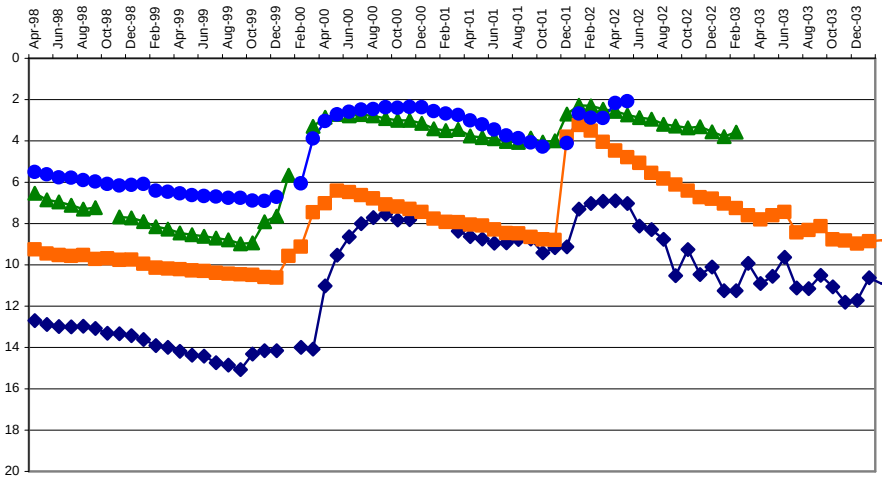
DEPARTMENT OF WATER AFFAIRS AND FORESTRY
LIMPOPO REGION
WATER RESOURCE MANAGEMENT

STATUS REPORT ON MONITORING & GROUNDWATER LEVEL TRENDS AUGUST 2007 – AUGUST 2008



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SEPTEMBER 2008

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1) EXECUTIVE SUMMARY

Groundwater levels

Water levels used for comparison in the report is the values for 1 August 2007, 1 May 2008 and 1 August 2008. Only a few stations could not be accessed, mostly due to locked gates. Data for the Kruger National Park will only be collected again in November 2008.

Comparison of water levels with the previous quarter: (May 2008 to August 2008)

- Stations visited = 151.
- Stations with data for both dates: = 134

	No of stations	% of stations	Average
Water level down more than 1 m	15	11.2%	-1.78m
Water level down less than 1m	101	75.4%	-0.30m
Higher water levels more than 1m	3	2.2%	3.79m
Higher water levels less than 1m	15	11.2%	0.21m
Total	**134**	**100%**	

This period represent the situation since the start to midway through the current dry season. As can be expected for this period, 116 (86.6%) of the 134 stations with data indicate lower water levels. The average decline for these 116 stations is only -0.5m.
Of the 18 stations indicating higher water levels, the increase at 15 of them is insignificant at 0.2m average. The 3 stations with more than 1m rise do not reflect natural conditions at any of them.

Comparison of water levels with the corresponding time last year: (August 2007 to August 2008)

LIMPOPO WATER MANAGEMENT AREA:
Lephalale (A4), Mokolo (A5), Mogalakwena (A6), Sand (A7) and Nzhelele (A8) drainages

Analysis of water level data for the past year, August 2007 to August 2008 mostly indicate no large fluctuations in ambient water levels. Data from 68 monitoring stations indicate 50% of stations with higher water levels than the corresponding period last year and the other 50% with lower water levels. Overall the differences are very small except for the A6 Drainage that indicates an overall rise of almost 1m in water levels.

On the longer term, 2-5 years, the majority of stations indicate some seasonal fluctuations but with an continuous slow decline. This is interpreted as part of a long-term cycle. In areas where long-term data is available, comparison of the current situation with historical trends indicate no serious reason for immediate concern. This however relate to the general condition over a large area and local deviations, especially due to over abstraction will be present.

LEVHUVHU-LETABA WATER MANAGEMENT AREA:
Levhuvhu (A9), Letaba (B8) and Shingwedzi (B9) drainages

No long-term data is yet available for any of these drainages. Data from 36 monitoring stations also indicate 50% of stations with higher water levels than the corresponding period last year and 50% with lower water levels. The overall situation is almost exactly as the

corresponding time last year. Available data only exist for up to 3-4 years in some areas but mostly only 1-2 years. Analysis of the data reveals a very good correlation with that of the Limpopo WMA over the past 2 years and the supposition is made that the correlation may be valid for conditions further in the past. Accepting this, the current situation would also indicate no reason for immediate serious concern overall. Again, local conditions may differ over short distances.

OLIFANTS WATER MANAGEMENT AREA:

Only a few monitoring stations yet in this WMA and spread over a very large area. Data for 15 existing stations indicate 40% with lower water levels and 60 % with higher. Although some stations are widely separated, the same type of correlation with stations in this area could be drawn as with the previous area and the same arguments are deemed valid.

IN GENERAL:

Despite little or no real seasonal recharge the past 2-3 years and general slow decline in water levels, the situation, compared to historical trends, is still in a healthy state. There area a few areas indicating that the declining rates are probably abnormal and should be monitored carefully. The 2 areas of importance is along the Nile River and the Levhuvhu River and is depicted in map 6. The density of the monitoring network do not allow for monitoring of local conditions and aquifer management by the users is, as always, of utmost importance

Monitoring network

Extension of the monitoring network is still ongoing. Replacing of old unsuitable or unstable stations is completed and 12 stations were phased out after May 2008. Some gaps already identified will be filled in 2009.

Summary:

Current stations			Planned stations					Current & planned
Active stations(including new)	Old/unstable phased out	New; No data yet	New boreholes drilled but not equipped yet	Still to be drilled	Project station to include	Possible old existing holes to be used	Total	Total sites to monitor (before gap filling)
185	12	5	10	6	4	7	27	212
(34 in KNP)	(May 2008 last data)	Included in column 1				(Sekhukhune area)		

The position of current and planned stations is depicted in MAP 1.

Other monitoring:

Tshitale project	Taaibosch project	Matlala project	National Groundwater Quality project
4 stations	16 stations	25 stations	55 stations

Except for the stations in the Kruger National Park, all active stations are registered on the National Groundwater Database. 4 of the newly drilled boreholes are also registered leaving 6 new to be registered.

Field verification of possible boreholes for inclusion in the National Groundwater Quality network has started. Field visits to the A7 7 A8 drainages were done and 13 sites visited and verified.

Extension of the rainfall recorder network was halted until a suitable solution to vandalism can be found.

2) STATUS OF MONITORING NETWORK

The Limpopo Province's Groundwater Level Monitoring Network currently consists of 185 active monitoring stations, including 34 in the KNP which were not visited in August. **(Map 1)**
Replacement and phasing out of old stations is completed and 12 stations were phased out after May 2008. 143 Stations were visited during August 2008. 3 Stations were inaccessible due locked gates and 5 are new with no time series data yet. 27 Additional new stations are currently planned of which 10 are already drilled but not yet equipped. Field verification of possible existing boreholes for 7 of the planned stations was done and 4 can be used. The 3 remaining will probably need drilling of new holes added to the 6 outstanding to drill. 4 Project boreholes are planned to be included in the network at a later stage. Some network gaps identified will be addressed next year. Cleaning of station A5N0001 as well as drilling of additional holes to investigate the validity of water level behavior at this station was completed but problems with access to the property prevented re-equipping of this station.
6 of the newly drilled boreholes still have to be registered on the National database

The borehole at Bismarck was severely damaged by cutting the casing off and welding it shut again. The loggers are assumed to have been lost down the hole. The incident is under investigation.

No progress on the phase 2 upgrading of existing stations.

The following project stations are monitored, 25 at Matlala, 4 at Tshitale and 16 at 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. **(Map 3)**
Field verification and station identification of possible additional stations is progressing well and the A7 & A8 drainages were visited with 13 sites completed.

3) DATA COLLECTION, EVALUATION AND REPORTING

Data was collected during August 2008 with the value for 1 August representing midway of the current dry season. Comparisons were drawn between 1 August 2007, (Corresponding period the previous year) 1 May 2008 (End of the previous wet season) and 1 August 2008 (Midway of the current dry season) **(Maps 4-6)**

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)

2 New stations were equipped in this drainage but no time series data is available yet. Another 6 boreholes have been drilled but not equipped yet.

4.2 A5 Drainage Area. (Lephalala River)

There are 5 active stations. 1 New borehole drilled must still be equipped and 1 must still be drilled. Station A5N0001, as well as 3 additional project boreholes around it, could not be equipped yet due to access problems.

Fluctuation of water levels at all of these stations is almost negligible.
(**GRAPHS 1-4)**

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

There are 39 monitoring stations in this drainage, 2 of which are new boreholes with no time series data yet.

Although some recharge the past season is evident in most, levels have, as can be expected, started to decline again since the onset of the dry season. **(GRAPH 5)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)
Data for 36 stations is available. 31 Stations (86.1 %) have lower levels and 5 stations (13.9%) indicate higher water levels. Overall an average decline of -0.41m was recorded for the period. **(GRAPHS 6 & 8)**

August 2007 to August 2008
Data for the whole year is available for 28 stations. 10 Stations (35.7%) indicate lower water levels than August last year and 18 stations (64.3%) indicate a rise in water levels. An overall rise of 1.1m was recorded over the past year **(GRAPH 7 & 8)**

Average water levels are still slightly higher than the long-term average values and are 3.73m higher than the maximum average recorded, **(GRAPH 9)**
The slow declining trend over the longer term persists.

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

There are currently 38 monitoring stations in this drainage.

Water levels are mostly quite stable with little fluctuation the past year with limited recharge evident at some stations. A slow declining trend over the longer term still persists **(GRAPH 10)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)
Data is available for 33 stations of which 6 stations (18.2%) indicate higher water levels, average 0.18m, while 27 stations (81.8%) indicate lower water levels, average -0.4m. Overall a decline of -0.29m was recorded over this period **(GRAPHS 11&13).**

August 2007 to August 2008

Data is available for 28 stations, 19 (67.9%) Indicate lower water levels, average -0.54m. 9 Stations (32.1%) indicate higher water levels, average 0.7m. Overall a decline of -0.14m was recorded for the period **(GRAPHS 12&13)**.

Current average water levels are lower than the long-term average and only 1.42m above the lowest average recorded **(GRAPH 14).**

Long-term trends show some corresponding behavior with that of drainage A6 .

4.5 A8 Drainage Area ((Nwanedzi, Nzhelele Rivers)

11 Stations are monitored in this area but as for the previous report, the data for the artesian station was not used as it is still overflowing.

A slight initial rise in water levels the past wet season followed by a decline again is evident at all stations. **(GRAPH 15)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

7 Stations indicate slightly lower water levels with an average of -0.21m **(GRAPHS 16 & 18)**.

August 2007 to August 2008
3 Stations indicate slightly declining water levels and 7 Stations higher water levels, average 0.57m **(GRAPHS 17 & 18)**.

An overall average rise of 0.33m was recorded over the past year **(GRAPH 18)**

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.

Water level trends vary but the general slow declining trend is visible here as in the other drainages, even with evidence of some recharge the past wet season **(GRAPH 19).**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

Data is available for all stations and lower water levels are indicated at all, average -0.66m (**GRAPHS 20&22)**.

August 2007 to August 2008)
9 Stations (50%) indicate lower water levels, average -0.6m and also 9 stations indicate higher water levels, average 0.54m **(GRAPHS 21&22)**.

Overall a very slight average decline of 0.04m 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.

Trends mostly indicate very little, or no fluctuation, the past year but a continuous slow decline **(GRAPH 23).**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

Data is available for all 14 stations and 13 stations indicate lower water levels, average -0.43m with 1 station indicating a very slight rise **(GRAPHS 24&26)**

August 2007 to August 2008
An equal amount, 7 each, indicate lower and higher water levels (**GRAPHS 25&26)**

Overall the situation is exactly the same as the corresponding time last year.

5.3 B9 Drainage Area. (Shingwidzi, Mphongolo Rivers)

3 Of the 4 stations monitored indicate an initial small rise in water level declining again in the dry season **(GRAPH 27)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

Water levels at all stations indicate a decline, average -0.6m **(GRAPHS 28 & 30).**

August 2007 to August 2008
2 Stations each indicate lower and higher water levels but the fluctuations are generally small **(GRAPHS 29&30)**

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.

Rising water levels at al stations but very little at B3N0022 **(GRAPH 31)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

All stations indicate higher levels **(GRAPH 32)**

August 2007 to August 2008
All Stations indicate higher water levels (**GRAPH 33)**

Despite the evident recovery of the water levels at B3N0001 and B3N0012, the current water levels are still far below long-term average (**GRAPH 34)**

6.2 B5 Drainage Area. (Olifants, Nkumpi Rivers)

Access to B5N0011 could not be gained in August and may pose real problems in future.

As in most other drainages, an initial rise in water levels followed by a decline **(GRAPH 35)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

4 Stations indicate lower water levels and 2 slightly higher **(GRAPHS 36&38)**

August 2007 to August 2008
4 Stations indicate higher water levels and 1 slightly lower **GRAPHS 37&38)**

Current average water levels are above the long-term averages as well as the lowest average recorded **(GRAPH 39)**

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

8 Stations are monitored in this drainage.

Very little fluctuation the past year **(GRAPH 40)**

Comparison with previous levels:

May 2008 to August 2008 (beginning to midway of current dry season)

All stations with data indicate lower water levels; average -0.5m **(GRAPHS 41&43)**

August 2007 to August 2008
5 Stations indicate lower water levels; average -1.5m and 2 higher **(GRAPHS 42&43)**.

Overall a decline of -0.96 was recorded the past year.

Areas of notable lower water levels: (Map 6).

- There are 2 discernable areas characterized by a concentration of boreholes with water levels declining more than 1, and even more than 2m since the beginning of the dry season. (Red polygons)
- Another area contains a concentration of boreholes with water levels declining 0,5m to 1m. (Orange polygon)
- A third area have a scattering of stations with water levels declining more than 0,5m (Blue dotted polygon)

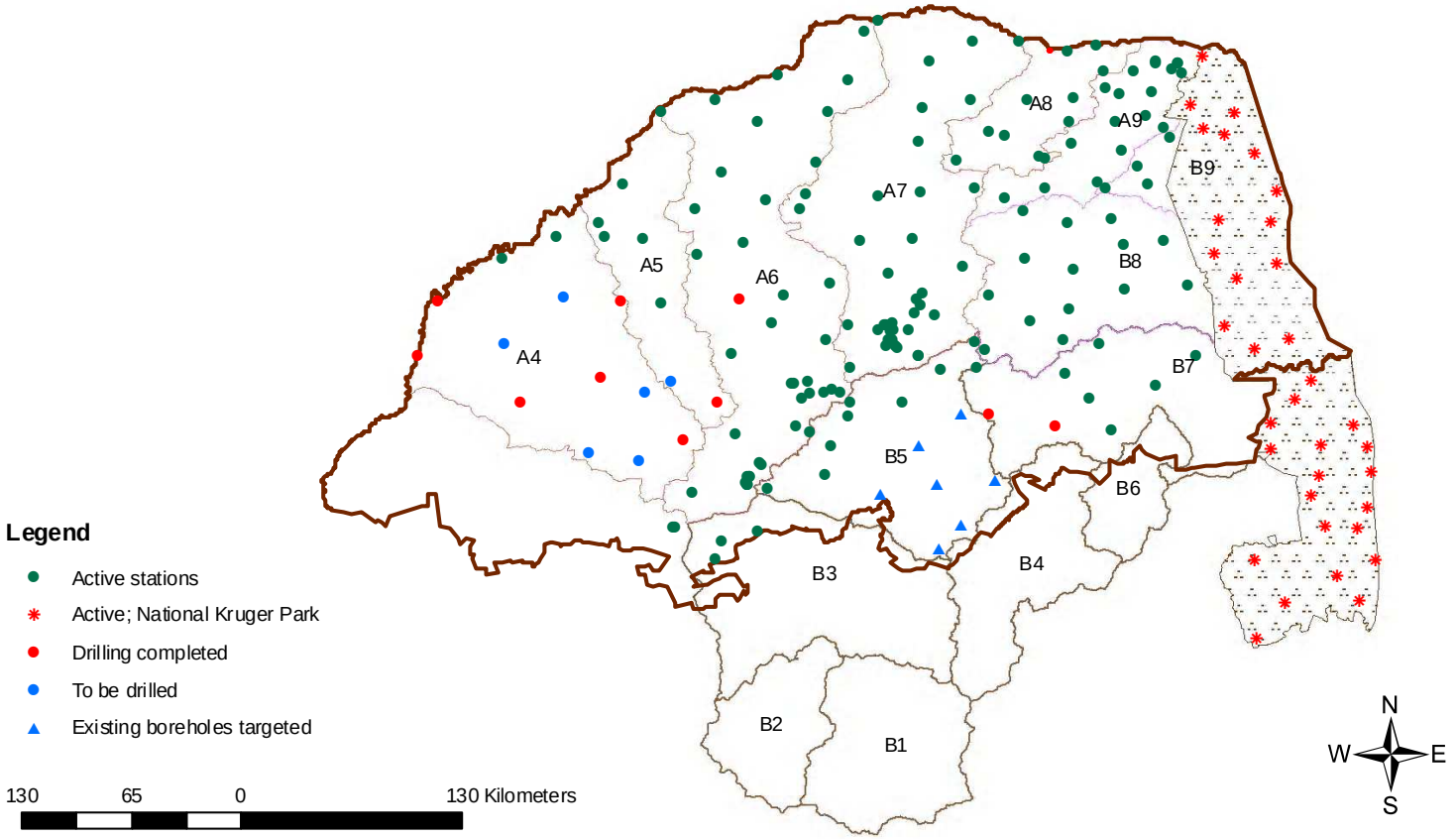
AREA 1: This area is located from around Mokopane southwards along the Nile River and somewhat west into the Springbok Flats. The water level behavior is probably an indication of the effect of abstraction for irrigation in the southern part and for town use in the area of Mokopane.

AREA 2: This area is located along the drainages of the Levhuvhu and Mutale Rivers from origins at Mpheni (Elim) and Tshidzivhe respectively down to the Kruger National Park

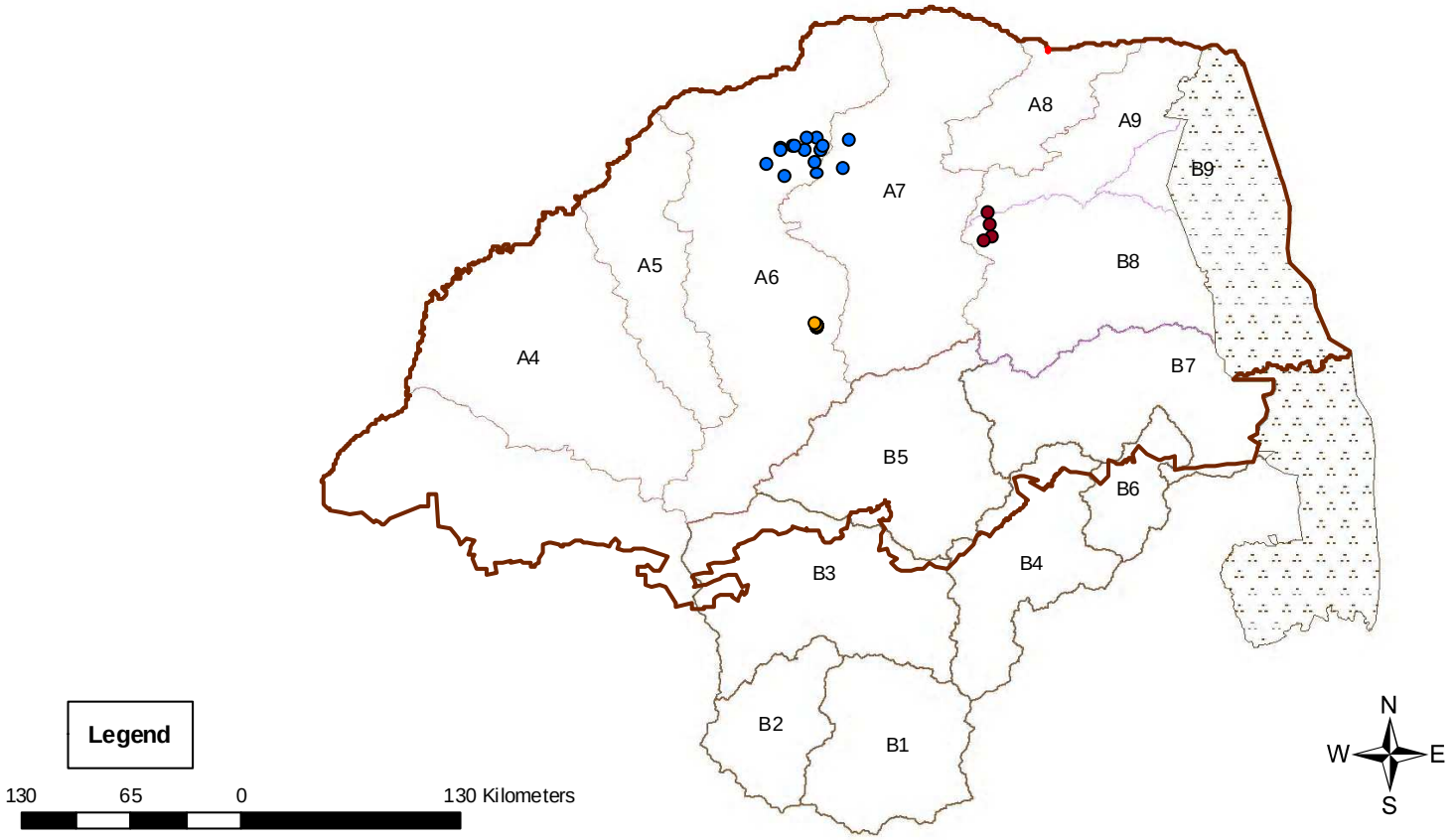
border at Punda Maria. This is a densely populated area and the main source of water supply is probably from groundwater.

AREA 3: The area in question is the western part of the B8 and the central part of the B7 drainages. The decline in water levels in this area is not so drastic and range between 0,5 to 1m. The behavior in the B8 drainage part may be the affect of abstraction as this is also a populated area. The area in B7 is however mostly cattle and game farming area which is usually not subjected to heavy abstraction.

AREA 4: This is mostly around Polokwane with 2 exceptions. A close look at these boreholes indicated that all of them are located in the vicinity of abstraction points or either for irrigation or human consumption. The decline is mostly less than 1m


LIMOPO GROUNDWATER LEVEL MONITORING
POSITIONS OF ACTIVE AND PLANNED MONITORING STATIONS; SEPTEMBER 2008
A8
A9
B9
A7
A5
A6
B8
A4
B7
B5
B6
B3
B4
B2
B1
Legend
Active stations
Active; National Kruger Park
Drilling completed
To be drilled
Existing boreholes targeted
130
65
0
130 Kilometers
N
W
E
S

MAP 1


LIMOPO GROUNDWATER LEVEL MONITORING
POSITIONS OF PROJECT MONITORING STATIONS; SEPTEMBER 2008
A8
A9
B9
A7
A5
A6
B8
A4
B7
B5
B6
B4
B3
B2
B1
Legend
130
65
0
130 Kilometers
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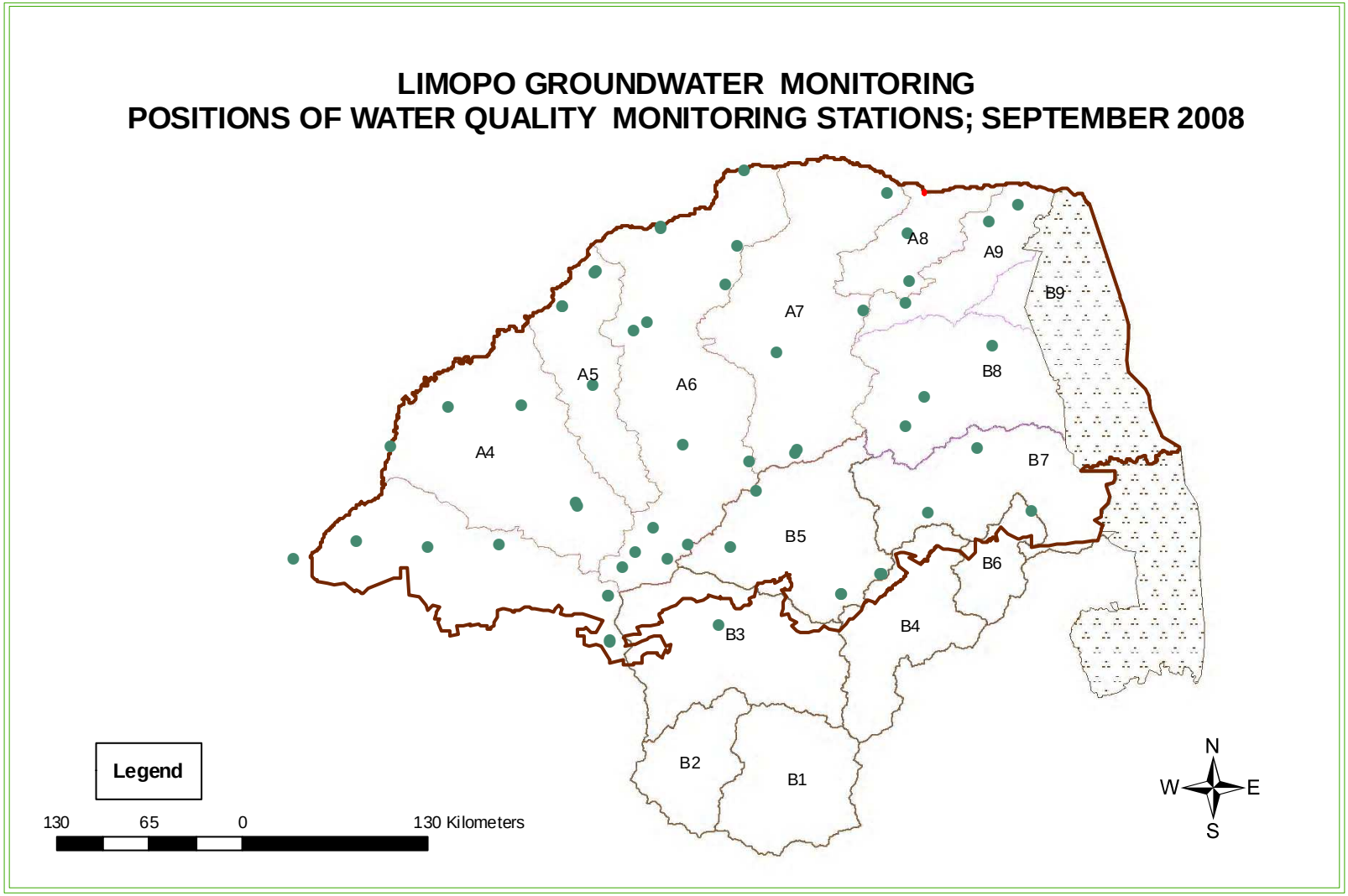
MAP 2


LIMOPO GROUNDWATER MONITORING
POSITIONS OF WATER QUALITY MONITORING STATIONS; SEPTEMBER 2008
A8
A9
B9
A7
A5
A6
B8
A4
B7
B5
B6
B3
B4
B2
B1
Legend
130 65 0 130 Kilometers
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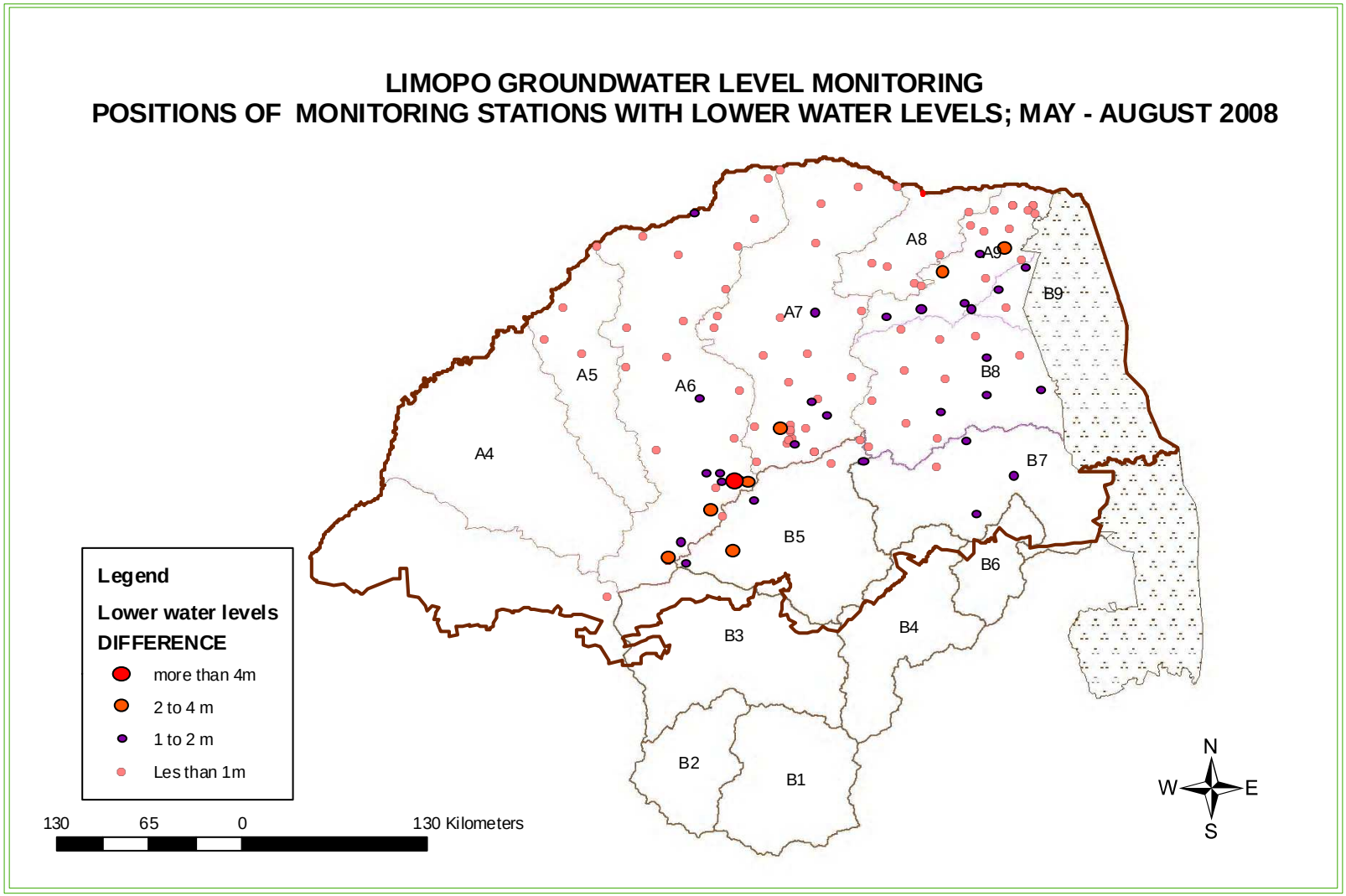
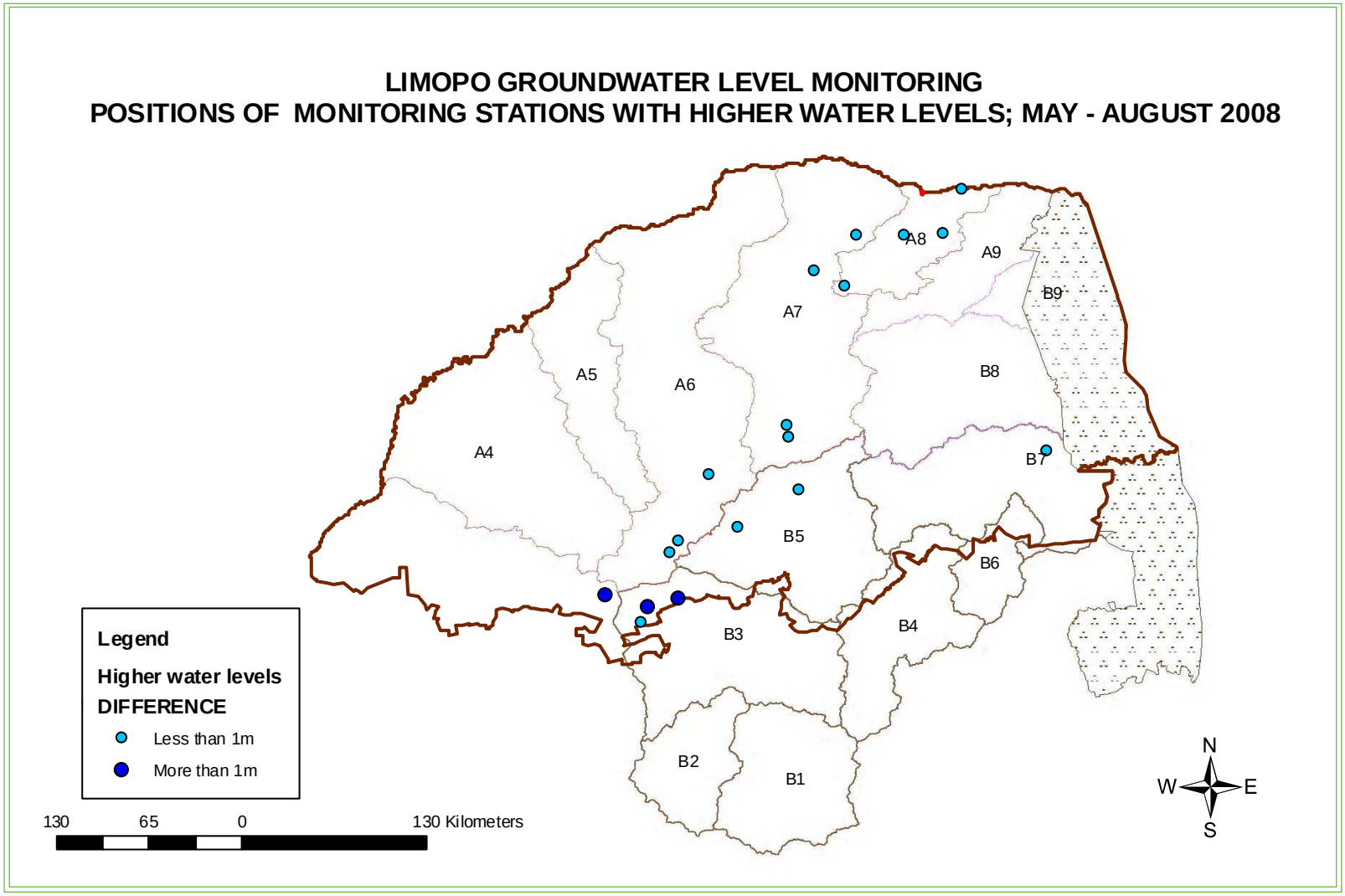
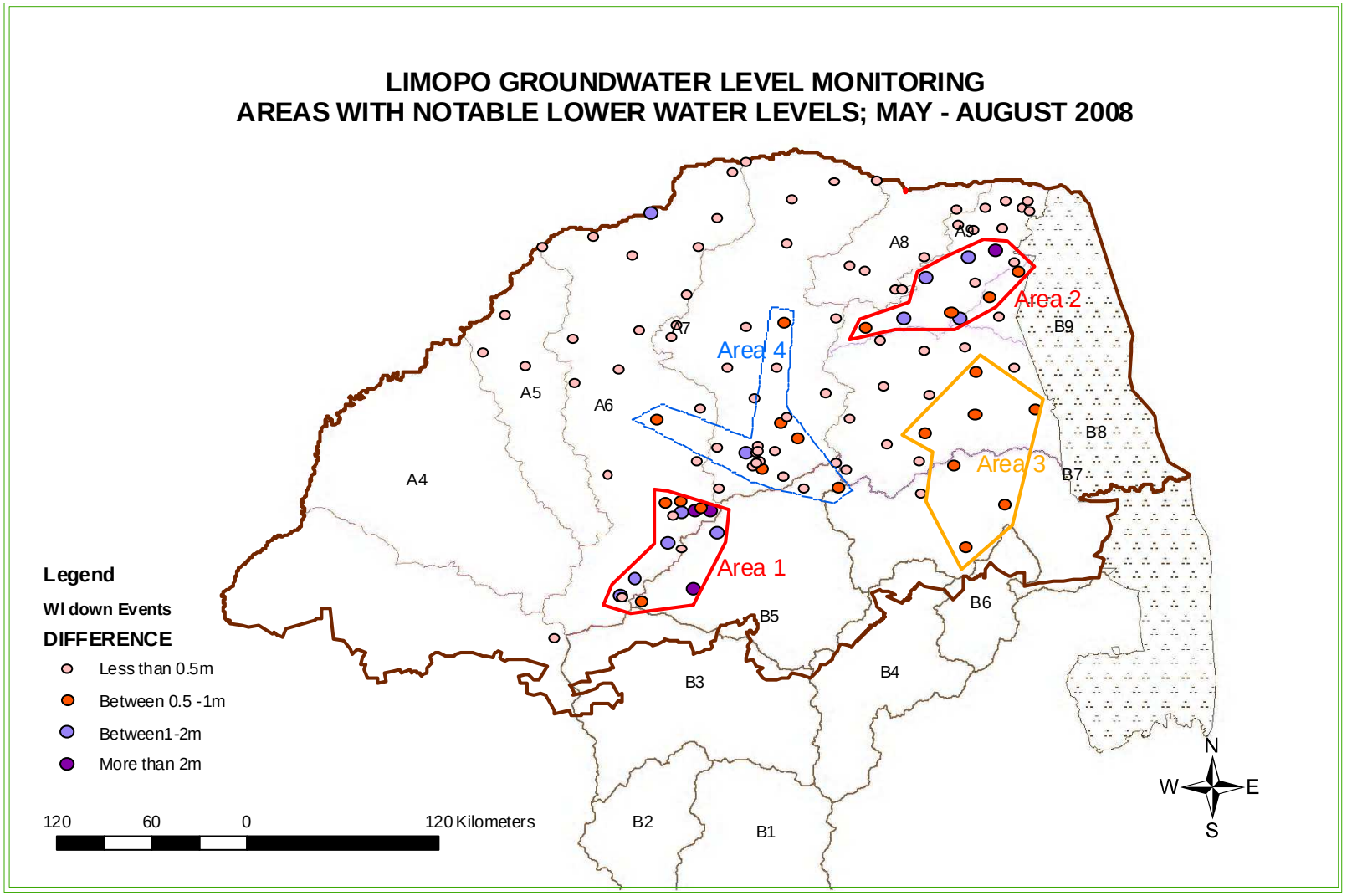
MAP 3


LIMOPO GROUNDWATER LEVEL MONITORING
POSITIONS OF MONITORING STATIONS WITH LOWER WATER LEVELS; MAY - AUGUST 2008
A8
A9
B9
A7
A5
A6
B8
A4
B7
B5
B6
B4
B3
B2
B1
Legend
Lower water levels
DIFFERENCE
more than 4m
2 to 4 m
1 to 2 m
Les than 1m
130
65
0
130 Kilometers
N
W
E
S

MAP 4

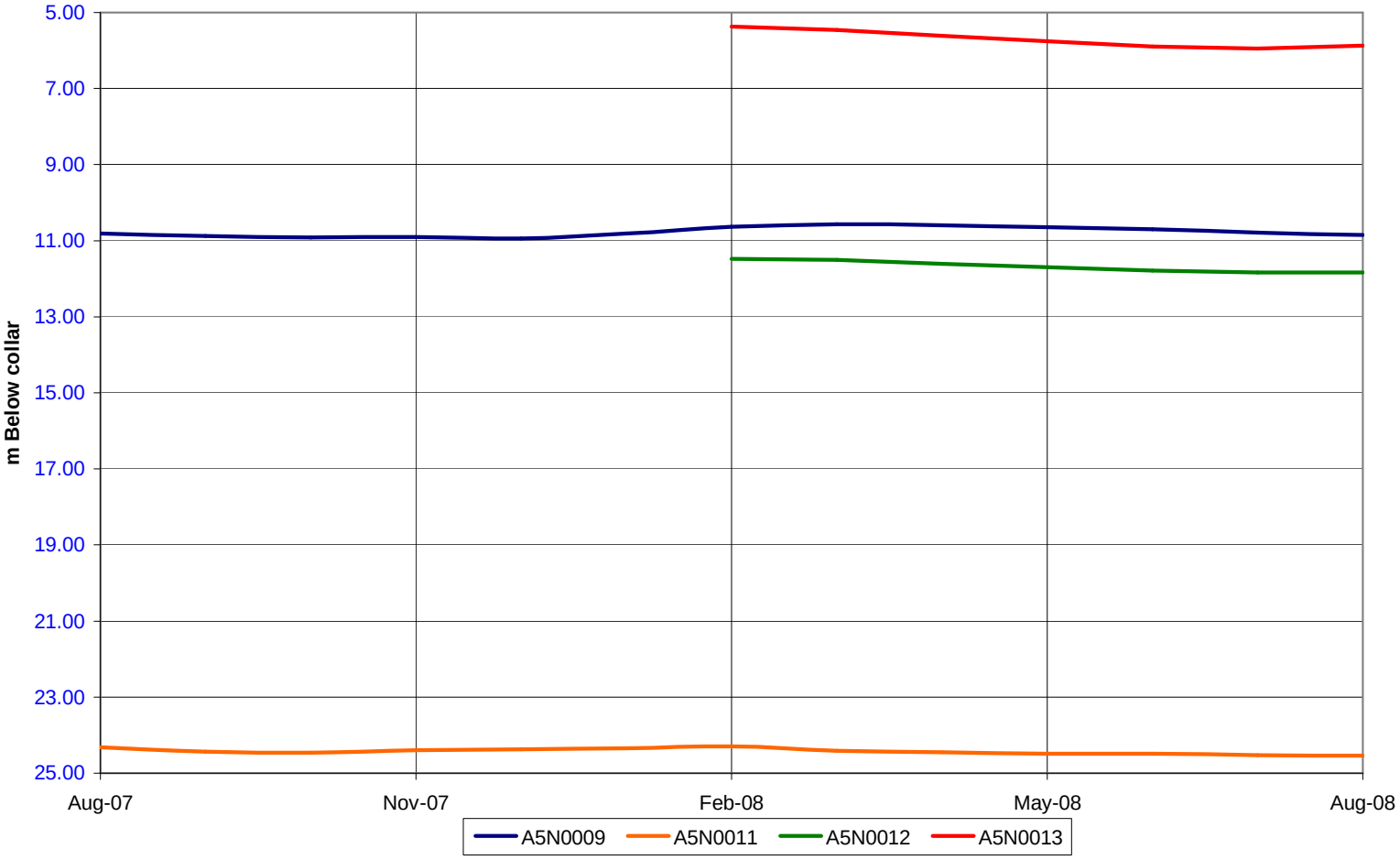

LIMOPO GROUNDWATER LEVEL MONITORING
POSITIONS OF MONITORING STATIONS WITH HIGHER WATER LEVELS; MAY - AUGUST 2008
A8
A9
B9
A7
A5
A6
B8
A4
B7
B5
B6
B3
B4
B2
B1
Legend
Higher water levels
DIFFERENCE
Less than 1m
More than 1m
130
65
0
130 Kilometers
N
W
E
S

MAP 5


LIMOPO GROUNDWATER LEVEL MONITORING
AREAS WITH NOTABLE LOWER WATER LEVELS; MAY - AUGUST 2008
Area 1
Area 2
Area 3
Area 4
A4
A5
A6
A7
A8
A9
B1
B2
B3
B4
B5
B6
B7
B8
B9
Legend
WI down Events
DIFFERENCE
Less than 0.5m
Between 0.5 -1m
Between1-2m
More than 2m
120
60
0
120 Kilometers
N
W
E
S

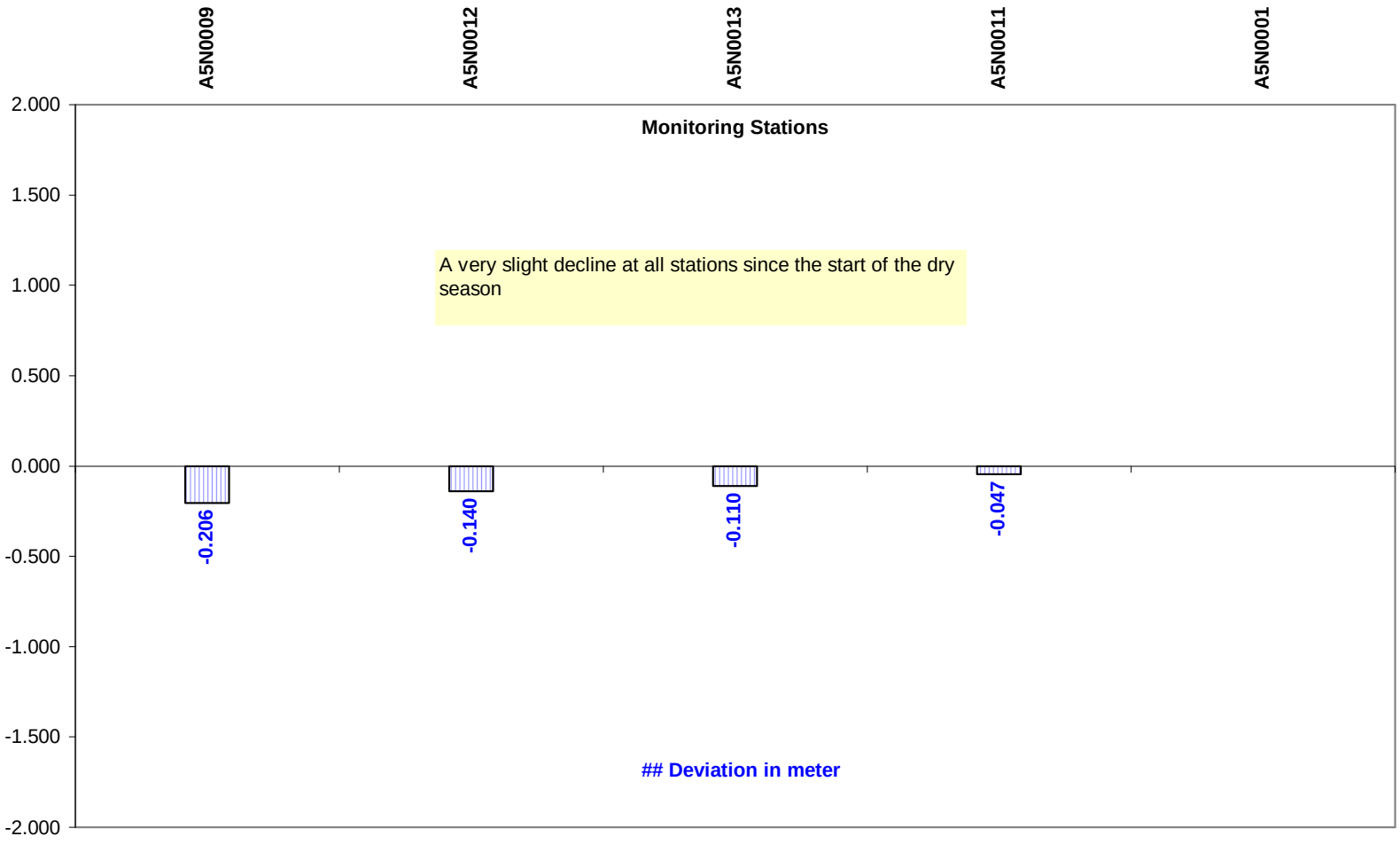
MAP 6

Comparison of water level trends at stations in A5 drainage: 1 August 2007 to 1 Agust 2008



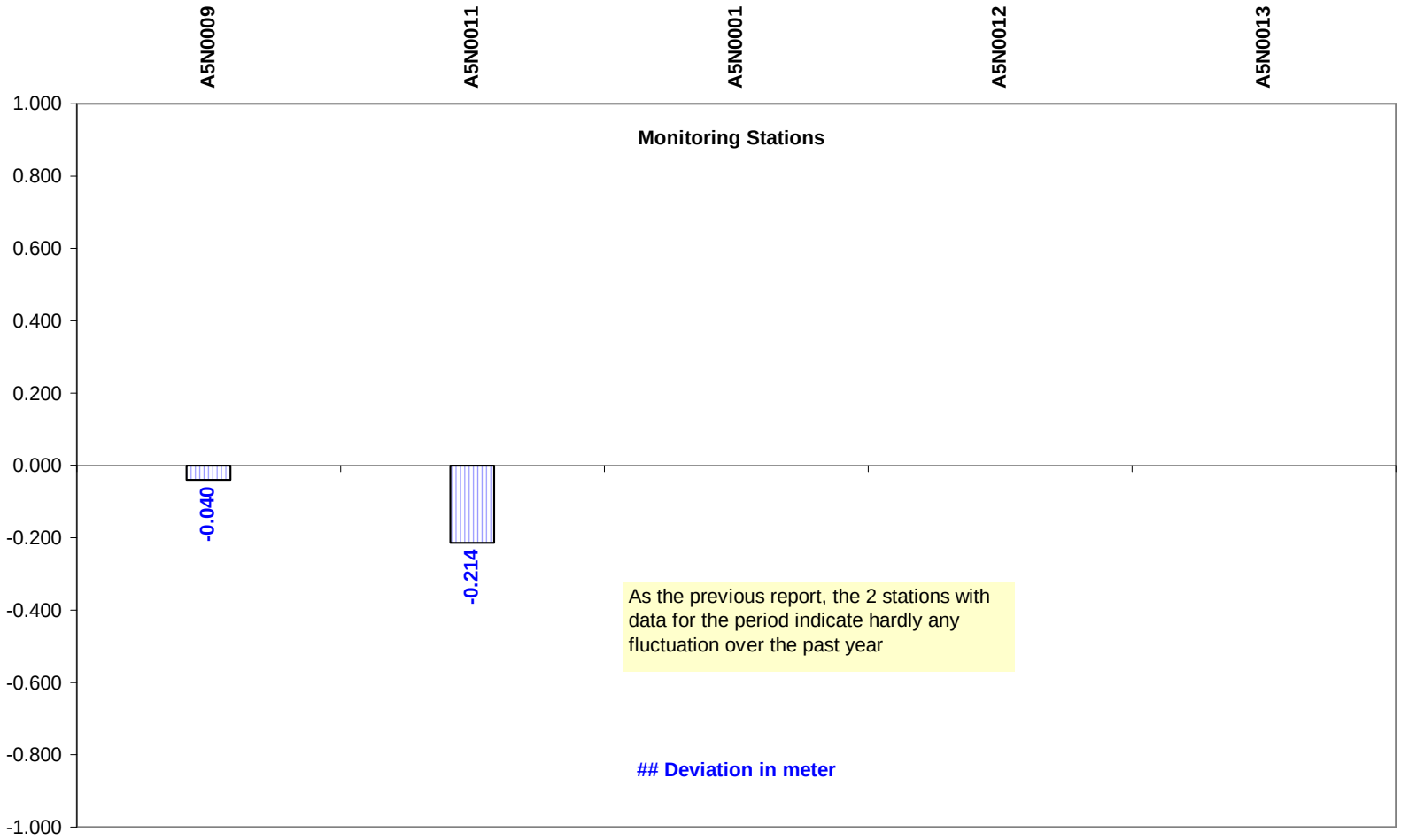
GRAPH 1

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

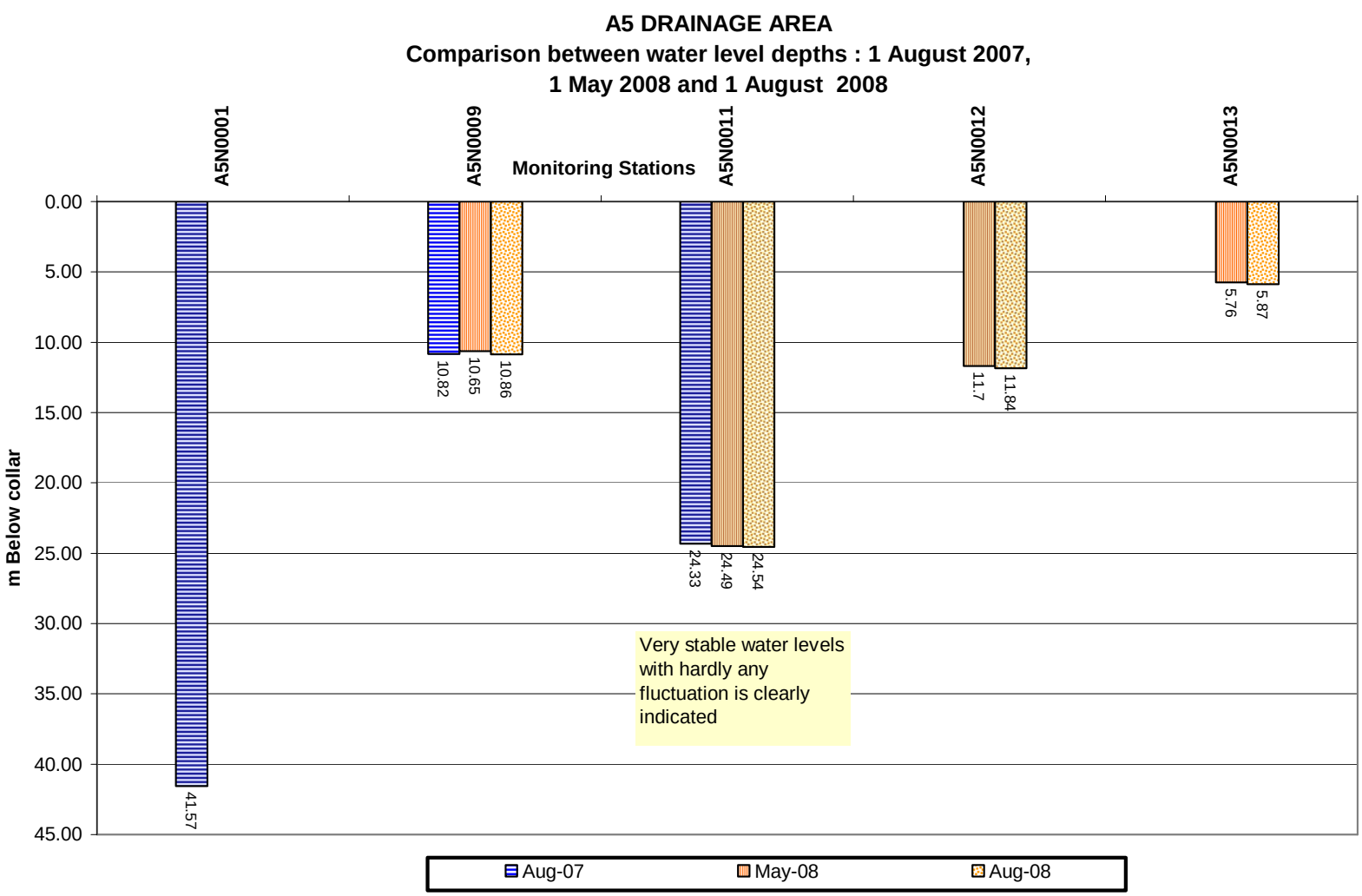


GRAPH 2

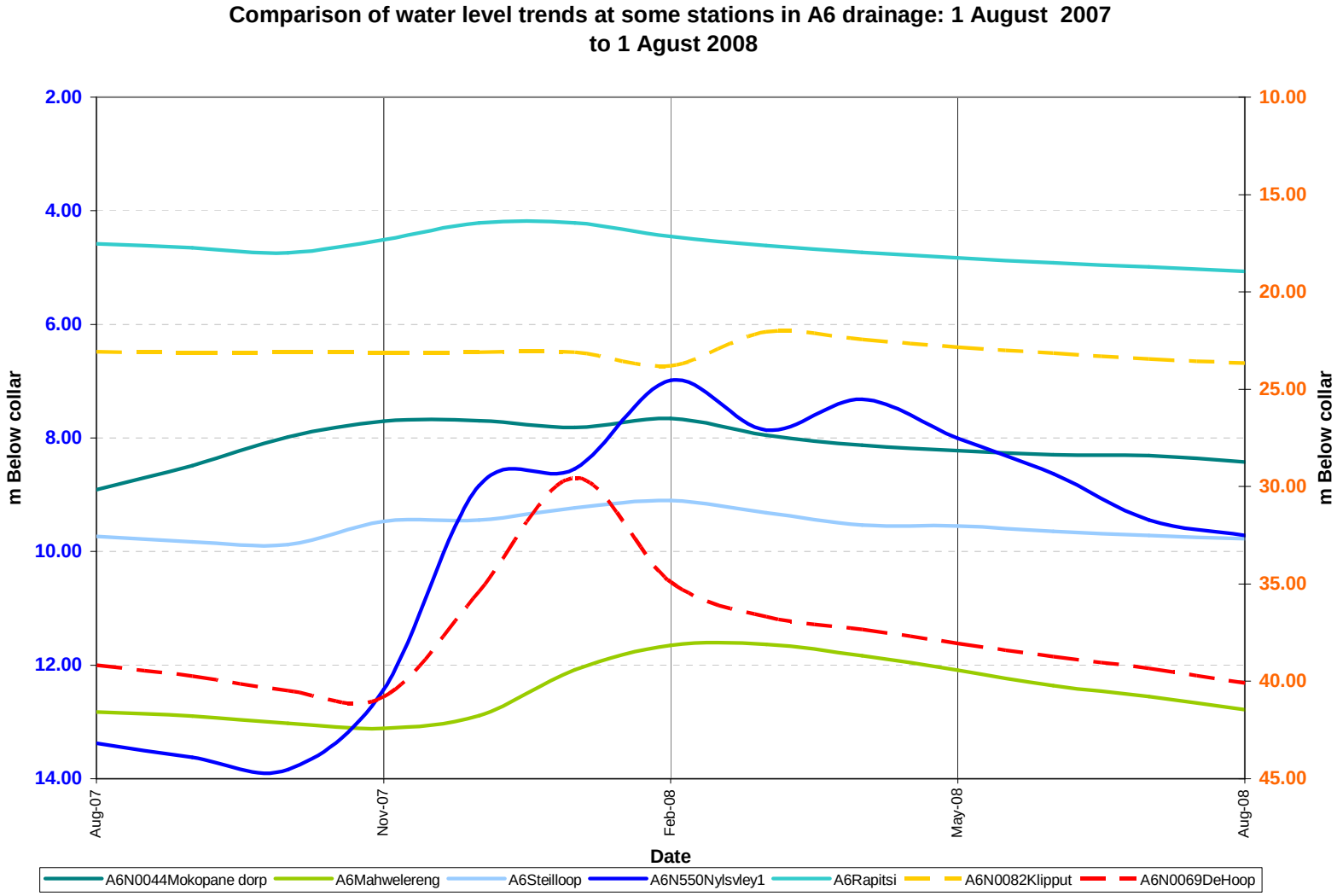
A5 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008



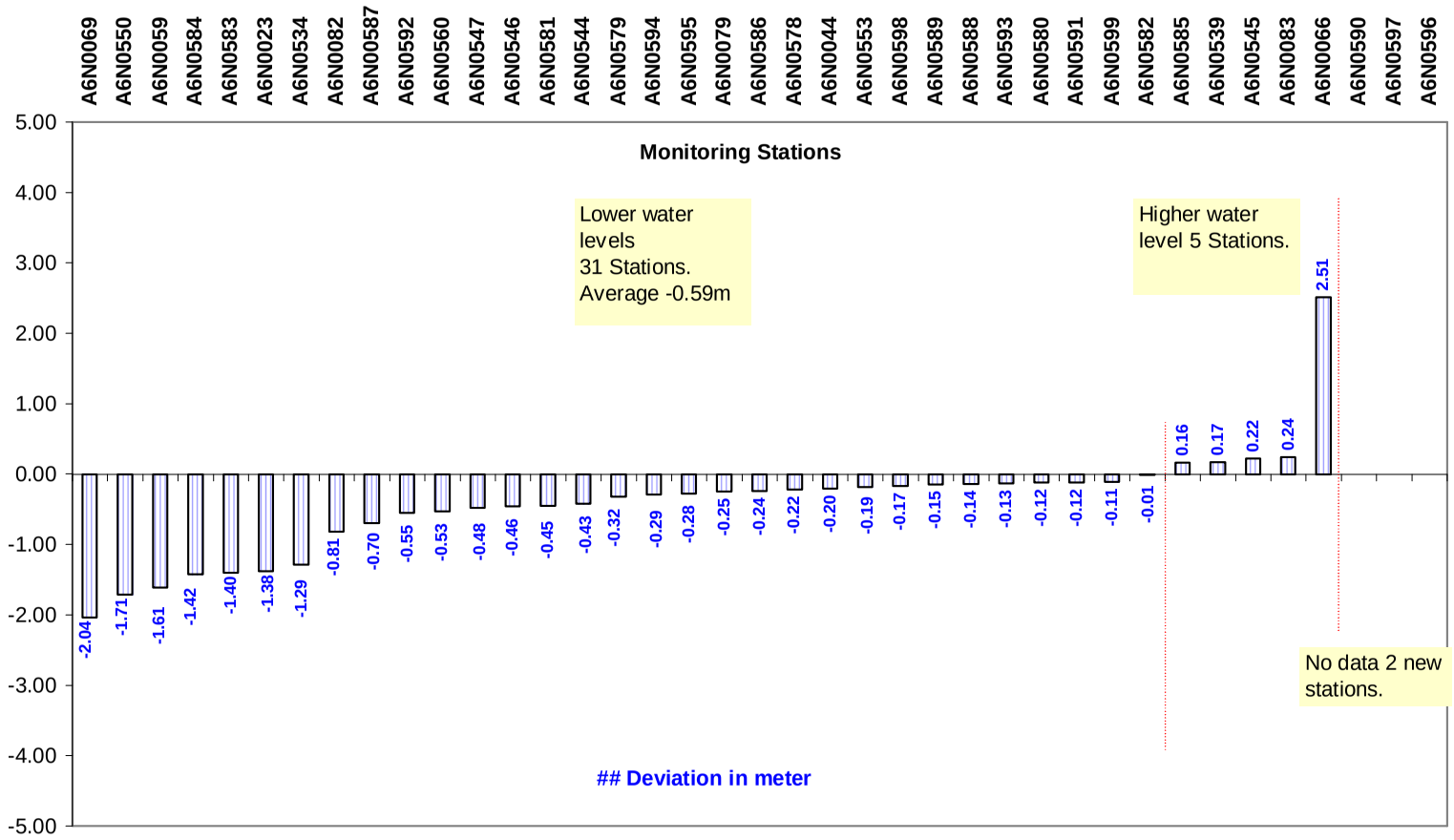
GRAPH 3


A5 DRAINAGE AREA
Comparison between water level depths : 1 August 2007,
1 May 2008 and 1 August 2008
A5N0001
A5N0009
A5N0011
A5N0012
A5N0013
Monitoring Stations
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
41.57
10.82
10.65
10.86
24.33
24.49
24.54
11.7
11.84
5.76
5.87
Very stable water levels with hardly any fluctuation is clearly indicated
Aug-07
May-08
Aug-08

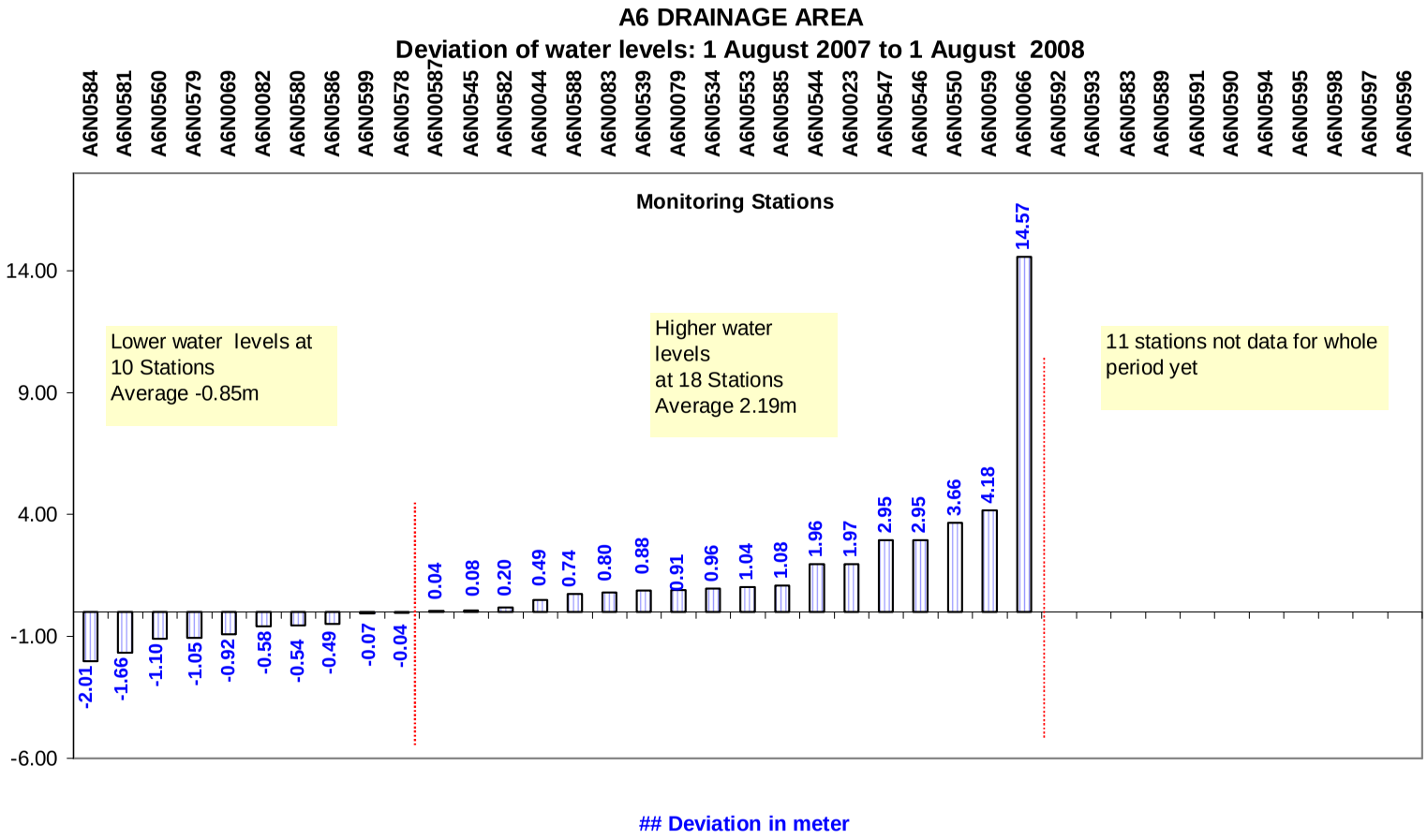
GRAPH 4


Comparison of water level trends at some stations in A6 drainage: 1 August 2007 to 1 Agust 2008
2.00
4.00
6.00
8.00
10.00
12.00
14.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
m Below collar
m Below collar
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Date
A6N0044Mokopane dorp
A6Mahwelereng
A6Steilloop
A6N550Nylsvley1
A6Rapitsi
A6N0082Klipput
A6N0069DeHoop

GRAPH 5

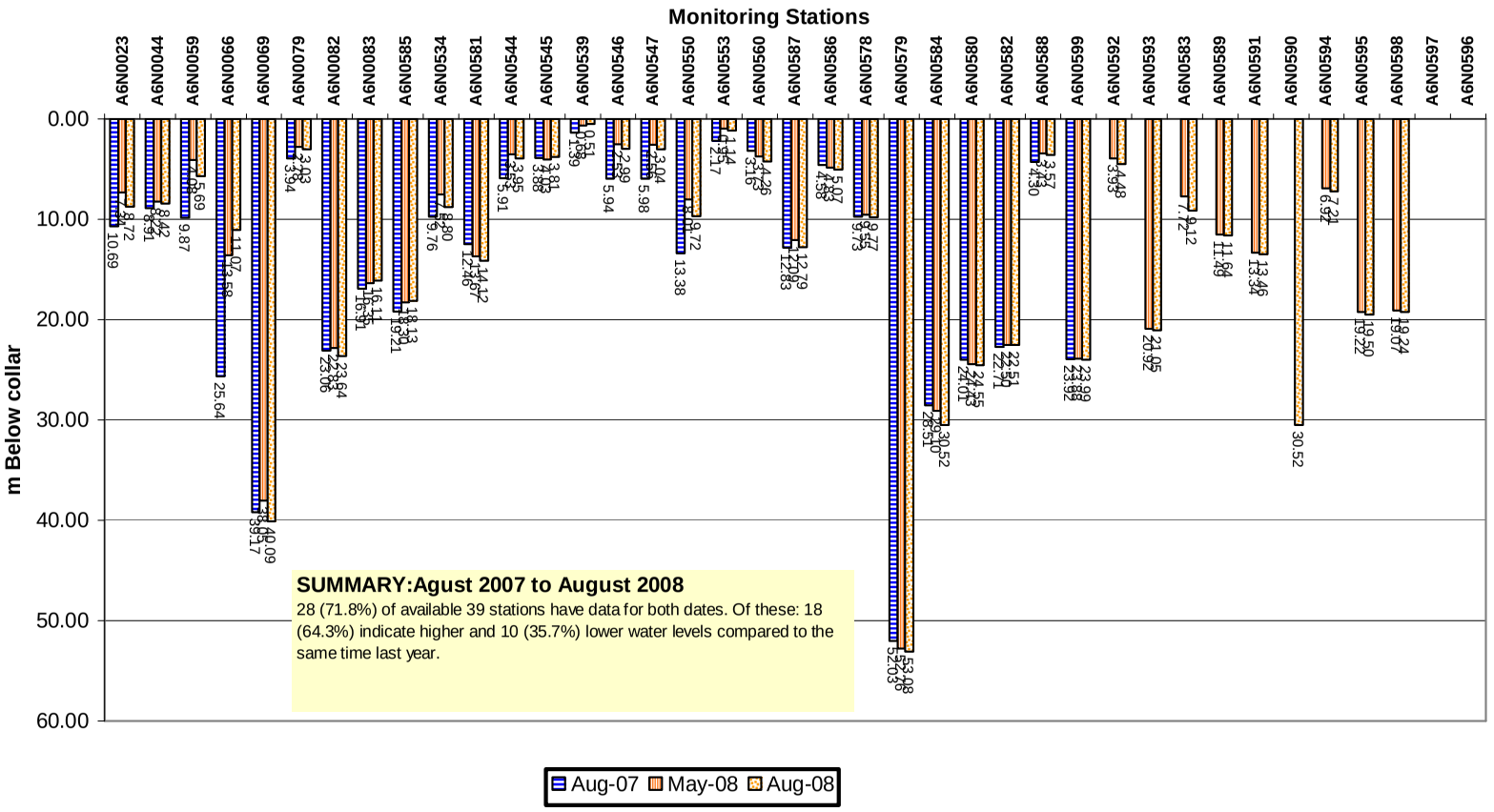

A6 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
A6N0069
A6N0550
A6N0059
A6N0584
A6N0583
A6N0023
A6N0534
A6N0082
A6N00587
A6N0592
A6N0560
A6N0547
A6N0546
A6N0581
A6N0544
A6N0579
A6N0594
A6N0595
A6N0079
A6N0586
A6N0578
A6N0044
A6N0553
A6N0598
A6N0589
A6N0588
A6N0593
A6N0580
A6N0591
A6N0599
A6N0582
A6N0585
A6N0539
A6N0545
A6N0083
A6N0066
A6N0590
A6N0597
A6N0596
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
31 Stations.
Average -0.59m
Higher water level 5 Stations.
No data 2 new stations.
-2.04
-1.71
-1.61
-1.42
-1.40
-1.38
-1.29
-0.81
-0.70
-0.55
-0.53
-0.48
-0.46
-0.45
-0.43
-0.32
-0.29
-0.28
-0.25
-0.24
-0.22
-0.20
-0.19
-0.17
-0.15
-0.14
-0.13
-0.12
-0.12
-0.11
-0.01
0.16
0.17
0.22
0.24
2.51
Deviation in meter

GRAPH 6


A6 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008
A6N0584
A6N0581
A6N0560
A6N0579
A6N0069
A6N0082
A6N0580
A6N0586
A6N0599
A6N0578
A6N00587
A6N0545
A6N0582
A6N0044
A6N0588
A6N0083
A6N0539
A6N0079
A6N0534
A6N0553
A6N0585
A6N0544
A6N0023
A6N0547
A6N0546
A6N0550
A6N0059
A6N0066
A6N0592
A6N0593
A6N0583
A6N0589
A6N0591
A6N0590
A6N0594
A6N0595
A6N0598
A6N0597
A6N0596
Monitoring Stations
14.00
9.00
4.00
-1.00
-6.00
Lower water levels at 10 Stations Average -0.85m
Higher water levels at 18 Stations Average 2.19m
11 stations not data for whole period yet
-2.01
-1.66
-1.10
-1.05
-0.92
-0.58
-0.54
-0.49
-0.07
-0.04
0.04
0.08
0.20
0.49
0.74
0.80
0.88
0.91
0.96
1.04
1.08
1.96
1.97
2.95
2.95
3.66
4.18
14.57
Deviation in meter

GRAPH 7

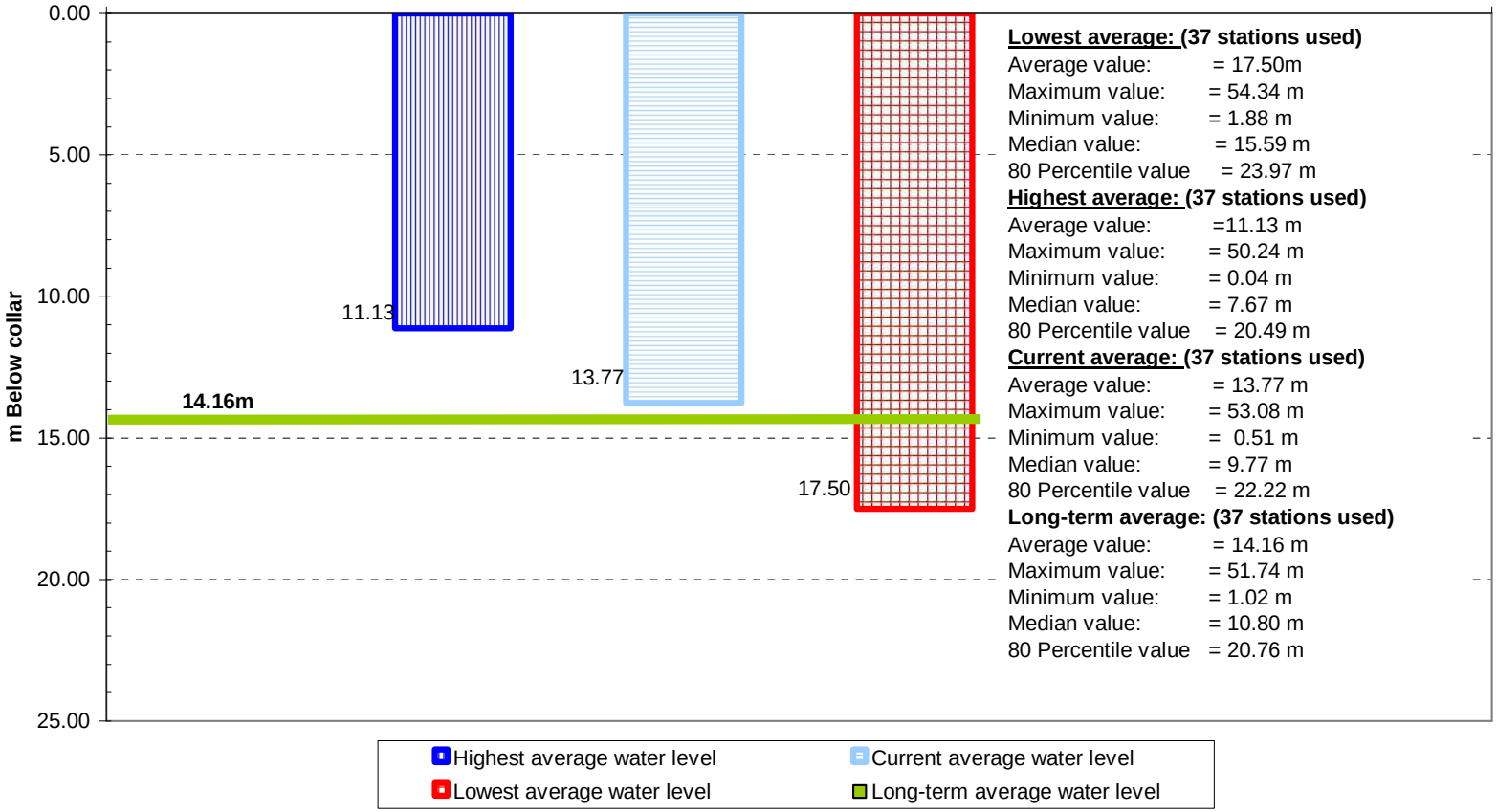
A6 DRAINAGE AREA
Comparison between water level depths: 1 August 2007, 1 May 2008, and 1 August 2008



GRAPH 8

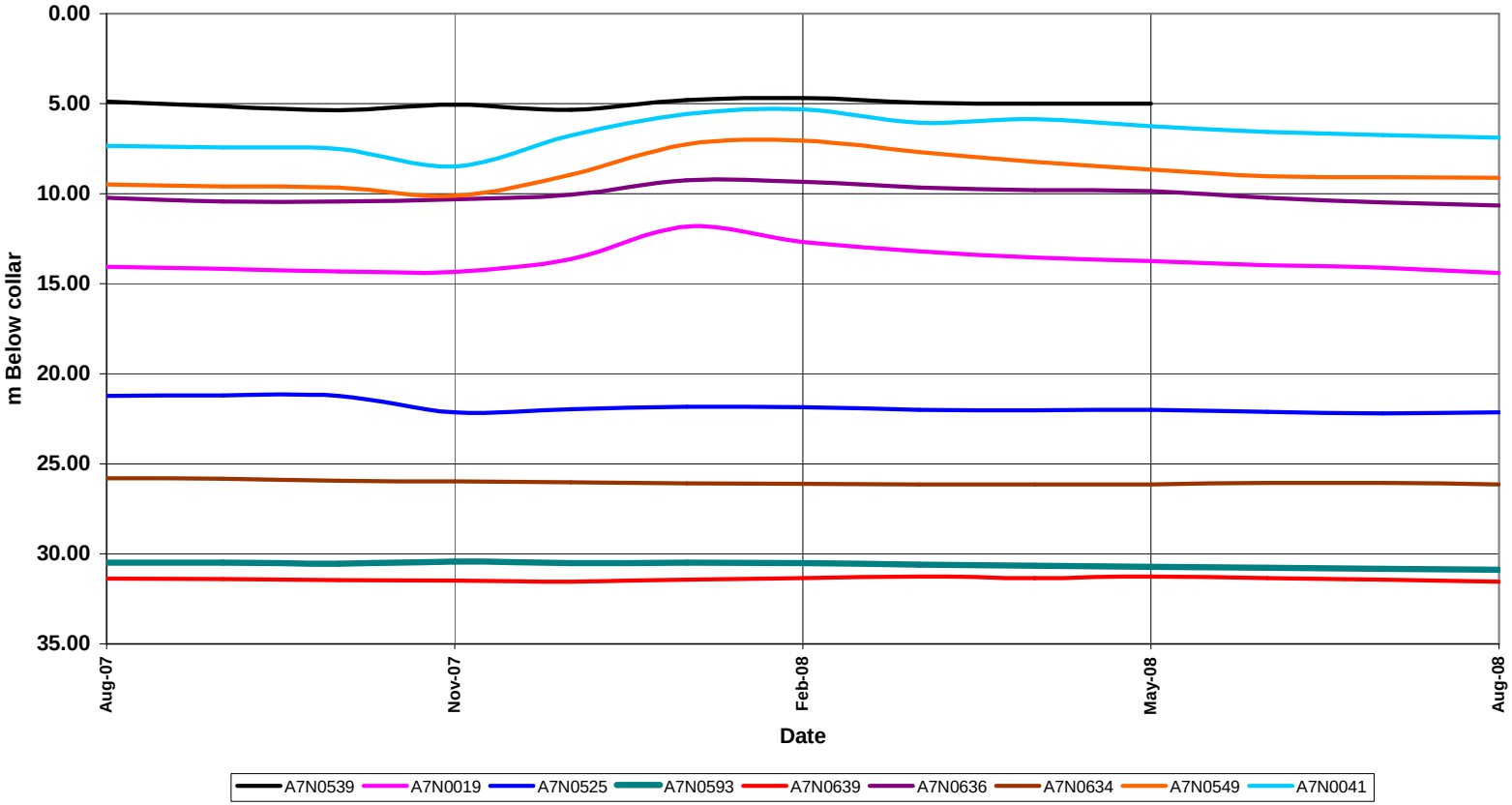
A6 DRAINAGE AREA

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

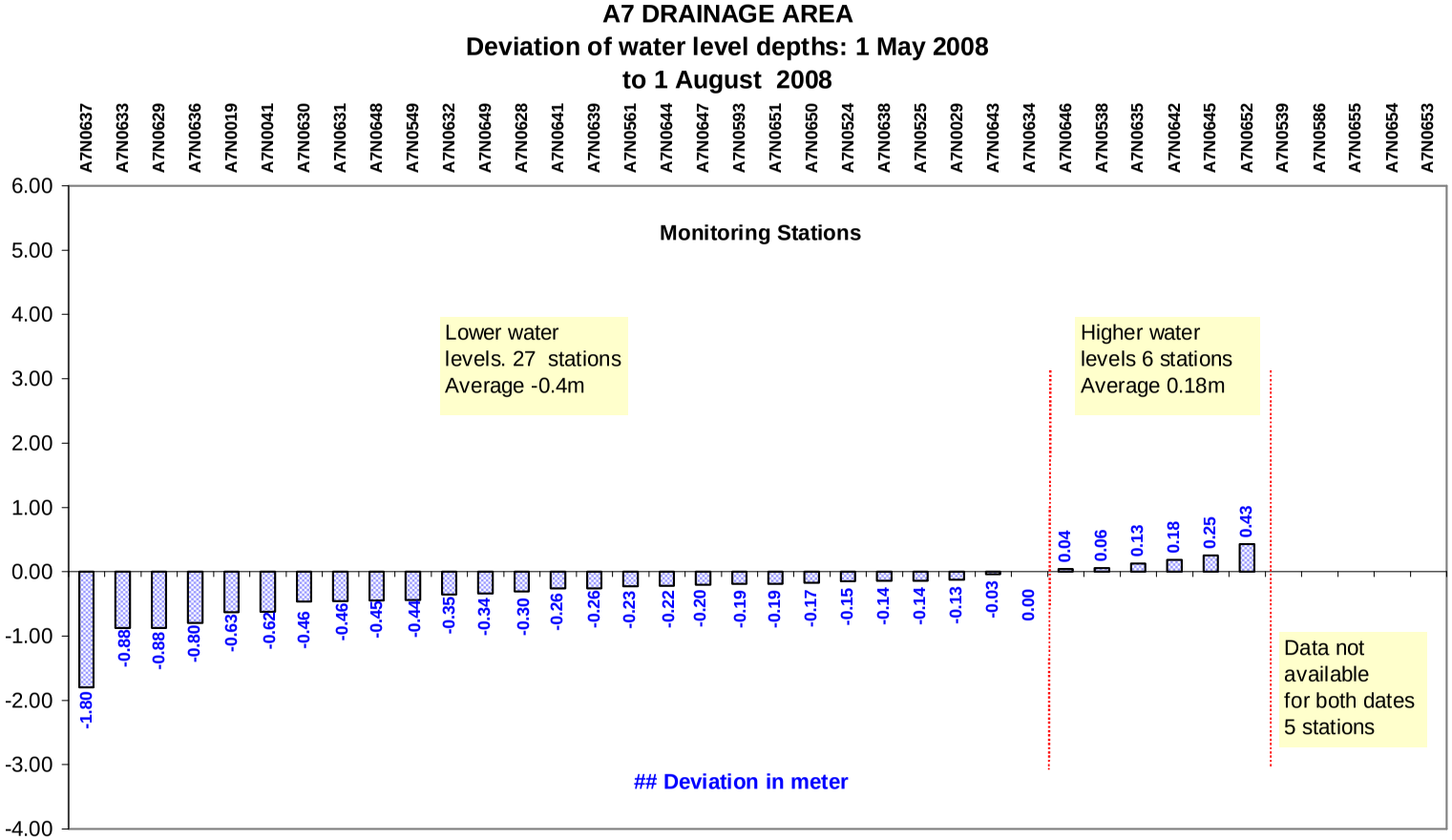


GRAPH 9

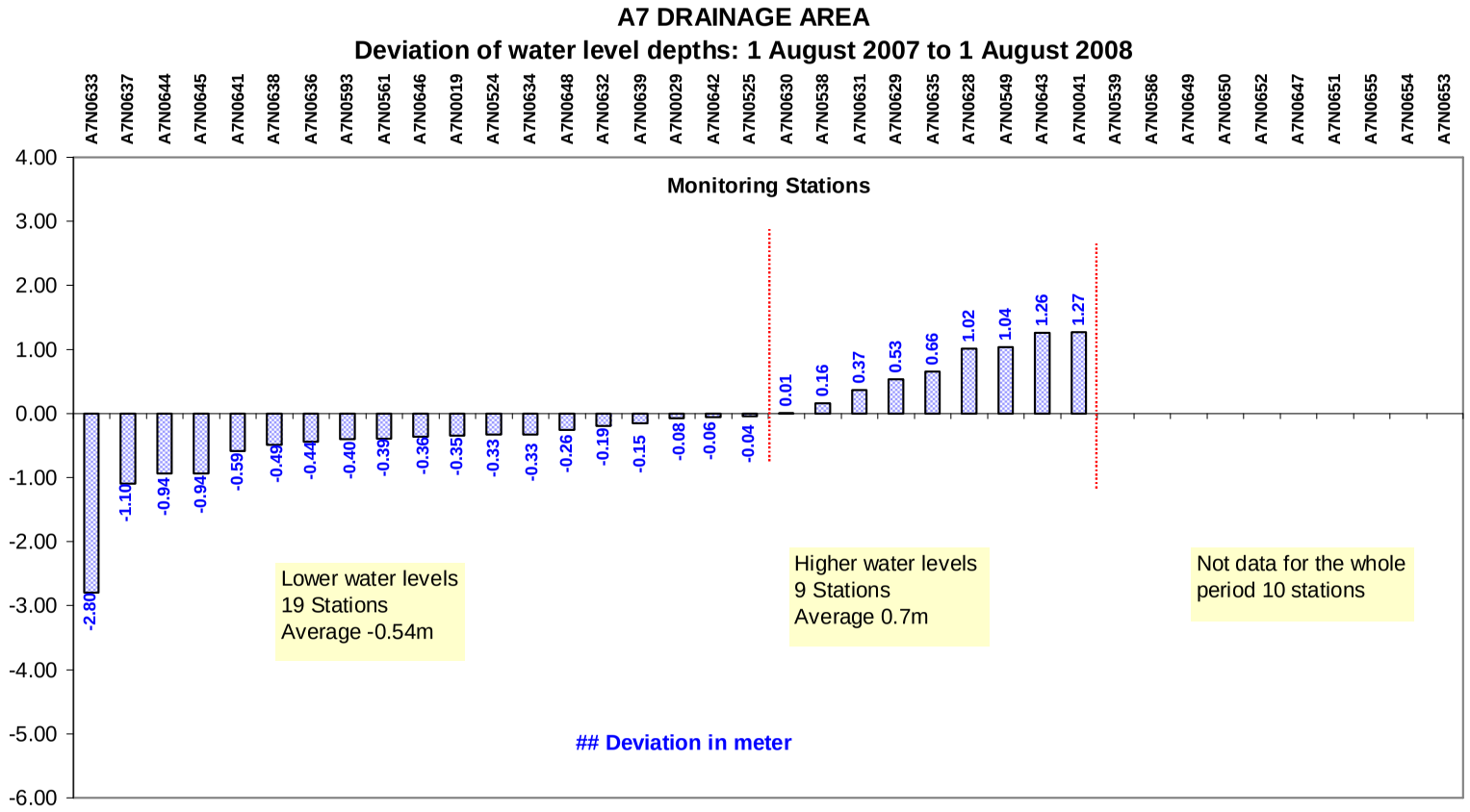
Comparison of water level trends at some stations in A7 drainage:
1 August 2007 to 1August 2008



GRAPH 10

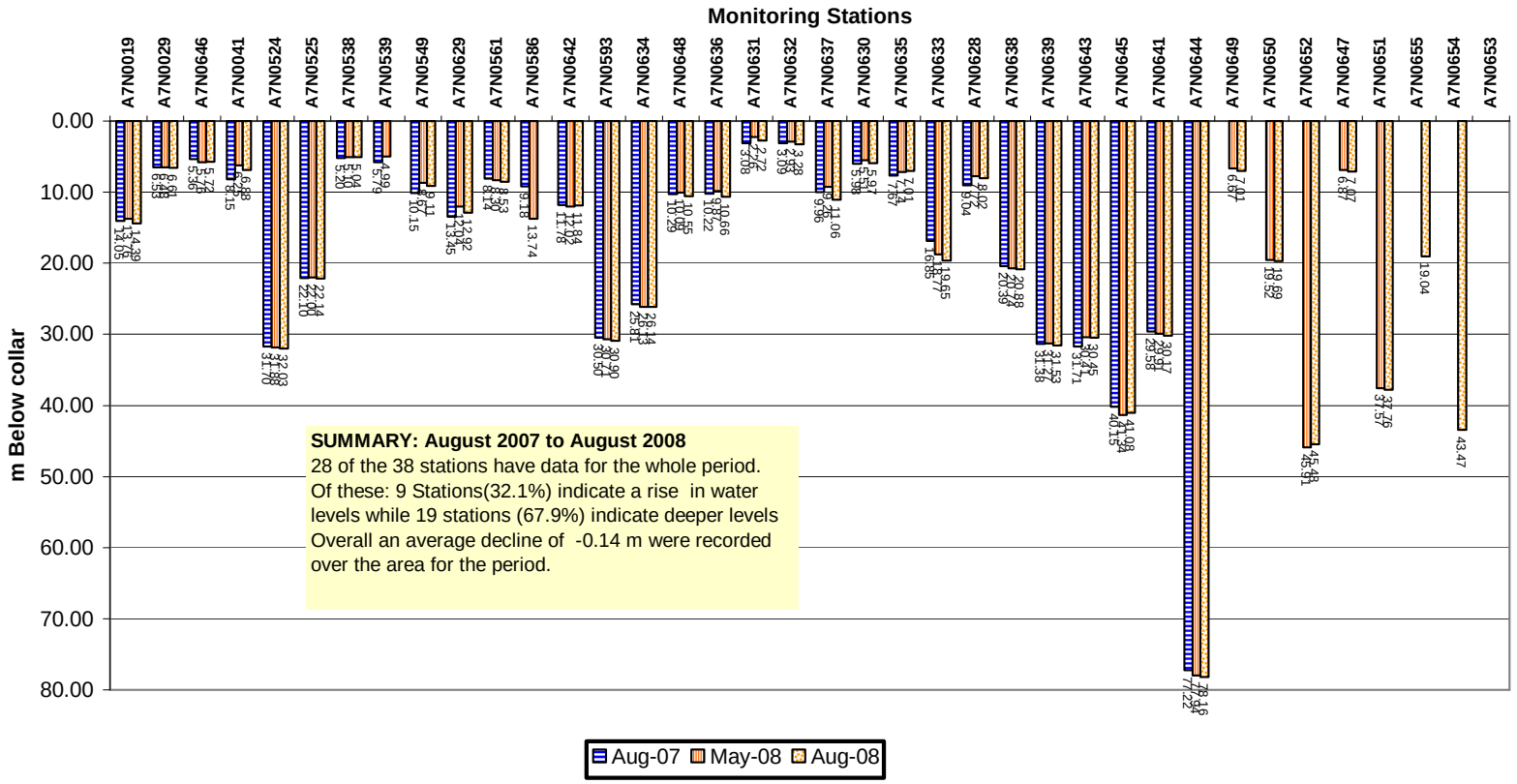

A7 DRAINAGE AREA
Deviation of water level depths: 1 May 2008
to 1 August 2008
A7N0637 A7N0633 A7N0629 A7N0636 A7N0019 A7N0041 A7N0630 A7N0631 A7N0648 A7N0549 A7N0632 A7N0649 A7N0628 A7N0641 A7N0639 A7N0561 A7N0644 A7N0647 A7N0593 A7N0651 A7N0650 A7N0524 A7N0638 A7N0525 A7N0029 A7N0643 A7N0634 A7N0646 A7N0538 A7N0635 A7N0642 A7N0645 A7N0652 A7N0539 A7N0586 A7N0655 A7N0654 A7N0653
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Monitoring Stations
Lower water levels. 27 stations Average -0.4m
Higher water levels 6 stations Average 0.18m
-1.80 -0.88 -0.88 -0.80 -0.63 -0.62 -0.46 -0.46 -0.45 -0.44 -0.35 -0.34 -0.30 -0.26 -0.26 -0.23 -0.22 -0.20 -0.19 -0.19 -0.17 -0.15 -0.14 -0.14 -0.13 -0.03 0.00 0.04 0.06 0.13 0.18 0.25 0.43
Data not available for both dates 5 stations
Deviation in meter

GRAPH 11

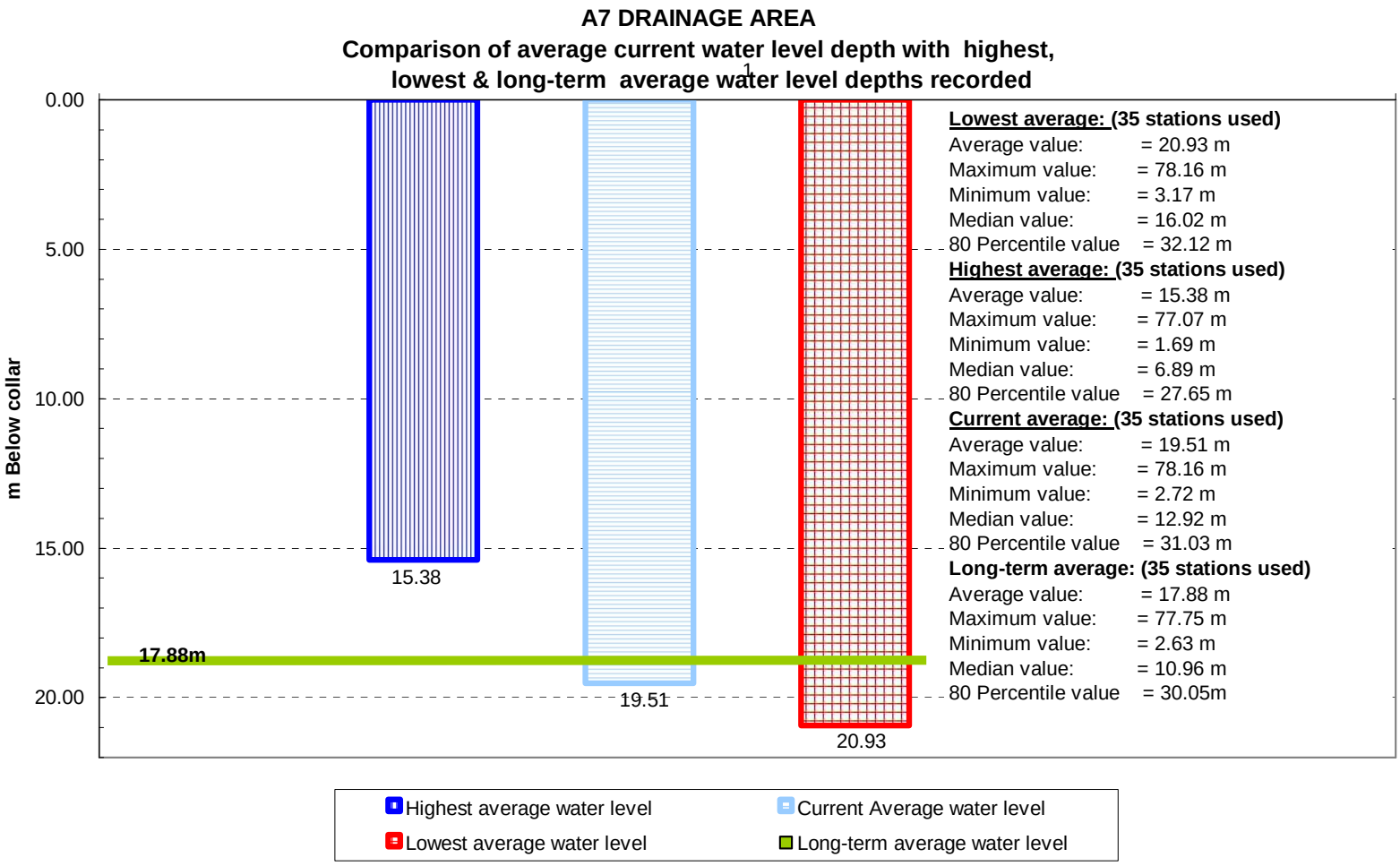

A7 DRAINAGE AREA
Deviation of water level depths: 1 August 2007 to 1 August 2008
A7N0633 A7N0637 A7N0644 A7N0645 A7N0641 A7N0638 A7N0636 A7N0593 A7N0561 A7N0646 A7N0019 A7N0524 A7N0634 A7N0648 A7N0632 A7N0639 A7N0029 A7N0642 A7N0525 A7N0630 A7N0538 A7N0631 A7N0629 A7N0635 A7N0628 A7N0549 A7N0643 A7N0041 A7N0539 A7N0586 A7N0649 A7N0650 A7N0652 A7N0647 A7N0651 A7N0655 A7N0654 A7N0653
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
Monitoring Stations
-2.80 -1.10 -0.94 -0.94 -0.59 -0.49 -0.44 -0.40 -0.39 -0.36 -0.35 -0.33 -0.33 -0.26 -0.19 -0.15 -0.08 -0.06 -0.04 0.01 0.16 0.37 0.53 0.66 1.02 1.04 1.26 1.27
Lower water levels
19 Stations
Average -0.54m
Higher water levels
9 Stations
Average 0.7m
Not data for the whole
period 10 stations
Deviation in meter

GRAPH 12

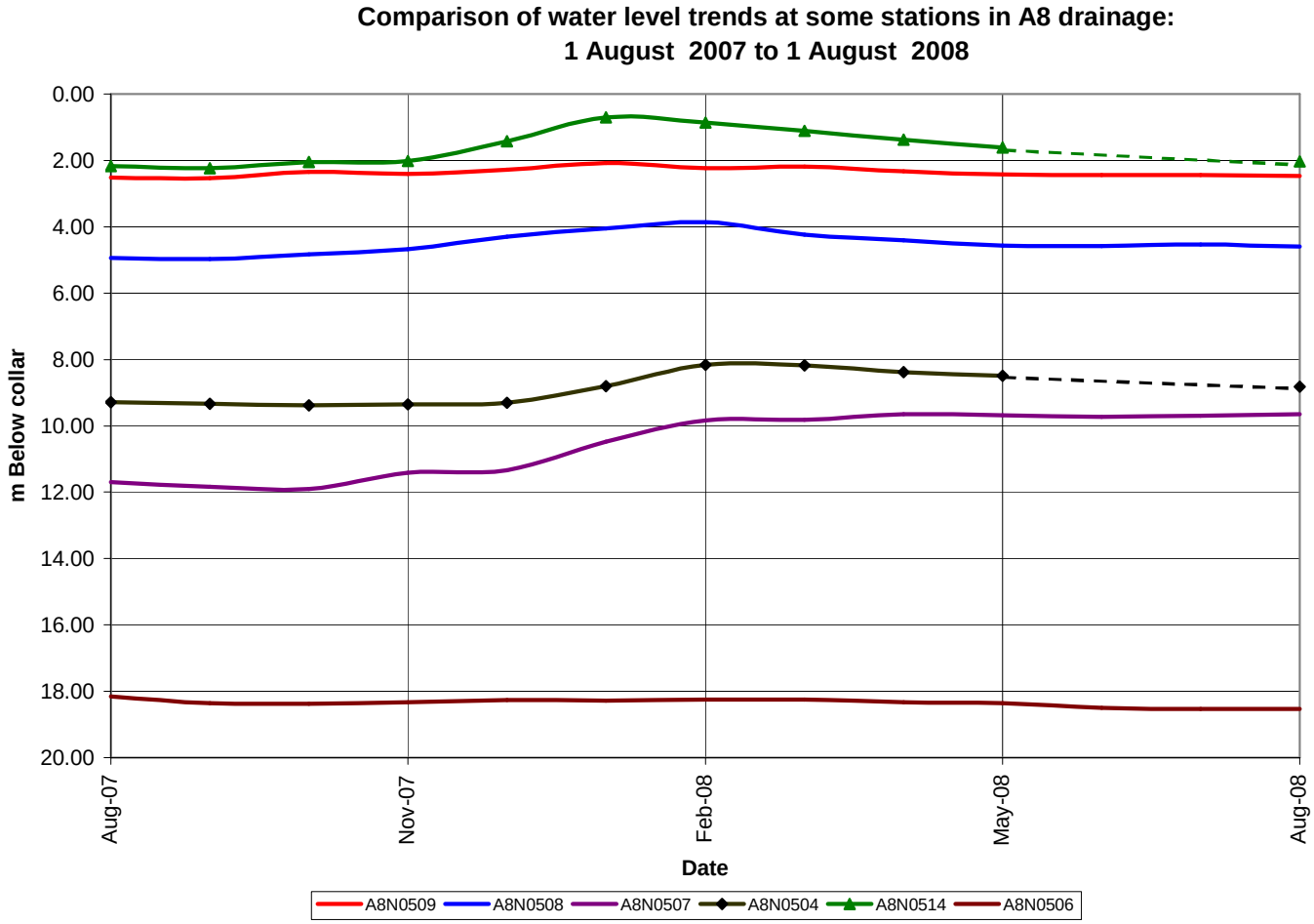
A7 DRAINAGE AREA
Comparison between water level depths: 1 August 2007, 1 May 2008 and 1 August 2008



GRAPH 13

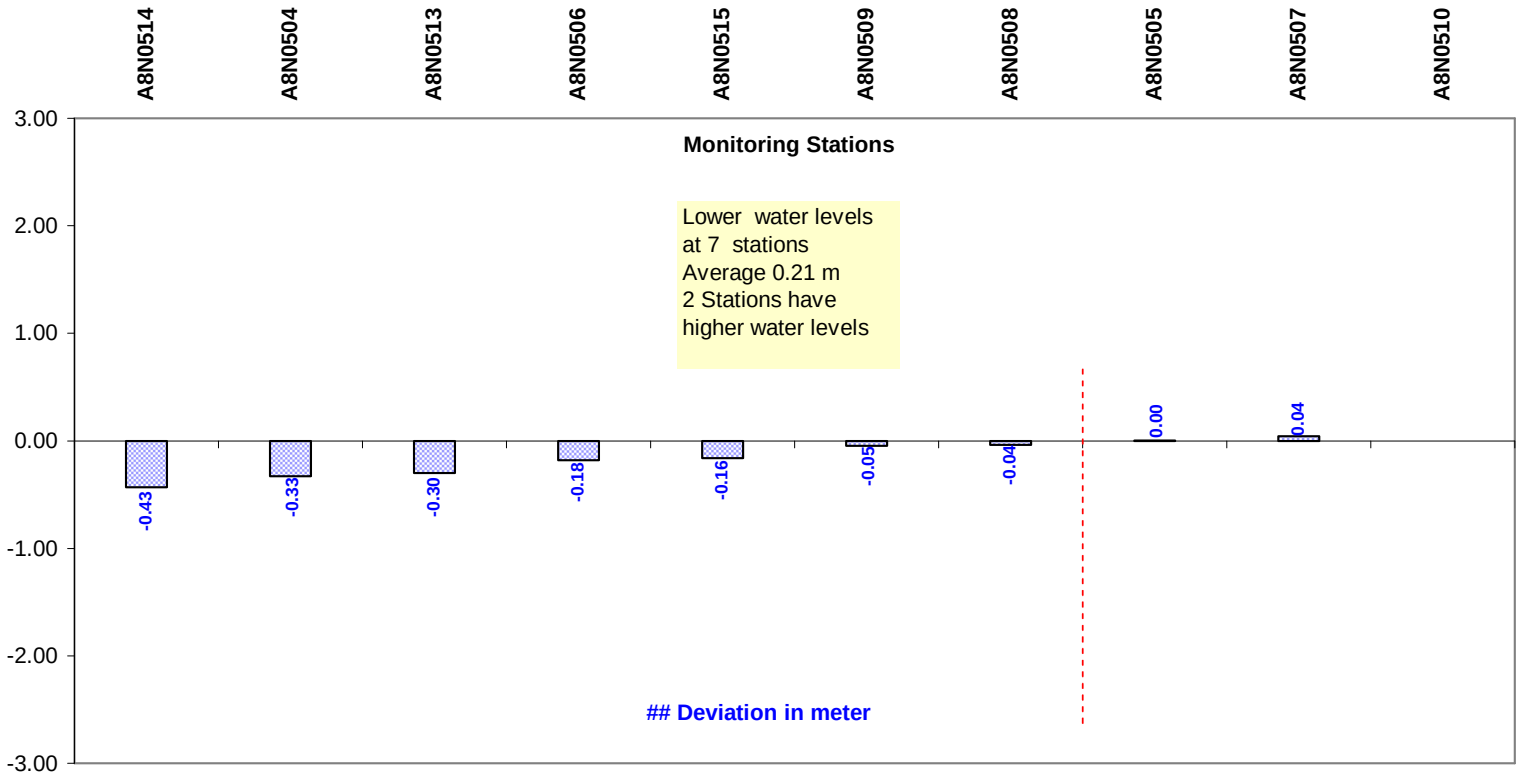

A7 DRAINAGE AREA
Comparison of average current water level depth with highest,
lowest & long-term average water level depths recorded
m Below collar
0.00
5.00
10.00
15.00
20.00
15.38
19.51
20.93
17.88m
Lowest average: (35 stations used)
Average value: = 20.93 m
Maximum value: = 78.16 m
Minimum value: = 3.17 m
Median value: = 16.02 m
80 Percentile value = 32.12 m
Highest average: (35 stations used)
Average value: = 15.38 m
Maximum value: = 77.07 m
Minimum value: = 1.69 m
Median value: = 6.89 m
80 Percentile value = 27.65 m
Current average: (35 stations used)
Average value: = 19.51 m
Maximum value: = 78.16 m
Minimum value: = 2.72 m
Median value: = 12.92 m
80 Percentile value = 31.03 m
Long-term average: (35 stations used)
Average value: = 17.88 m
Maximum value: = 77.75 m
Minimum value: = 2.63 m
Median value: = 10.96 m
80 Percentile value = 30.05m
Highest average water level
Current Average water level
Lowest average water level
Long-term average water level

GRAPH 14


Comparison of water level trends at some stations in A8 drainage:
1 August 2007 to 1 August 2008
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-07
Nov-07
Feb-08
May-08
Aug-08
Date
A8N0509
A8N0508
A8N0507
A8N0504
A8N0514
A8N0506

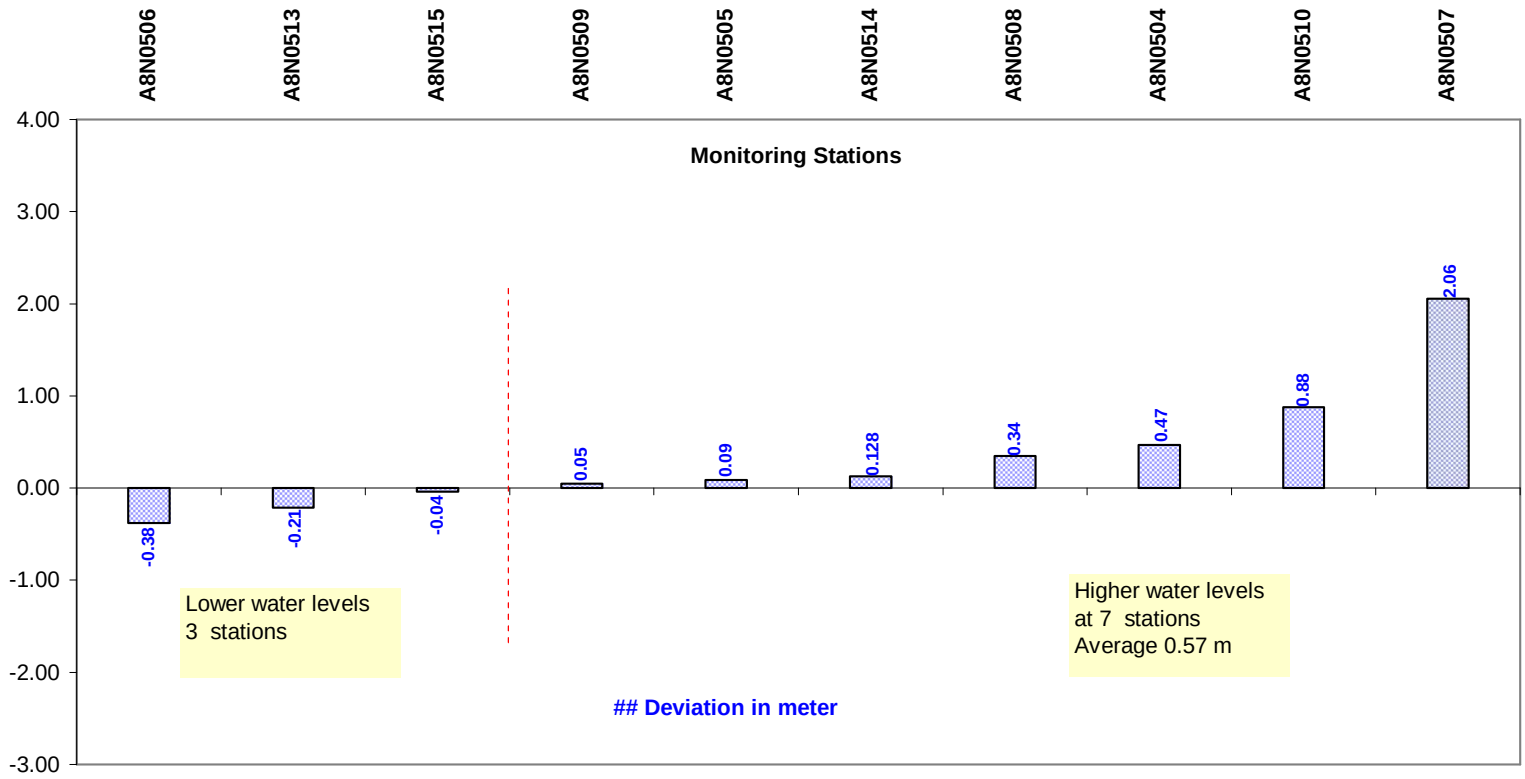
GRAPH 15

A8 DRAINAGE AREA
Deviation of water level depths: 1 May 2008 to 1 August 2008

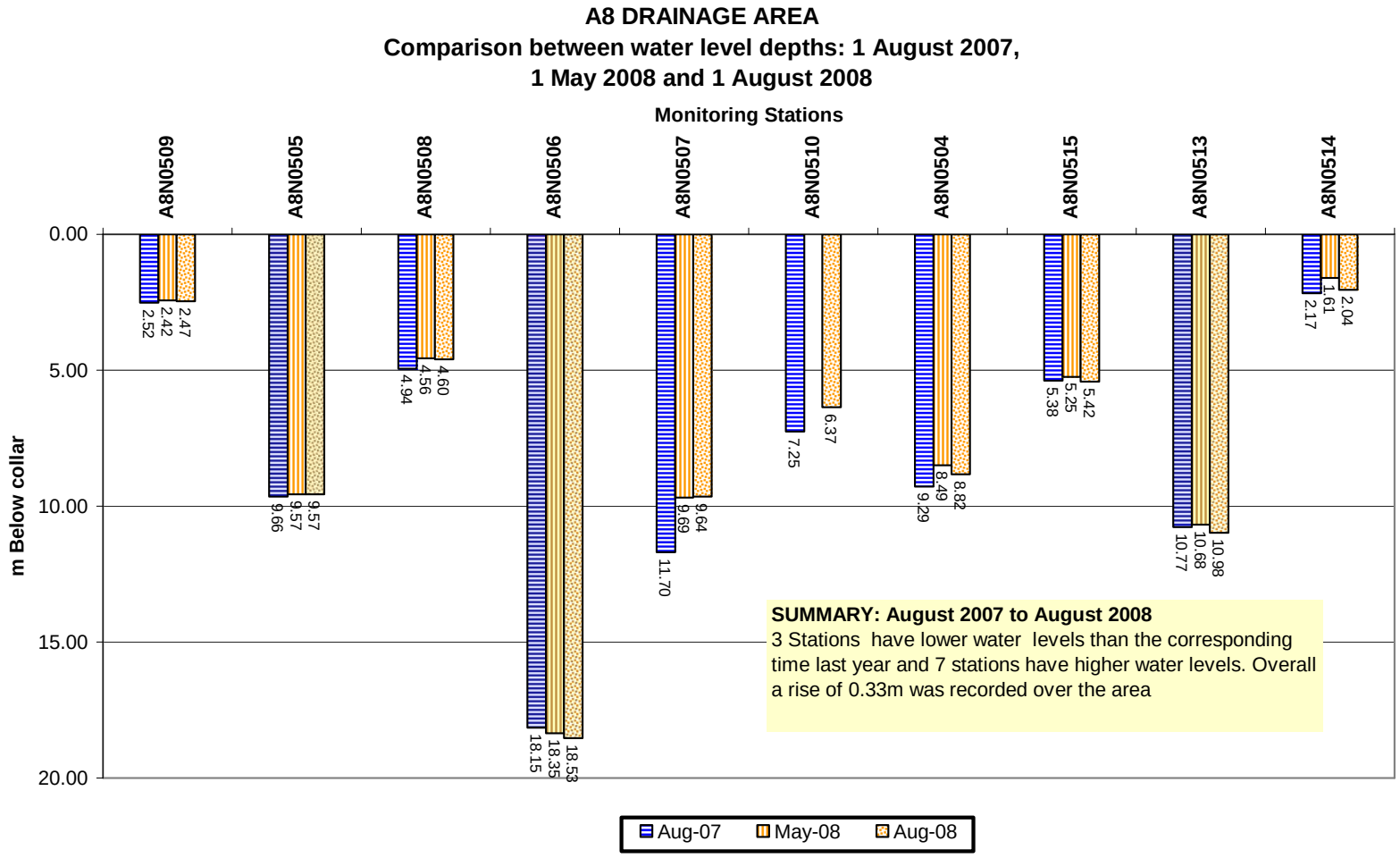


GRAPH 16

A8 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to1 August 2008

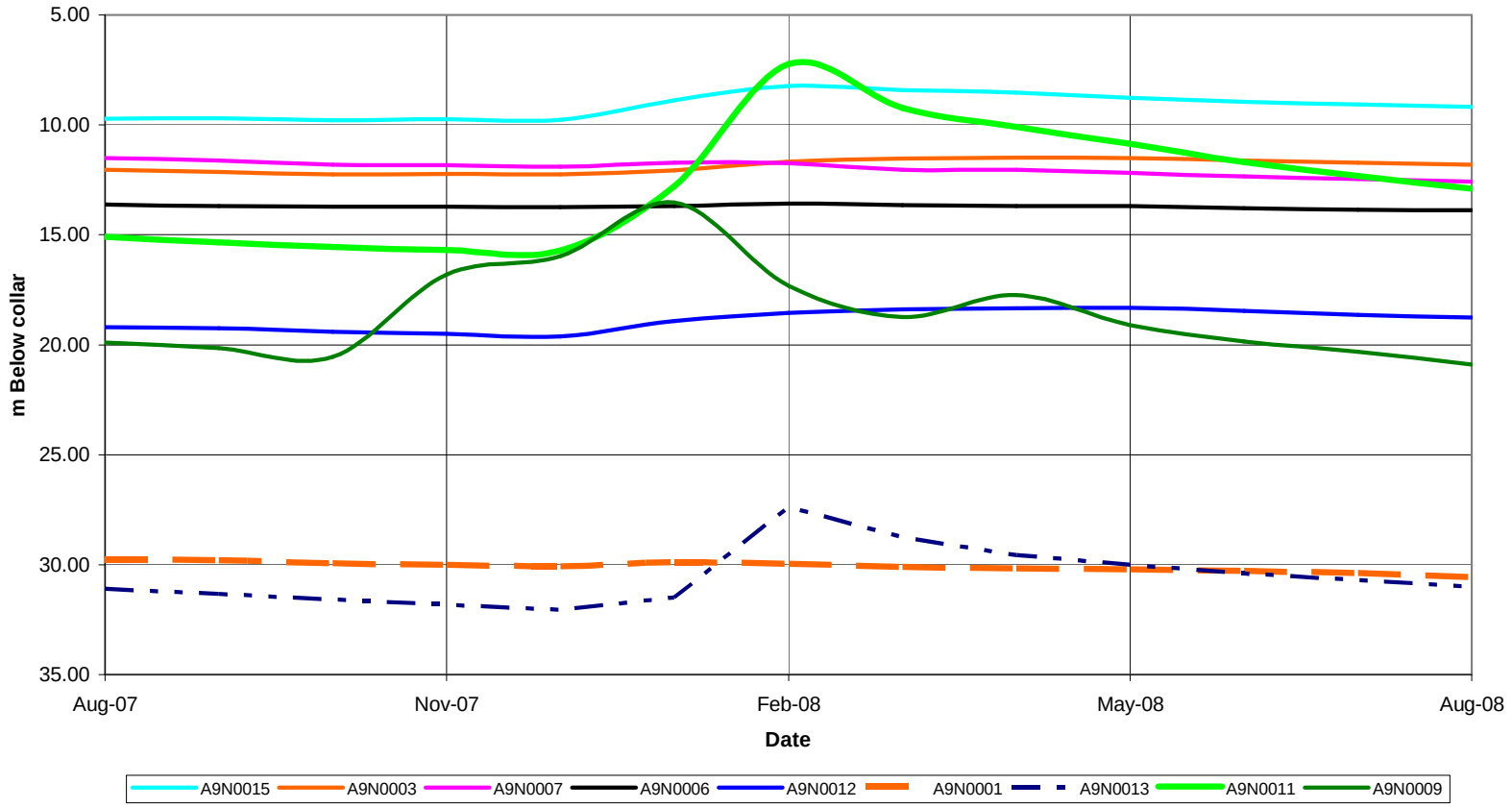


GRAPH 17


A8 DRAINAGE AREA
Comparison between water level depths: 1 August 2007,
1 May 2008 and 1 August 2008
Monitoring Stations
A8N0509
A8N0505
A8N0508
A8N0506
A8N0507
A8N0510
A8N0504
A8N0515
A8N0513
A8N0514
m Below collar
0.00
5.00
10.00
15.00
20.00
2.52
2.42
2.47
9.66
9.57
9.57
4.94
4.56
4.60
18.15
18.35
18.53
11.70
9.69
9.64
7.25
6.37
9.29
8.49
8.82
5.38
5.25
5.42
10.77
10.68
10.98
2.17
1.61
2.04
SUMMARY: August 2007 to August 2008
3 Stations have lower water levels than the corresponding time last year and 7 stations have higher water levels. Overall a rise of 0.33m was recorded over the area
Aug-07
May-08
Aug-08

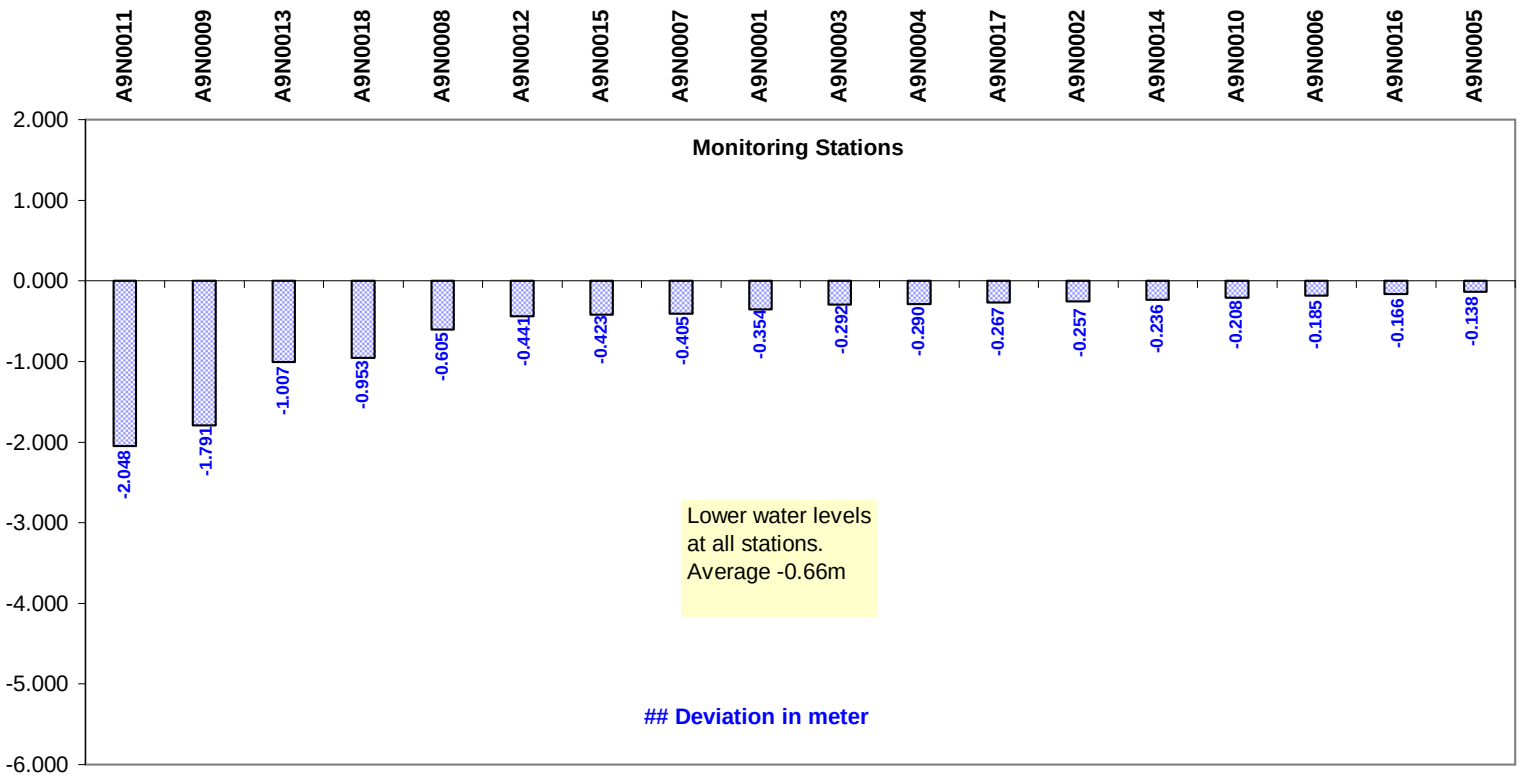
GRAPH 18

Comparison of water level trends at some stations in A9 drainage : 1 August 2007 to 1 August 2008



GRAPH 19

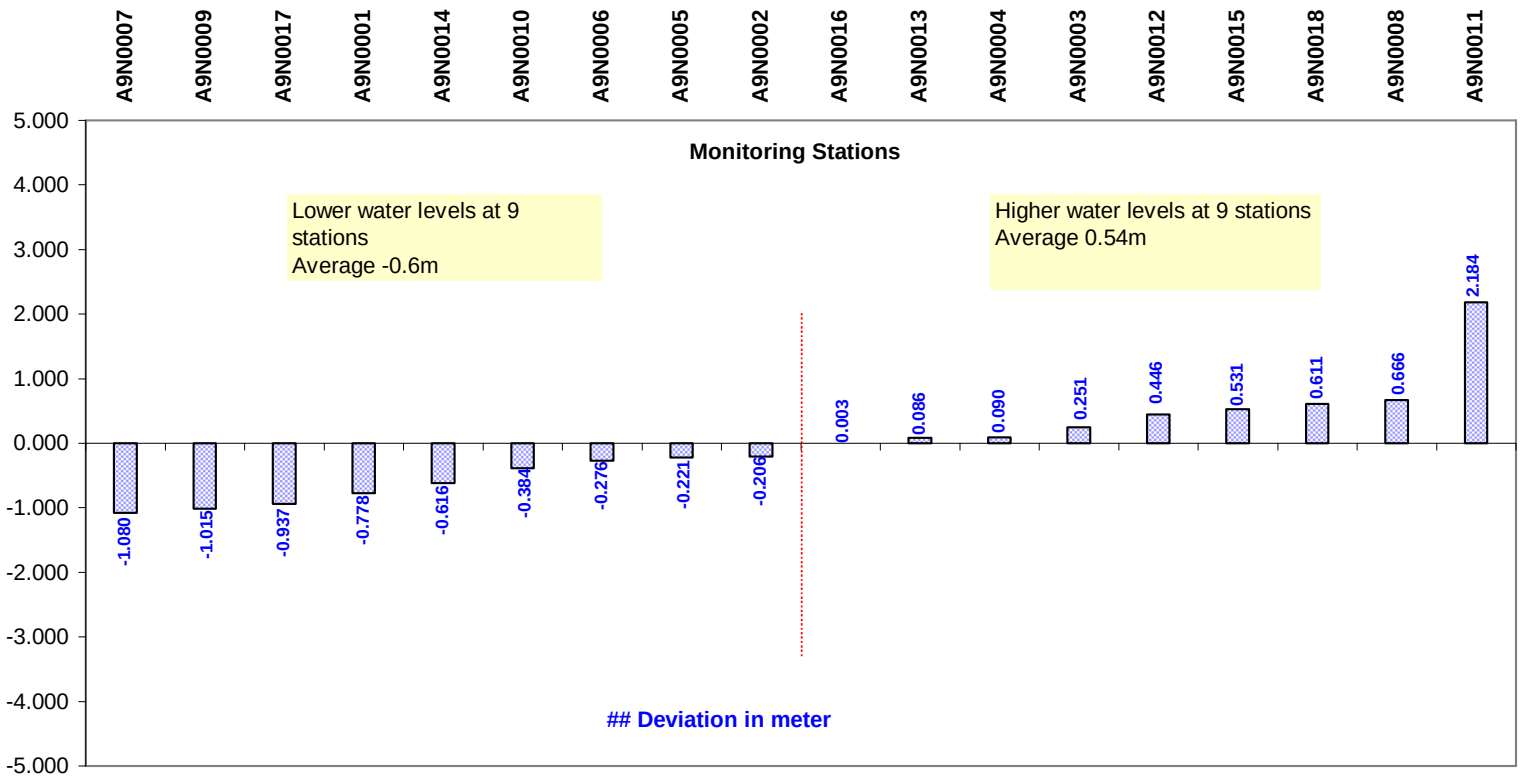
A9 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008



GRAPH 20

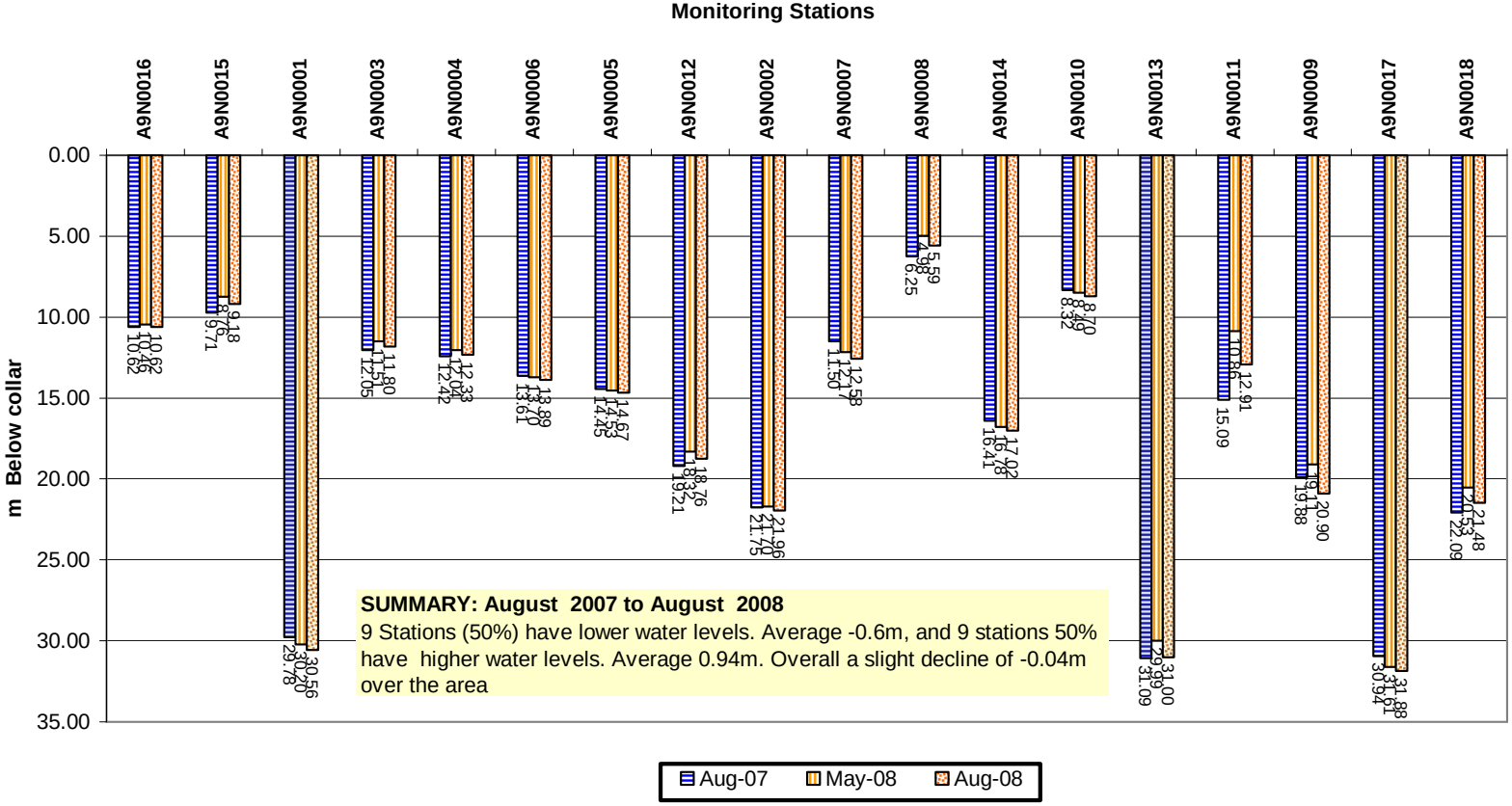
A9 DRAINAGE AREA

Deviation of water levels: 1 August 2007 to 1 August 2008

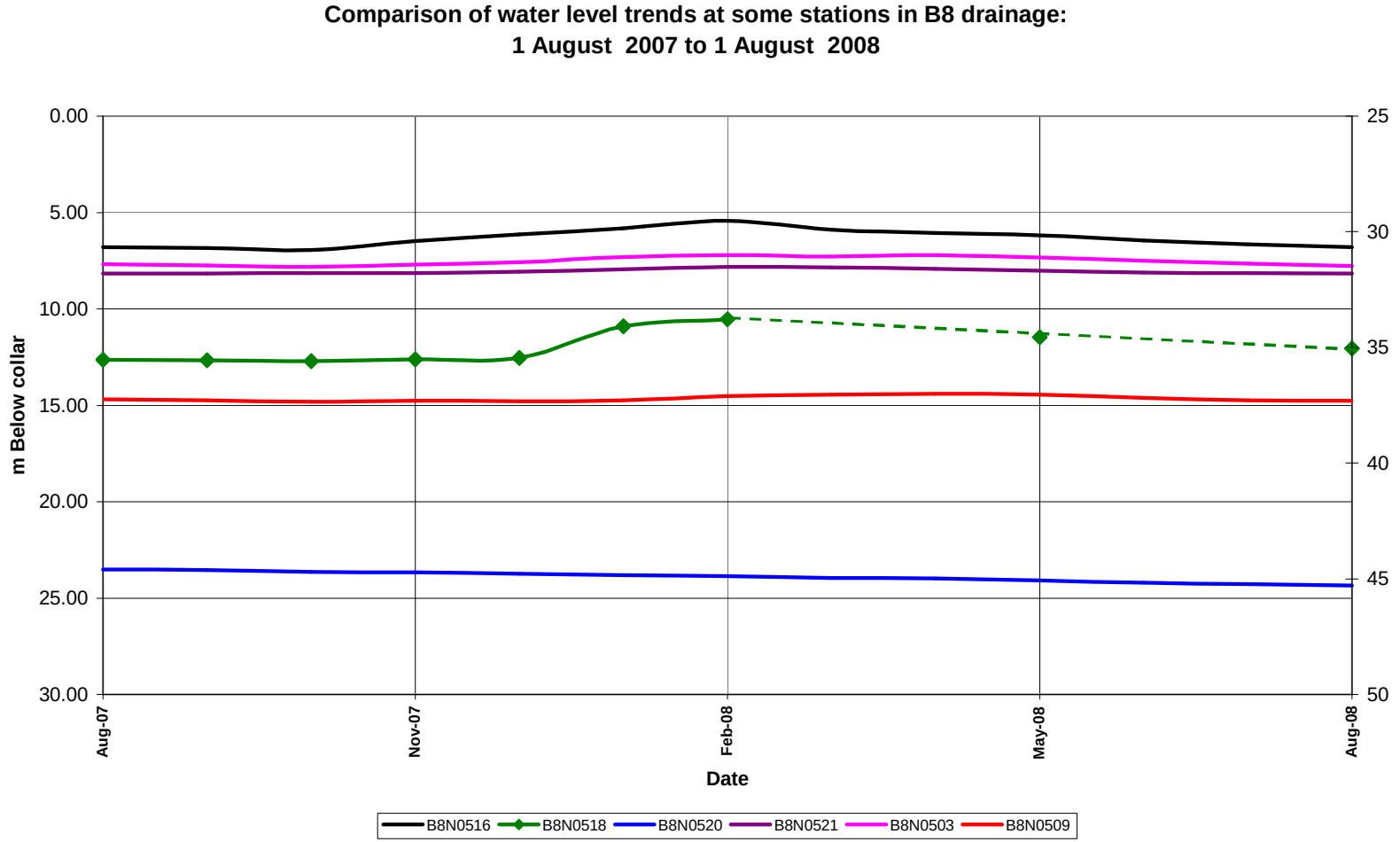


GRAPH 21

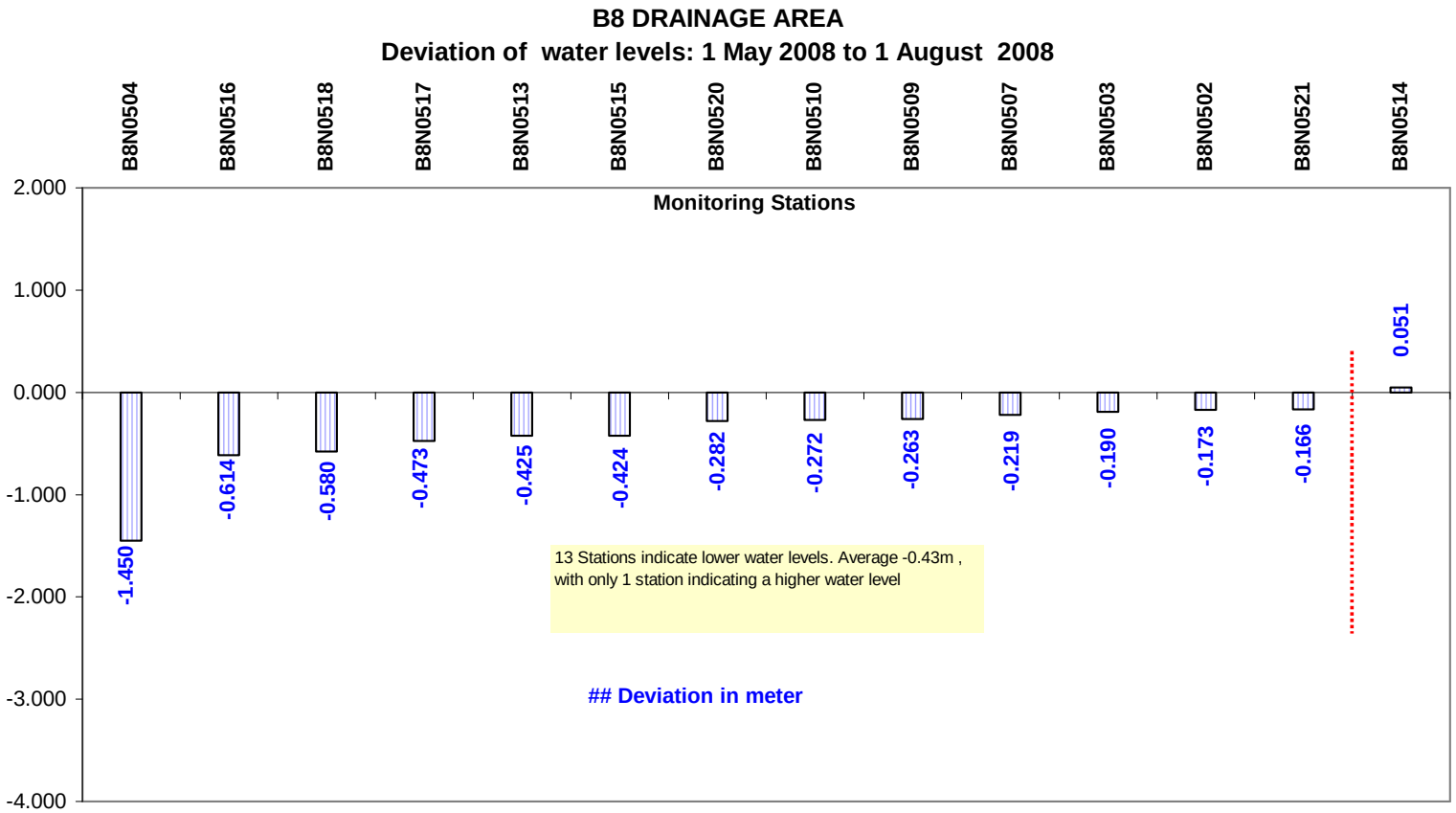
A9 DRAINAGE AREA
Comparison between water level depths: 1 August 2007,
1 May 2008 and 1 August 2008



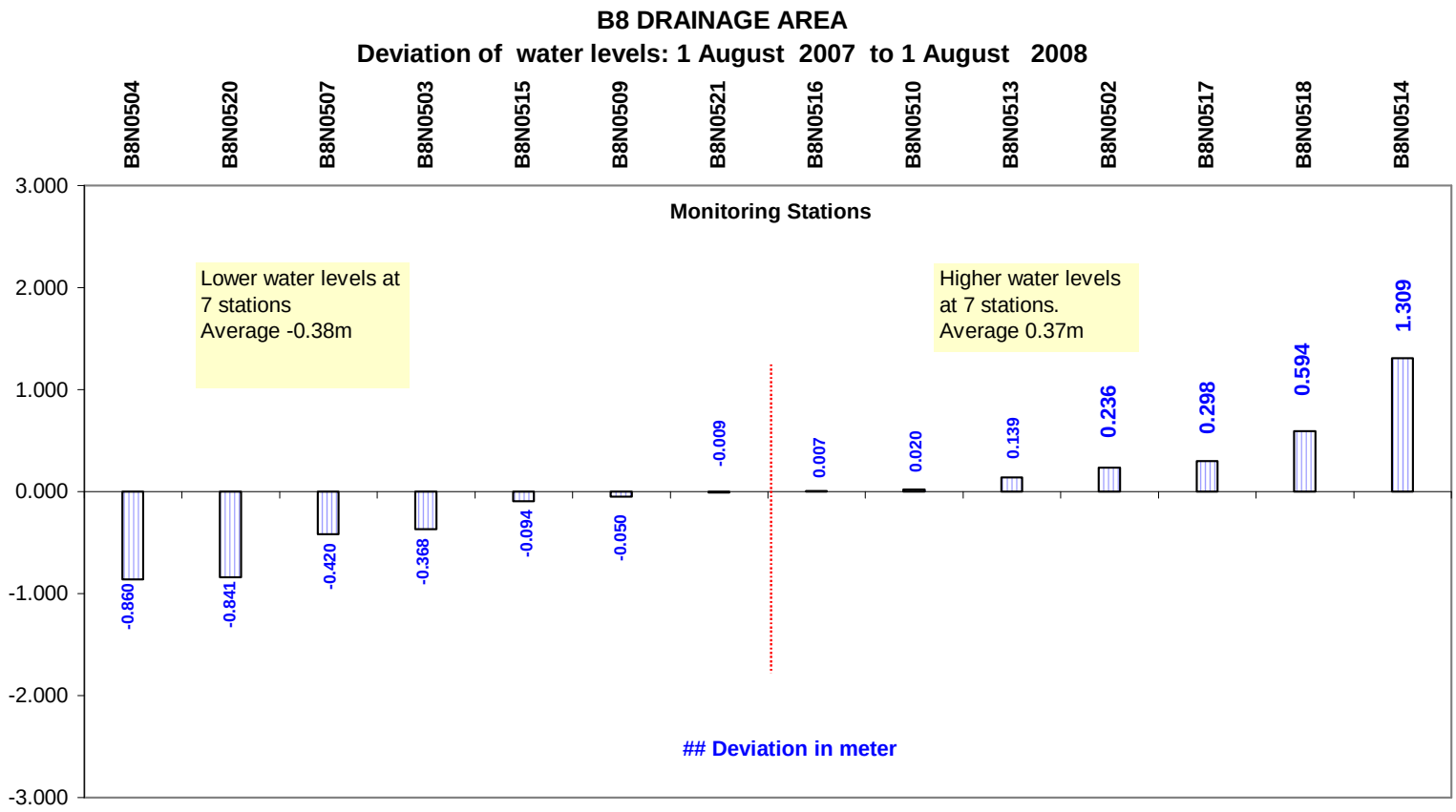
GRAPH 22


Comparison of water level trends at some stations in B8 drainage:
1 August 2007 to 1 August 2008
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
25
30
35
40
45
50
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Date
B8N0516
B8N0518
B8N0520
B8N0521
B8N0503
B8N0509

GRAPH 23

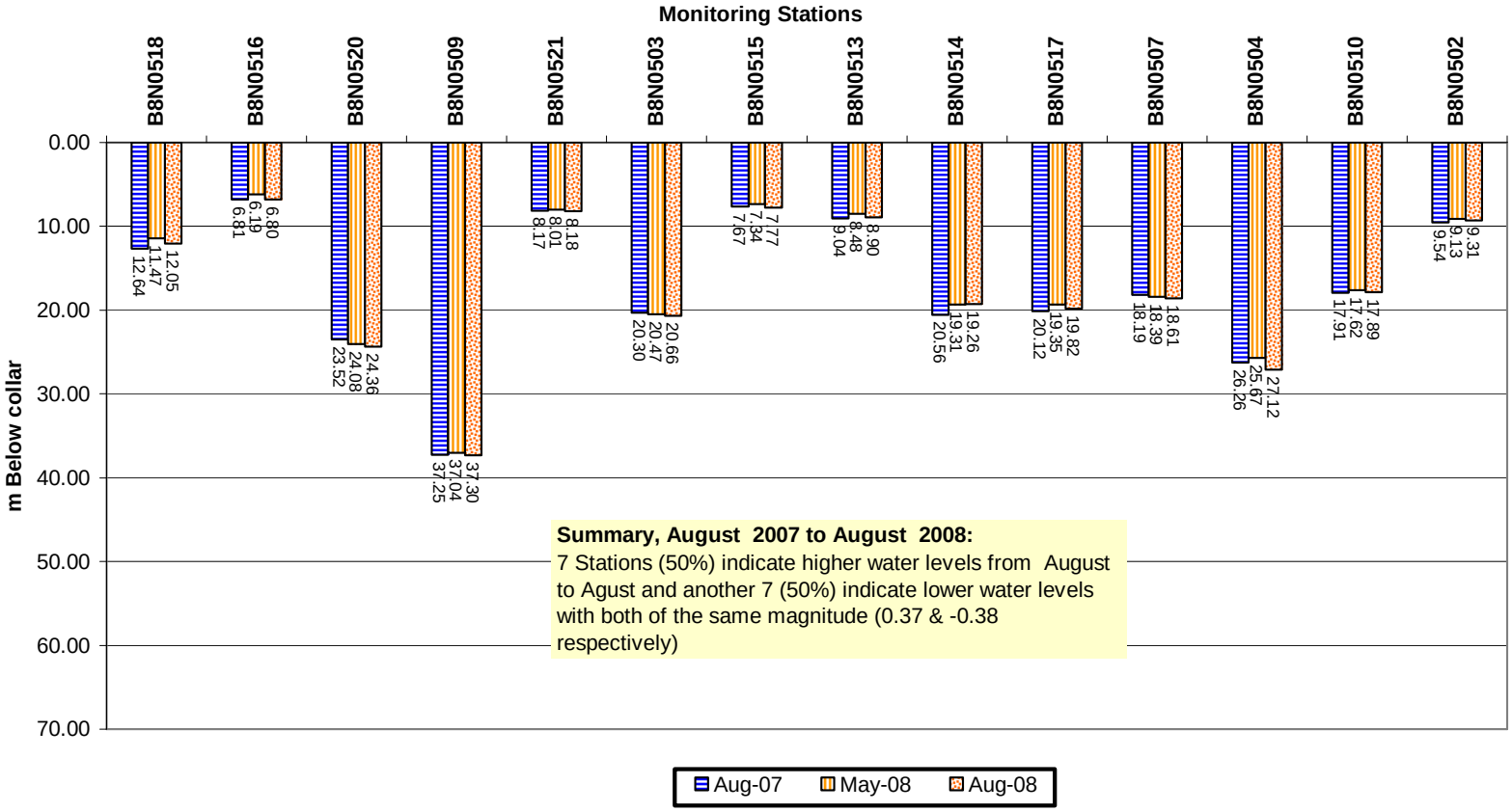

B8 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
B8N0504
B8N0516
B8N0518
B8N0517
B8N0513
B8N0515
B8N0520
B8N0510
B8N0509
B8N0507
B8N0503
B8N0502
B8N0521
B8N0514
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
-1.450
-0.614
-0.580
-0.473
-0.425
-0.424
-0.282
-0.272
-0.263
-0.219
-0.190
-0.173
-0.166
0.051
13 Stations indicate lower water levels. Average -0.43m , with only 1 station indicating a higher water level
Deviation in meter

GRAPH 24

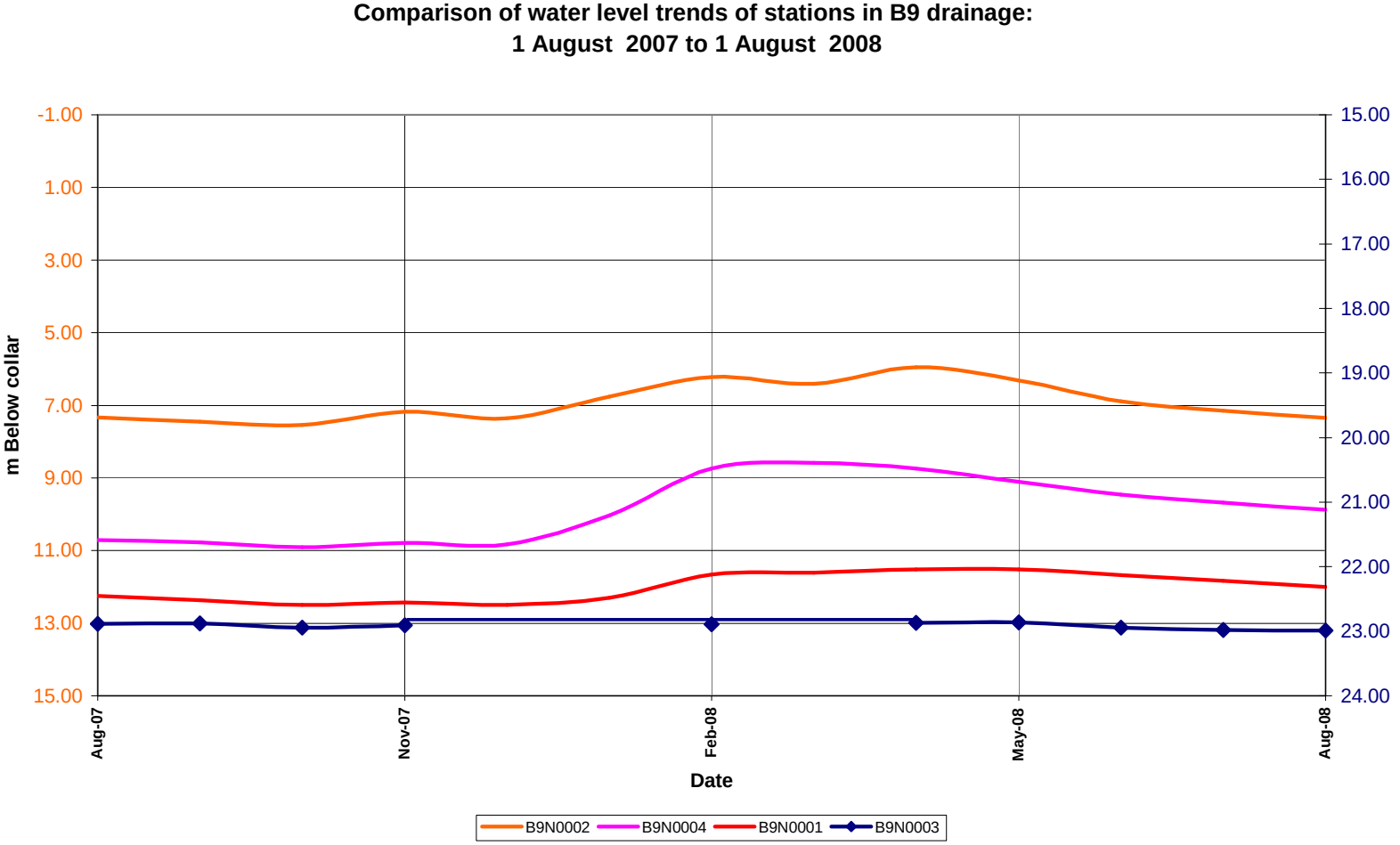

B8 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008
B8N0504
B8N0520
B8N0507
B8N0503
B8N0515
B8N0509
B8N0521
B8N0516
B8N0510
B8N0513
B8N0502
B8N0517
B8N0518
B8N0514
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
Monitoring Stations
Lower water levels at 7 stations
Average -0.38m
Higher water levels at 7 stations.
Average 0.37m
-0.860
-0.841
-0.420
-0.368
-0.094
-0.050
-0.009
0.007
0.020
0.139
0.236
0.298
0.594
1.309
Deviation in meter

GRAPH 25

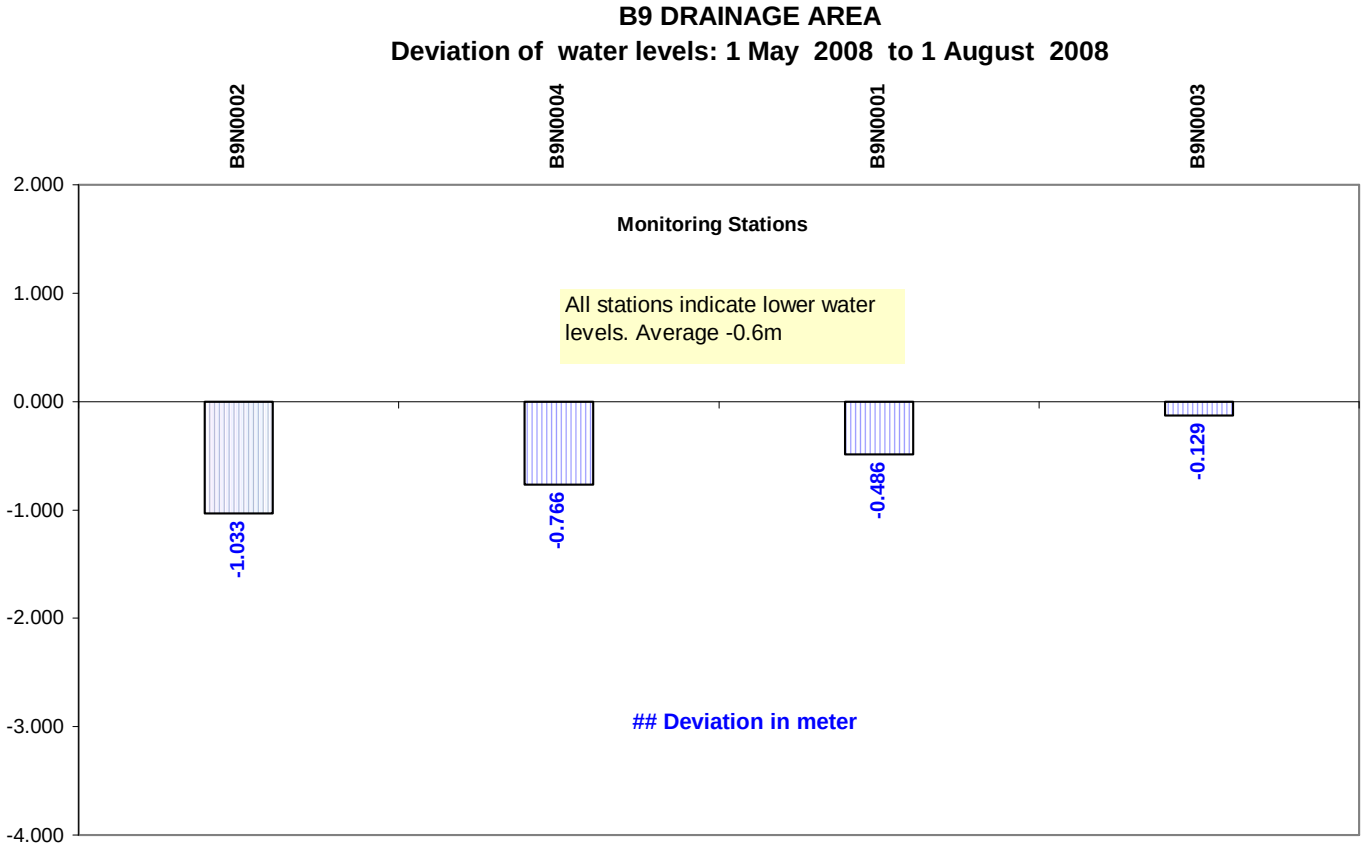
B8 DRAINAGE AREA
Comparison between water level depths: 1 August 2007, 1 May 2008 and 1 August 2008



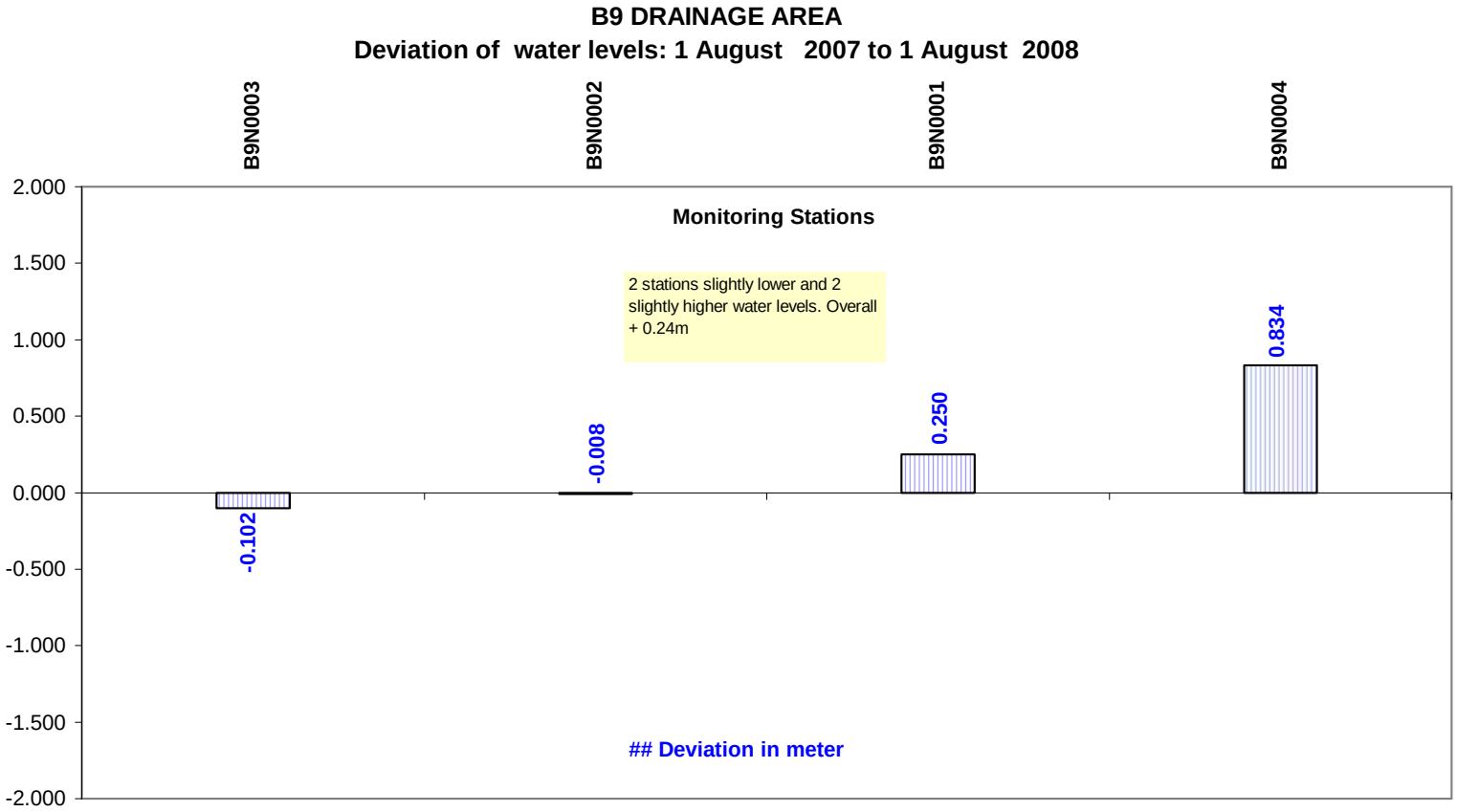
GRAPH 26


Comparison of water level trends of stations in B9 drainage:
1 August 2007 to 1 August 2008
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-07
Nov-07
Feb-08
May-08
Aug-08
Date
B9N0002
B9N0004
B9N0001
B9N0003

GRAPH 27

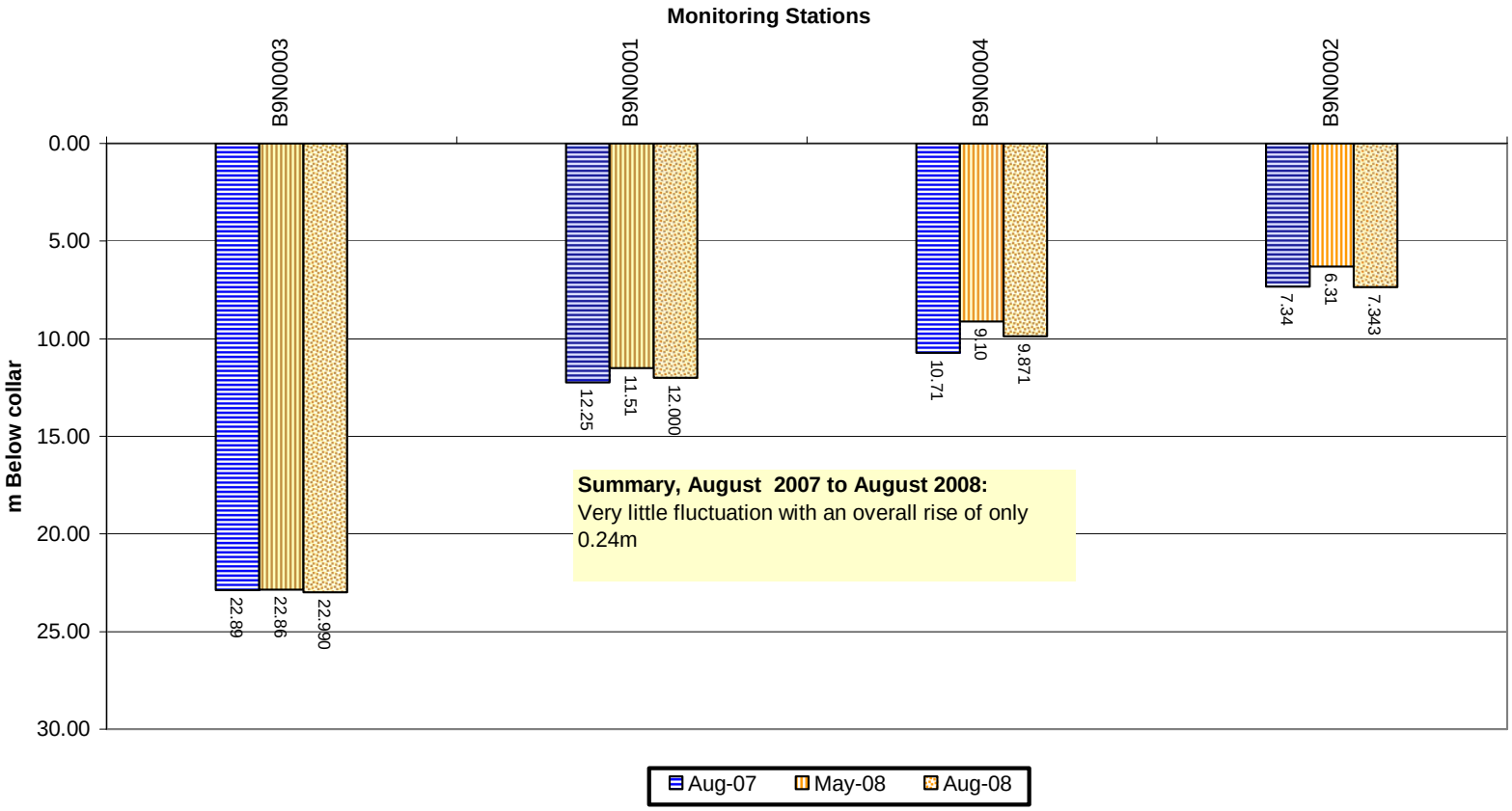

B9 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
B9N0002
B9N0004
B9N0001
B9N0003
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
Monitoring Stations
All stations indicate lower water levels. Average -0.6m
-1.033
-0.766
-0.486
-0.129
Deviation in meter

GRAPH 28

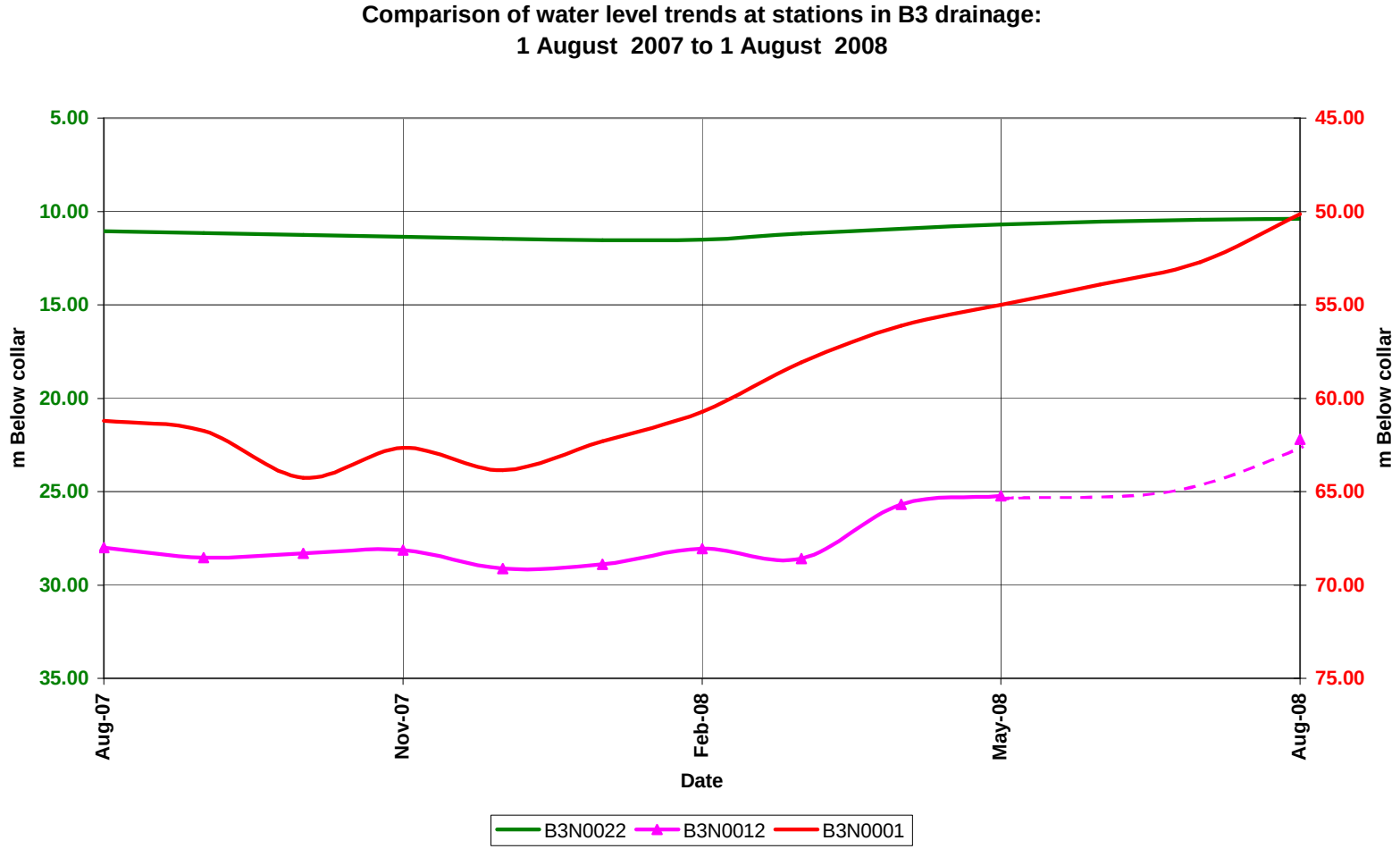

B9 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008
B9N0003
B9N0002
B9N0001
B9N0004
2.000
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
-2.000
Monitoring Stations
2 stations slightly lower and 2 slightly higher water levels. Overall + 0.24m
-0.102
-0.008
0.250
0.834
Deviation in meter

GRAPH 29

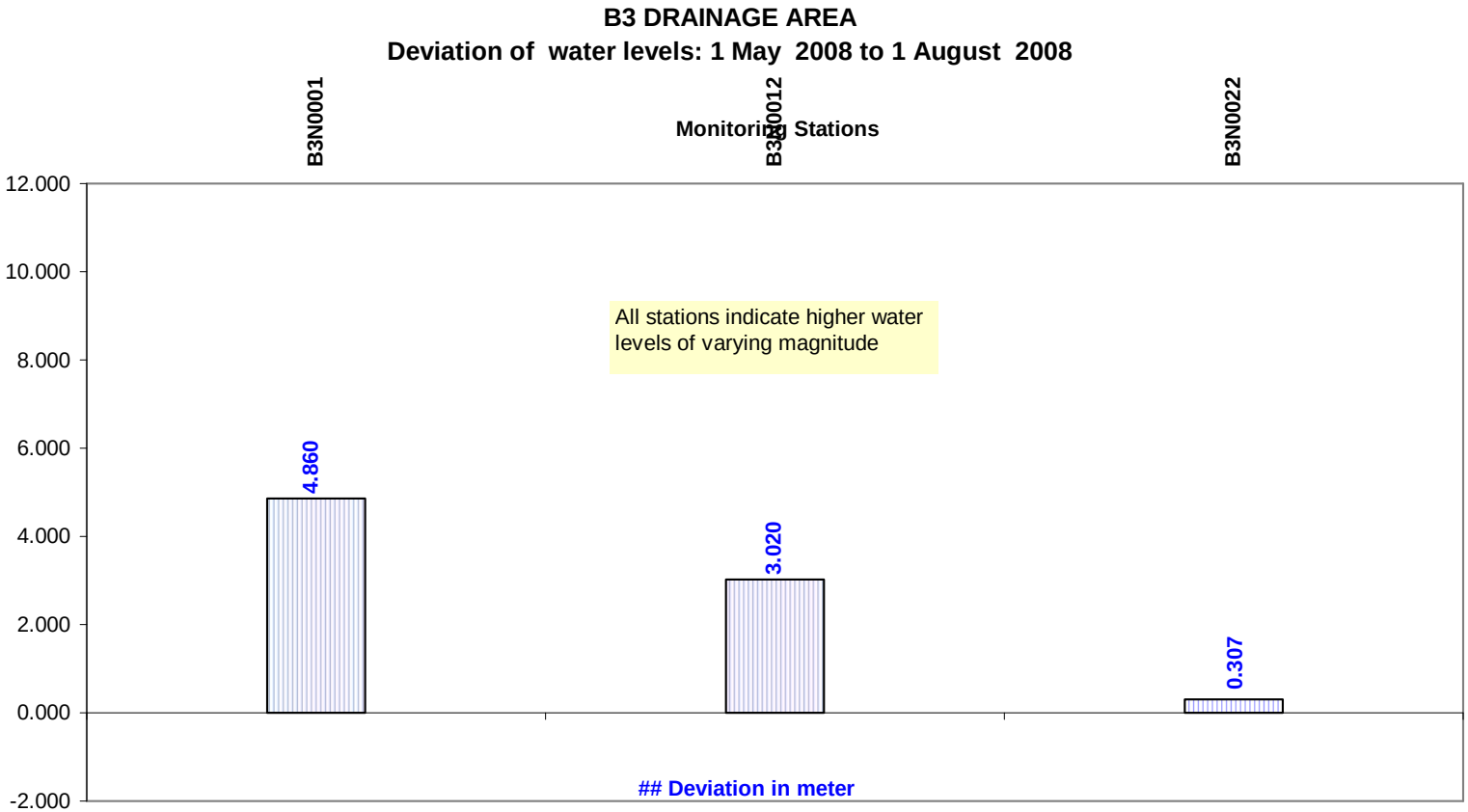
B9 DRAINAGE AREA
Comparison between water level depths: 1 Agust 2007, 1 May 2008 and 1 August 2008



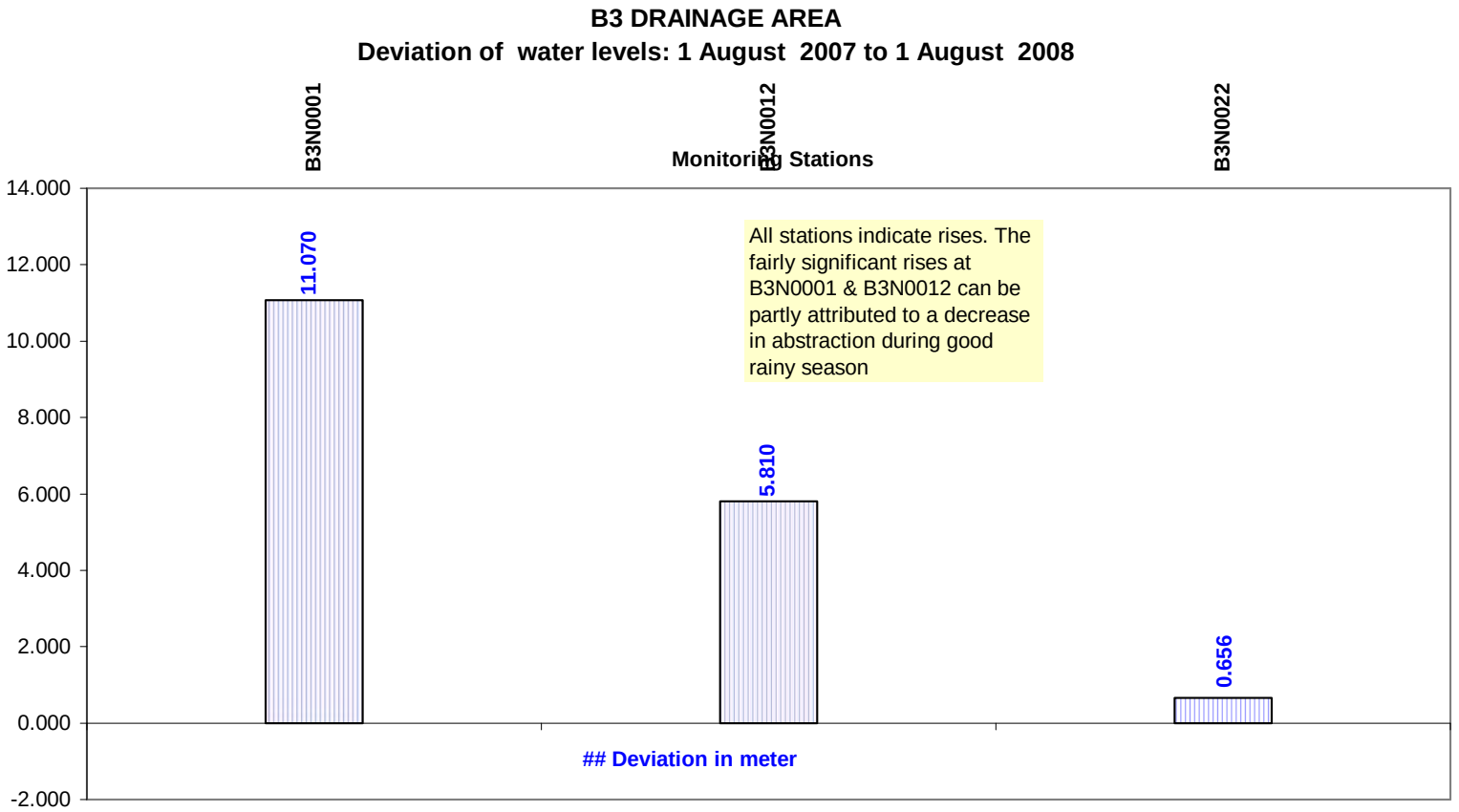
GRAPH 30


Comparison of water level trends at stations in B3 drainage:
1 August 2007 to 1 August 2008
5.00
10.00
15.00
20.00
25.00
30.00
35.00
m Below collar
45.00
50.00
55.00
60.00
65.00
70.00
75.00
m Below collar
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Date
B3N0022
B3N0012
B3N0001

GRAPH 31

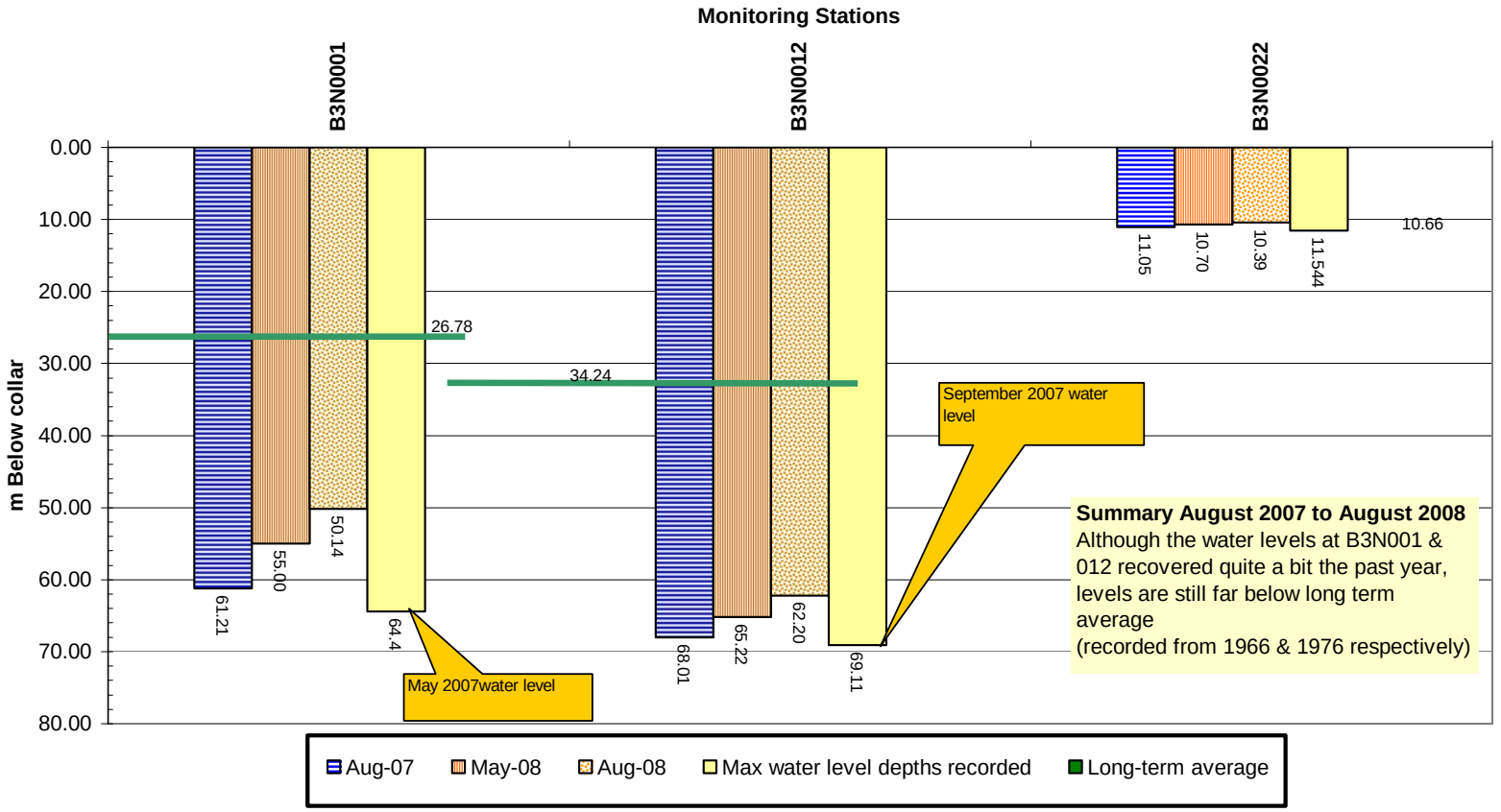

B3 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
B3N0001
B3N0012
B3N0022
Monitoring Stations
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
All stations indicate higher water levels of varying magnitude
4.860
3.020
0.307
Deviation in meter

GRAPH 32

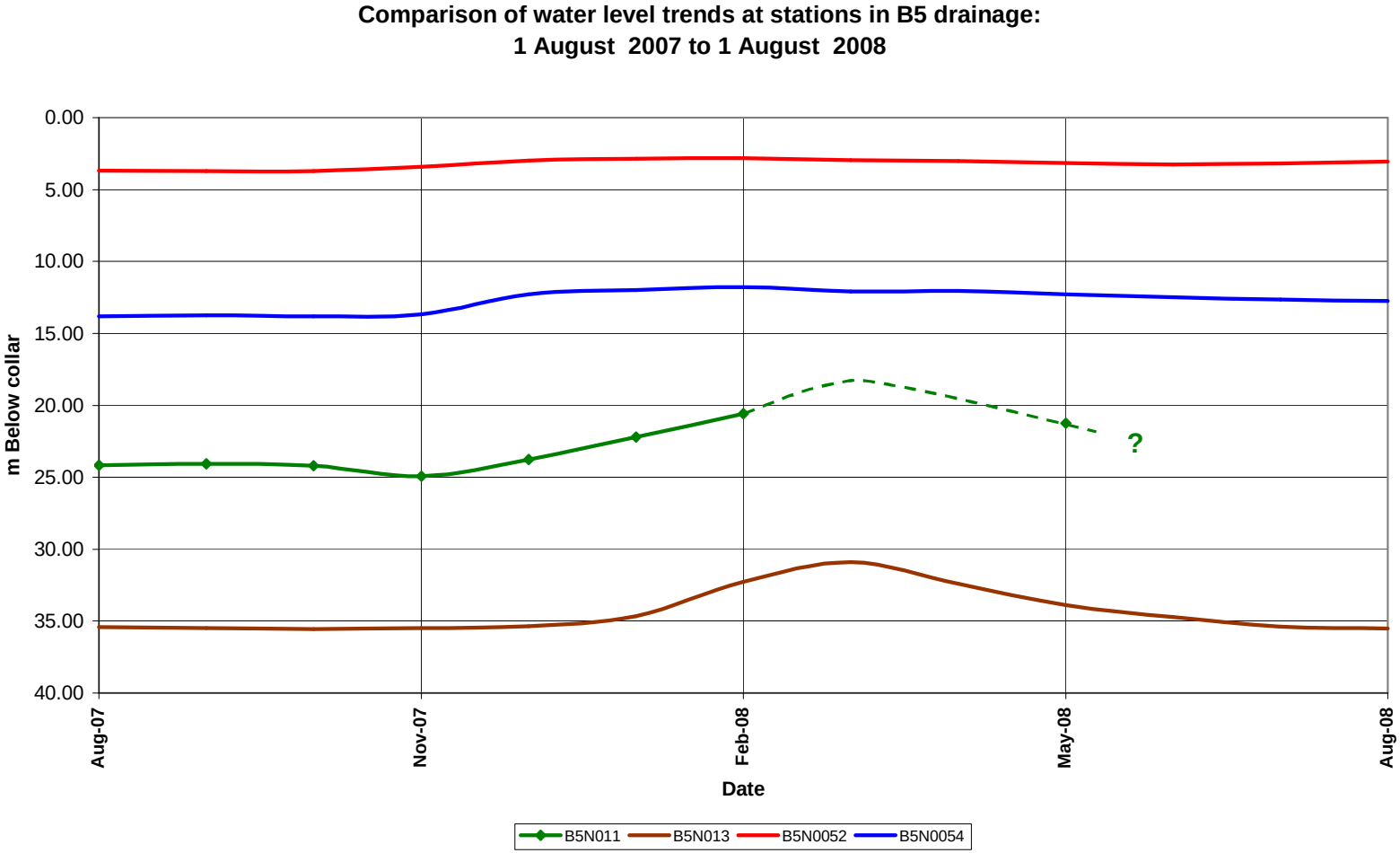

B3 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008
B3N0001
B3N0012
B3N0022
Monitoring Stations
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
11.070
5.810
0.656
All stations indicate rises. The fairly significant rises at B3N0001 & B3N0012 can be partly attributed to a decrease in abstraction during good rainy season
Deviation in meter

GRAPH 33

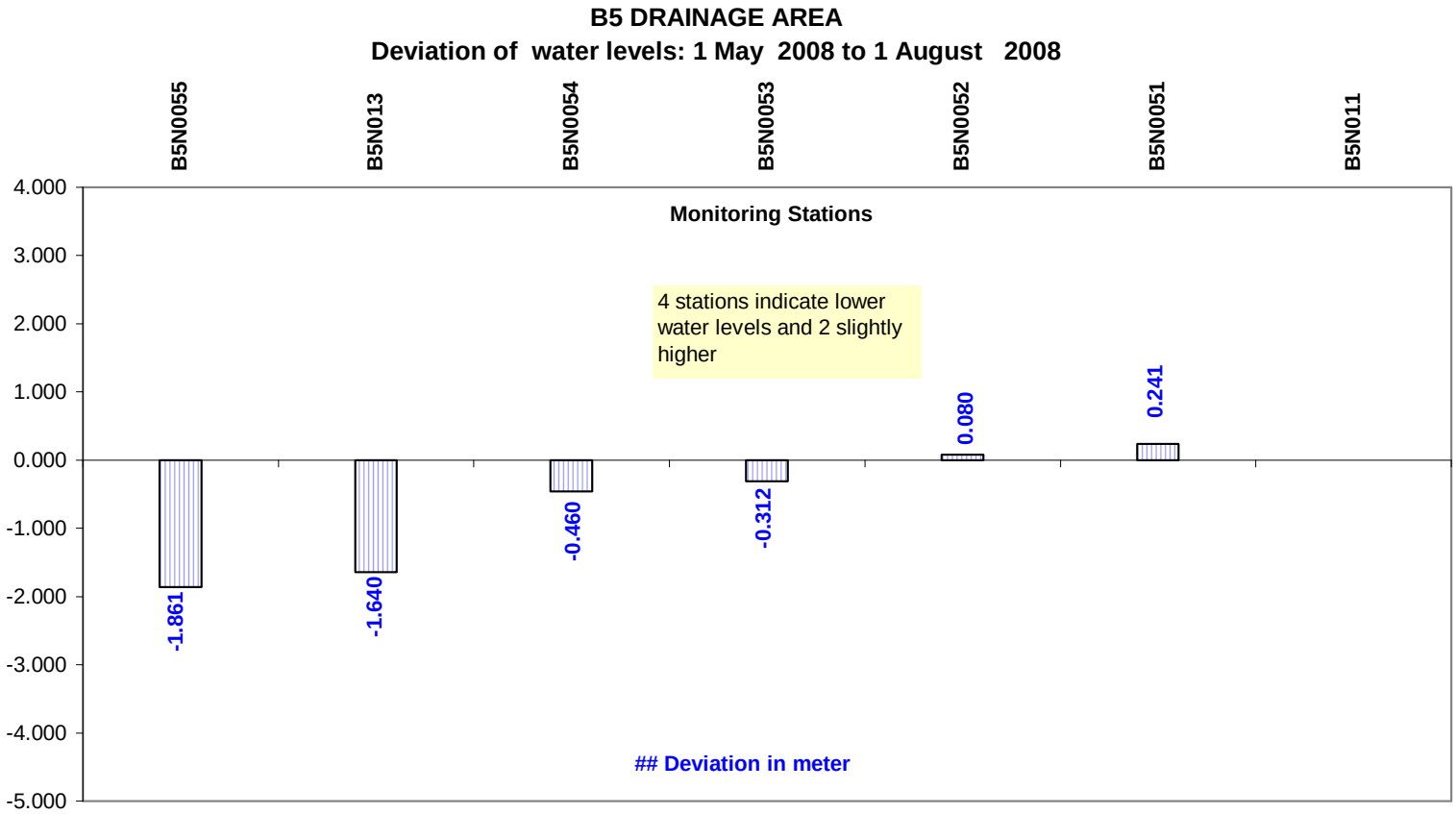
B3 DRAINAGE AREA
Comparison between water level depths: 1 August 2007
1 May 2008, 1 August 2008 and maximum depths recorded



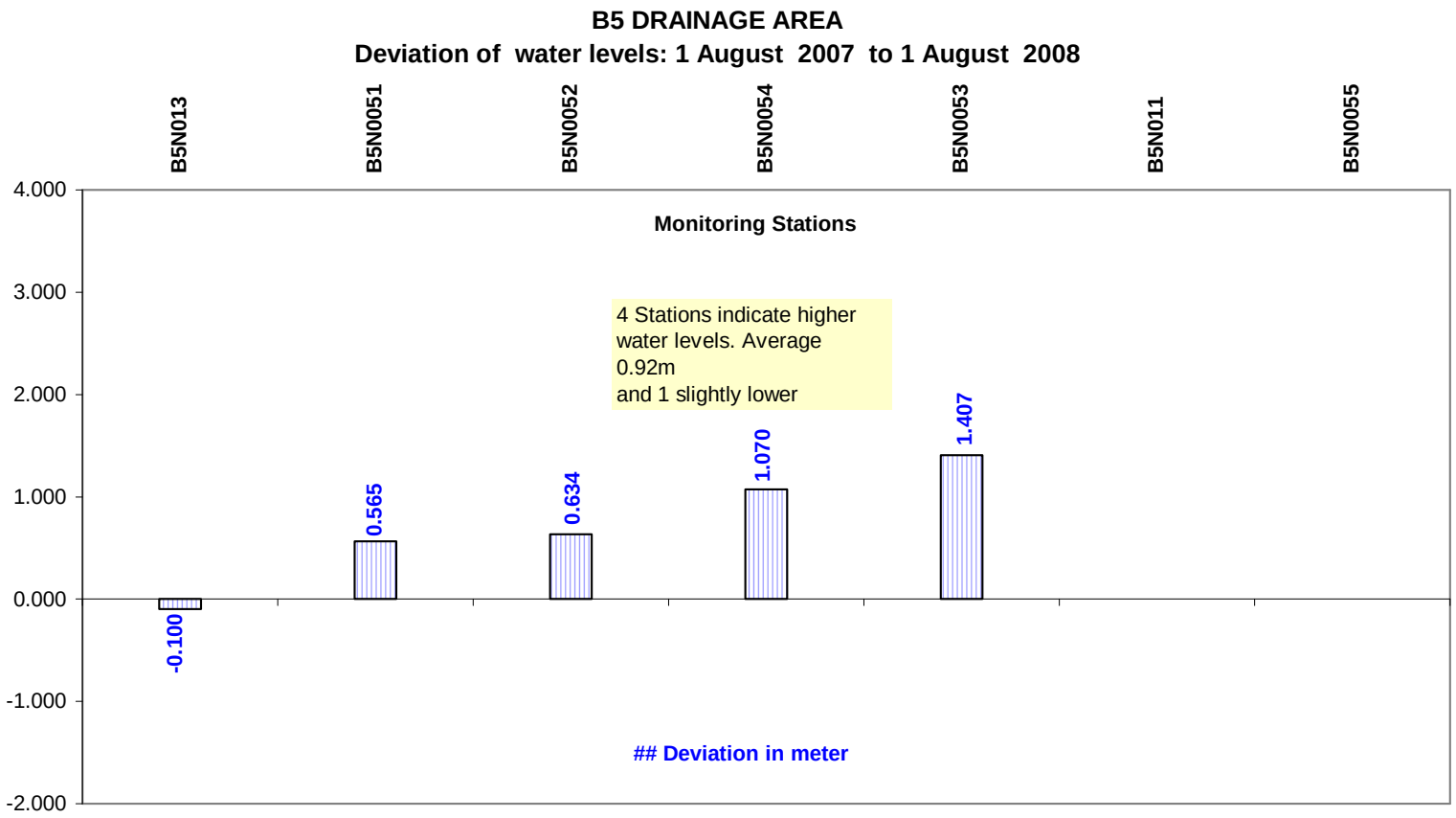
GRAPH 34


Comparison of water level trends at stations in B5 drainage:
1 August 2007 to 1 August 2008
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
m Below collar
Aug-07
Nov-07
Feb-08
May-08
Aug-08
Date
?
B5N011
B5N013
B5N0052
B5N0054

GRAPH 35

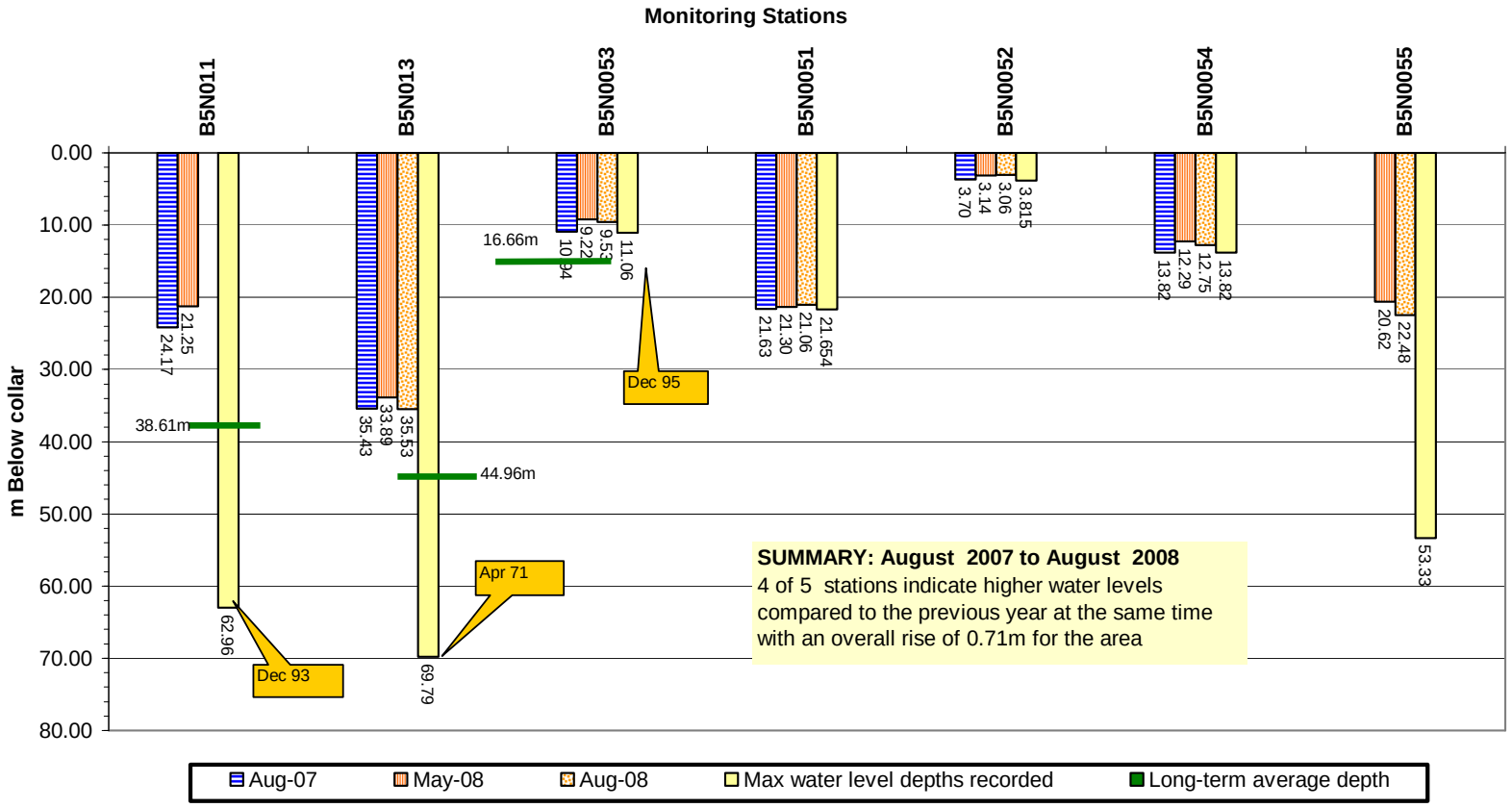

B5 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
B5N0055
B5N013
B5N0054
B5N0053
B5N0052
B5N0051
B5N011
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
-4.000
-5.000
Monitoring Stations
4 stations indicate lower water levels and 2 slightly higher
-1.861
-1.640
-0.460
-0.312
0.080
0.241
Deviation in meter

GRAPH 36

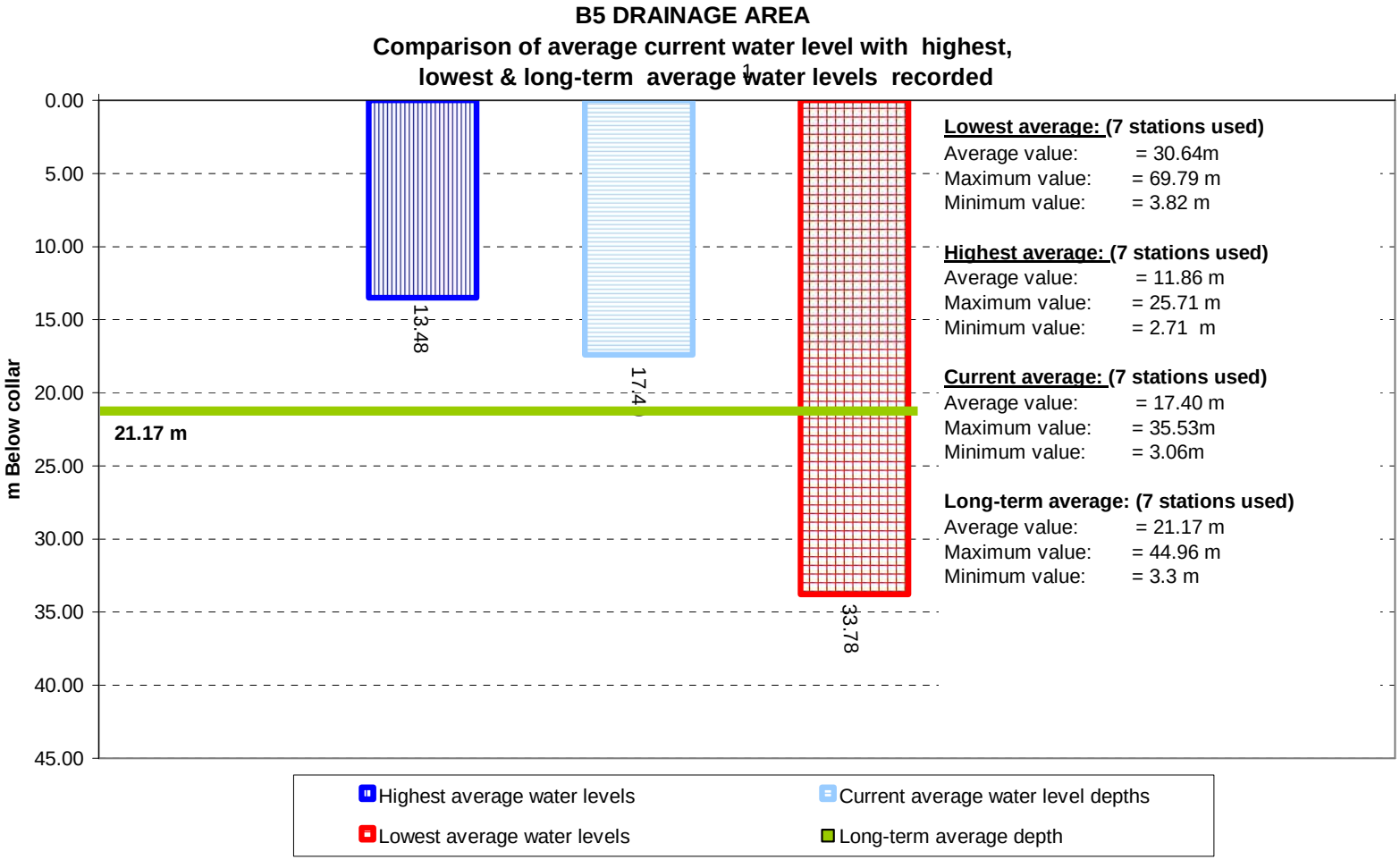

B5 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008
B5N013
B5N0051
B5N0052
B5N0054
B5N0053
B5N011
B5N0055
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
Monitoring Stations
4 Stations indicate higher water levels. Average 0.92m
and 1 slightly lower
-0.100
0.565
0.634
1.070
1.407
Deviation in meter

GRAPH 37

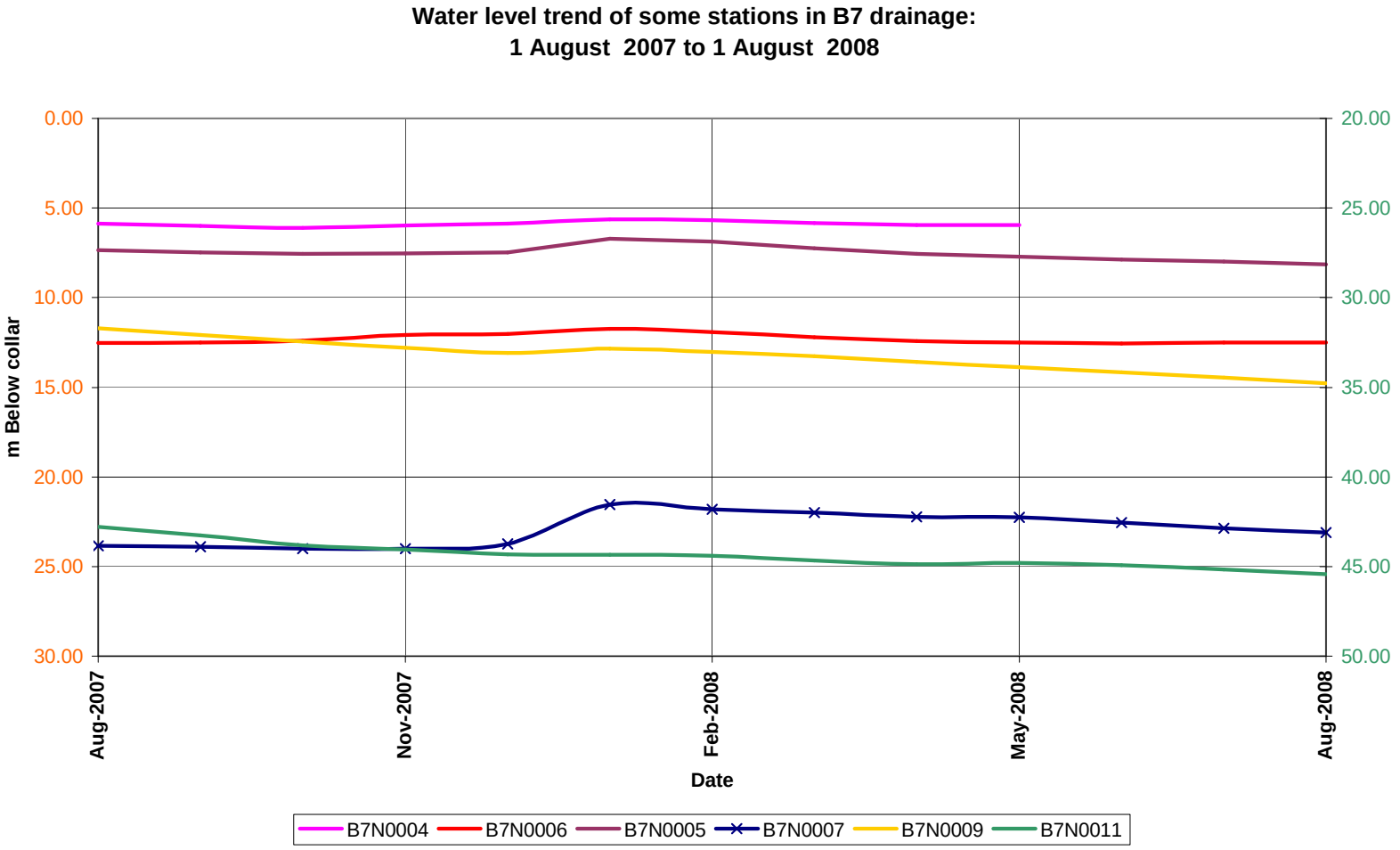
B5 DRAINAGE AREA
Comparison between water level depths: 1 August 2007, 1 May 2008 , 1 August 2008 and maximum depths recorded



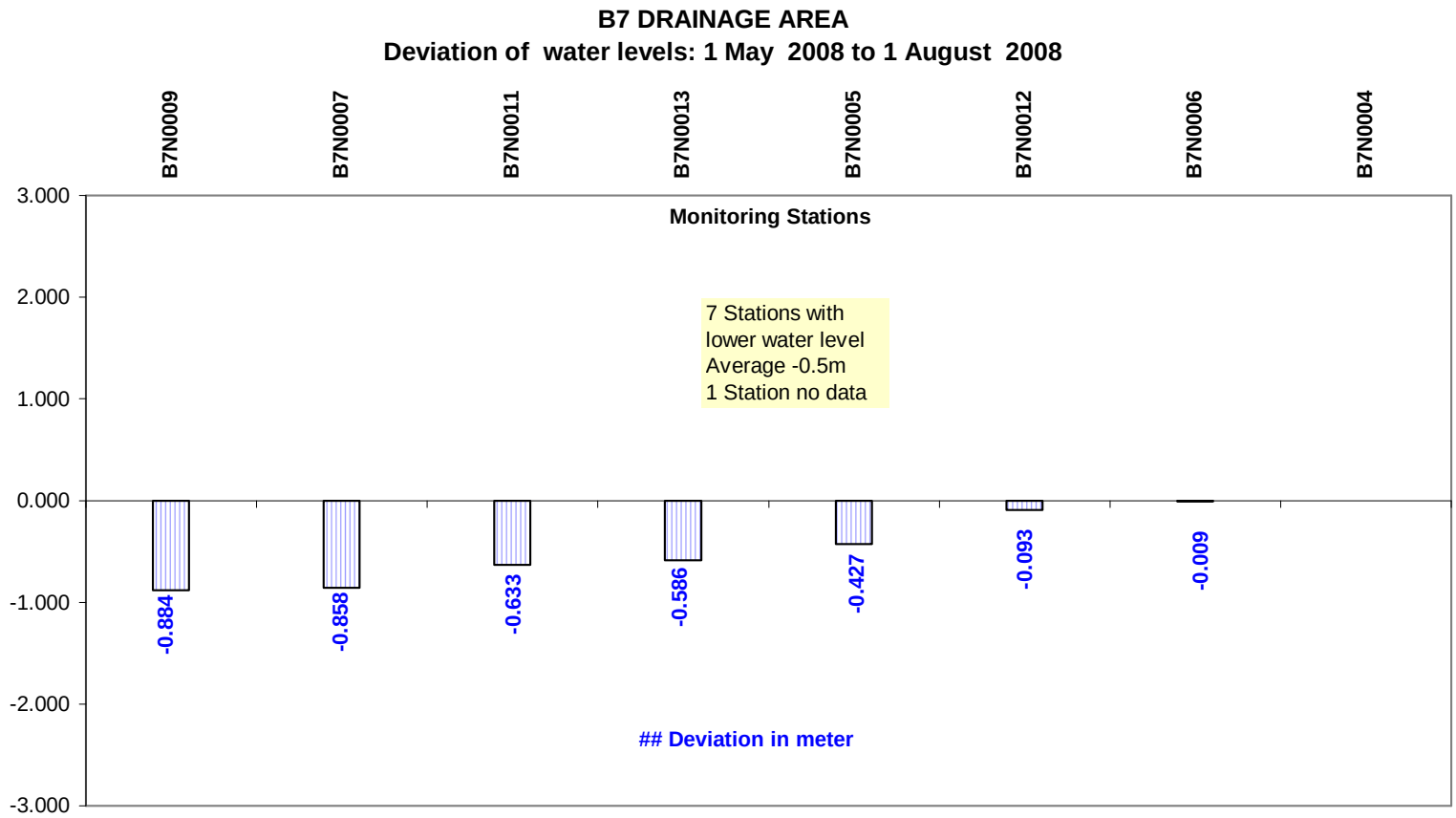
GRAPH 38


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
21.17 m
13.48
17.4
33.78
Lowest average: (7 stations used)
Average value: = 30.64m
Maximum value: = 69.79 m
Minimum value: = 3.82 m
Highest average: (7 stations used)
Average value: = 11.86 m
Maximum value: = 25.71 m
Minimum value: = 2.71 m
Current average: (7 stations used)
Average value: = 17.40 m
Maximum value: = 35.53m
Minimum value: = 3.06m
Long-term average: (7 stations used)
Average value: = 21.17 m
Maximum value: = 44.96 m
Minimum value: = 3.3 m
Highest average water levels
Current average water level depths
Lowest average water levels
Long-term average depth

GRAPH 39

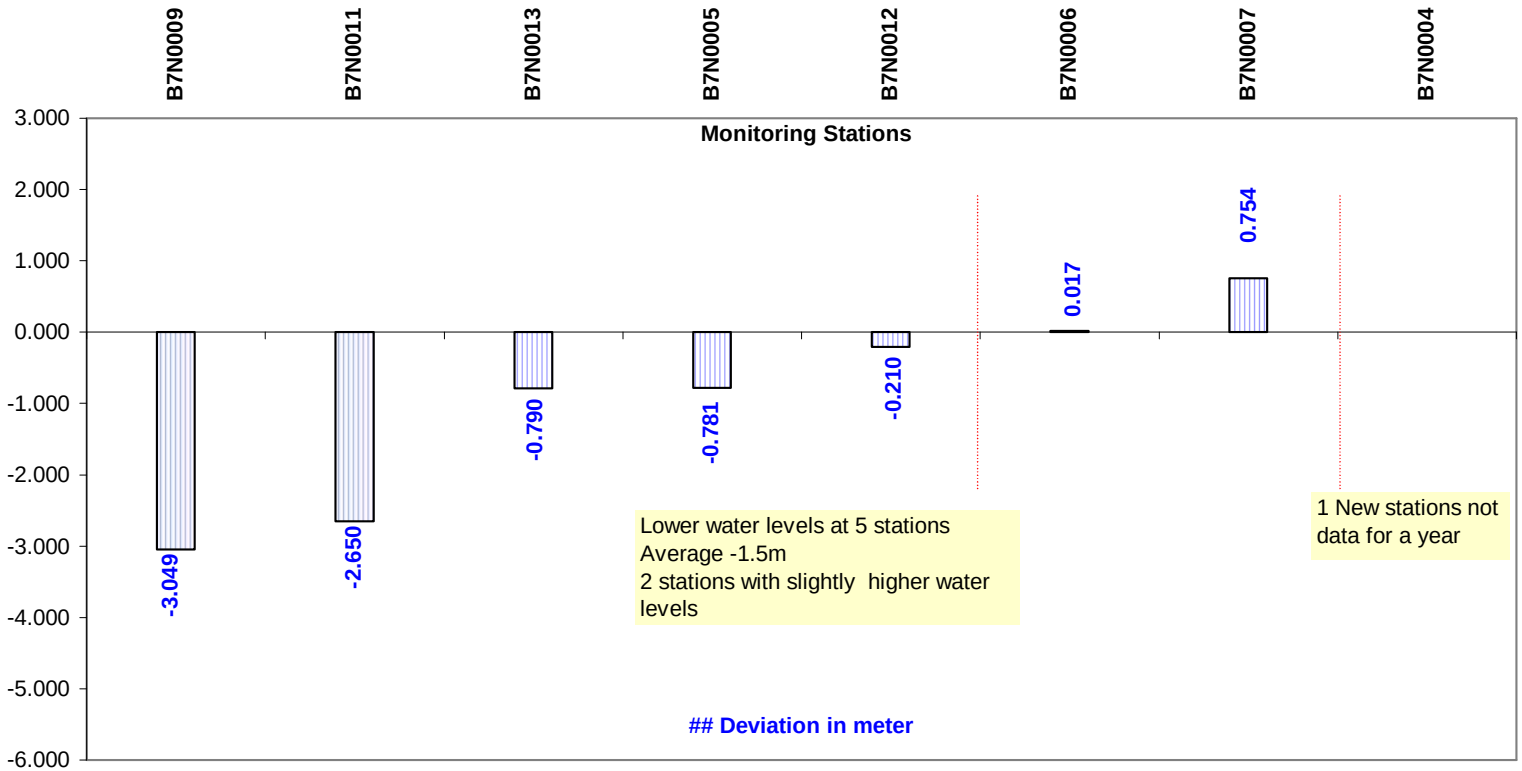

Water level trend of some stations in B7 drainage:
1 August 2007 to 1 August 2008
m Below collar
0.00
5.00
10.00
15.00
20.00
25.00
30.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Aug-2007
Nov-2007
Feb-2008
May-2008
Aug-2008
Date
B7N0004
B7N0006
B7N0005
B7N0007
B7N0009
B7N0011

GRAPH 40


B7 DRAINAGE AREA
Deviation of water levels: 1 May 2008 to 1 August 2008
B7N0009
B7N0007
B7N0011
B7N0013
B7N0005
B7N0012
B7N0006
B7N0004
3.000
2.000
1.000
0.000
-1.000
-2.000
-3.000
Monitoring Stations
7 Stations with
lower water level
Average -0.5m
1 Station no data
-0.884
-0.858
-0.633
-0.586
-0.427
-0.093
-0.009
Deviation in meter

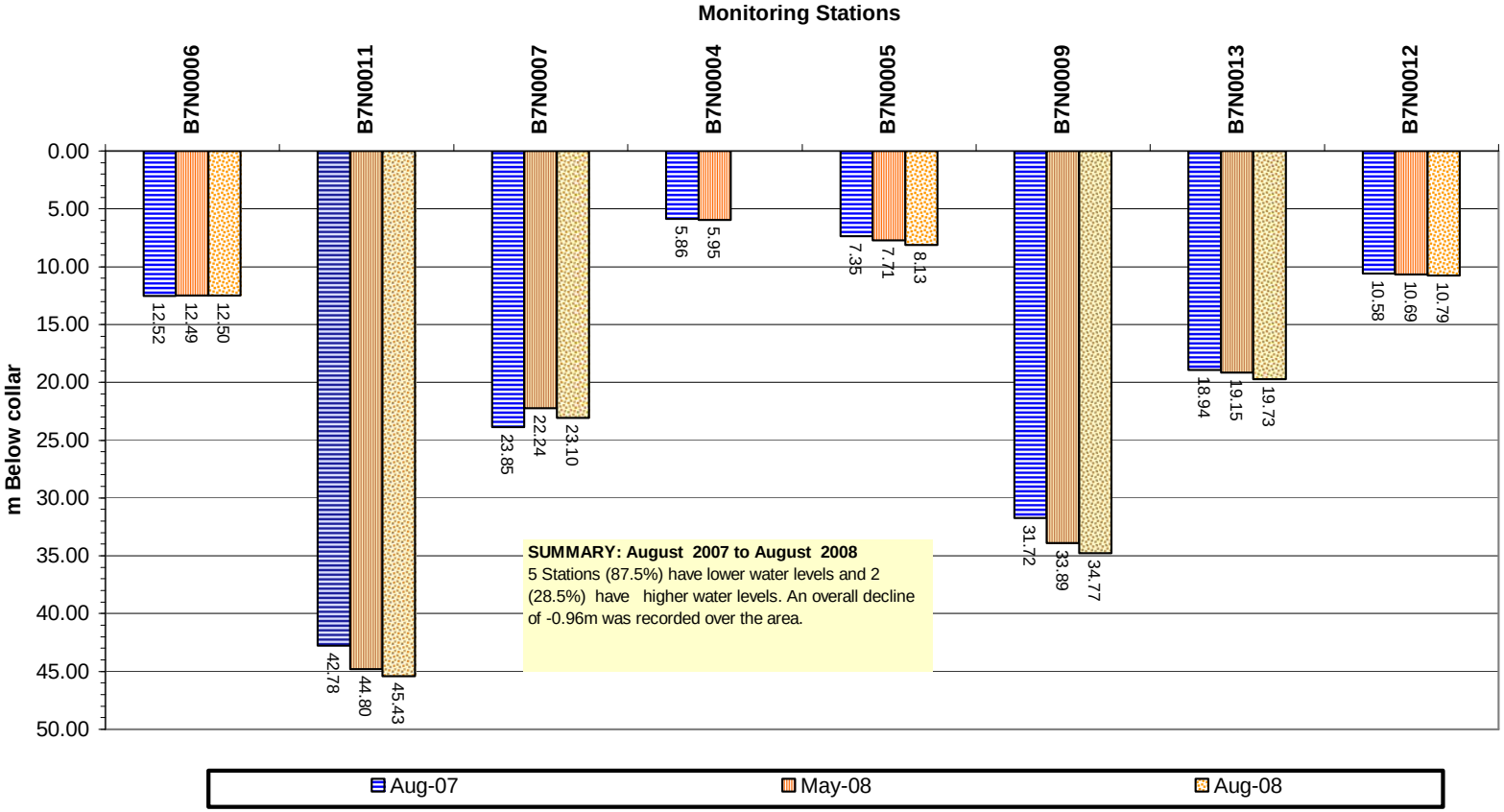
GRAPH 41

B7 DRAINAGE AREA
Deviation of water levels: 1 August 2007 to 1 August 2008



GRAPH 42

B7 DRAINAGE AREA
Comparison between water levels: 1 August 2007,
1 May 2008 and 1 August 2008



GRAPH 43