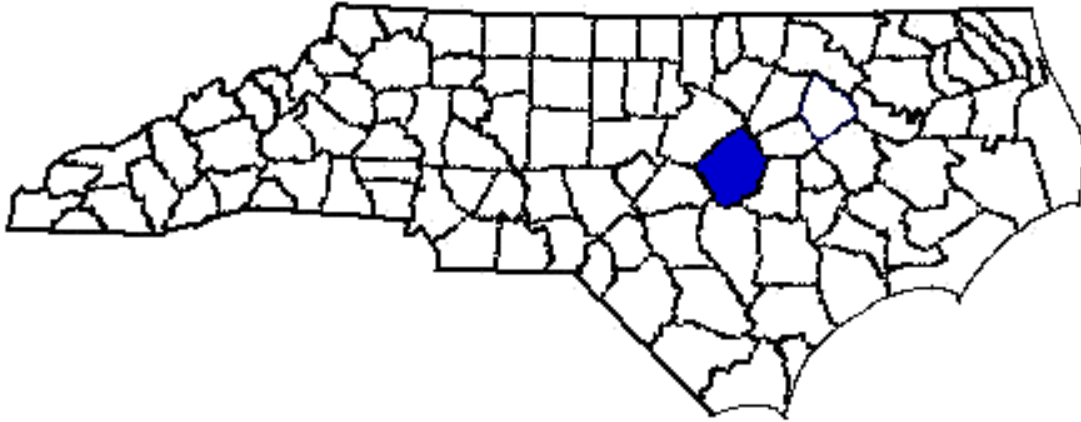


ANNUAL REPORT FOR 2004



**White Oak Creek
Johnston County
Project No. 6.408014T
TIP No. R-2000 WM**



Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2004

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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year on the White Oak Creek Mitigation Site. Site construction began in January 2002 and was completed in March 2002. The site was planted in late March 2002 and replanted in December 2002. The 2004-year represents the second year of vegetation monitoring. Hydrology monitoring in 2004 represents the third year of monitoring at the site. The site must demonstrate both hydrologic and vegetation success for a minimum of five consecutive years or until the site is deemed successful. The site is monitored with thirty-eight groundwater monitoring gauges and eight vegetation plots.

The 2004-year represents the third year for hydrology monitoring. Overall, twenty-six of the thirty-six (non-reference) monitoring gauges indicate saturation within 12" of the surface for greater than 12.5% of the growing season. The two reference gauges, REF-37 and REF-38, also met the saturation criteria. Ten of the thirty-six gauges did not meet the jurisdictional success criteria for the 2004-monitoring year.

The 2004 vegetation monitoring of the site revealed an average density of 375 trees per acre. This average is well above the minimum success criteria of 320 trees per acre.

Per letter from the Ecosystem Enhancement Program to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The White Oak Creek Site is located adjacent to the west bank of White Oak Creek, immediately south of Winston Road (SR 1550) and north of Austin Pond, approximately 2.5 miles west of Clayton, NC in Johnston County.

The site, totaling 50.69 acres in size, was mostly in open pastureland that was used to support horses in the past. Currently, the site has been returned to its natural condition. Construction started in January 2002 and was completed in March 2002. Planting was completed in March 2002.

1.2 PURPOSE

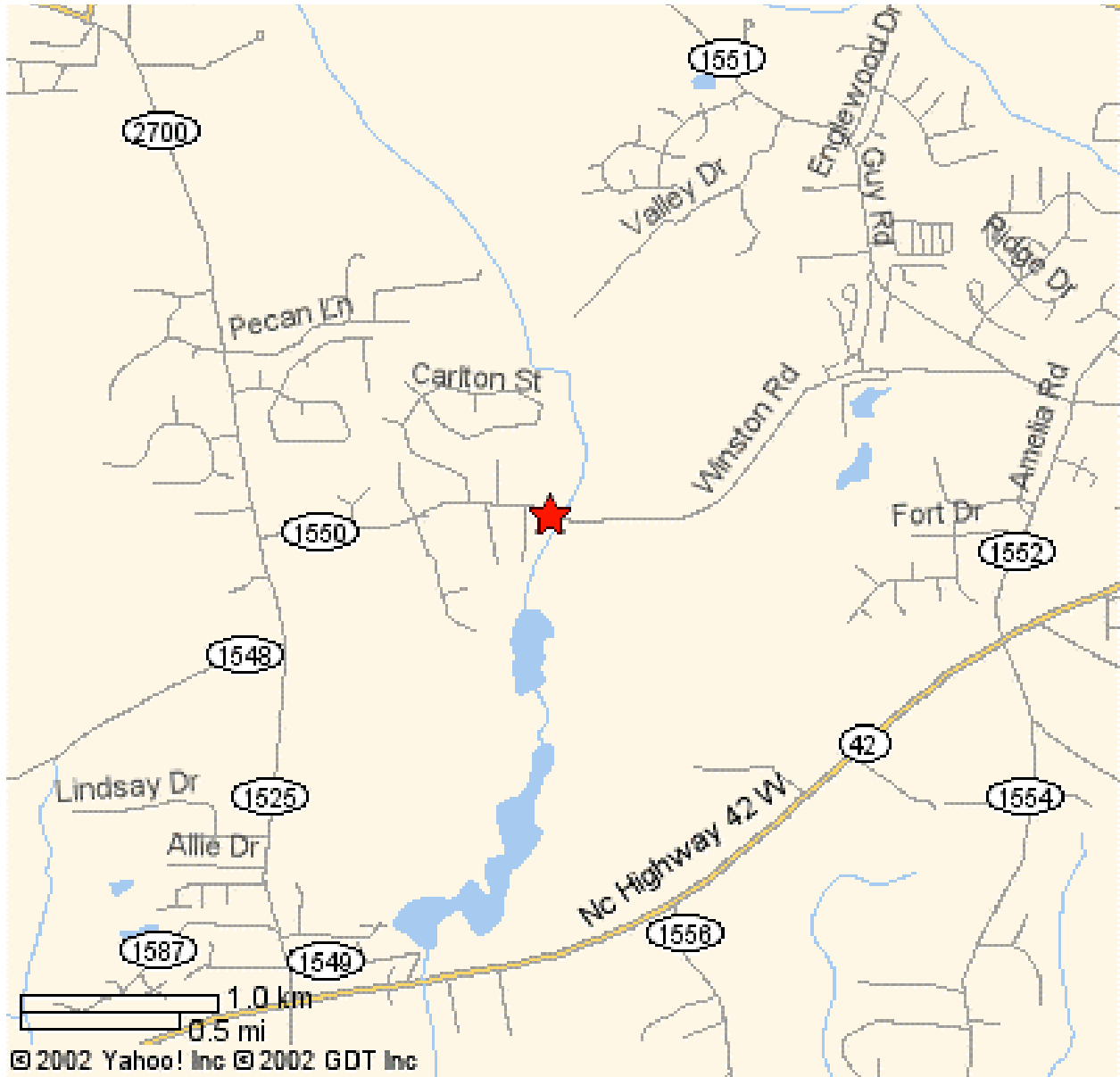
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the 2004-growing season at the White Oak Creek Mitigation Site.

Activities in 2004 reflect the third year of hydrology monitoring and the second year for vegetation monitoring, following the restoration efforts. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season, and site photographs.

1.3 PROJECT HISTORY

January 2002- March 2002	Site Construction
March 2002	Site Planted
August 2002	Vegetation Monitoring (1 yr.)
March – November 2002	Hydrologic Monitoring (1 yr.)
December 2002	Site Replanted
June 2003	Vegetation Monitoring (Restart Year 1)
March – November 2003	Hydrologic Monitoring (2 yr.)
June 2004	Vegetation Monitoring (2 yr.)
March – November 2004	Hydrologic Monitoring (3 yr.)

Figure 1: Vicinity Map



2.0 HYDROLOGY

2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season during a normal precipitation year. Areas inundated for less than 5% of the growing season are always classified as non-wetlands.

A site may be found to meet the hydrology performance criteria on the basis of comparison of monitoring data taken from the site with monitoring data taken from an established reference site approved by the Corps. The Corps retains the discretion to find that the hydrology criteria are met if such monitoring data from the mitigation site and the reference site are similar.

The growing season in Johnston County begins March 26 and ends November 10. These dates correspond to a 50% probability that temperatures will not drop to 28°F or lower after March 26 and before November 10.¹ The growing season is 229 days; therefore, optimum hydrology requires 12.5% of this season, or at least 29 consecutive days. Local climate must also represent average conditions for the area.

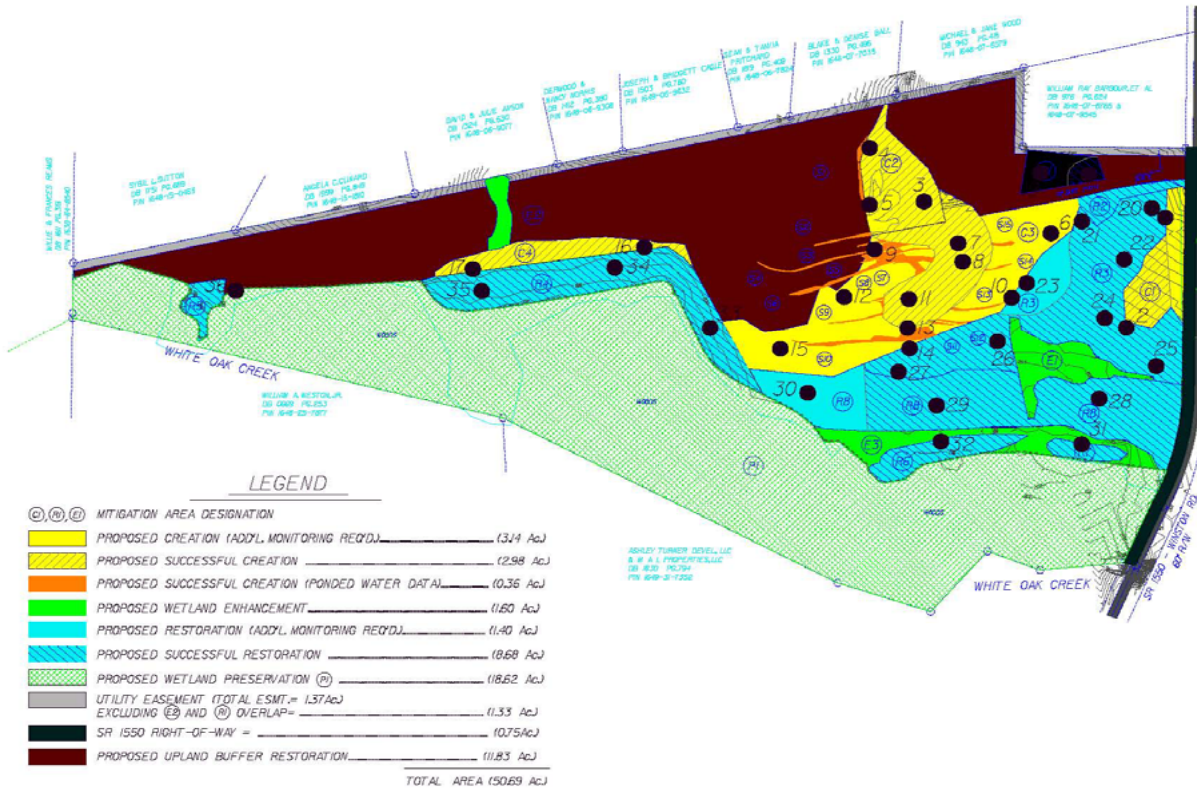
2.2 HYDROLOGIC DESCRIPTION

In March of 2002, thirty-eight monitoring gauges were installed across the site (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This represents the third full growing season that the monitoring gauges have been in place.

The White Oak Creek Site was designed to receive hydrologic input from rainfall and surface water accessing the floodplain. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

¹ Natural Resources Conservation Service, Soil Survey of Wake County, North Carolina, p. 79.

Figure 2. Gauge Location Map



2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each well. This number was converted into a percentage of the 229-day growing season (March 26 – November 10). The results are presented in Table 1.

Appendix A contains a plot of the groundwater depth for each monitoring well. If the gauge shows saturation for greater than 12.5% of the growing season, the maximum number of consecutive days is noted on each graph. The individual precipitation events are shown on the monitoring well graphs as bars.

Figure 3 provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%. Gauges highlighted in black indicate no wetland hydrology (less than 5% of the growing season).

Table 1. 2004 White Oak Creek Hydrologic Monitoring Results

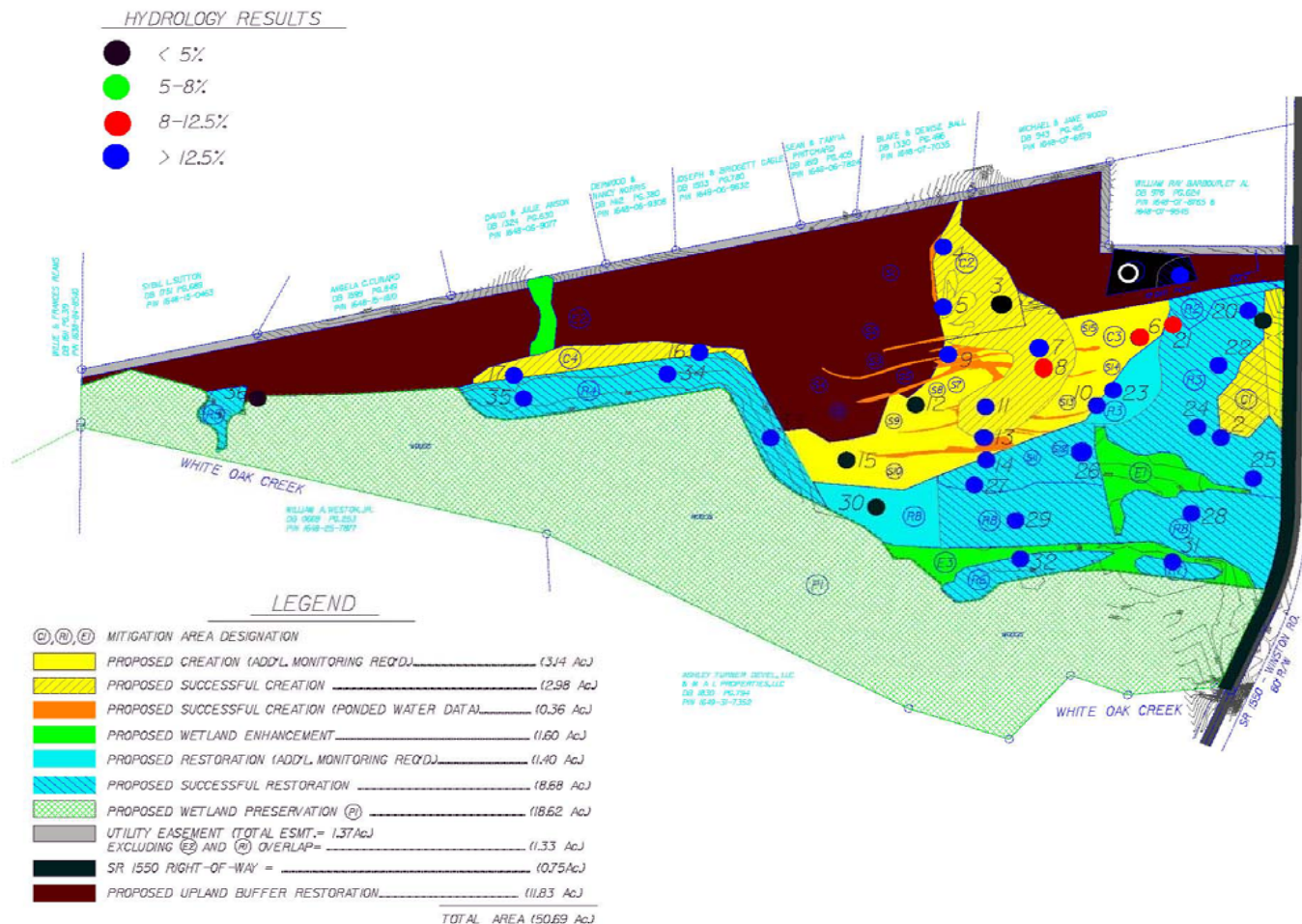
Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Dates Meeting Success
GW-1*	×				1.7	
GW-2*+				×	13.5	March 26-April 25 April 27-May 10 Aug 30-Sept 26
GW-3*	×				4.8	
GW-4+				×	100	March 26-Nov 10
GW-5*+				×	51.7	March 26-May 14 June 15-Oct 11
GW-6			×		11.7	March 26-April 21 Aug 13-Aug 25 Aug 30-Sept 25
GW-7*+				×	13.0	March 26-April 25 April 27-May 10 Aug 30-Sept 26
GW-8*			×		9.1	Sept 16-Sep 28 Oct 19-Nov 8
GW-9+				×	39.1	March 26-May 10
GW-10*+				×	29.6	March 26-June 1 June 5-July 16
GW-11*+				×	80.9	April 2-Oct 4
GW-12*	×				0.9	
GW-13+				×	45.2	March 26-May 28 July 30-Nov 10
GW-14*+				×	23.0	April 2-May 16 Aug 13-Oct 4
GW-15*	×				0.4	
GW-16*+				×	83.9	March 26-Oct 4
GW-17*+				×	50.4	March 26-July 19
GW-18+				×	45.2	March 26-May 20 May 31-July 26
GW-19	×				3.0	
GW-20*+				×	22.6	March 26-May 16 June 5-June 18
GW-21*			×		11.4	April 1-April 20 Aug 30-Sept 24

Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Dates Meeting Success
GW-22*				×	20.1	March 26-May 10
GW-23*+				×	18.3	April 1-May 12 Aug 30-Oct 2
GW-24*				×	20.5	March 26-May 11
GW-25*+				×	32.3	March 26-May 17 July 30-Oct 11
GW-26*				×	46.3	April 2-July 16 Sept 25-Nov 5
GW-27*+				×	45.0	May 31-June 22 July 30-Nov 10
GW-28*+				×	18.3	April 1-May 12
GW-29*+				×	35.8	March 26-June 15
GW-30*	×				1.3	
GW-31*+				×	18.3	April 1-May 12
GW-32*+				×	74.3	May 23-Nov 10
GW-33*+				×	49.1	March 26-July 16
GW-34+				×	100.0	March 26-Nov 10
GW-35+				×	44.8	March 26-May 28 July 30-Nov 10
GW-36*	×				0	
REF-37+				×	100	March 26-Nov 10
REF-38+				×	20.4	March 26-May 11

* Gauge experienced a malfunction during the growing season.

+Gauge met the success criterion during an average rainfall month (February, April, May, July, and November).

Figure 3. Hydrologic Monitoring Gauge Results



2.3.2 Climatic Data

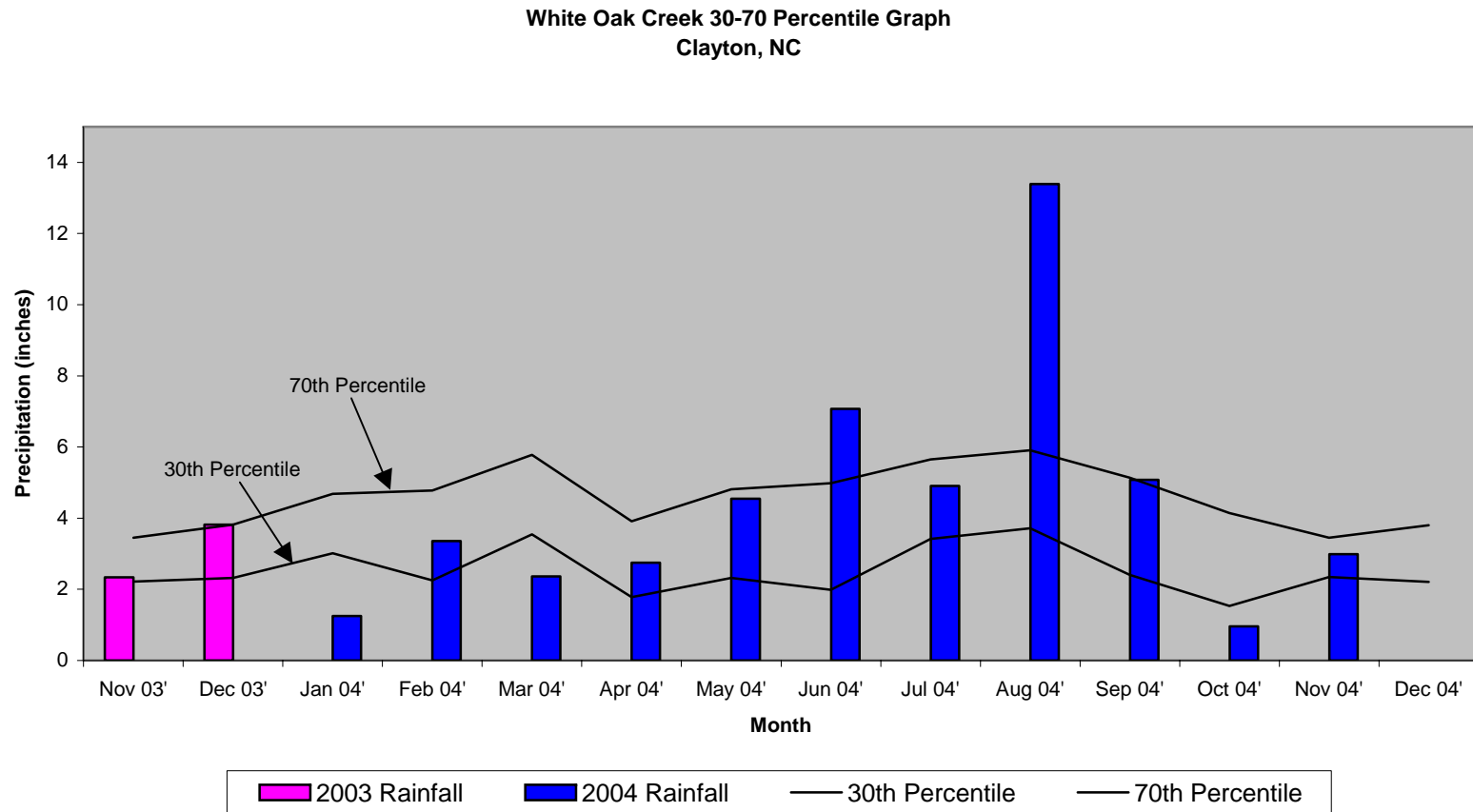
Figure 4 represents an evaluation of the local climate in comparison with historical data in order to determine whether 2004 was “average” in terms of rainfall. The two lines represent the 30th and 70th percentiles of monthly precipitation for Clayton. The bars are the monthly rainfall totals for parts of 2003 and 2004. The onsite rain gauge experienced a gauge malfunction, therefore the rain gauge from the Clayton weather station was used for the following dates: January 1 - May 4 and July 9 - November 26. The State Climate Office collected the historical and monthly rainfall data.

For the 2004-year, the month of January, March, and October recorded below average rainfall. The months of November (03’), December (03’), February, April, May, July, and November all recorded average rainfall for the site. June, August, and September all recorded above average rainfall. Overall, 2004 experienced an average rainfall year.

2.4 CONCLUSIONS

Twenty-six of the thirty-six (non-reference) monitoring gauges indicated saturation within 12” of the surface for greater than 12.5% of the growing season. Three gauges resulted in saturation between 8% and 12.5% and no gauges showed saturation levels between 5% and 8%. Seven of the thirty-six gauges had saturation levels less than 5% of the growing season. Both reference gauges (REF-37 and REF-38) met the jurisdiction criteria in 2004.

Figure 4: 30-70 Percentile Graph



3.0 VEGETATION: WHITE OAK MITIGATION SITE (YEAR 2 MONITORING)

3.1 SUCCESS CRITERIA

Success Criteria states that at least 320 stems per acre must survive after the completion of the third growing season. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5.)

3.2 DESCRIPTION OF SPECIES

The following tree species were planted in the Wetland Areas:

Zone 1: Wetland Restoration Area (10.03 acres)

Quercus lyrata, Overcup Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Fraxinus pennsylvanica, Green Ash
Cornus amomum, Silky Dogwood
Sambucus canadensis, Elderberry
Cephalanthus occidentalis, Buttonbush

Zone 2: Wetland Enhancement Area (1.58 acres)

Quercus lyrata, Overcup Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Fraxinus pennsylvanica, Green Ash
Cornus amomum, Silky Dogwood
Sambucus canadensis, Elderberry
Cephalanthus occidentalis, Buttonbush

Zone 3: Wetland Creation Area (6.59 acres)

Quercus lyrata, Overcup Oak

Quercus michauxii, Swamp Chestnut Oak

Quercus phellos, Willow Oak

Quercus nigra, Water Oak

Nyssa sylvatica var. *biflora*, Swamp Blackgum

Fraxinus pennsylvanica, Green Ash

3.3 RESULTS OF VEGETATION MONITORING

Table 2. Vegetation Monitoring Statistics

Plot #	Overcup Oak	Swamp Chestnut Oak	Willow Oak	Water Oak	Swamp Blackgum	Green Ash	Silky Dogwood	Elderberry	Buttonbush	Total (2 year)	Total (at planting)	Density (Trees/Acre)
1		5	3	2	1	4	9	1	1	26	40	442
2	2	2	1	1		5	2		2	15	38	268
3	2	1		2		7	7	2	4	25	45	378
4	1	3	1			5	3	2	6	21	24	595
5		1				7	1	1	4	14	37	257
6		2			1	5	1			9	31	197
7	1	12	2	4	1	5	3	1	3	32	40	544
8	4	1		1		3	2	1	3	15	32	319
Total Density Average											375	

Site Notes: Other species noted: ragweed, broomsedge, *Scirpus* sp., black willow, *Juncus* sp., trumpet creeper, briars, fennel, smartweed, cattails, yellow nutsedge, fescue, arrow arum, lespedeza, and various grasses. Due to heavy competition of *Juncus* sp. in plots 2, 3, 6, and 8 the trees were very difficult to find. Plots 3 and 8 had approximately 2 to 3 inches of standing water at time of monitoring. There were a few sweetgum noted in the front portion of the site near the road but at this time the sweetgum are not a problem.

3.4 CONCLUSIONS

Of the 50.7 acres on this site, approximately 18.2 acres involved tree planting. An upland buffer area that consisted of 12.04 acres was planted. There were 8-vegetation monitoring plots established throughout the planting areas. The 2004 vegetation monitoring of the site revealed an average tree density of 375 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The third year for hydrologic monitoring resulted in twenty-six of the thirty-six (non-reference) monitoring gauges showing saturation within 12" of the surface for greater than 12.5% of the growing season. The two reference gauges, REF-37 and REF-38, also exceeded the optimum saturation period. Ten of the thirty-six gauges did not meet the jurisdictional success criteria for the 2004-monitoring year.

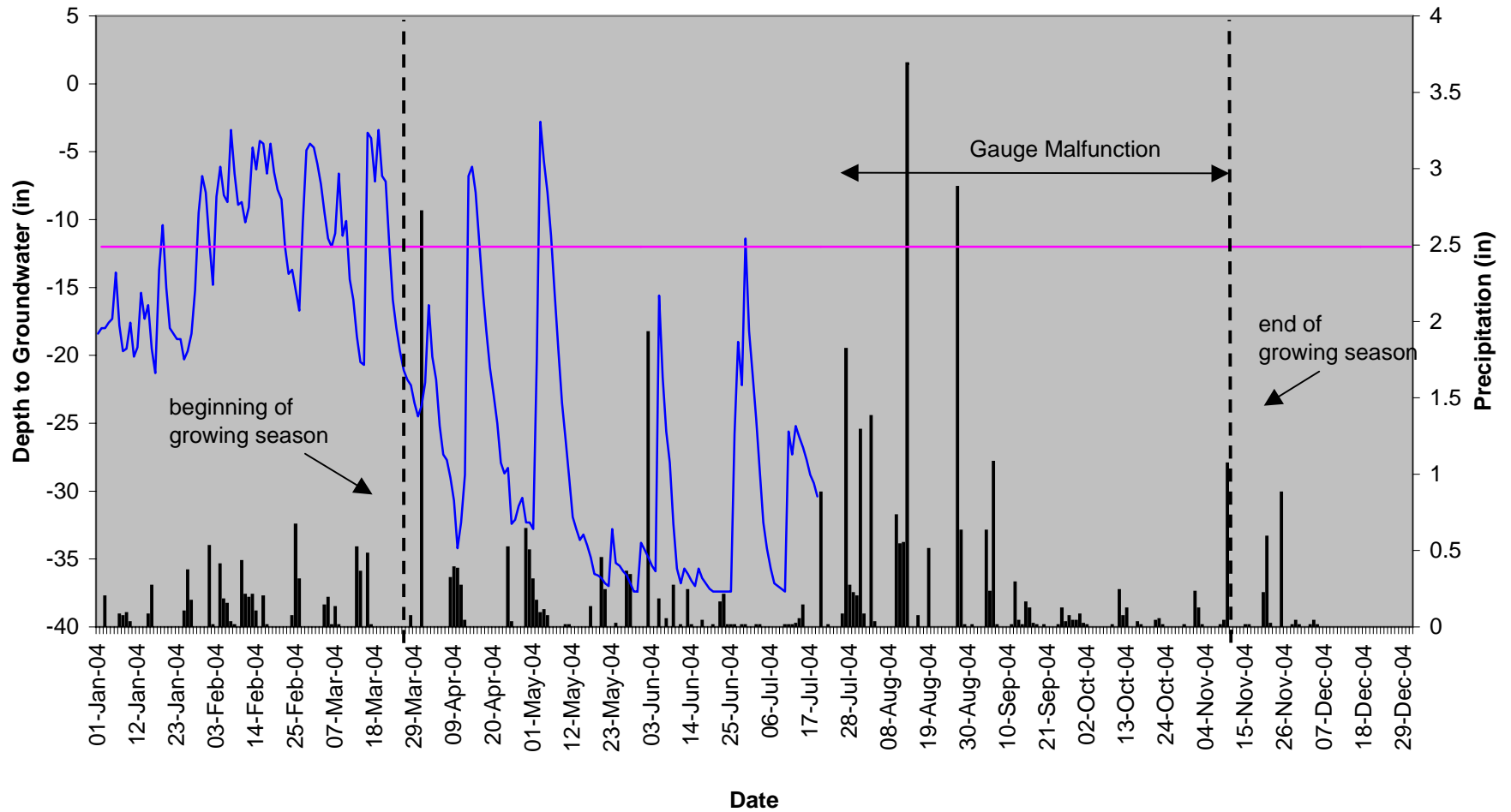
Due to the low stem counts after year one, the site was replanted in December 2002. The site has improved with an average density of 375 trees per acre, which is above the minimum success of 320 trees per acre.

Per letter from the Ecosystem Enhancement Program to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

APPENDIX A

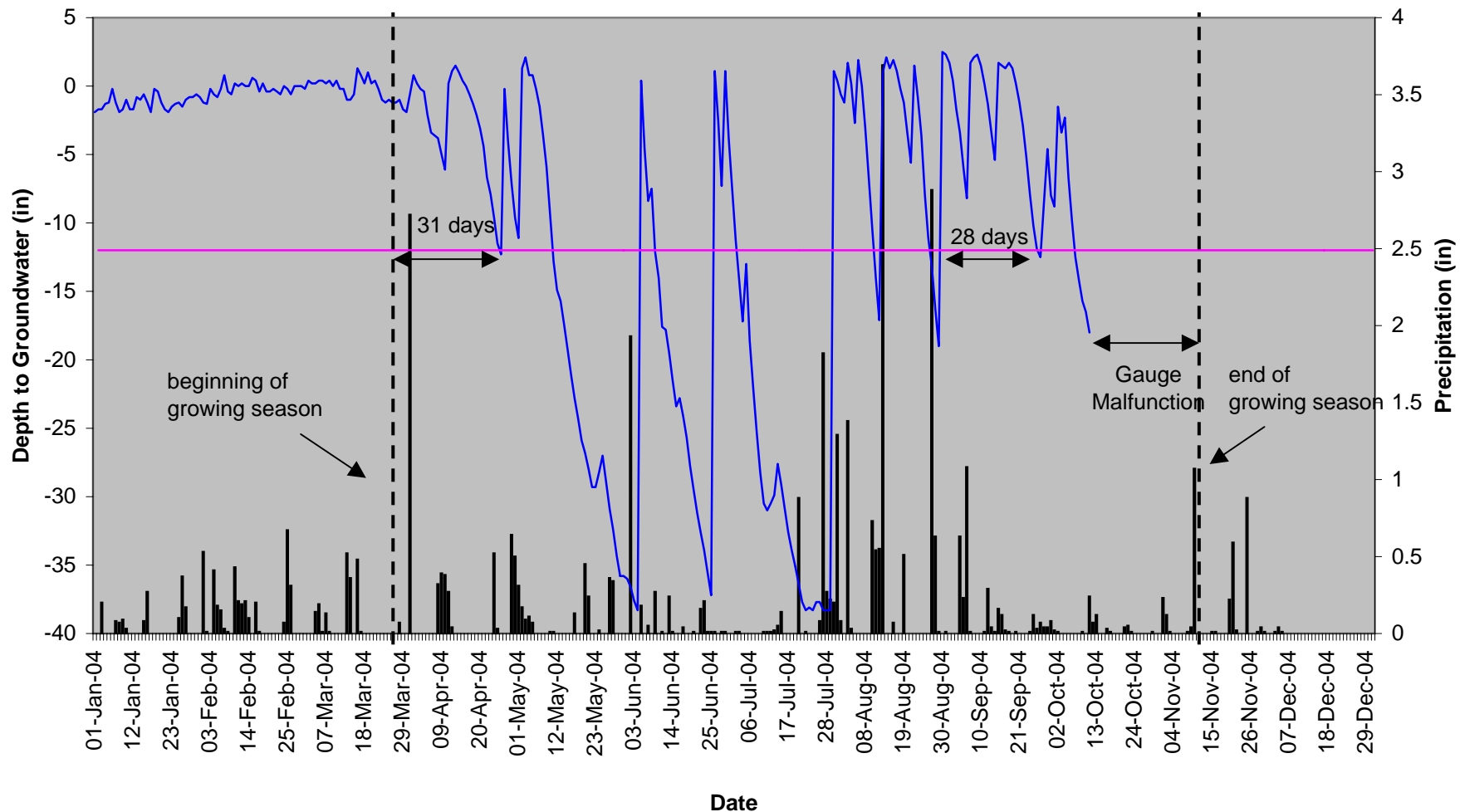
GAUGE DATA GRAPHS

White Oak Creek WO-GW1



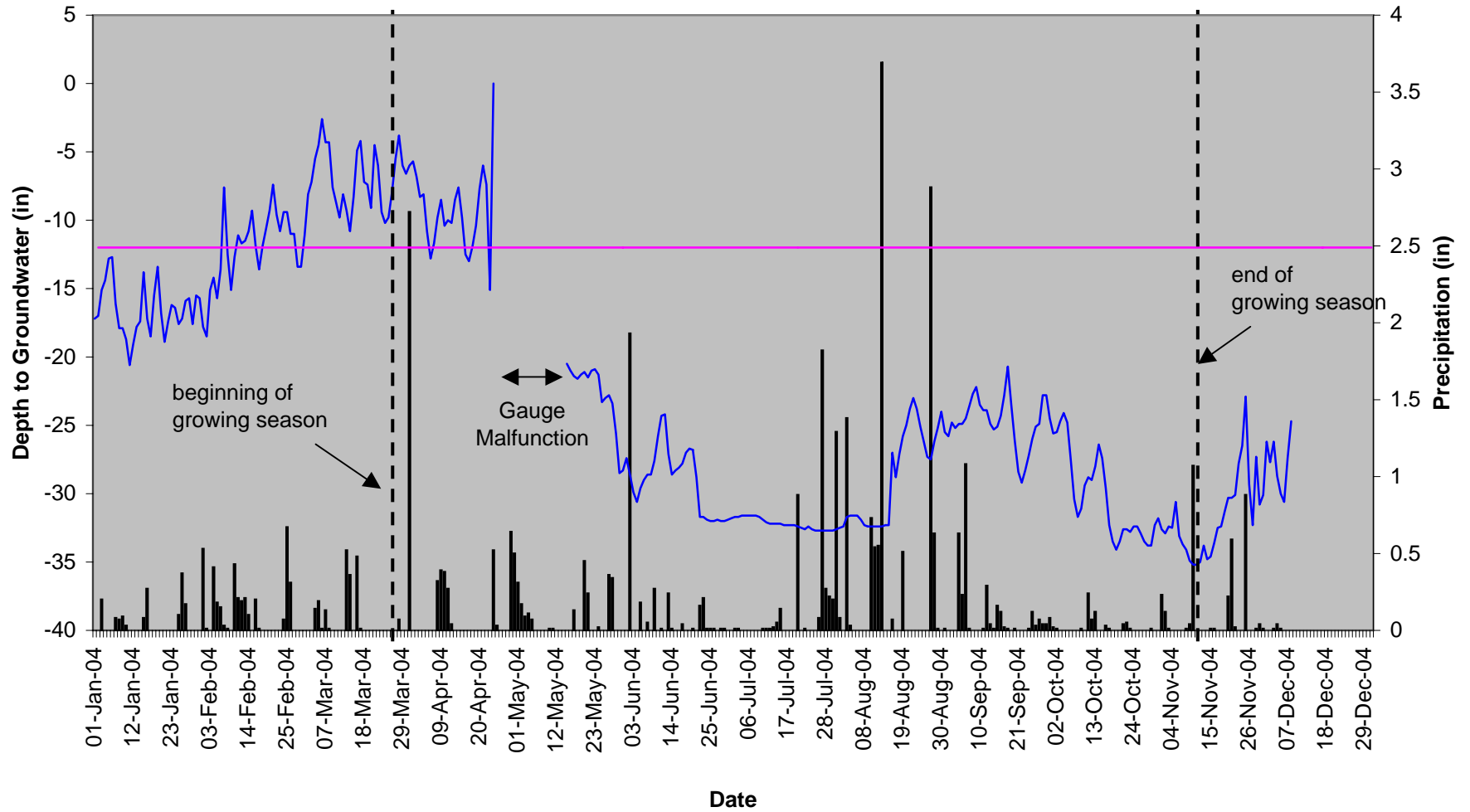
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White Oak Creek WO-GW2



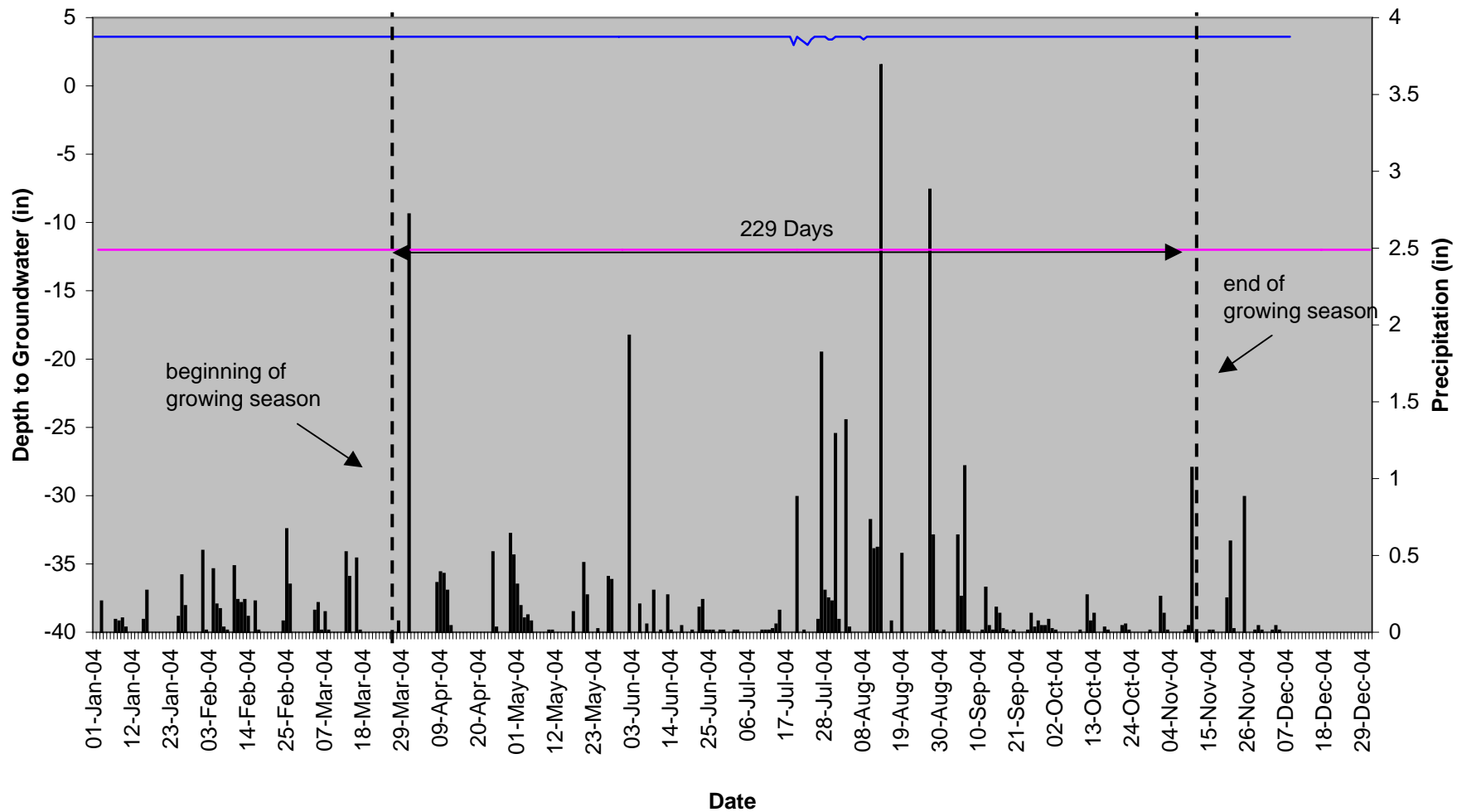
■ Rain Gauge — WM9BEBBCFA GW-2 — Required Depth

White Oak Creek WO-GW3



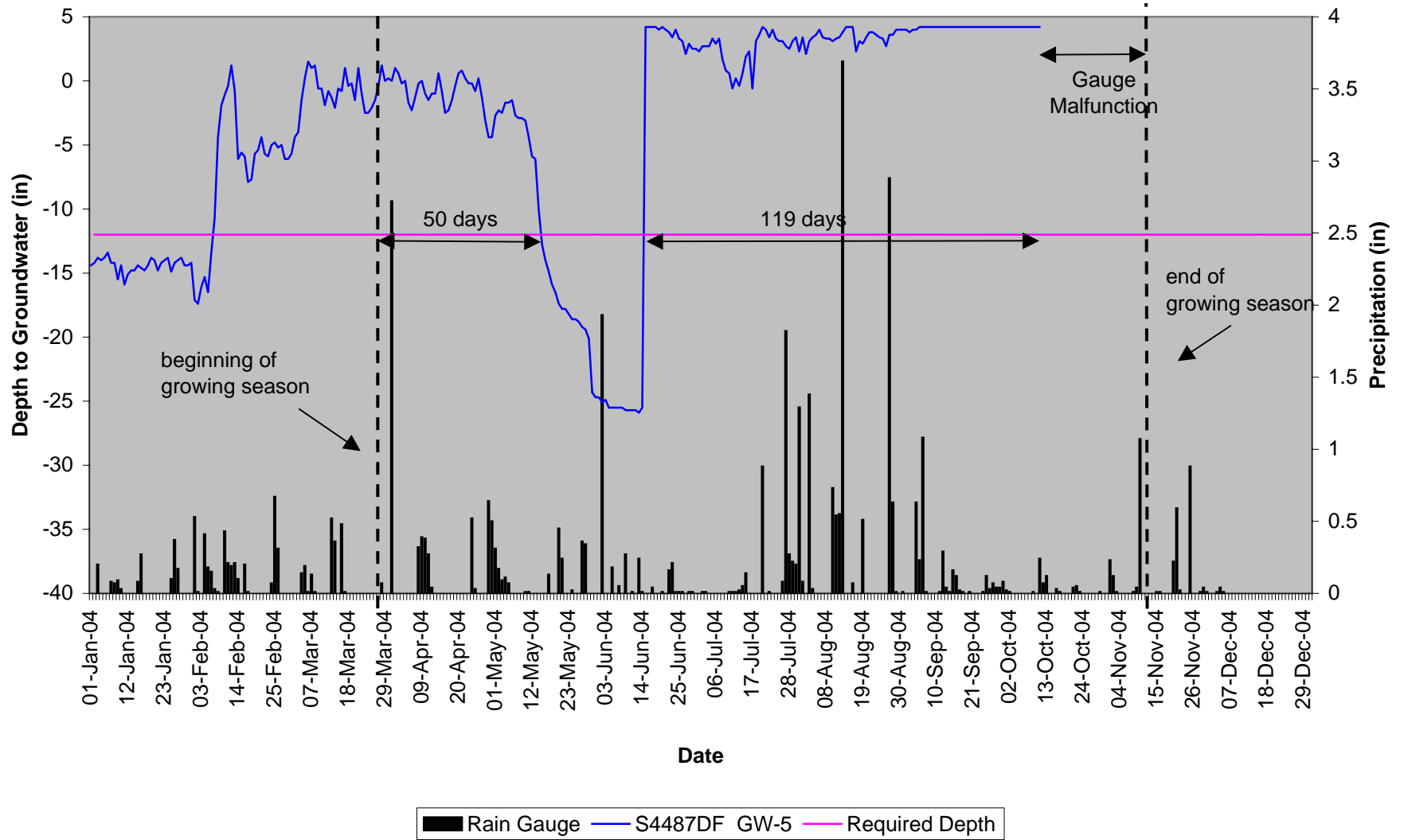
■ Rain Gauge — DL8E529FC GW-3 — Required Depth

White Oak Creek WO-GW4

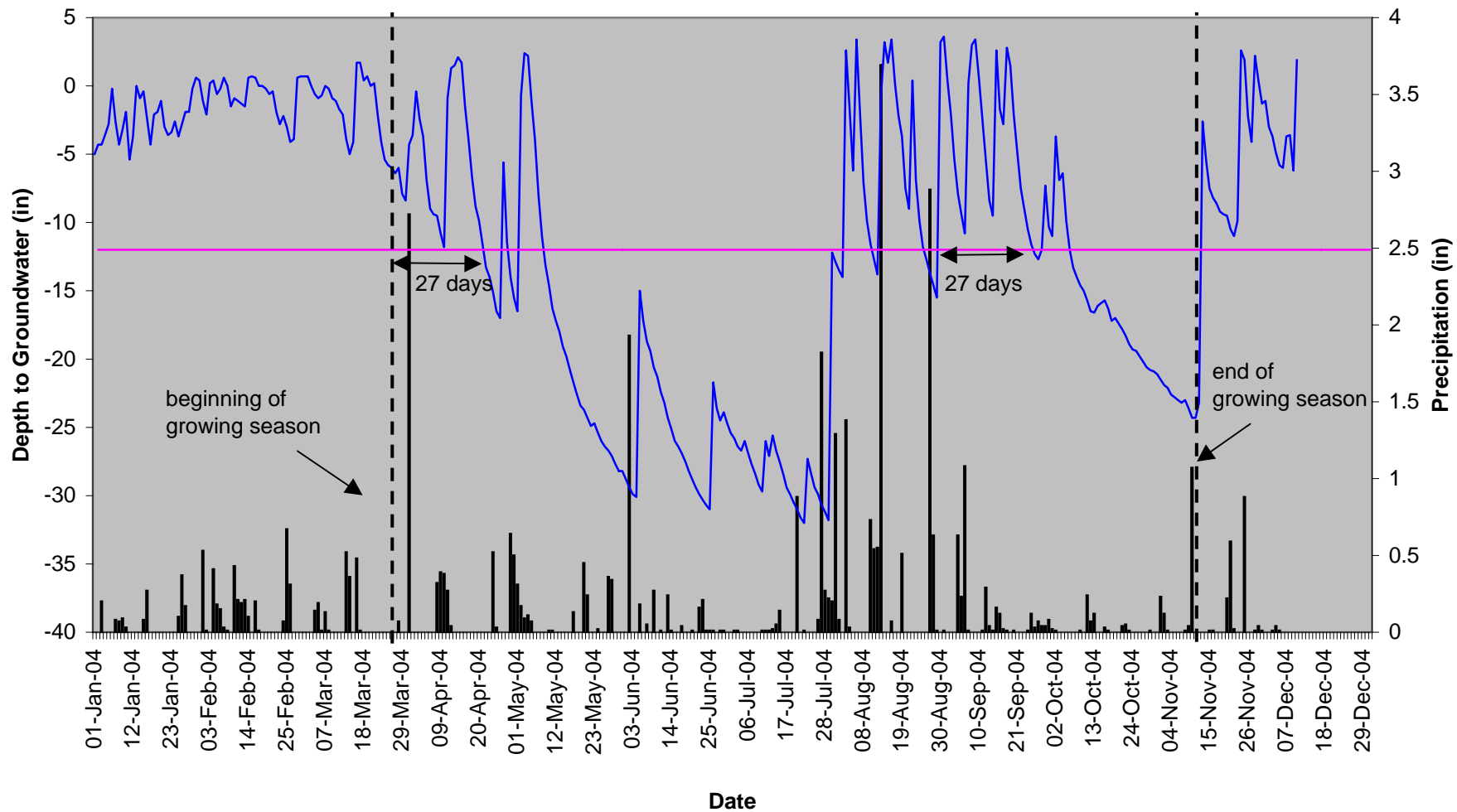


■ Rain Gauge — S448A17 GW-4 — Required Depth

White Oak Creek WO-GW5

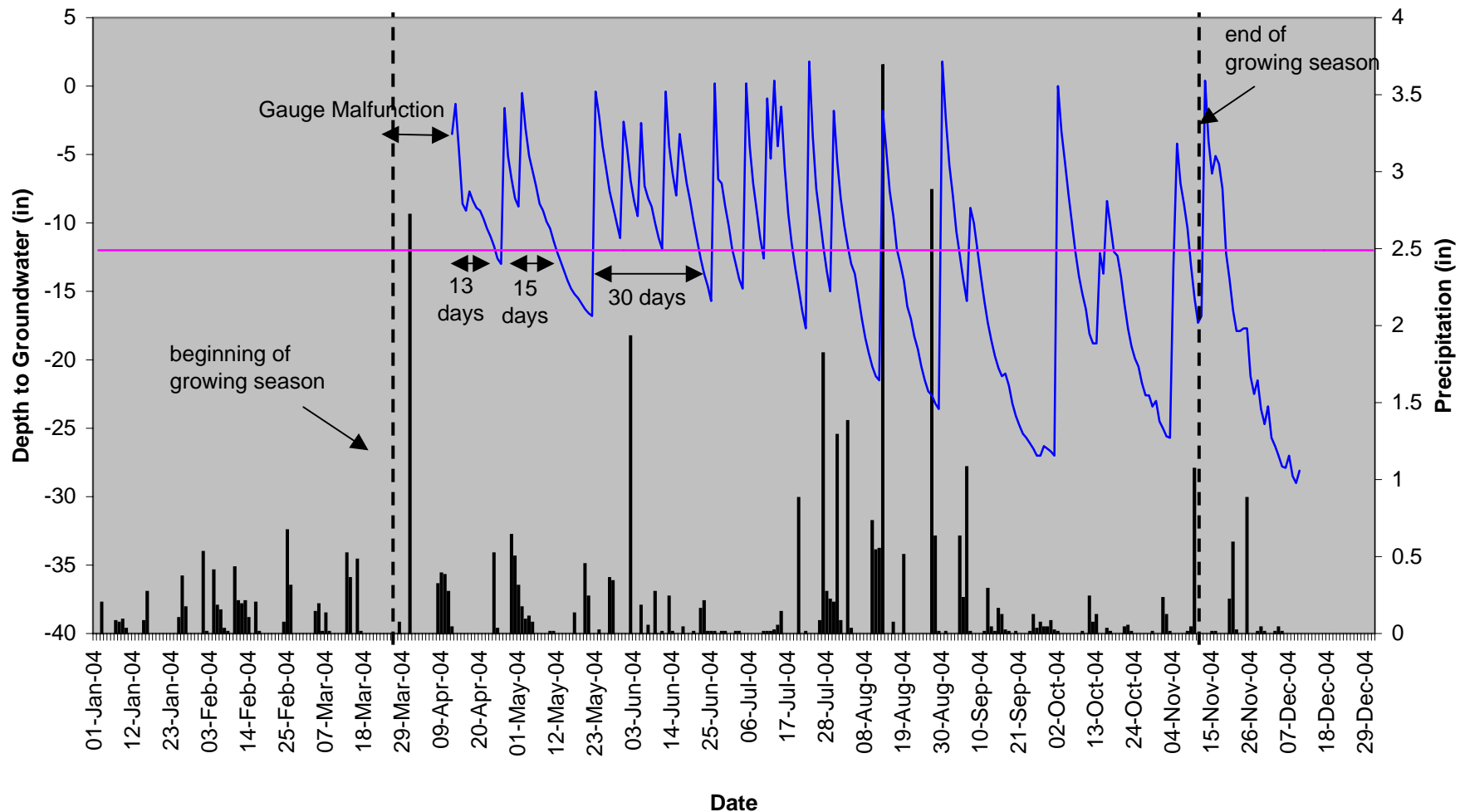


White Oak Creek WO-GW6



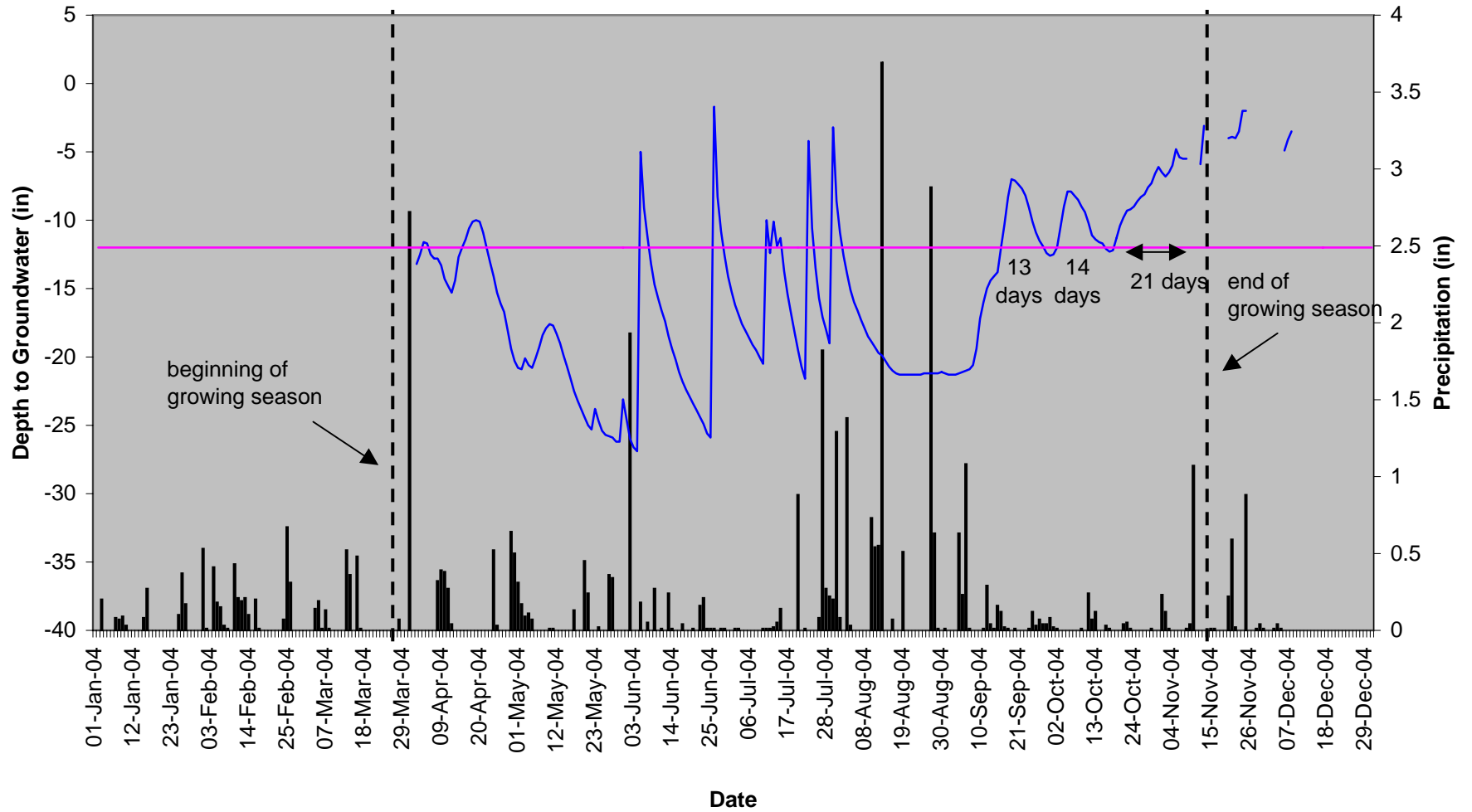
■ Rain Gauge — S4487EB GW-6 — Required Depth

White Oak Creek WO-GW7



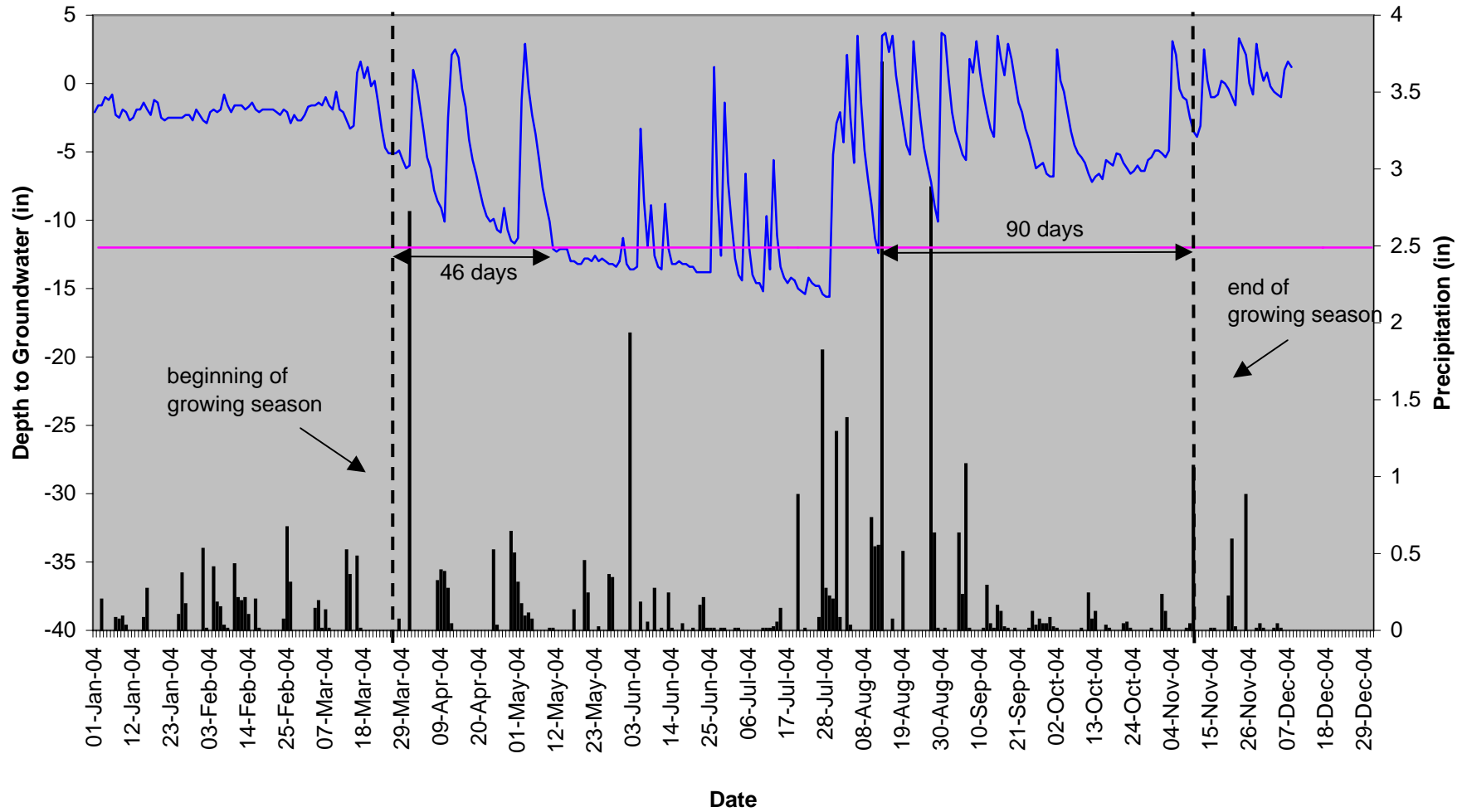
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White Oak Creek WO-GW8



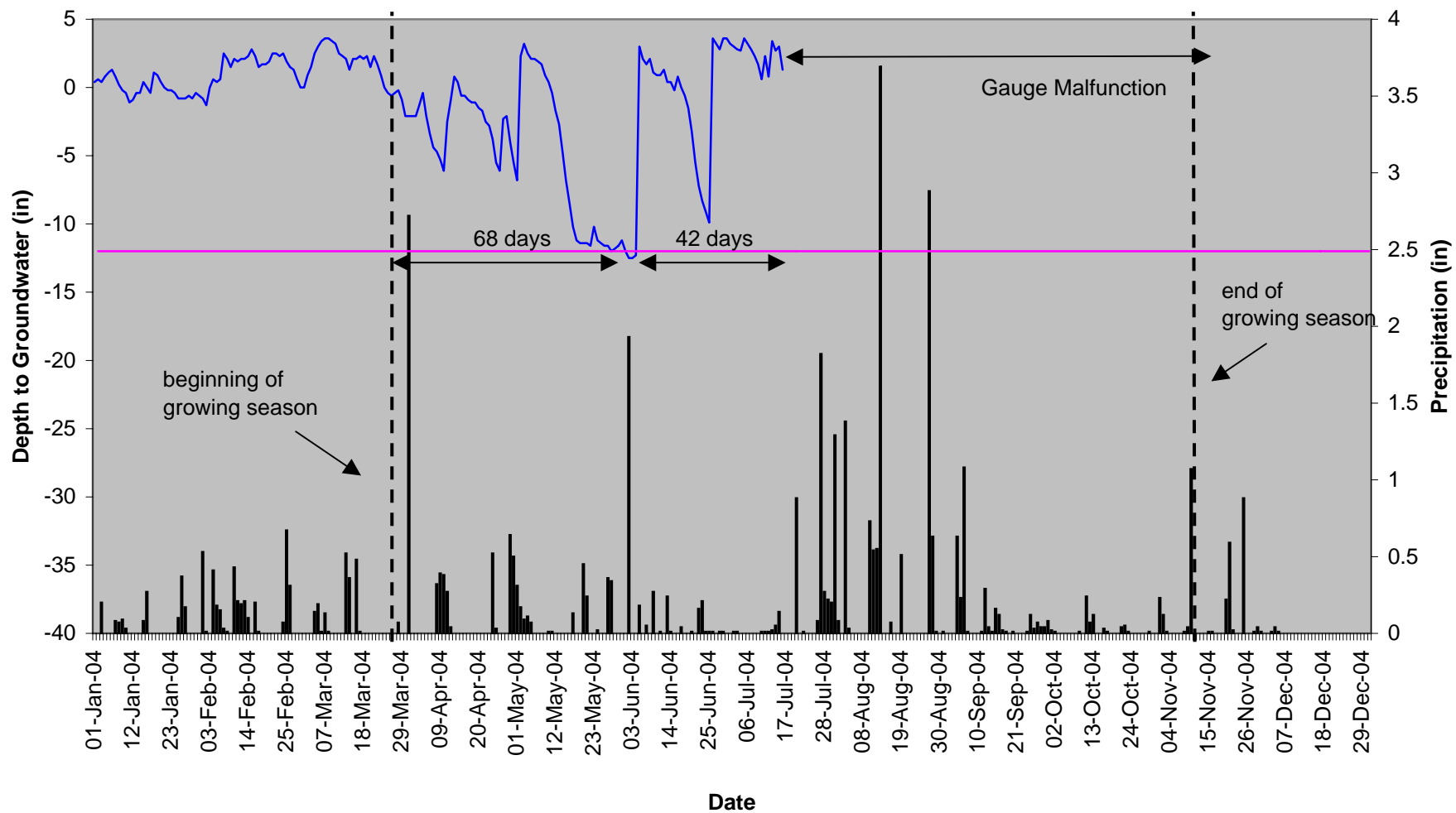
Rain Gauge
 DL9795ABD
 GW-8
 Required Depth

White Oak Creek WO-GW9



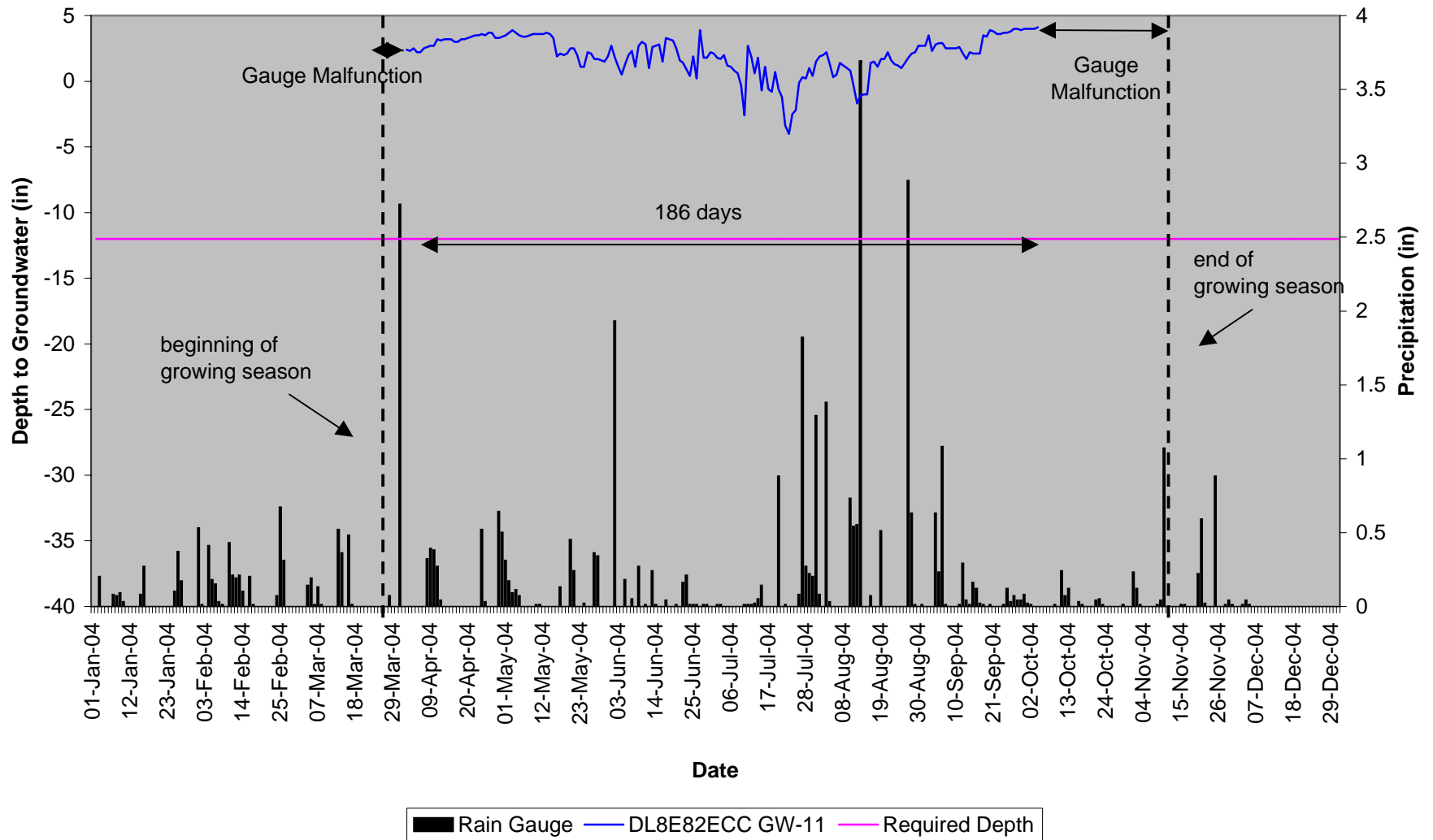
■ Rain Gauge — S504258 GW-9 — Required Depth

White Oak Creek WO-GW10

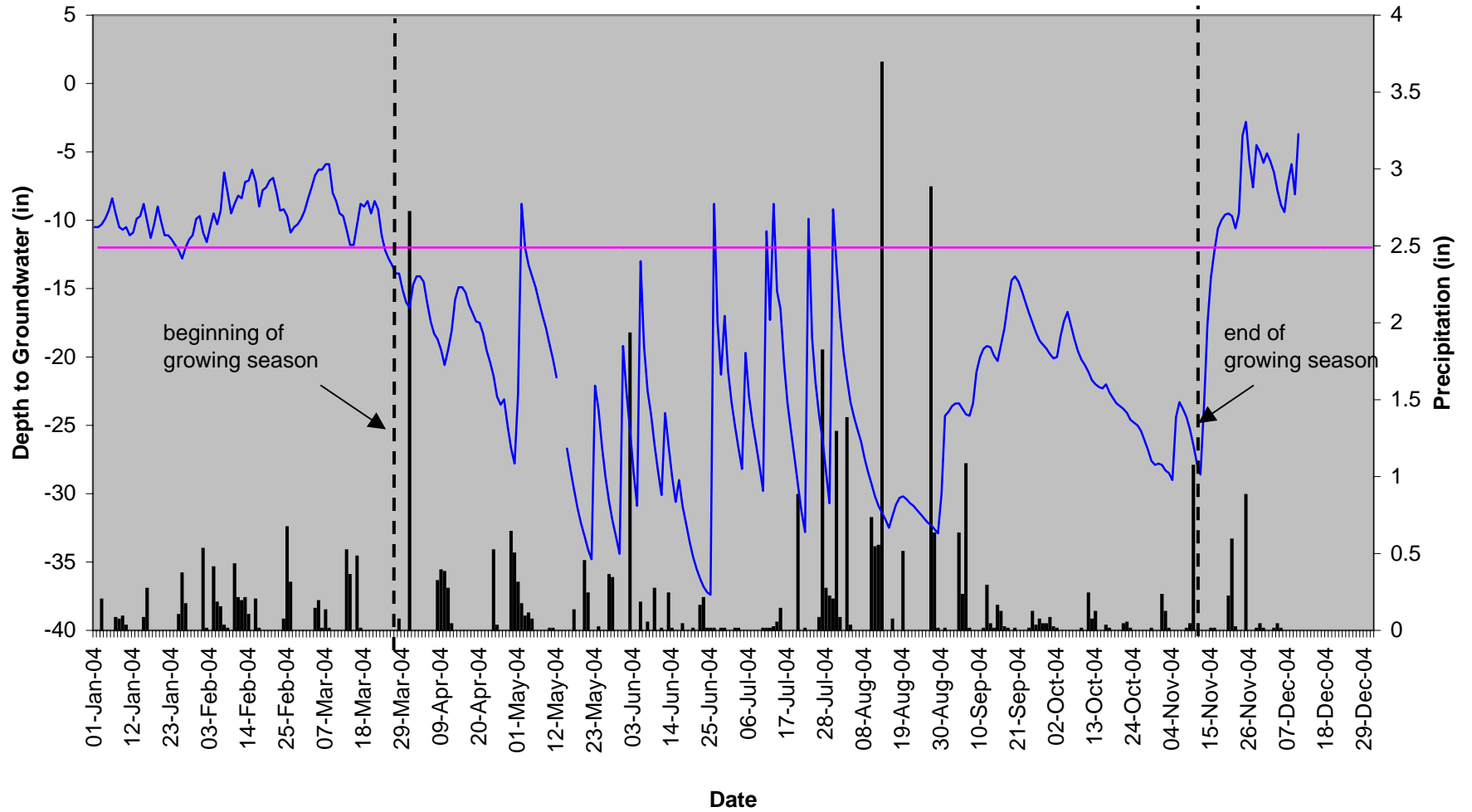


■ Rain Gauge — WM9DE5CAE GW-10 — Required Depth

White Oak Creek WO-GW11

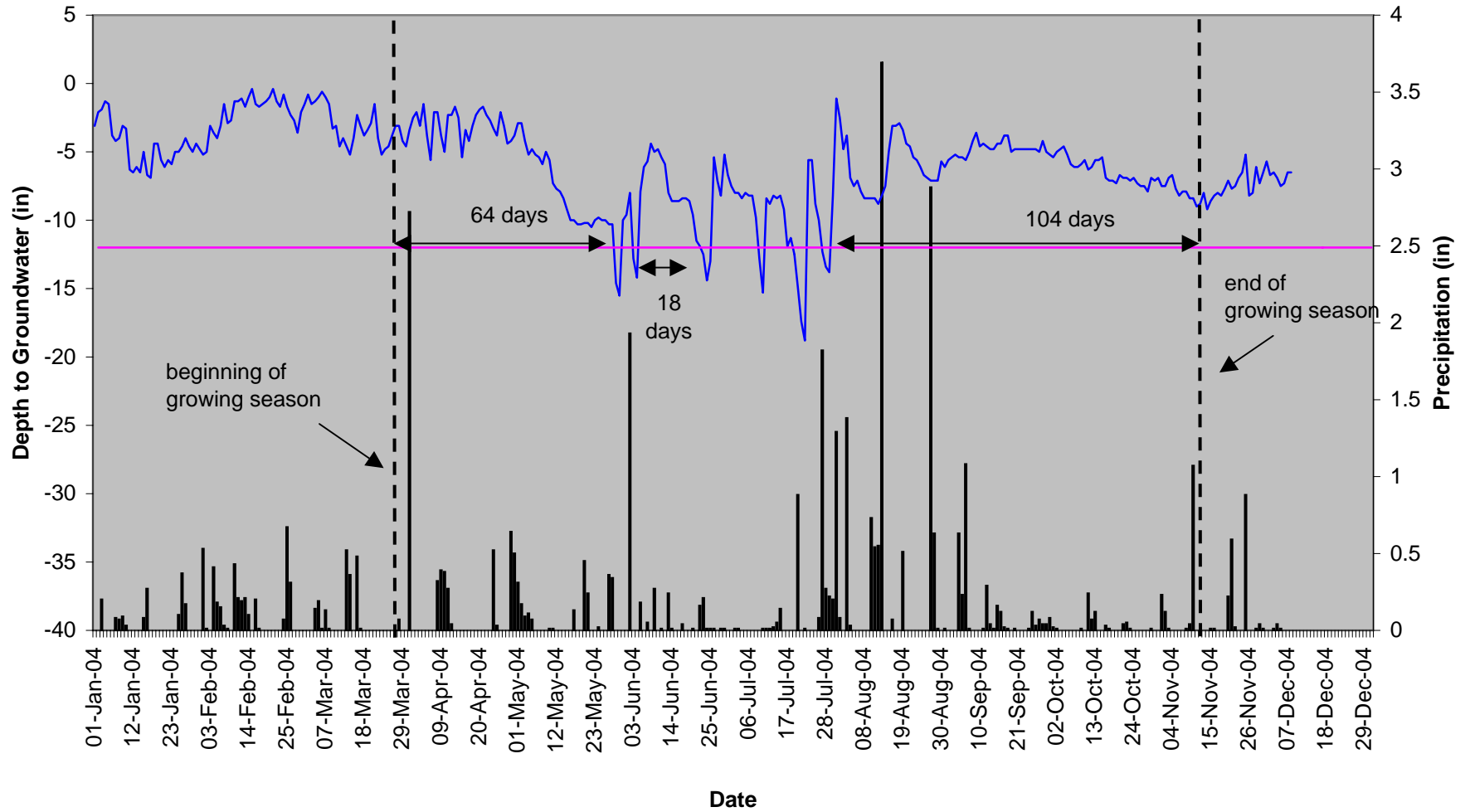


White Oak Creek WO-GW12



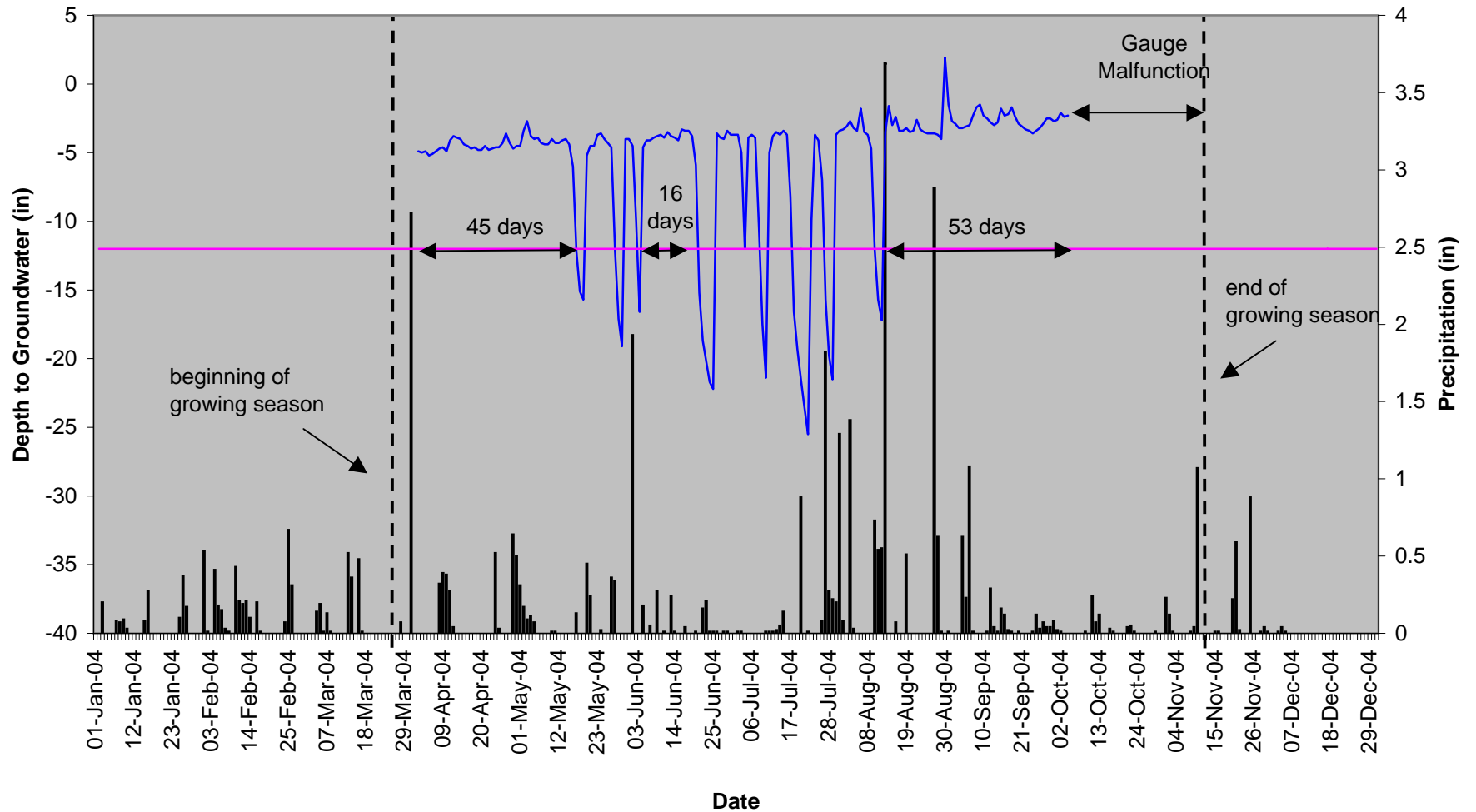
■ Rain Gauge — DL8E55F13 GW-12 — Required Depth

White Oak Creek WO-GW13



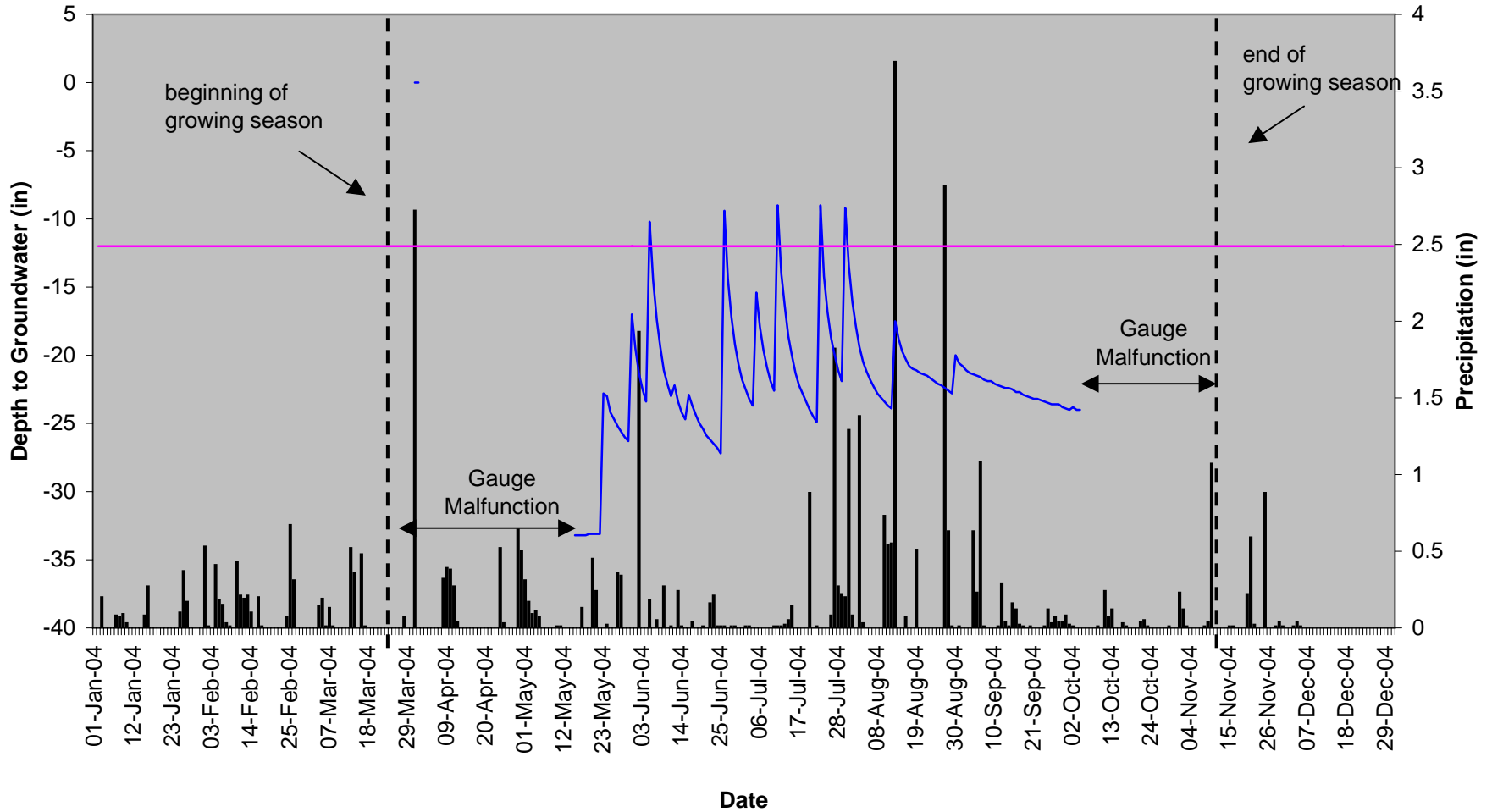
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White Oak Creek WO-GW14



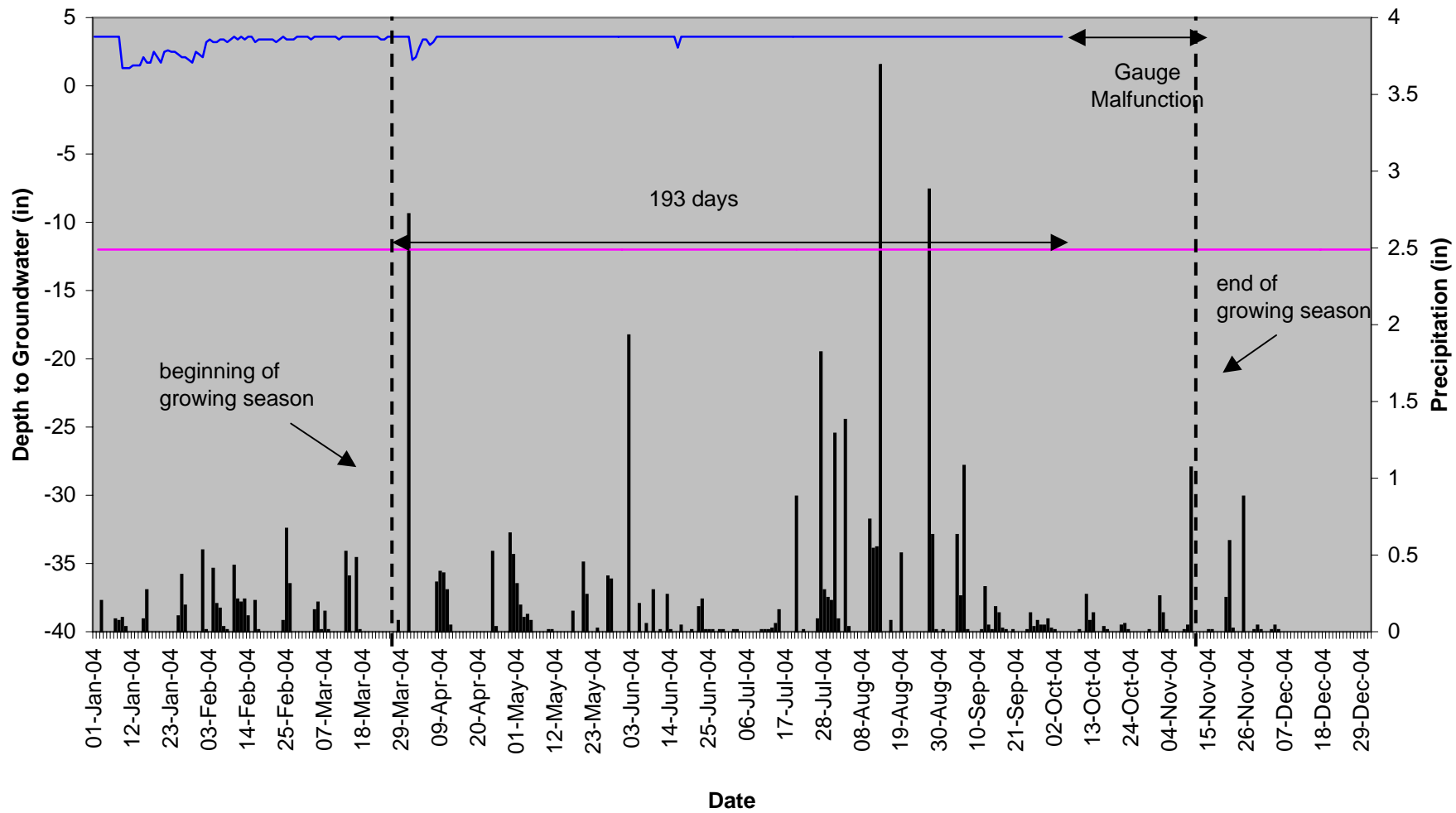
Rain Gauge
 DL9D7ECE7 GW-14
 Required Depth

White Oak Creek WO-GW15



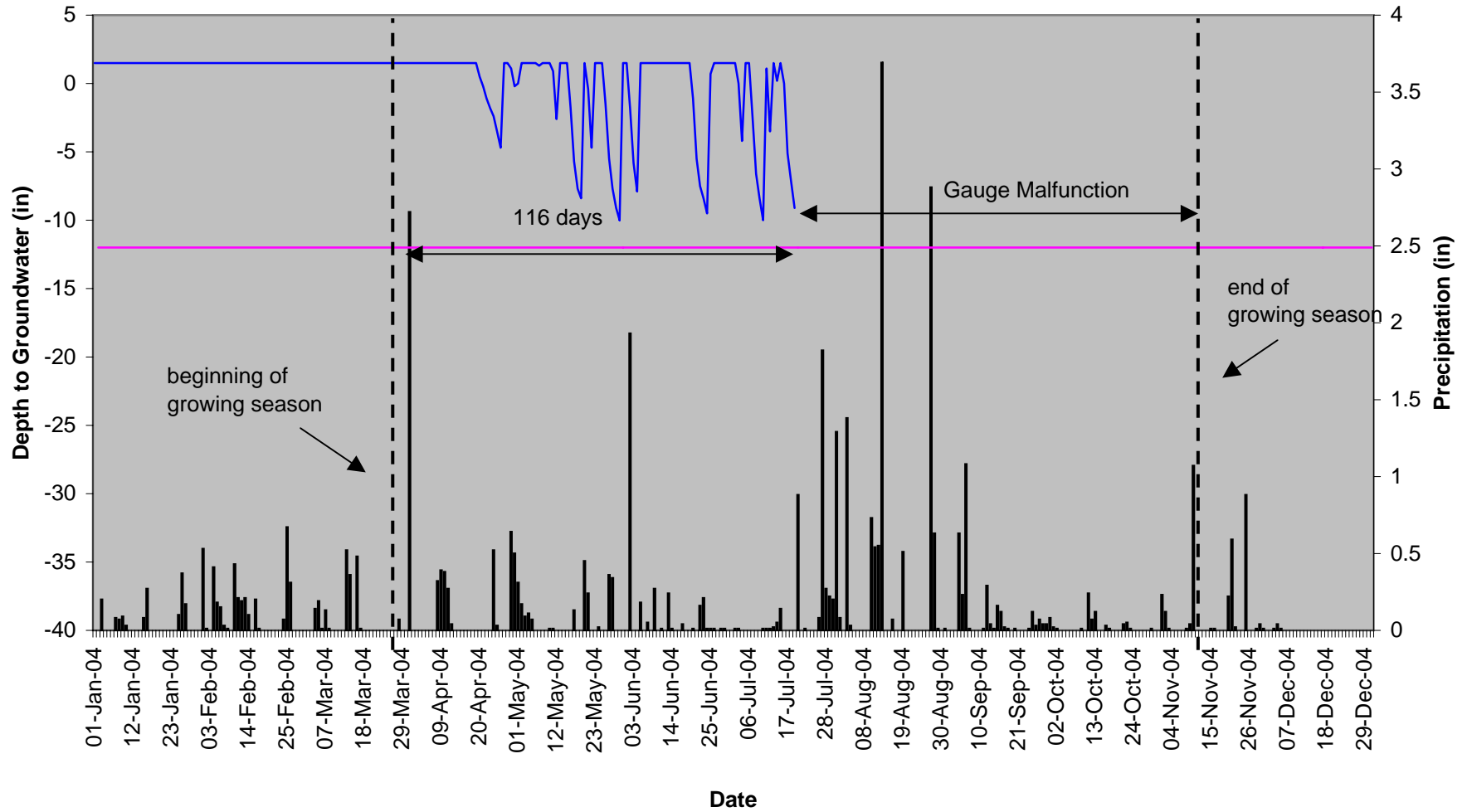
■ Rain Gauge — WM9DE497E GW-15 — Required Depth

White Oak Creek WO-GW16



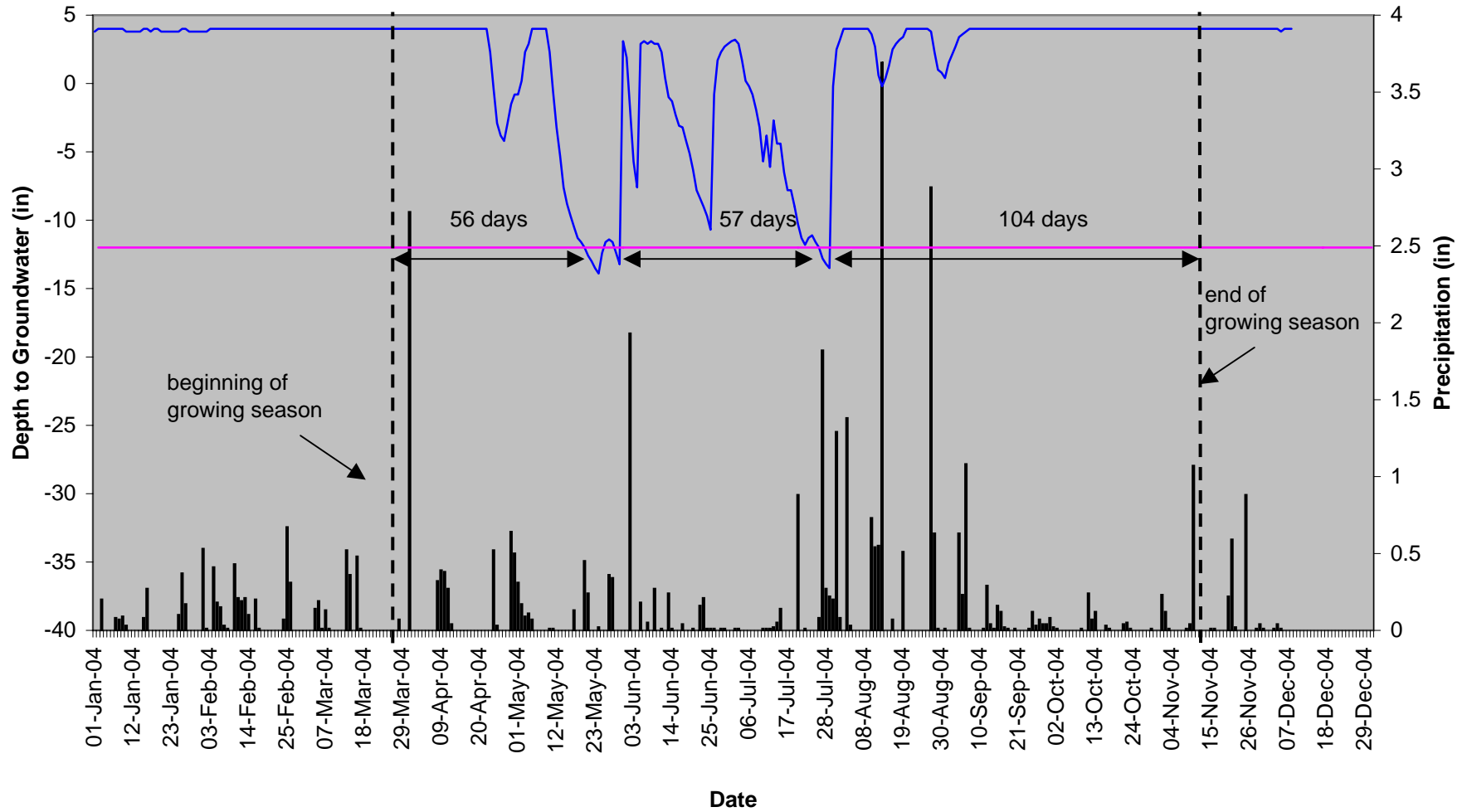
Legend: Rain Gauge (black bars), S448798 GW-16 (blue line), Required Depth (magenta line)

White Oak Creek WO-GW17



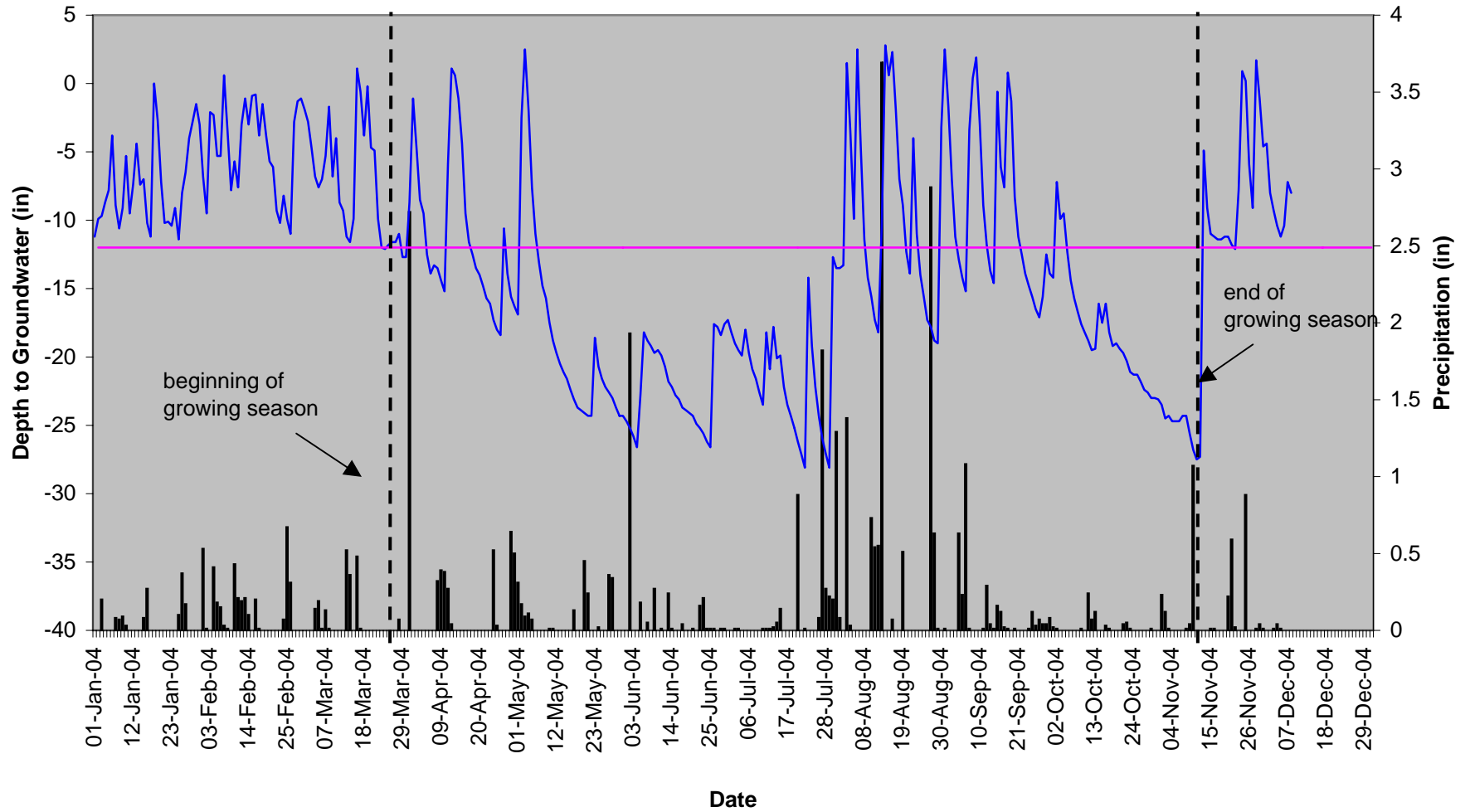
■ Rain Gauge — S213FEA GW-17 — Required Depth

White Oak Creek WO-GW18



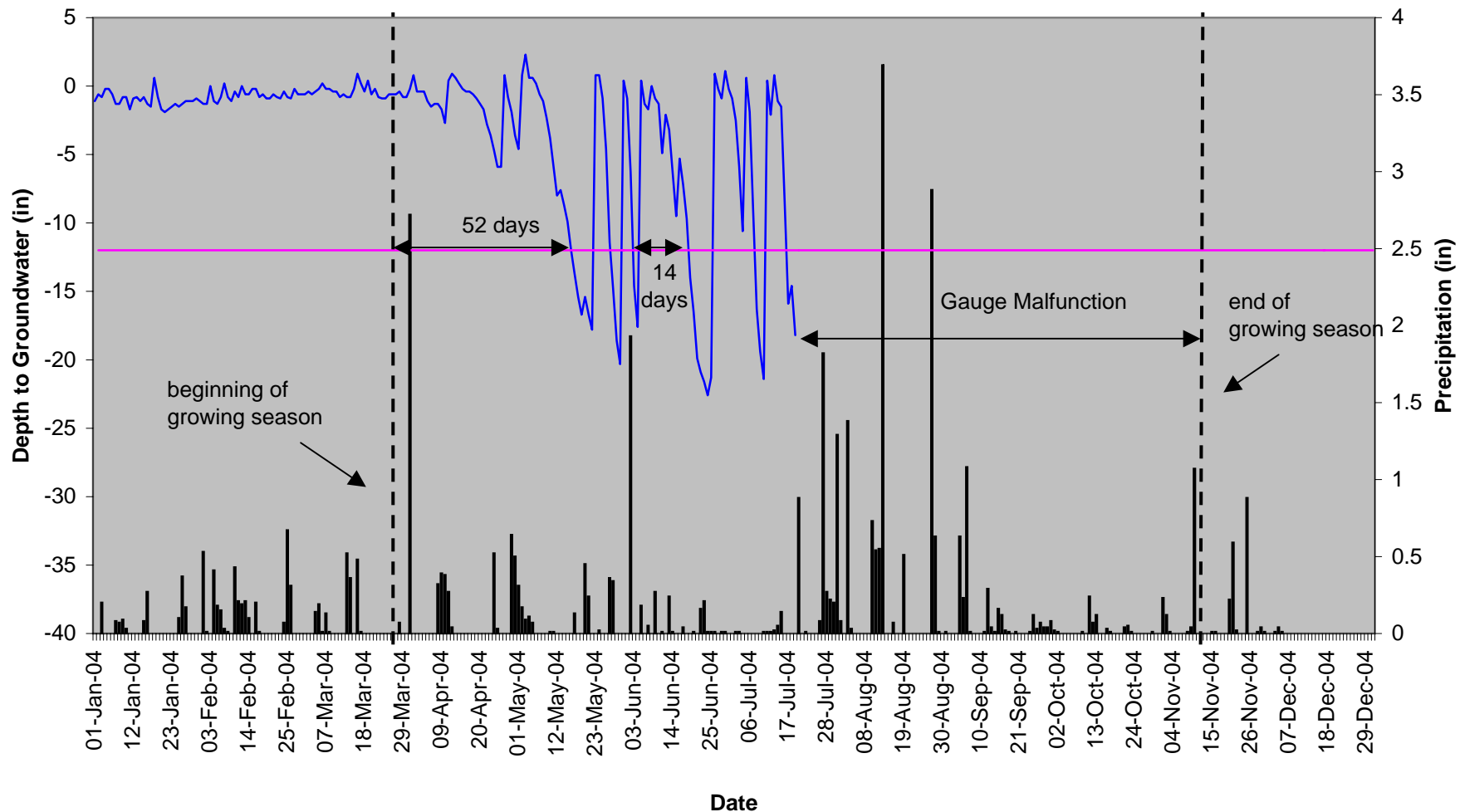
Rain Gauge
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 Required Depth

White Oak Creek WO-GW19



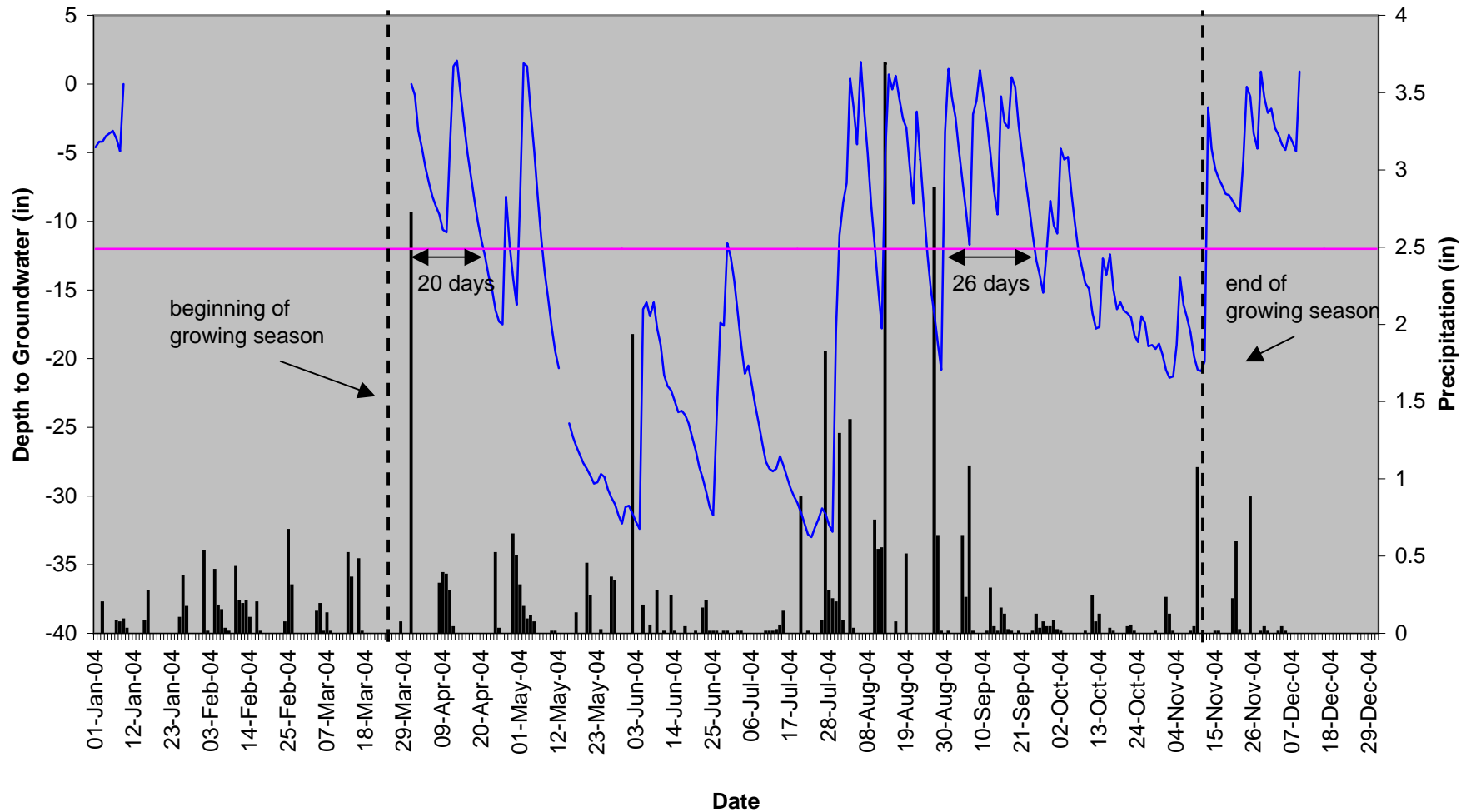
■ Rain Gauge — S4CFF90 GW-19 — Required Depth

White Oak Creek WO-GW20



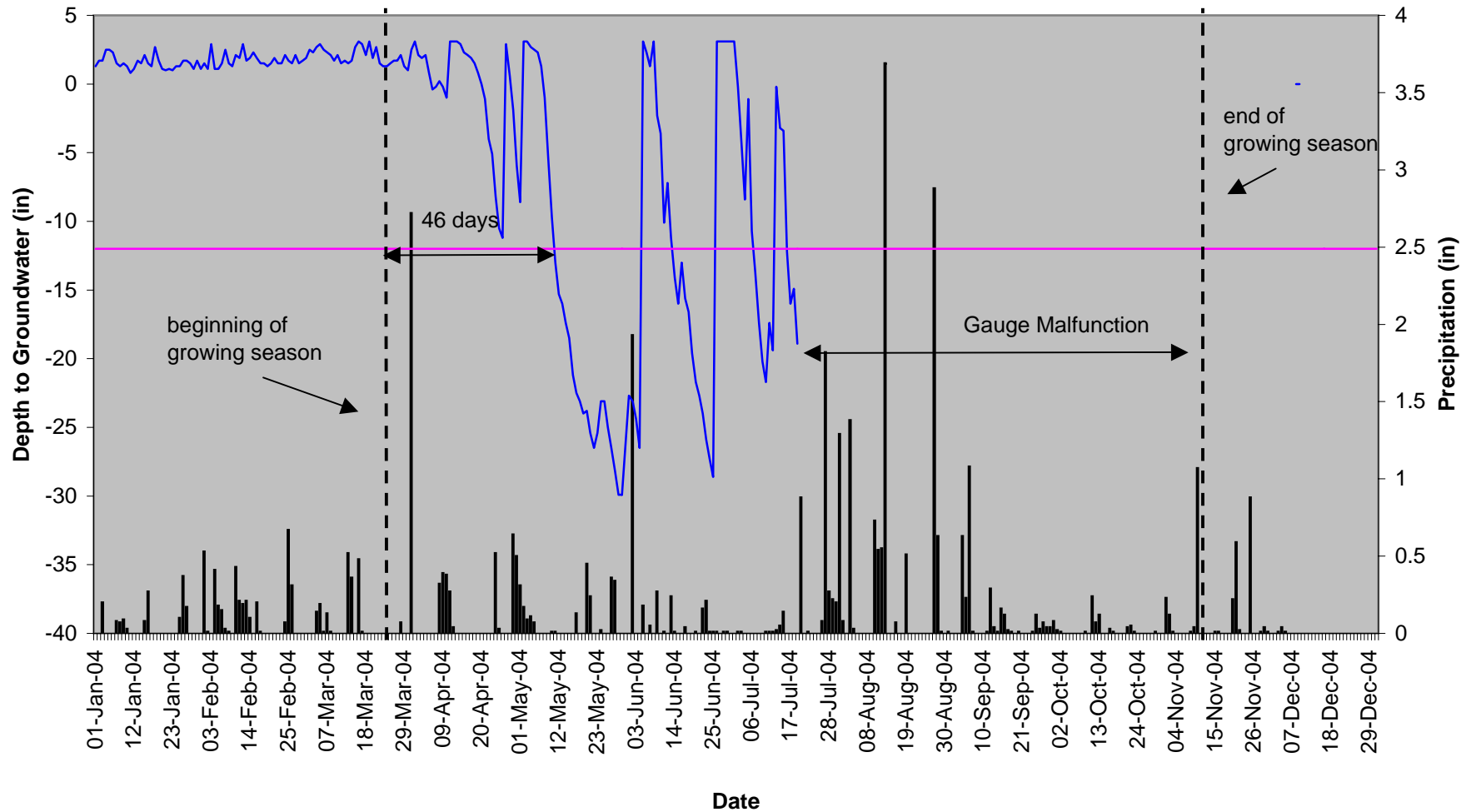
Rain Gauge
 WM9DE4246 GW-20
 Required Depth

White Oak Creek WO-GW21



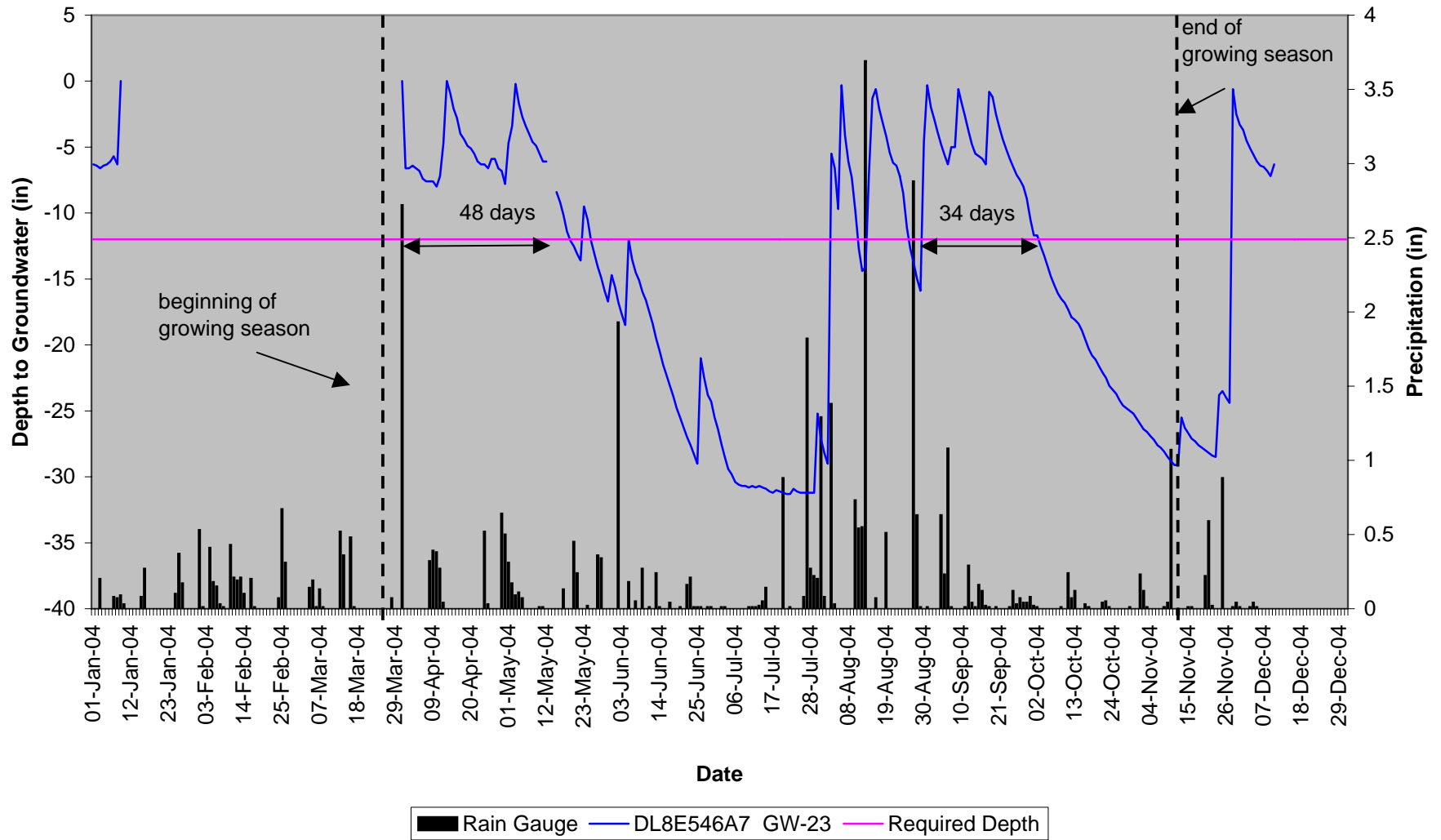
■ Rain Gauge — DL8E52B93 GW-21 — Required Depth

White Oak Creek WO-GW22

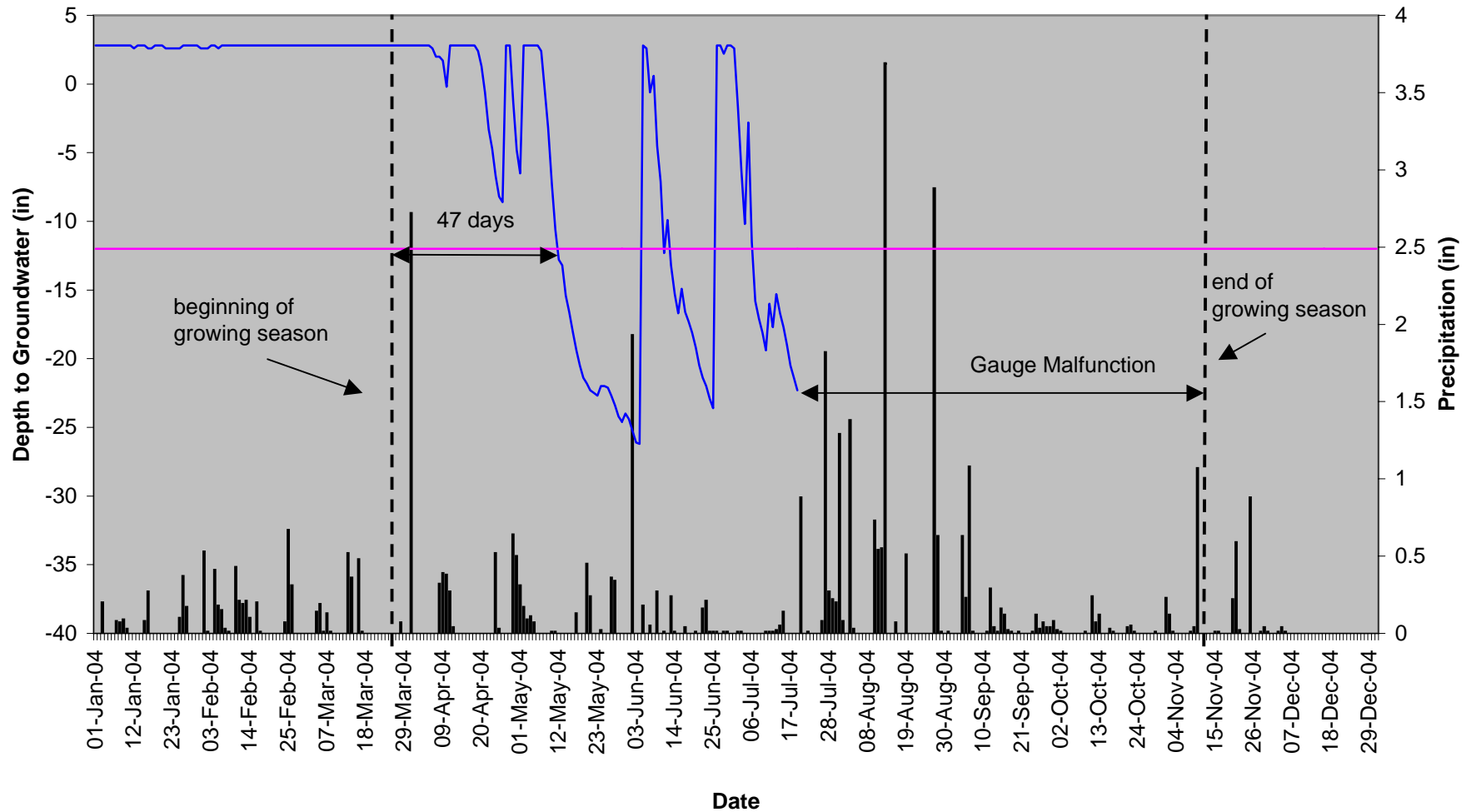


■ Rain Gauge — WM9DE4889 GW-22 — Required Depth

White Oak Creek WO-GW23

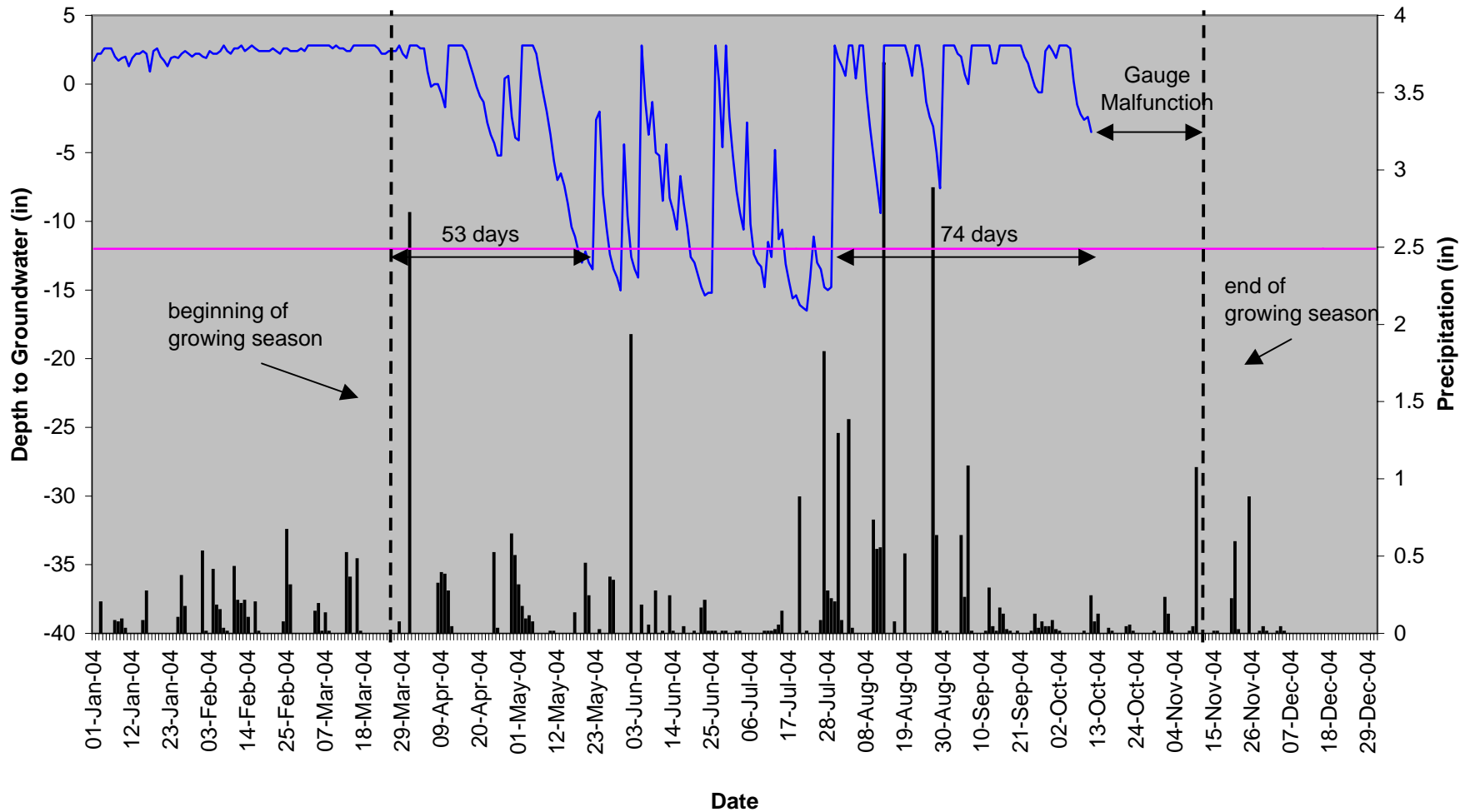


White Oak Creek WO-GW24



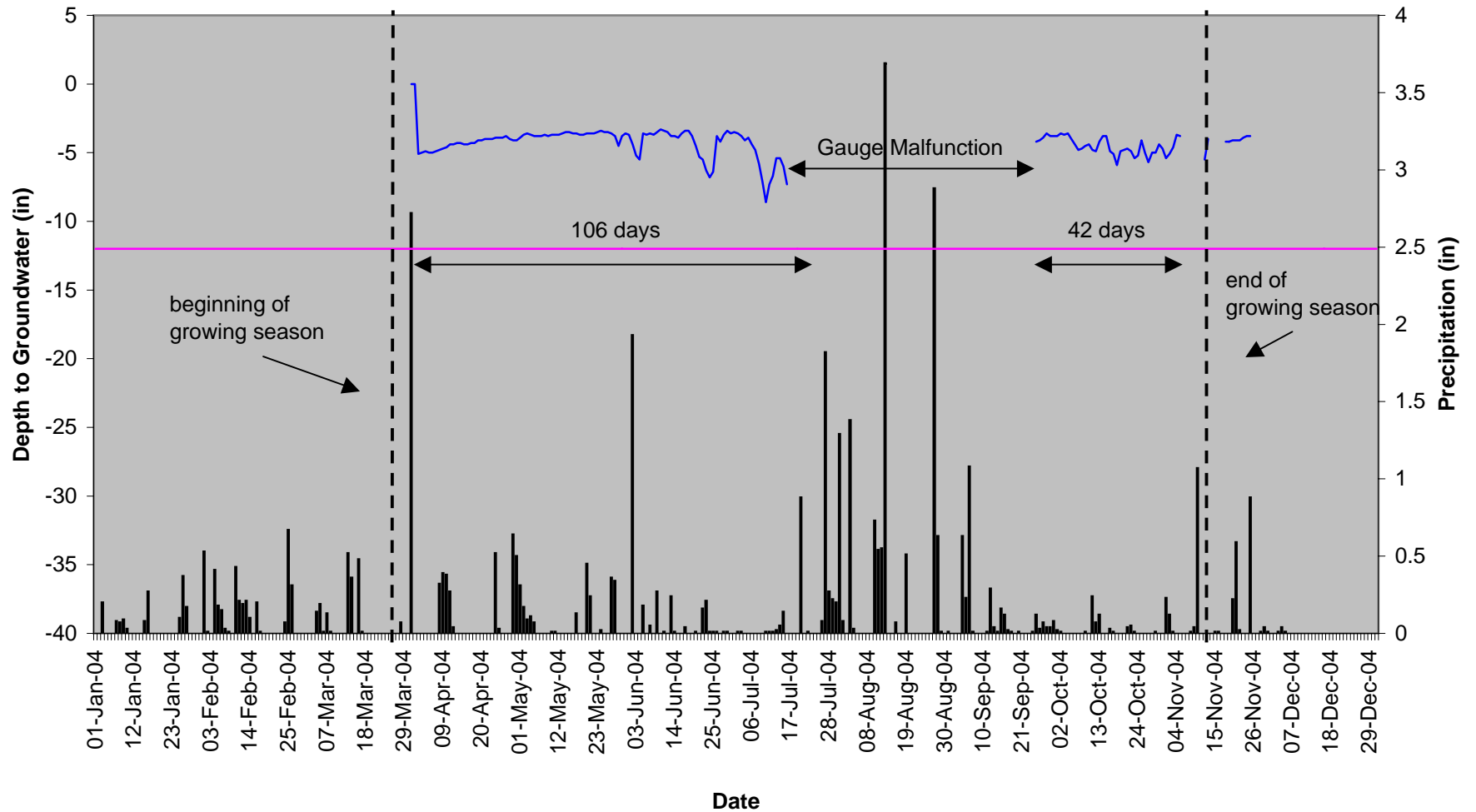
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White Oak Creek WO-GW25



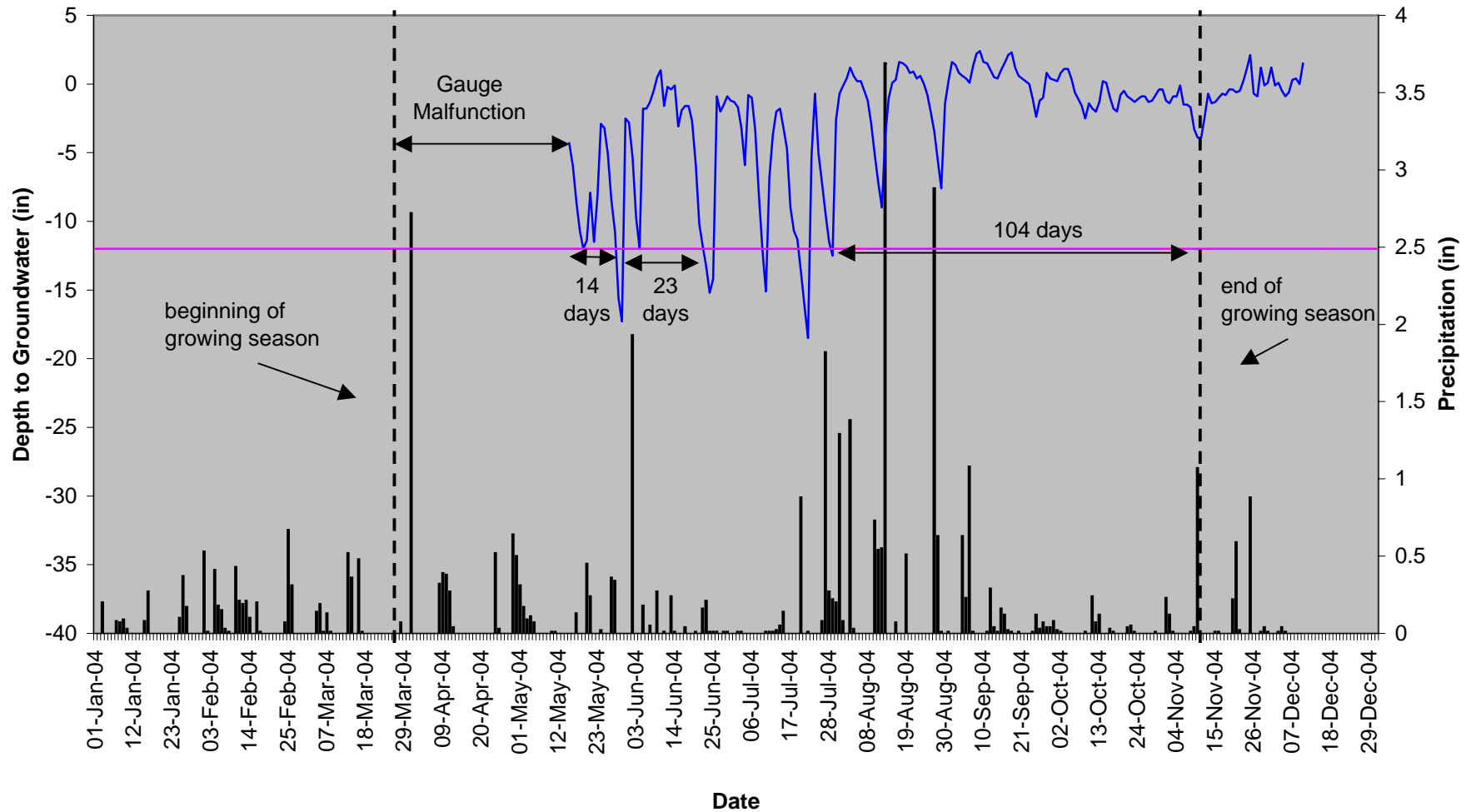
■ Rain Gauge — WM9DE73E2 GW-25 — Required Depth

White Oak Creek WO-GW26



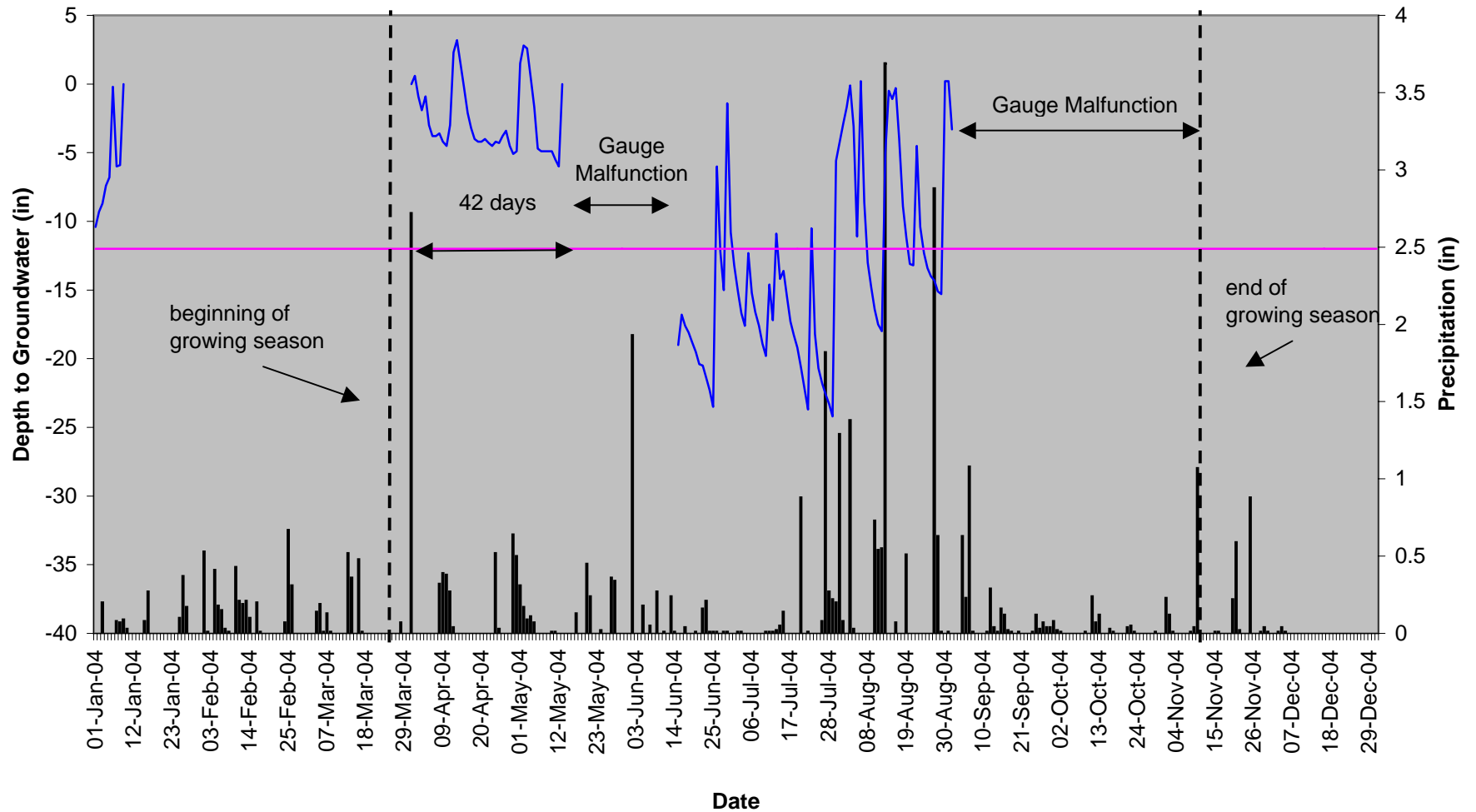
■ Rain Gauge — DL8E83B10 GW-26 — Required Depth

White Oak Creek WO-GW27



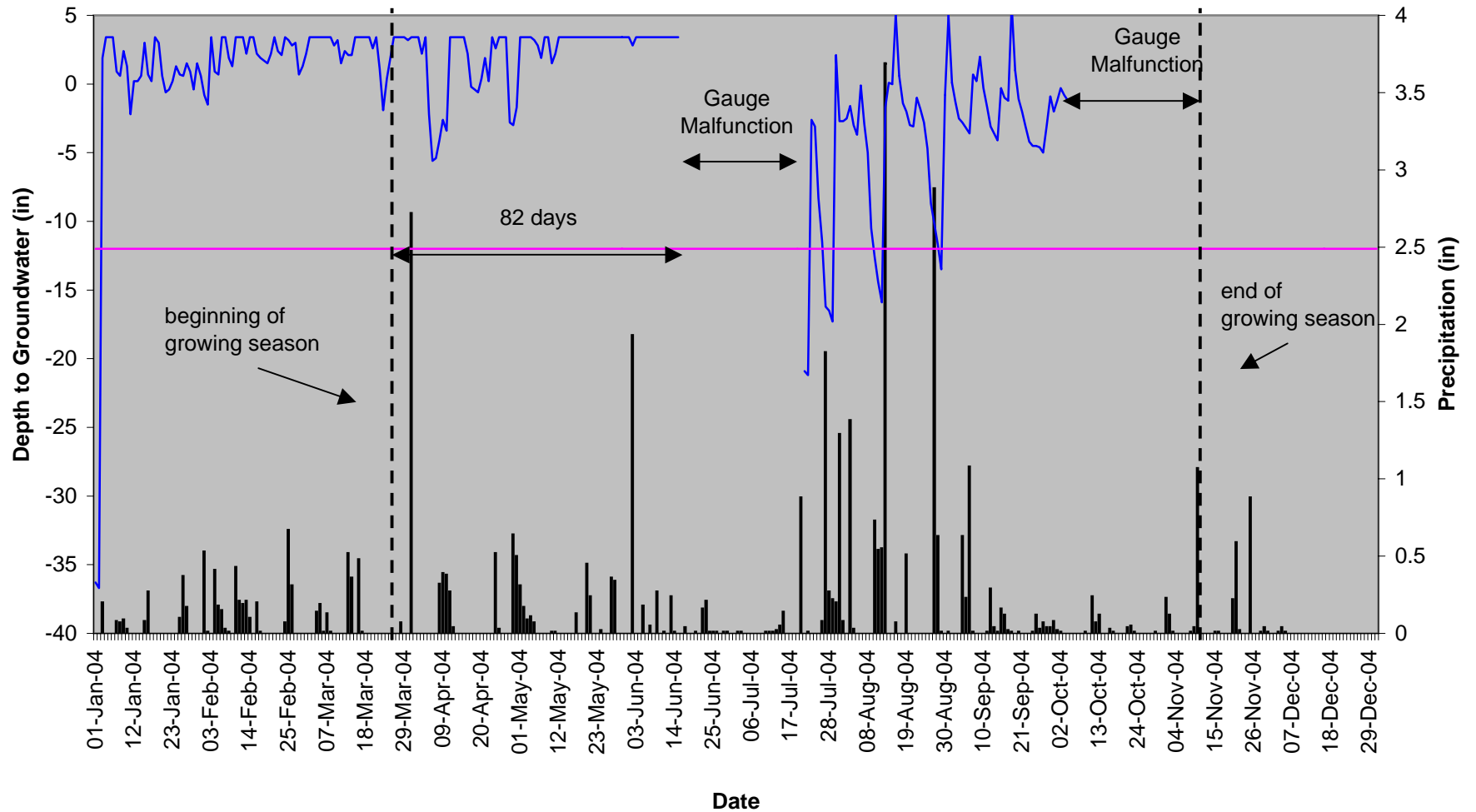
Rain Gauge
 DL8E54126 GW-27
 Required Depth

White Oak Creek WO-GW28



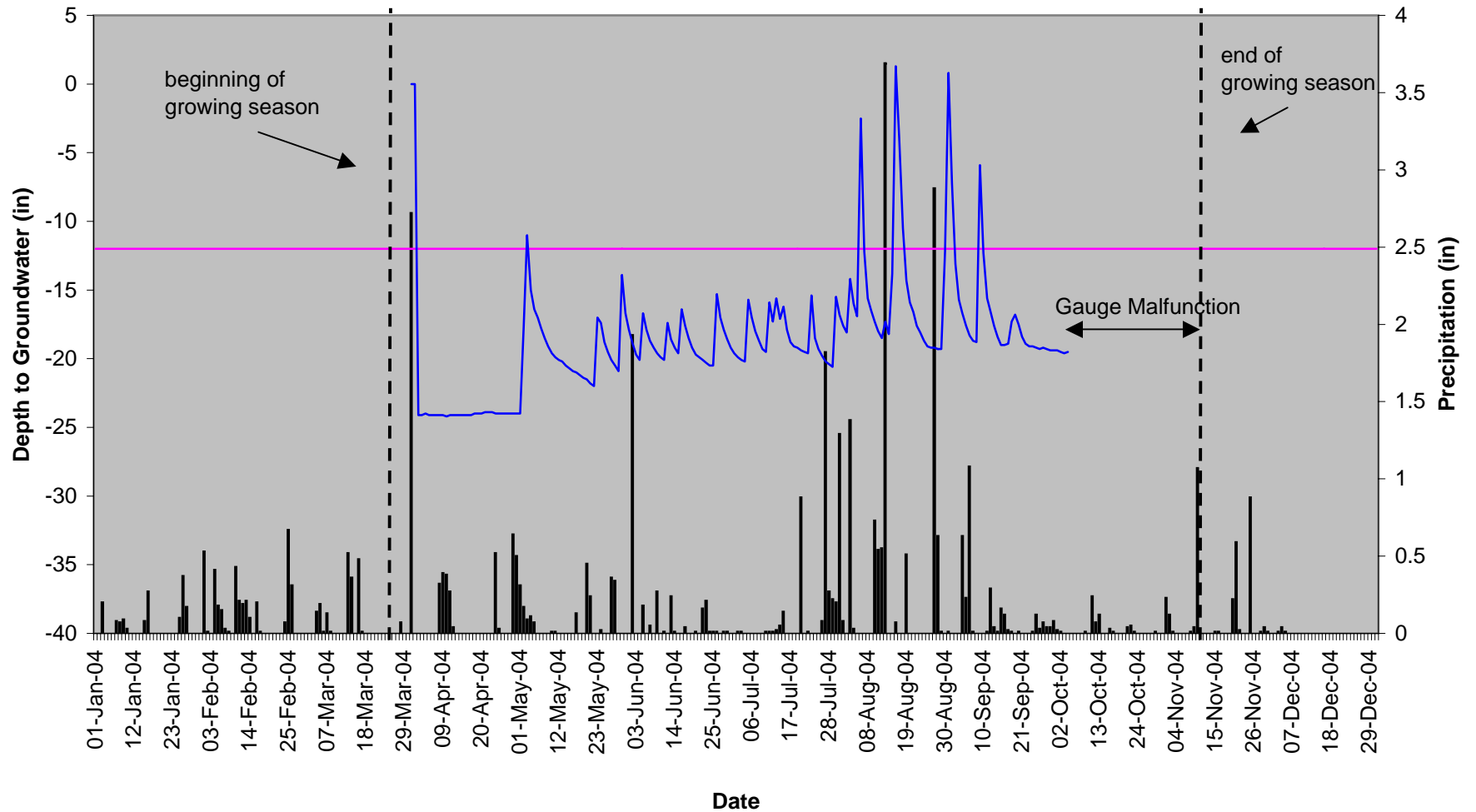
■ Rain Gauge — GW28 — Required Depth

White Oak Creek WO-GW29



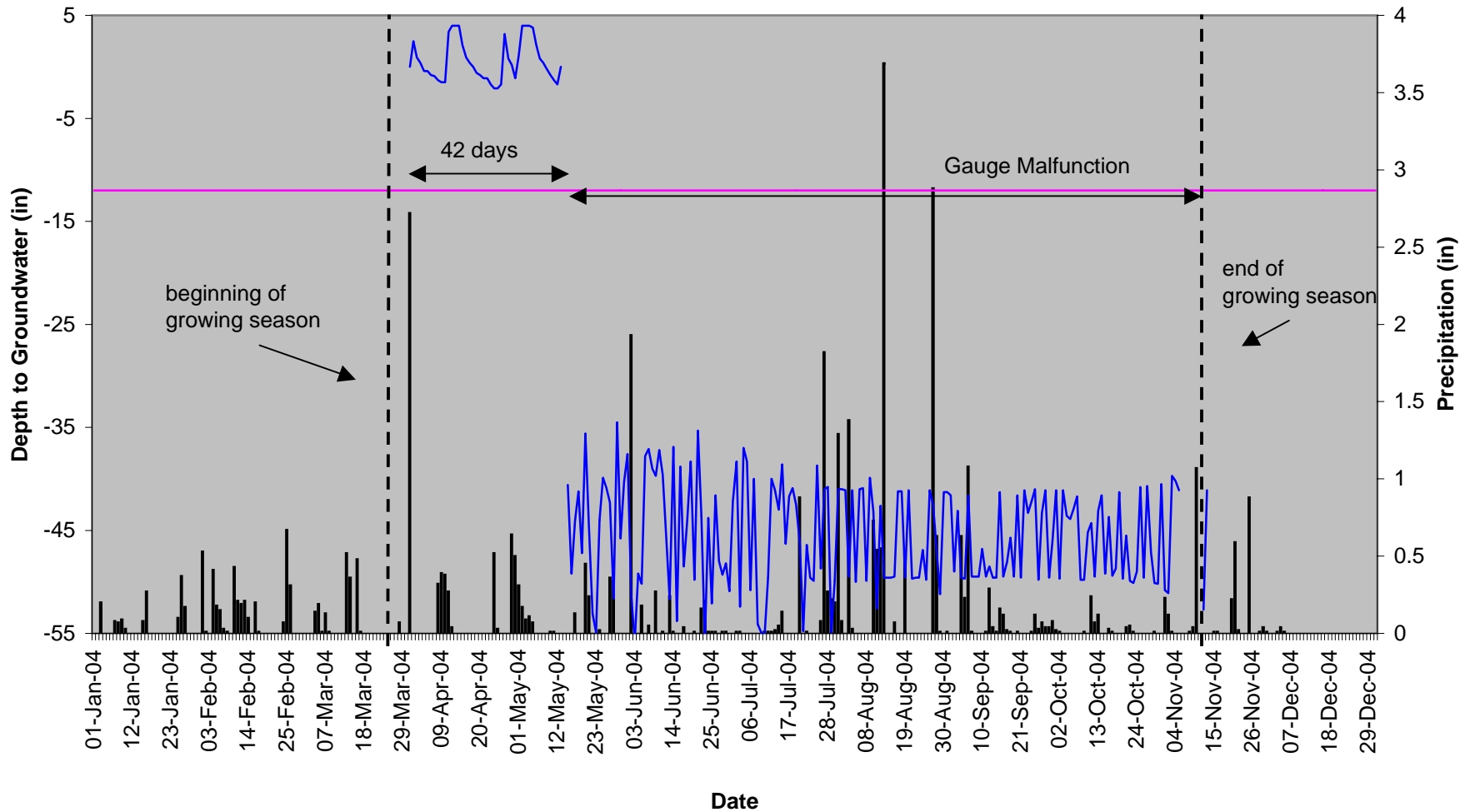
■ Rain Gauge — DL8E55FC5 GW-29 — Required Depth

White Oak Creek WO-GW30



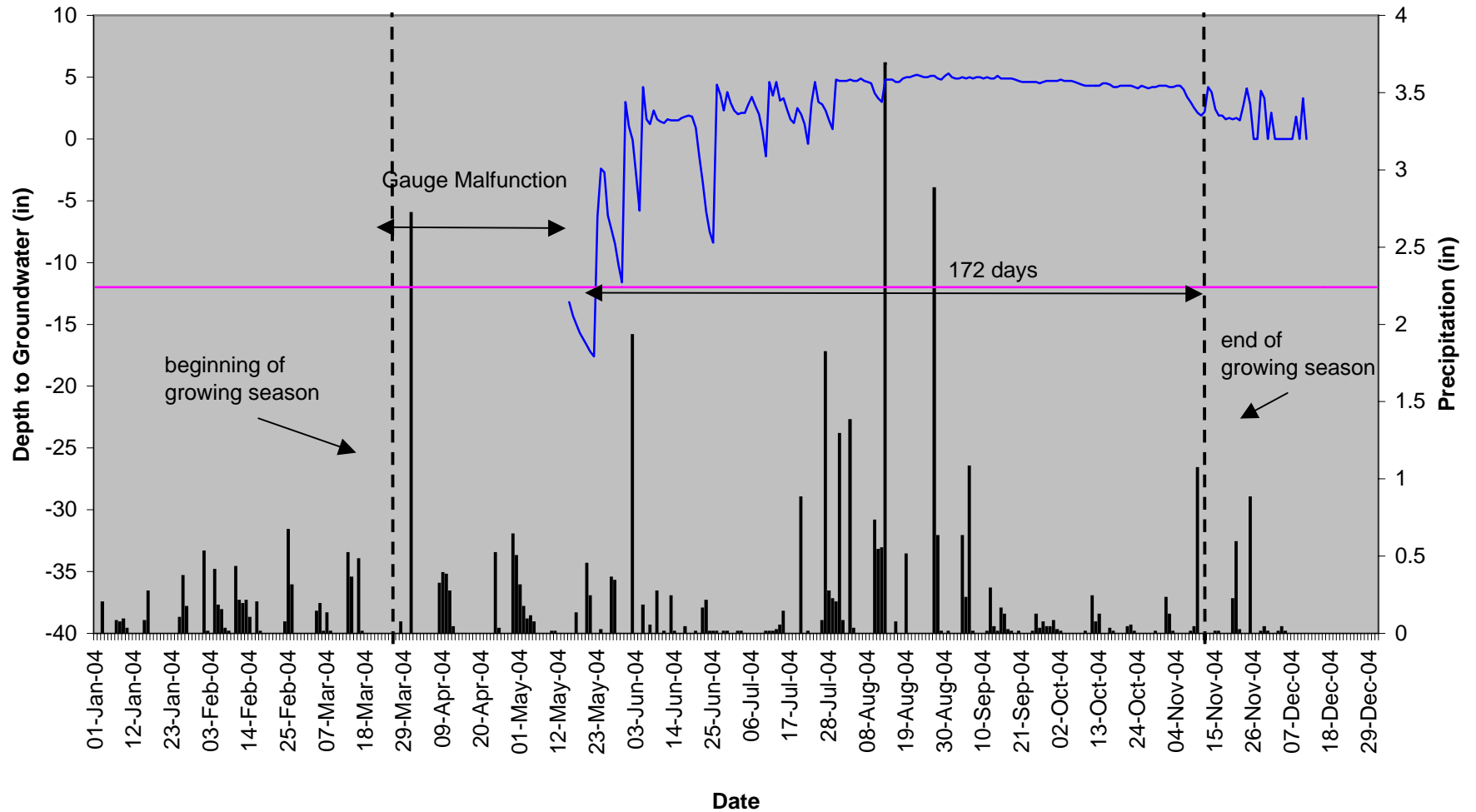
■ Rain Gauge — Required Depth — DL8E556CA GW-30

White Oak Creek WO-GW31



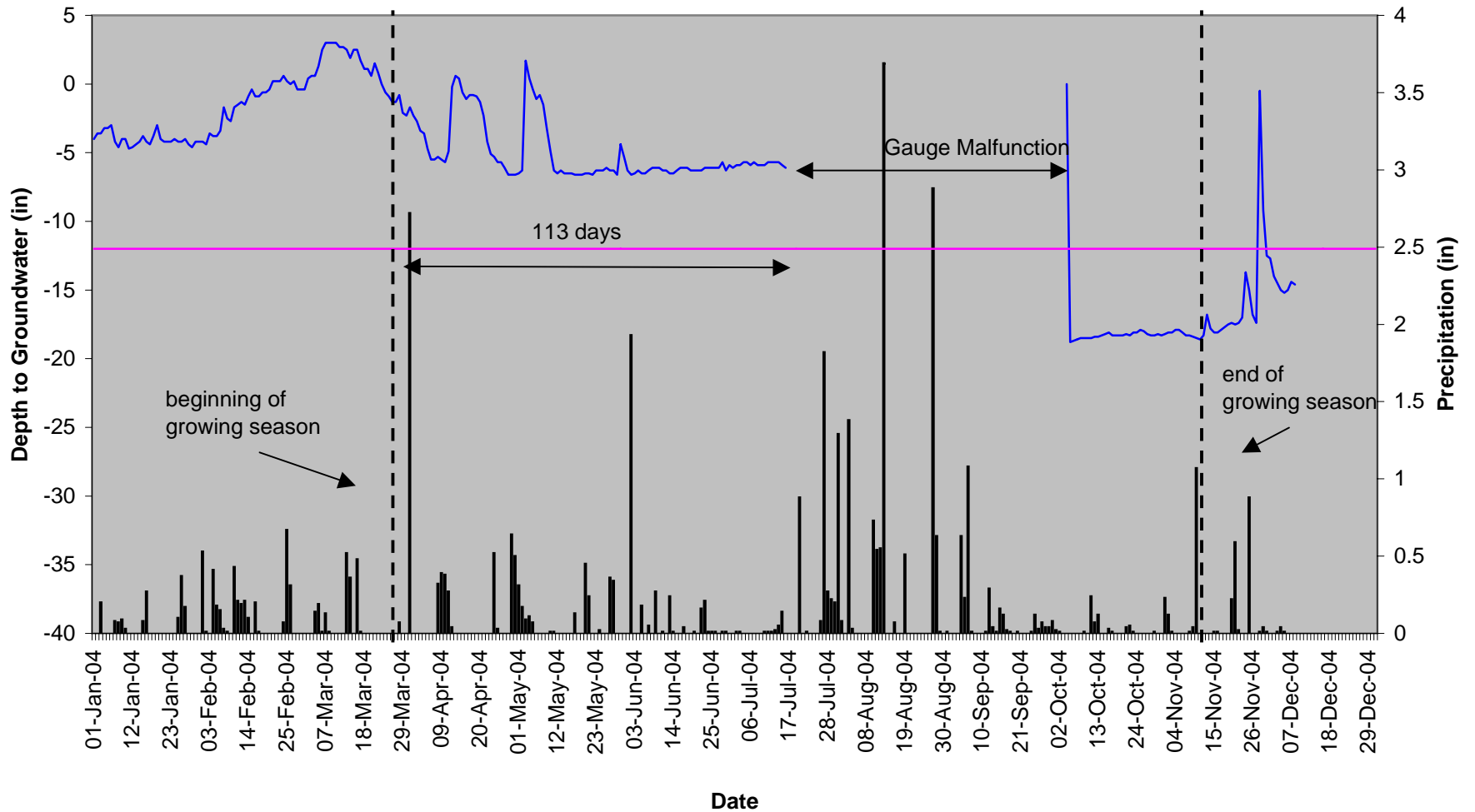
Rain Gauge
 DL8E576F0 GW-31
 Required Depth

White Oak Creek WO-GW32



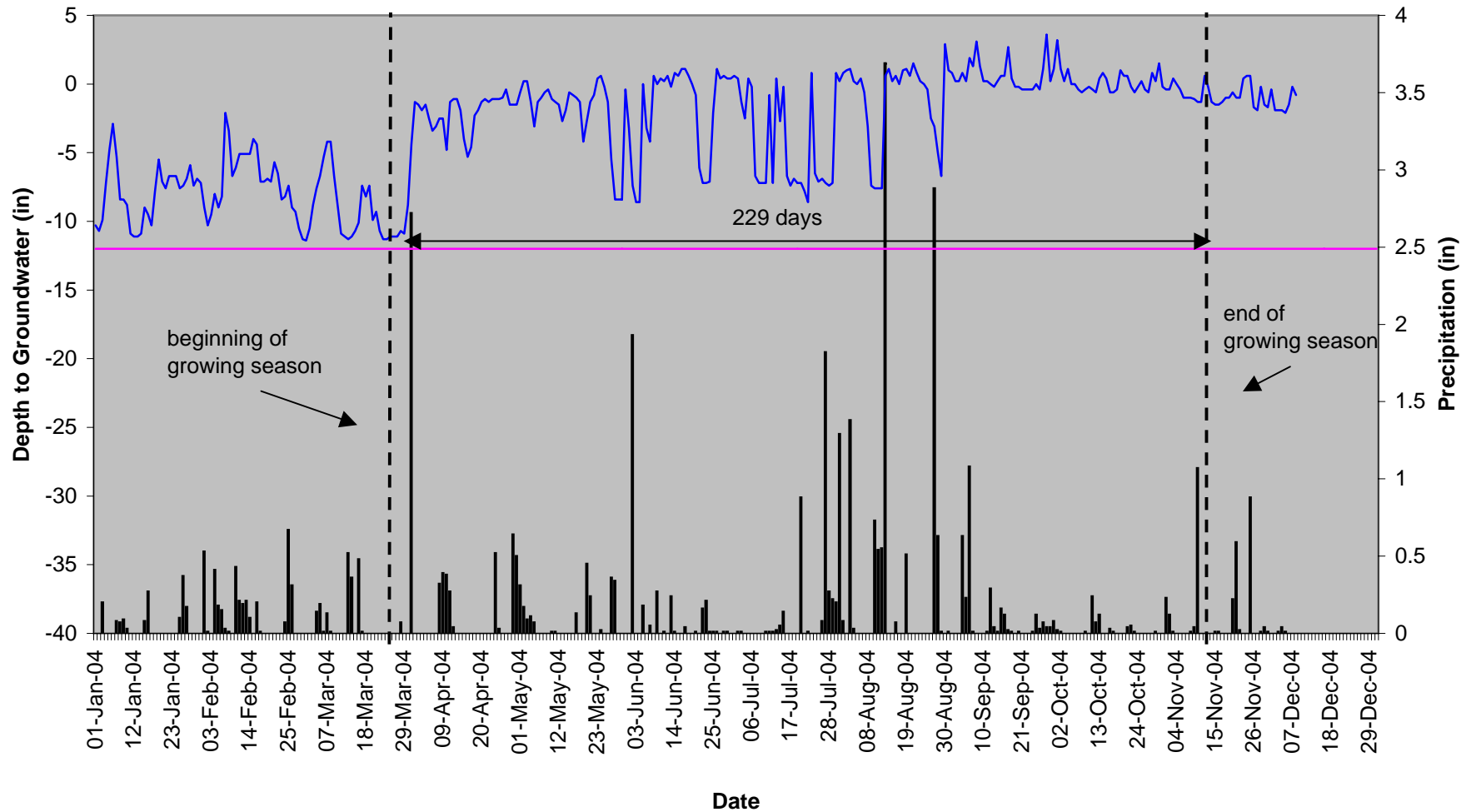
■ Rain Gauge — DL8E57C68 GW-32 — Required Depth

White Oak Creek WO-GW33



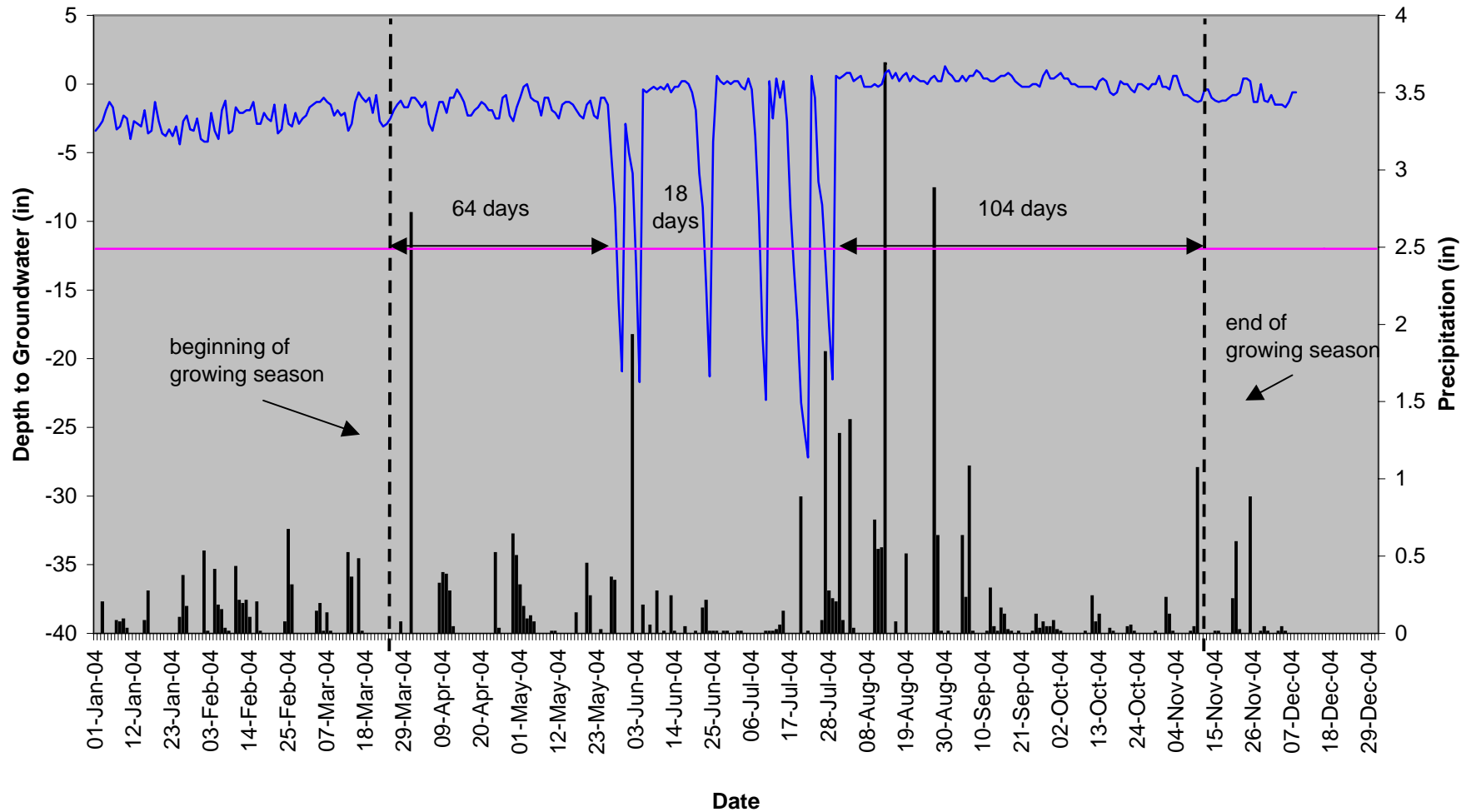
■ Rain Gauge — WM9BEBE36 GW-33 — Required Depth

White Oak Creek WO-GW34



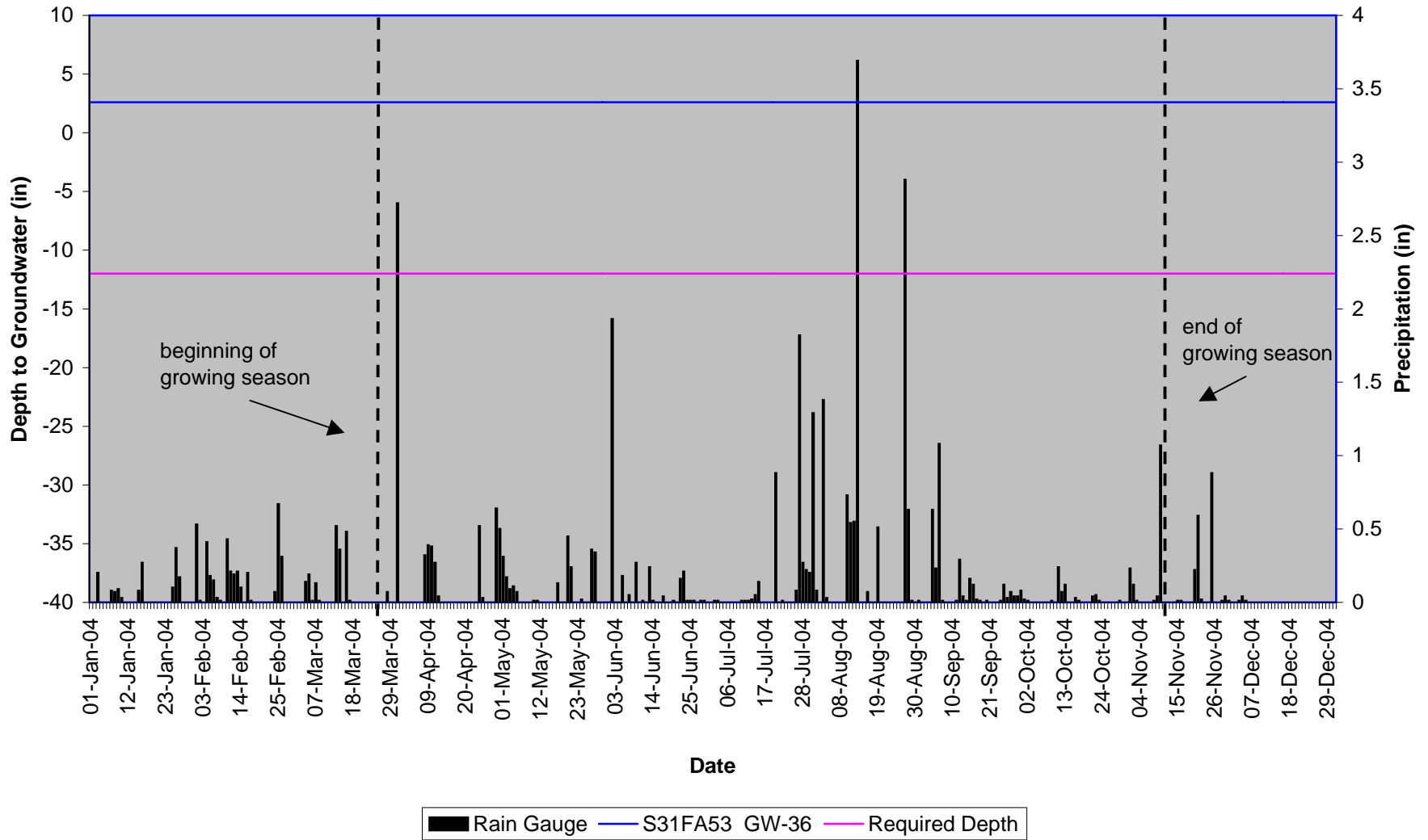
■ Rain Gauge — S448814 GW-34 — Required Depth

White Oak Creek WO-GW35

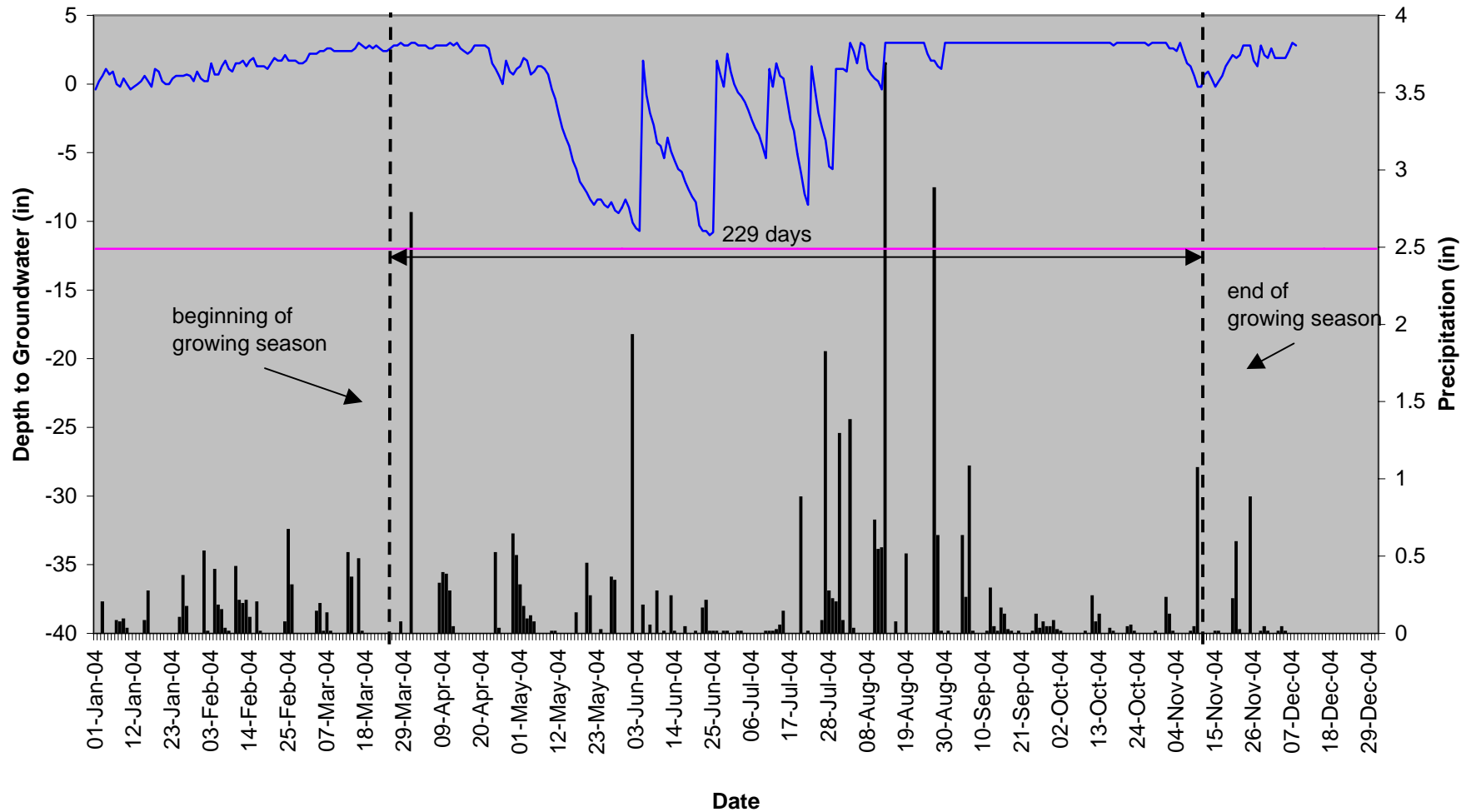


■ Rain Gauge — S4CFEA0 GW-35 — Required Depth

White Oak Creek WO-GW36

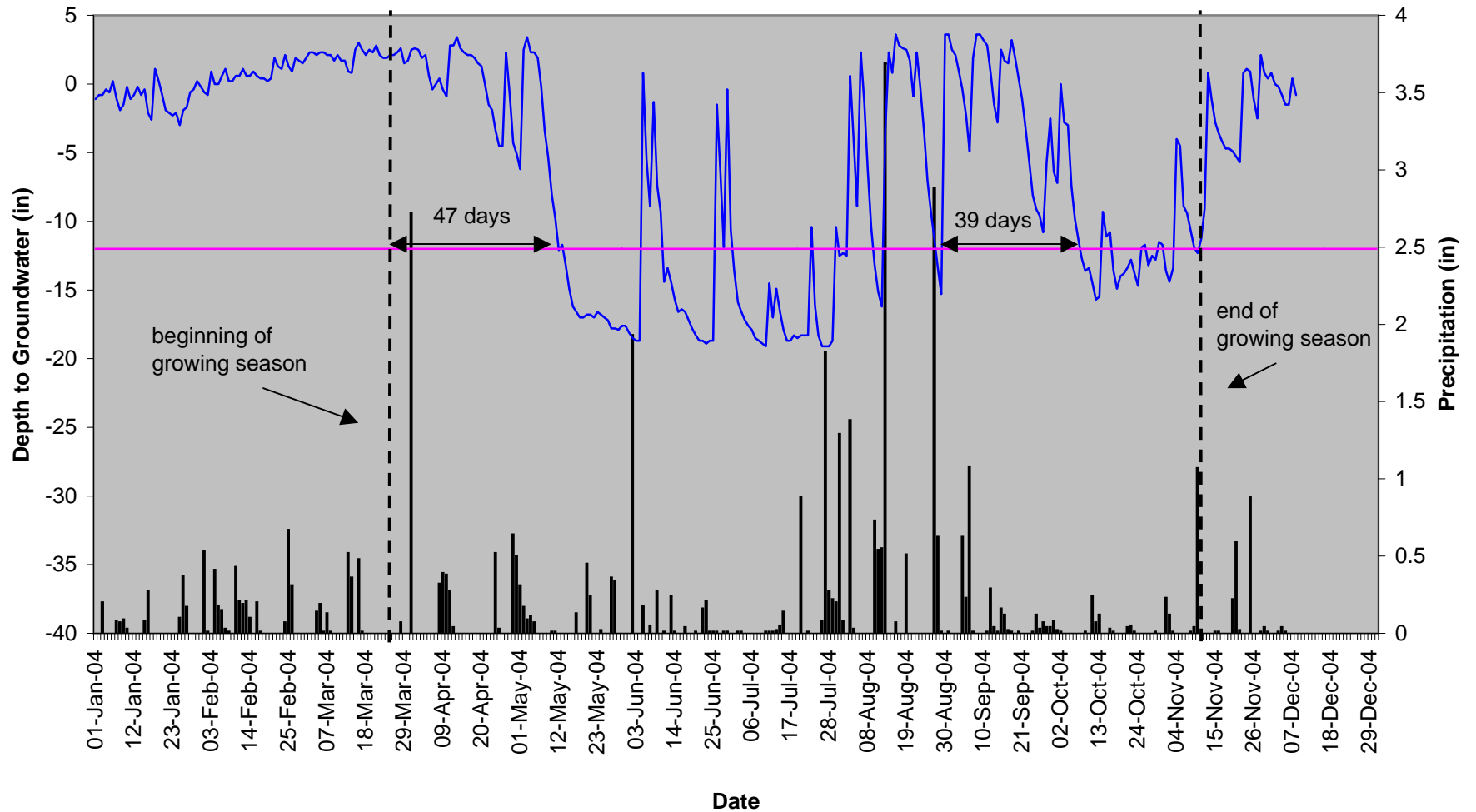


White Oak Creek REF-37



■ Rain Gauge — S4489CF REF-37 — Required Depth

White Oak Creek
REF-38



■ Rain Gauge — S4487DE REF-38 — Required Depth

APPENDIX B

SITE PHOTOS & PLANTING PLAN

White Oak Creek



Photo 1



Photo 2



Photo 3



Photo 4



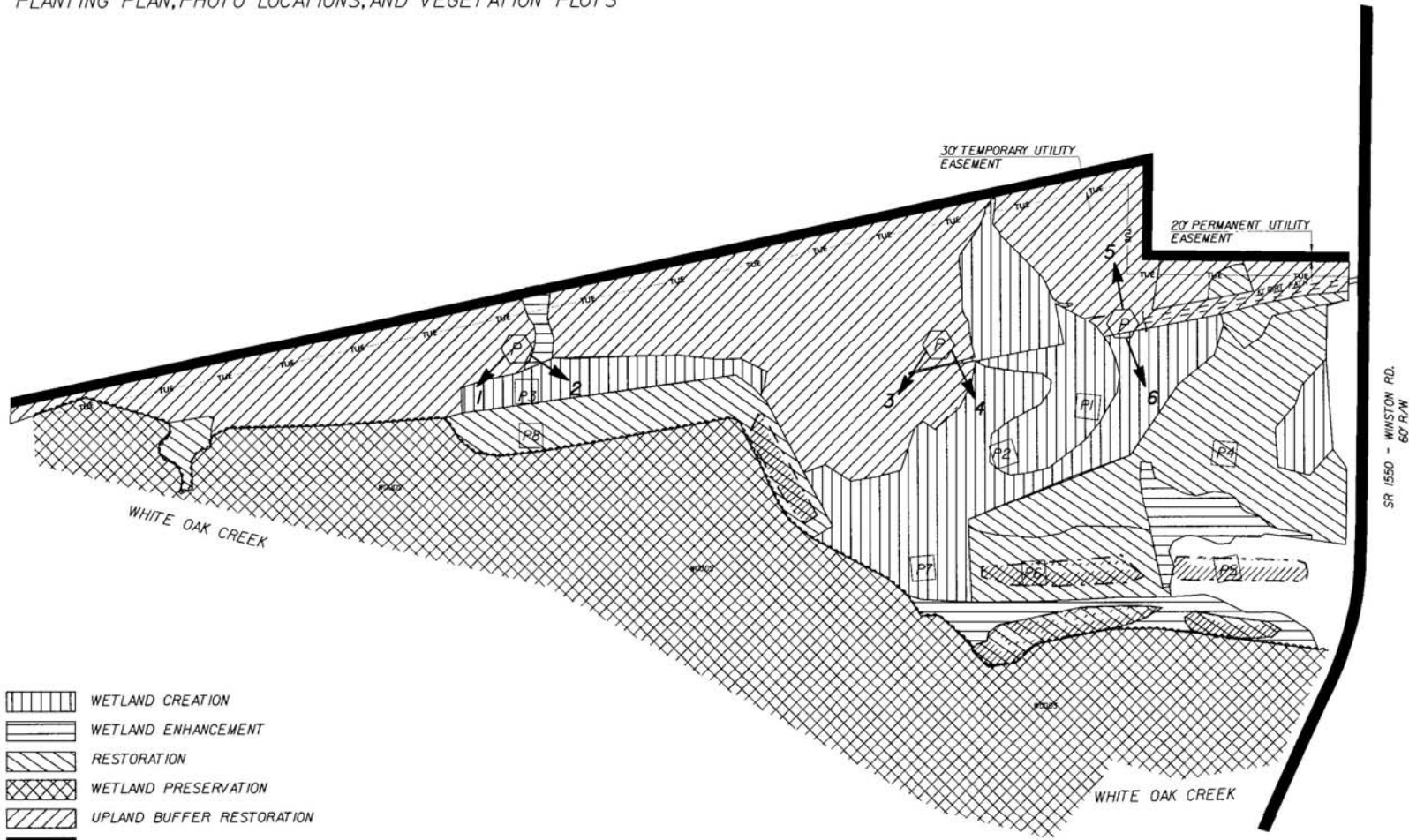
Photo 5











Photo 6

2004

WHITE OAK CREEK MITIGATION SITE
 PLANTING PLAN, PHOTO LOCATIONS, AND VEGETATION PLOTS



-  WETLAND CREATION
-  WETLAND ENHANCEMENT
-  RESTORATION
-  WETLAND PRESERVATION
-  UPLAND BUFFER RESTORATION
-  UTILITY EASEMENT
-  VEGETATION MONITORING PLOT
-  PHOTO LOCATIONS

C:\Users\j\Documents\20080514\Map - AS 84027.rvt

