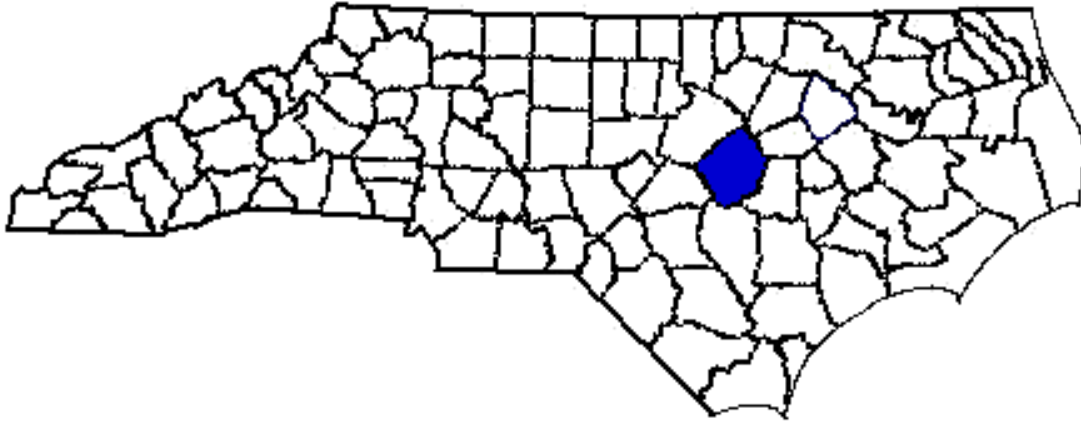


ANNUAL REPORT FOR 2002



**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 2002/ Revised March 2003

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Summary

The following report summarizes the monitoring activities that have occurred in the past year at the White Oak Creek Mitigation Site. Site construction began January 2002 and was completed in March 2002. Planting was accomplished in late March 2002. Monitoring activities in 2002 represent the first year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success a minimum of 5 consecutive years.

The site contains 38 monitoring gauges and eight vegetation plots.

This report utilizes daily rainfall data and monthly historical data from the Clayton weather station, which is maintained by the NC State Climate Office.

Twenty-four of the 36 monitoring gauges (non-reference gauges) indicate saturation for greater than 12.5% of the growing season, four gauges indicated between 8 and 12.5%, three gauges had saturation levels between 5 to 8%, and seven out of the 36 gauges had saturation levels less than 5%.

Of the two reference gauges, REF-38 showed saturation or inundation greater than 12.5% of the growing season within 12", while REF-37 showed saturation for between 8 and 12.5%.

The 2002 vegetation monitoring of the site revealed an average tree density of 225 trees per acre. This average is below the minimum success criteria of 320 trees per acre. The site was replanted in December 2002.

Based on the monitoring results from the 2002-growing season, NCDOT recommends that both hydrologic and vegetation monitoring continue.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The White Oak Creek Site is located on 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, is mostly in open pastureland that was used in the past to support horses. 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 late 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 2002 growing season at the White Oak Creek Mitigation Site.

Activities in 2002 reflect the first year of 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.

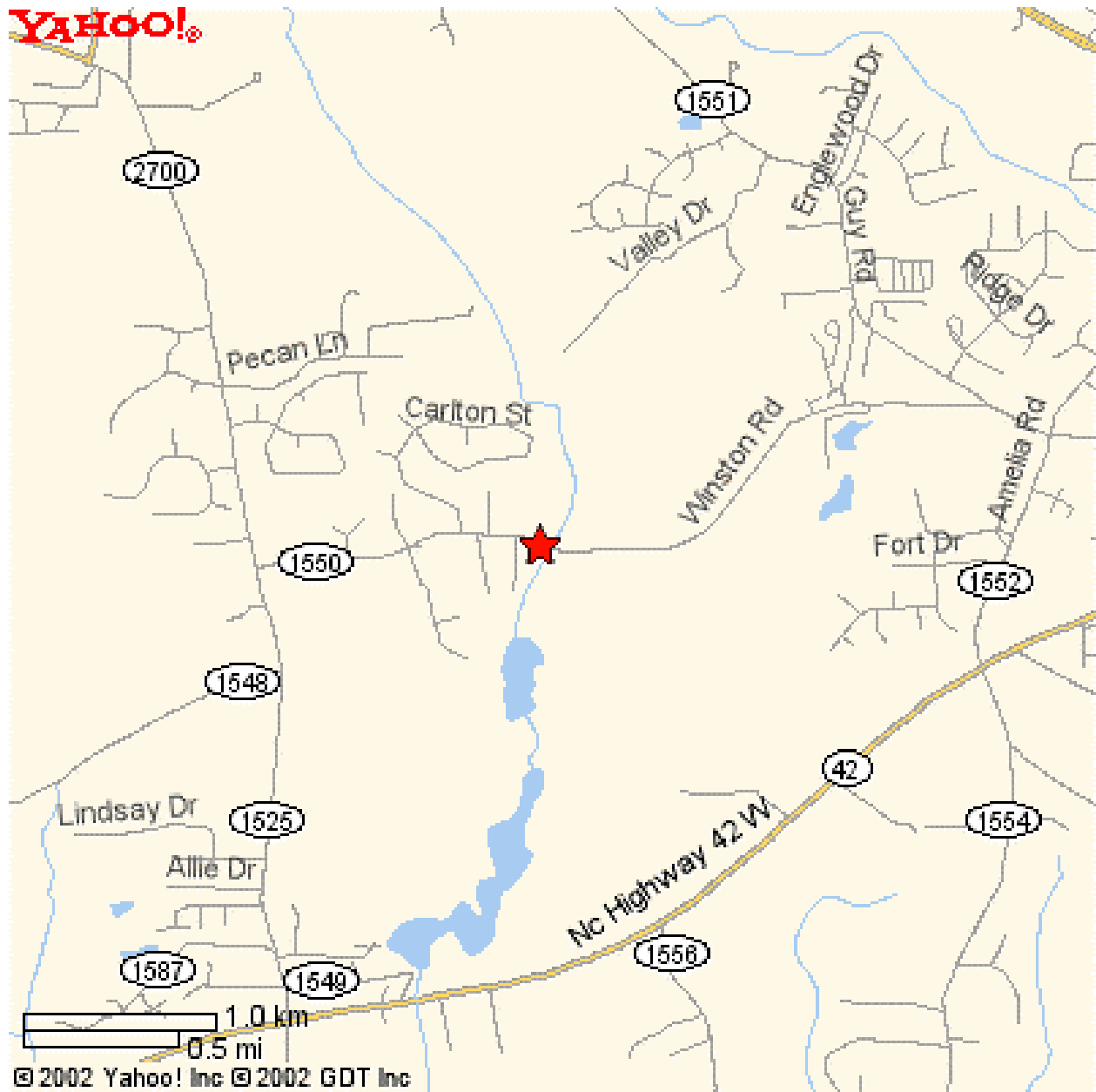
1.3 PROJECT HISTORY

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	Supplemental Planting

1.4 DEBIT LEDGER

The White Oak Mitigation site was constructed as an “up-front” effort for use by the Department for compensatory mitigation requirements involving roadway impacts to wetlands in the Neuse River Basin. Currently, no projects have been debited from this mitigation site. Regulatory agencies have stipulated that no credits shall be released until site success is shown.

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. Area inundated for less than 12.5% 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, 38 monitoring gauges were installed across the site (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This represents the first 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 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.

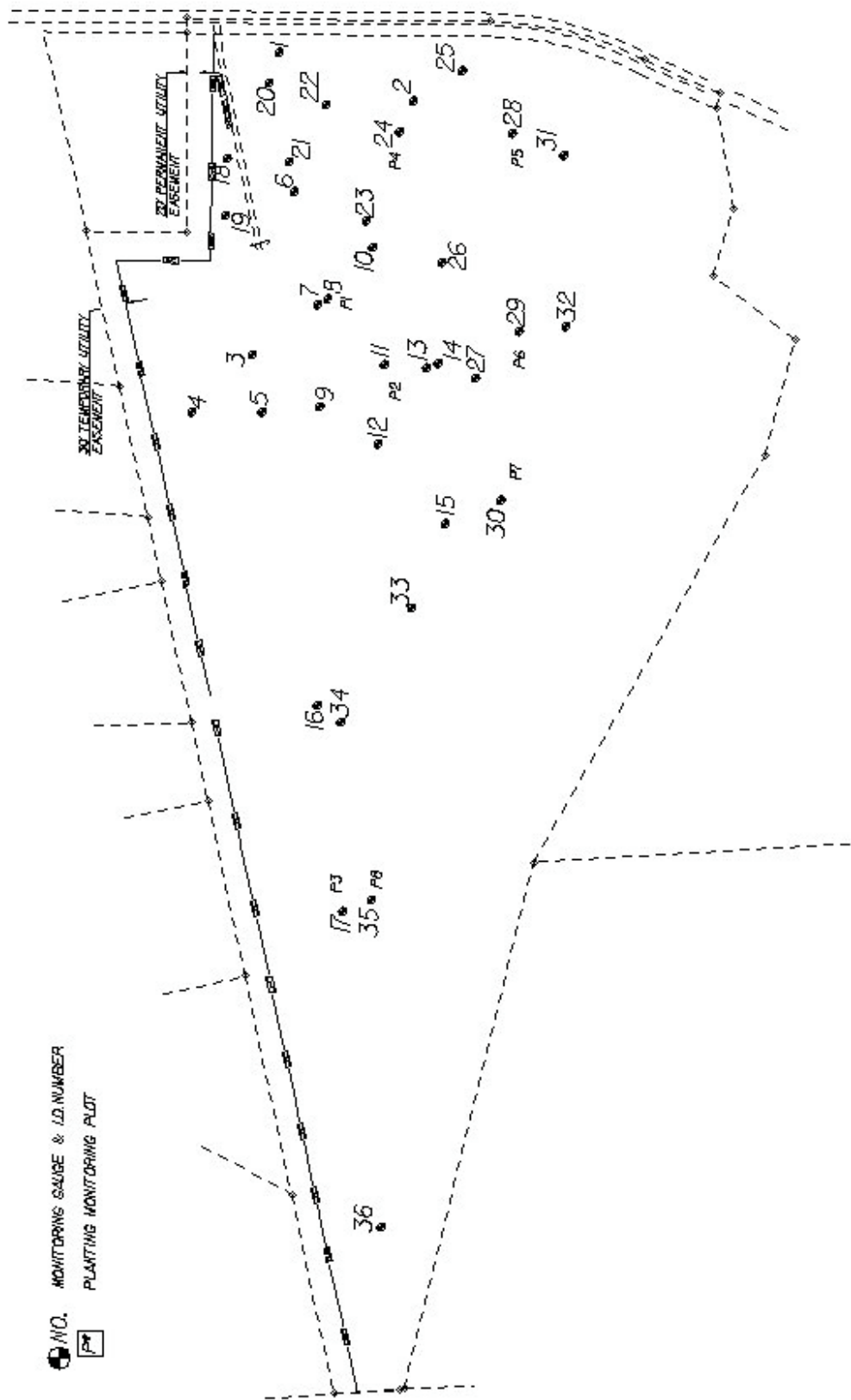


Figure 2. Monitoring Gauge Location Map

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 2.

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 represents 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 season, while those in green indicate hydrology between 5% and 8% of the season. Gauges highlighted in black indicate no wetland hydrology (less than 5% of the growing season).

Table 2. White Oak Creek Hydrologic Monitoring Results

Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
GW-1	✓				3.9	
GW-2				✓	13.1	10/12-11/10
GW-3	✓				4.8	
GW-4				✓	31.9	3/26-6/26
GW-5				✓	13.1	10/12-11/10
GW-6			✓		9.2	10/21-11/10
GW-7		✓			7.0	3/26-4/9
GW-8				✓	13.1	10/12-11/10
GW-9				✓	13.1	10/12-11/10
GW-10				✓	13.1	10/12-11/10
GW-11				✓	24.0	8/16-10/8 10/11-11/10
GW-12	✓				3.5	
GW-13	✓				1.8	
GW-14			✓		9.2	10/21-11/10
GW-15	✓				0	
GW-16				✓	31.4	8/1-11/10
GW-17				✓	15.7	4/26-5/31 10/11-11/10
GW-18			✓		9.2	10/21-11/10
GW-19		✓			5.7	10/21-11/2

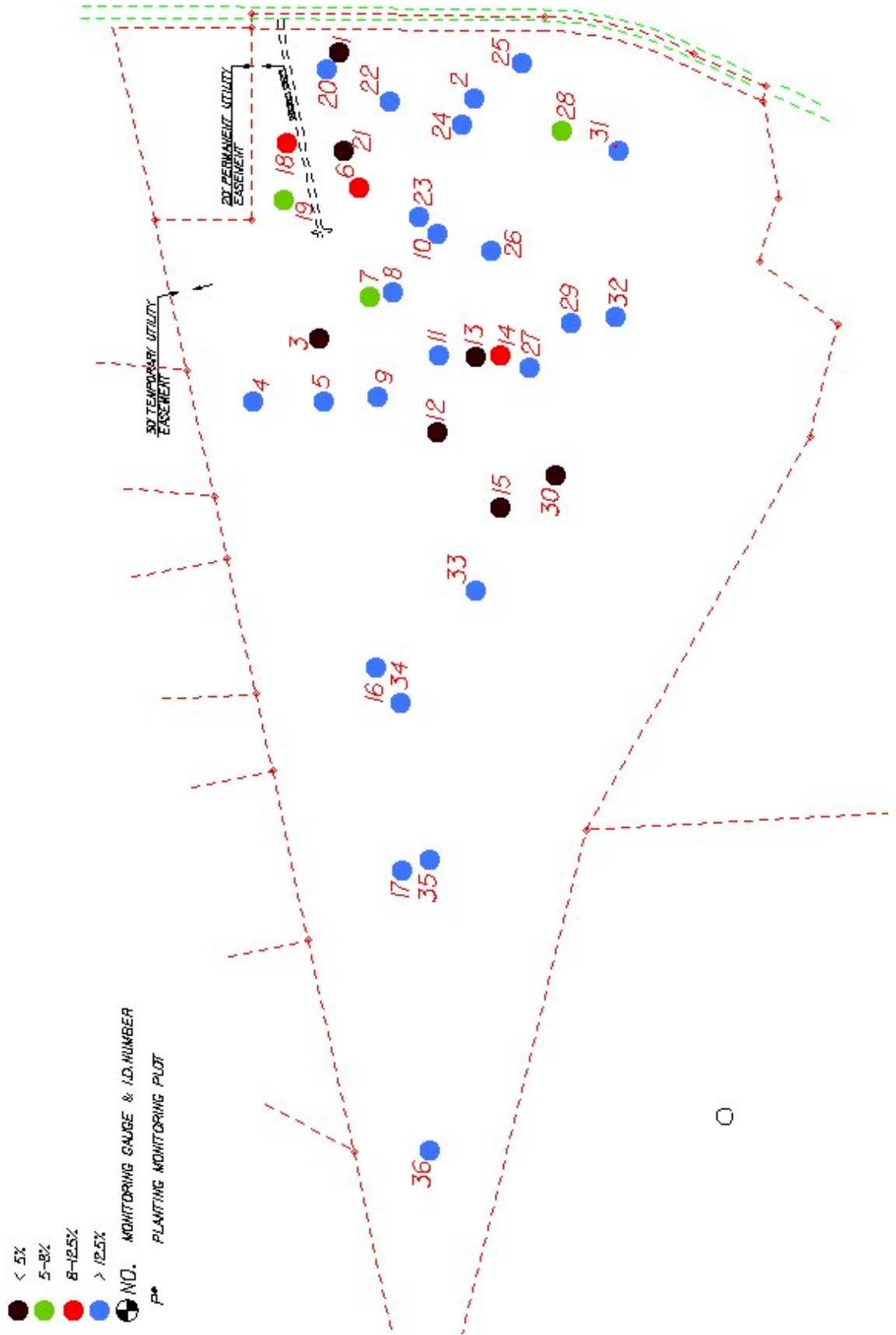
Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
GW-20				✓	13.1	10/12-11/10
GW-21	✓				.4	
GW-22				✓	13.1	10/12-11/10
GW-23				✓	13.1	10/12-11/10
GW-24				✓	13.1	10/12-11/10
GW-25				✓	13.1	10/12-11/10
GW-26				✓	30.1	3/16-6/2 10/12-11/10
GW-27				✓	13.1	10/12-11/10
GW-28		✓			5.7	10/21-11/2
GW-29				✓	24.9	3/16-4/29 9/15-11/10
GW-30	✓				.87	
GW-31				✓	33.6	3/16-4/26 8/26-11/10
GW-32				✓	36.2	3/16-5/18 8/20-11/10
GW-33				✓	19.7	3/16-4/29 8/18-10/1 10/12- 11/10
GW-34				✓	28.8	3/16-5/30 8/ 26-10/8 10/11- 11/10
GW-35				✓	13.1	10/12-11/10
GW-36				✓	33.6	3/26-5/27 8/26-11/10

REF-37			✓		12.2	3/26-4/22 10/21-11/10
REF-38				✓	17.0	3/26-5/3 8/26-9/22 10/12-11/10

During the growing season from March to November 2002, 24 of the 36 gauges (non-reference gauges) met jurisdictional hydrologic success of at least 12.5% during the growing season. Four gauges showed saturation between 8 and 12.5% of the growing season, while only 3 gauges showed saturation between 5-8%. Conversely, 7 gauges met hydrology less than 5% of the growing season.

Of the two reference gauges, REF-38 showed saturation or inundation greater than 12.5% of the growing season within 12", while REF-37 showed saturation for between 8 and 12.5%.

Figure 3: Hydrologic Success Map



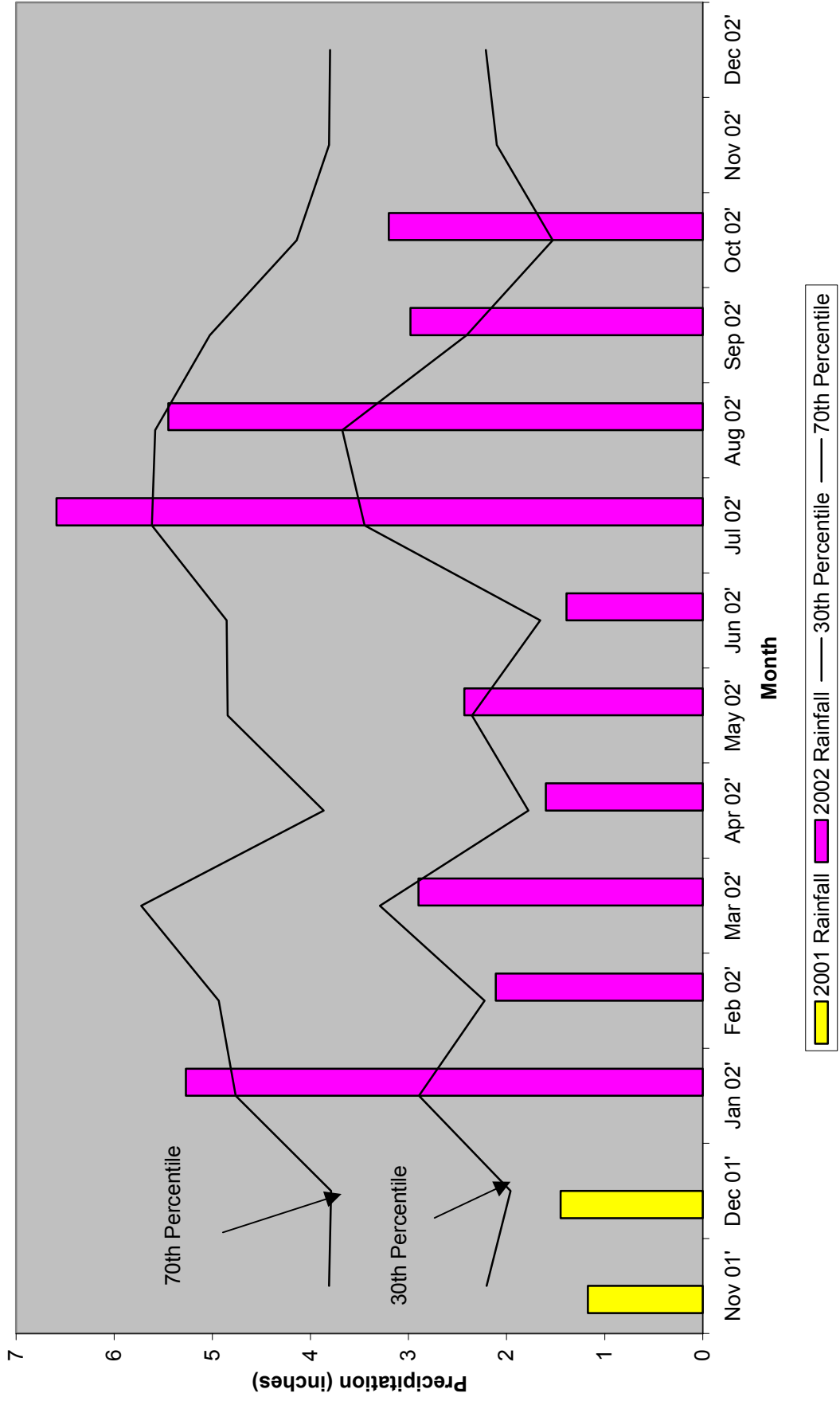
2.3.2 Climatic Data

Figure 4 represents an examination of the local climate in comparison with historical data in order to determine whether 2002 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 2001 and 2002. The historical data and monthly rainfall was collected by the National Climatic Data Center. Months with below average rainfall include November (01’), December (01’) February, March, April, and June. The months of May, August, September, and October all recorded average rainfall for the site. January and July recorded above average rainfall. Overall the site experienced below average rainfall in 2002.

2.4 CONCLUSIONS

2002 represents the first year for hydrologic monitoring. Twenty-four of the 36 (non-reference gauges) indicated saturation within 12” of the ground for greater than 12.5% of the growing season. NCDOT will continue to monitor this site for hydrology.

Figure 4
White Oak Creek 30-70 Percentile Graph 2002
Clayton, NC



3.0 VEGETATION: WHITE OAK MITIGATION SITE (YEAR 1 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

Cephalanthus occidentalis, Buttonbush

Zone 3: Wetland Creation Area (6.48 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

Plot #	Overcup Oak	Swamp Chestnut Oak	Willow Oak	Water Oak	Swamp Blackgum	Green Ash	Silky Dogwood	Elderberry	Buttonbush	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1			2	2					3	7	26	117
2	4		1					2		7	27	113
3	4	1	1			2	2	2	2	14	21	290
4										0	15	0
5		1					2		4	7	21	145
6	2					4				6	22	119
7	5						2		6	13	31	182
8	5			1		1				7	21	145
Total Density Average												139

Site Notes: Other species noted: ragweed, broomsedge, *Scirpus* sp., and various grasses. Trees planted on 10 foot centers (435 trees per acre).

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 2002 vegetation monitoring of the site revealed an average tree density of 139 trees per acre. This average is below the minimum success criteria of 320 trees per acre. Site was replanted in December 2002.

NCDOT will continue vegetation monitoring at the White Oak Mitigation Site.

4.0 Overall Conclusions/Recommendations

Due to the low stem counts after year 1, the site was replanted per the original mitigation plan in December 2002.

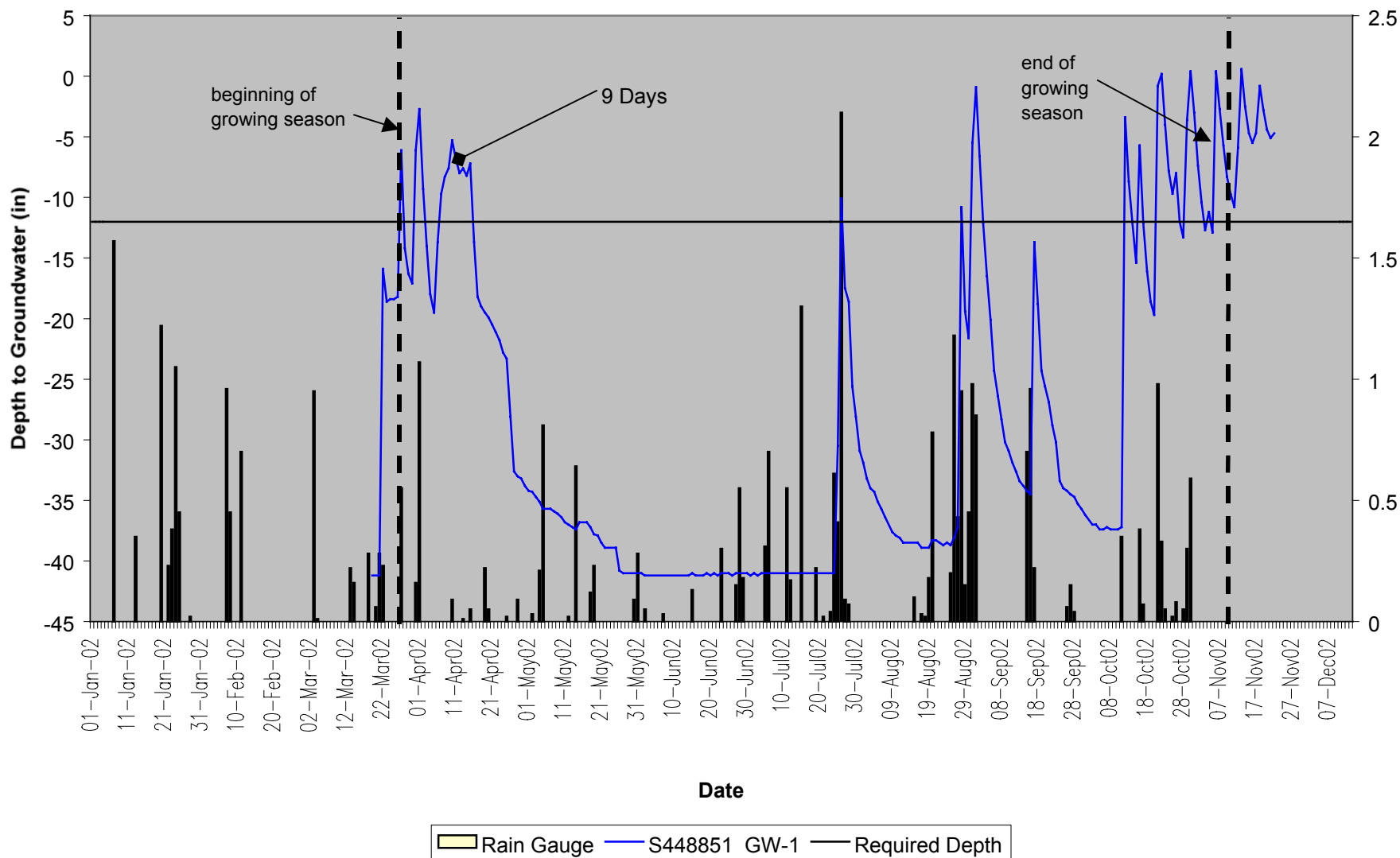
NCDOT proposes to continue both hydrologic and vegetation monitoring at the site.

APPENDIX A

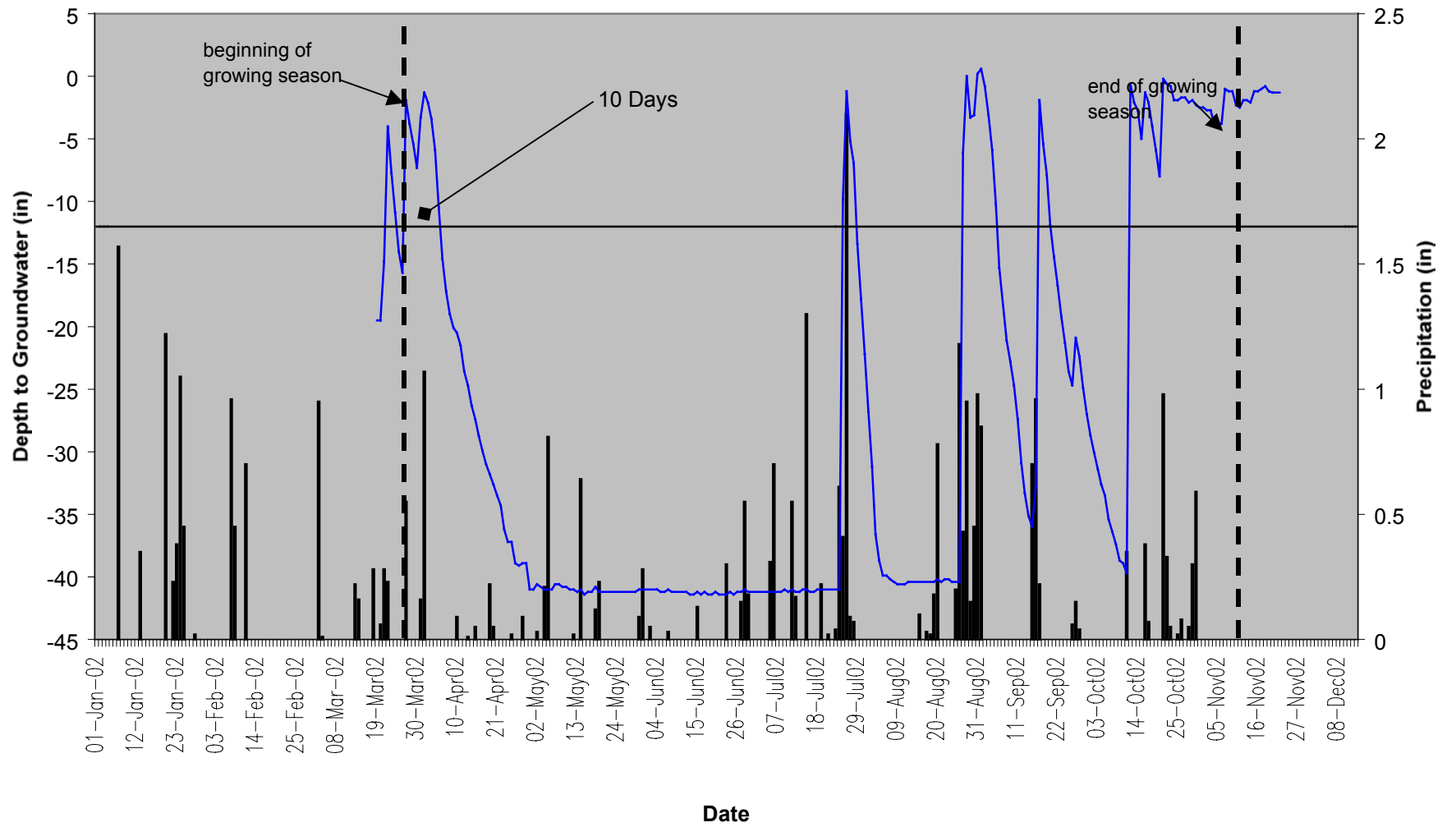
DEPTH TO GROUNDWATER GRAPHS

White Oak First 20 Monitoring Gauges

S448851

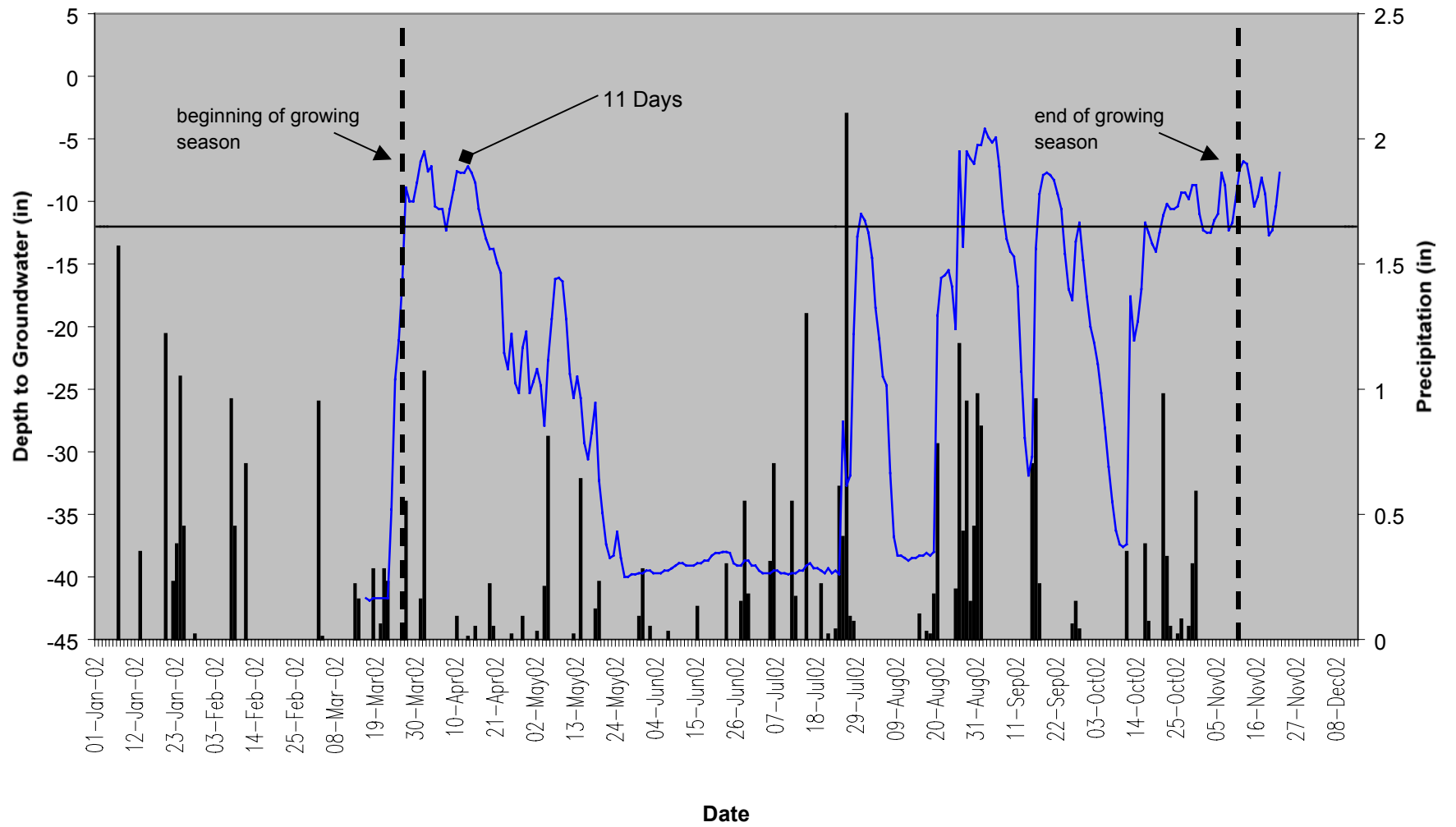


S4487AA



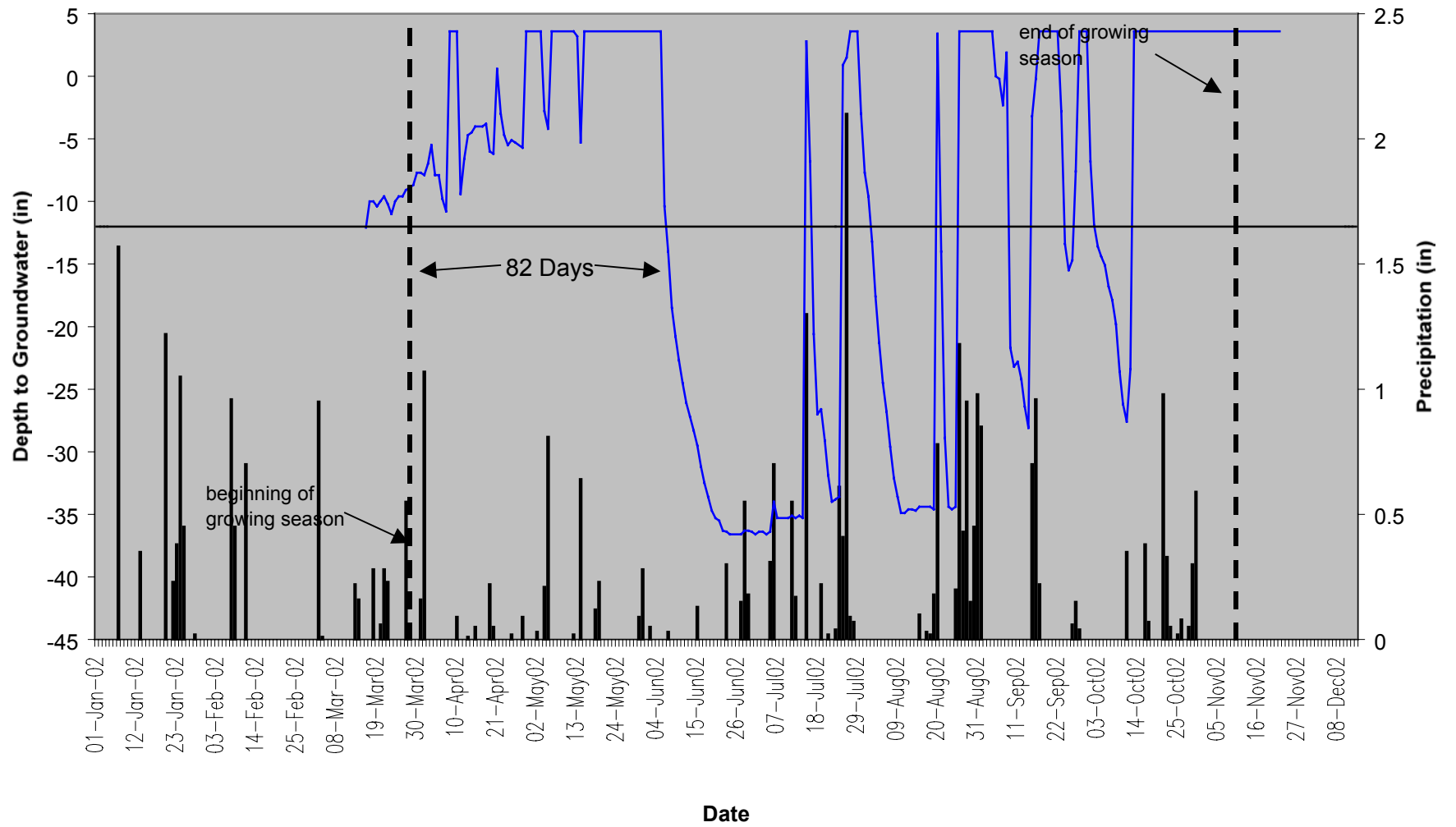
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S448947



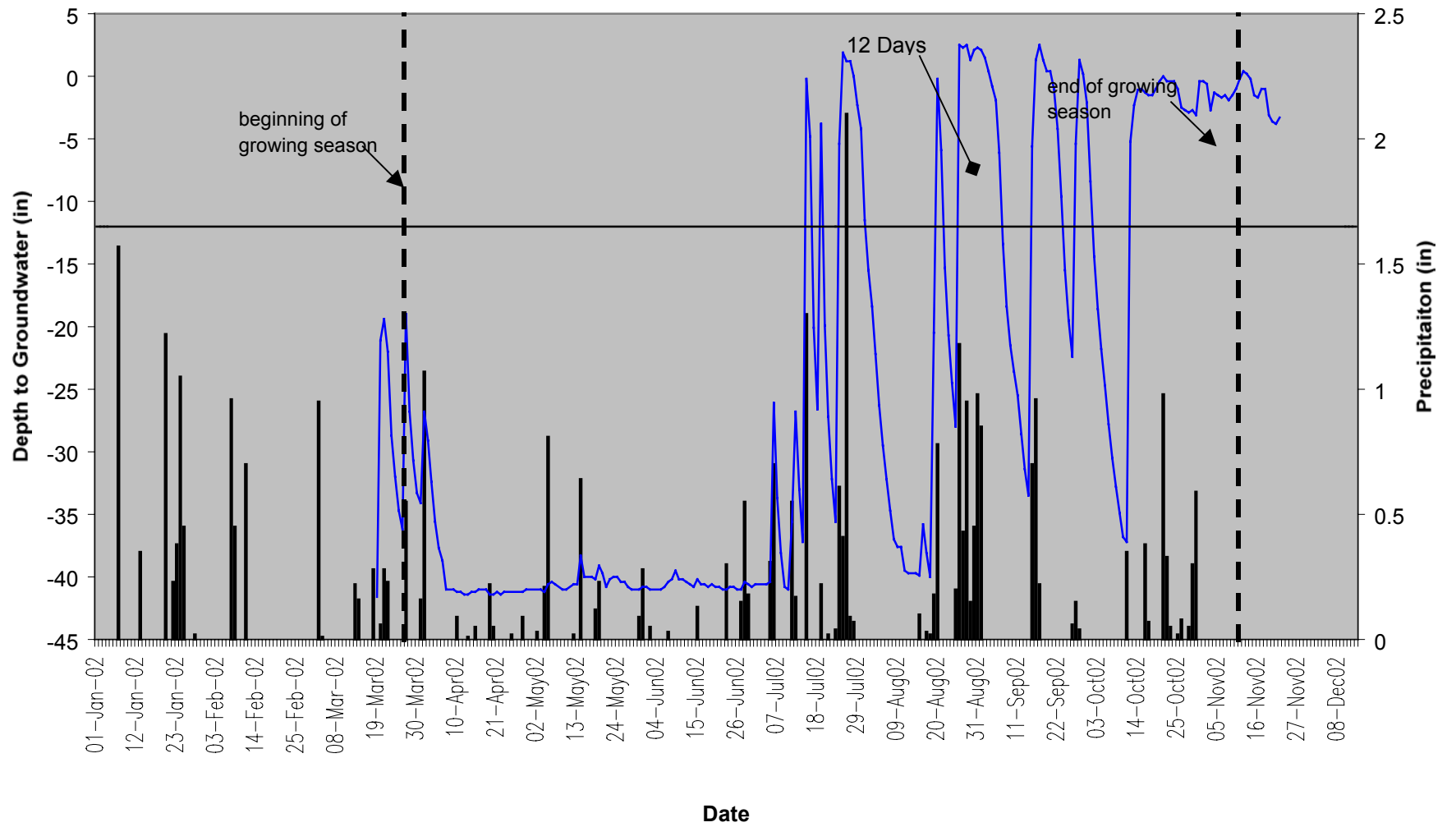
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S448A17



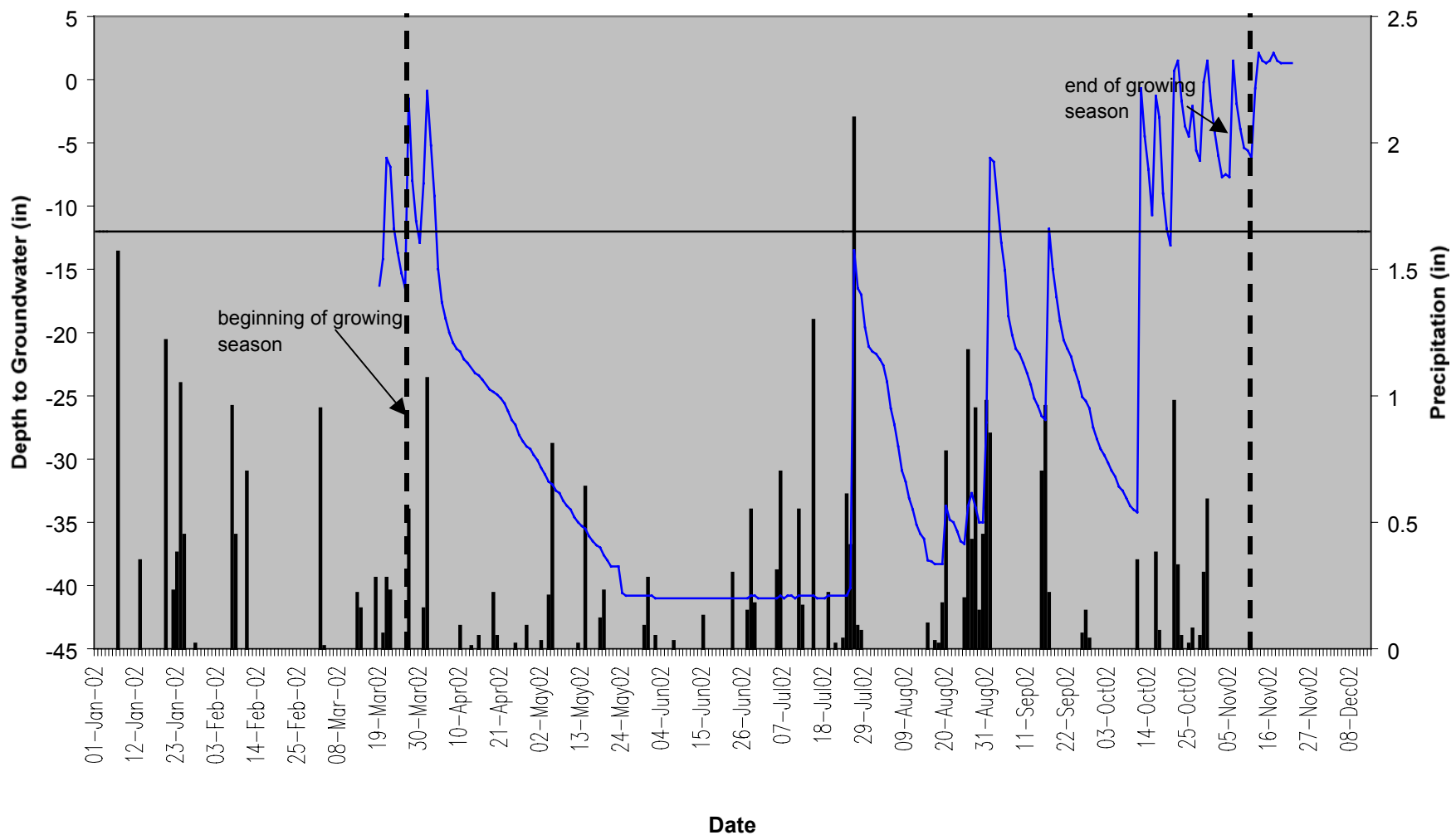
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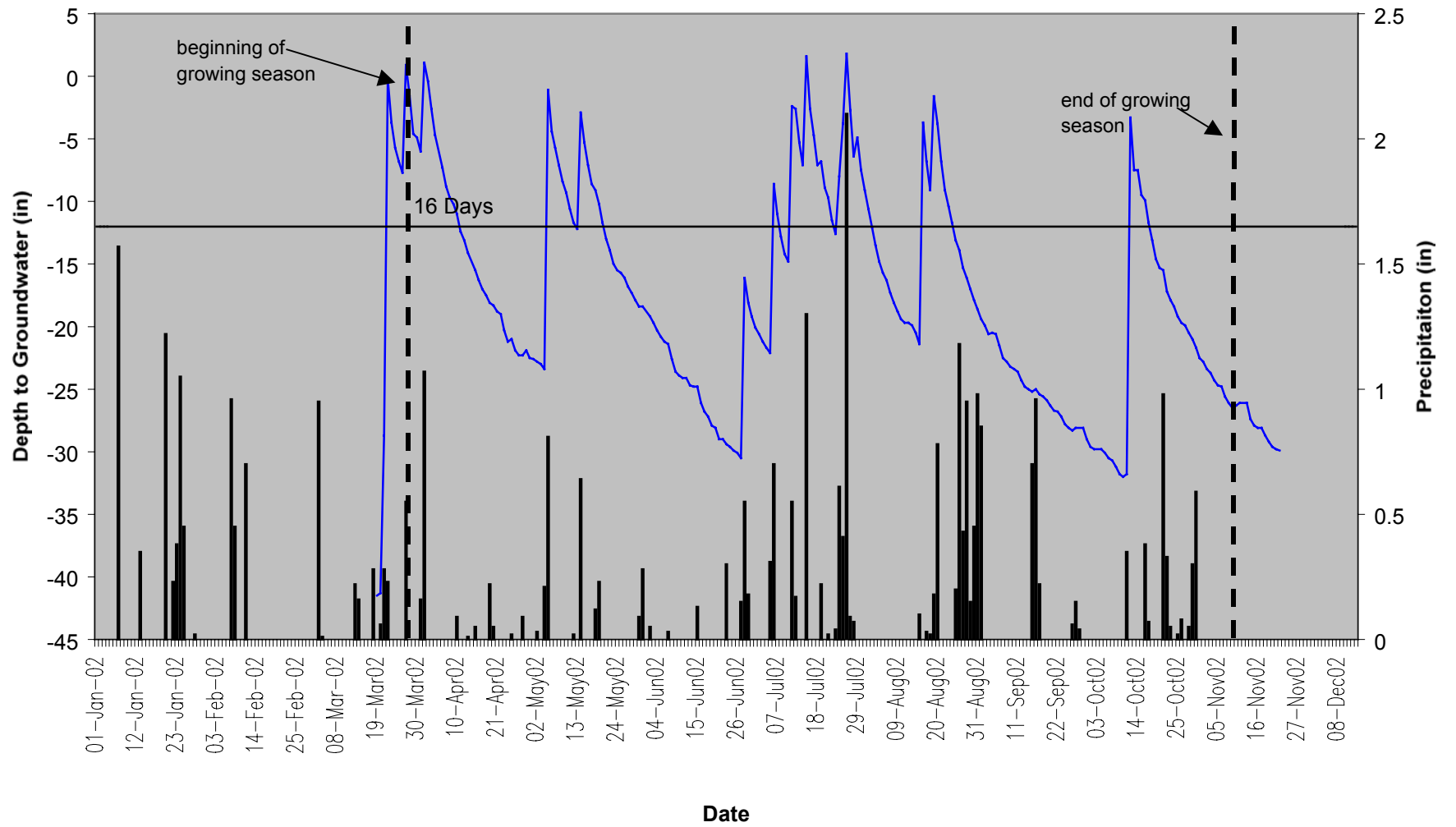
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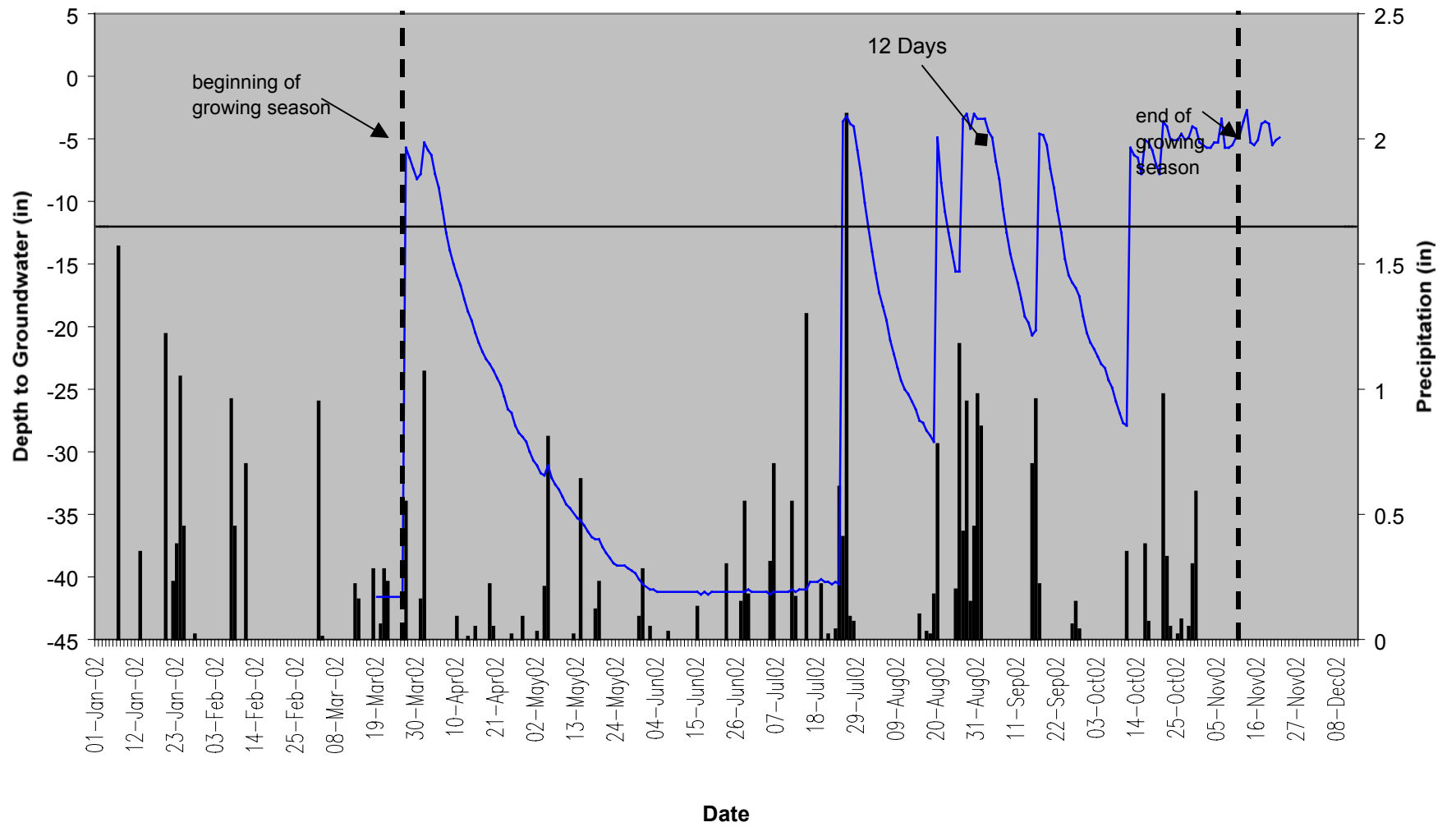
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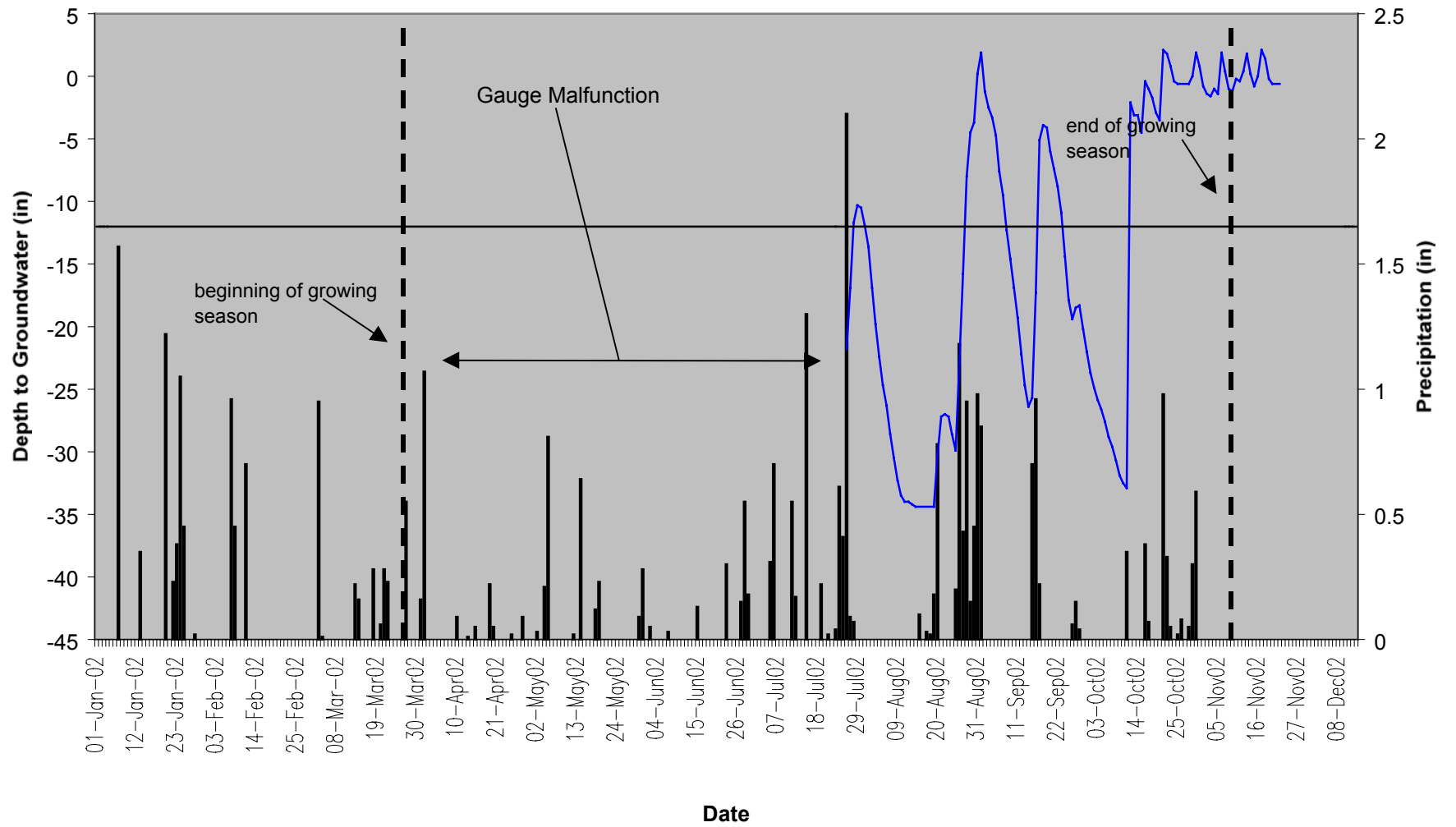
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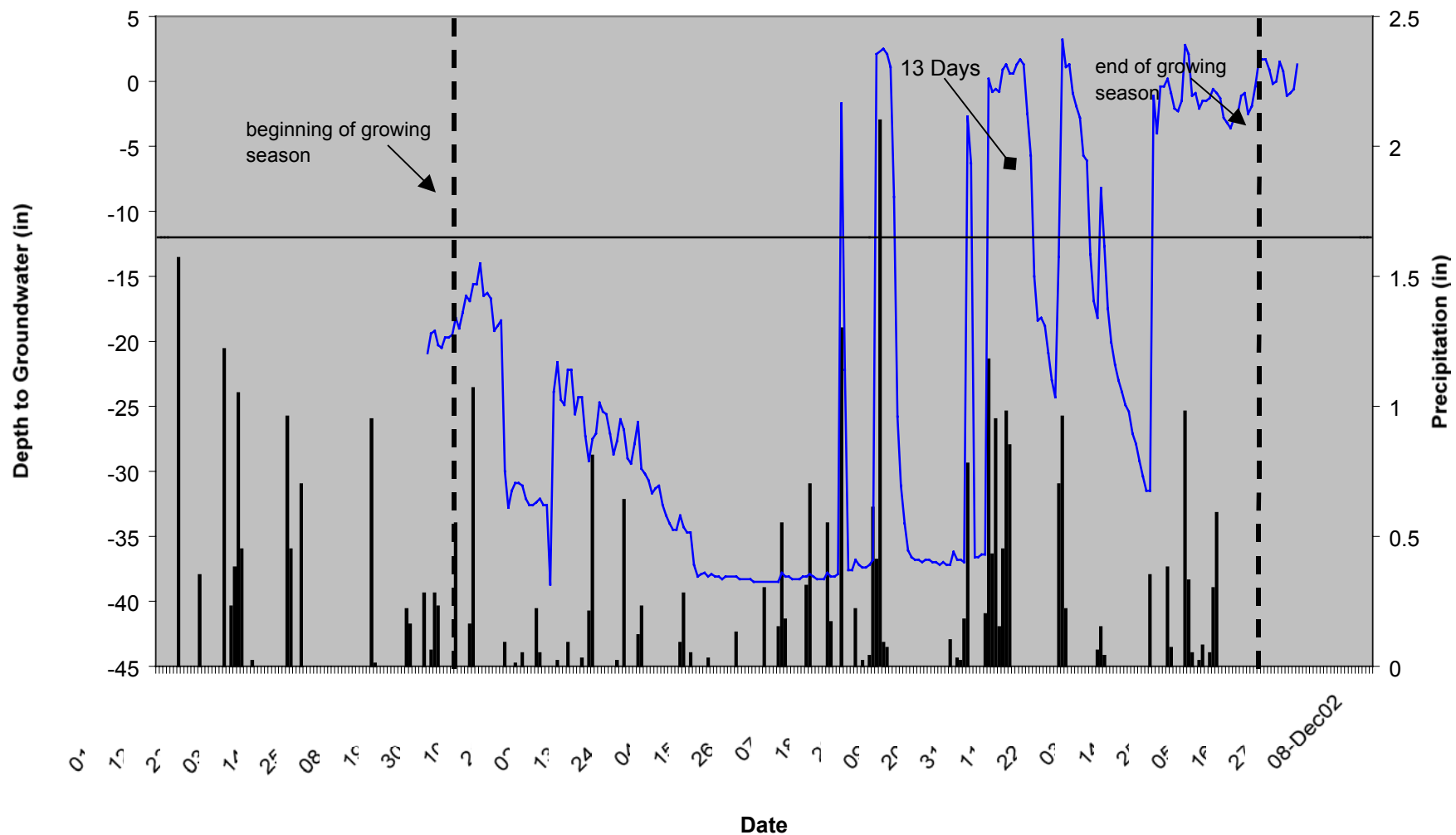
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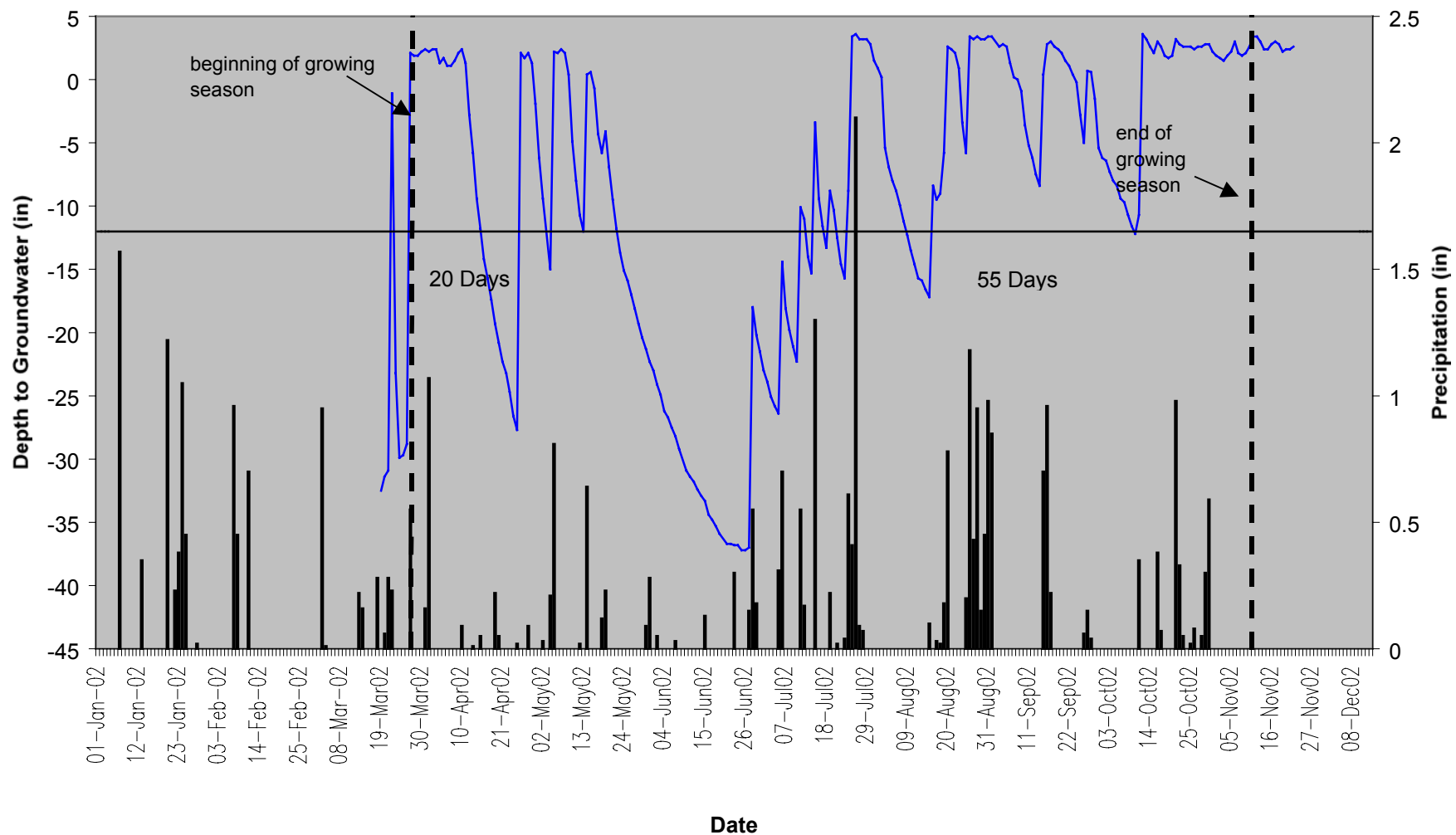
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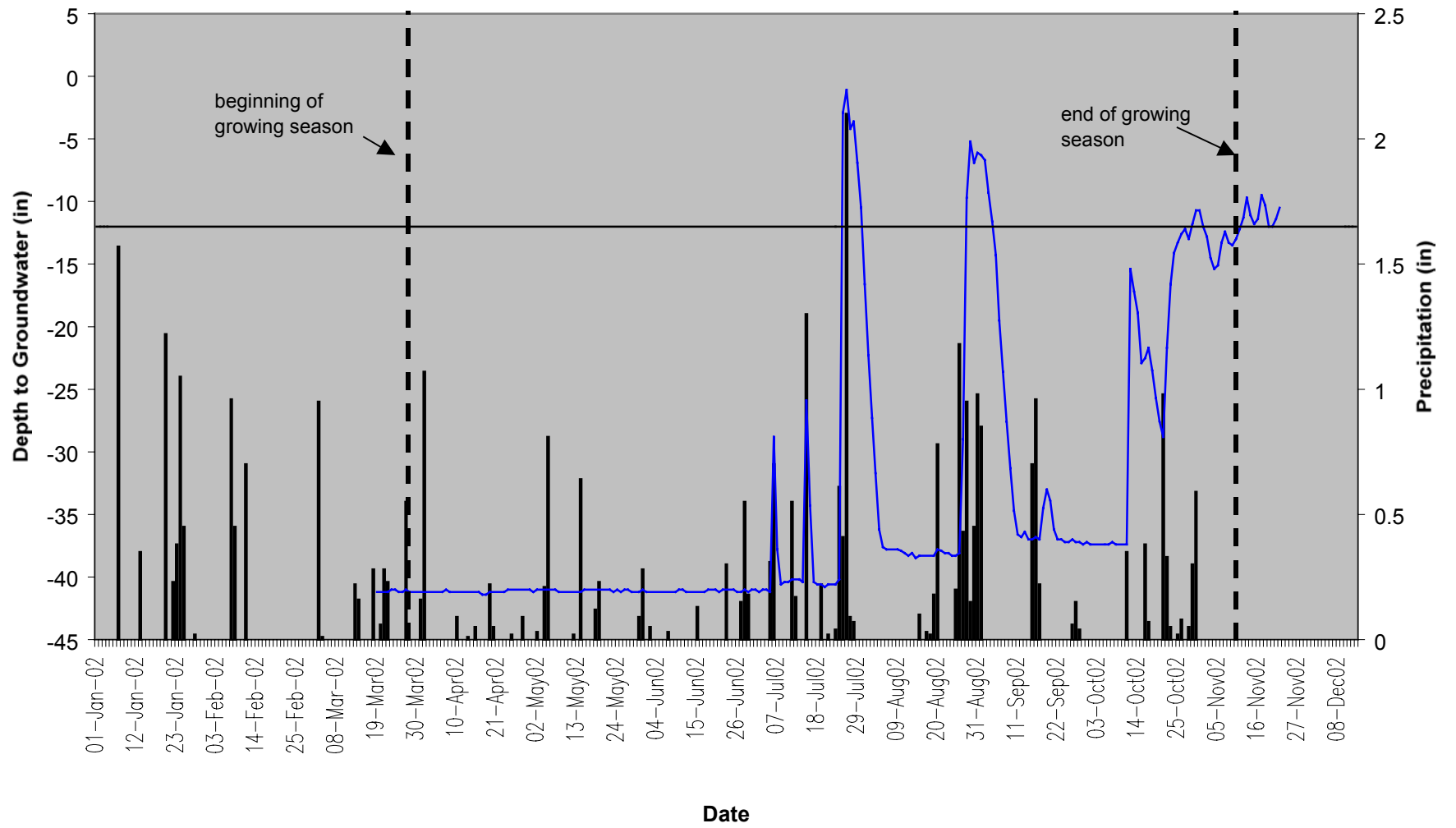
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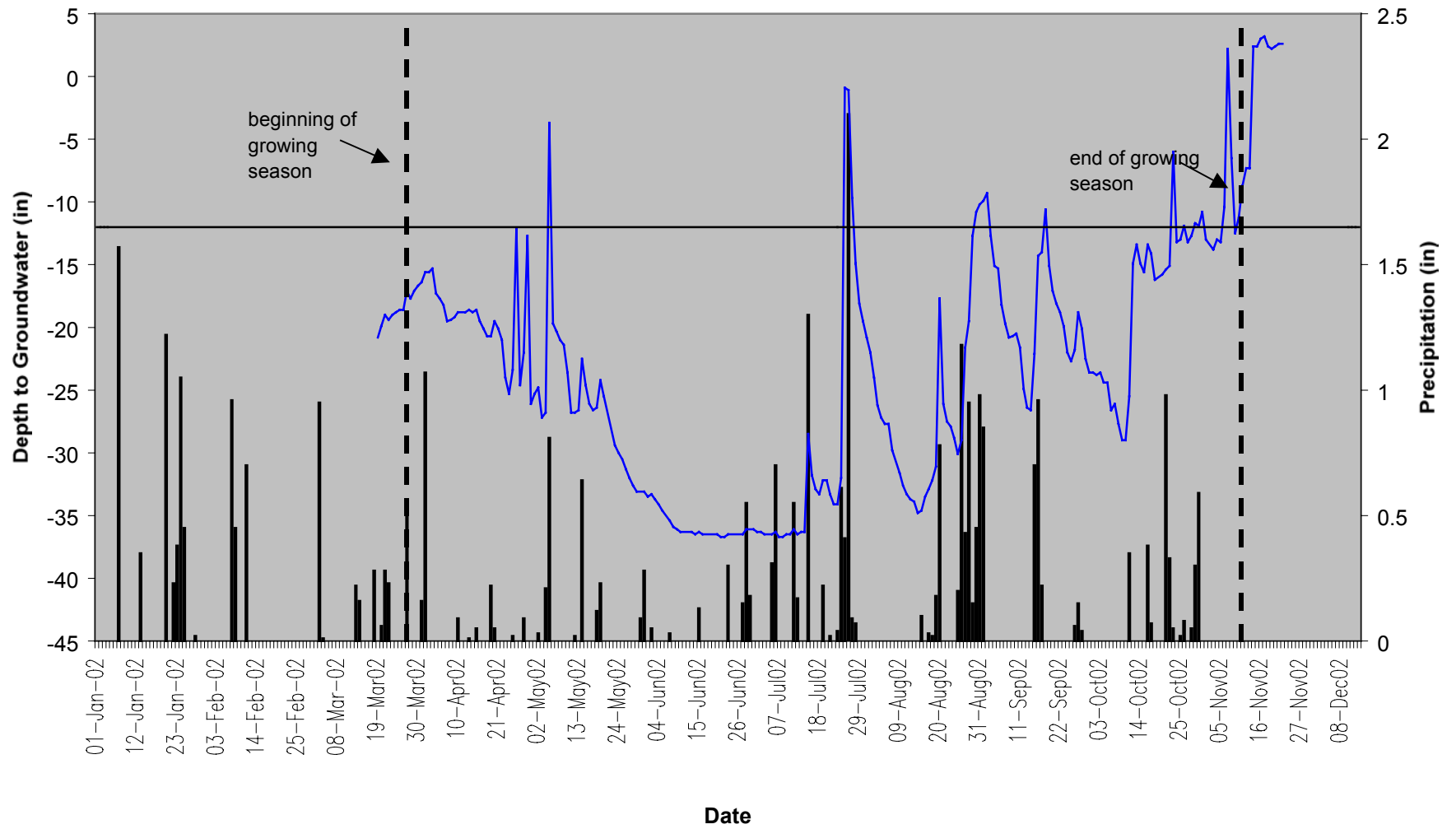
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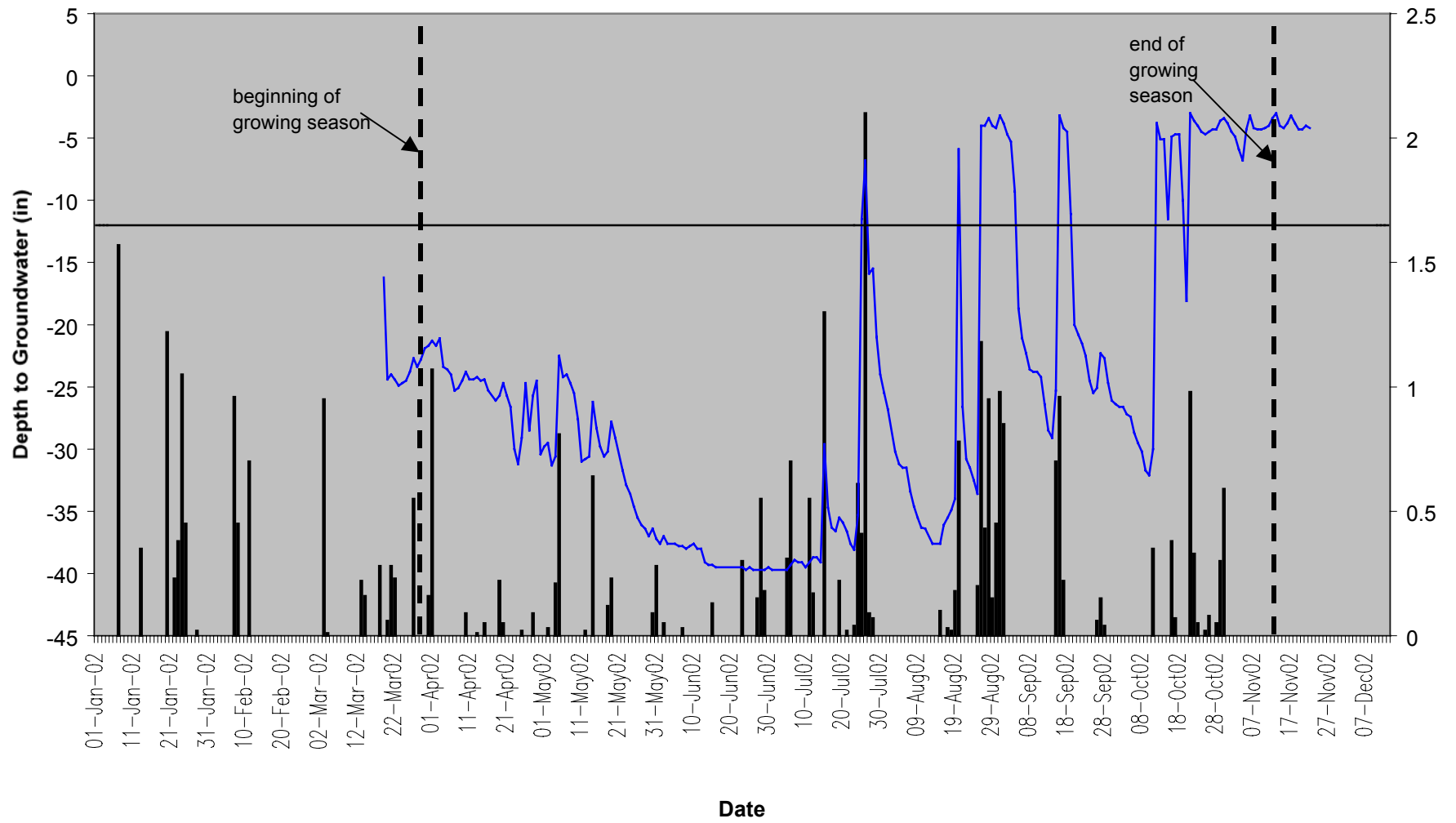
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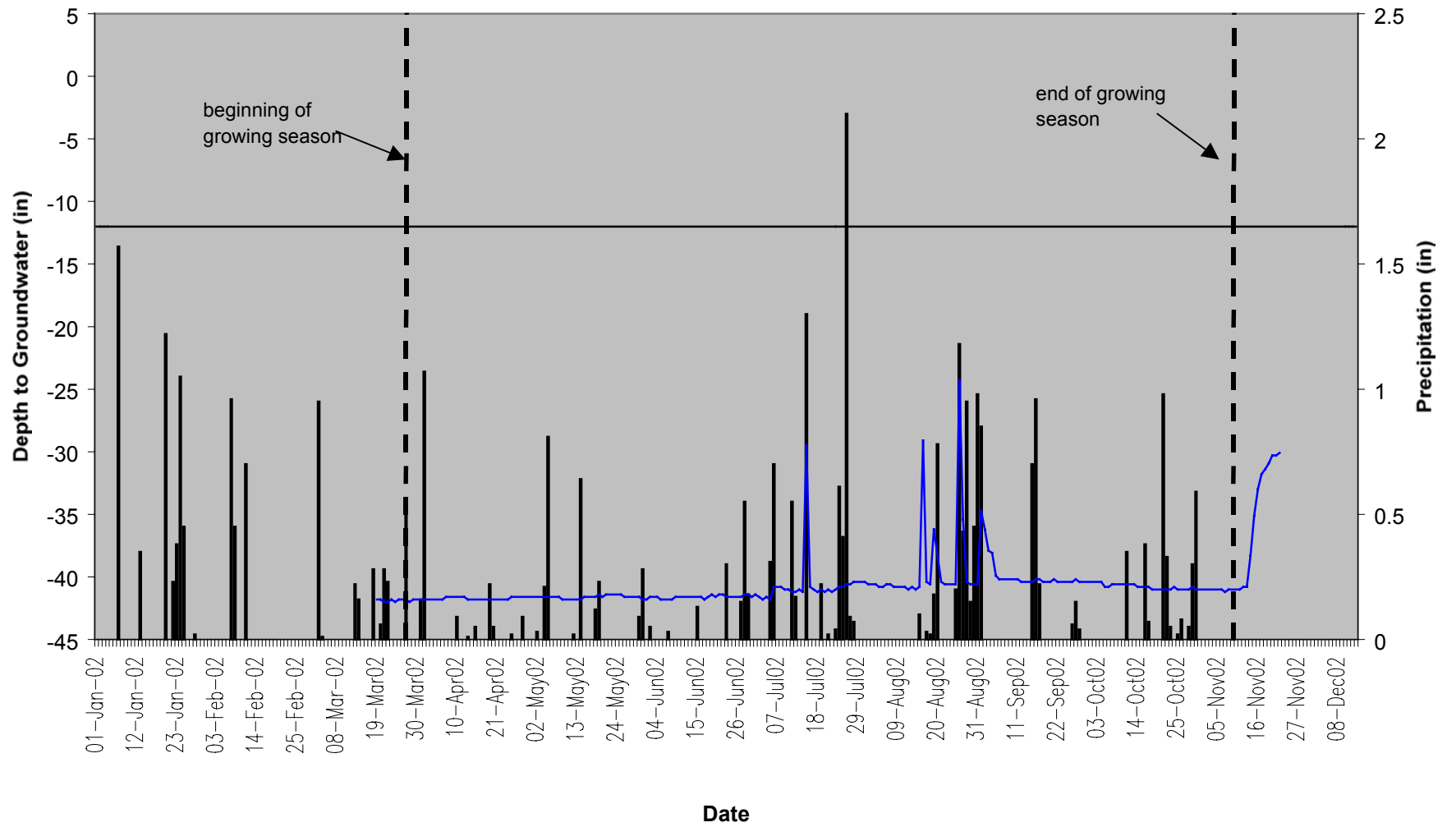
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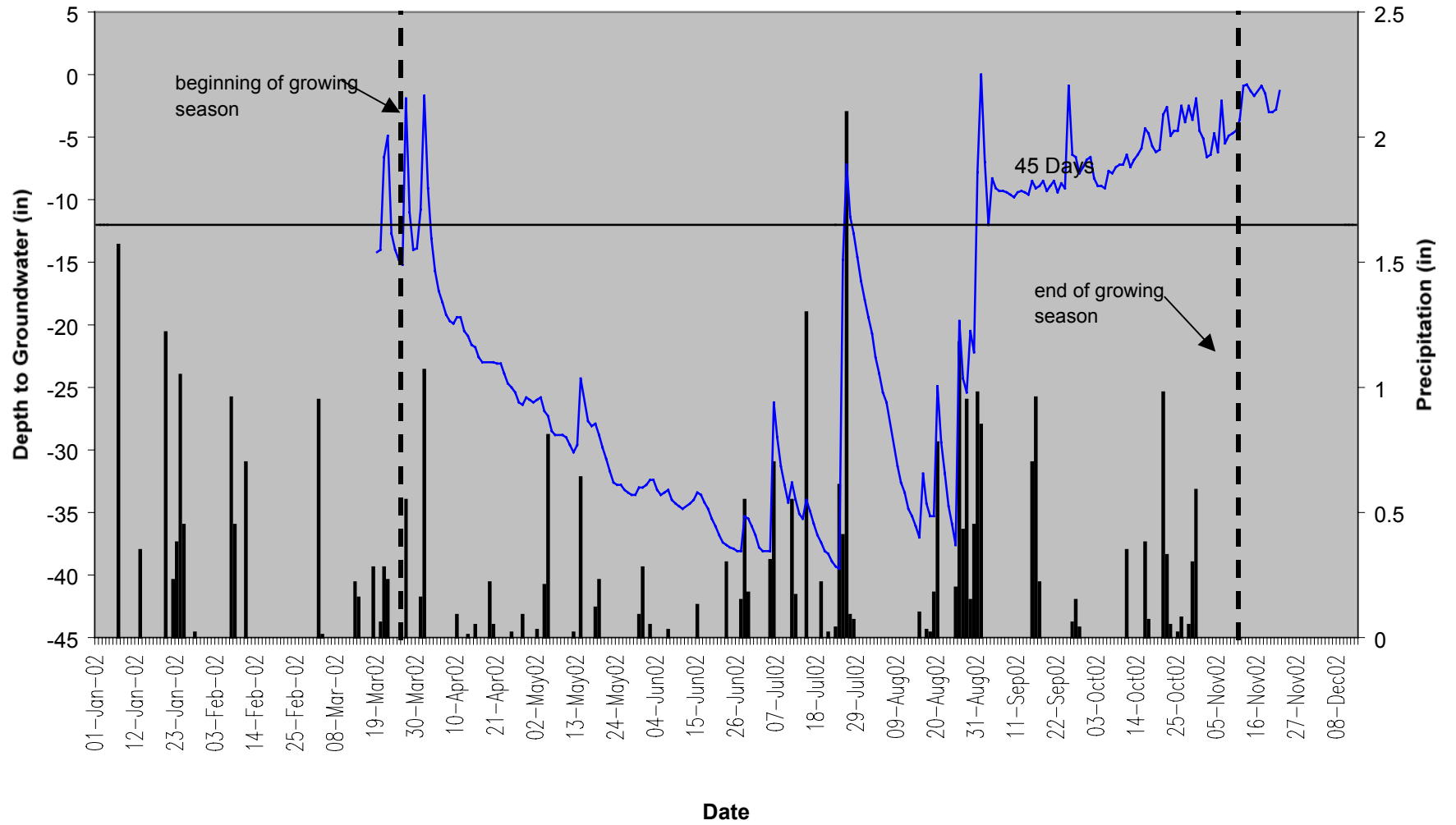
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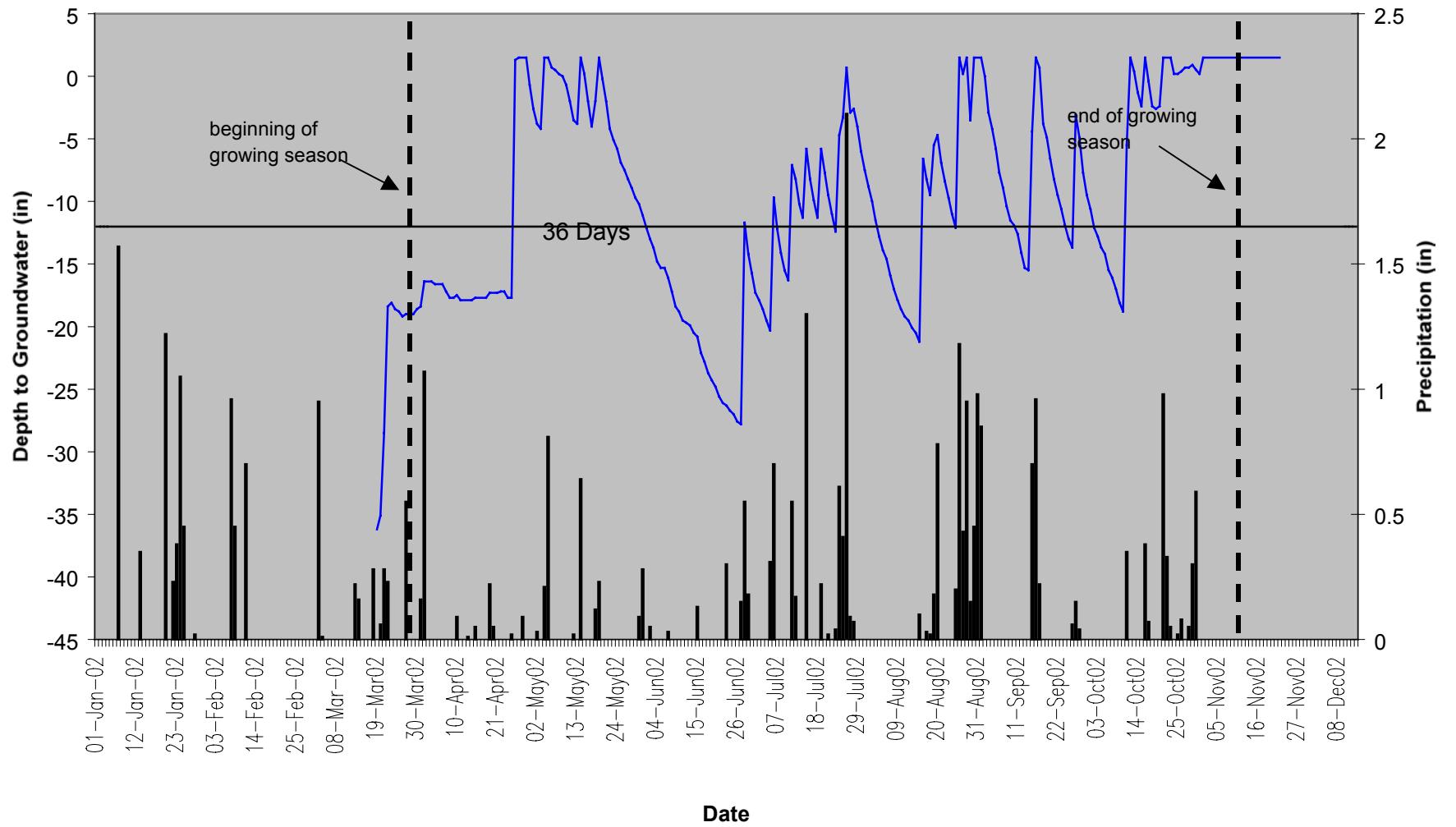
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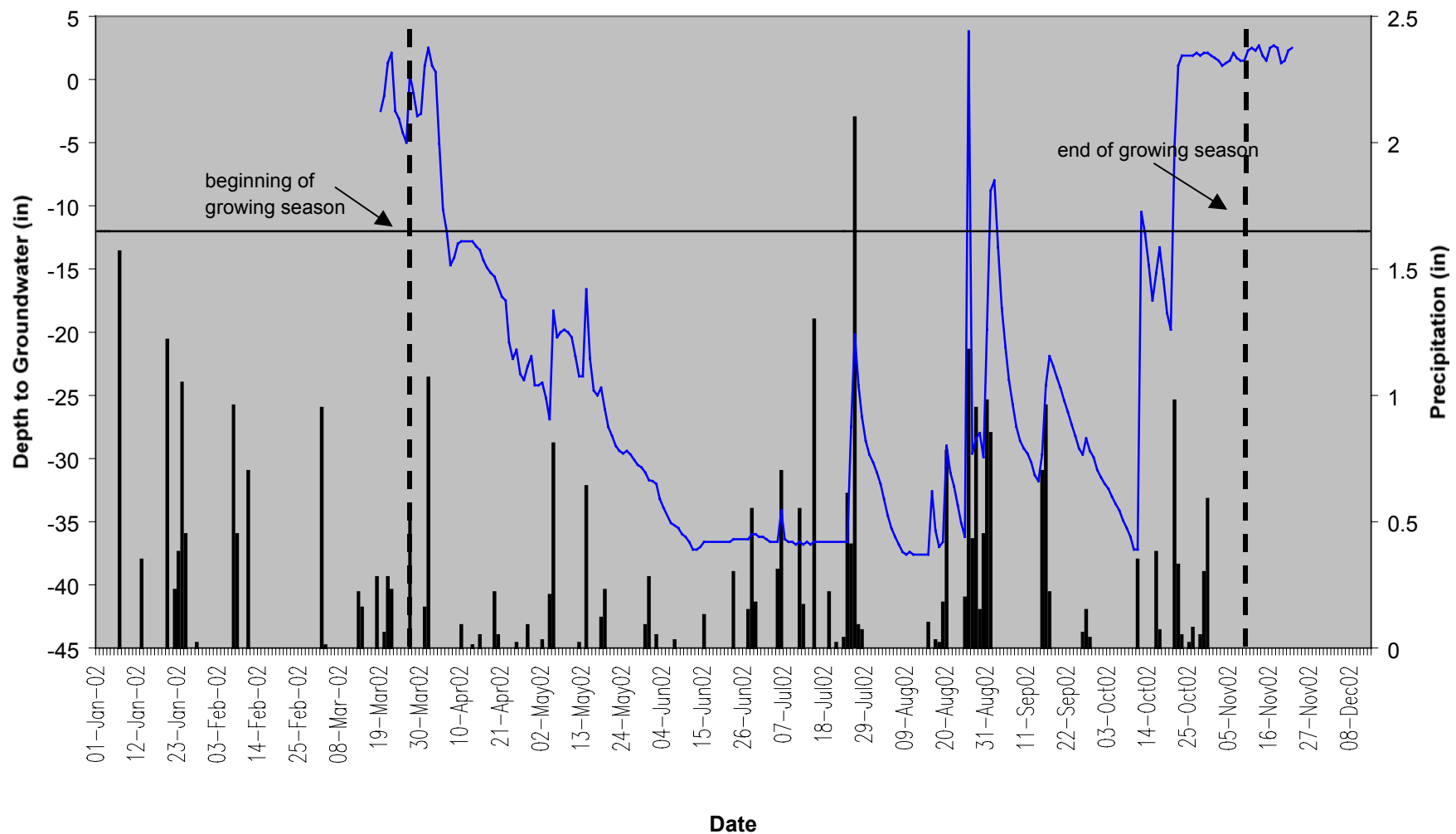
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S213FEA



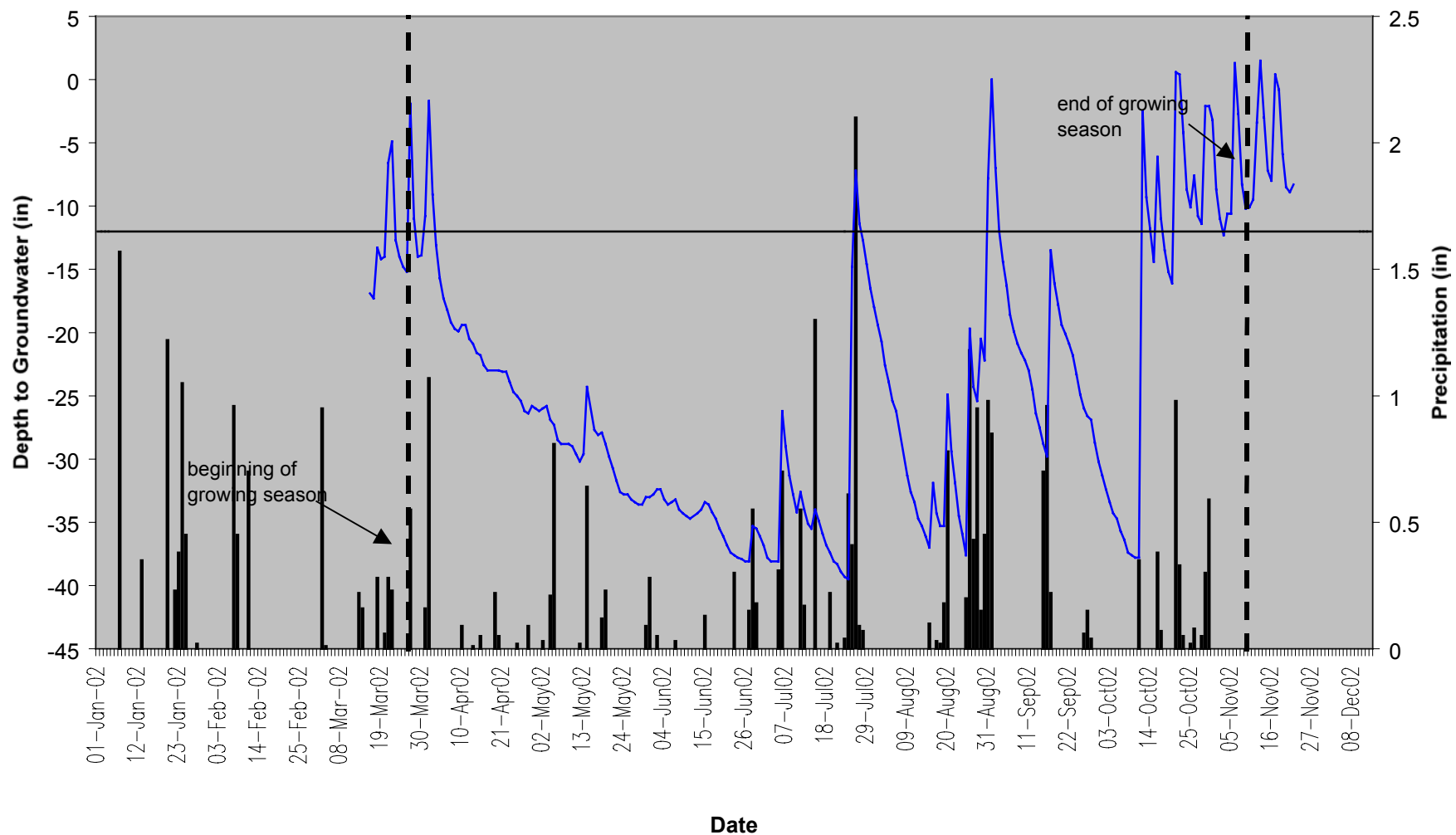
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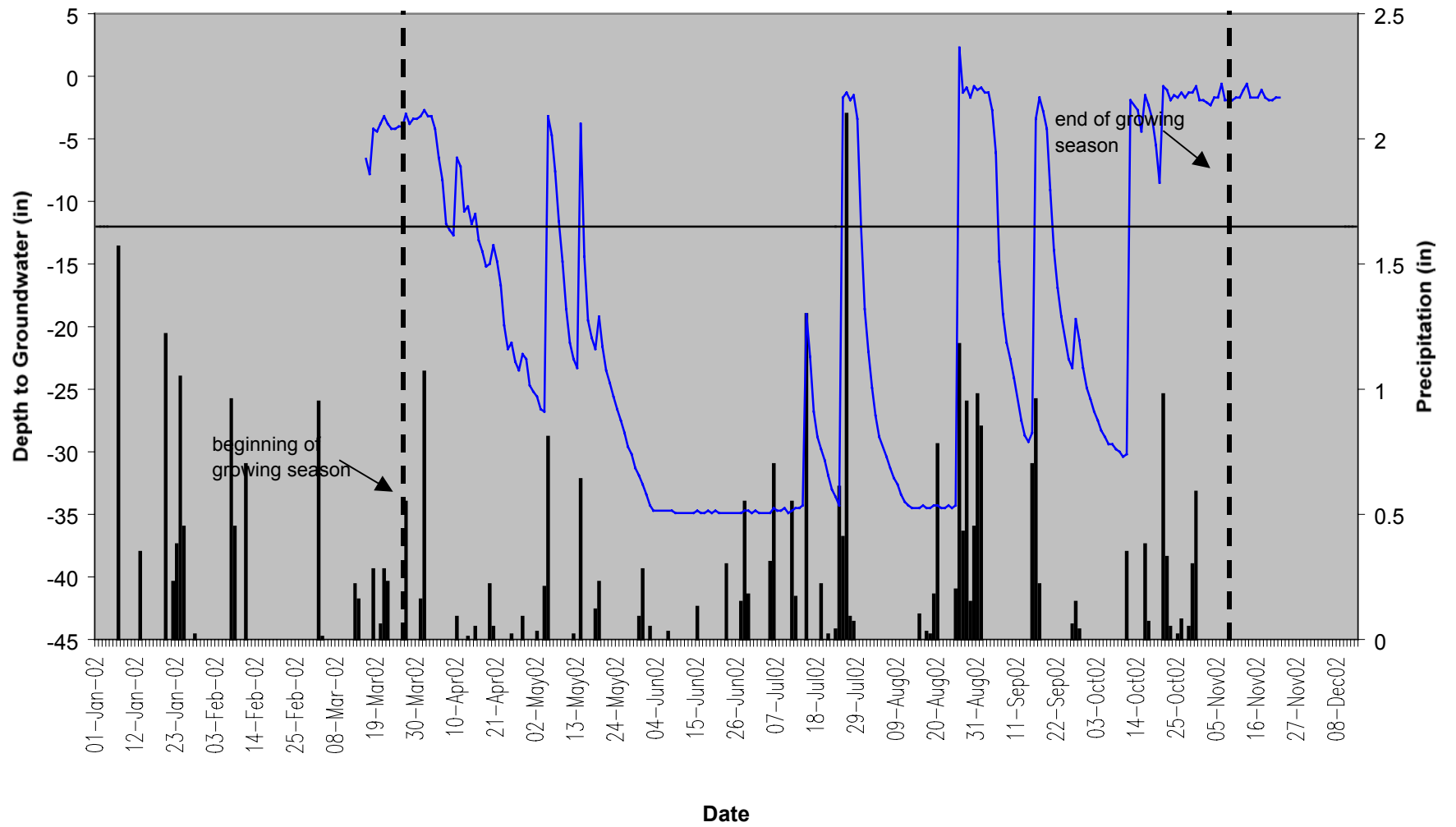
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S4CFF90



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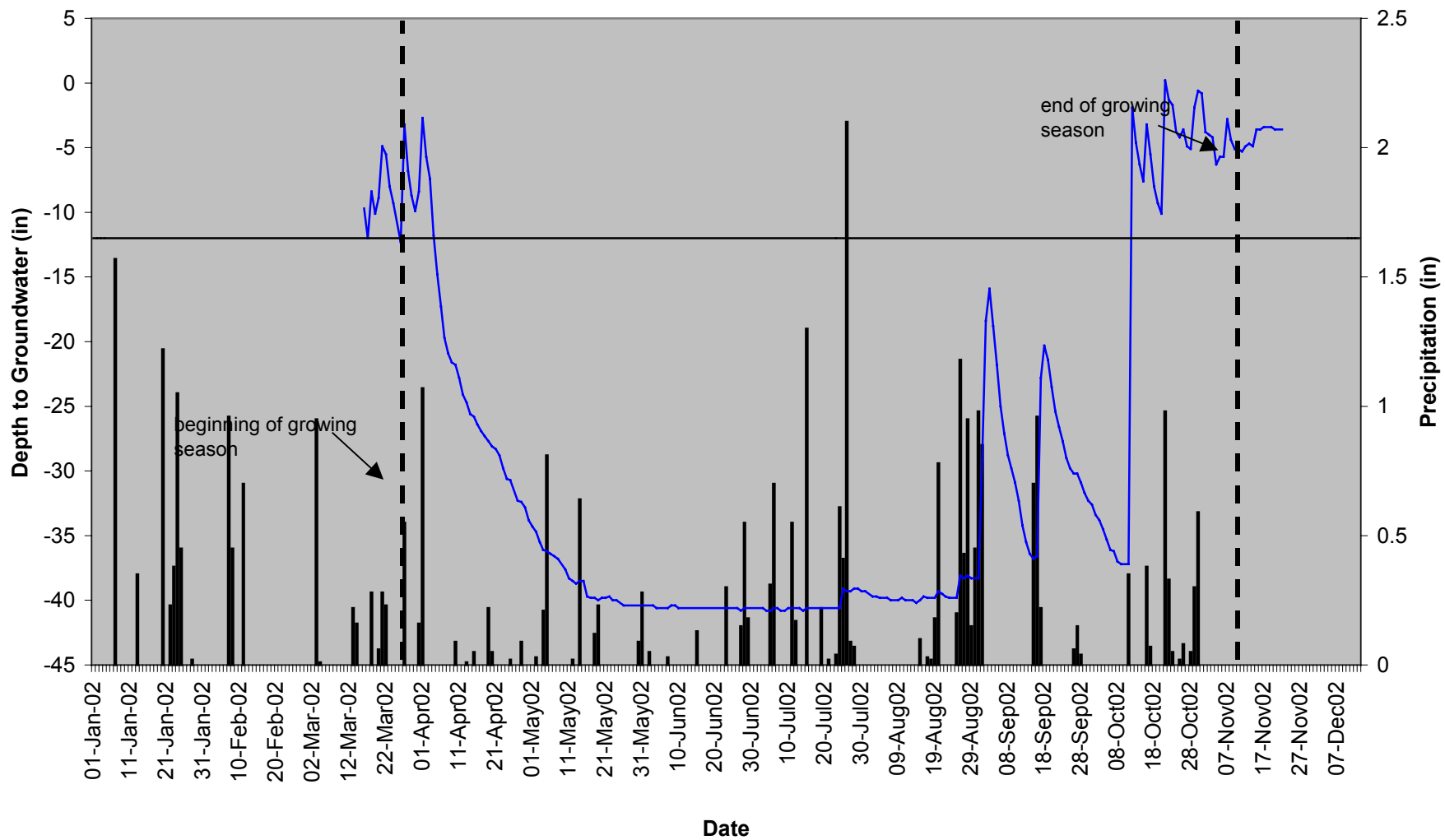
S448903



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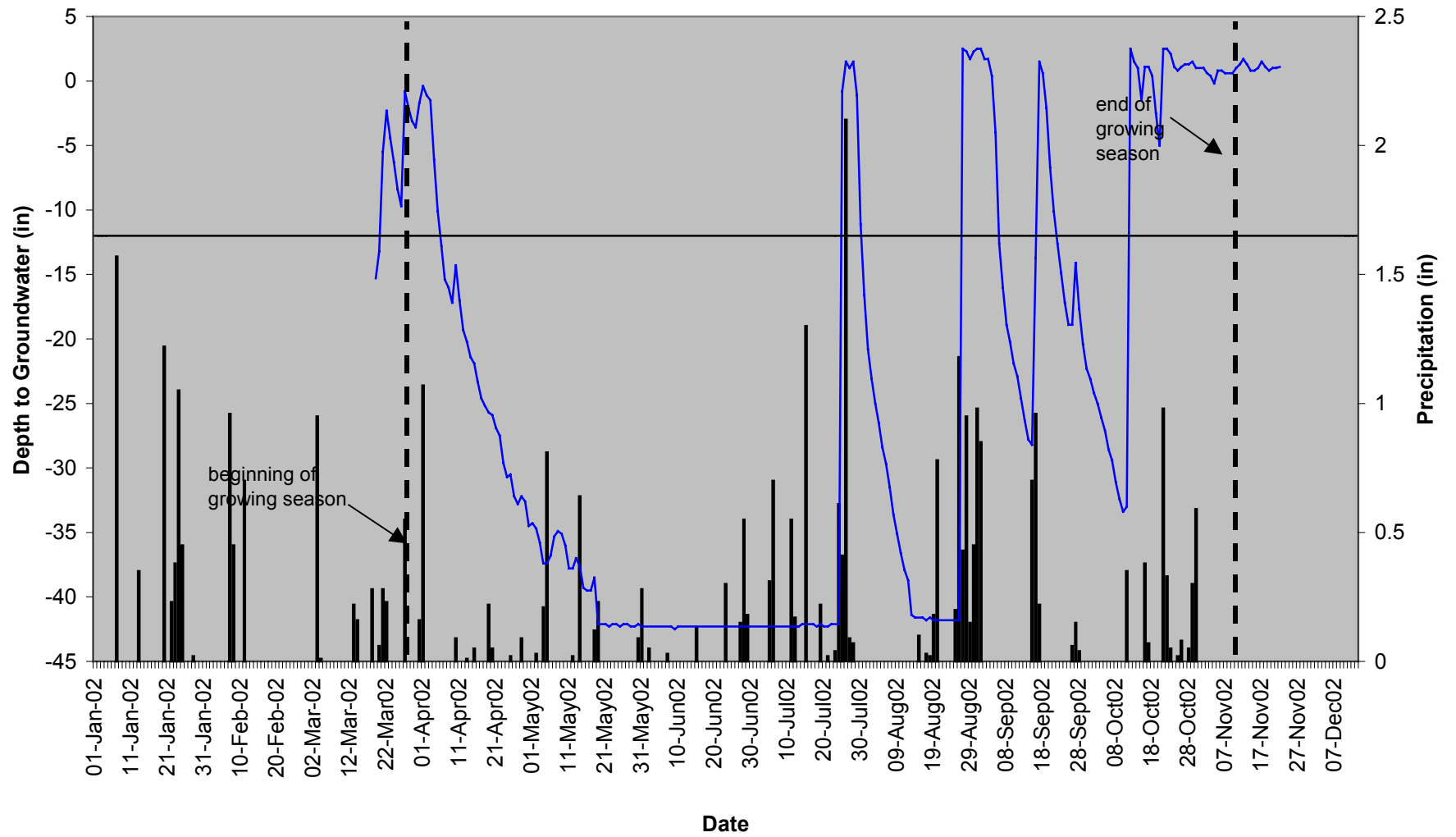
White Oak Creek Gauges GW-21 - GW-38

S4488F6



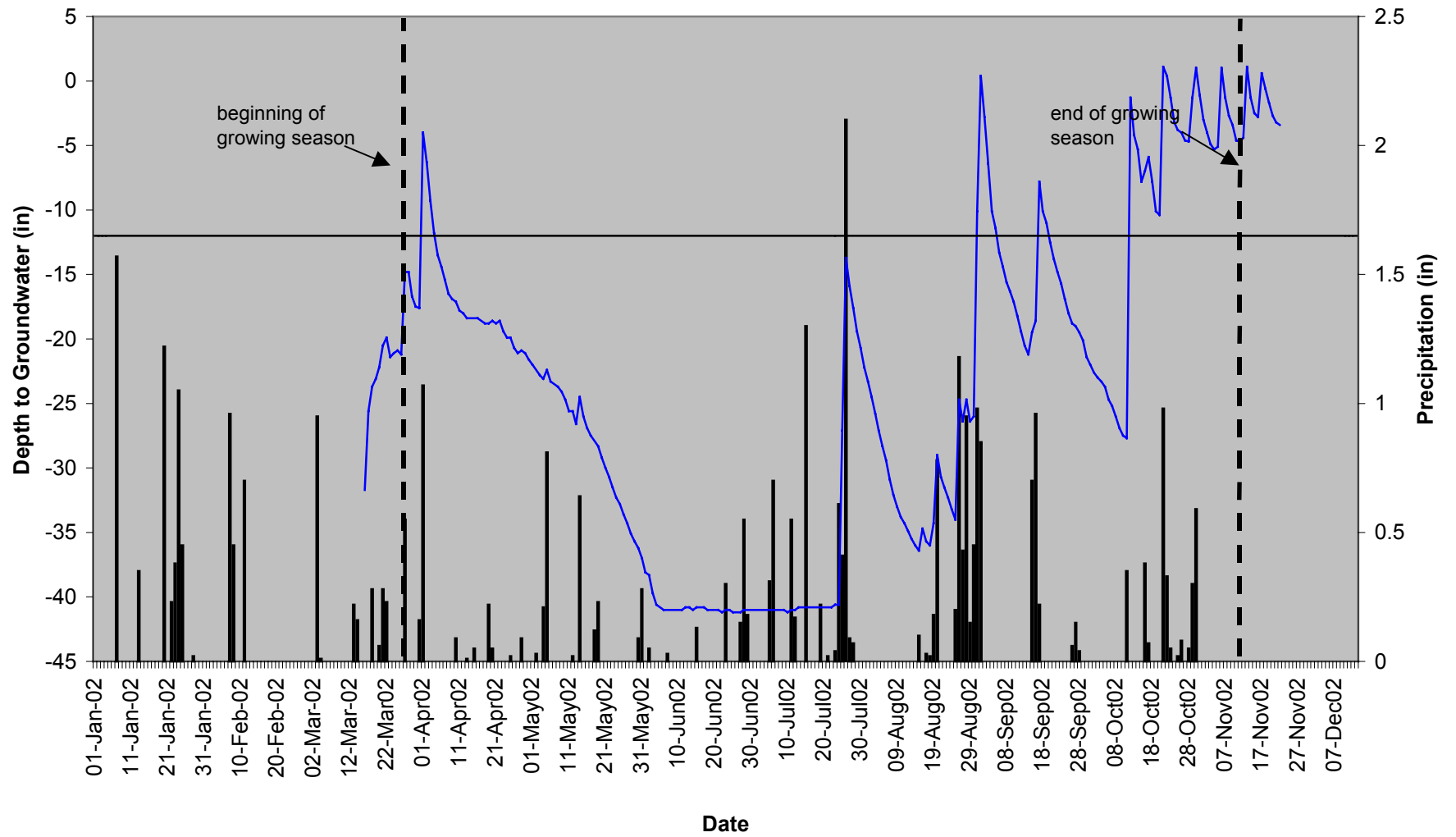
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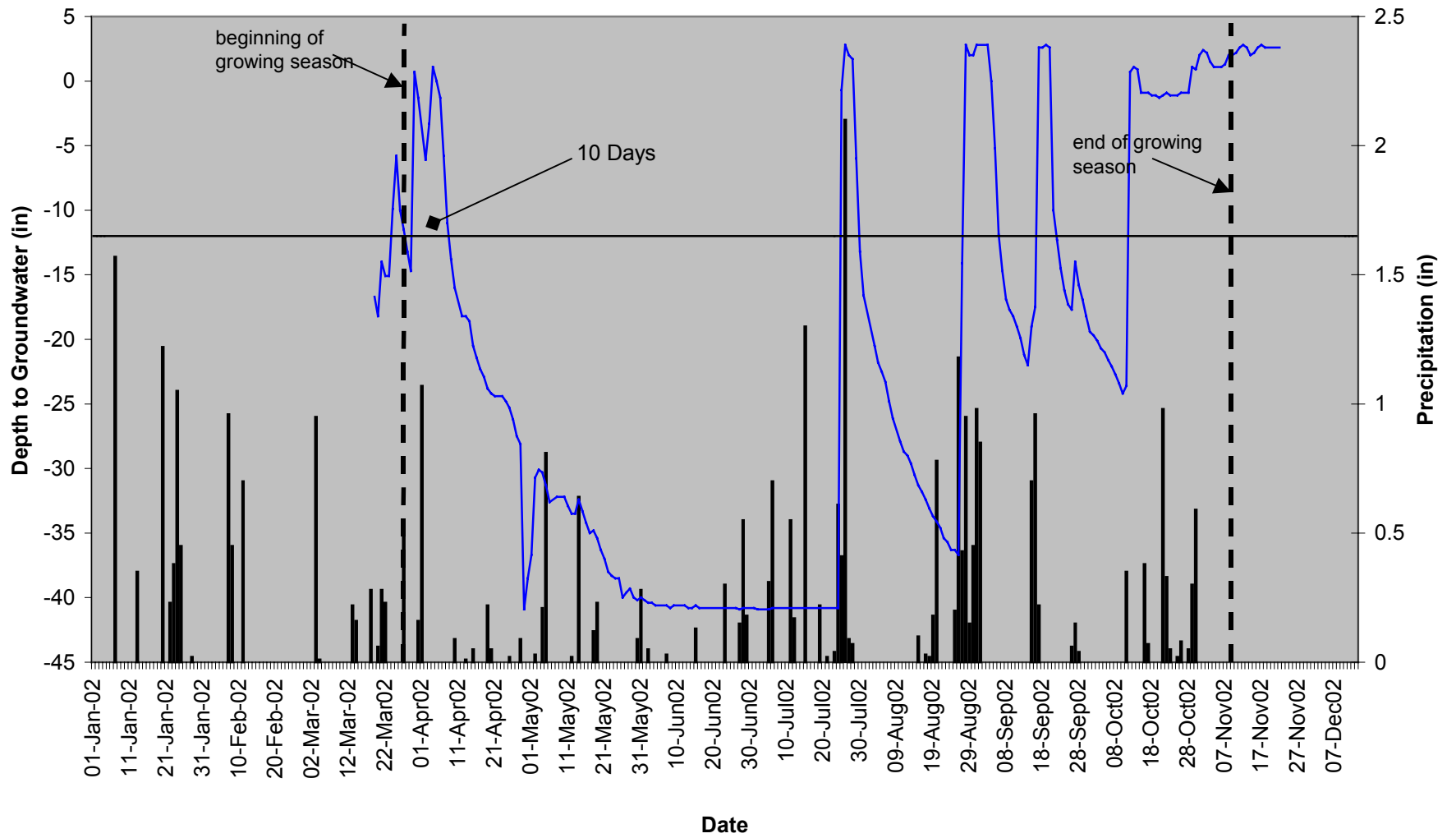
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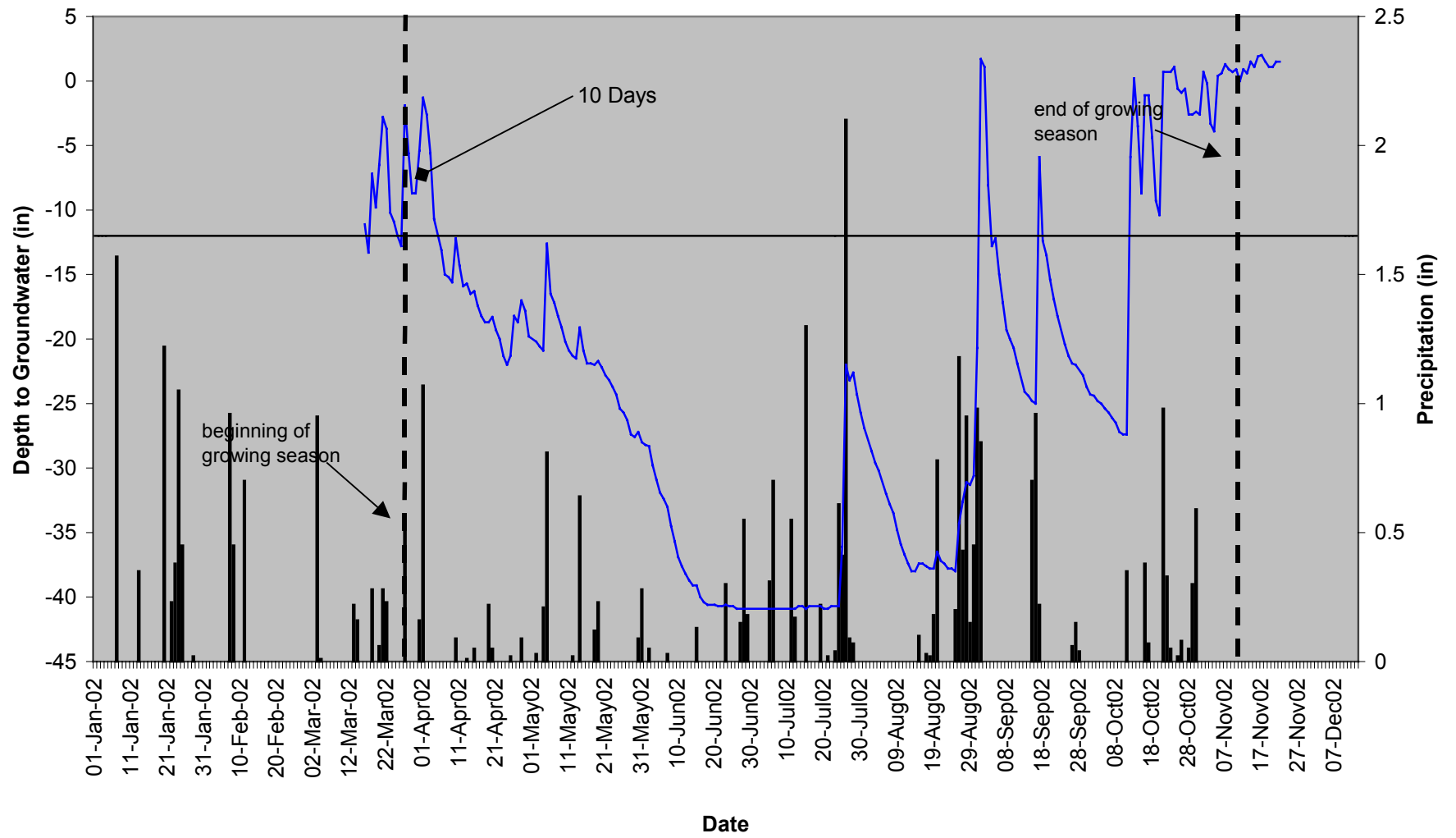
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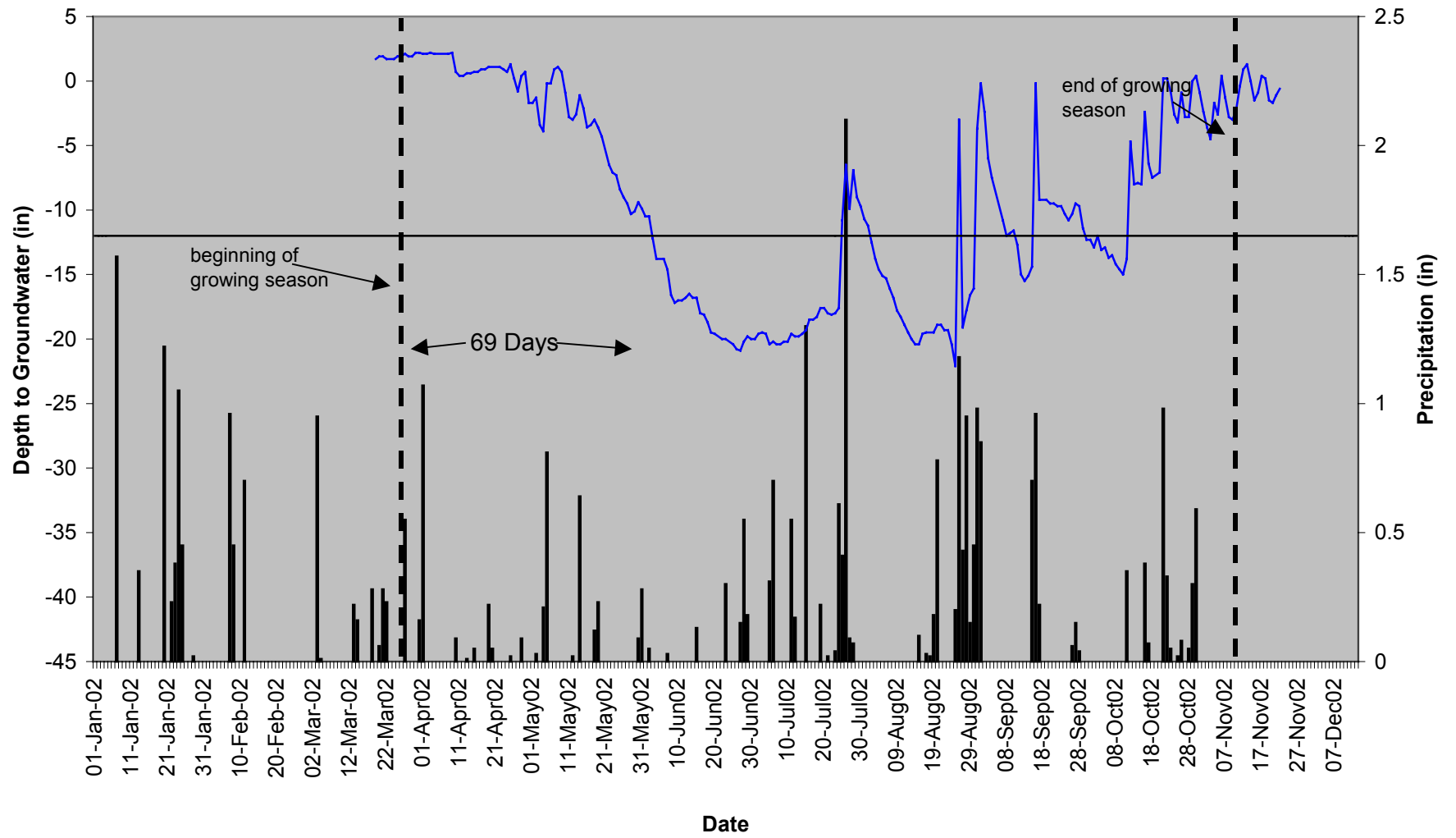
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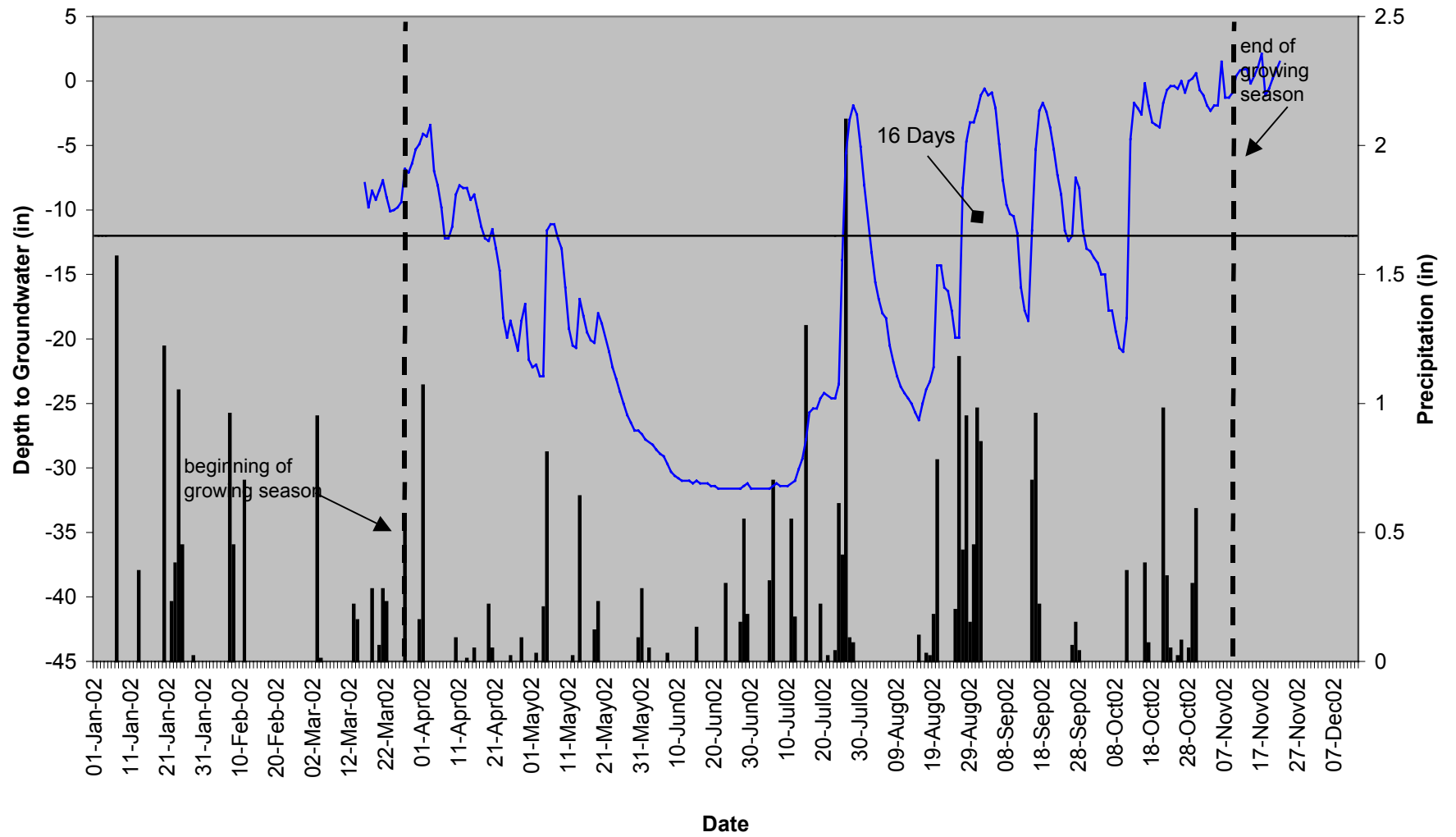
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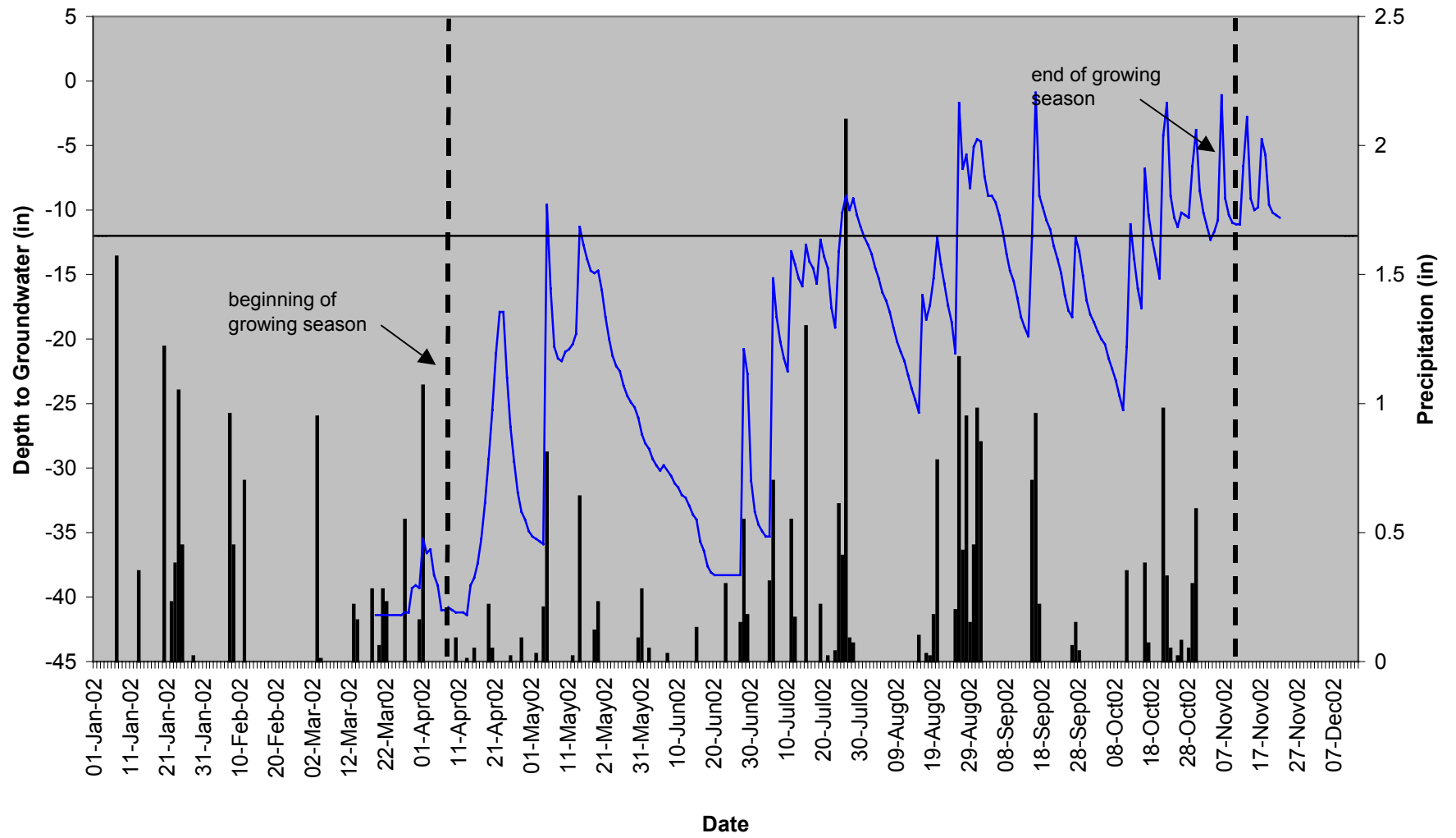
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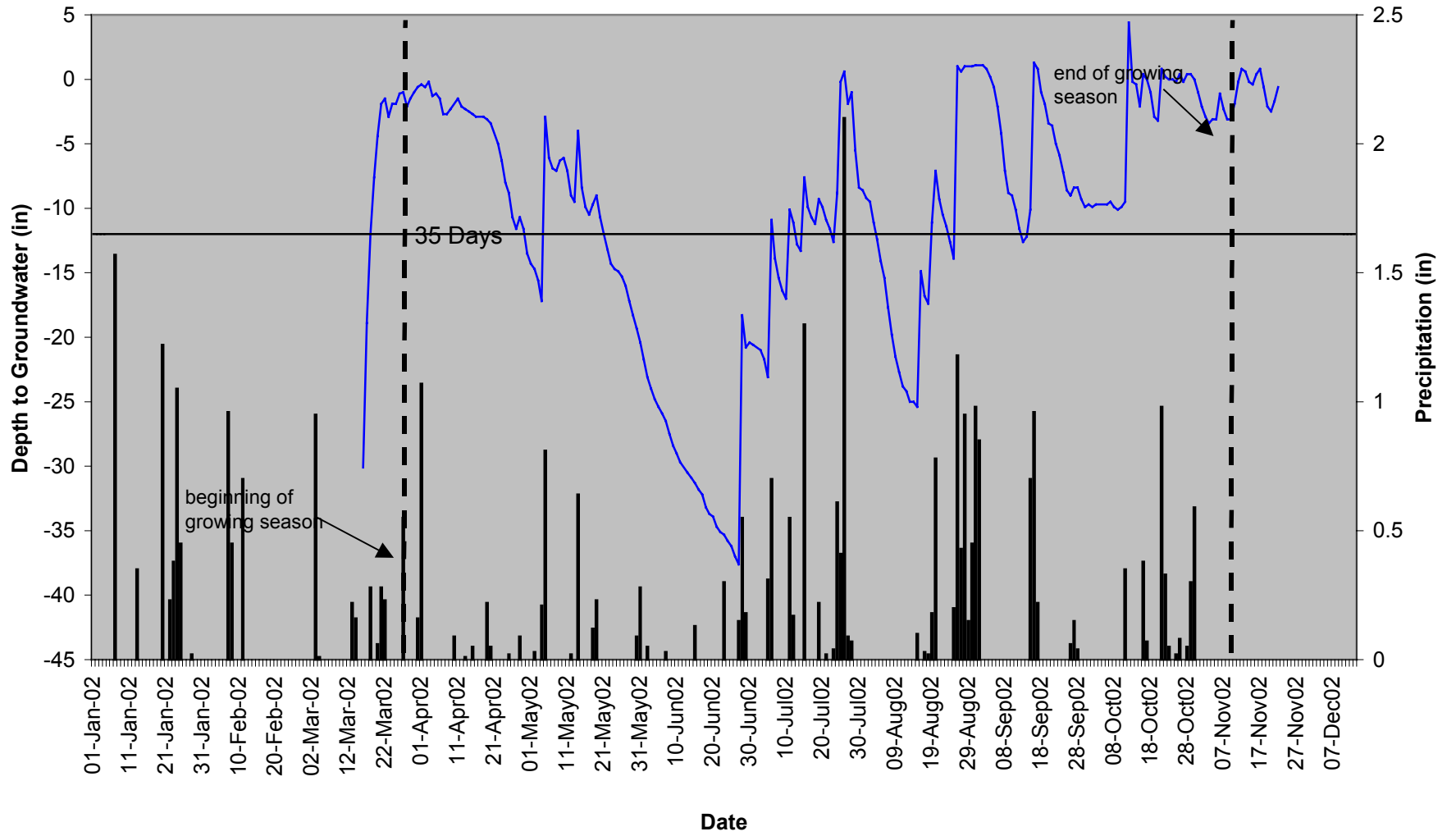
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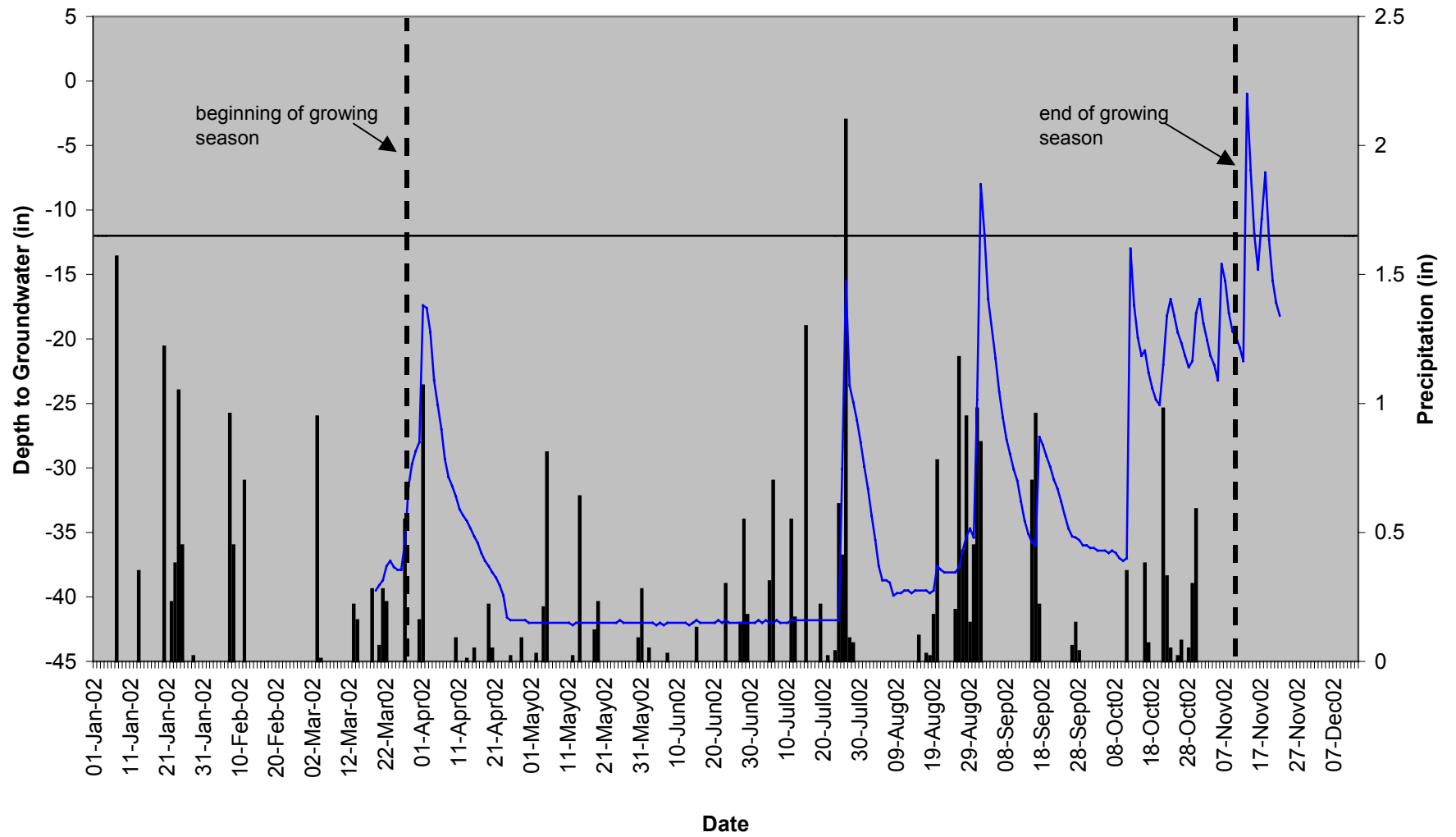
Legend: Rain Gauge (black bar), S4D029B GW-28 (blue line), Required Depth (horizontal line)

S448A07



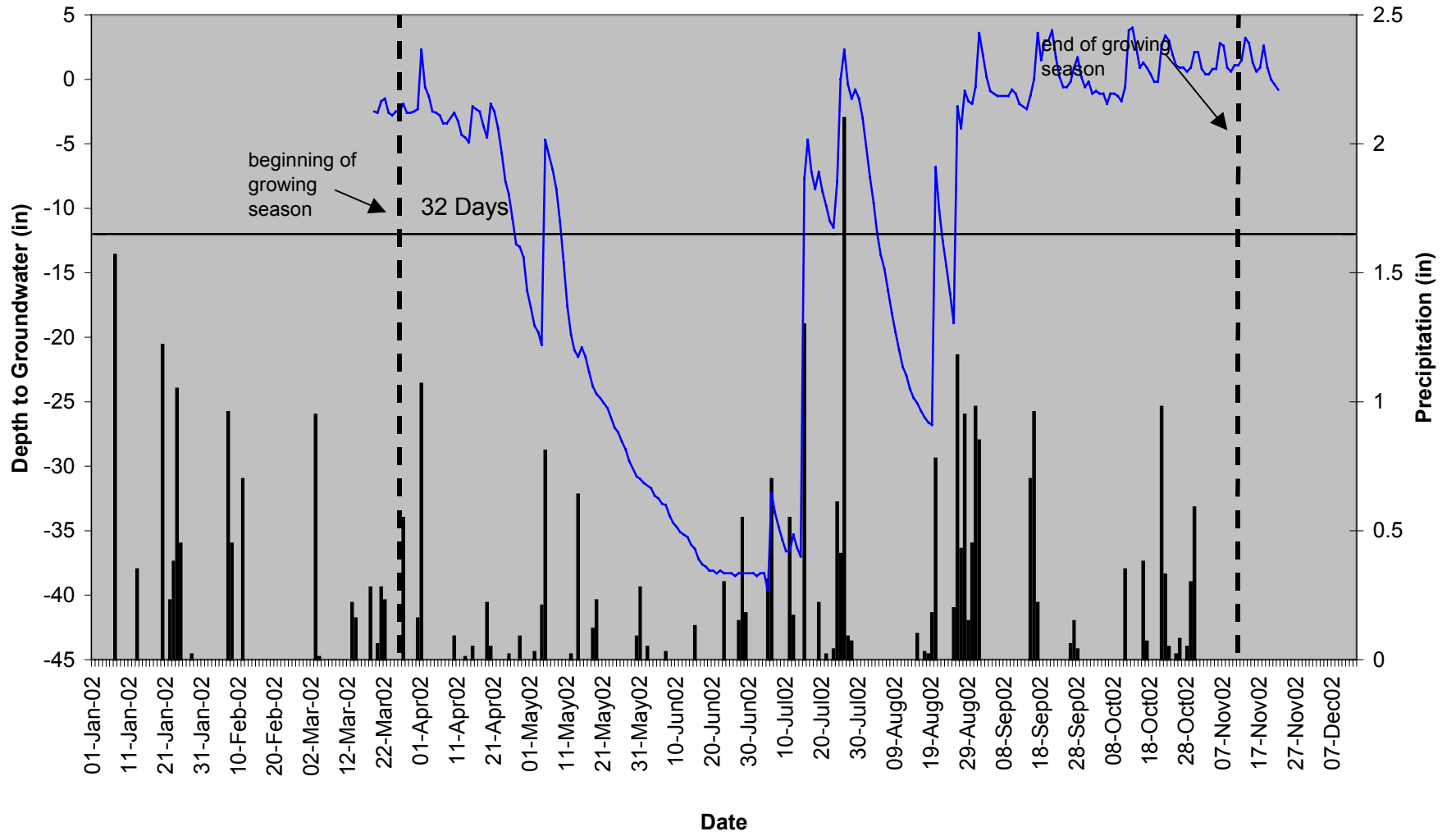
Legend: Rain Gauge (black bar), S448A07 GW-29 (blue line), Required Depth (black line)

S448761



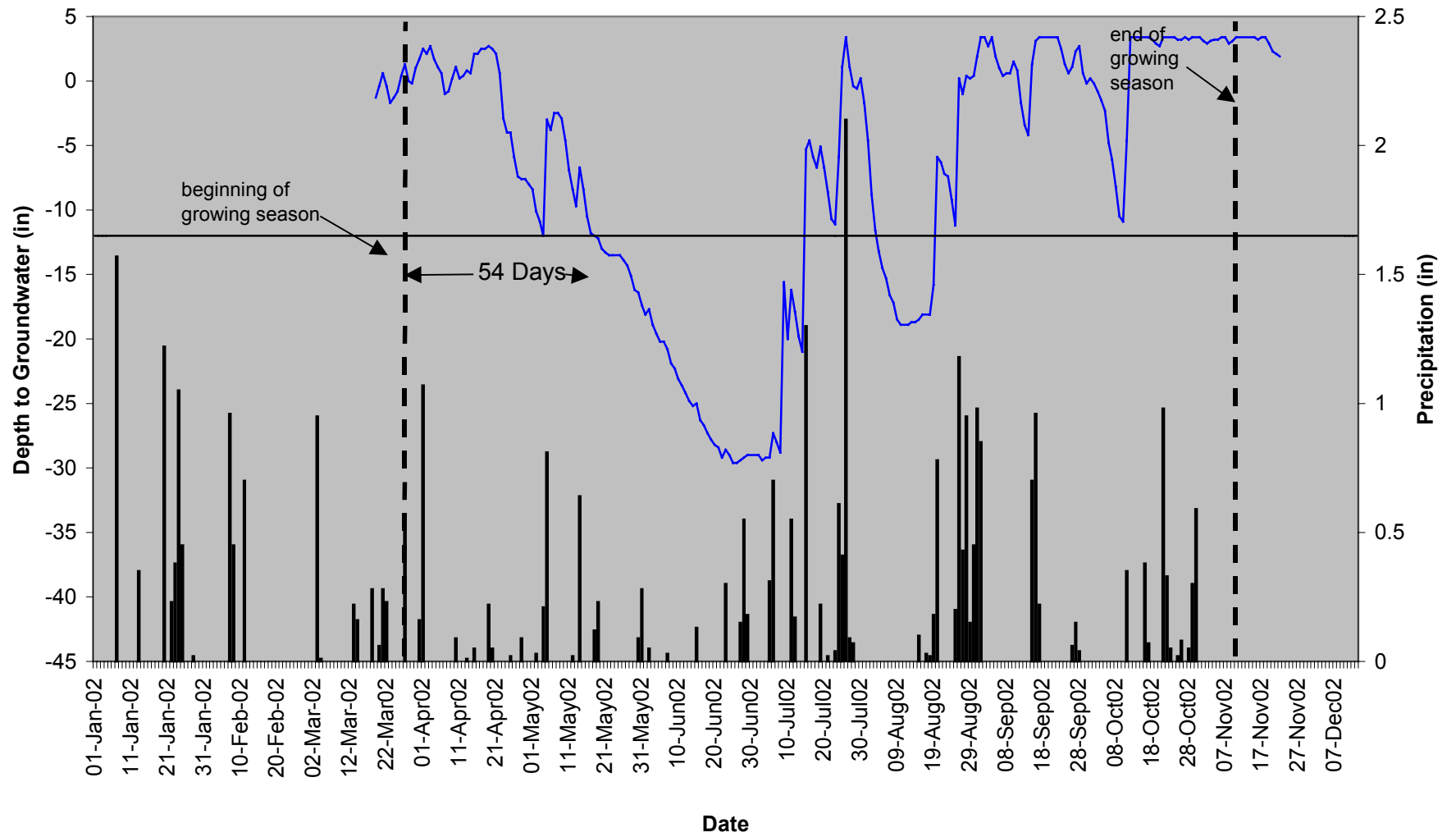
Legend: Rain Gauge (black bar), Required Depth (horizontal line), S448761 GW-30 (blue line)

S44882B



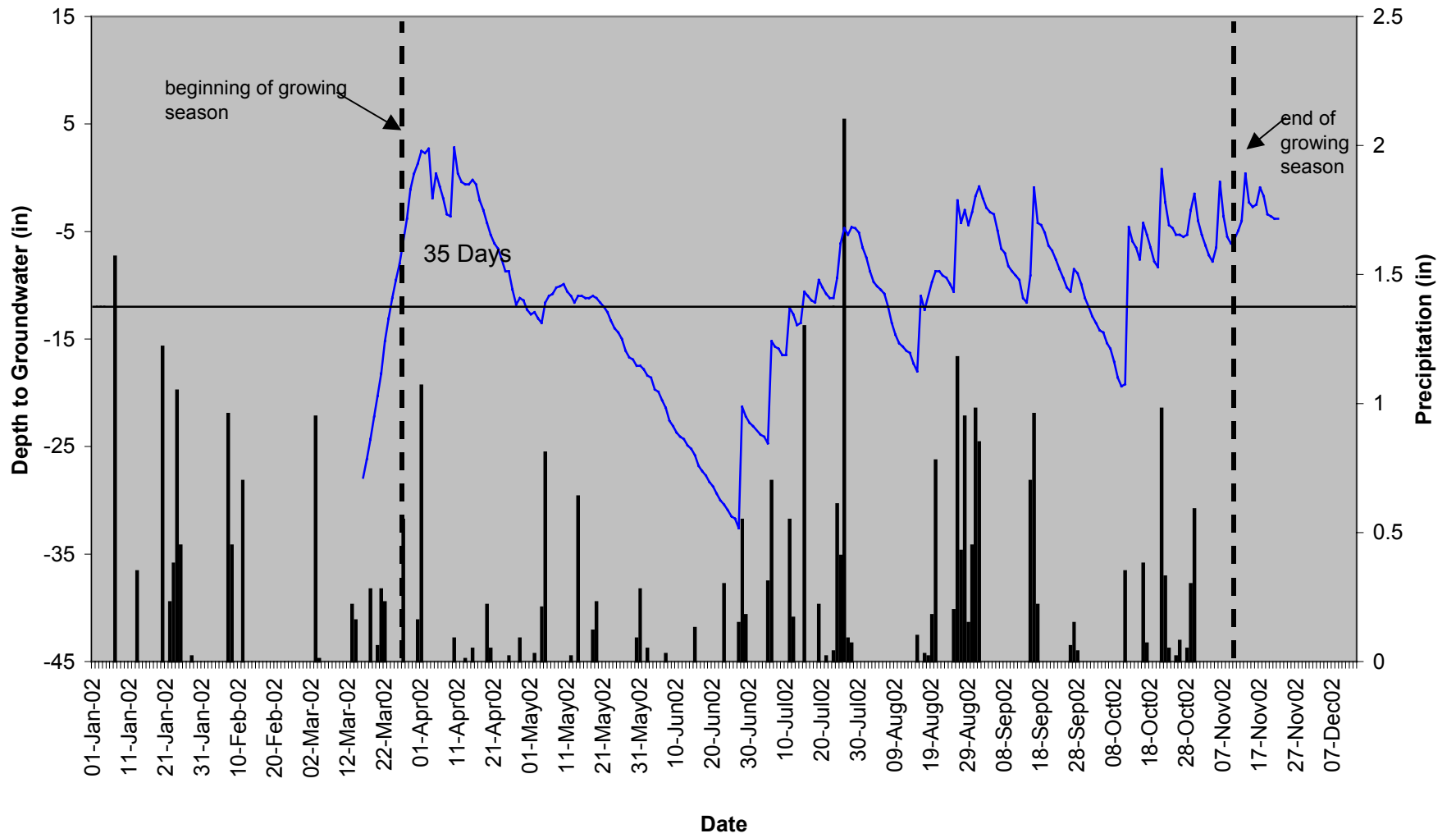
Legend: Rain Gauge (black bar), S44882B GW-31 (blue line), Required Depth (horizontal black line)

S448826



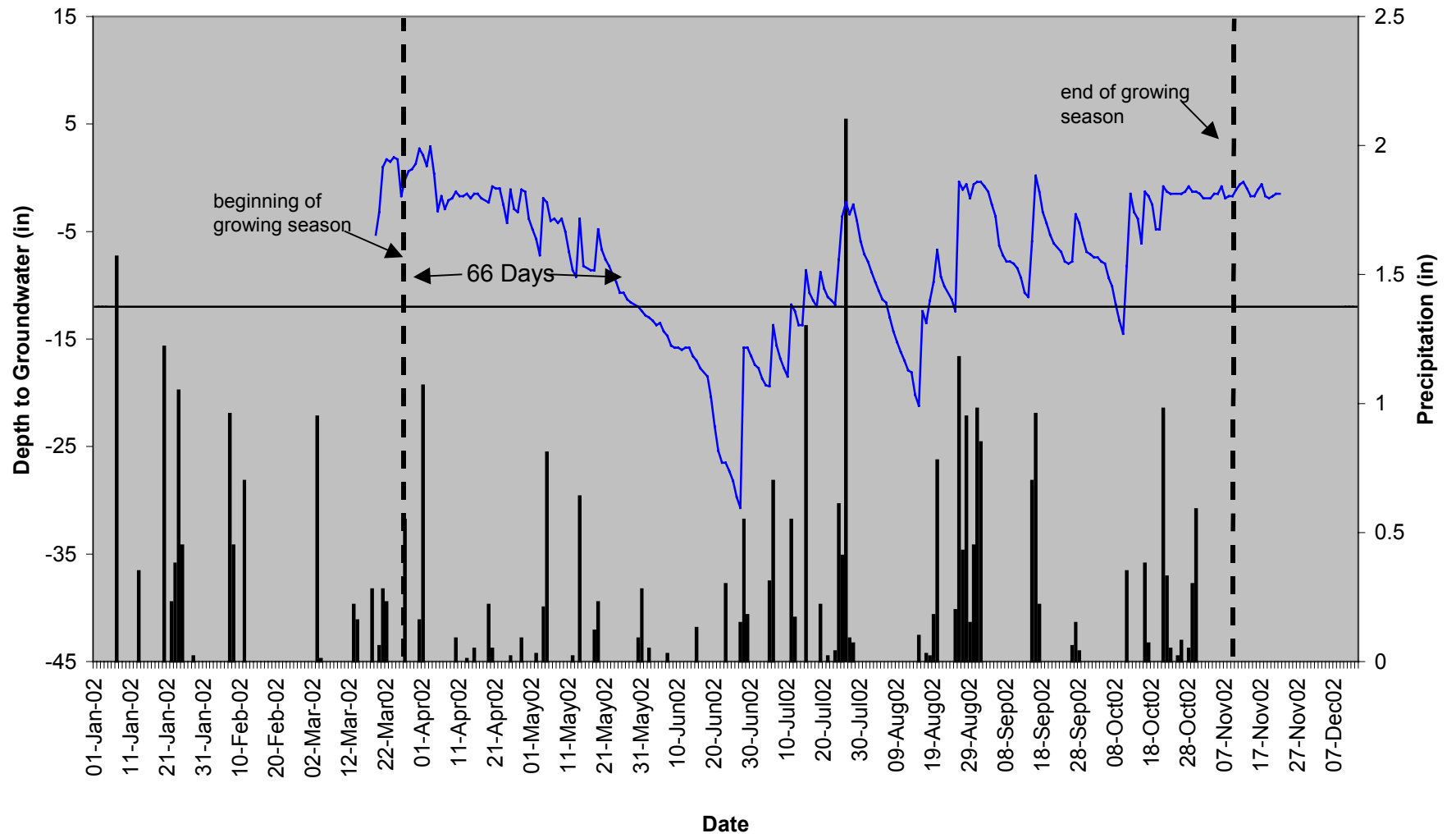
Legend: Rain Gauge (black bar), S448826 GW-32 (blue line), Required Depth (black line)

S44883D



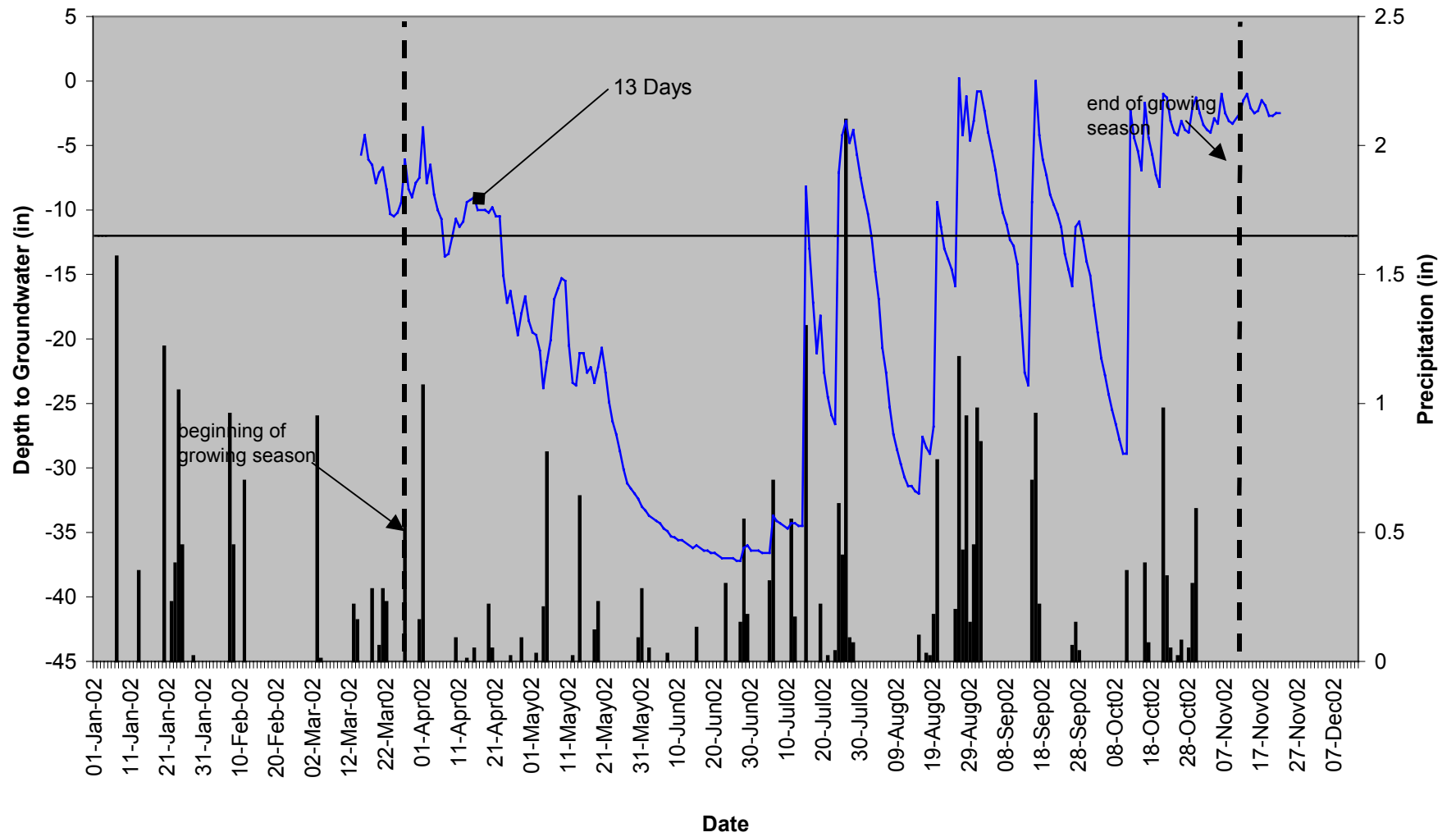
Legend: Rain Gauge (black bar), S44883D GW-33 (blue line), Required Depth (horizontal line)

S448814

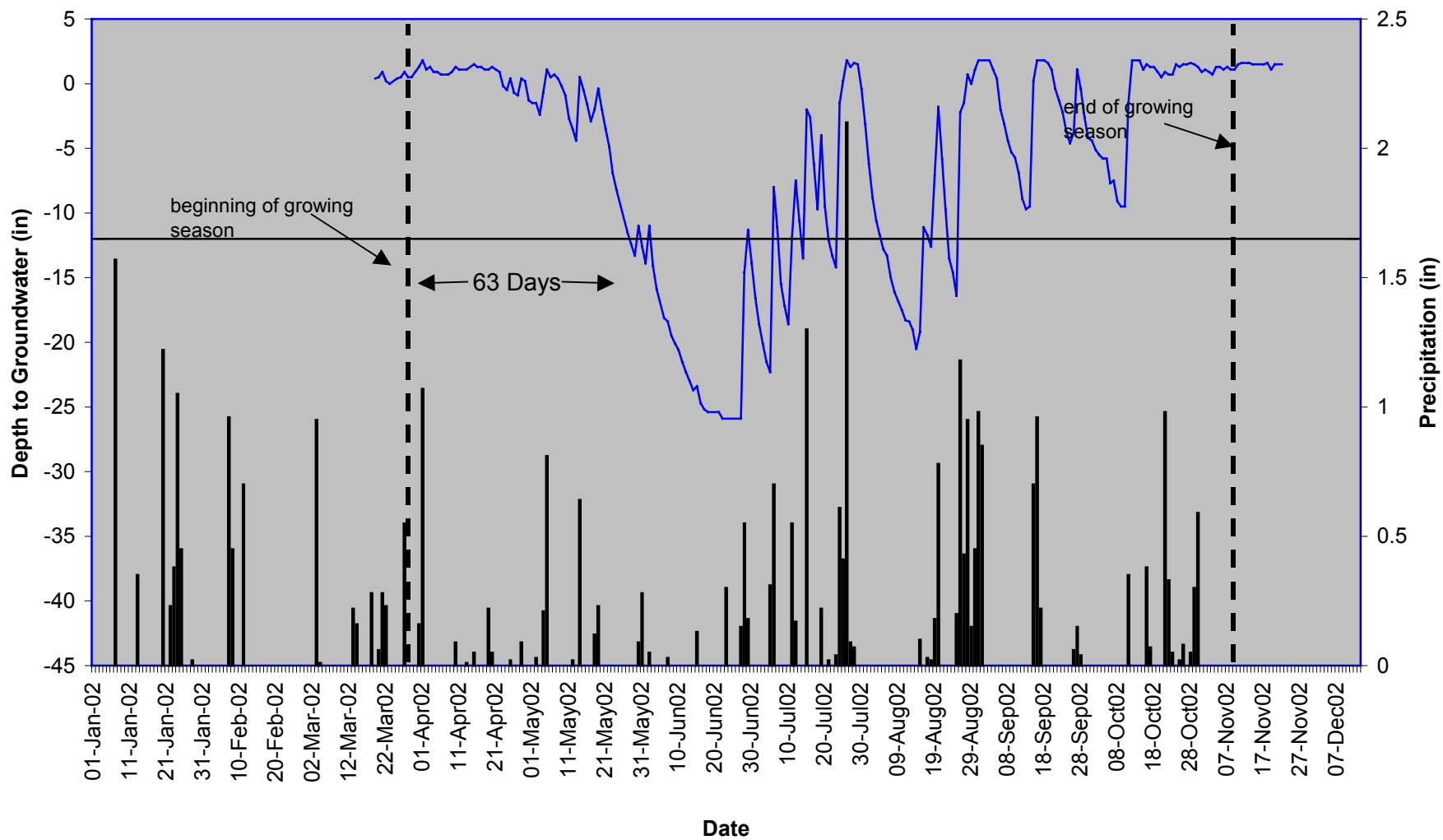


Legend: Rain Gauge (black bar), S448814 GW-34 (blue line), Required Depth (horizontal line)

S4CFEA0

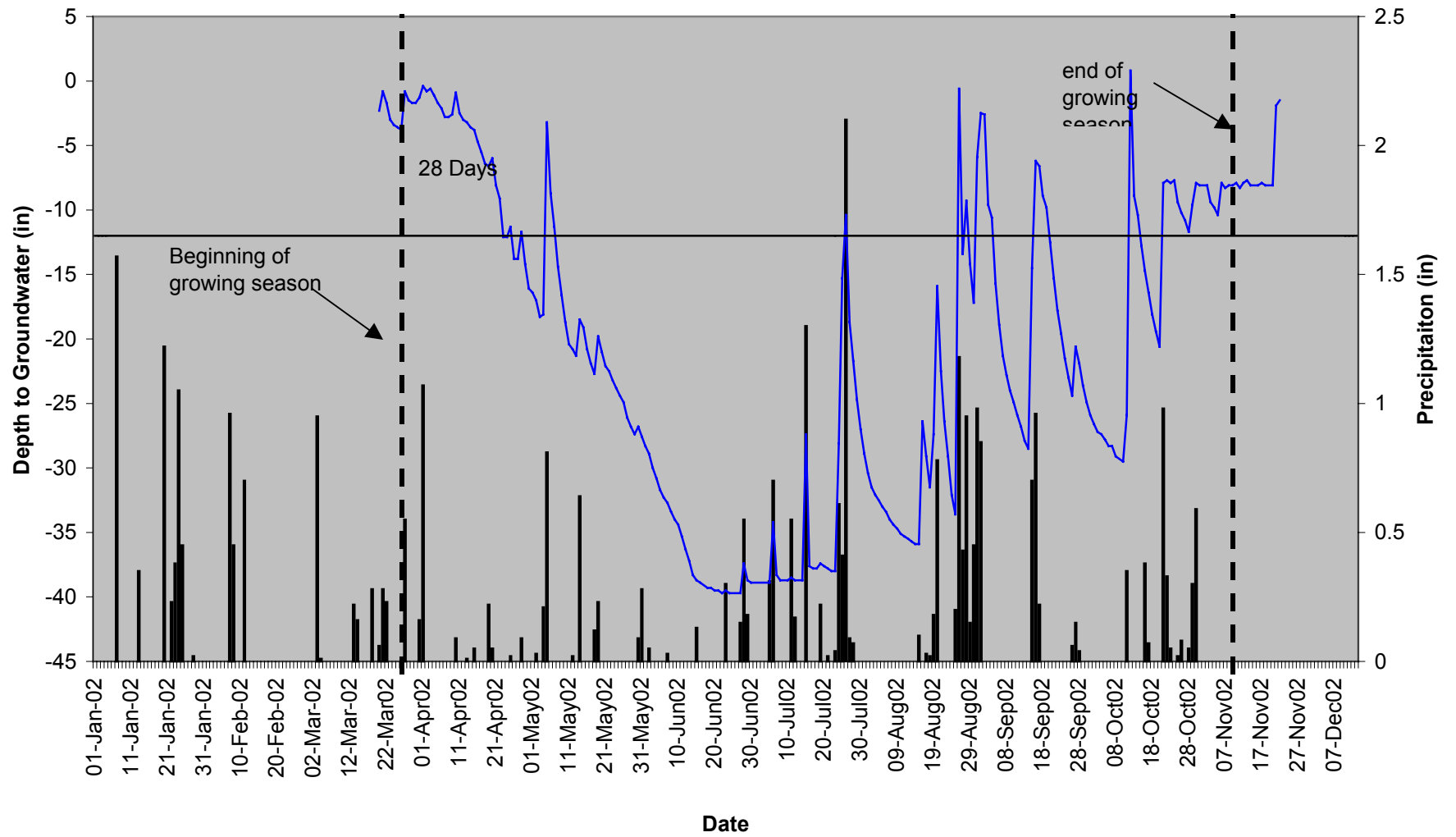


Legend: Rain Gauge (black bars), S4CFEA0 GW-35 (blue line), Required Depth (horizontal line)



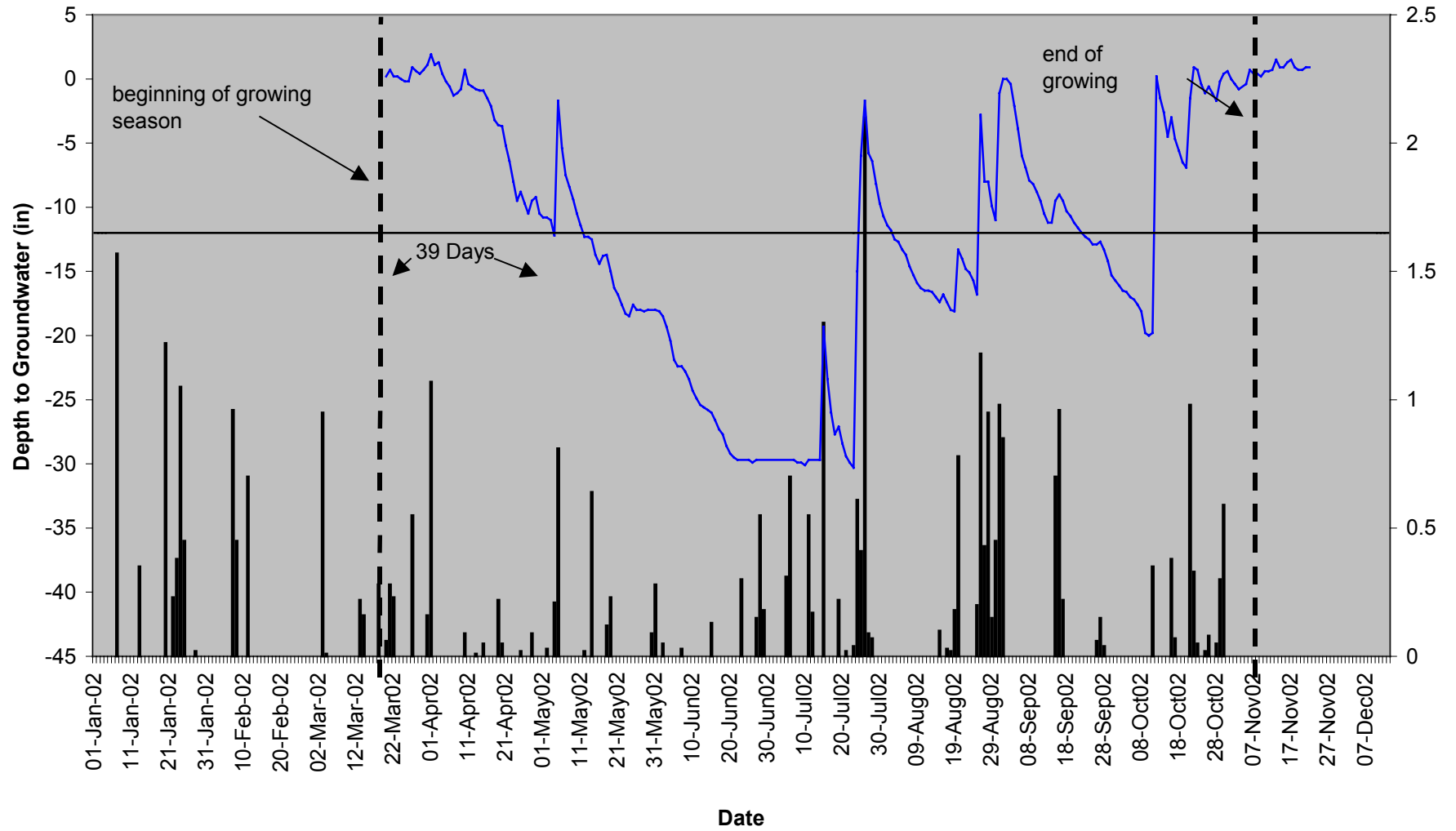
Rain Gauge
 S214022 GW-36
 Required Depth

S4487DE REF-37



Legend: Rain Gauge (black bar), S4487DE REF-37 (blue line), Required Depth (horizontal line)

S4489CF REF-38



Legend: Rain Gauge (black bar), S4489CF REF-38 (blue line), Required Depth (horizontal line)

APPENDIX B

SITE PHOTOS & PLANTING PLAN

White Oak Creek



Photo 1



Photo 2



Photo 3



Photo 4

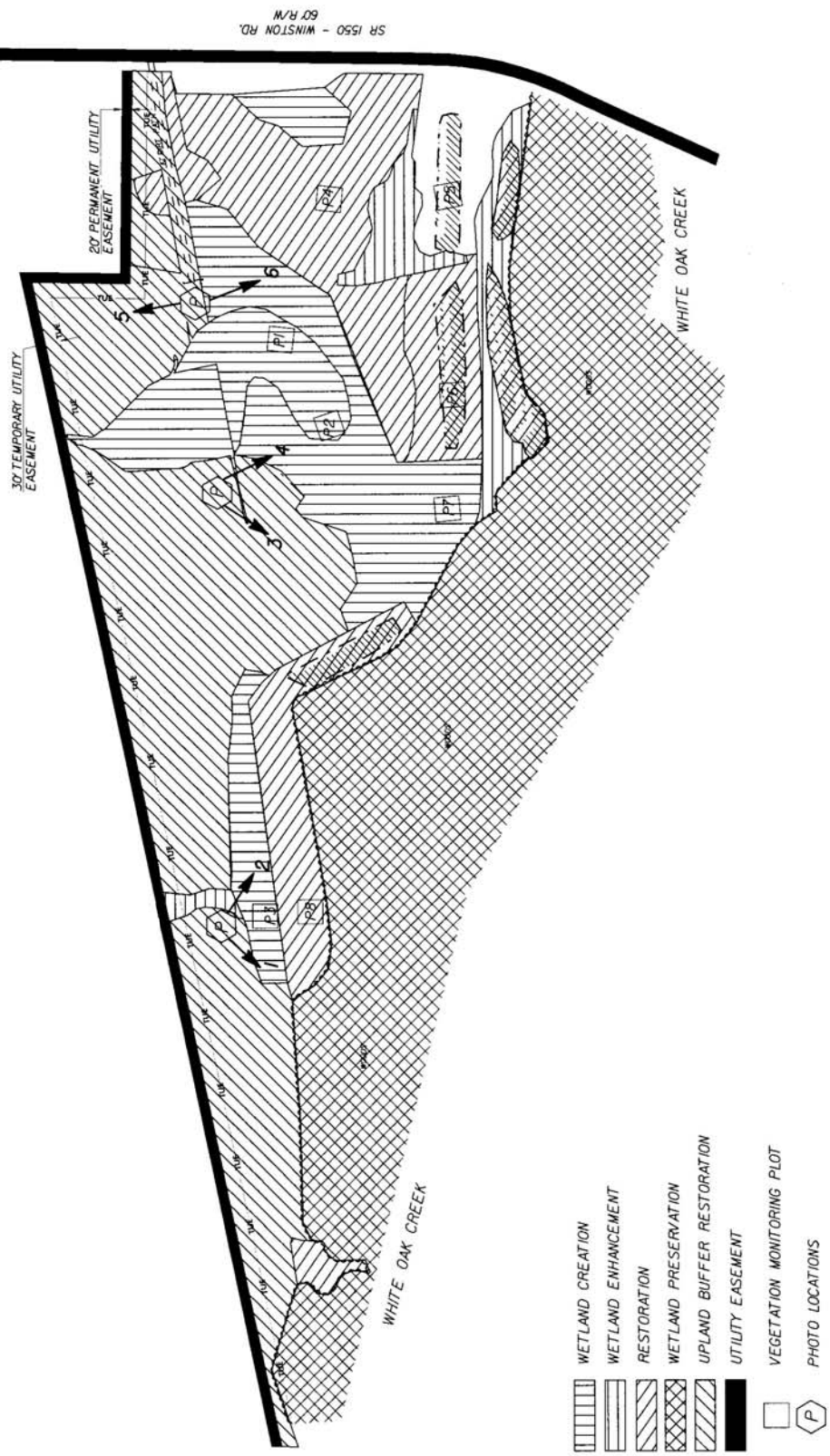










Photo 5



Photo 6

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

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