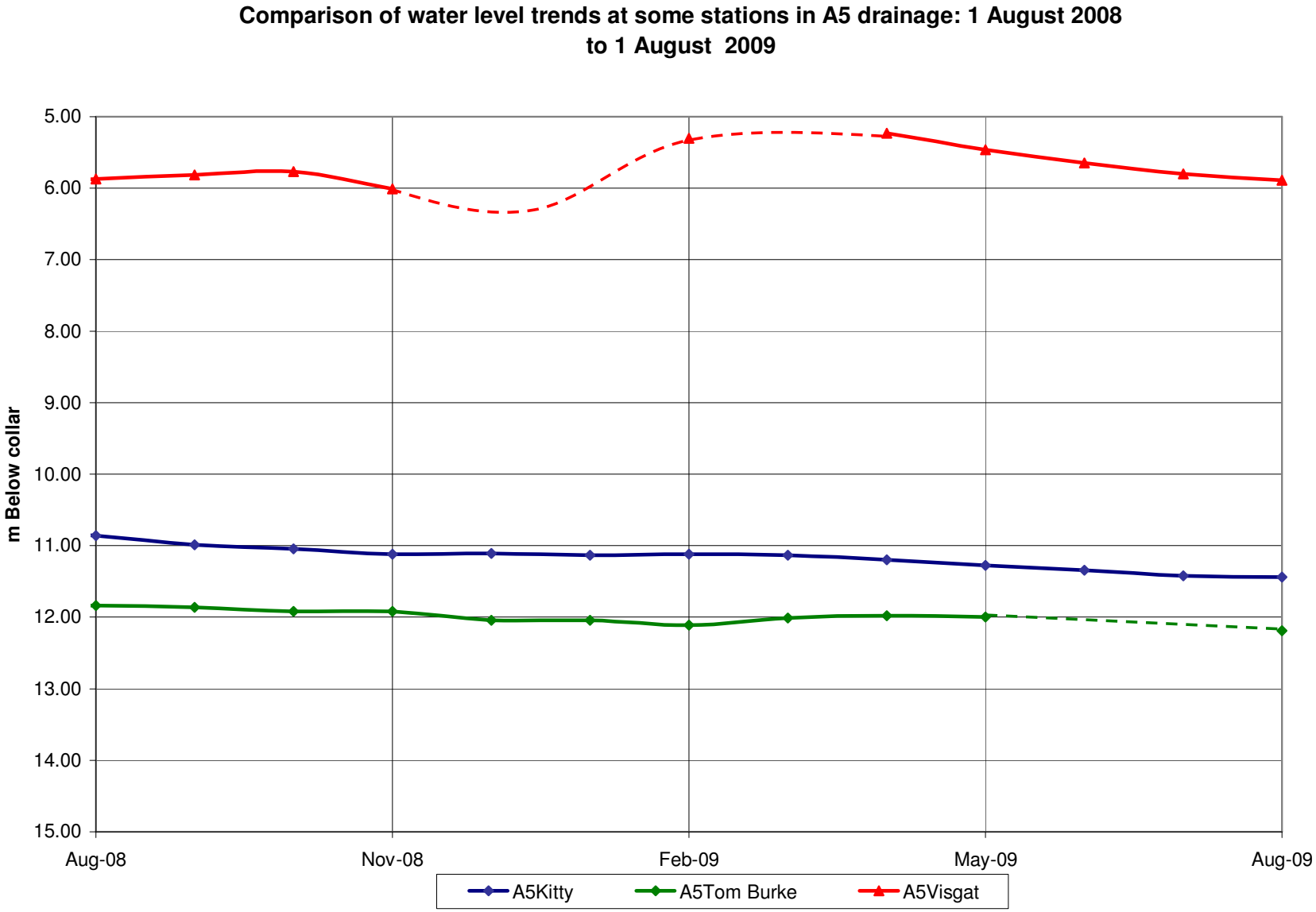
MAP 5


Water level trend of some stations in A4 drainage:
1 May 2008 to 1 May 2009
m Below collar
15.00
17.00
19.00
21.00
23.00
25.00
27.00
29.00
31.00
33.00
35.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Aug-2008
Nov-2008
Feb-2009
May-2009
Aug-2009
Date
A4Cumberland
A4MatlabasLimpopo
A4Mokolo End
A4MatlabasMamba
A4Stockpoort
A4MokoloPoer se loop

GRAPH 1

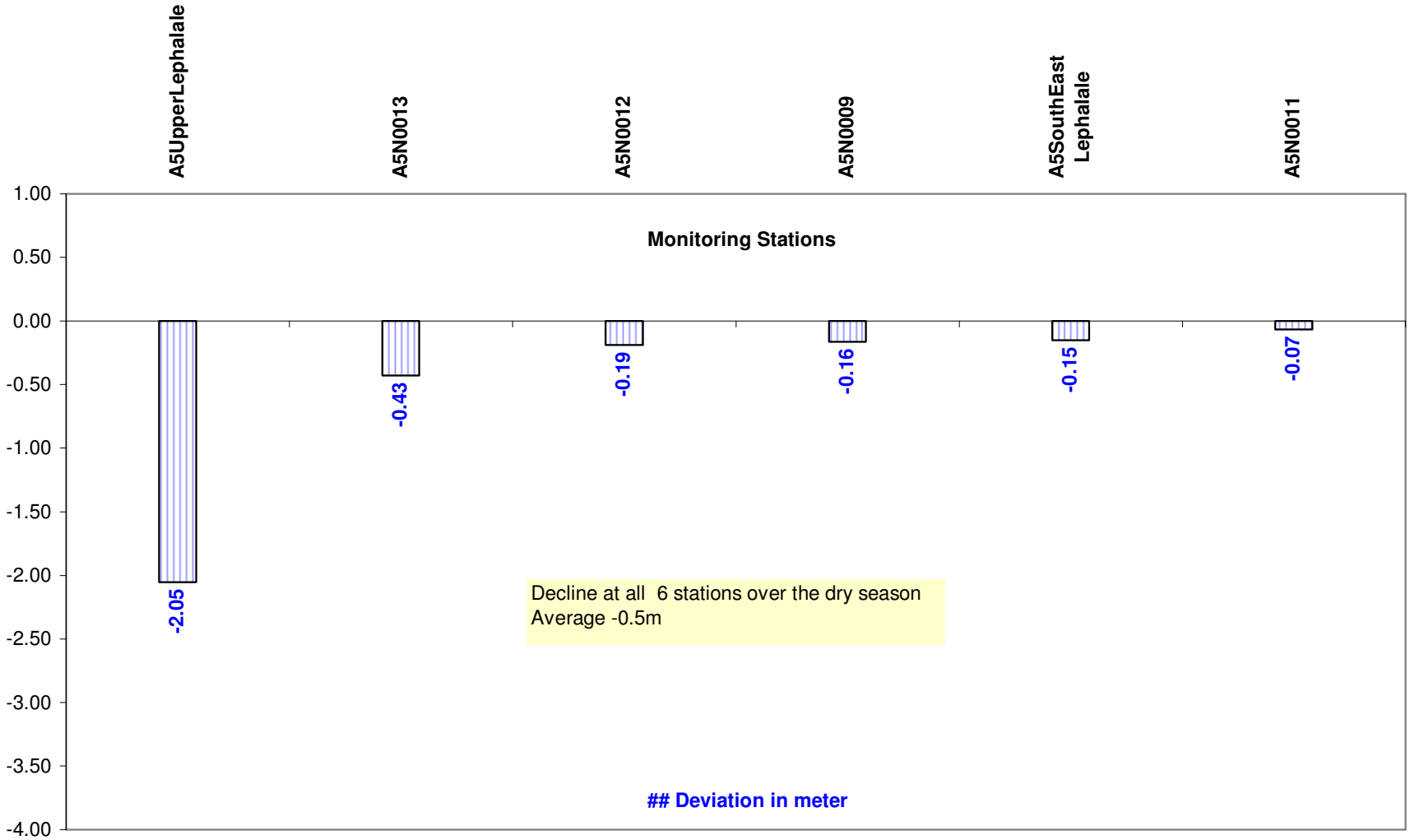

A4 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
A4MatlabasLimpopo
A4MokoloPoer se loop
A4MatlabasMamba
A4Mokolo End
A4Stockpoort
A4Cumberland
A4Naboom-Vaalwater
A4Vaalwater
A4Matlabas-Mokolo
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
Monitoring Stations
As can be expected for the dry season, 5 of the 6 stations with data indicate declines in water levels. The deviations is however small. 3 New stations haven't got data for the whole period
-0.495
-0.178
-0.057
-0.042
-0.015
0.057
Deviation in meter

GRAPH 2


Comparison of water level trends at some stations in A5 drainage: 1 August 2008 to 1 August 2009
m Below collar
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
Aug-08
Nov-08
Feb-09
May-09
Aug-09
A5Kitty
A5Tom Burke
A5Visgat

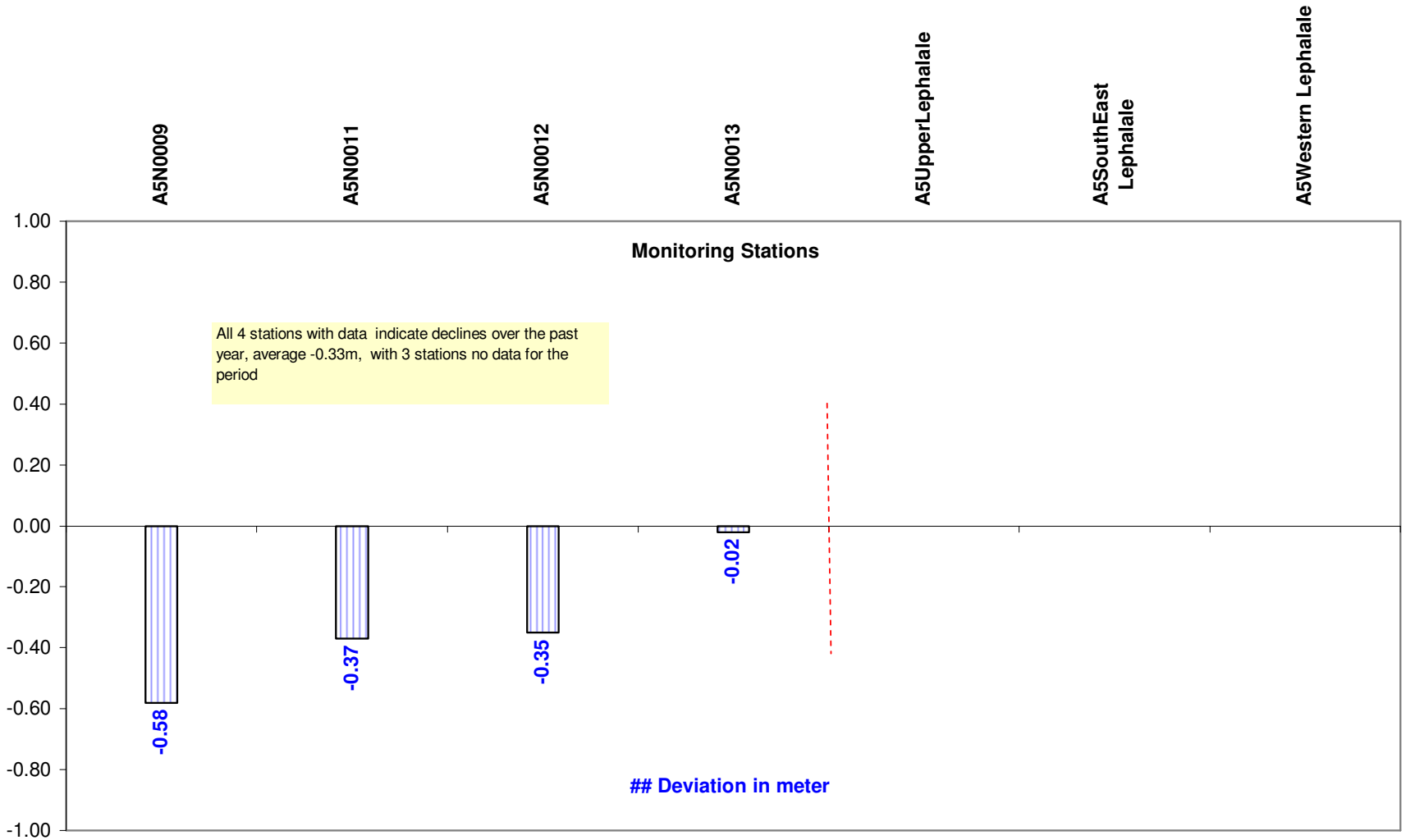
GRAPH 3

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

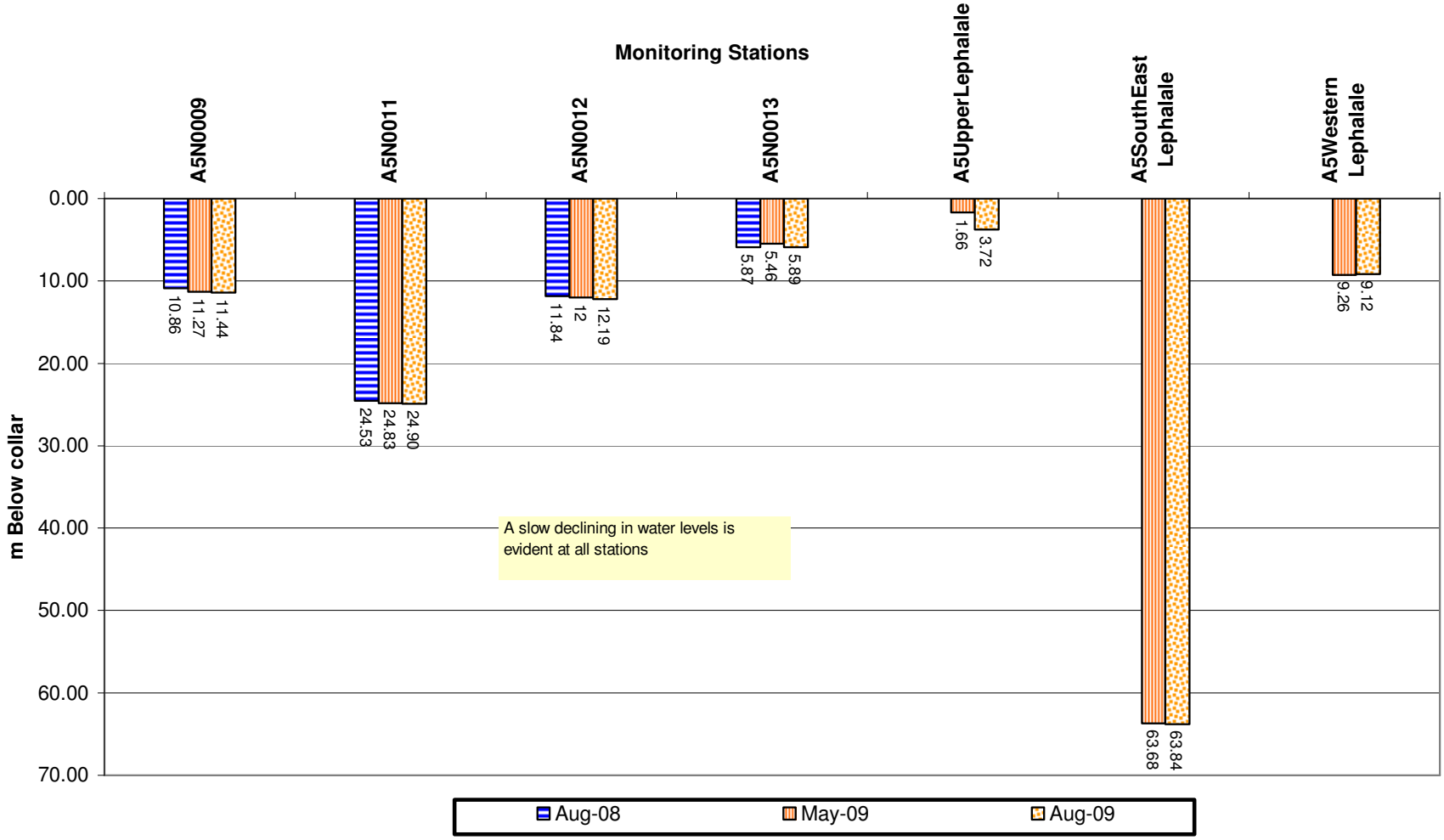


GRAPH 4

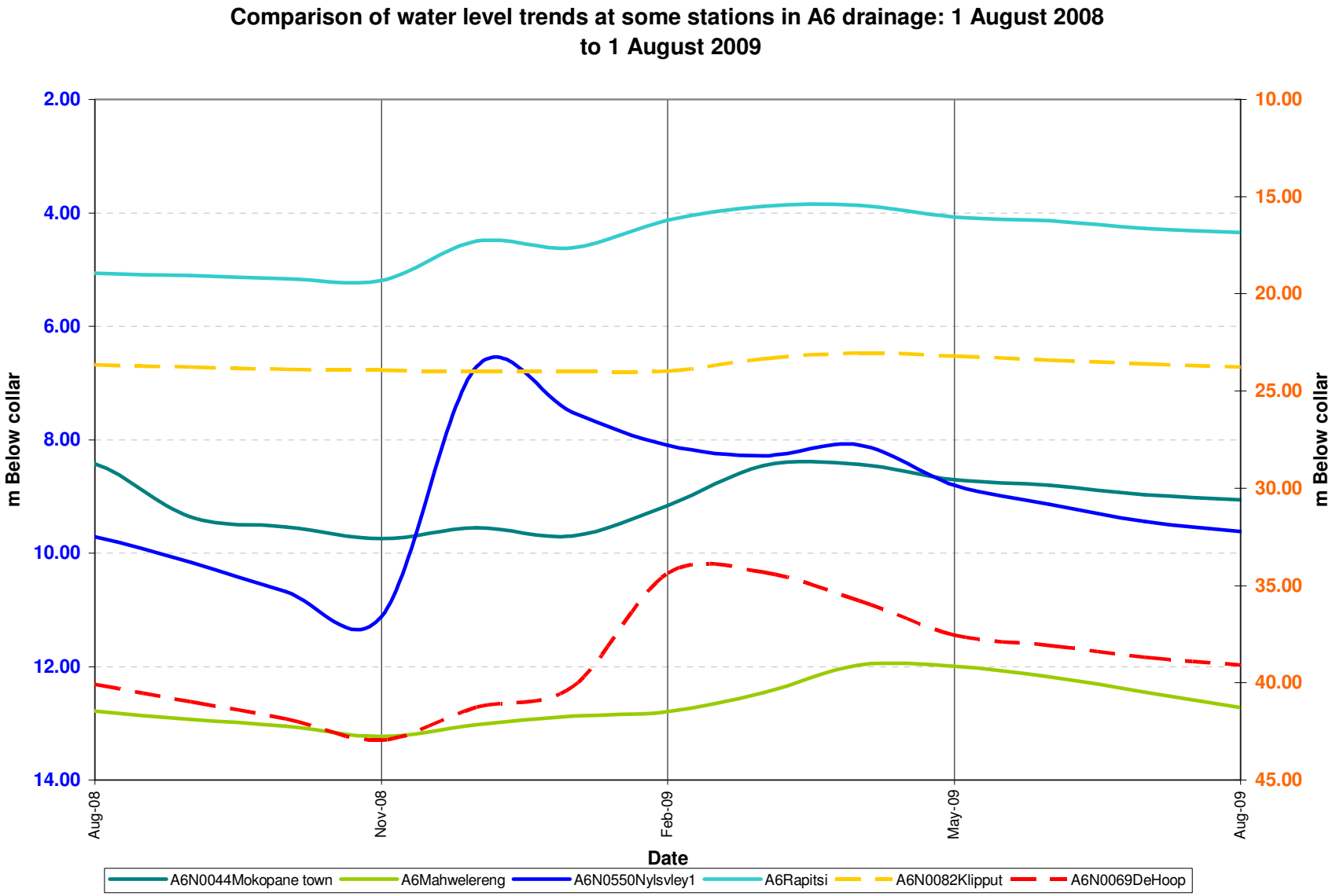
A5 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009



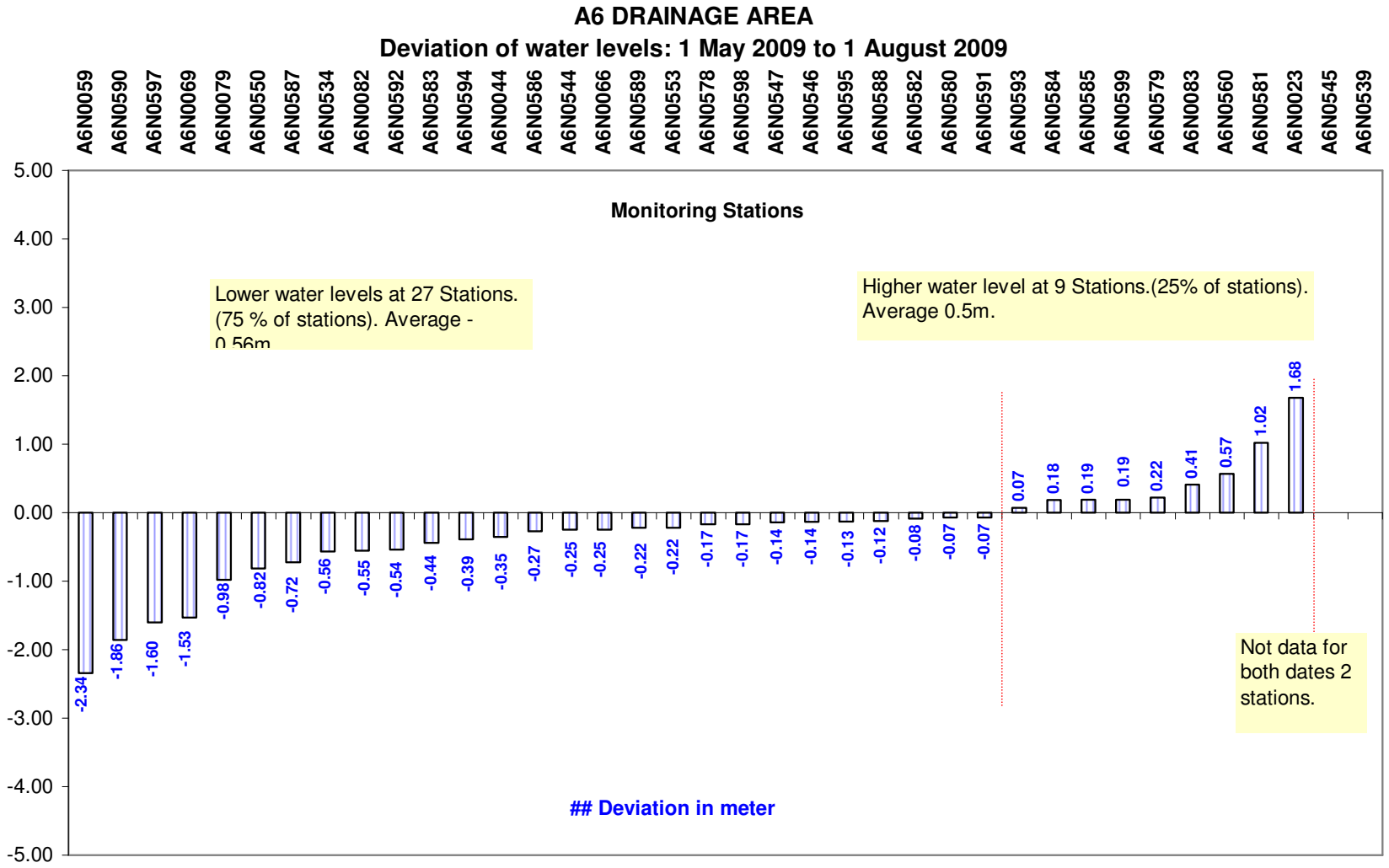
GRAPH 5


A5 DRAINAGE AREA
Comparison between water level depths : 1 August 2008,
1 May 2009 and 1 August 2009
Monitoring Stations
A5N0009
A5N0011
A5N0012
A5N0013
A5UpperLephalale
A5SouthEast Lephalale
A5Western Lephalale
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
10.86
11.27
11.44
24.53
24.83
24.90
11.84
12
12.19
5.87
5.46
5.89
1.66
3.72
63.68
63.84
9.26
9.12
A slow declining in water levels is evident at all stations
Aug-08
May-09
Aug-09

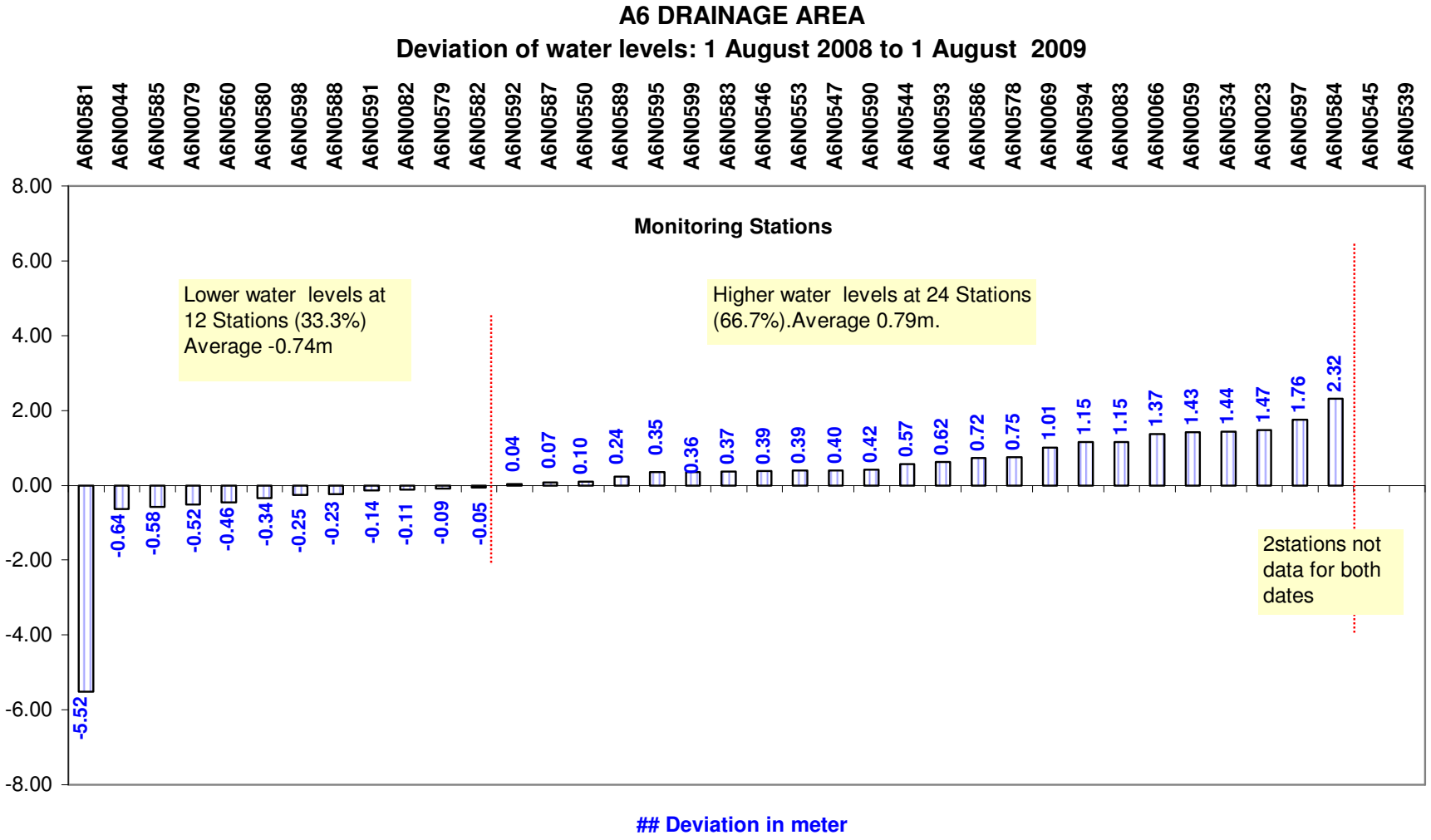
GRAPH 6


Comparison of water level trends at some stations in A6 drainage: 1 August 2008 to 1 August 2009
2.00
4.00
6.00
8.00
10.00
12.00
14.00
m Below collar
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
m Below collar
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
A6N0044Mokopane town
A6Mahwelereng
A6N0550Nylsvley1
A6Rapitsi
A6N0082Klipput
A6N0069DeHoop

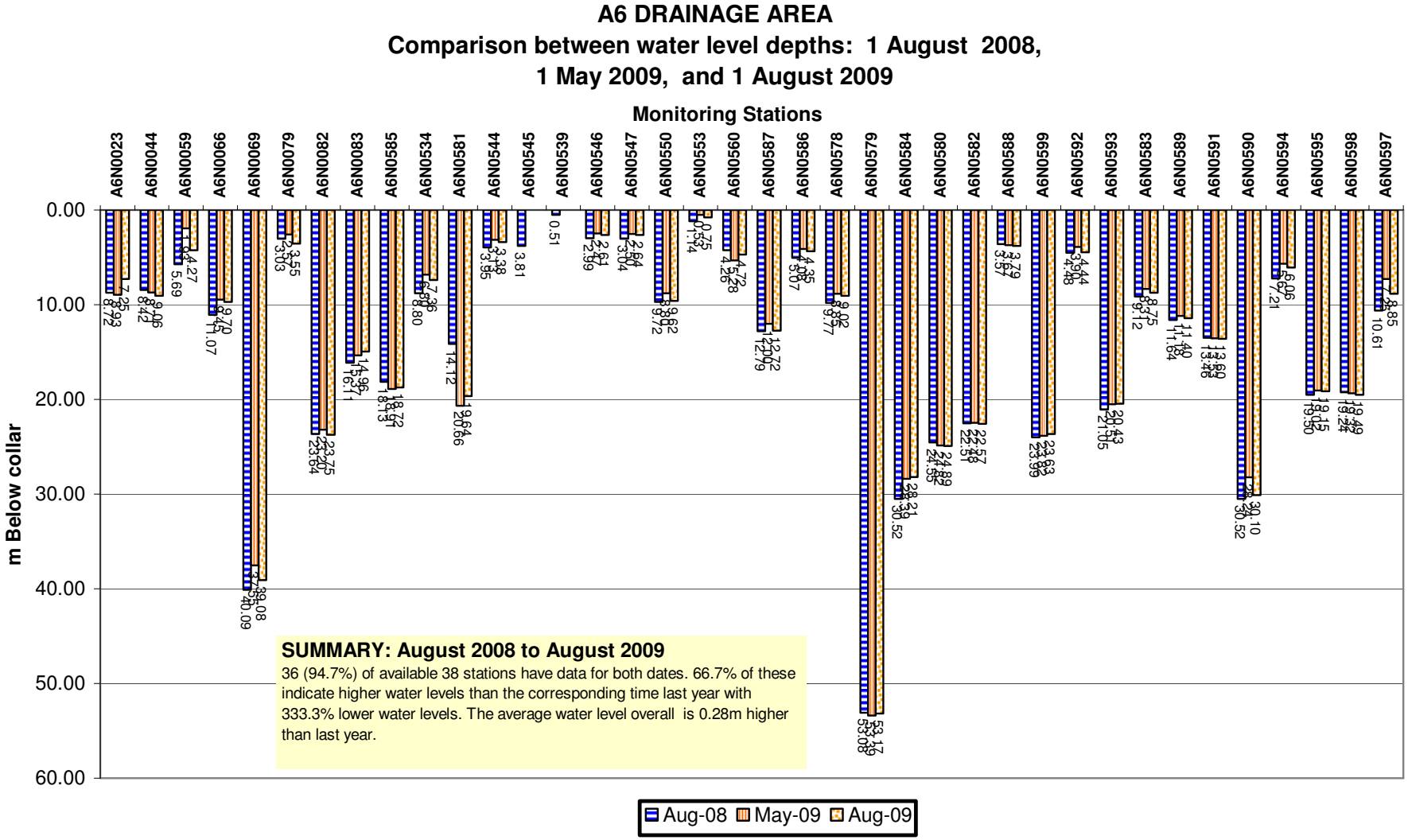
GRAPH 7


A6 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
A6N0059 A6N0590 A6N0597 A6N0069 A6N0079 A6N0550 A6N0587 A6N0534 A6N0082 A6N0592 A6N0583 A6N0594 A6N0044 A6N0586 A6N0544 A6N0066 A6N0589 A6N0553 A6N0578 A6N0598 A6N0547 A6N0546 A6N0595 A6N0588 A6N0582 A6N0580 A6N0591 A6N0593 A6N0584 A6N0585 A6N0599 A6N0579 A6N0083 A6N0560 A6N0581 A6N0023 A6N0545 A6N0539
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
Monitoring Stations
Lower water levels at 27 Stations. (75 % of stations). Average - 0.56m
Higher water level at 9 Stations.(25% of stations). Average 0.5m.
-2.34 -1.86 -1.60 -1.53 -0.98 -0.82 -0.72 -0.56 -0.55 -0.54 -0.44 -0.39 -0.35 -0.27 -0.25 -0.25 -0.22 -0.22 -0.17 -0.17 -0.14 -0.14 -0.13 -0.12 -0.08 -0.07 -0.07
0.07 0.18 0.19 0.19 0.22 0.41 0.57 1.02 1.68
Not data for both dates 2 stations.
Deviation in meter

GRAPH 8

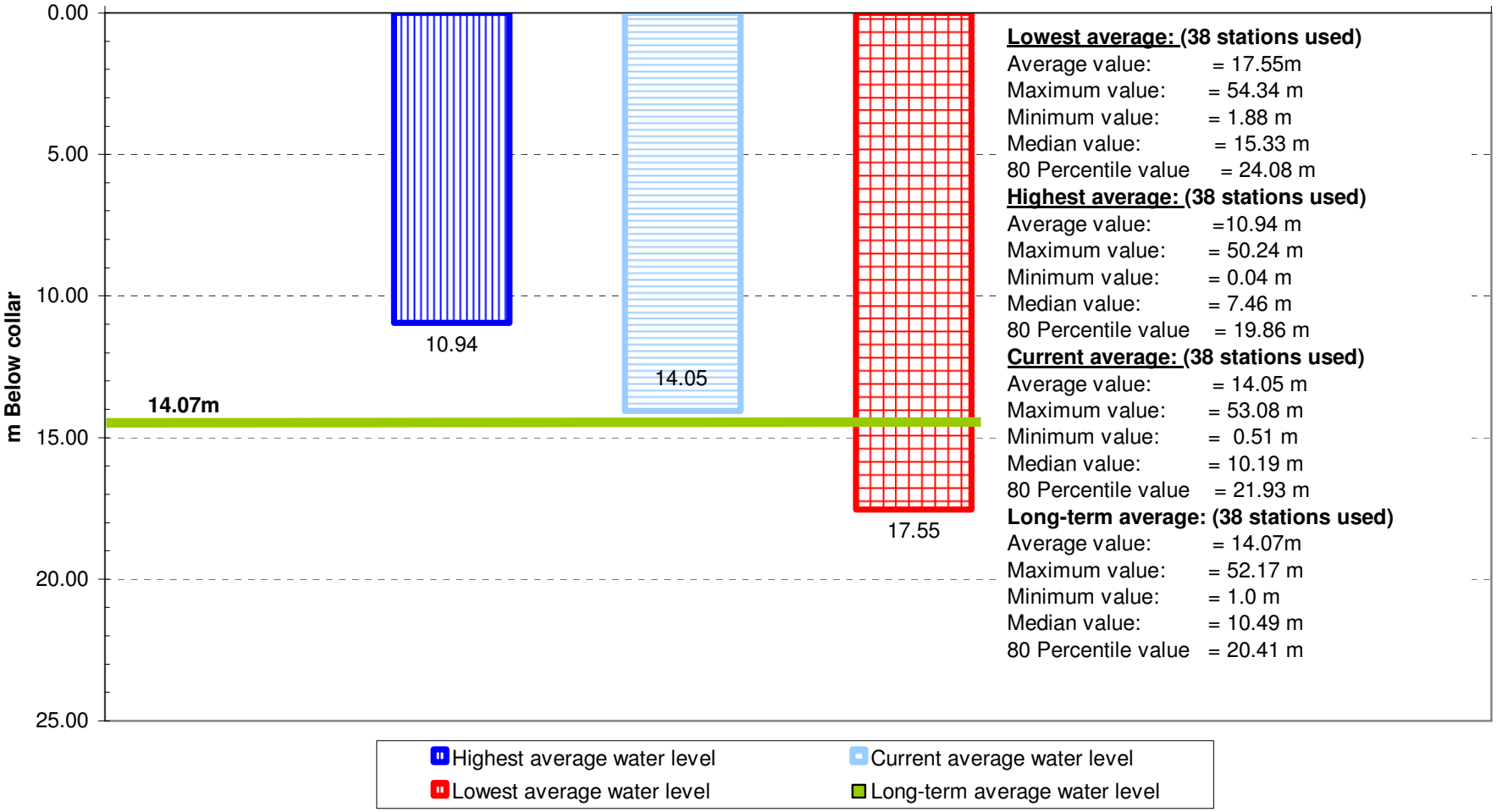

A6 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
A6N0581 A6N0044 A6N0585 A6N0079 A6N0560 A6N0580 A6N0598 A6N0588 A6N0591 A6N0082 A6N0579 A6N0582 A6N0592 A6N0587 A6N0550 A6N0589 A6N0595 A6N0599 A6N0583 A6N0546 A6N0553 A6N0547 A6N0590 A6N0544 A6N0593 A6N0586 A6N0578 A6N0069 A6N0594 A6N0083 A6N0066 A6N0059 A6N0534 A6N0023 A6N0597 A6N0584 A6N0545 A6N0539
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
Monitoring Stations
Lower water levels at 12 Stations (33.3%) Average -0.74m
Higher water levels at 24 Stations (66.7%).Average 0.79m.
-5.52 -0.64 -0.58 -0.52 -0.46 -0.34 -0.25 -0.23 -0.14 -0.11 -0.09 -0.05 0.04 0.07 0.10 0.24 0.35 0.36 0.37 0.39 0.39 0.40 0.42 0.57 0.62 0.72 0.75 1.01 1.15 1.15 1.37 1.43 1.44 1.47 1.76 2.32
2stations not data for both dates
Deviation in meter

GRAPH 9

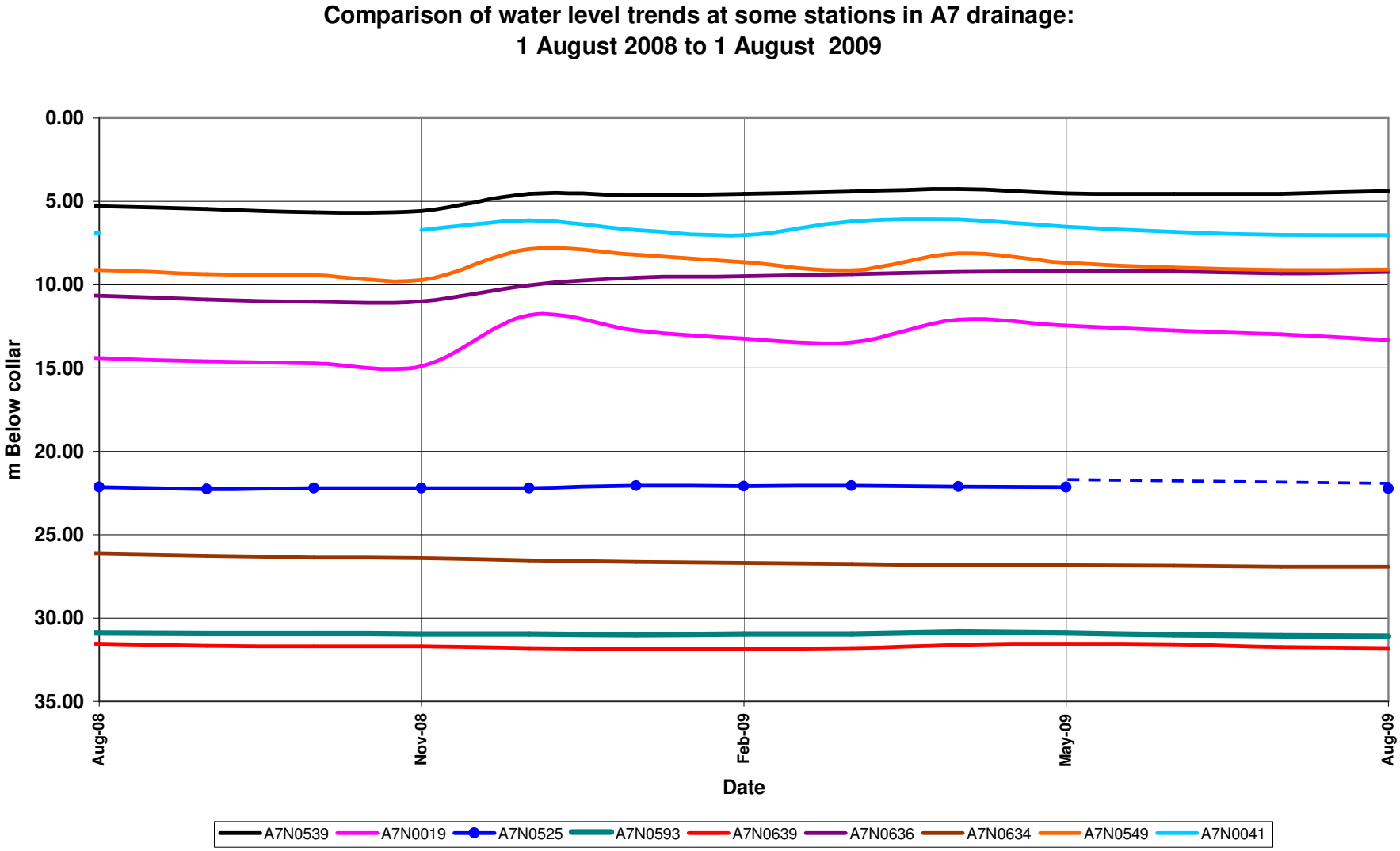

A6 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009, and 1 August 2009
Monitoring Stations
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
A6N0023
A6N0044
A6N0059
A6N0066
A6N0069
A6N0079
A6N0082
A6N0083
A6N0585
A6N0534
A6N0581
A6N0544
A6N0545
A6N0539
A6N0546
A6N0547
A6N0550
A6N0553
A6N0560
A6N0587
A6N0586
A6N0578
A6N0579
A6N0584
A6N0580
A6N0582
A6N0588
A6N0599
A6N0592
A6N0593
A6N0583
A6N0589
A6N0591
A6N0590
A6N0594
A6N0595
A6N0598
A6N0597
SUMMARY: August 2008 to August 2009
36 (94.7%) of available 38 stations have data for both dates. 66.7% of these indicate higher water levels than the corresponding time last year with 333.3% lower water levels. The average water level overall is 0.28m higher than last year.
Aug-08
May-09
Aug-09

GRAPH 10

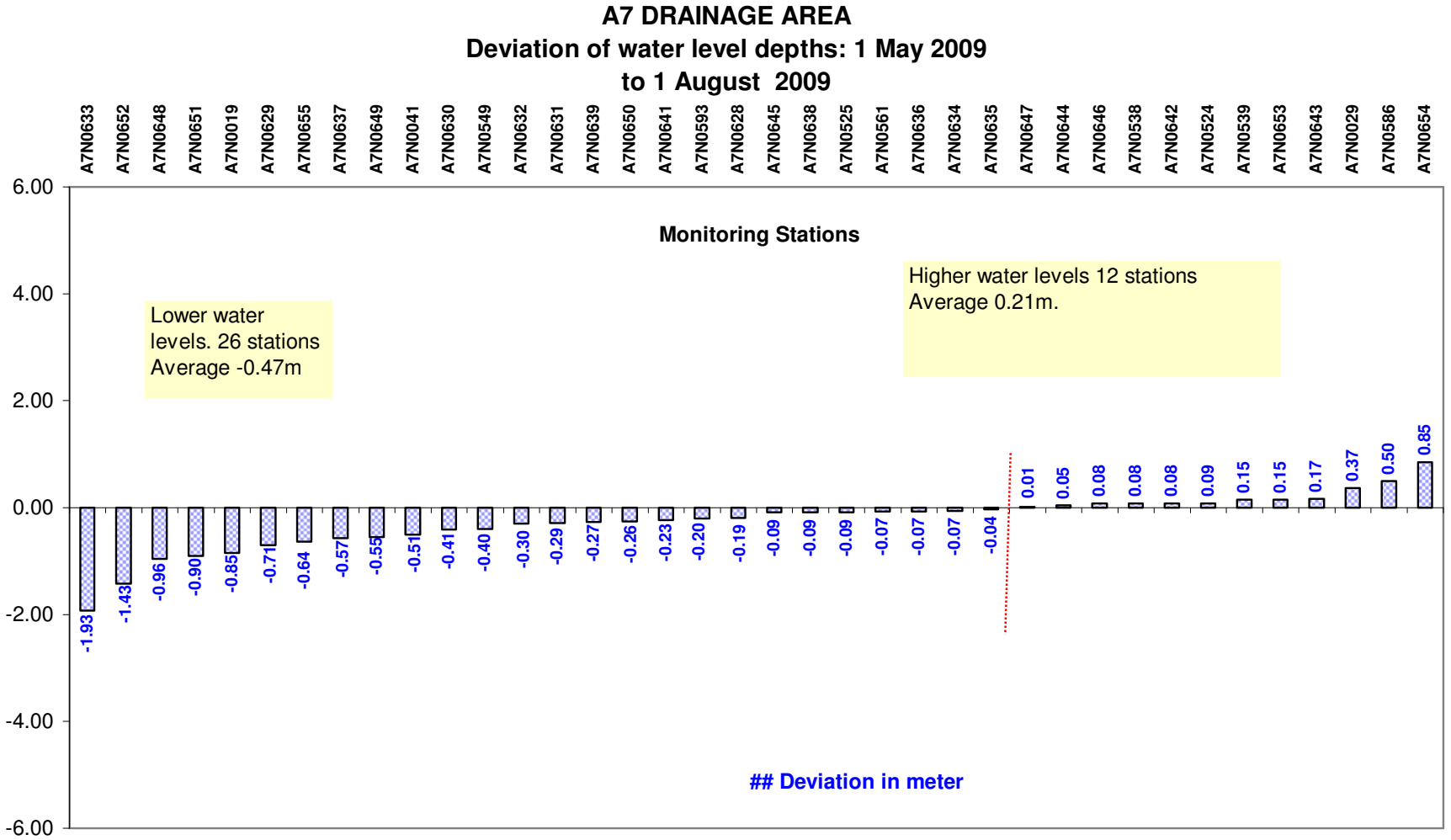
A6 DRAINAGE AREA
Comparison of average current water level depths with highest, lowest & long-term average water level depths recorded



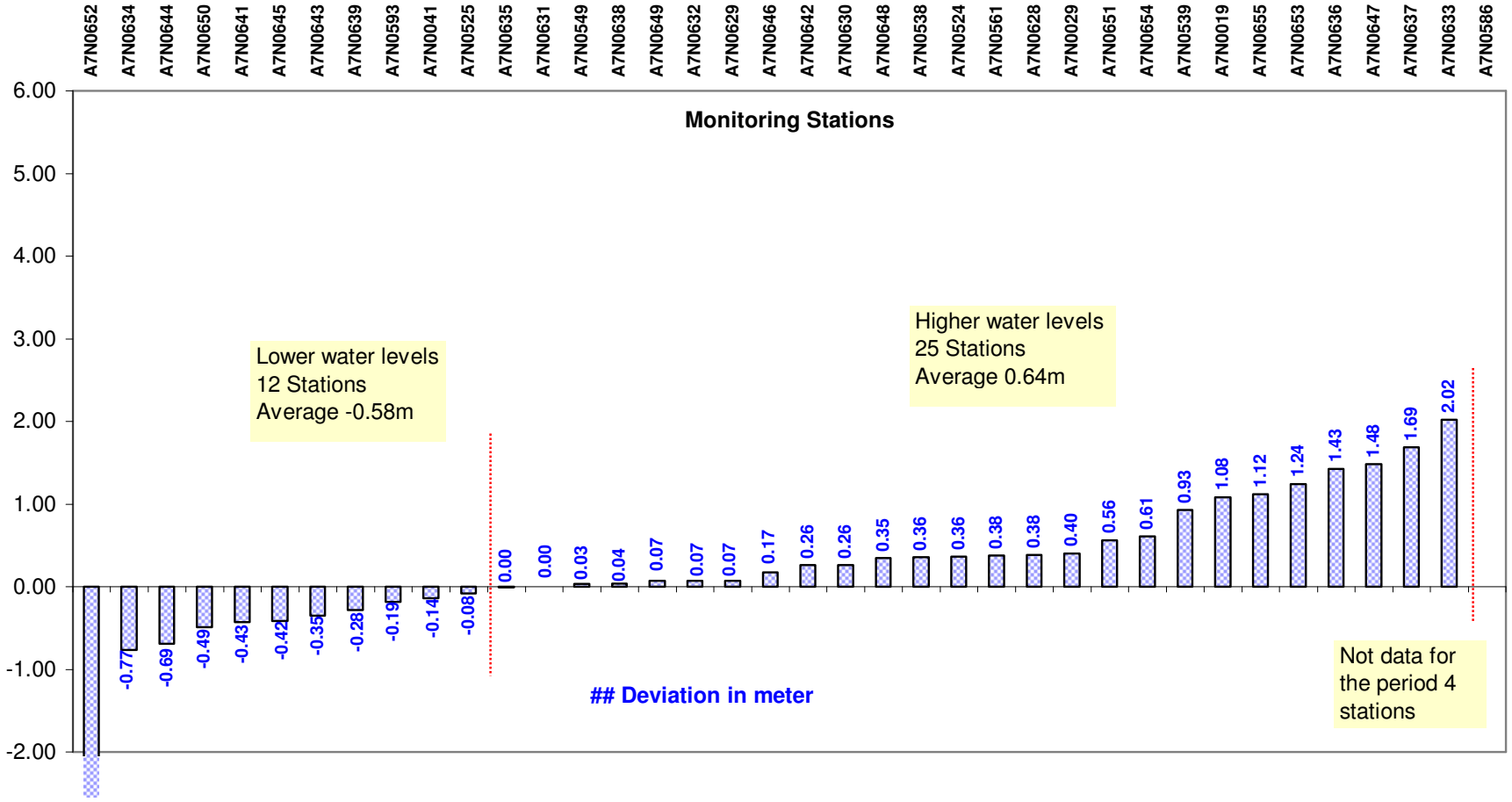
GRAPH 11


Comparison of water level trends at some stations in A7 drainage:
1 August 2008 to 1 August 2009
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
m Below collar
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
A7N0539
A7N0019
A7N0525
A7N0593
A7N0639
A7N0636
A7N0634
A7N0549
A7N0041

GRAPH 12

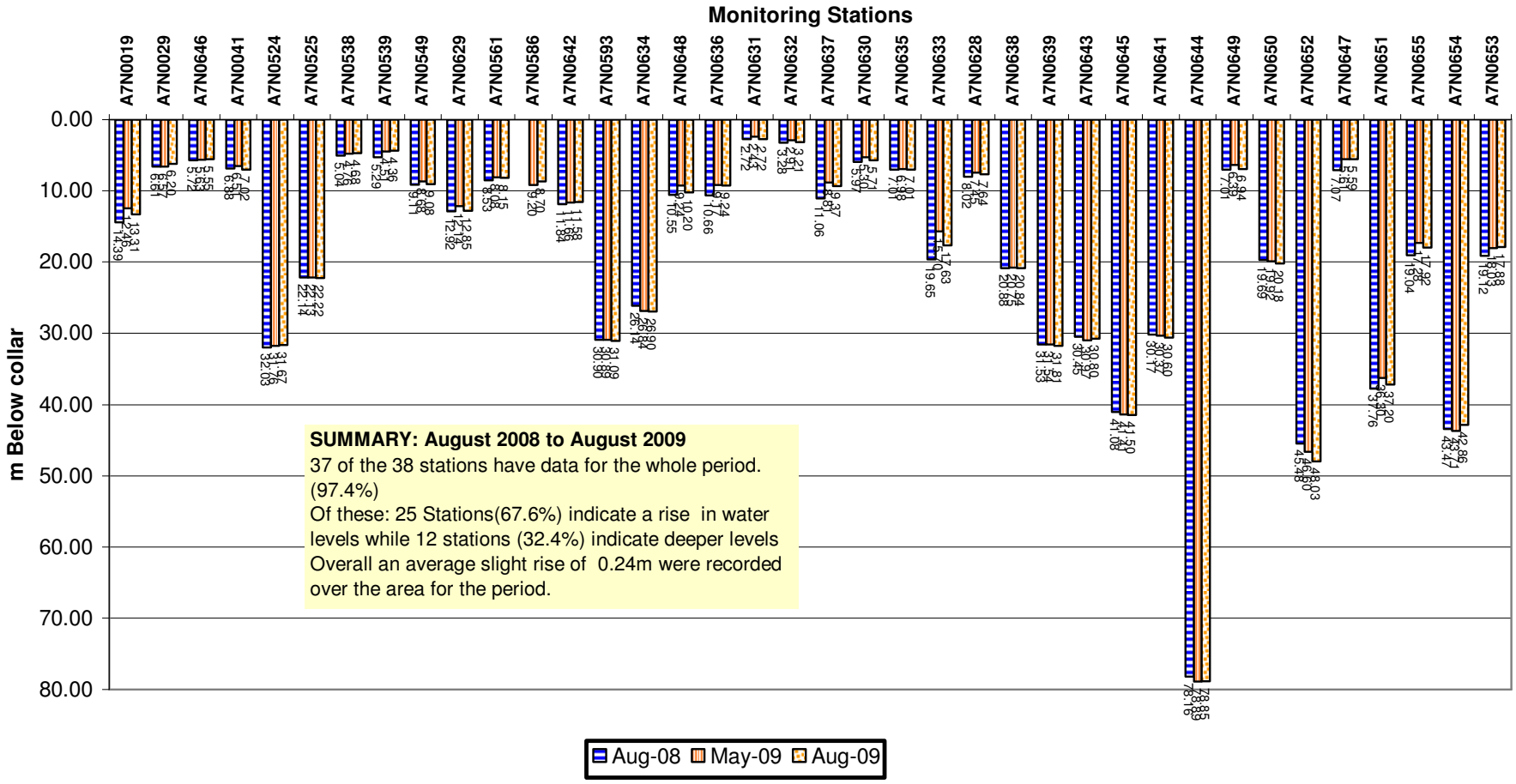

A7 DRAINAGE AREA
Deviation of water level depths: 1 May 2009
to 1 August 2009
A7N0633 A7N0652 A7N0648 A7N0651 A7N0019 A7N0629 A7N0655 A7N0637 A7N0649 A7N0041 A7N0630 A7N0549 A7N0632 A7N0631 A7N0639 A7N0650 A7N0641 A7N0593 A7N0628 A7N0645 A7N0638 A7N0525 A7N0561 A7N0636 A7N0634 A7N0635 A7N0647 A7N0644 A7N0646 A7N0538 A7N0642 A7N0524 A7N0539 A7N0653 A7N0643 A7N0029 A7N0586 A7N0654
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
Monitoring Stations
Lower water levels. 26 stations Average -0.47m
Higher water levels 12 stations Average 0.21m.
-1.93 -1.43 -0.96 -0.90 -0.85 -0.71 -0.64 -0.57 -0.55 -0.51 -0.41 -0.40 -0.30 -0.29 -0.27 -0.26 -0.23 -0.20 -0.19 -0.09 -0.09 -0.09 -0.07 -0.07 -0.07 -0.04 0.01 0.05 0.08 0.08 0.08 0.09 0.15 0.15 0.17 0.37 0.50 0.85
Deviation in meter

GRAPH 13

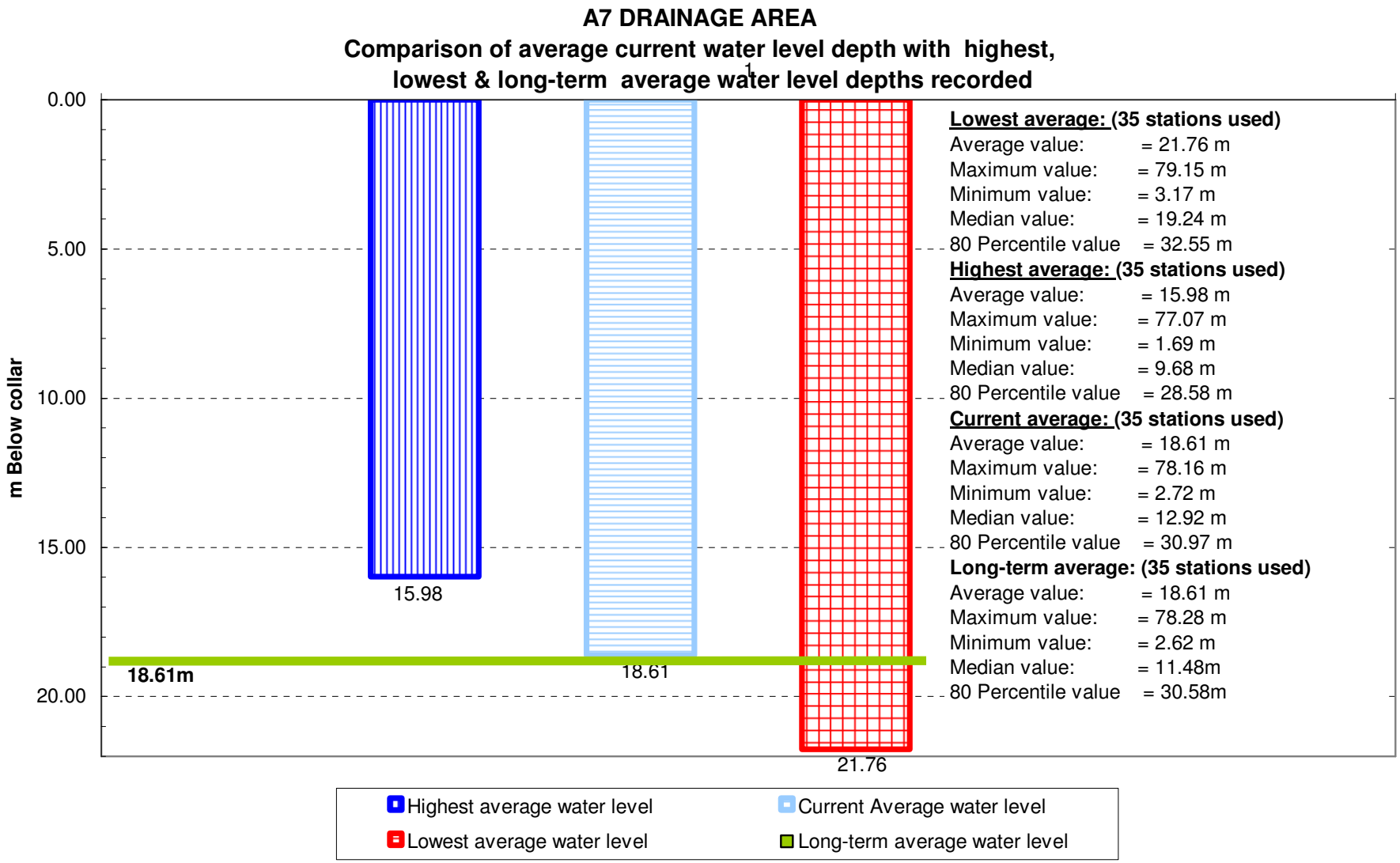

A7 DRAINAGE AREA
Deviation of water level depths: 1 August 2008 to 1 August 2009
A7N0652 A7N0634 A7N0644 A7N0650 A7N0641 A7N0645 A7N0643 A7N0639 A7N0593 A7N0041 A7N0525 A7N0635 A7N0631 A7N0549 A7N0638 A7N0649 A7N0632 A7N0629 A7N0646 A7N0642 A7N0630 A7N0648 A7N0538 A7N0524 A7N0561 A7N0628 A7N0029 A7N0651 A7N0654 A7N0539 A7N0019 A7N0655 A7N0653 A7N0636 A7N0647 A7N0637 A7N0633 A7N0586
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
Monitoring Stations
Lower water levels
12 Stations
Average -0.58m
Higher water levels
25 Stations
Average 0.64m
-0.77 -0.69 -0.49 -0.43 -0.42 -0.35 -0.28 -0.19 -0.14 -0.08 0.00 0.00 0.03 0.04 0.07 0.07 0.07 0.17 0.26 0.26 0.35 0.36 0.36 0.38 0.38 0.40 0.56 0.61 0.93 1.08 1.12 1.24 1.43 1.48 1.69 2.02
Deviation in meter
Not data for
the period 4
stations

GRAPH 14

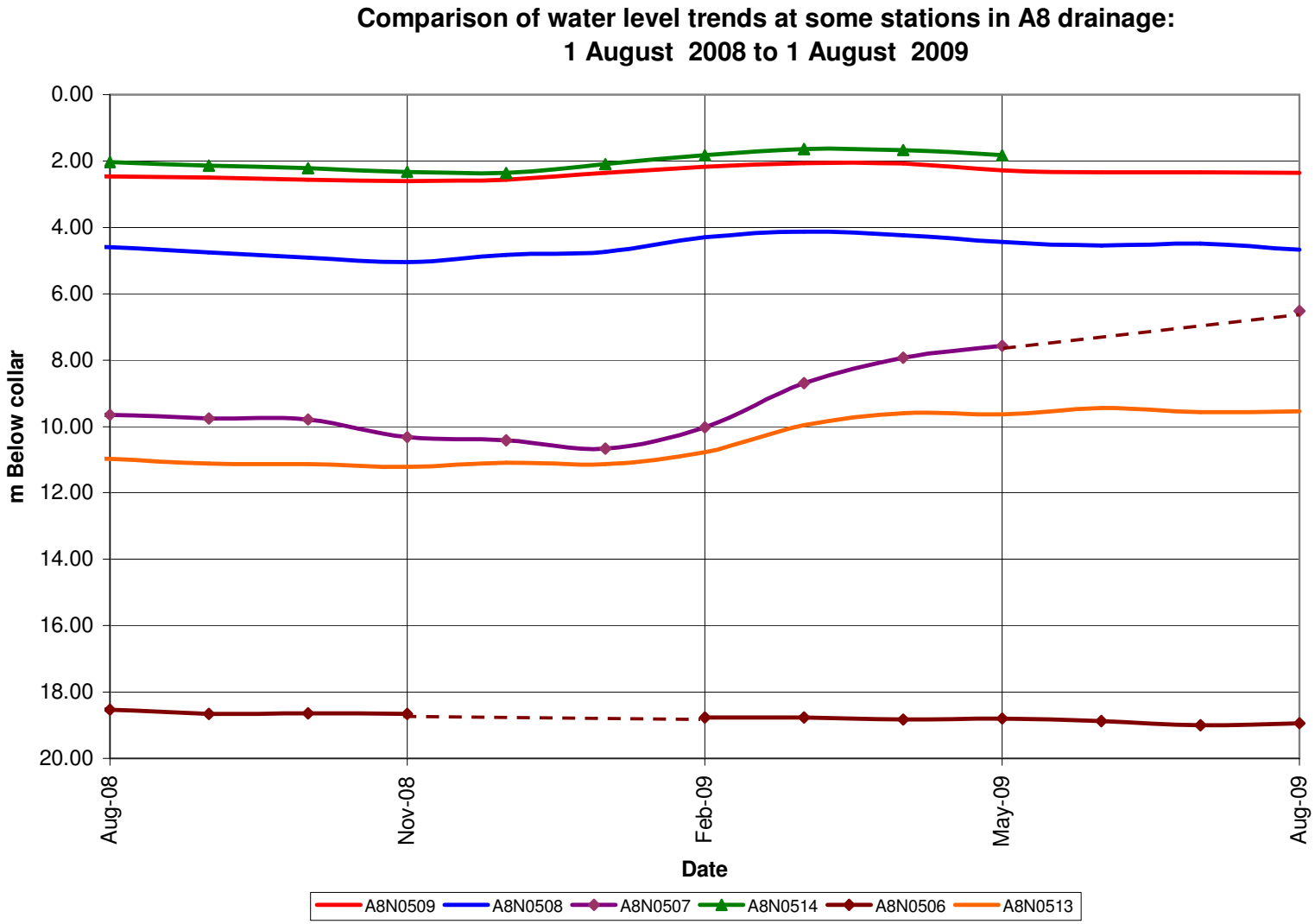
A7 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009 and 1 August 2009



GRAPH 15

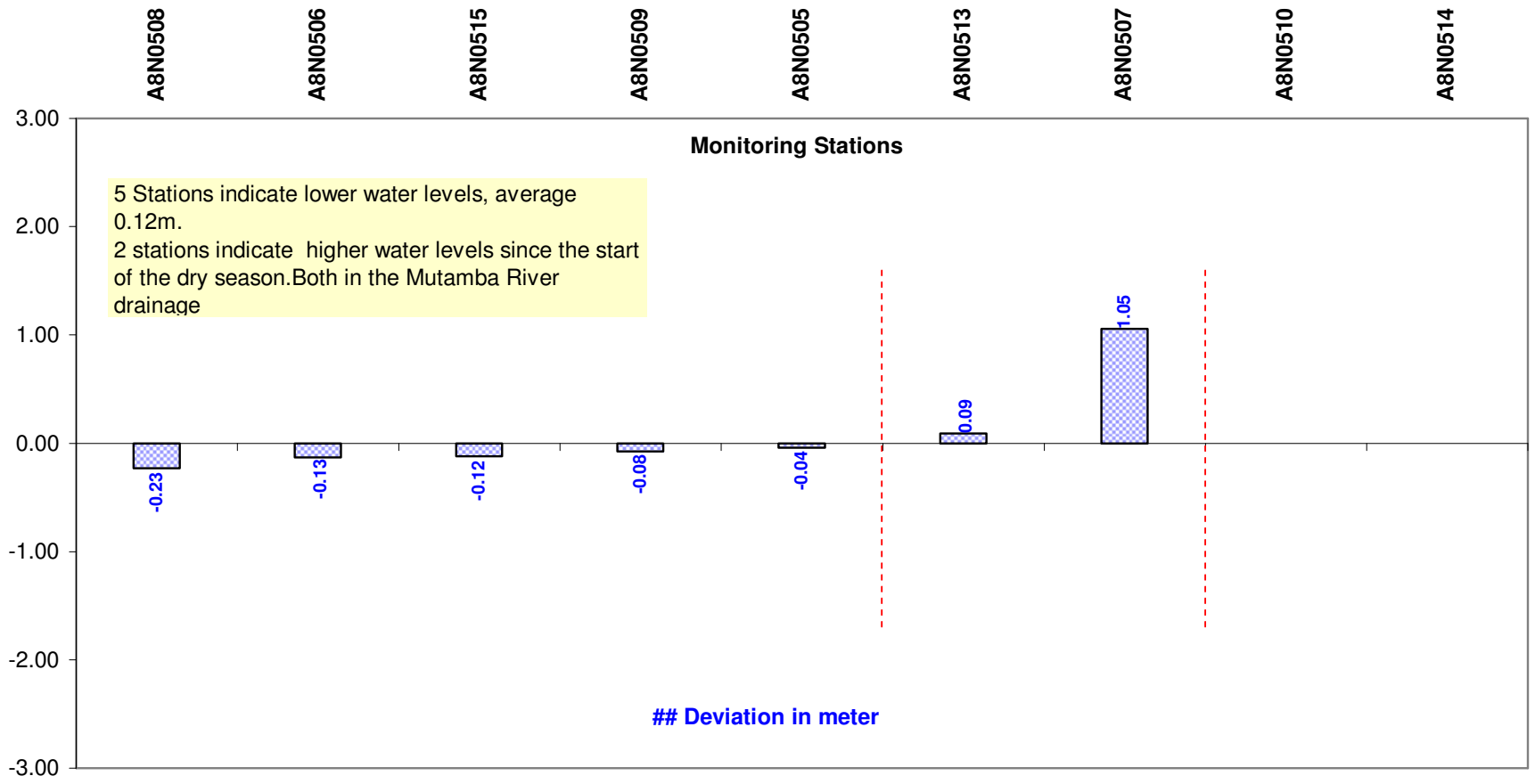

A7 DRAINAGE AREA
Comparison of average current water level depth with highest,
lowest & long-term average water level depths recorded
m Below collar
0.00
5.00
10.00
15.00
20.00
15.98
18.61
21.76
18.61m
Lowest average: (35 stations used)
Average value: = 21.76 m
Maximum value: = 79.15 m
Minimum value: = 3.17 m
Median value: = 19.24 m
80 Percentile value = 32.55 m
Highest average: (35 stations used)
Average value: = 15.98 m
Maximum value: = 77.07 m
Minimum value: = 1.69 m
Median value: = 9.68 m
80 Percentile value = 28.58 m
Current average: (35 stations used)
Average value: = 18.61 m
Maximum value: = 78.16 m
Minimum value: = 2.72 m
Median value: = 12.92 m
80 Percentile value = 30.97 m
Long-term average: (35 stations used)
Average value: = 18.61 m
Maximum value: = 78.28 m
Minimum value: = 2.62 m
Median value: = 11.48m
80 Percentile value = 30.58m
Highest average water level
Current Average water level
Lowest average water level
Long-term average water level

GRAPH 16


Comparison of water level trends at some stations in A8 drainage:
1 August 2008 to 1 August 2009
m Below collar
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
A8N0509
A8N0508
A8N0507
A8N0514
A8N0506
A8N0513

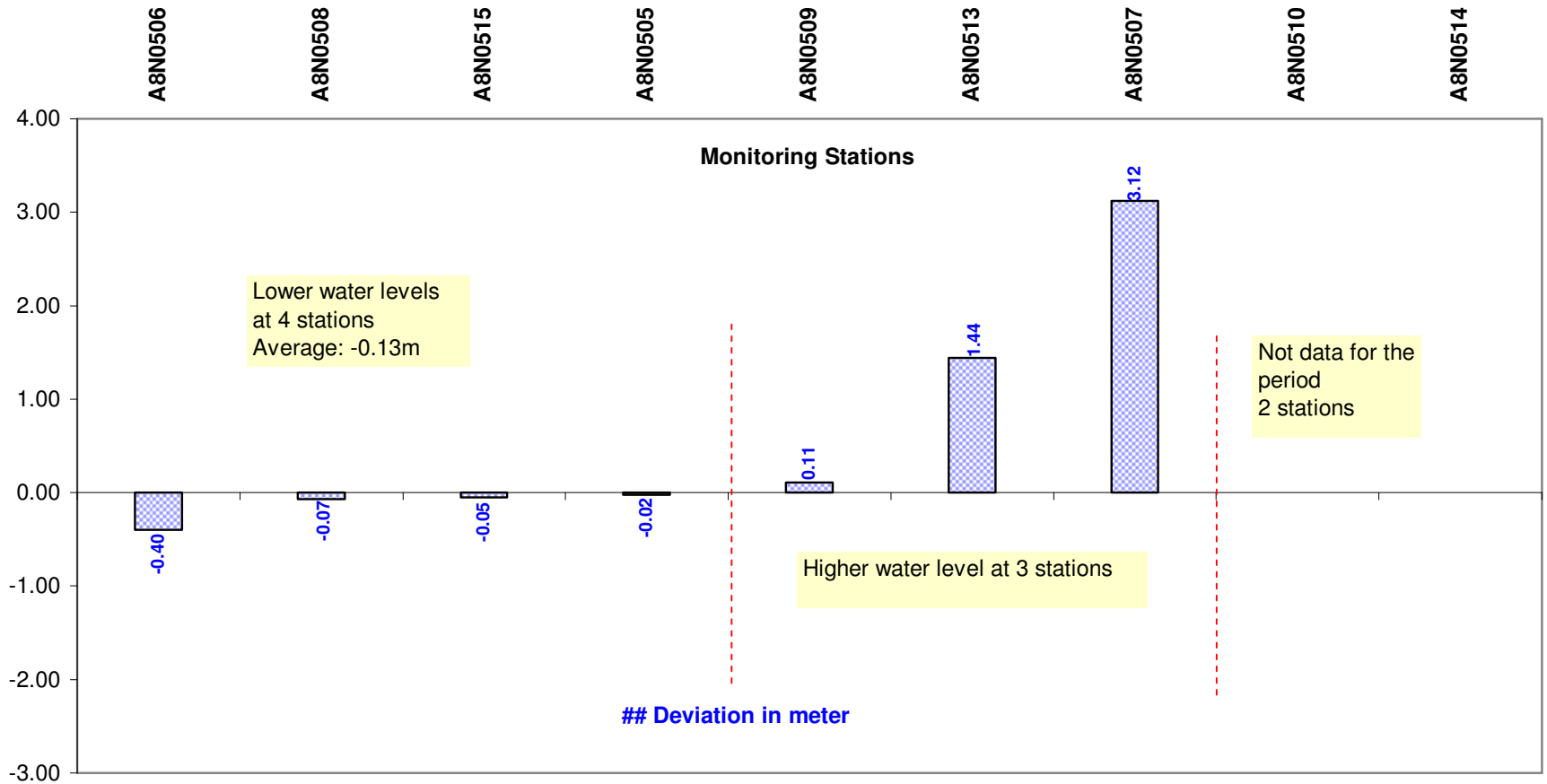
GRAPH 17

A8 DRAINAGE AREA
Deviation of water level depths: 1 May 2009 to 1 August 2009

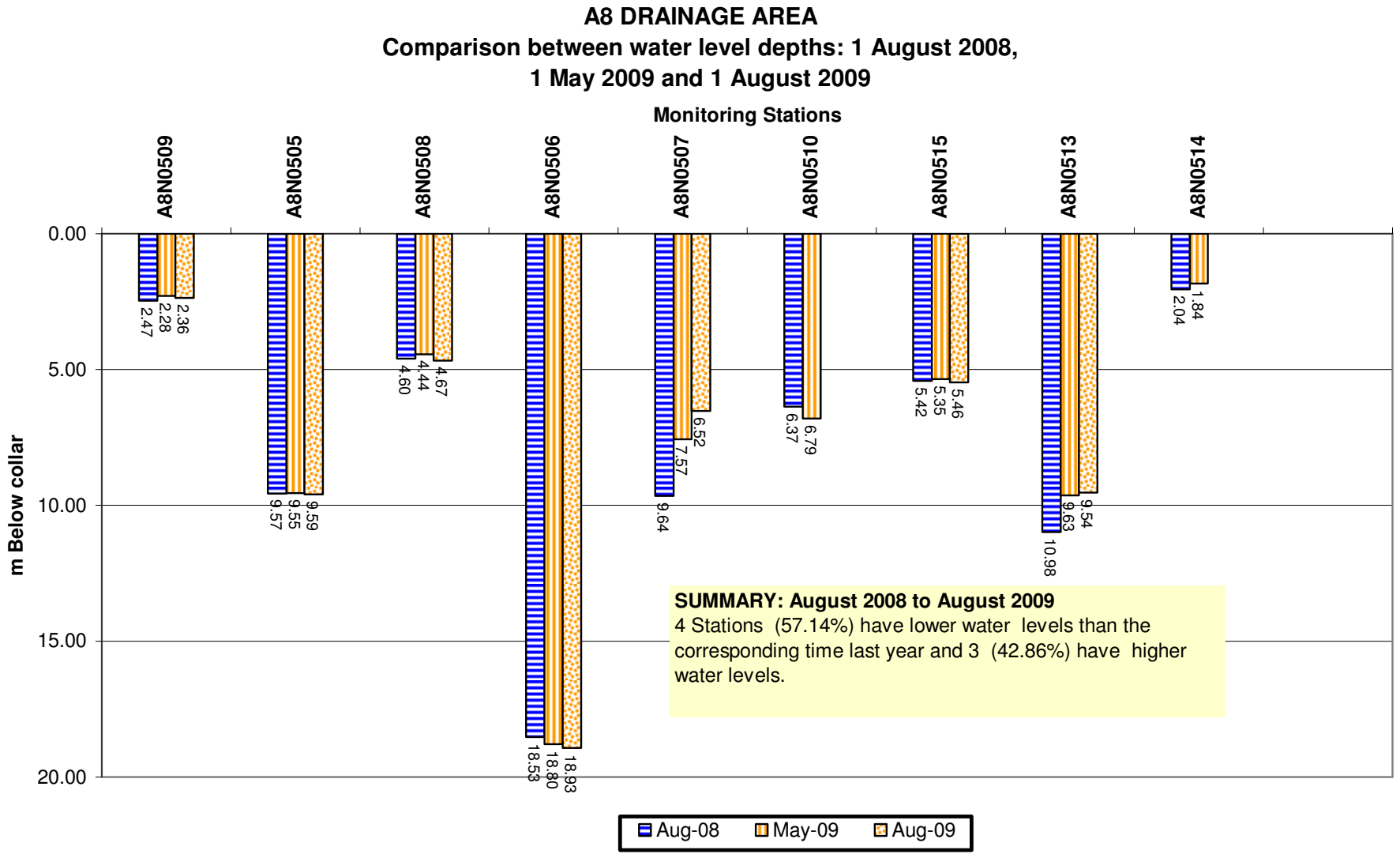


GRAPH 18

A8 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009

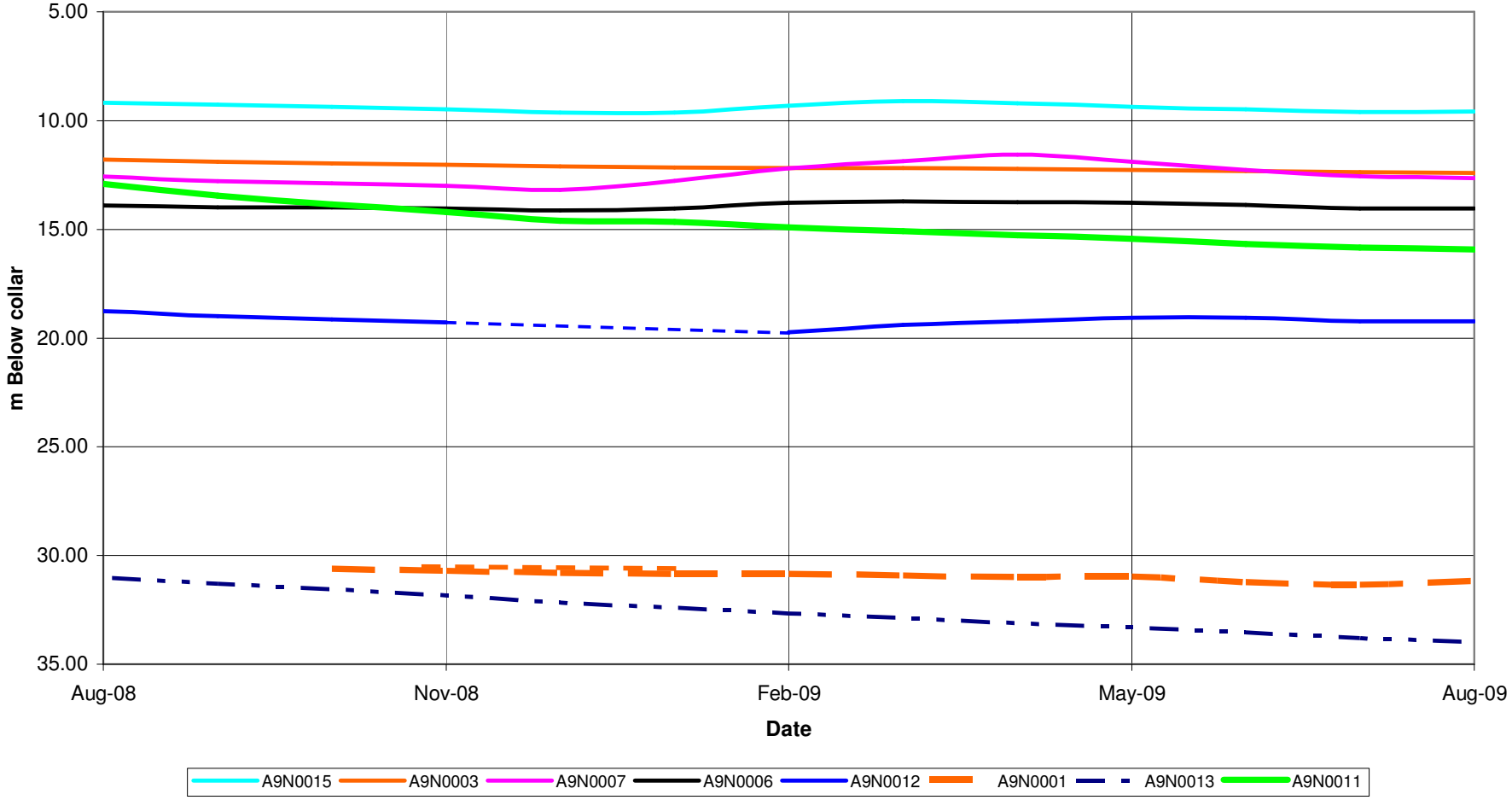


GRAPH 19

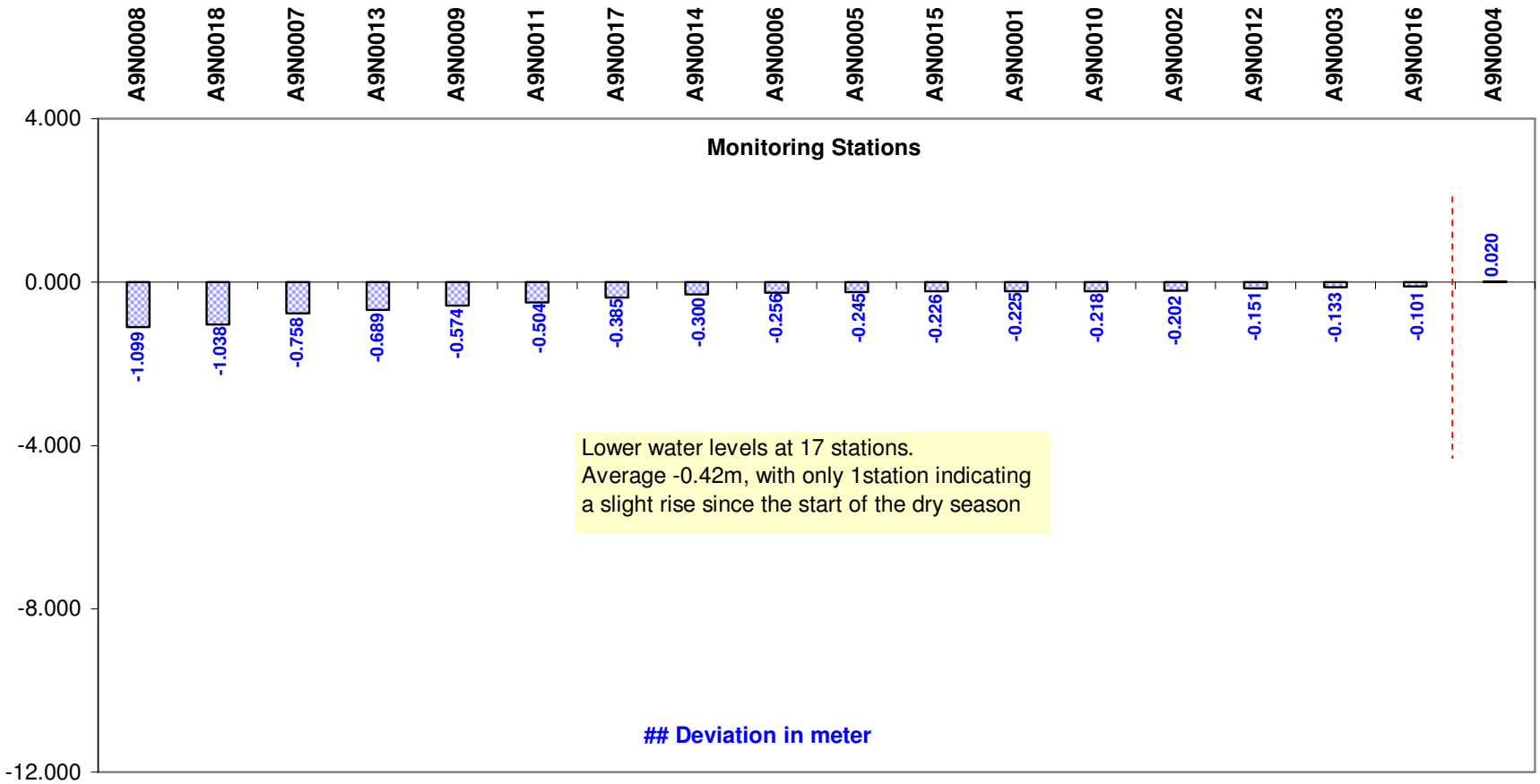

A8 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009 and 1 August 2009
Monitoring Stations
A8N0509
A8N0505
A8N0508
A8N0506
A8N0507
A8N0510
A8N0515
A8N0513
A8N0514
m Below collar
0.00
5.00
10.00
15.00
20.00
2.47
2.28
2.36
9.57
9.55
9.59
4.60
4.44
4.67
18.53
18.80
18.93
9.64
7.57
6.52
6.37
6.79
5.42
5.35
5.46
10.98
9.63
9.54
2.04
1.84
SUMMARY: August 2008 to August 2009
4 Stations (57.14%) have lower water levels than the corresponding time last year and 3 (42.86%) have higher water levels.
Aug-08
May-09
Aug-09

GRAPH 20

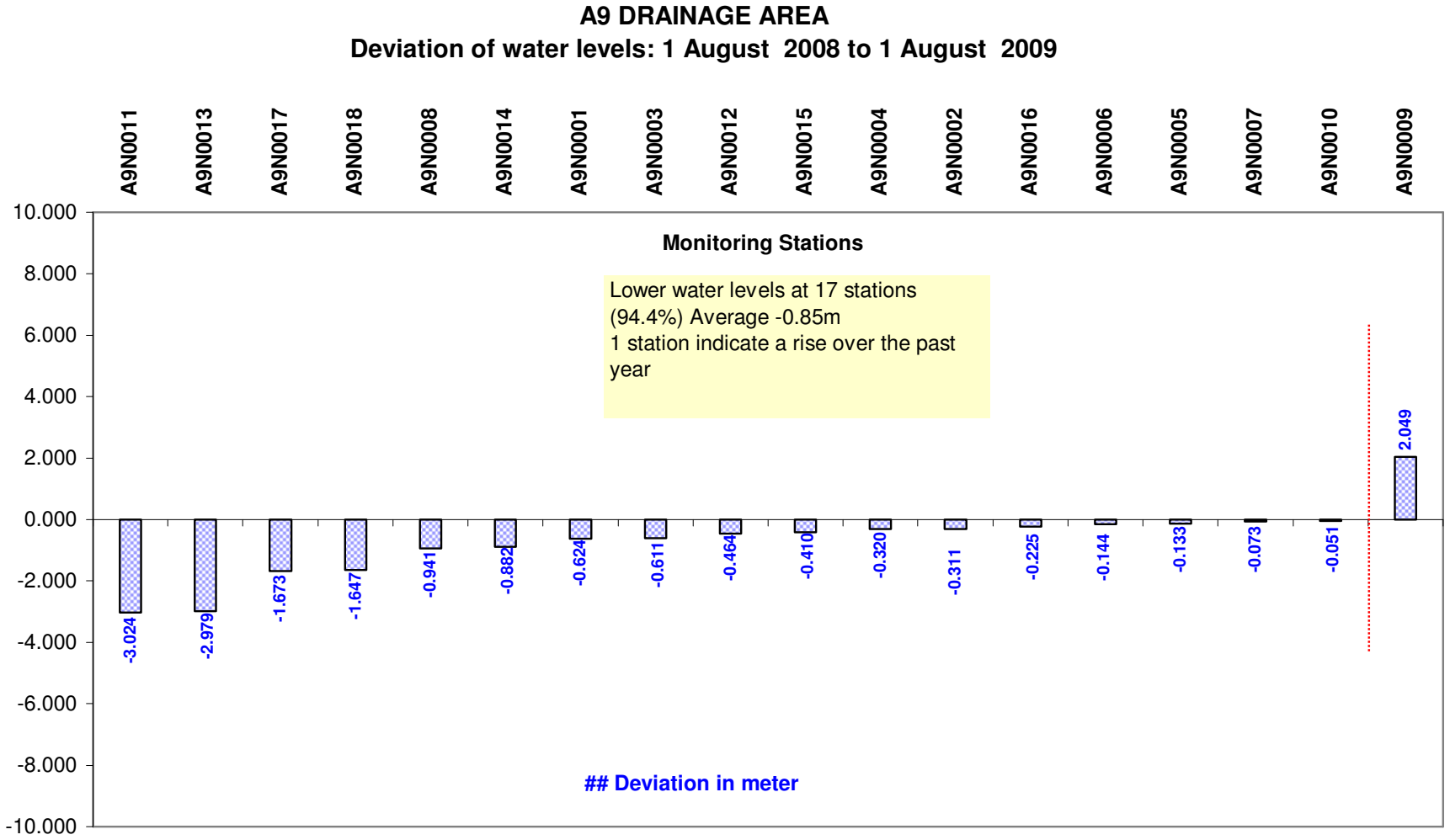
Comparison of water level trends at some stations in A9 drainage :
1 August 2008 to 1 August 2009



GRAPH 21

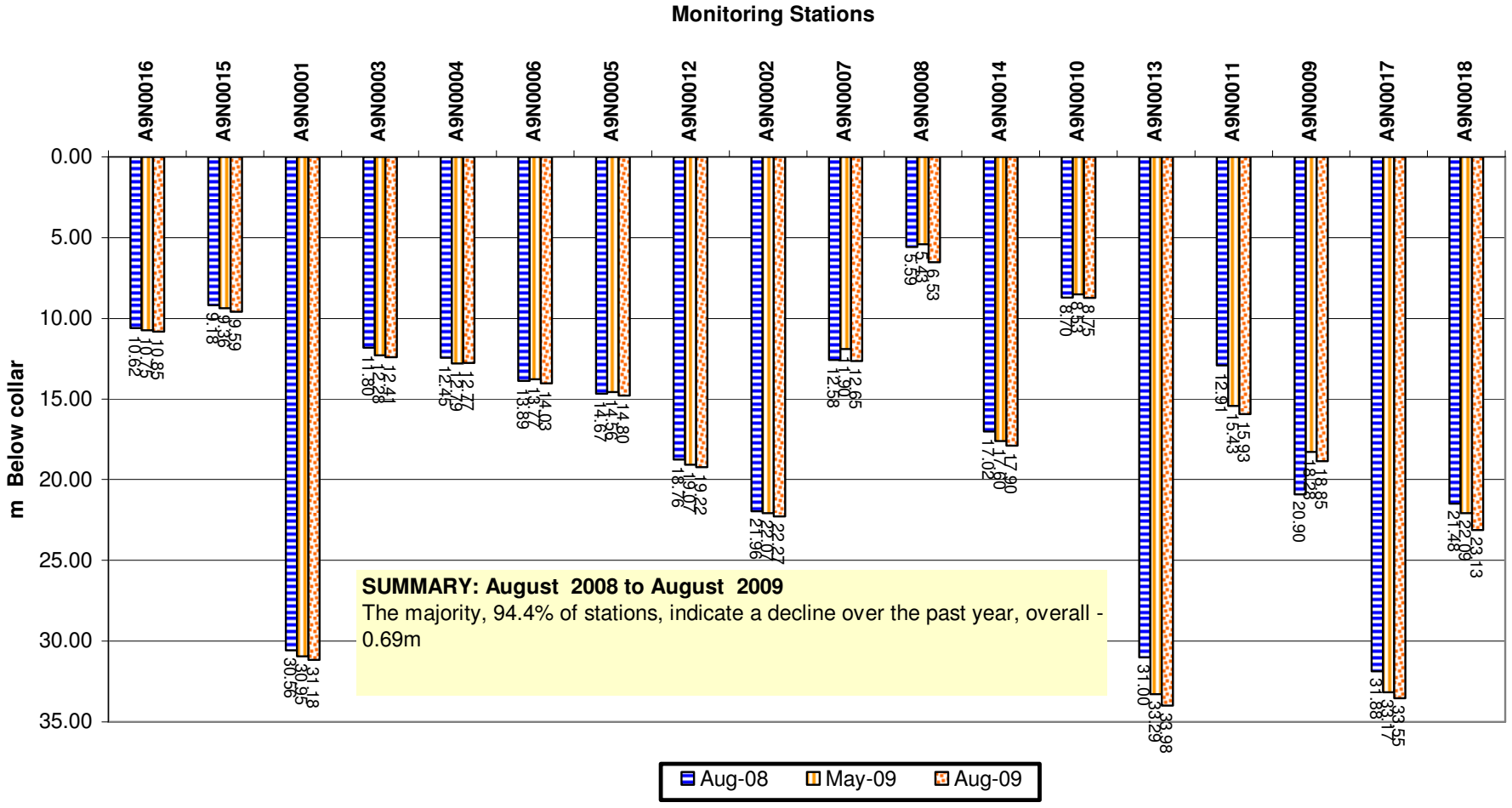

A9 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
A9N0008
A9N0018
A9N0007
A9N0013
A9N0009
A9N0011
A9N0017
A9N0014
A9N0006
A9N0005
A9N0015
A9N0001
A9N0010
A9N0002
A9N0012
A9N0003
A9N0016
A9N0004
4.000
0.000
-4.000
-8.000
-12.000
Monitoring Stations
-1.099
-1.038
-0.758
-0.689
-0.574
-0.504
-0.385
-0.300
-0.256
-0.245
-0.226
-0.225
-0.218
-0.202
-0.151
-0.133
-0.101
0.020
Lower water levels at 17 stations.
Average -0.42m, with only 1station indicating
a slight rise since the start of the dry season
Deviation in meter

GRAPH 22


A9 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
A9N0011
A9N0013
A9N0017
A9N0018
A9N0008
A9N0014
A9N0001
A9N0003
A9N0012
A9N0015
A9N0004
A9N0002
A9N0016
A9N0006
A9N0005
A9N0007
A9N0010
A9N0009
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
-6.000
-8.000
-10.000
Monitoring Stations
Lower water levels at 17 stations (94.4%) Average -0.85m
1 station indicate a rise over the past year
-3.024
-2.979
-1.673
-1.647
-0.941
-0.882
-0.624
-0.611
-0.464
-0.410
-0.320
-0.311
-0.225
-0.144
-0.133
-0.073
-0.051
2.049
Deviation in meter

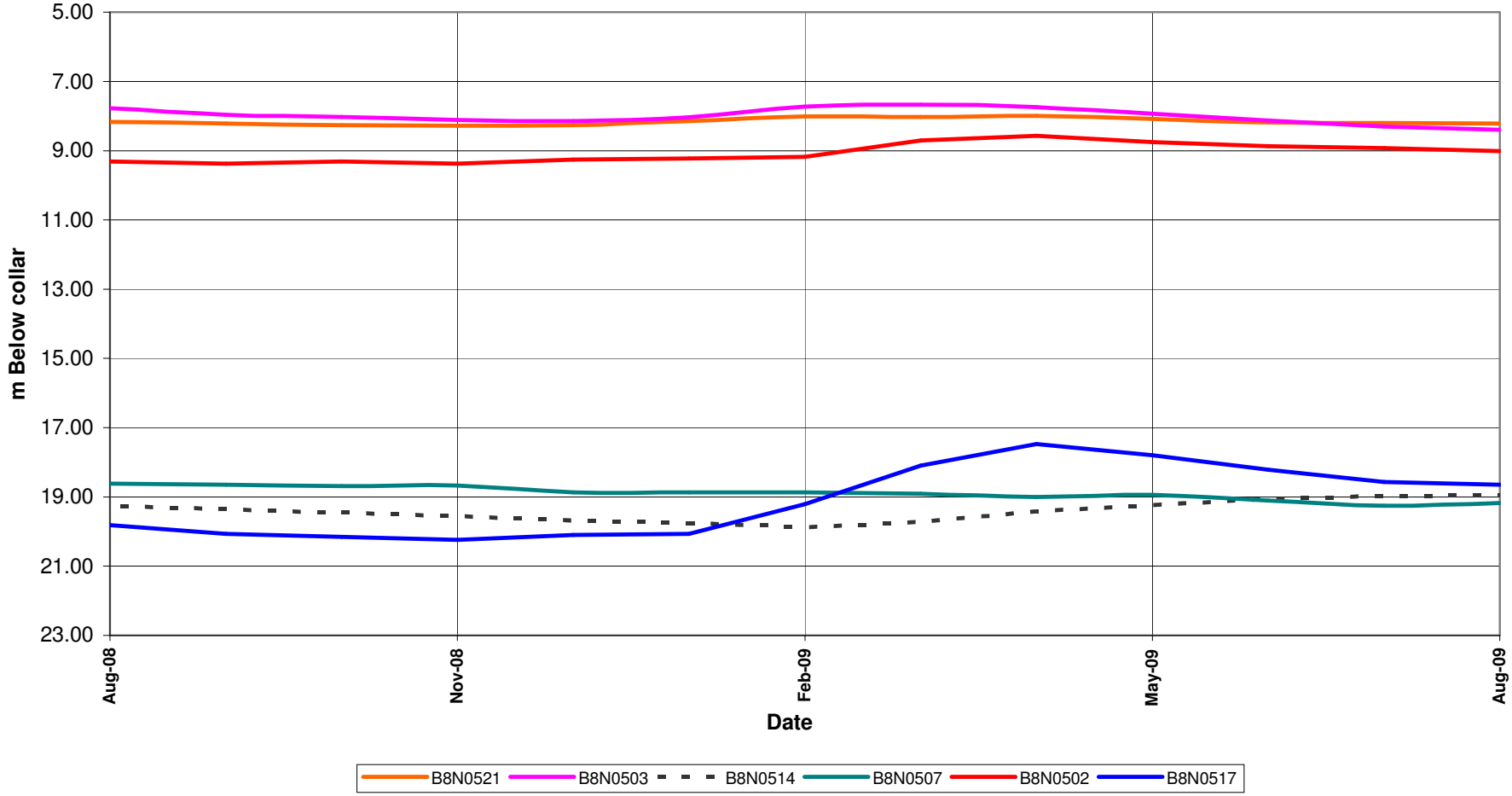
GRAPH 23

A9 DRAINAGE AREA
Comparison between water level depths: 1 August 2008, 1 May 2009 and 1 August 2009

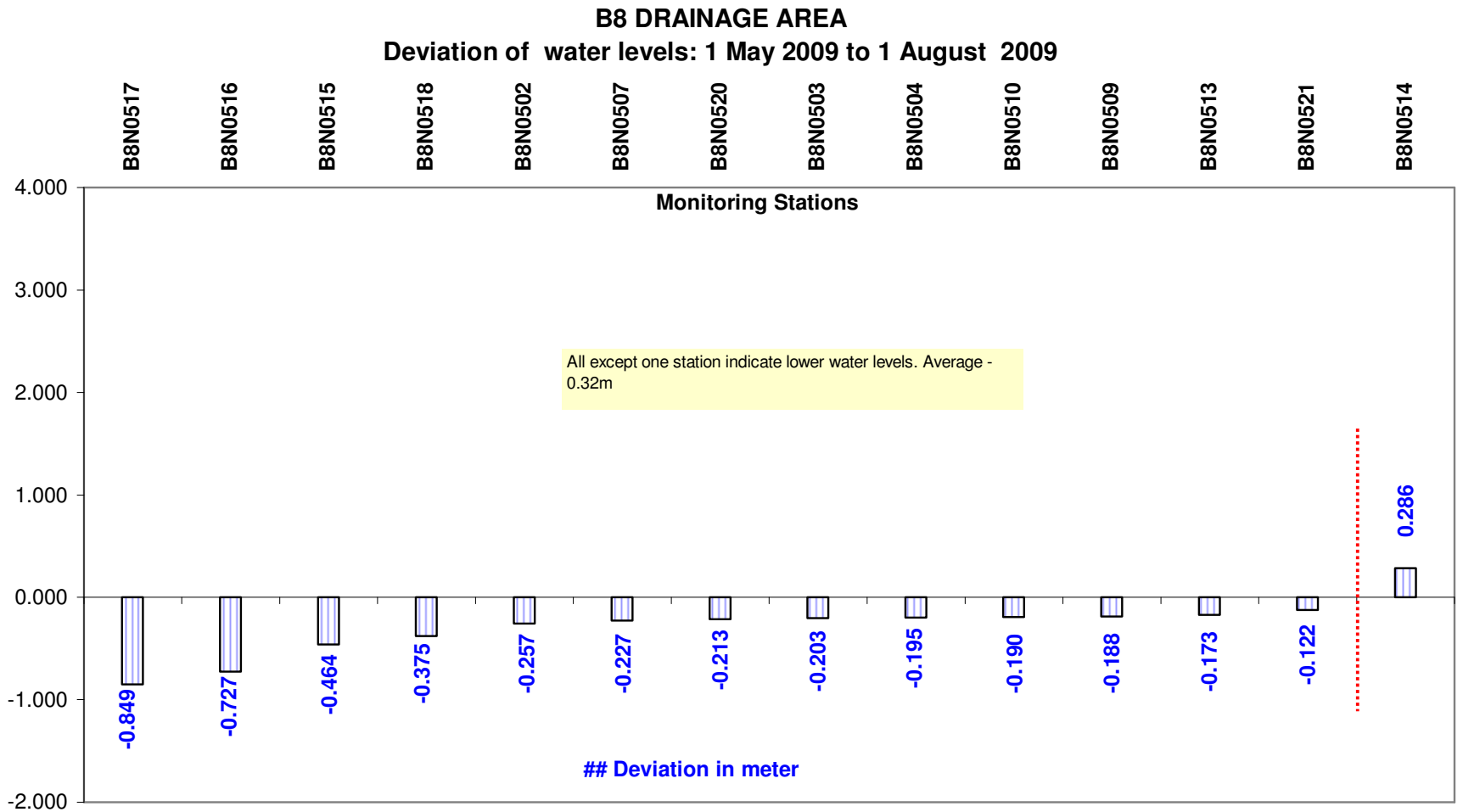


GRAPH 24

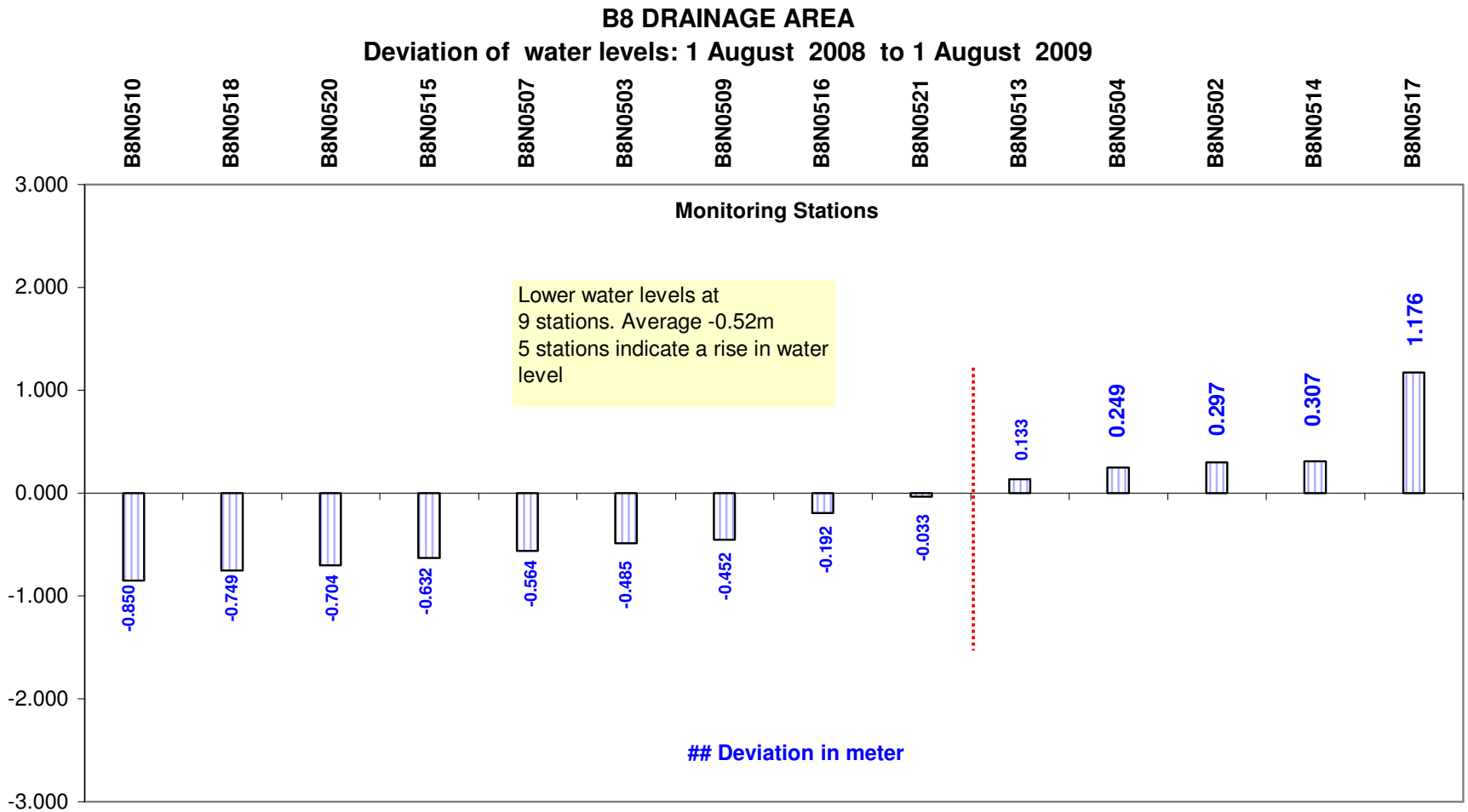
Comparison of water level trends at some stations in B8 drainage:
1 August 2008 to 1 August 2009



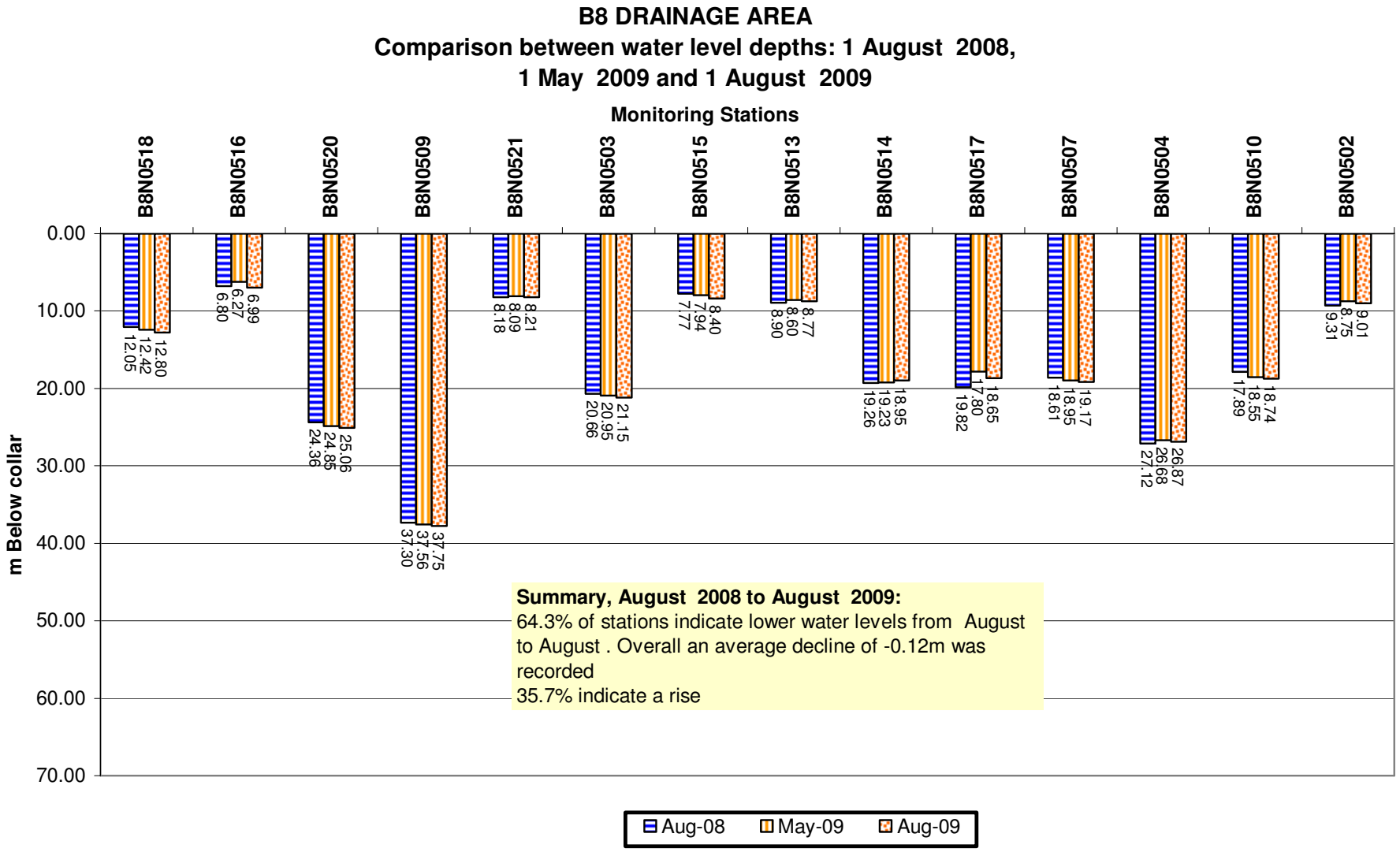
GRAPH 25


B8 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
B8N0517
B8N0516
B8N0515
B8N0518
B8N0502
B8N0507
B8N0520
B8N0503
B8N0504
B8N0510
B8N0509
B8N0513
B8N0521
B8N0514
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
Monitoring Stations
All except one station indicate lower water levels. Average -0.32m
-0.849
-0.727
-0.464
-0.375
-0.257
-0.227
-0.213
-0.203
-0.195
-0.190
-0.188
-0.173
-0.122
0.286
Deviation in meter

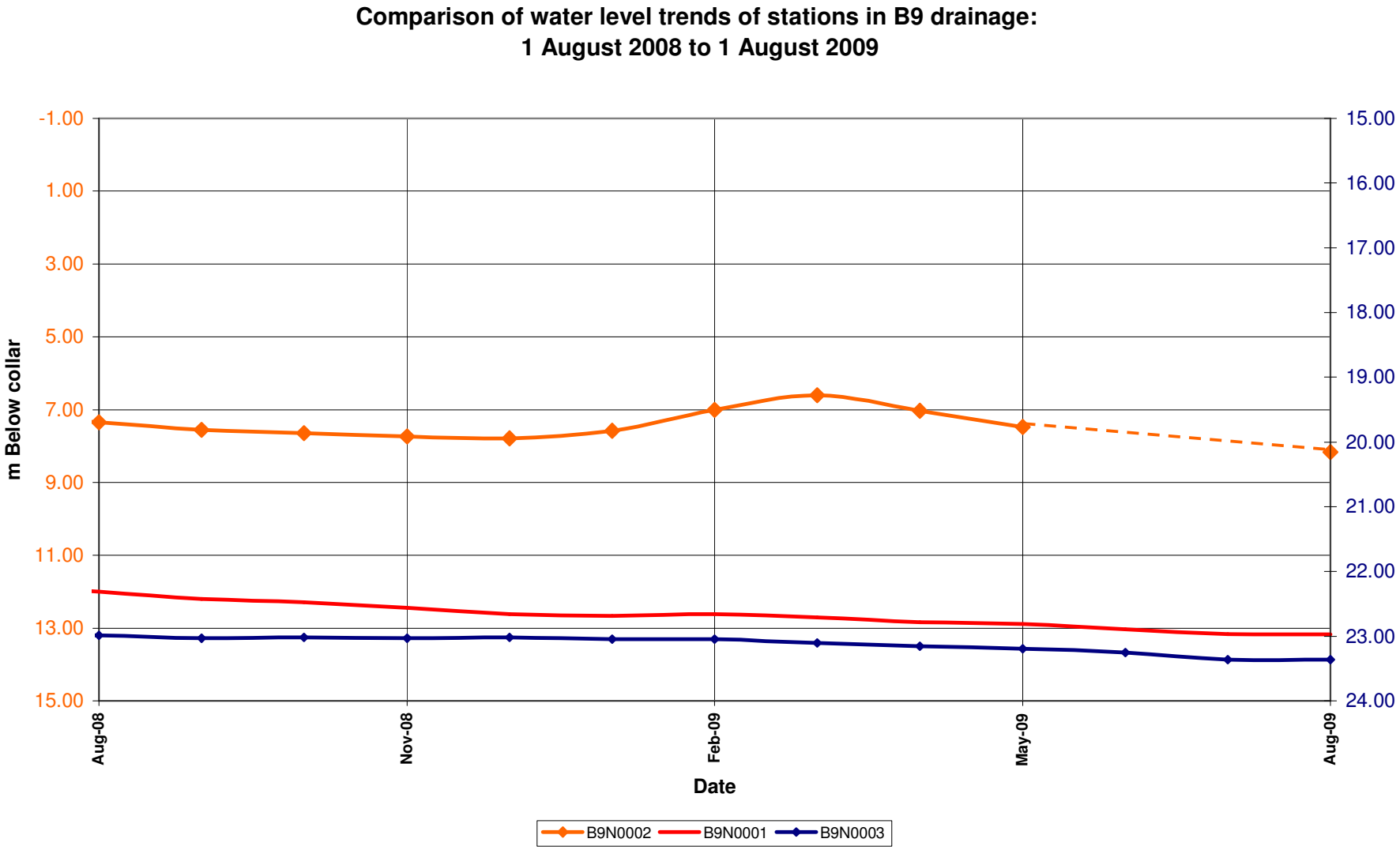
GRAPH 26


B8 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
B8N0510
B8N0518
B8N0520
B8N0515
B8N0507
B8N0503
B8N0509
B8N0516
B8N0521
B8N0513
B8N0504
B8N0502
B8N0514
B8N0517
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
Monitoring Stations
Lower water levels at
9 stations. Average -0.52m
5 stations indicate a rise in water level
-0.850
-0.749
-0.704
-0.632
-0.564
-0.485
-0.452
-0.192
-0.033
0.133
0.249
0.297
0.307
1.176
Deviation in meter

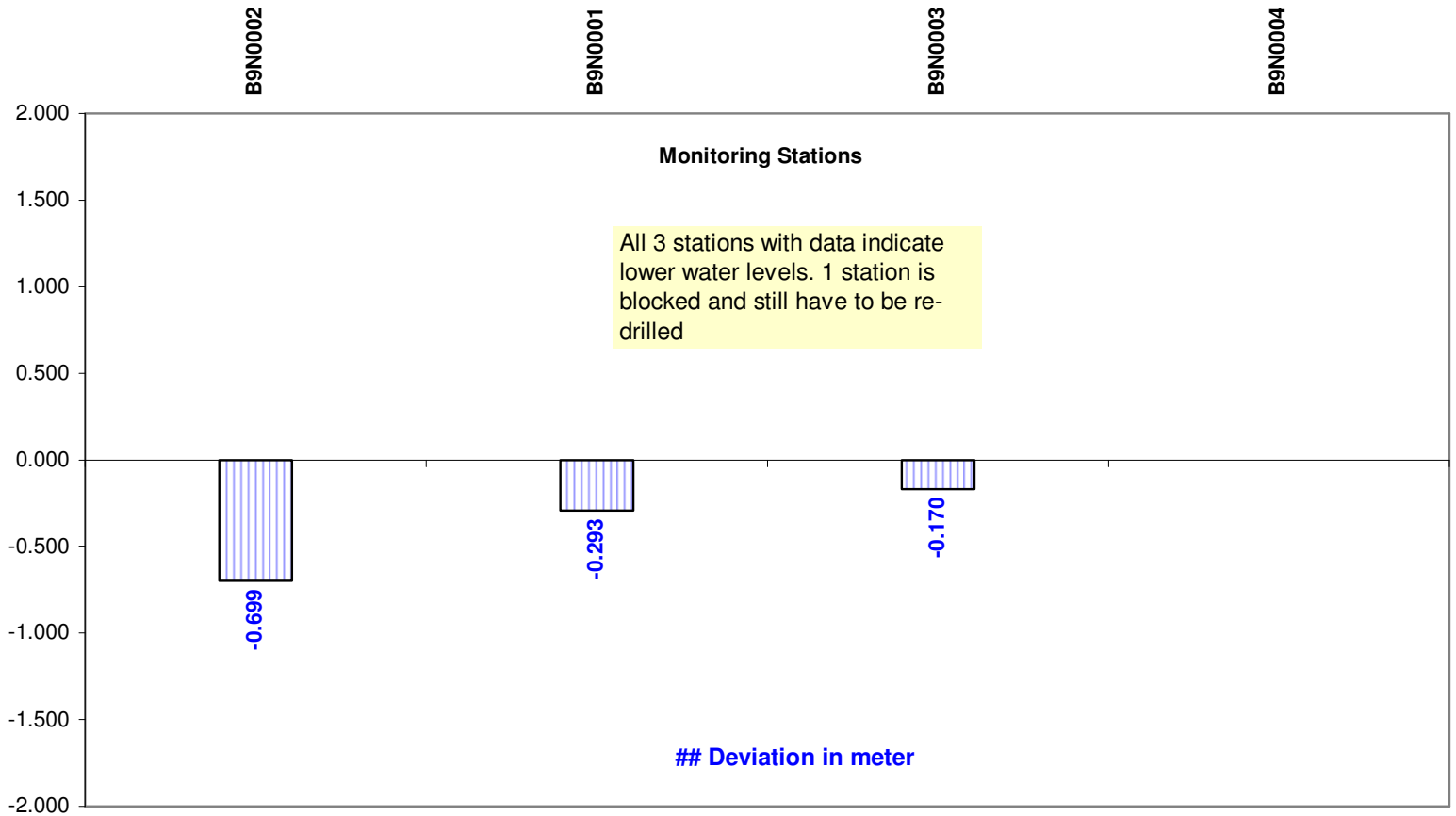
GRAPH 27


B8 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009 and 1 August 2009
Monitoring Stations
B8N0518
B8N0516
B8N0520
B8N0509
B8N0521
B8N0503
B8N0515
B8N0513
B8N0514
B8N0517
B8N0507
B8N0504
B8N0510
B8N0502
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
12.05
12.42
12.80
6.80
6.27
6.99
24.36
24.85
25.06
37.30
37.56
37.75
8.18
8.09
8.21
20.66
20.95
21.15
7.77
7.94
8.40
8.90
8.60
8.77
19.26
19.23
18.95
19.82
17.80
18.65
18.61
18.95
19.17
27.12
26.68
26.87
17.89
18.55
18.74
9.31
8.75
9.01
Summary, August 2008 to August 2009:
64.3% of stations indicate lower water levels from August to August . Overall an average decline of -0.12m was recorded
35.7% indicate a rise
Aug-08
May-09
Aug-09

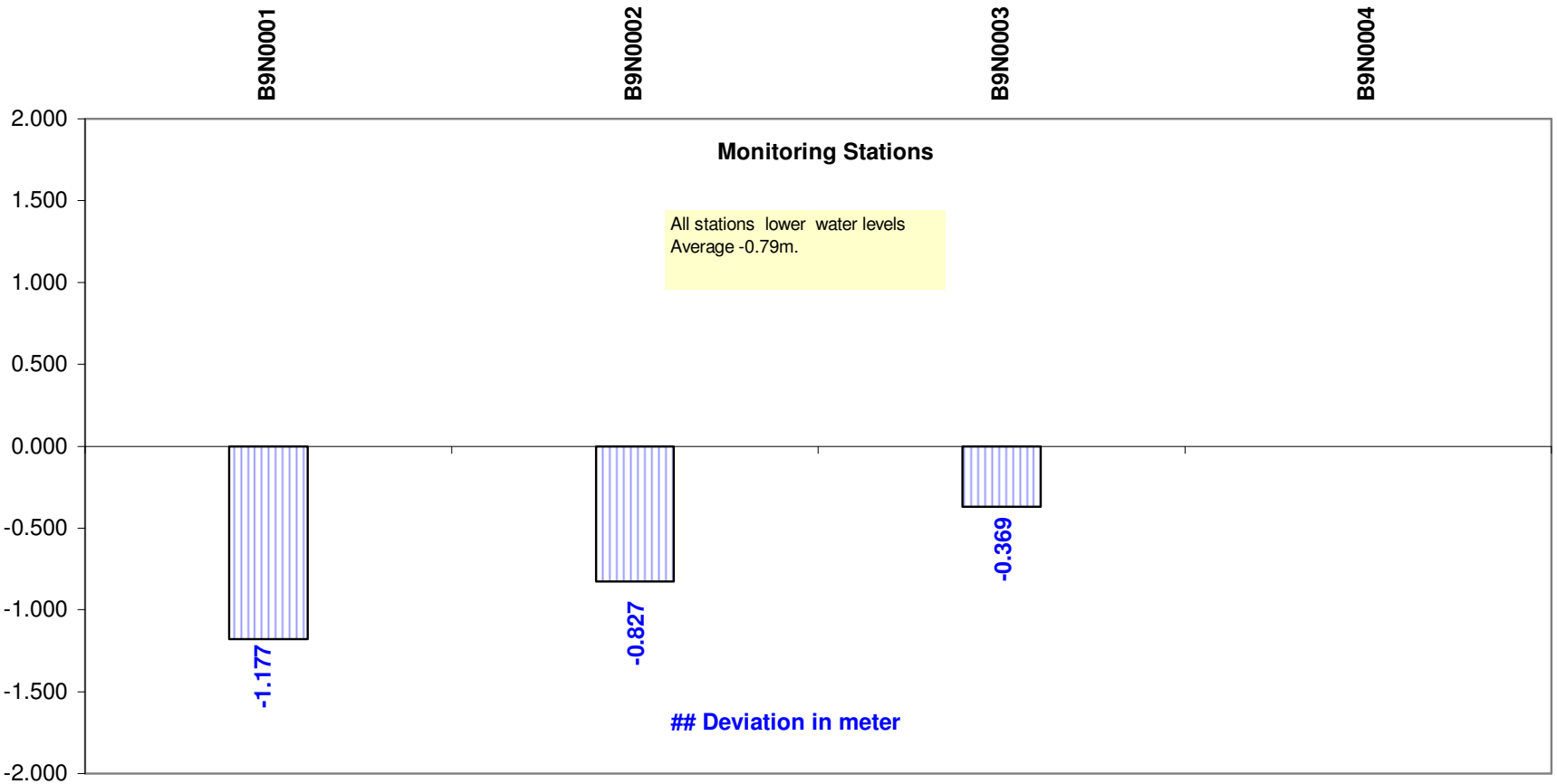
GRAPH 28


Comparison of water level trends of stations in B9 drainage:
1 August 2008 to 1 August 2009
m Below collar
-1.00
1.00
3.00
5.00
7.00
9.00
11.00
13.00
15.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
24.00
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
B9N0002
B9N0001
B9N0003

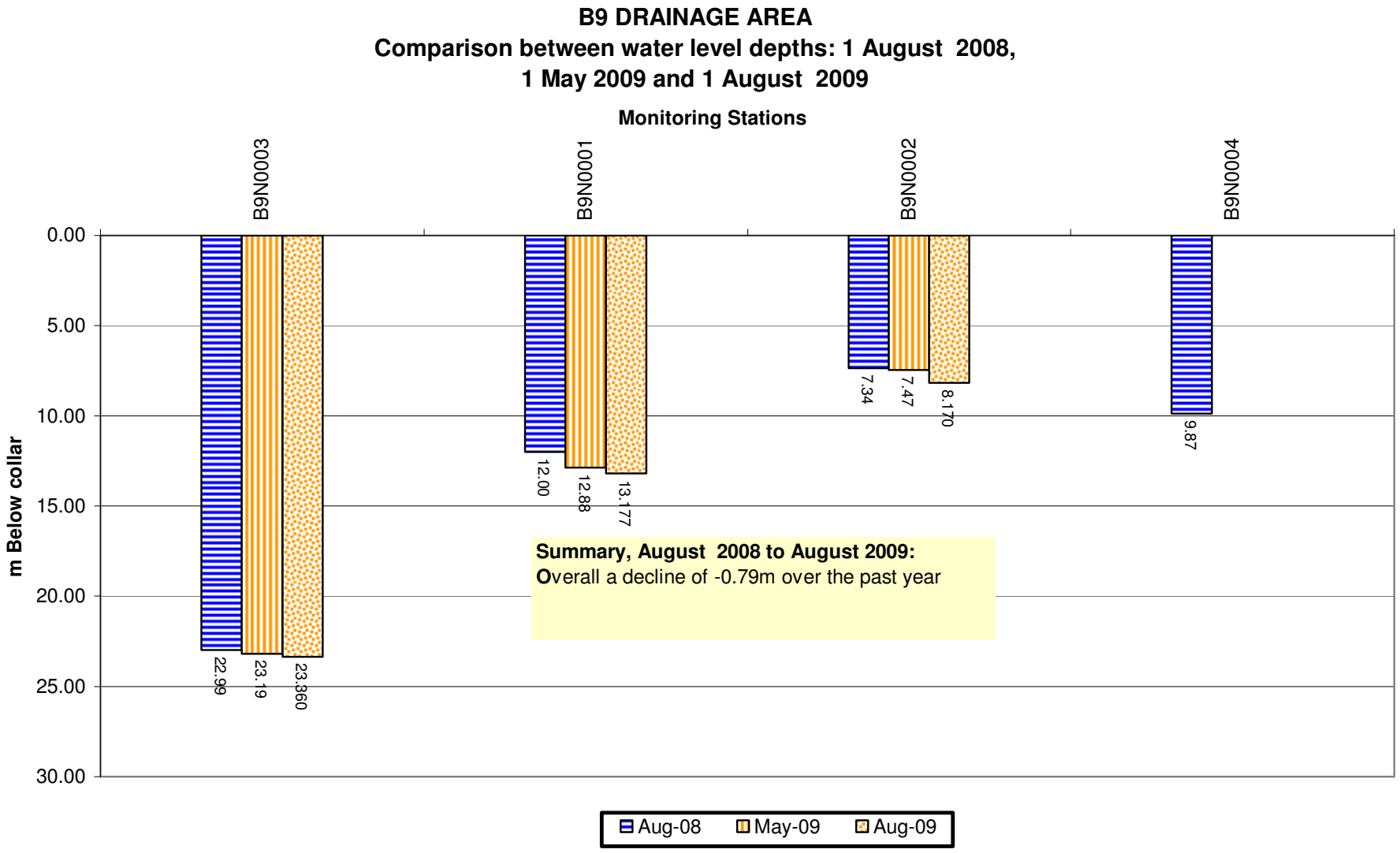
GRAPH 29


B9 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
B9N0002
B9N0001
B9N0003
B9N0004
2.000
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
-2.000
Monitoring Stations
All 3 stations with data indicate lower water levels. 1 station is blocked and still have to be re-drilled
-0.699
-0.293
-0.170
Deviation in meter

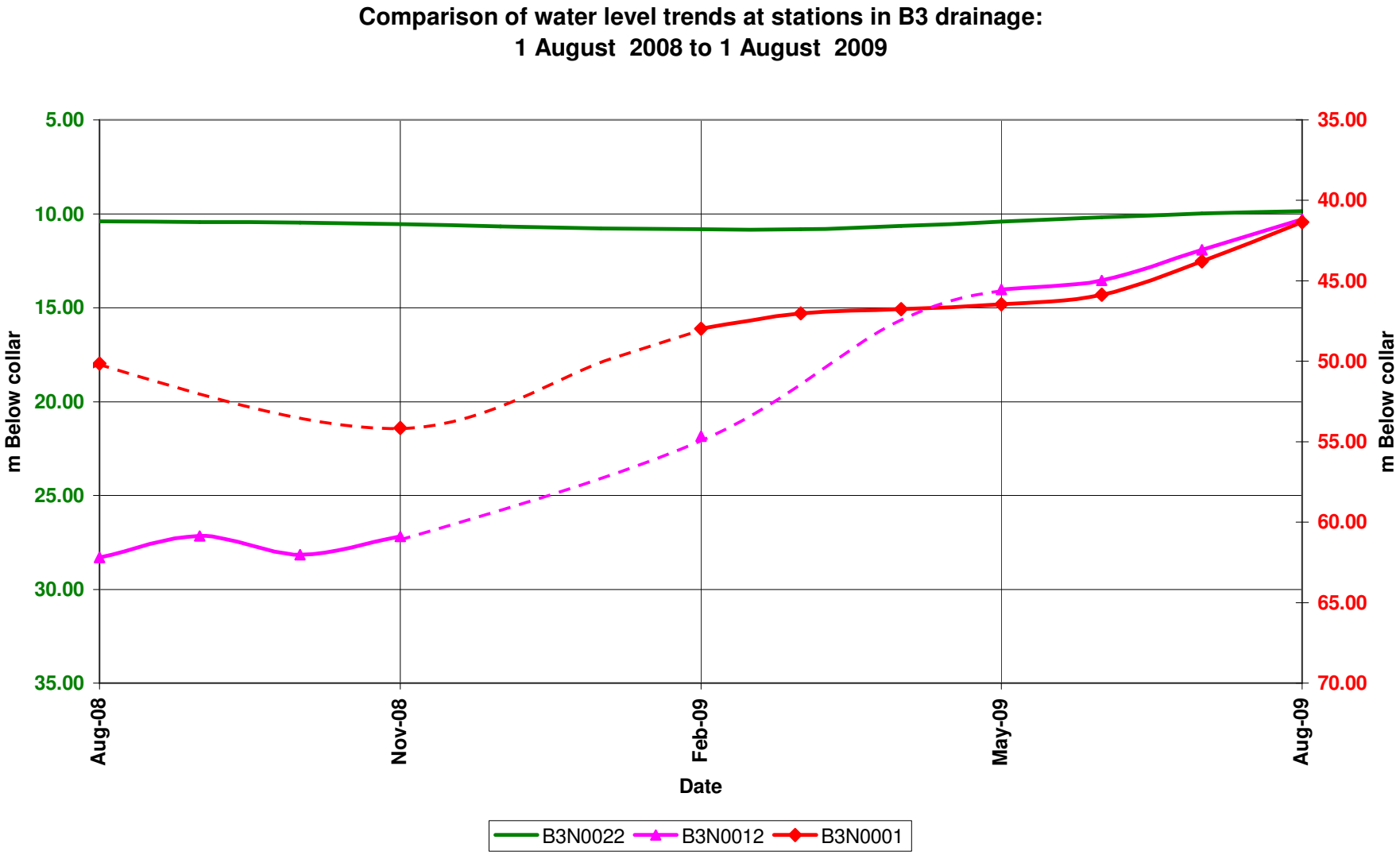
GRAPH 30


B9 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
B9N0001
B9N0002
B9N0003
B9N0004
2.000
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
-2.000
Monitoring Stations
All stations lower water levels
Average -0.79m.
-1.177
-0.827
-0.369
Deviation in meter

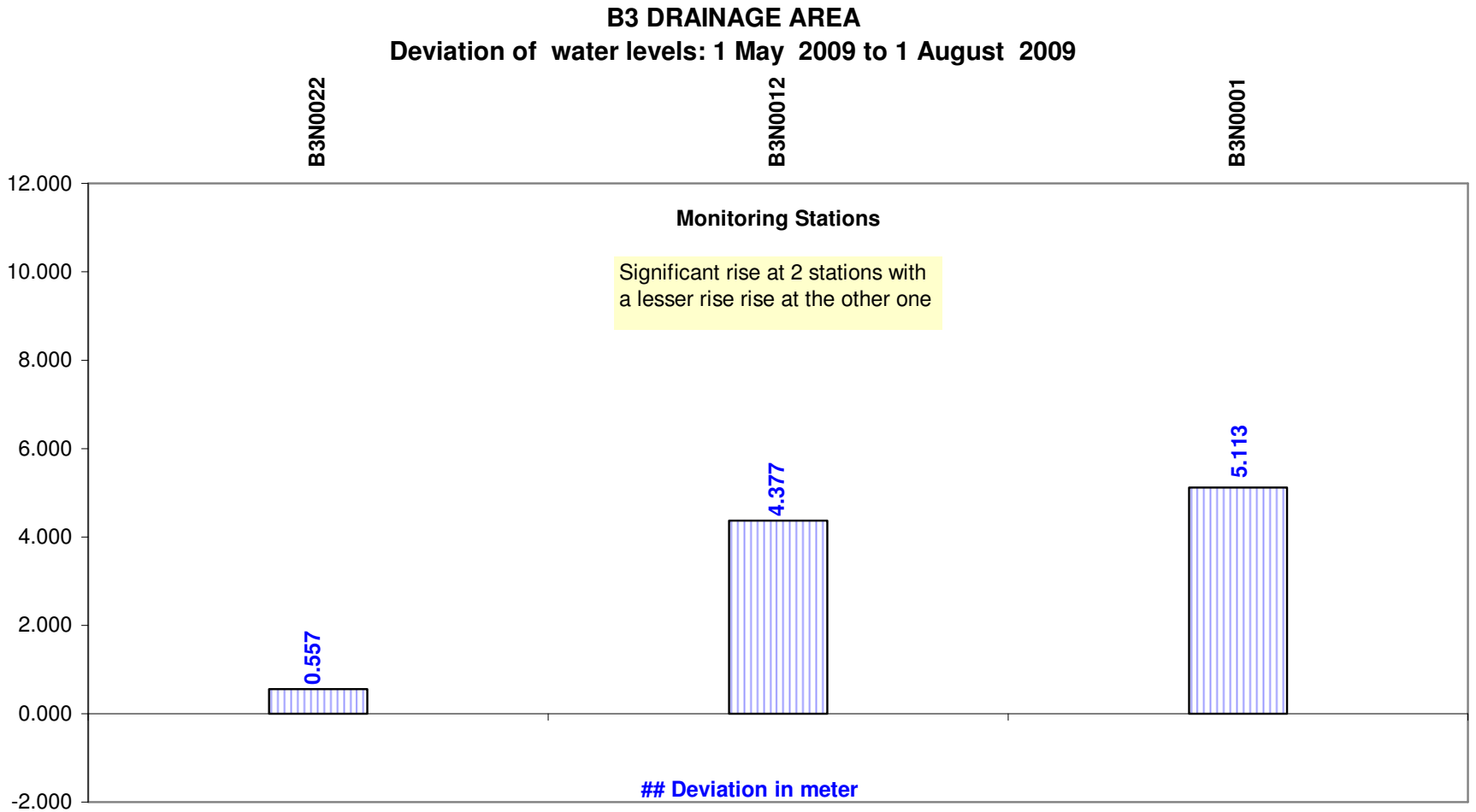
GRAPH 31


B9 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009 and 1 August 2009
Monitoring Stations
B9N0003
B9N0001
B9N0002
B9N0004
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
22.99
23.19
23.360
12.00
12.88
13.177
7.34
7.47
8.170
9.87
Summary, August 2008 to August 2009:
Overall a decline of -0.79m over the past year
Aug-08
May-09
Aug-09

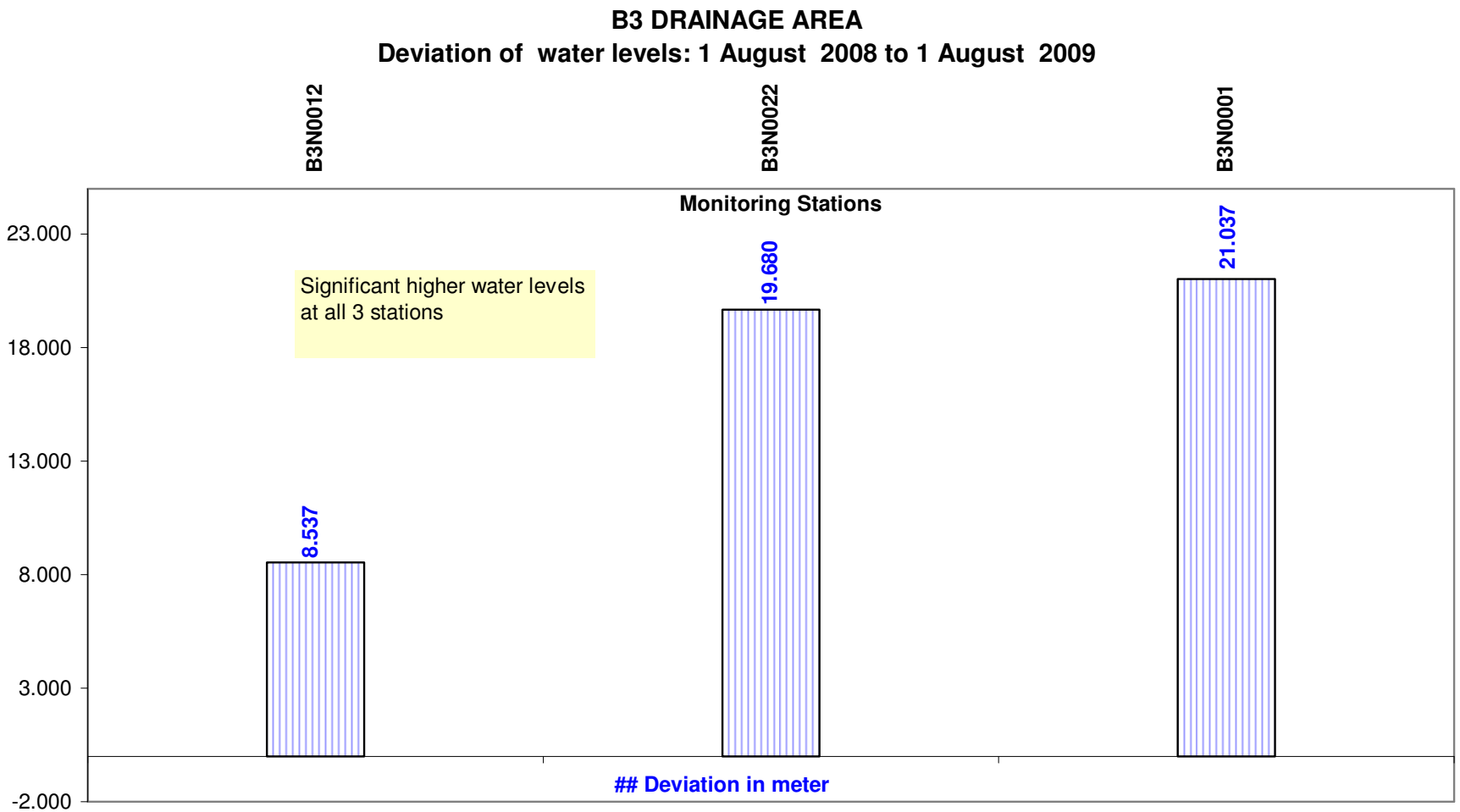
GRAPH 32


Comparison of water level trends at stations in B3 drainage:
1 August 2008 to 1 August 2009
5.00
10.00
15.00
20.00
25.00
30.00
35.00
m Below collar
35.00
40.00
45.00
50.00
55.00
60.00
65.00
70.00
m Below collar
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
B3N0022
B3N0012
B3N0001

GRAPH 33

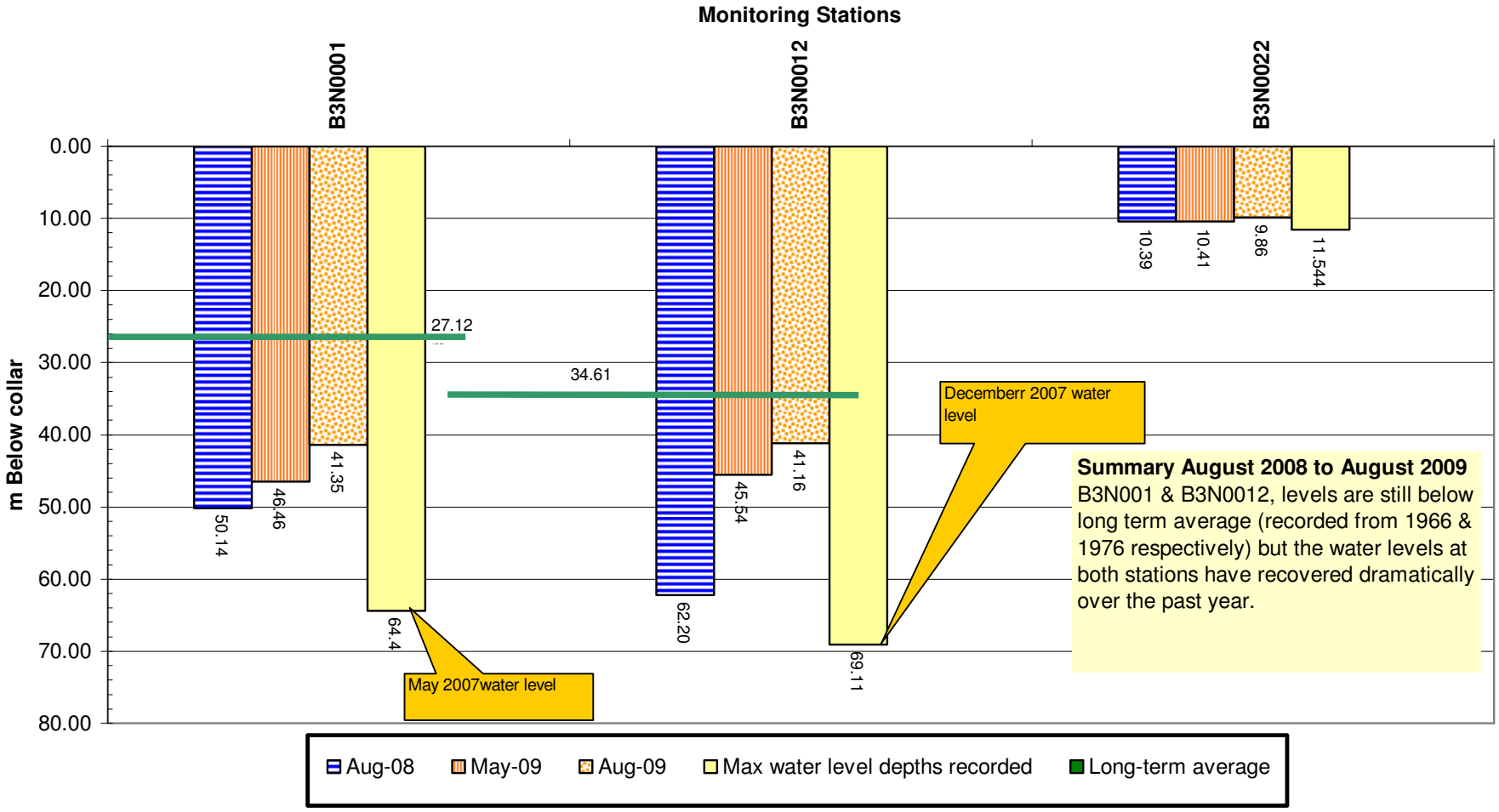

B3 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
B3N0022
B3N0012
B3N0001
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
Monitoring Stations
Significant rise at 2 stations with
a lesser rise rise at the other one
0.557
4.377
5.113
Deviation in meter

GRAPH 34

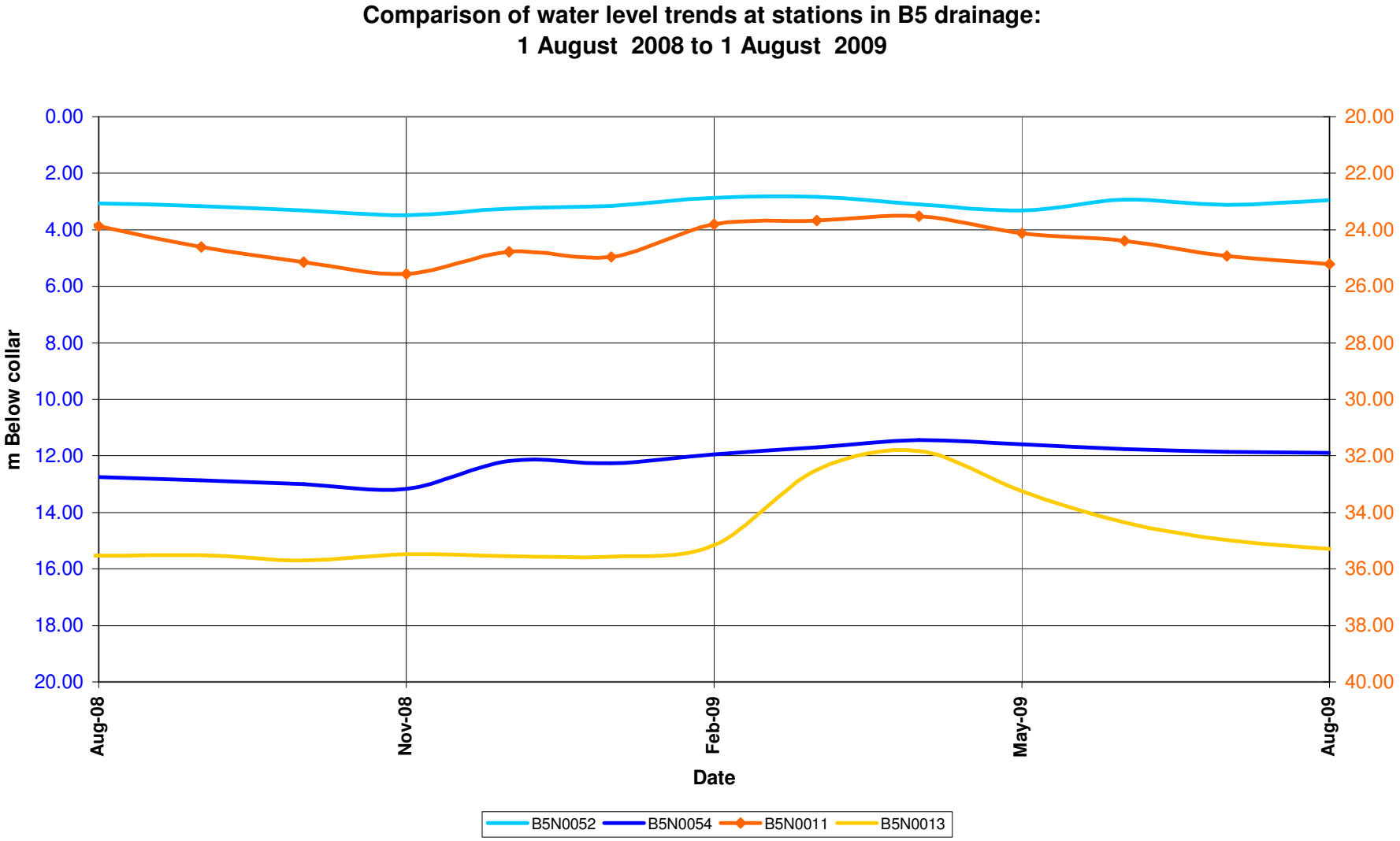

B3 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
B3N0012
B3N0022
B3N0001
Monitoring Stations
23.000
18.000
13.000
8.000
3.000
-2.000
Significant higher water levels at all 3 stations
8.537
19.680
21.037
Deviation in meter

GRAPH 35

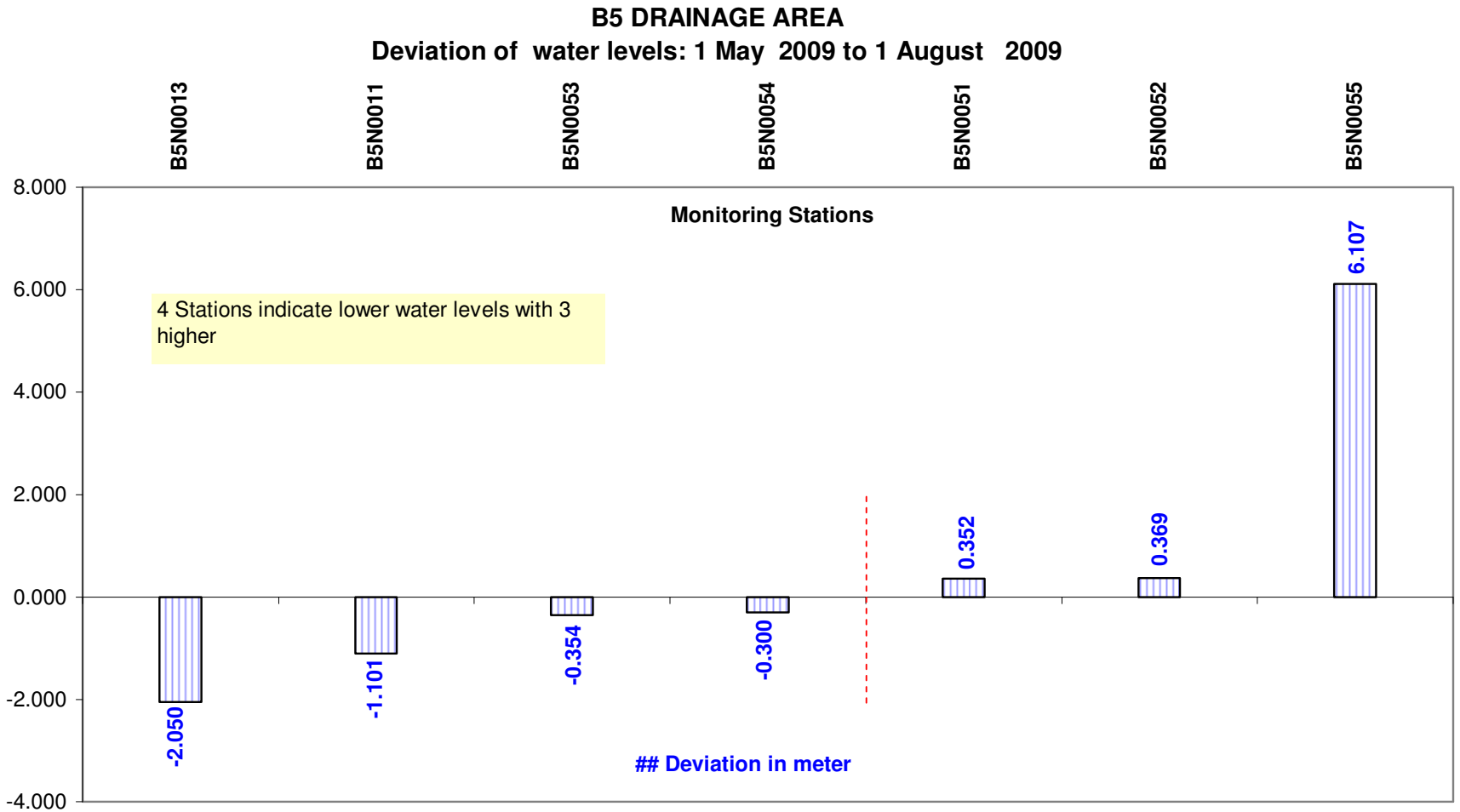
B3 DRAINAGE AREA
Comparison between water level depths: 1 August 2008
1 May 2009, 1 August 2009 and maximum depths recorded



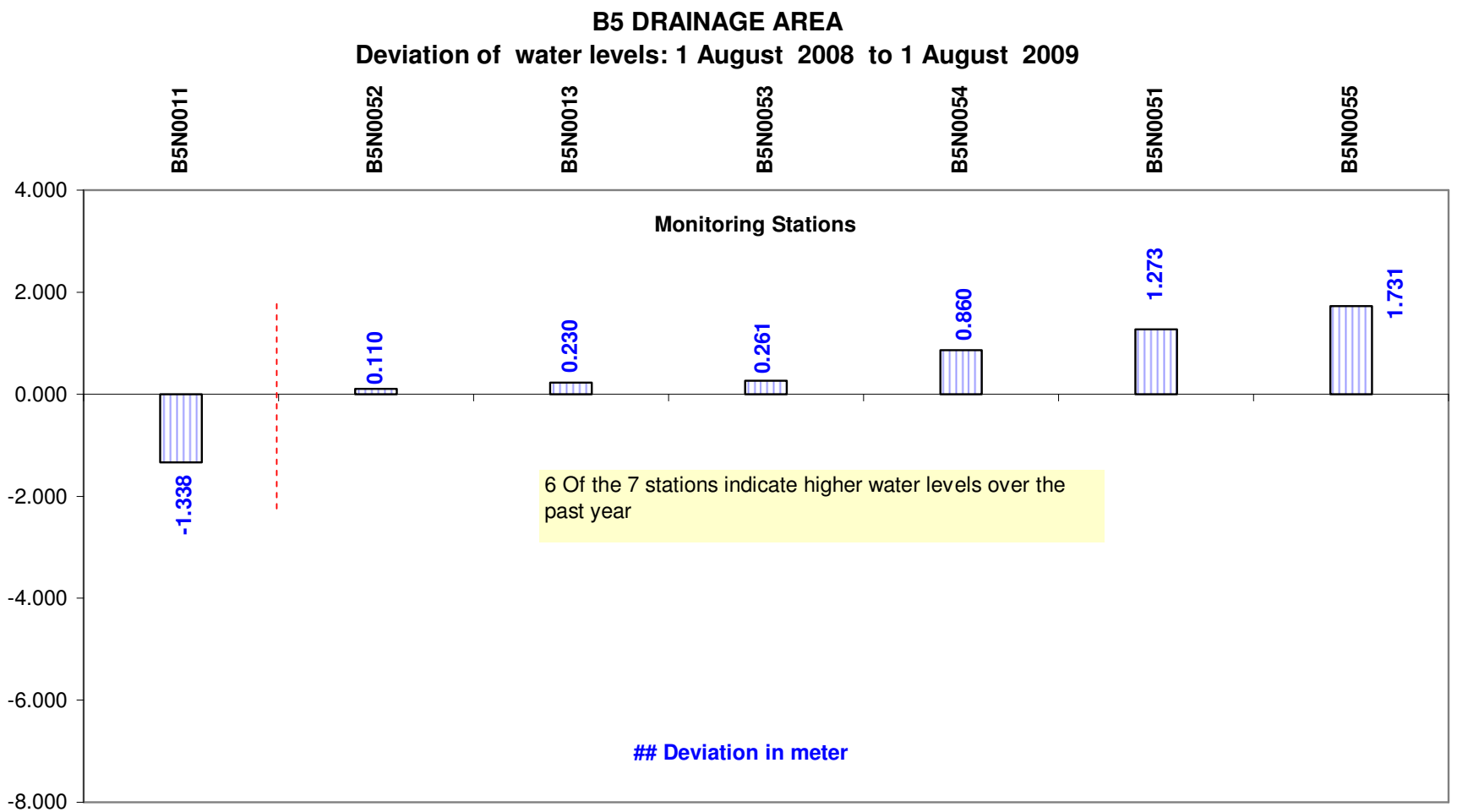
GRAPH 36


Comparison of water level trends at stations in B5 drainage:
1 August 2008 to 1 August 2009
m Below collar
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
20.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00
36.00
38.00
40.00
Aug-08
Nov-08
Feb-09
May-09
Aug-09
Date
B5N0052
B5N0054
B5N0011
B5N0013

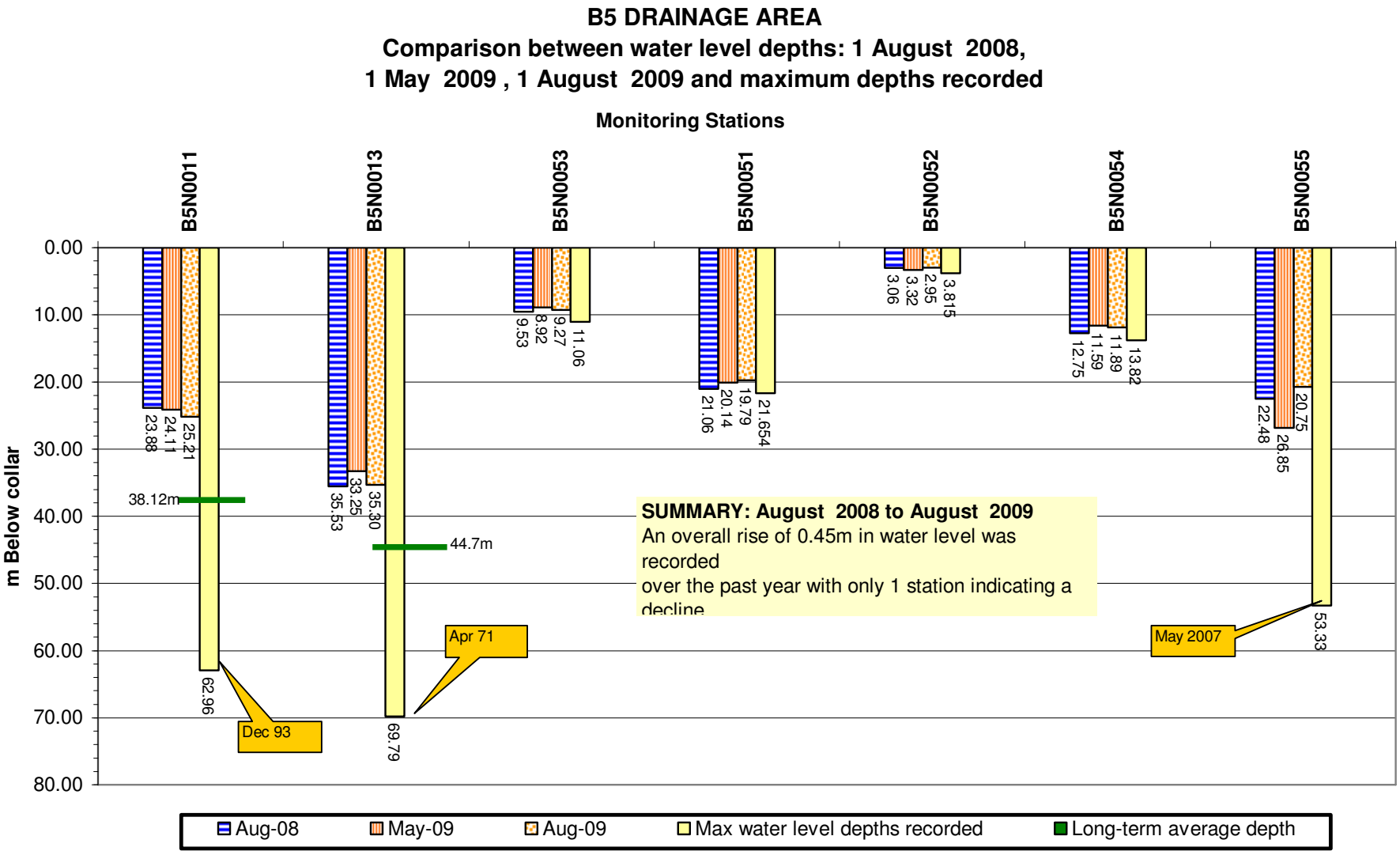
GRAPH 37


B5 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
B5N0013
B5N0011
B5N0053
B5N0054
B5N0051
B5N0052
B5N0055
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
Monitoring Stations
4 Stations indicate lower water levels with 3 higher
-2.050
-1.101
-0.354
-0.300
0.352
0.369
6.107
Deviation in meter

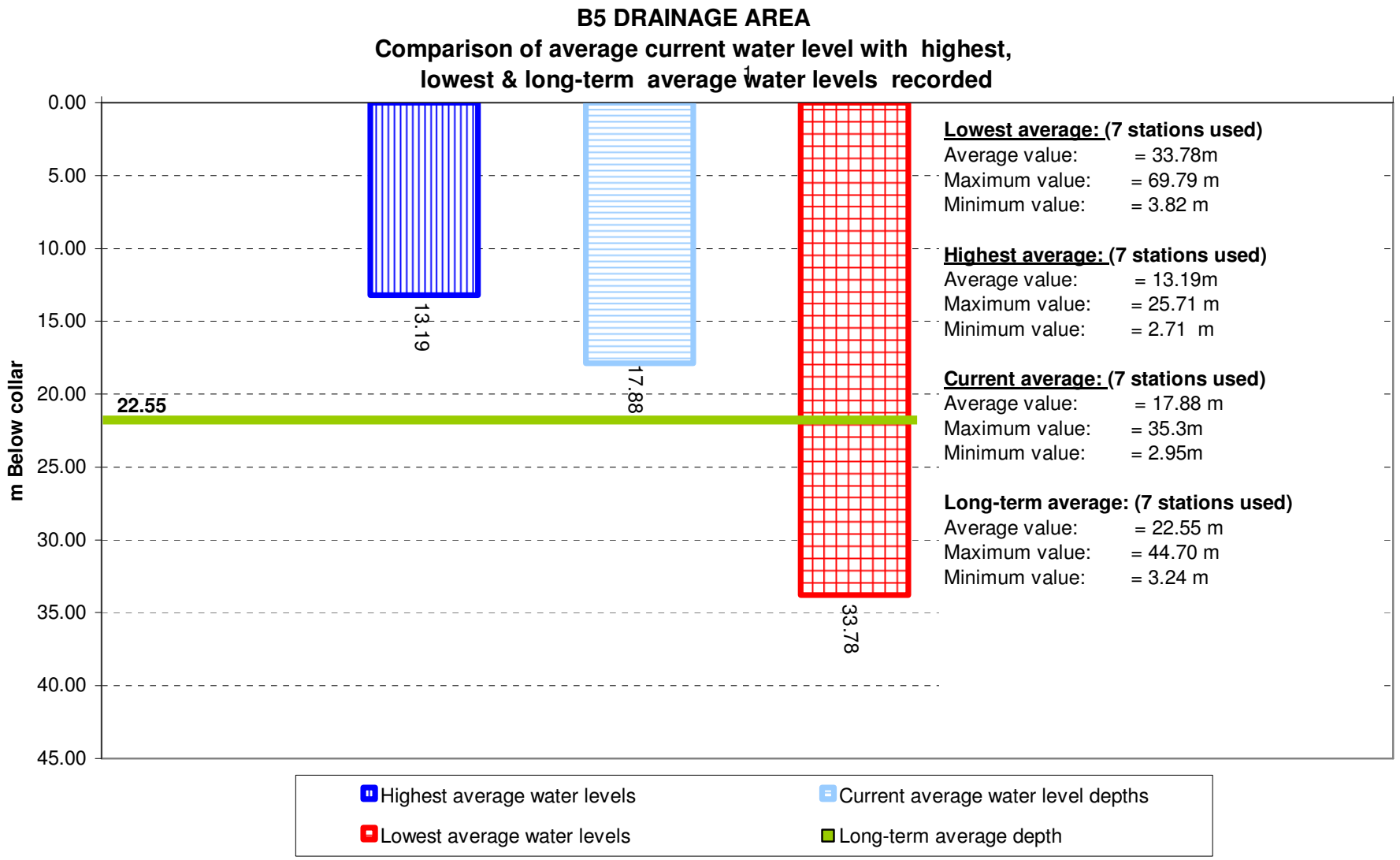
GRAPH 38


B5 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009
B5N0011
B5N0052
B5N0013
B5N0053
B5N0054
B5N0051
B5N0055
4.000
2.000
0.000
-2.000
-4.000
-6.000
-8.000
Monitoring Stations
-1.338
0.110
0.230
0.261
0.860
1.273
1.731
6 Of the 7 stations indicate higher water levels over the past year
Deviation in meter

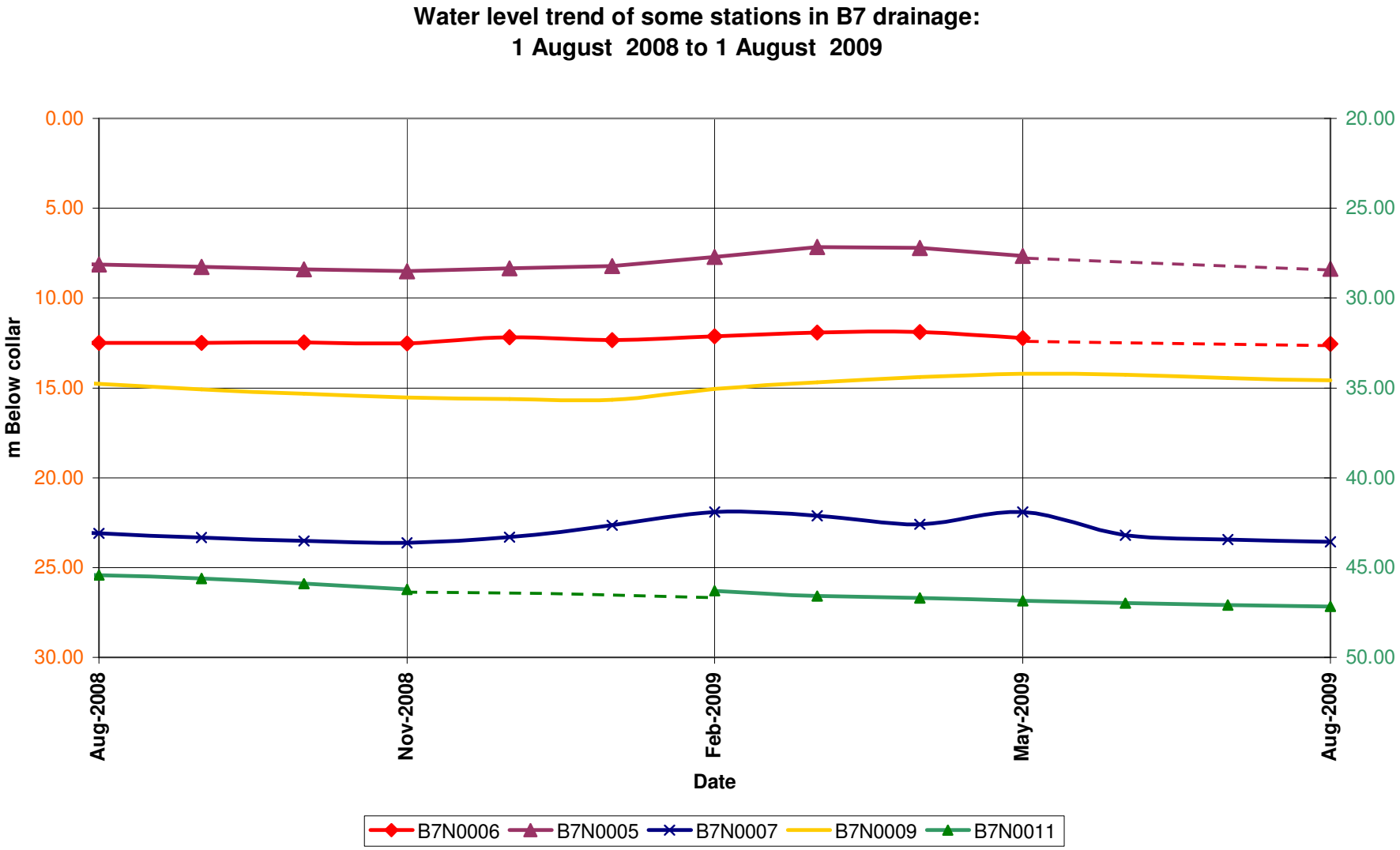
GRAPH 39


B5 DRAINAGE AREA
Comparison between water level depths: 1 August 2008,
1 May 2009 , 1 August 2009 and maximum depths recorded
Monitoring Stations
B5N0011
B5N0013
B5N0053
B5N0051
B5N0052
B5N0054
B5N0055
m Below collar
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
23.88
24.11
25.21
62.96
38.12m
Dec 93
35.53
33.25
35.30
69.79
44.7m
Apr 71
9.53
8.92
9.27
11.06
21.06
20.14
19.79
21.654
3.06
3.32
2.95
3.815
12.75
11.59
11.89
13.82
22.48
26.85
20.75
53.33
May 2007
SUMMARY: August 2008 to August 2009
An overall rise of 0.45m in water level was recorded
over the past year with only 1 station indicating a decline
Aug-08
May-09
Aug-09
Max water level depths recorded
Long-term average depth

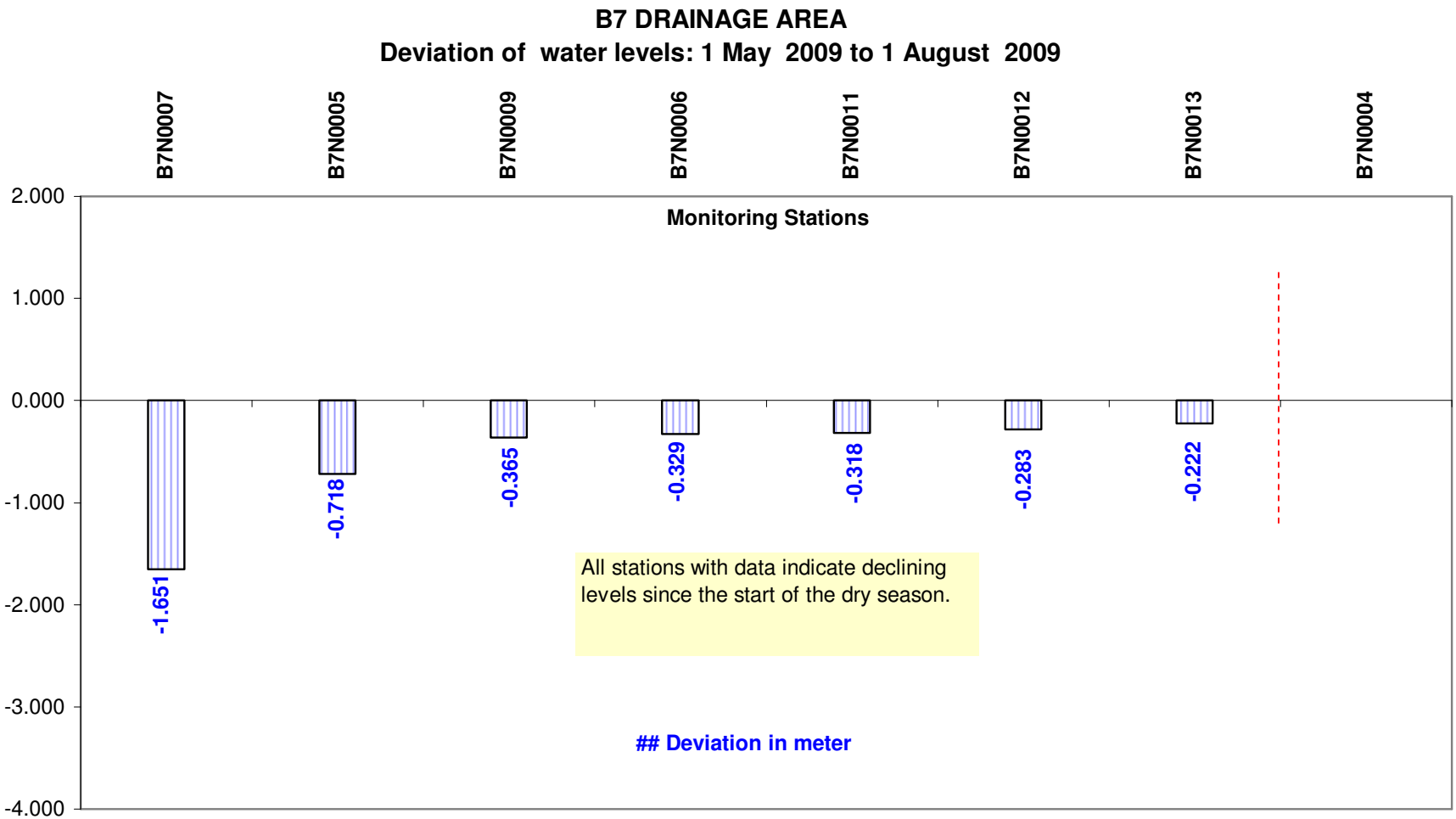
GRAPH 40


B5 DRAINAGE AREA
Comparison of average current water level with highest,
lowest & long-term average water levels recorded
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
22.55
13.19
17.88
33.78
Lowest average: (7 stations used)
Average value: = 33.78m
Maximum value: = 69.79 m
Minimum value: = 3.82 m
Highest average: (7 stations used)
Average value: = 13.19m
Maximum value: = 25.71 m
Minimum value: = 2.71 m
Current average: (7 stations used)
Average value: = 17.88 m
Maximum value: = 35.3m
Minimum value: = 2.95m
Long-term average: (7 stations used)
Average value: = 22.55 m
Maximum value: = 44.70 m
Minimum value: = 3.24 m
Highest average water levels
Current average water level depths
Lowest average water levels
Long-term average depth

GRAPH 41

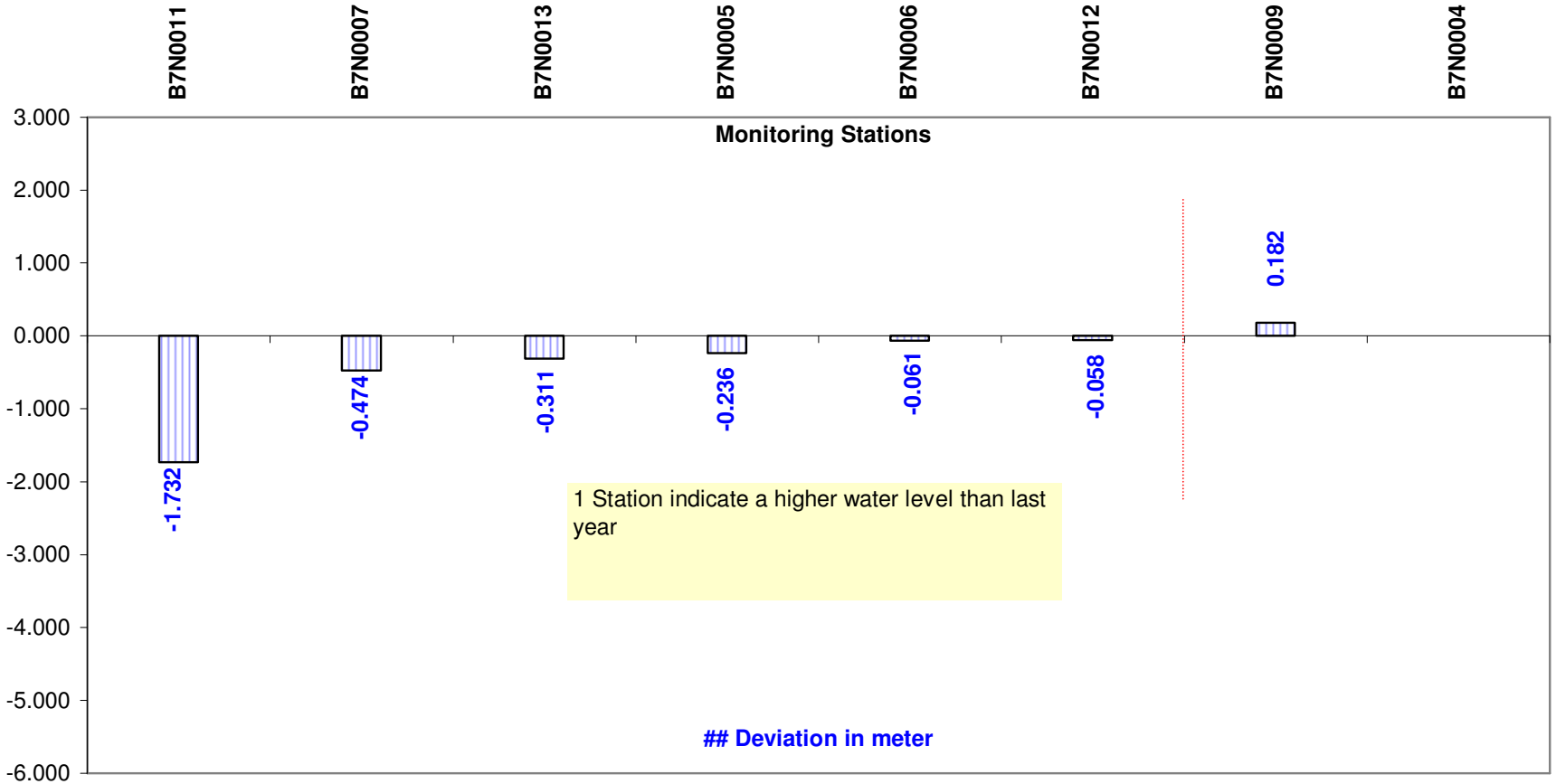

Water level trend of some stations in B7 drainage:
1 August 2008 to 1 August 2009
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Aug-2008
Nov-2008
Feb-2009
May-2009
Aug-2009
Date
B7N0006
B7N0005
B7N0007
B7N0009
B7N0011

GRAPH 42

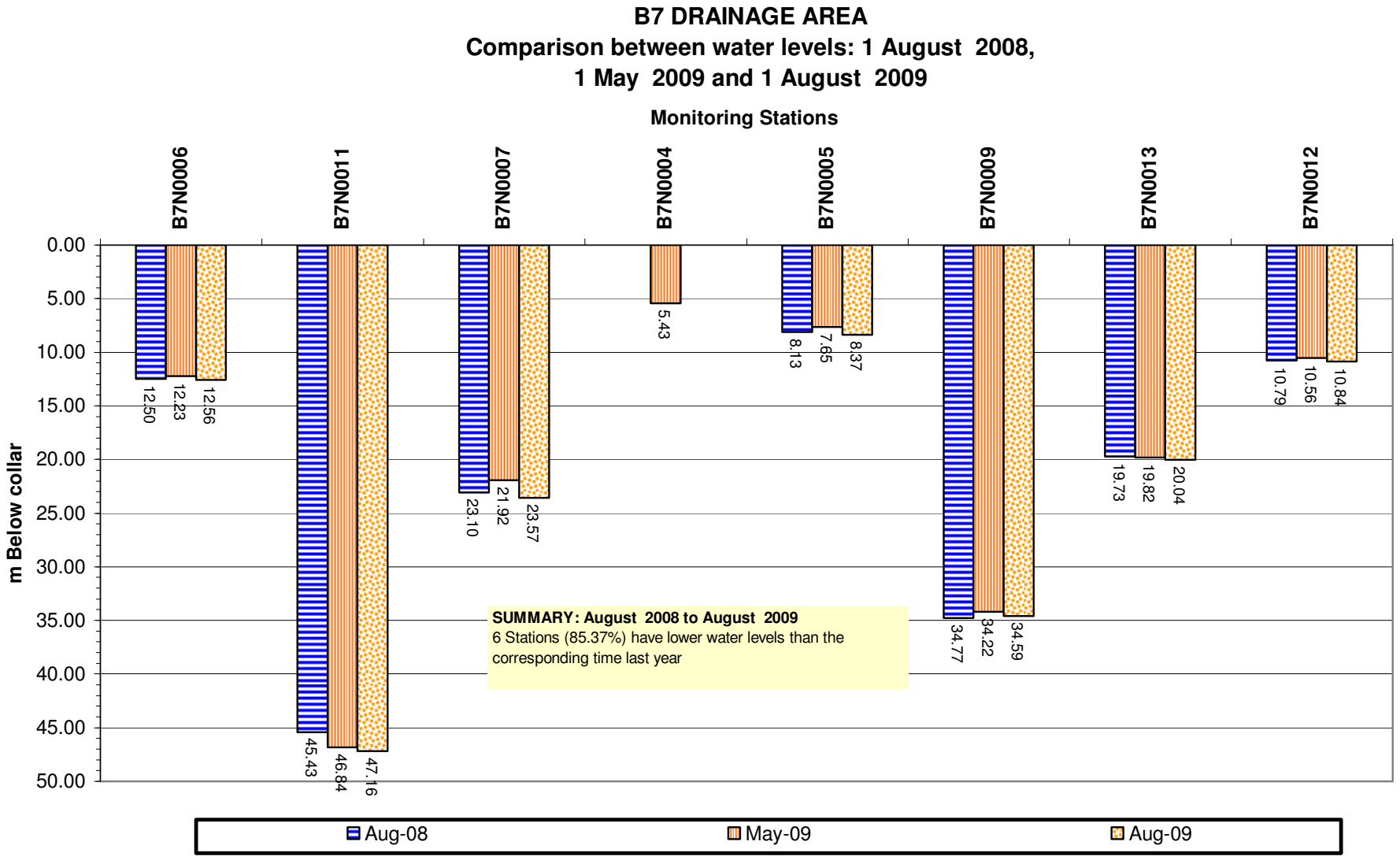

B7 DRAINAGE AREA
Deviation of water levels: 1 May 2009 to 1 August 2009
B7N0007
B7N0005
B7N0009
B7N0006
B7N0011
B7N0012
B7N0013
B7N0004
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
-1.651
-0.718
-0.365
-0.329
-0.318
-0.283
-0.222
All stations with data indicate declining levels since the start of the dry season.
Deviation in meter

GRAPH 43

B7 DRAINAGE AREA
Deviation of water levels: 1 August 2008 to 1 August 2009



GRAPH 44


B7 DRAINAGE AREA
Comparison between water levels: 1 August 2008,
1 May 2009 and 1 August 2009
Monitoring Stations
B7N0006
B7N0011
B7N0007
B7N0004
B7N0005
B7N0009
B7N0013
B7N0012
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
12.50
12.23
12.56
45.43
46.84
47.16
23.10
21.92
23.57
5.43
8.13
7.65
8.37
34.77
34.22
34.59
19.73
19.82
20.04
10.79
10.56
10.84
SUMMARY: August 2008 to August 2009
6 Stations (85.37%) have lower water levels than the corresponding time last year
Aug-08
May-09
Aug-09

GRAPH 45