ANNUAL REPORT FOR 2004

Mallard Creek Mitigation Site
Mecklenburg County
Project No. 8.U670123
TIP No. R-211 WM

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 at the Mallard Creek Mitigation Site. This site was originally constructed in 1994 and underwent remediation in 1997. Monitoring activities in 2004 represent the seventh year of monitoring following the remediation. The site must demonstrate both hydrologic and vegetation success for a minimum of three years or until the site is deemed successful.

The Mallard Creek Site is divided into two sites. Site 1 is the smaller of the two, containing three groundwater gauges, one surface gauge, and two vegetation plots. Site 2 contains seven groundwater gauges, one surface gauge, one rain gauge, and four vegetation plots. Site 2, which is located across Mallard Creek Church Road from Site 1, is at a slightly higher elevation than its counterpart.

The daily rainfall data depicted on the gauge data graphs was recorded from an onsite rain gauge that was installed on May 4, 2000. Additional Charlotte rainfall data used for the 30-70 graph was provided by the NC State Climate Office. In 2004, Charlotte experienced an average to above average rainfall year.

For Site 1, all three groundwater-gauges revealed saturation greater than 12.5% of the growing season. The surface gauge located on Site 1, revealed periodic inundation during the growing season.

Hydrologic data at Site 2 indicated that five of the seven monitoring gauges met the hydrologic success criteria for the seventh year of monitoring. The surface gauge located on Site 2, revealed periodic inundation during the growing season.

There were six vegetation-monitoring plots established throughout the planting areas; two plots in Site 1 and four plots in Site 2. The 2004 vegetation monitoring revealed an average density of 490 trees per acre. This average is well above the minimum success criteria of 320 trees per acre. NCDOT proposes to discontinue vegetation monitoring at the Mallard Creek Mitigation Site.

The Mallard Creek Church Road widening project, U-2508C, is scheduled for completion in late March 2005. This highway project will add additional hydrology to the site during the construction.

Per the letter from the Ecosystem Enhancement Program (EEP) 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 Mallard Creek Mitigation Site, located in Mecklenburg County, consists of two separate wetland sites. Both are situated along SR 2833 (Mallard Creek Church Road), just east of US 29 (Figure 1). The two sites serve as mitigation for wetland impacts associated with the Charlotte Outer Loop (R-211 DA, USACE Action I.D. 199200013).

Both sites, totaling 10 acres in size, consist of bottomland hardwood forest restoration and creation. The sites were initially constructed and planted in 1994; however, hydrologic and vegetation problems forced remediation in 1997. Remediation activities involved grading both sites to more accurately reflect groundwater profiles.

The site was developed in cooperation with Mecklenburg County. As a result of this partnership, the county will incorporate the mitigation sites into a greenway plan for the area. A boardwalk has been constructed on Site 2 as part of the Mecklenburg County Parks and Recreation system. An additional section of boardwalk will be constructed adjacent to Site 1 when Mallard Creek Church Road is widened.

1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative criteria must be met for a minimum of three consecutive years or until the site is deemed successful. 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-year at the Mallard Creek Mitigation Site.

Activities in 2004 reflect the seventh year of monitoring following the remediation efforts in 1997. Included in this report are analyses of both hydrologic and vegetative monitoring results.

Figure 1. Site Location Map

1.3 PROJECT HISTORY

October 1994	Site 1 & 2: Grading Construction
February 1995	Site 2: Planted; Site 1: No Planting
September 1995	Vegetation Monitoring (1yr.)
March - November 1996	Hydrologic Monitoring
September 1996	Vegetation Monitoring (2 yr.)
October 1997	Site 1 & 2: Remediation, Grading Construction
February 1998	Site 2: Boardwalk Construction
January-February 1998	Tree Planting: Site 1 & 2
May 1998	Monitoring Gauges Installed
May - November 1998	Hydrologic Monitoring (1 yr.)
September 1998	Vegetation Monitoring (1 yr.)
May - November 1999	Hydrologic Monitoring (2 yr.)
September 1999	Vegetation Monitoring (2 yr.)
March - November 2000	Hydrologic Monitoring (3 yr.)
September 2000	Vegetation Monitoring (3 yr.)
December 2000	Water Main Fixed Adjacent to Site 1
March - November 2001	Hydrologic Monitoring (4 yr.)
June 2001	Vegetation Monitoring (4 yr.)
March - November 2002	Hydrologic Monitoring (5 yr.)
August 2002	Vegetation Monitoring (5 yr.)
March - November 2003	Hydrologic Monitoring (6 yr.)
October 2003	Vegetation Monitoring (6 yr.)
October 2003	Soils Investigation
August 2004	Vegetation Monitoring (7 yr.)
March - November 2004	Hydrologic Monitoring (7 yr.)

2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state 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. Areas inundated or saturated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated or saturated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Mecklenburg County begins March 22 and ends November 11 (235 days). These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 22 and before November 11.[1] Based on the current guidelines, the 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 May of 1998, ten groundwater gauges, one rain gauge, and one surface water gauge were installed at the Mallard Creek Mitigation Sites. The original rain gauge was replaced on May 4, 2000. In April 2003, one surface gauge was installed on Site 2 (Figure 2). The automatic groundwater gauges record daily readings of groundwater depth.

The Mallard Creek Site was designed to receive hydrologic input from both rainfall and runoff from Mallard Creek Church Road. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events. The 2004 data represents the seventh growing season for hydrologic monitoring following the remediation efforts in 1997.

[1] Natural Resources Conservation Service, Soil Survey of Mecklenburg County, North Carolina, p.61.

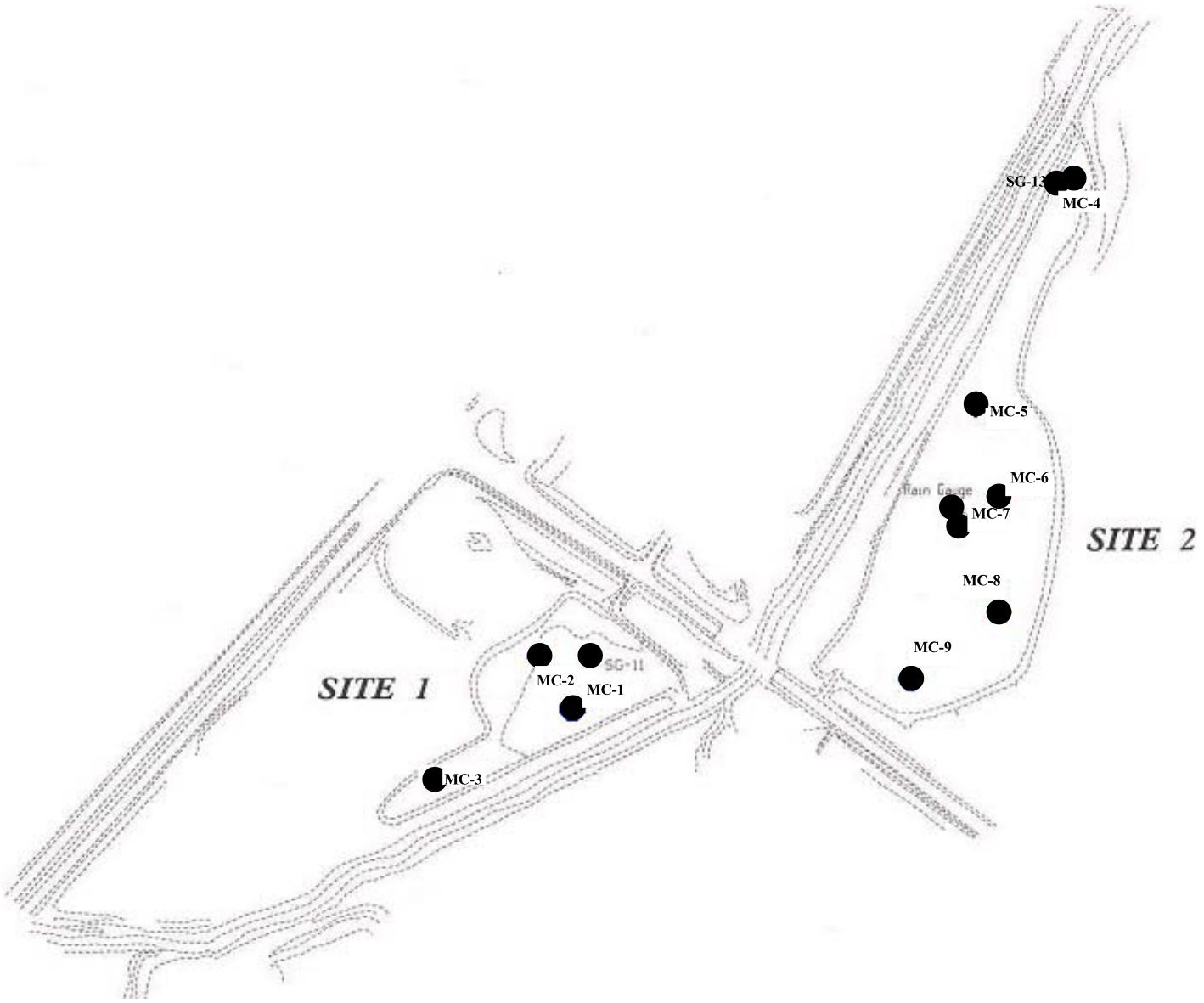


Figure 2. Gauge Location Map

N

Not to Scale

2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

To determine if the site met the federal guidelines (saturation within 12 inches of the surface for at least 12.5% of the growing season), the maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 235-day growing season (March 22 – November 11). The results are presented in Table 1.

Table 1. 2004 Hydrologic Monitoring Results

Monitoring Gauge	<5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
Site 1						
MC-1				✕	17.9	June 15-July 15 Sept 15-Oct 26
MC –2+				✕	26.8	March 21-May 22 Oct 7-Nov 10
MC –3+				✕	35.3	June 15-Sept 5 Sept 7-Nov 10
Site 2						
MC –4+				✕	41.7	June 15-July 16 July 18-Oct 23
MC –5+				✕	63.4	June 15-Nov 10
MC –6+				✕	63.4	March 21-April 19 June 15-Nov 10
MC –7+				✕	63.4	June 15-Nov 10
MC – 8	✕				4.7	
MC – 9			✕		10.2	
MC – 12+				✕	63.4	March 21-April 22 June 15-Nov 10

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

Appendix A contains hydrologic graphs. The maximum number of consecutive days is noted on each graph. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data obtained from the Charlotte weather station.

The placement of the groundwater gauges and a graphical representation of the hydrologic monitoring results are provided in Figure 3.

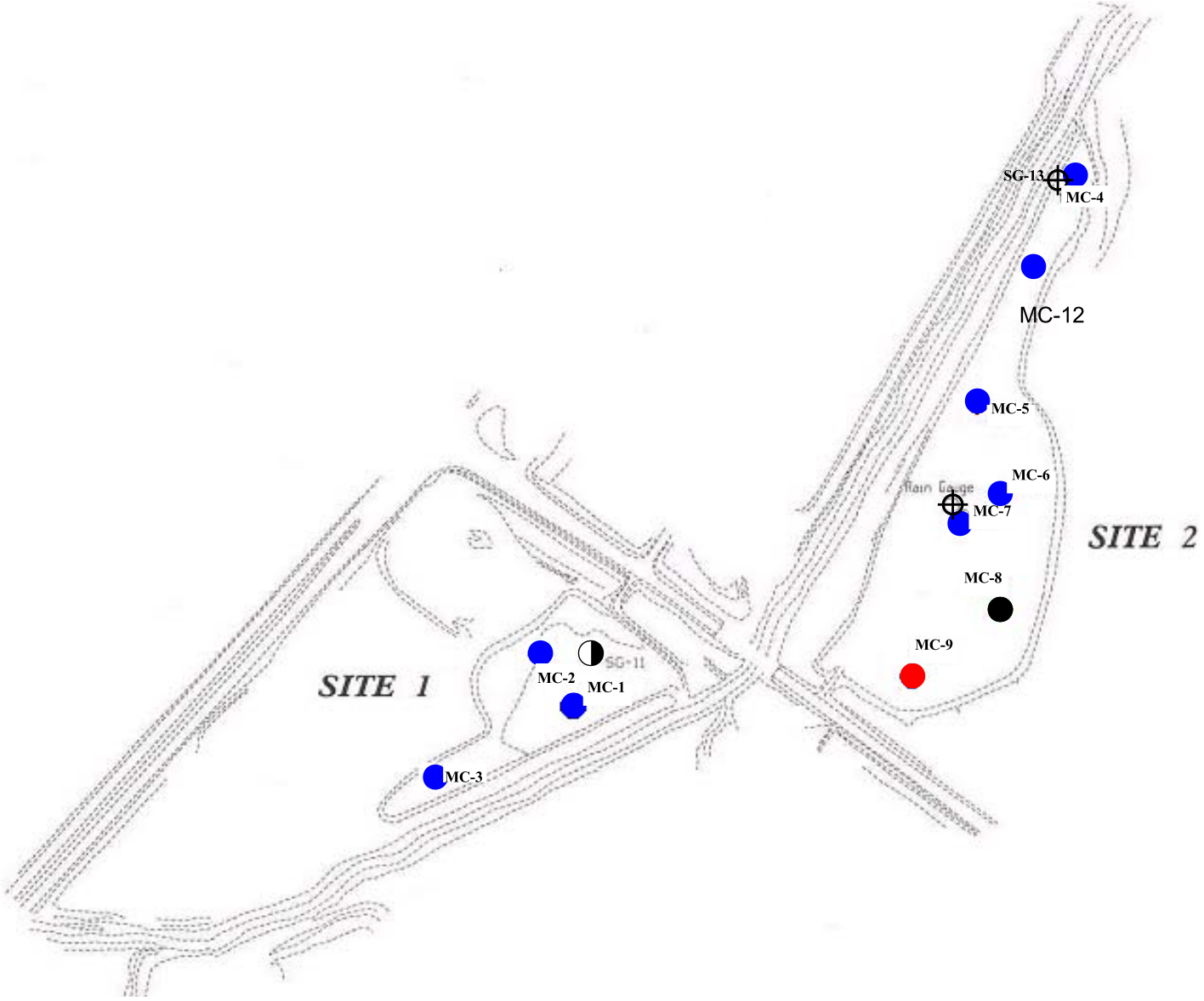


Figure 3. 2004 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

- Rain Gauge
- Surface Gauge

N

Not to Scale

2.3.2 Climatic Data

Figure 4 is a comparison of 2003 and 2004 monthly rainfall to historical precipitation for the area. This comparison indicates whether 2004 was “average” in terms of climate conditions by comparing the rainfall to that of historical rainfall (data collected between 1973 and 2004). The NC State Climate Office provided all historical data.

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

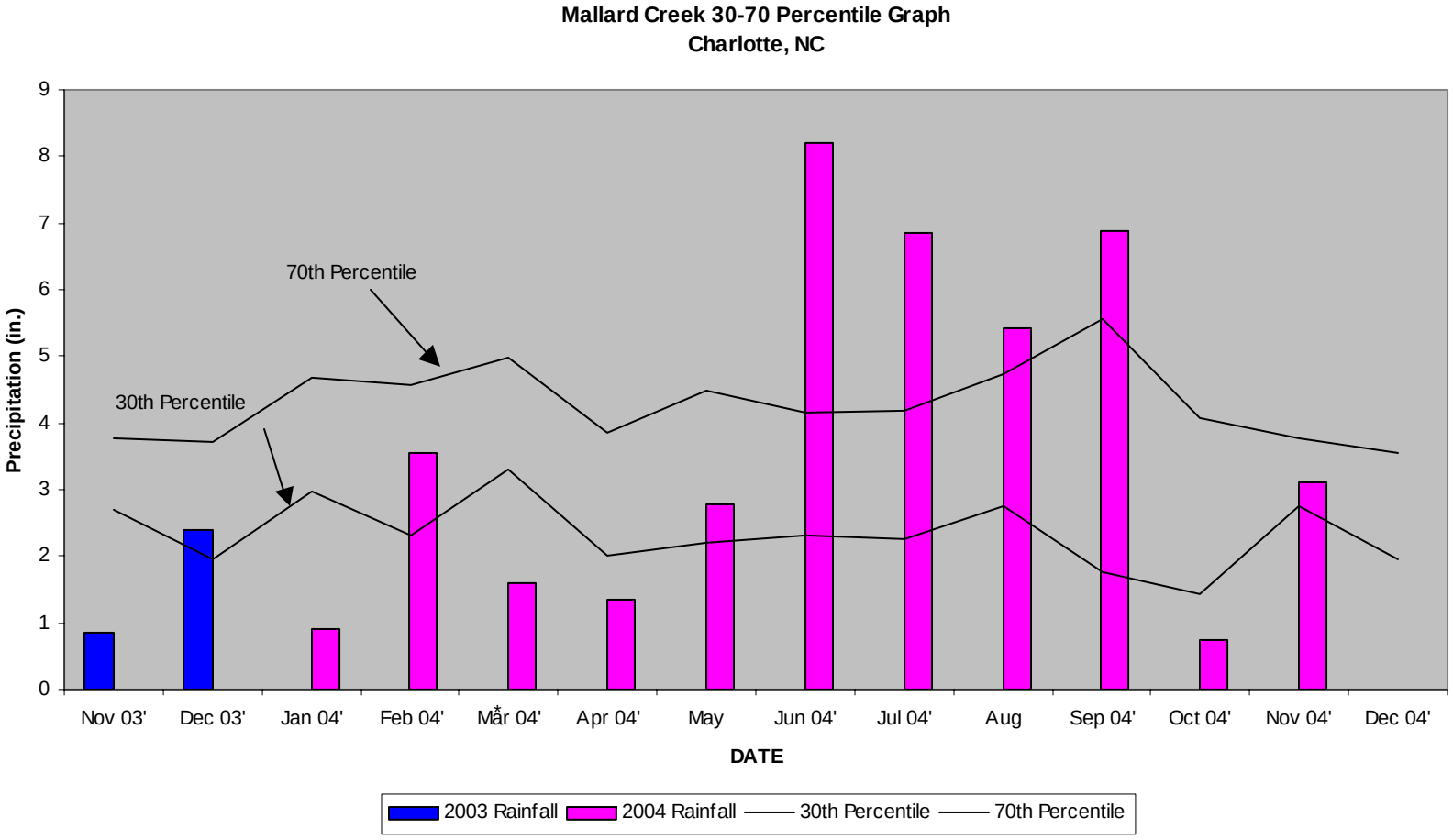
2.4 CONCLUSIONS

For Site 1, all three groundwater-gauges revealed saturation greater than 12.5% of the growing season. The surface gauge located on Site 1, revealed periodic inundation during the growing season.

Hydrologic data at Site 2 indicated that five of the seven monitoring gauges met the hydrologic success criteria for the seventh year of monitoring. The surface gauge located on Site 2, revealed periodic inundation during the growing season.

EEP will begin monitoring the hydrology at the Mallard Creek Mitigation Site for the 2005 monitoring year.

Figure 4. 30-70 Percentile Graph



3.0 VEGETATION: MALLARD CREEK MITIGATION SITE (YEAR 7 MONITORING)

3.1 SUCCESS CRITERIA

The success criteria state that there must be a minimum of 320 trees per acre surviving for three consecutive years.

3.2 DESCRIPTION OF SPECIES

The following tree species were planted in the Wetland Creation Area:

Fraxinus pennsylvanica, Green Ash

Nyssa sylvatica var*. sylvatica*, Blackgum

Quercus lyrata, Overcup Oak

Quercus nigra, Water Oak

3.3 RESULTS OF VEGETATION MONITORING

Plot # (Type)	Green Ash	Blackgum	Overcup Oak	Water Oak	Total (7 year)	Total (at planting)	Density (Trees/Acre
1(BLH)	16		4		20	31	439
2(BLH)	9		15	1	25	27	630
3(BLH)	14		12		26	35	505
4(BLH)	11	1	9	2	23	31	505
5(BLH)	18		6	2	26	38	465
6(BLH)	19		2		21	36	397
	Average Density						**490**

Site Notes: Other species noted: cottonwood, various grasses, black willow, lespedeza, *Juncus* sp., boxelder, horse-nettle, smartweed, foxtail, swamp chestnut oak, *Panicum* sp., woolgrass, volunteer green ash, cattail, *Sagittaria* sp., and sycamore. Beaver activity noted on Site 2. Standing water on Site 1 ranged from 4 inches to 2 feet in depth and from 1 to 4 feet on Site 2.

3.4 CONCLUSIONS

Approximately 10 acres of this site were re-graded in the Fall of 1997. The total site is made up of two wetland mitigation areas. The first area (Site 1) is a 2.8-acre site located in the southwest quadrant of the intersection of SR 2833 and Mallard Creek, while the remaining 7.2 acres are located directly across SR 2833 in the northwest quadrant. There were six vegetation-monitoring plots established throughout the planting areas; two plots in Site 1 and four plots in Site 2. The 2004 vegetation monitoring revealed an average tree density of 490 trees per acre. This average is well above the minimum success criteria of 320 trees per acre.

NCDOT proposes to discontinue vegetation monitoring at the Mallard Creek Mitigation Site.

4.0 OVERALL CONCLUSIONS / RECOMMENDATIONS

For Site 1, all three groundwater-gauges revealed saturation greater than 12.5% of the growing season. The surface gauge located on Site 1, revealed periodic inundation during the growing season. Hydrologic data at Site 2 indicated that five of the seven monitoring gauges met the hydrologic success criteria for the seventh year of monitoring. The surface gauge located on Site 2, revealed periodic inundation during the growing season.

The 2004 vegetation monitoring revealed an average density of 490 trees per acre. This average is well above the minimum success criteria of 320 trees per acre. NCDOT proposes to discontinue vegetation monitoring at the Mallard Creek Mitigation Site.

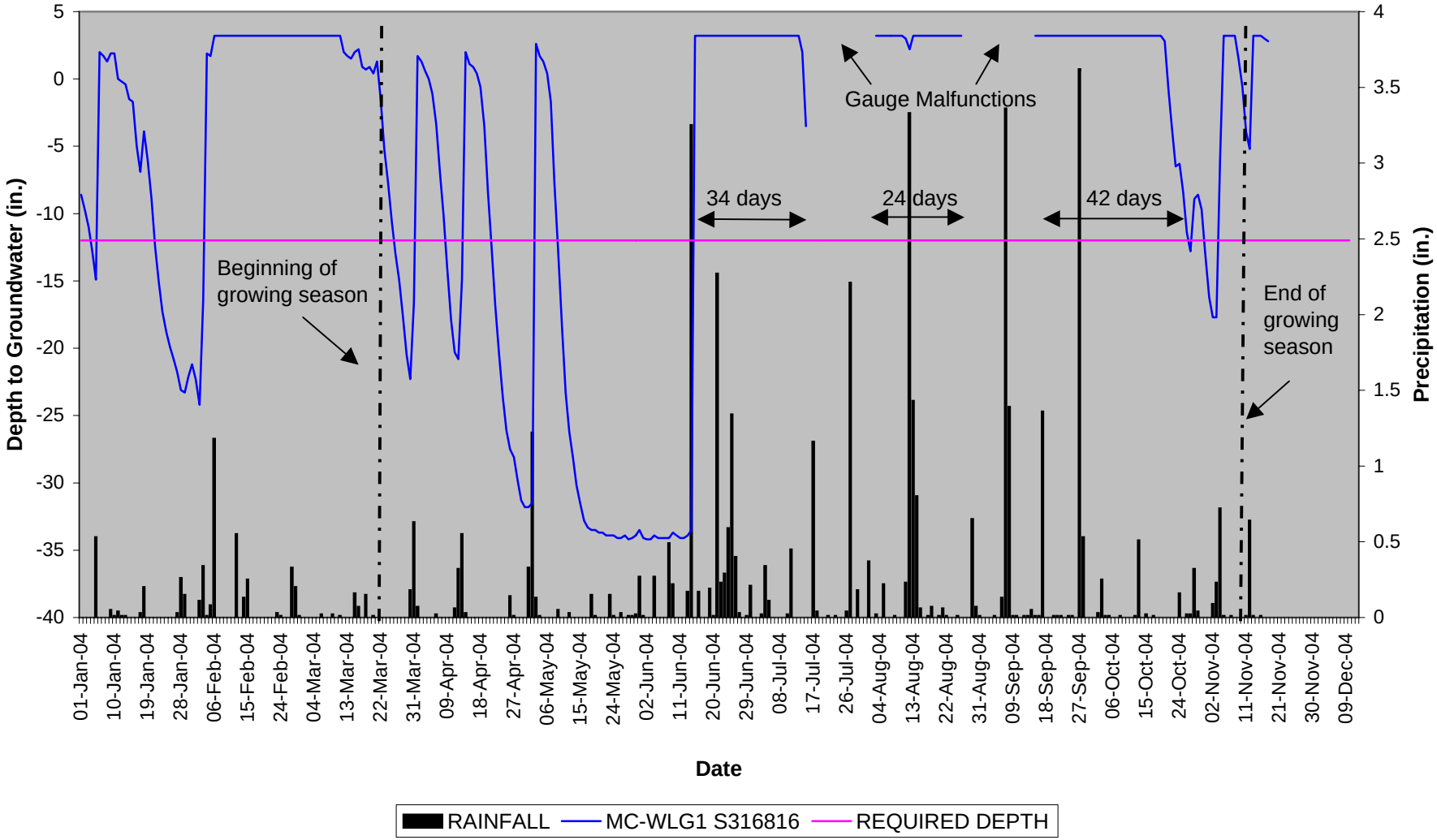
Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

APPENDIX A

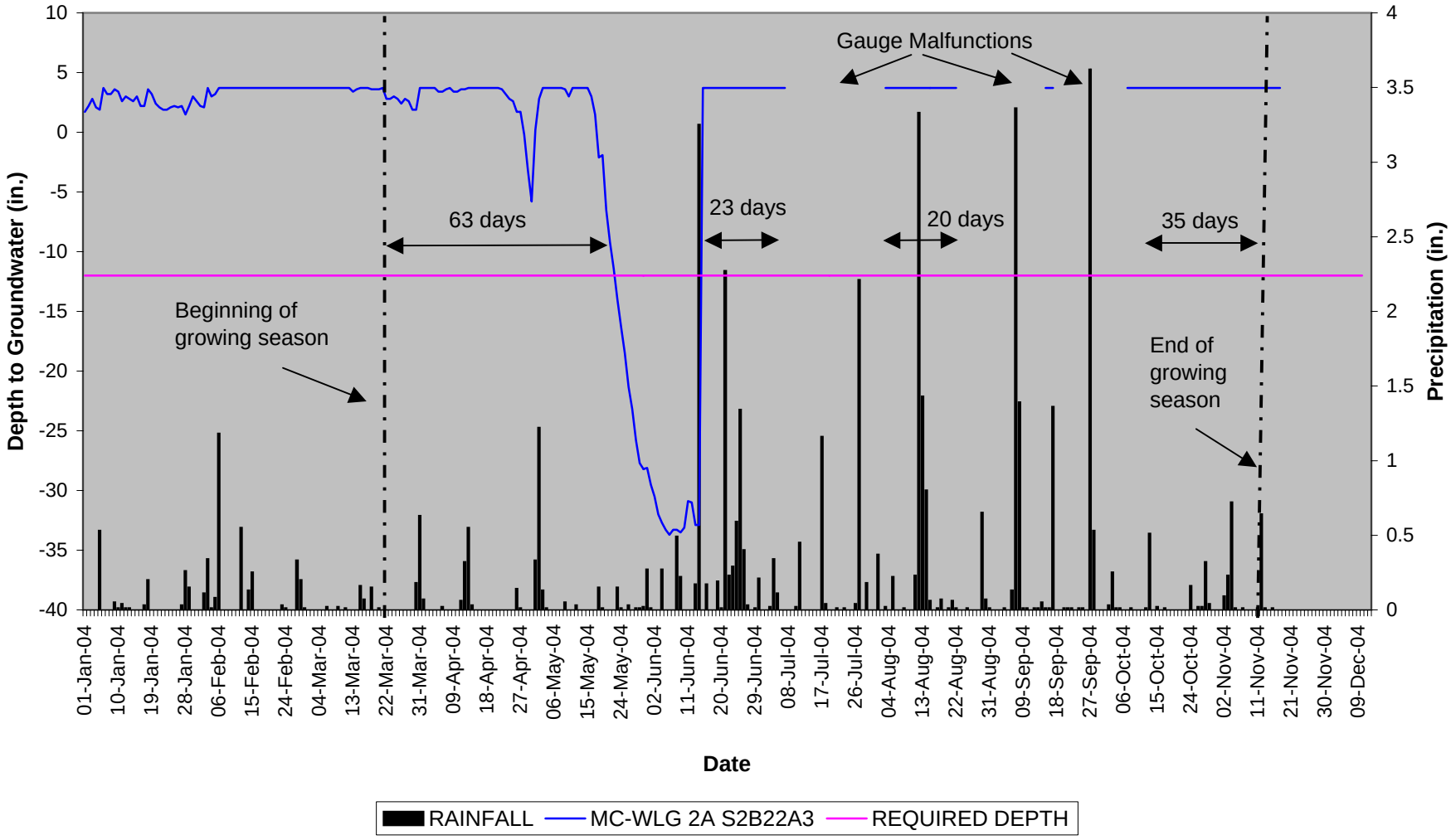
GAUGE DATA GRAPHS

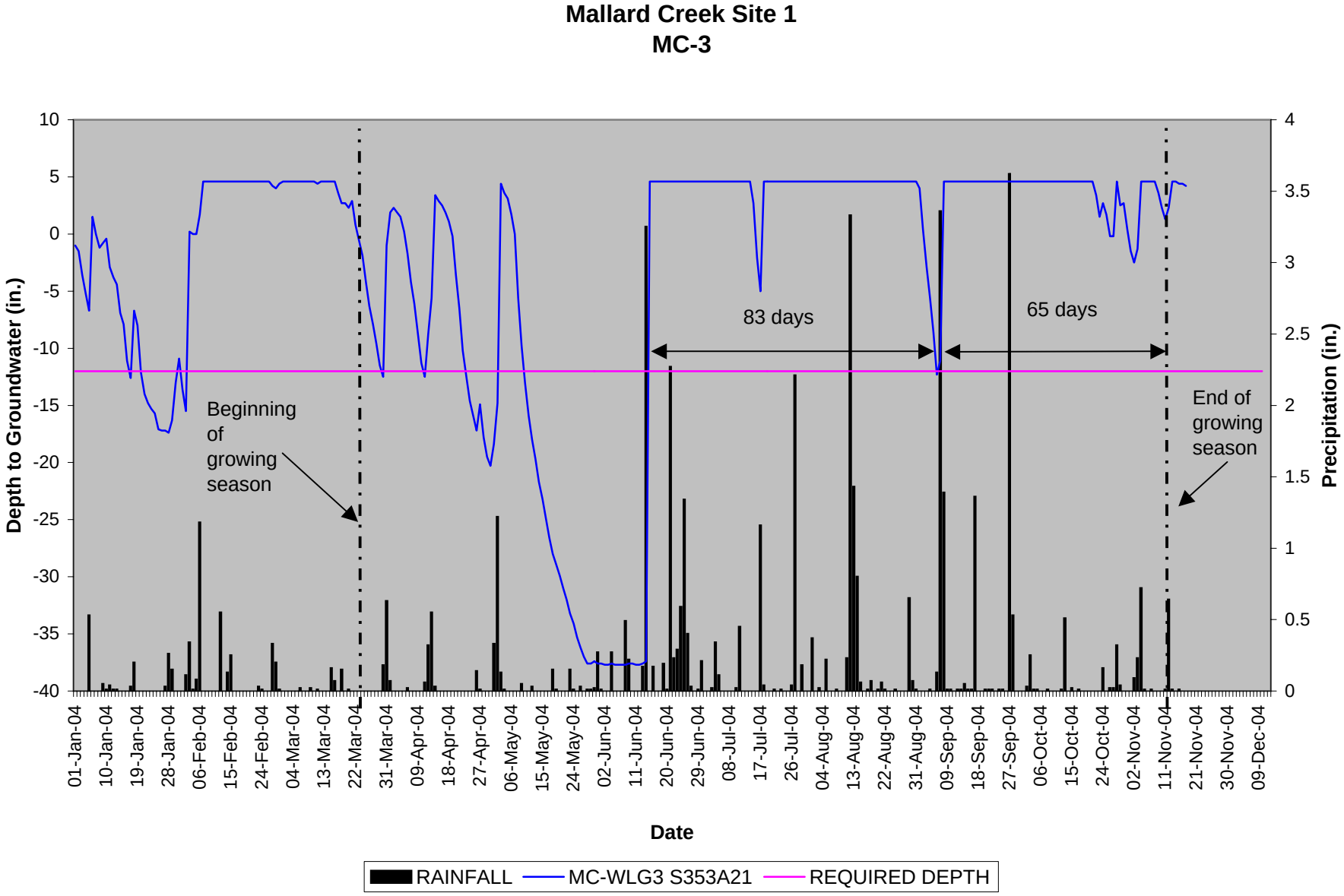
GROUNDWATER GAUGE GRAPHS

Mallard Creek Site 1
MC-1

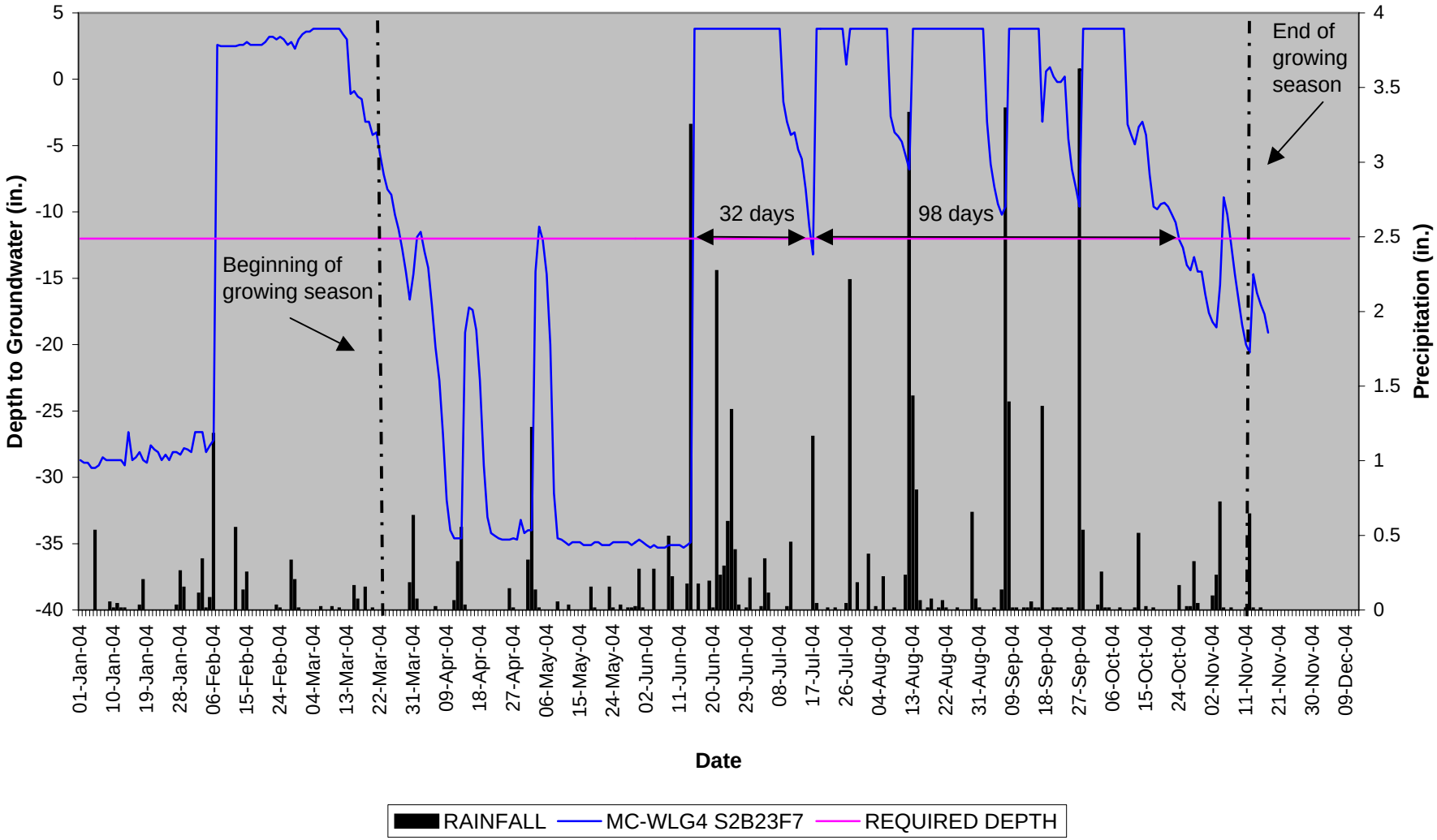


Mallard Creek Site 1
MC-2

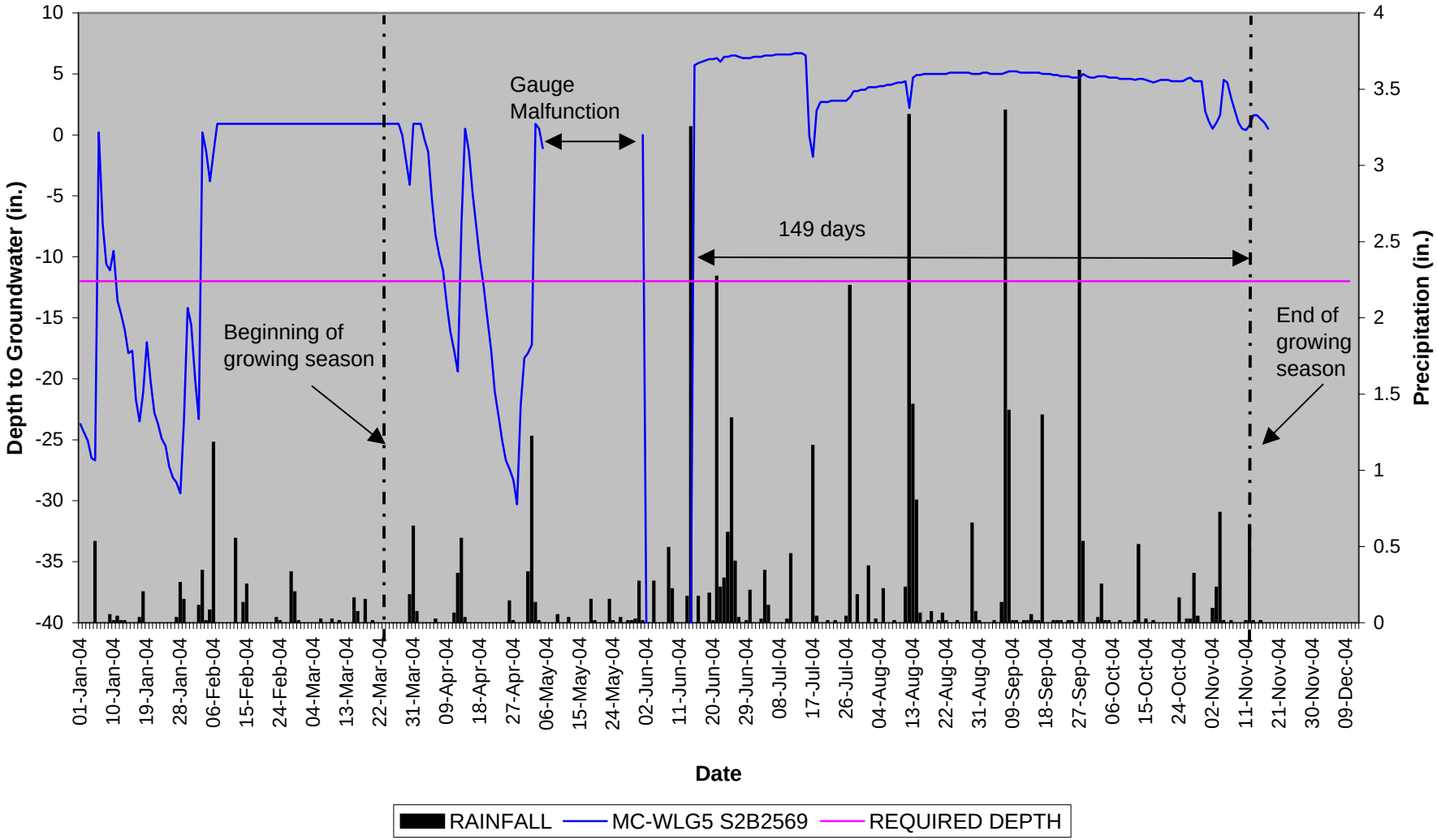


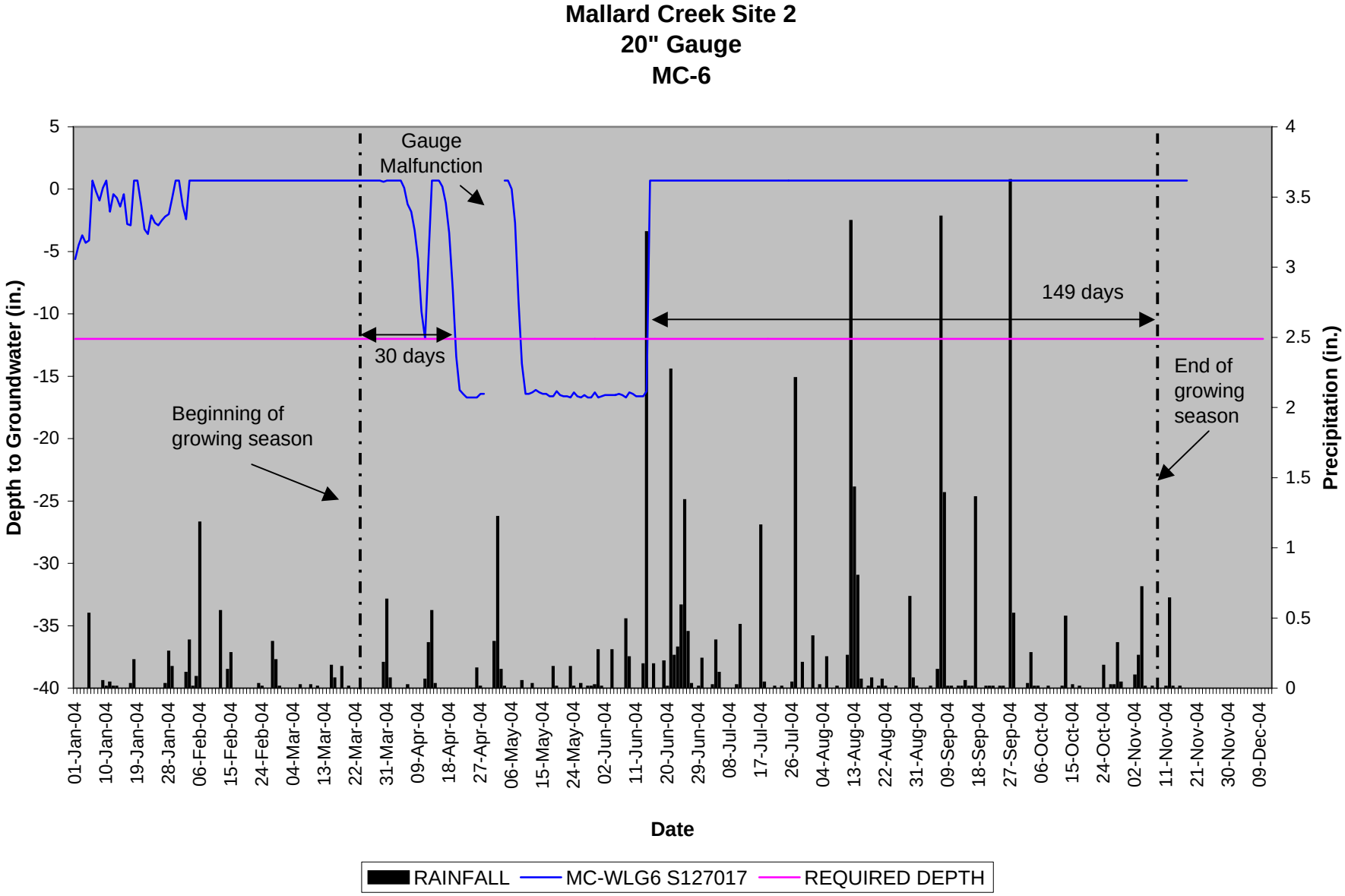

Mallard Creek Site 1
MC-3
Depth to Groundwater (in.)
Precipitation (in.)
Date
83 days
65 days
Beginning of growing season
End of growing season
RAINFALL
MC-WLG3 S353A21
REQUIRED DEPTH

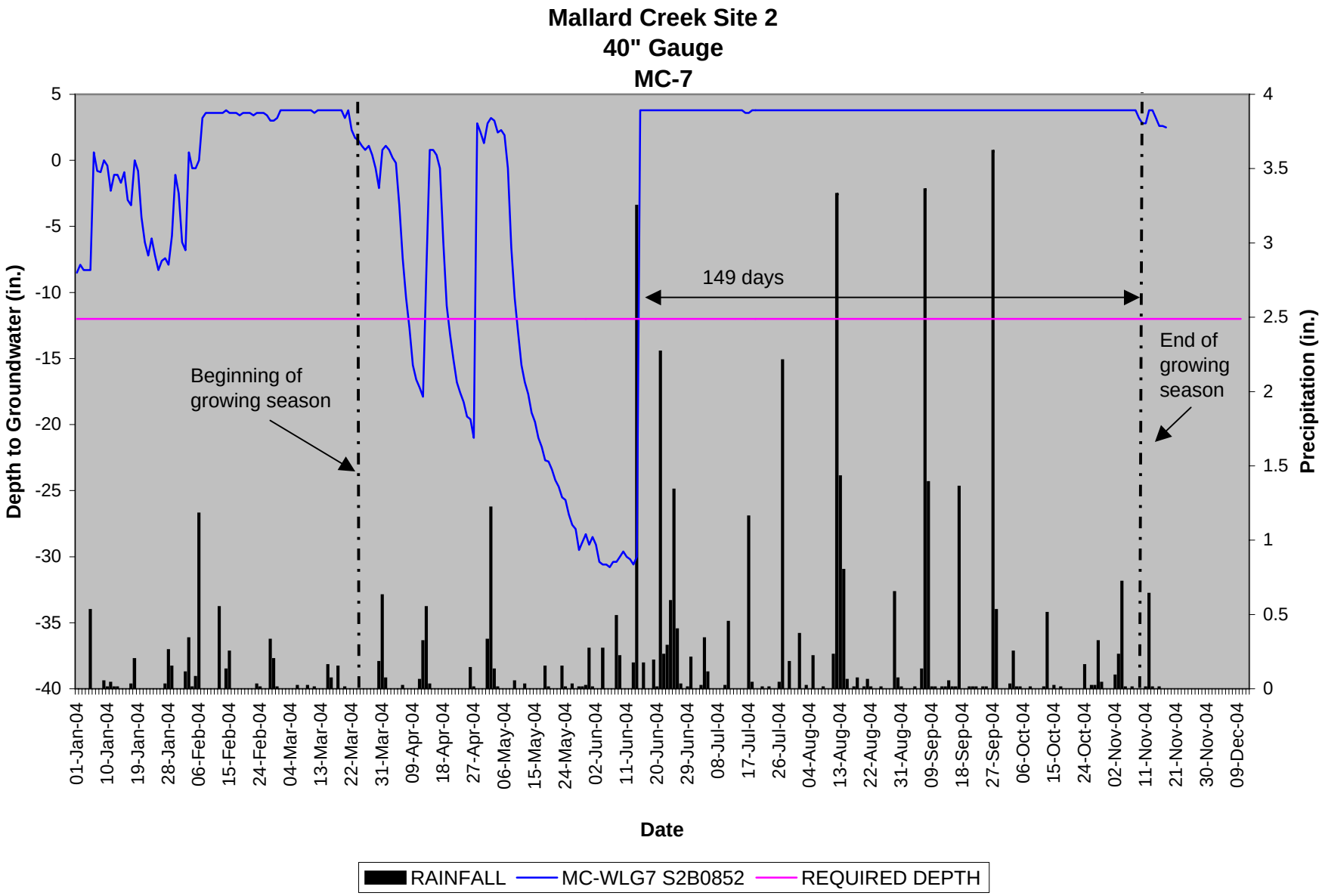
Mallard Creek Site 2
MC-4

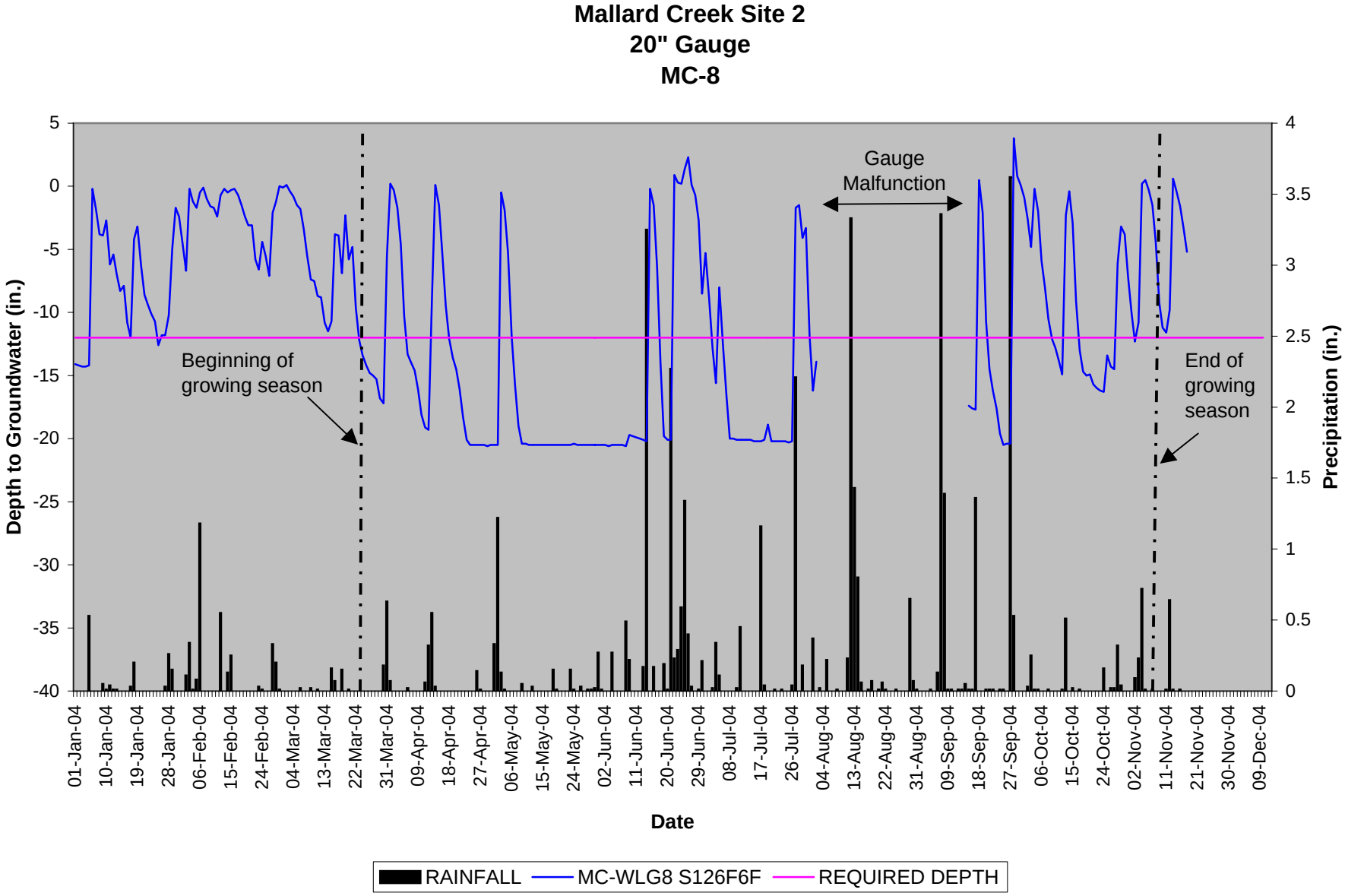


Mallard Creek Site 2
MC-5




Mallard Creek Site 2
20" Gauge
MC-6
Depth to Groundwater (in.)
Precipitation (in.)
Date
Gauge Malfunction
30 days
149 days
Beginning of growing season
End of growing season
RAINFALL
MC-WLG6 S127017
REQUIRED DEPTH


Mallard Creek Site 2
40" Gauge
MC-7
Depth to Groundwater (in.)
Precipitation (in.)
Date
149 days
Beginning of growing season
End of growing season
RAINFALL
MC-WLG7 S2B0852
REQUIRED DEPTH


Mallard Creek Site 2
20" Gauge
MC-8
Depth to Groundwater (in.)
Precipitation (in.)
Date
Gauge Malfunction
Beginning of growing season
End of growing season
RAINFALL
MC-WLG8 S126F6F
REQUIRED DEPTH
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
01-Jan-04
10-Jan-04
19-Jan-04
28-Jan-04
06-Feb-04
15-Feb-04
24-Feb-04
04-Mar-04
13-Mar-04
22-Mar-04
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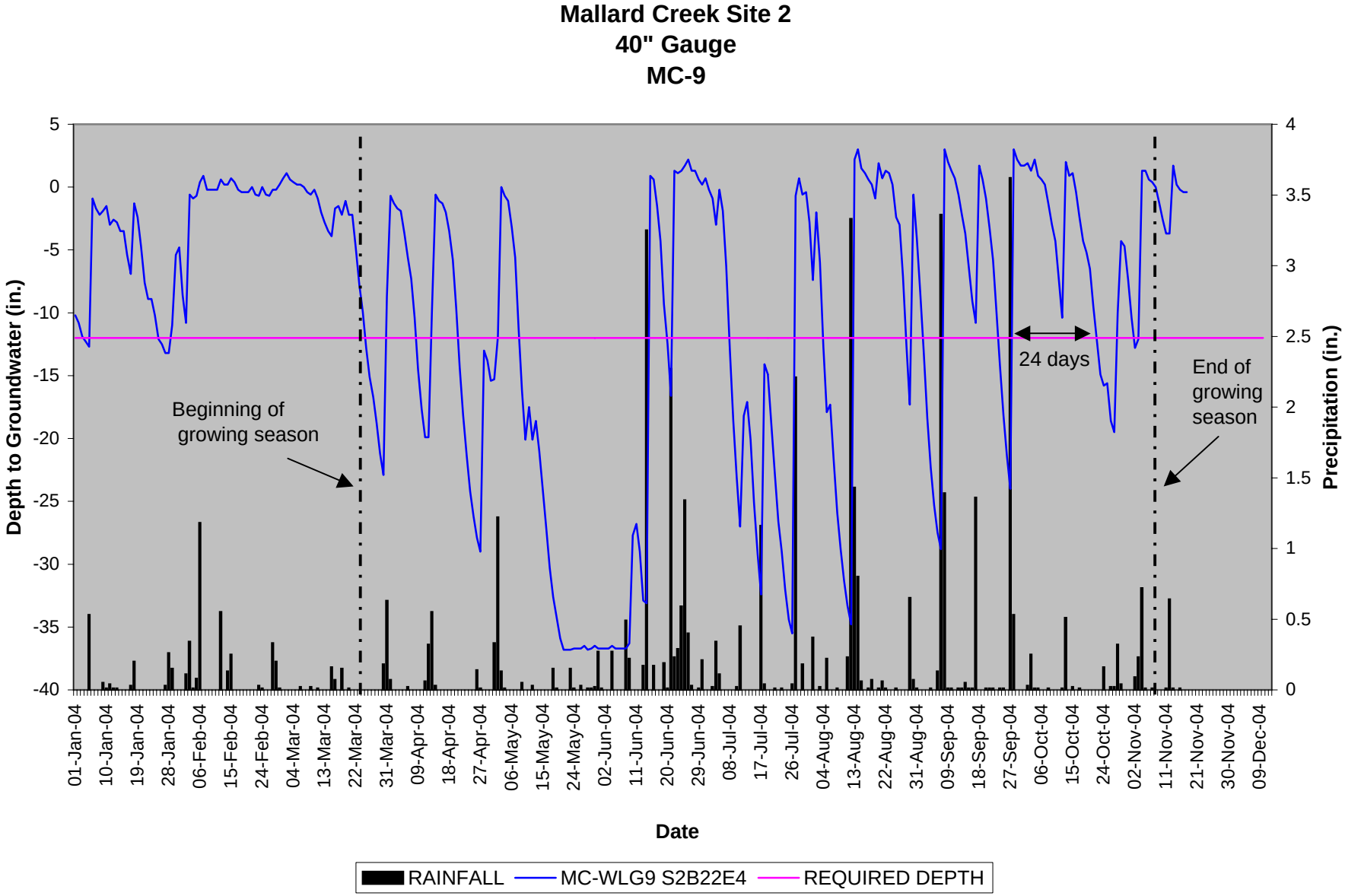
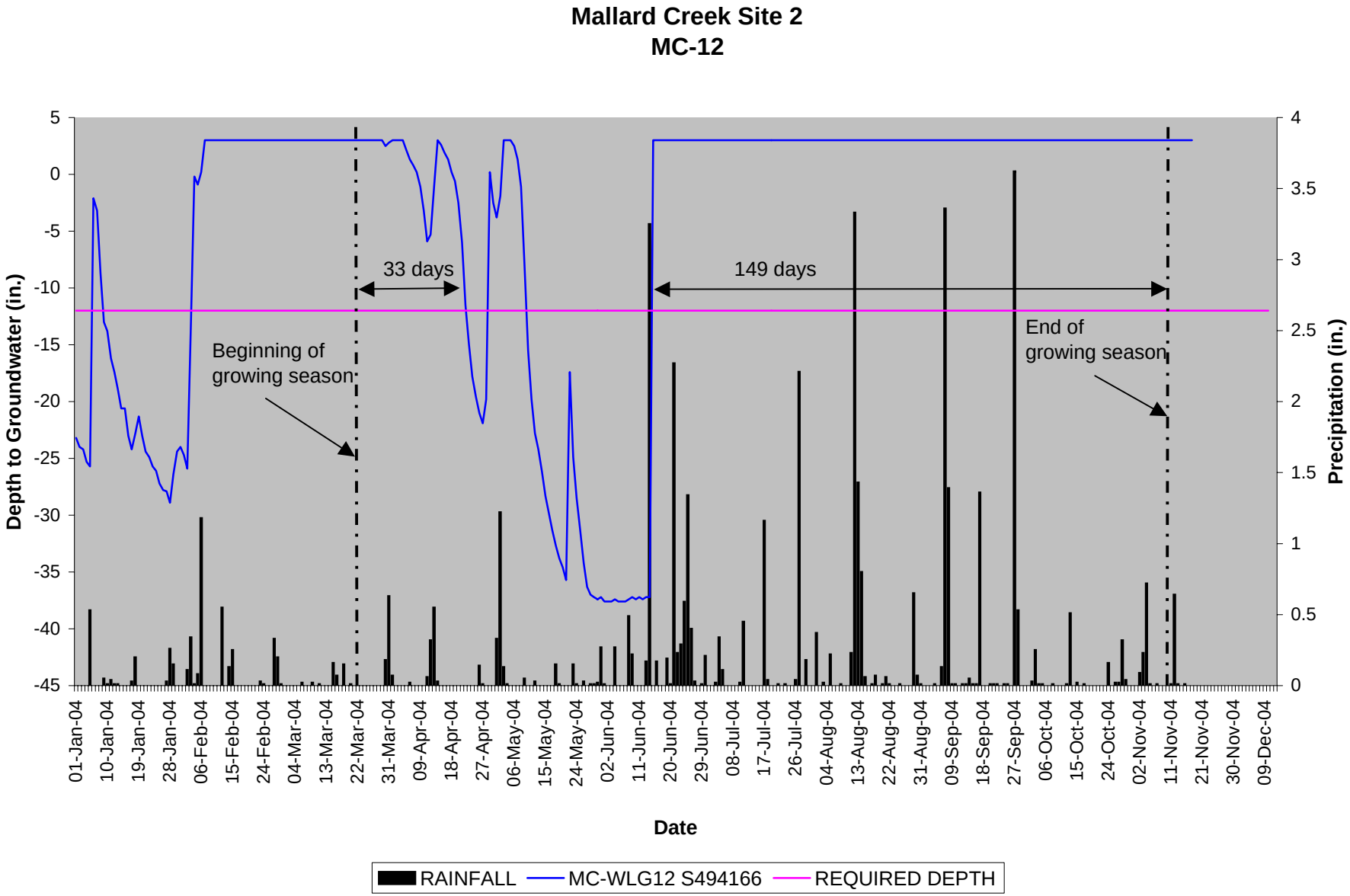
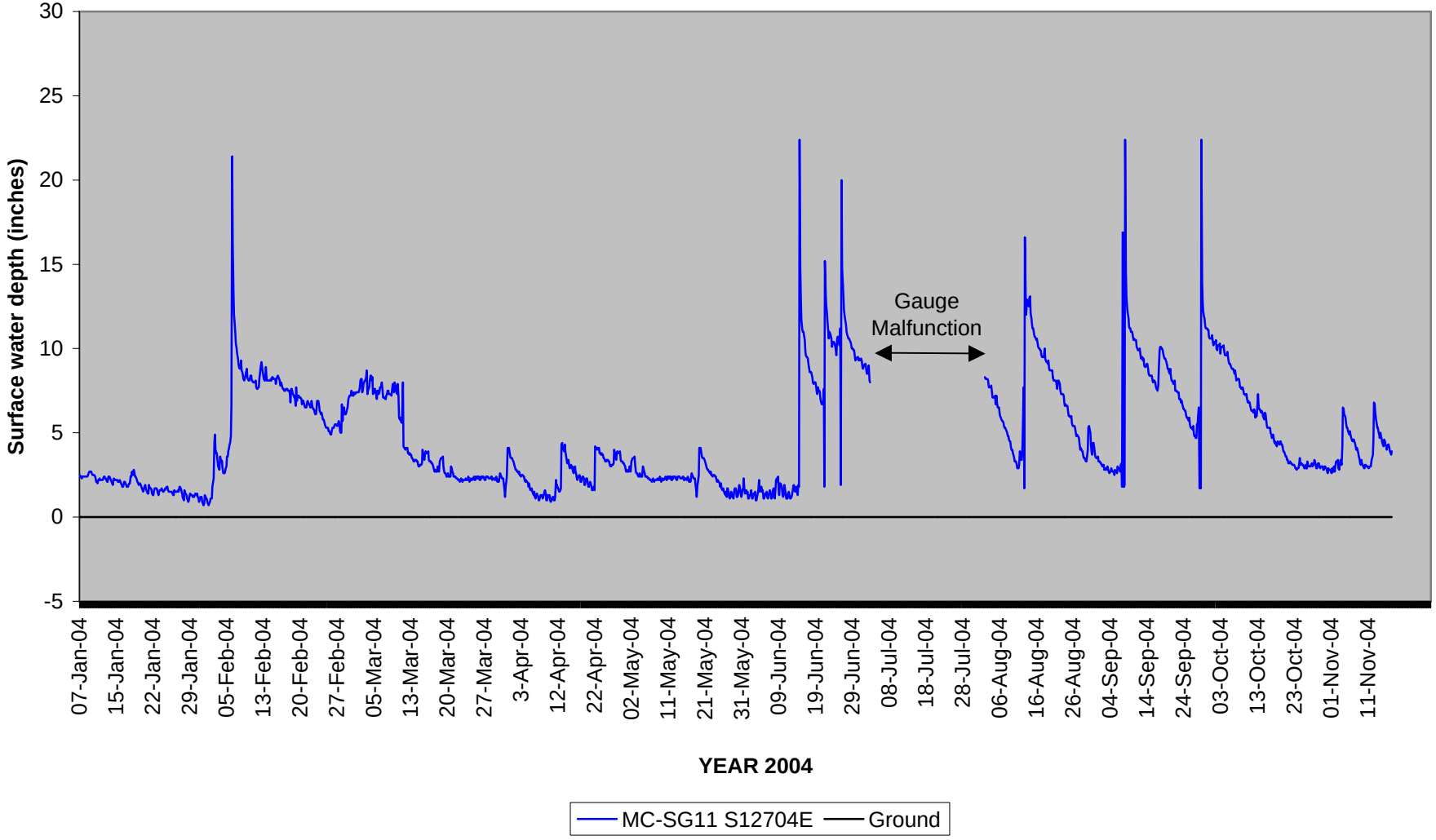
30-Nov-04
09-Dec-04


Mallard Creek Site 2
40" Gauge
MC-9
Depth to Groundwater (in.)
Precipitation (in.)
Date
Beginning of growing season
24 days
End of growing season
RAINFALL
MC-WLG9 S2B22E4
REQUIRED DEPTH

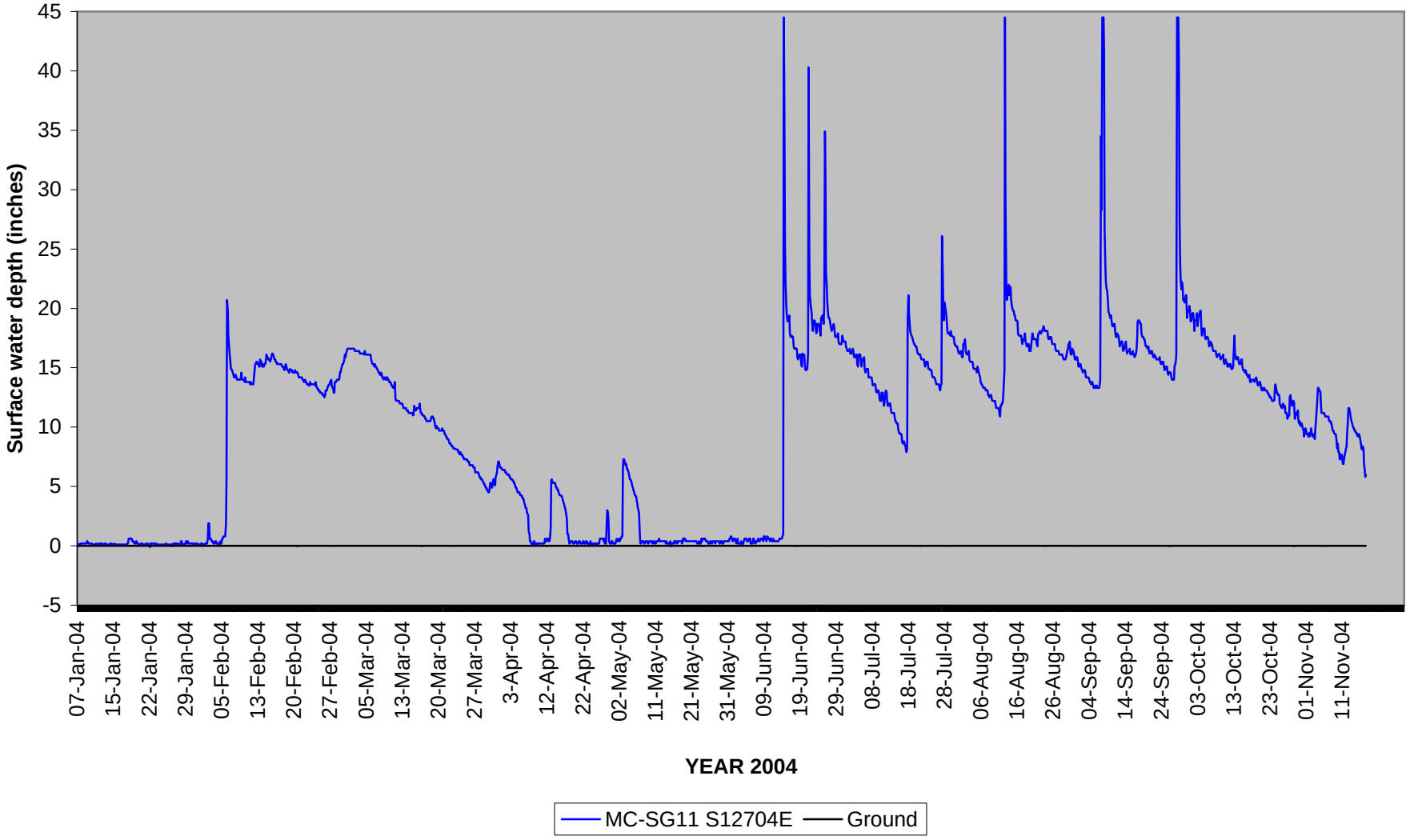

Mallard Creek Site 2
MC-12
Depth to Groundwater (in.)
Precipitation (in.)
Date
33 days
149 days
Beginning of growing season
End of growing season
RAINFALL
MC-WLG12 S494166
REQUIRED DEPTH

SURFACE WATER GAUGE GRAPHS

Mallard Creek Site 1
MC-SG11



Mallard Creek Site 2
MC-SG13



APPENDIX B

SITE PHOTOS

PHOTO AND PLOT LOCATIONS

MALLARD CREEK

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2004

MALLARD CREEK

Photo 7

Photo 8

2004

MALLARD CREEK