

ANNUAL REPORT FOR 2001



Gurley Mitigation Site
Greene County
Project No. 8.T340306
TIP No. R-1023WM



Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2001

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Summary

The following report summarizes the monitoring and construction activities during 2001 at the Gurley Mitigation Site, Greene County. Originally constructed in 1997, the site provides compensatory wetland mitigation for several NCDOT projects in the Neuse River Basin.

The Atlantic White Cedar area in the northwest corner of the site was planted in early 1999. Following planting, one additional vegetation transect and two additional monitoring gauges were installed to monitor this portion of the site.

Per the request of the Corps of Engineers, the hydrologic monitoring requirements of the site were changed from the requirements stated in the approved mitigation plan. The riverine portion of the site must show saturation for 12.5% of the growing season, while the non-riverine areas must show saturation within 12 inches of the surface for at least 8% of the growing season.

In June 2001, the Department re-evaluated areas of the site, where hydrologic success was marginal or unsuccessful. A wetland delineation was performed throughout the site, as a requirement by the resource agencies, to verify that the Department possessed successful mitigation to address existing permit requirements relating to compensatory mitigation at the site. The Army Corps of Engineers approved the delineation in June 2001. The confirmed wetland delineation map that was produced from this exercise is included in this report.

Hydrologic monitoring in 2001 showed two of four Riverine gauges recorded saturation for more than 12.5% of the growing season. Six of twelve non-Riverine gauges recorded saturation for more than 8% of the growing season. In total, eight of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season.

Vegetation monitoring yielded an average tree density of 529 trees per acre, which is above the minimum success a criterion of 320 trees per acre.

NCDOT recommends that monitoring of the site continue.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The Gurley Tract Mitigation Site is located in Greene County, approximately 12 miles northeast of Goldsboro (Figure 1). The site provides 170 acres of riverine and non-riverine restoration and enhancement. Gurley Tract provides compensatory mitigation for several projects in the Neuse River basin. The following plant communities are included in the site: Coastal Plain bottomland hardwood swamp, non-riverine wet hardwood forest, streambed Atlantic White Cedar Forest, and Cypress/Tupelo Swamp.

1.2 PURPOSE

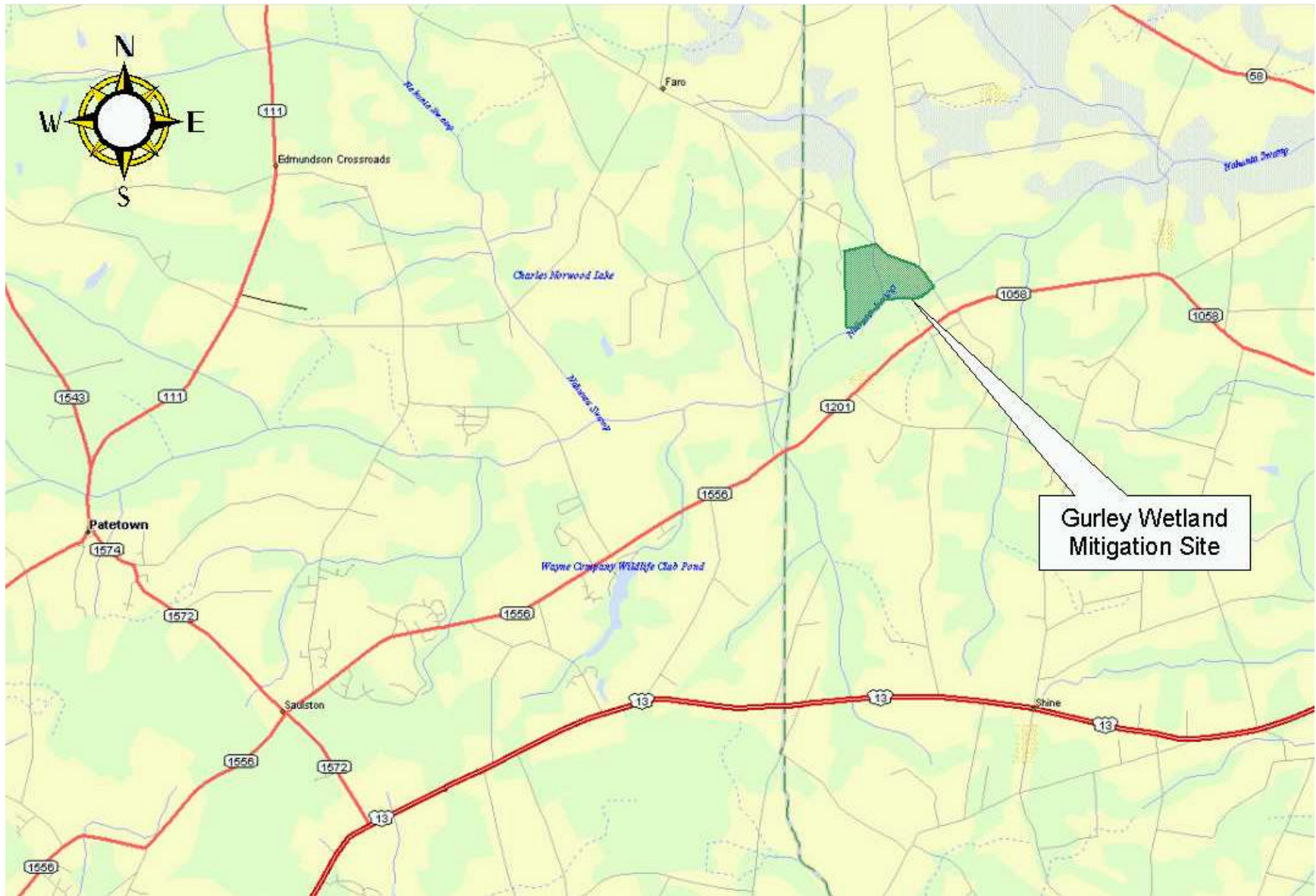
In order to demonstrate successful mitigation, the site must achieve success for five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report describes the results of the hydrologic and vegetation monitoring during the 2001 growing season at the Gurley Tract Mitigation Site. 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

The site was initially monitored for both wetland hydrology and vegetation in 1998. Since the publication of the 1998 Annual Monitoring Report, additional work has been completed on the mitigation site.

December 1997	Site Constructed
January 1998	Site Planted
Spring 1998	Monitoring Gauges Installed
May - November 1998	Hydrologic Monitoring (1 yr.)
October 1998	Vegetation Monitoring (1 yr.)
February 1999	Zone 4 (Atlantic White Cedar Area) Planted
March - November 1999	Hydrologic Monitoring (2 yr.)
August 1999	Remediation on Nahunta Swamp bank
September & October 1999	Vegetation Monitoring (2 yr.)
October 2000	Vegetation Monitoring (3 yr.)
March - November 2000	Hydrologic Monitoring (3 yr.)
June 2001	Wetland Delineation of Site
June 2001	Vegetation Monitoring (4 yr.)
August-September 2001	GPS Mapping of Beaver Impoundment
March - November 2001	Hydrologic Monitoring (4 yr.)

Figure 1. Site Location Map



1.4 DEBIT LEDGER

Table 1. Gurley Tract Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			Ratios	TIP Debit								
	Acres at Start	Acres Remaining	Percent Remaining		R-525 D	R-1023 AB B	B-3070	R-2001 B	R-2719 BA	R-525 G	U-3472	R-1030	R-2719 BA
SPH Restoration (RR)	48.6	26.52	54.57	1.5:1	1.48	12.66	1.19	4.68			2.07		
BLH Restoration (NRR)	56.2	16.19	28.81	2:01	1.08	34.58				3.76	0.59		
BLH Enhancement	45.8	0	0.00	4:01		45.8							
SPH Preservation	5.9	0	0.00	10:01			5.9						
Total	170.2	42.71	25.09										

SPH: Swamp Hardwood BLH: Bottomland Hardwood RR: Riverine NRR: Non-riverine

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 inches of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils.

Upon request of the US Army Corps of Engineers, the hydrologic monitoring requirements for the Gurley Tract site have been altered from the original mitigation plan. The new success criteria states that the riverine portions of the site must be saturated within 12 inches of the surface for at least 12.5% of the growing season. The non-riverine areas must be saturated for at least 8% of the growing season. Monitoring will be conducted for a total of five years. The riverine and non-riverine portions of the site are illustrated in Figure 2; riverine areas on this map are shaded.

According to the Soil Conservation Service, the growing season in Greene County extends from March 17 to November 15, approximately 244 days. A consecutive 12.5% of the growing season for Gurley Tract would equal 30.5 days; a consecutive 8% would be equivalent to 19.5 days. Local climate must represent average conditions for the area in order for the hydrologic data to be valid.

2.2 HYDROLOGIC DESCRIPTION

Nine monitoring gauges, one rain gauge, and two surface gauges were installed in the spring of 1998 (Figure 2). Since the initial monitoring gauge installation, seven additional gauges were installed prior to the 1999-growing season. One surface water gauge was also installed in the "mother's ditch" channel in the center of the site. The automatic monitoring gauges record the depth to the groundwater level. Daily readings were taken throughout the growing season.

Appendix A contains a plot of the water depth for each of the monitoring gauges and surface gauge for 2001. Precipitation events are included on each graph as bars. Historical precipitation data represents that of a North Carolina State Climate Office rain gauge in Goldsboro (AG), North Carolina. This was the closest gauge with current rainfall data to the mitigation site. 2001 rainfall data came from an onsite rain gauge.

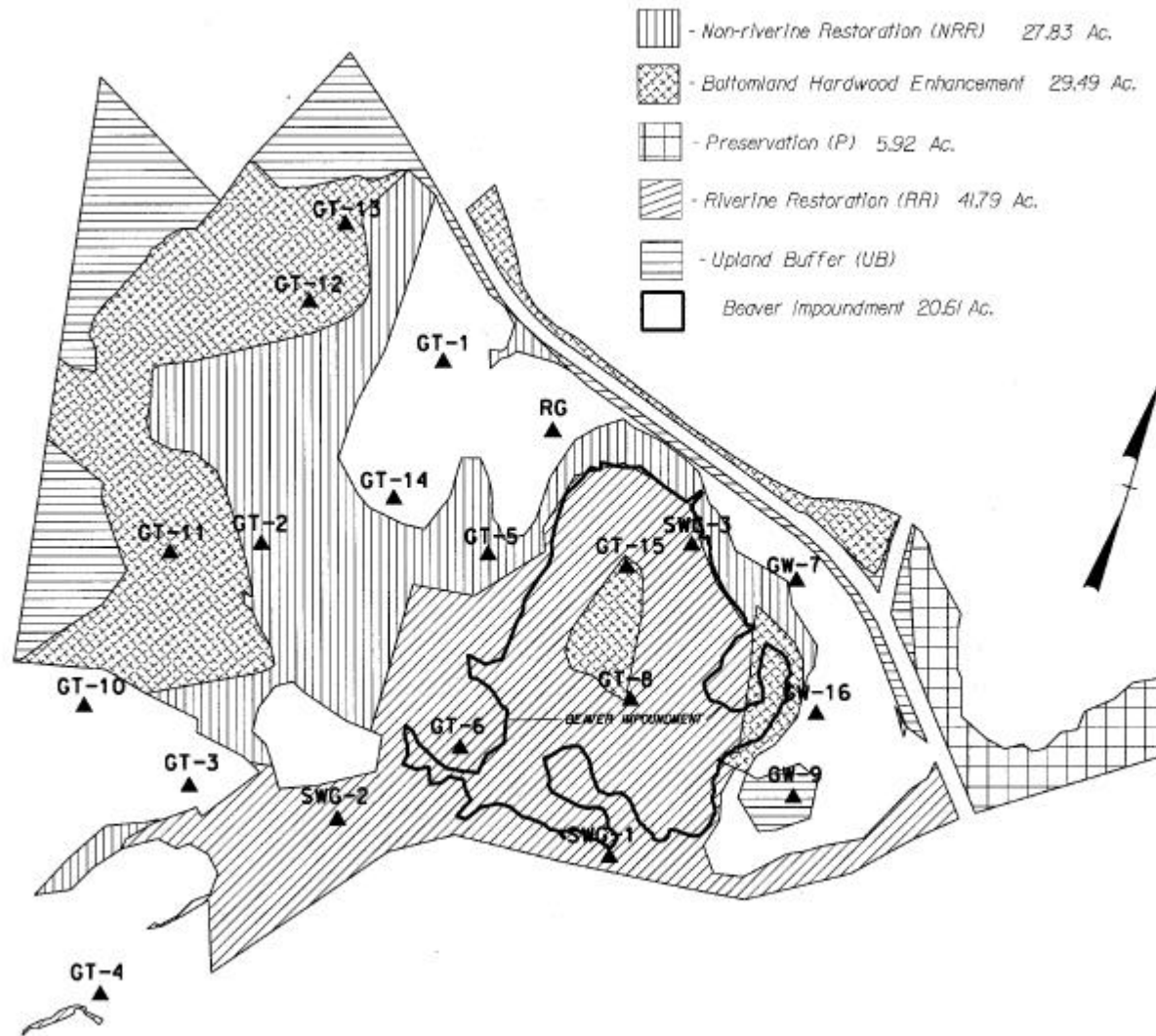


Figure 2. Monitoring Gauge Locations

2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

The total 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 244-day growing season. Table 2 presents the hydrologic results for 2001.

Figure 3 is a graphical representation of the hydrologic monitoring results for 2001, which will determine the success of the mitigation site.

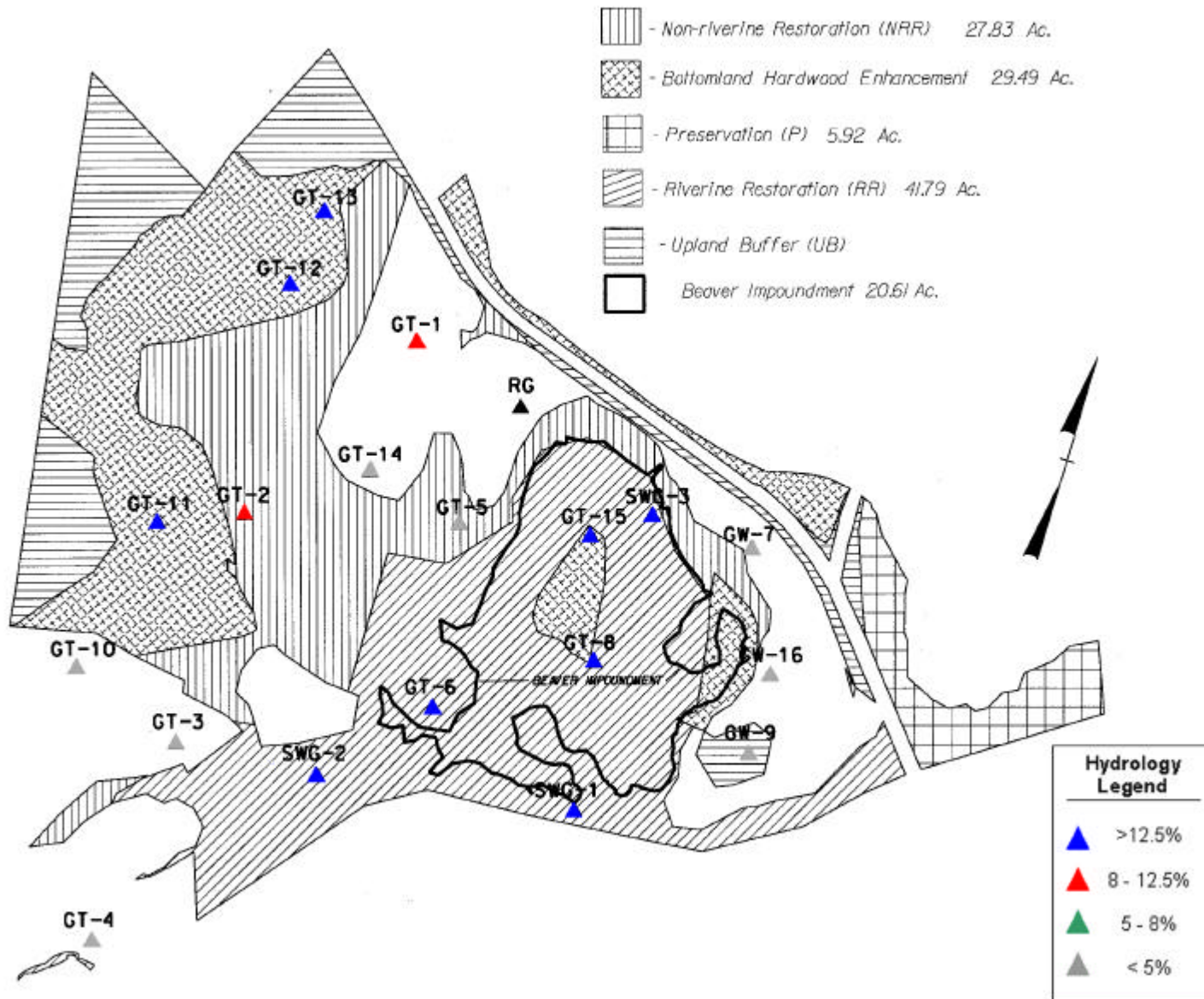
Gauges that show a “flatline” indicate either a maximum or minimum range for recording data. This does not necessarily mean there is a problem with the gauge, for example, when a graph reaches the 2 inch line, the water table is at least 2 inches above the ground.

Specific Monitoring Gauge Problems: Gauge 4, 5, 11, and 14 malfunctioned from March 17 until replaced May 10. Gauge 11 still showed saturation greater than 12.5% of the growing season. Gauge 10 had a dead battery from June 13 to July 14. Gauge 13 had a dead battery from May 13 to June 5; however, still showed saturation greater than 12.5% of the growing season.

Table 2. Hydrologic Monitoring Results, March 17– November 15, 2001

Monitoring Gauge	< 5%	5-8%	8-12.5%	>12.5%	Actual %	Dates of Saturation
NON-RIVERINE (Success = saturation for 8% of the growing season)						
GW-1			✓		10.2	Mar 17 – Apr 10
GW-2			✓		8.6	Mar 21 – Apr 10
GW-3	✓				1.6	Aug 12 – Aug 15
GW-5	✓				2.5	Aug 29 – Sep 3
GW-7	✓				1.6	Mar 21 – Mar 24
GW-9	✓				0.0	-
GW-10	✓				4.5	Mar 29 – Apr 8
GW-11				✓	23.0	Mar 21 – Jul 15
GW-12				✓	44.3	Mar 17 – Jul 2
GW-13				✓	67.2	Jun 5 – Nov 15
GW-15				✓	100.0	Mar 17 – Nov 15
GW-16	✓				0.8	Mar 21 – Mar 22
RIVERINE (Success = saturation for 12.5% of the growing season)						
GW-4	✓				0.0	-
GW-6				✓	100.0	Mar 17 – Nov 11
GW-8				✓	100.0	Mar 17 – Nov 11
GW-14	✓				2.0	May 27 – May 31

Figure 3. Hydrologic Monitoring Results



Hydrologic monitoring in 2001 showed two of the four riverine gauges recorded saturation for more than 12.5% of the growing season. Six of the twelve non-riverine gauges recorded saturation for more than 8% of the growing season. In total, eight of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season.

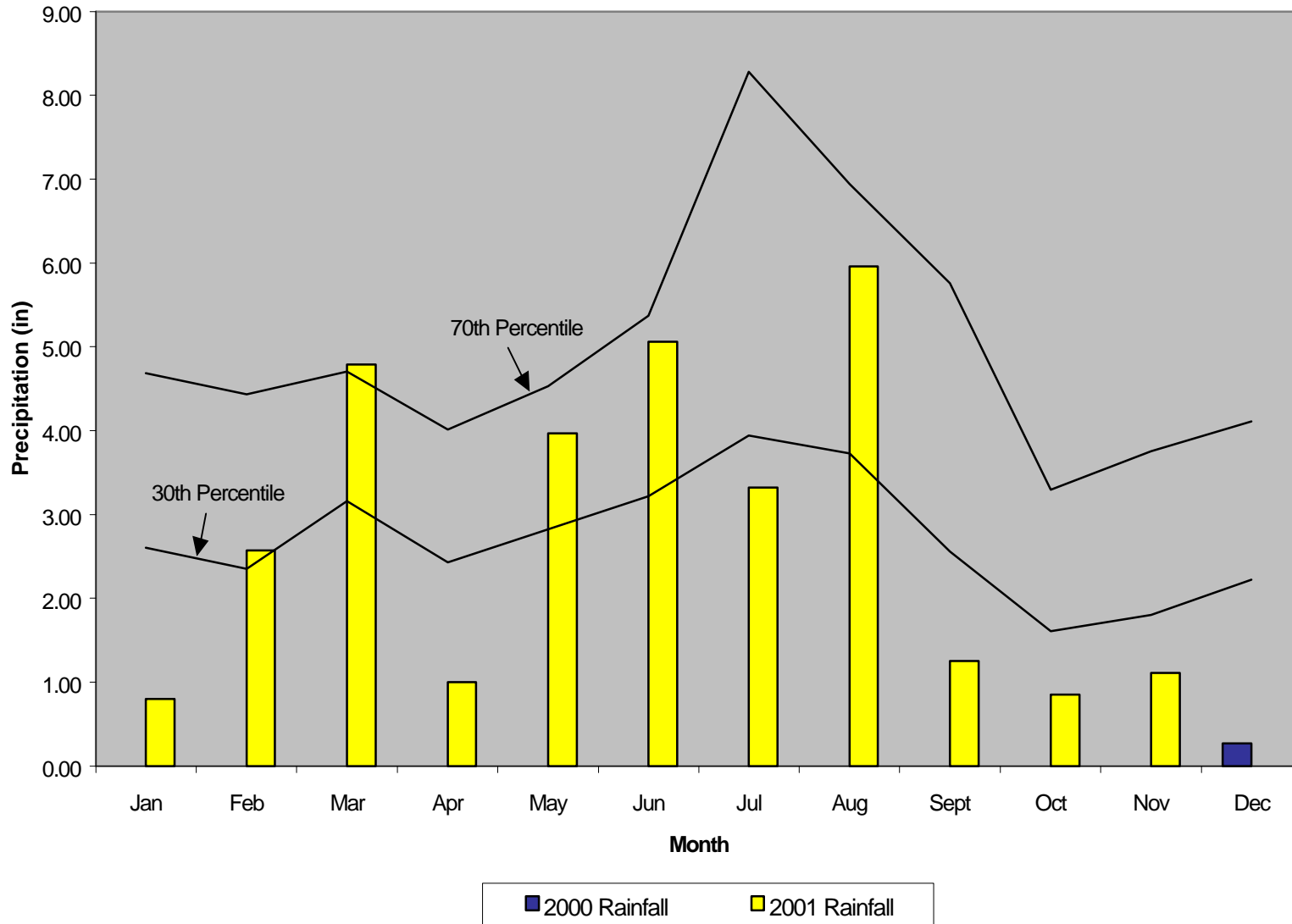
For those gauges that are located outside of the identified wetland delineation area, recording saturation for less than 5% of the growing season, NCDOT proposes to cease monitoring and remove these gauges.

2.3.2 Climatic Data

Figure 4 is a comparison of 2001 monthly rainfall to historical precipitation for the area. The two lines represent the 30th and 70th percentiles of monthly precipitation for Goldsboro, NC. The bars are the monthly rainfall totals for 2001. The historical data was collected by the National Climatic Data Center; the on site rain gauges provided the recent rainfall data.

The site received average rainfall in February, May, June, and August. The site received slightly above average rainfall in March. December (2000), January, April, July, September, October, and November were below average rainfall months. Overall, the site experienced below normal rainfall in 2001.

Figure 4. Gurley 30-70 Percentile Graph



2.4 WETLAND DELINEATION AND BEAVER IMPOUNDMENT

Following a site visit with the regulatory agencies in early May 2001, the Department was advised to perform a wetland delineation on the wetland mitigation site. The purpose of this delineation was to verify that the mitigation site contained enough successful wetland credits to offset the project impacts that are currently debited from the site.

The Department dispatched a team of biologists in late May 2001 to perform the wetland delineation at the Gurley Tract. On June 22, 2001, the Army Corps of Engineers performed a verification of the wetland delineation. At that time, a discussion initiated regarding the beaver impoundment, which is located within the Riverine Restoration and Bottomland Hardwood Enhancement area. The ACOE requested that the Department map the total area of the beaver impoundment, so that further evaluations could be made.

In July/August 2001, the Department dispatched an environmental consultant to complete this task. The map in Figure 1 and Figure 2, depict the wetland delineation and the beaver impoundment. Table 3, shows the area of each specific type of mitigation described on the Gurley site, as reflected by the wetland delineation.

Table 3. Gurley Tract Mitigation Site Wetland Delineation (June 2001)

Site Habitat	Ac.
SPH Restoration (RR)	41.79
BLH Restoration (NRR)	27.83
BLH Enhancement	29.49
SPH Preservation	5.92

SPH: Swamp Hardwood; BLH: Bottomland Hardwood; RR: Riverine; NRR: Non-riverine

Note: Calculations do not remove the 20.61 Ac. Beaver Impoundment.

2.5 CONCLUSIONS

Hydrologic monitoring in 2001 showed two of the four riverine gauges recorded saturation for more than 12.5% of the growing season. Six of the twelve non-riverine gauges recorded saturation for more than 8% of the growing season. In total, eight of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season. One possible explanation for decreased success at certain gauges is attributed to below average rainfall throughout portions of the growing season.

3.0 Vegetation: Gurley Mitigation Site (Year 4 Monitoring)

3.1 SUCCESS CRITERIA

The March 1998 Mitigation Plan states that there must be a minimum of 320 trees per acre living for at least three consecutive years.

Subsequent permit conditions associated with the site state that NCDOT will monitor the site for five years. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. 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 Restoration Area:

Zone 1: Coastal Plain Bottomland Hardwood Forest (18.86 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 2: Non-Riverine Wet Hardwood Forest (17.57 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Liriodendron tulipifera, Tulip Poplar
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 3: Streambank Levee Forest (3 acres)

Quercus michauxii, Swamp Chestnut Oak

Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Quercus lyrata, Overcup Oak
Salix nigra, Black Willow
Betula nigra, River Birch

Zone 4: Atlantic White Cedar Forest (7 Acres; Planted February 1999)

Chamaecyparis thyoides, Atlantic White Cedar
Nyssa aquatica, Water Tupelo
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum

3.3 RESULTS OF VEGETATION MONITORING

Table 4. Vegetation Monitoring Statistics, by zone and plot

ZONE	Plot #	Baldcypress	Green Ash	Swp. Black Gum	Swp. Chestnut Oak	Water Oak	Willow Oak	Cherrybark Oak	Water Tupelo	Sycamore	Tulip Poplar	Pond Pine	White Oak	Atl. White Cedar	River Birch	Am. Hornbeam	Overcup Oak	Total	Total (at planting)	Density (Tree/Acre)
1	2	11	2	12	7		8	13	8							2		63	63	680
	3	9		2	4		7	14	5								3	44	45	665
	T1	2	8	1	10	2	2		5									30	31	658
	T3	13	1		3			1										18	25	490
	T4		4	6				1	1	1								13	30	295
	T5	5	5		3	1	3		4									21	37	386
ZONE 1 AVERAGE DENSITY																			529	
2	4	3	5		7	2	9	5			6	5	3				1	46	55	569
	5	1	3		6	1	6	3	6	7	4	2	1					40	52	523
	6	15	2	6	5	2	1	8			6	3				1	1	50	50	680
ZONE 2 AVERAGE DENSITY																			591	
4	1		9	1					3					3				16	33	330
	T2		1	1				8						28				38	47	550
ZONE 3 AVERAGE DENSITY																			440	
TOTAL AVERAGE DENSITY																			529	

Site Notes:

Zone 1: Other species noted: trumpet creeper, *Aster* sp., fennel, winged sumac, broomsedge, woolgrass, cane, blackberry, muscadine, plume grass, *Juncus* sp., *Carex*

sp., *Baccharis* sp., river birch, red maple, and sweetgum (40-50 in plot 2, 10-15 in plot 3, 5-10 in plot T5). The occurrence of these species does not appear to be affecting the survival of the planted trees. 6 inches of standing water in part of plot T3, 18-24 inches of standing water in plot T4, 8-16 inches of standing water in T5. Beaver activity evident in plot T4.

Zone 2: Other species noted: trumpet creeper, *Baccharis* sp., fennel, red maple, *Aster* sp., broomsedge, sicklepod, and sweetgum (25-30 in plot 4, 3-5 in plot 5, 50+ in plot 6). The occurrence of these species does not appear to be affecting the survival of the planted trees.

Zone 3: Trees surviving along levee.

Zone 4: Other species noted: black willow, *Juncus* sp., smartweed, jewelweed, alder, cattails, and volunteer oaks. The occurrence of these species does not appear to be affecting the survival of the planted trees.

3.4 CONCLUSIONS

Of the 426 acres of this site, approximately 46 acres involved tree planting. There were 6 test plots and 5 transects established throughout the planting areas. The 2001 vegetation monitoring of the planted areas revealed an average density of 529 trees per acre for Zone 1, 591 trees per acre for Zone 2 and 440 trees per acre for Zone 4. All zones are well above the minimum requirement of 320 trees per acre.

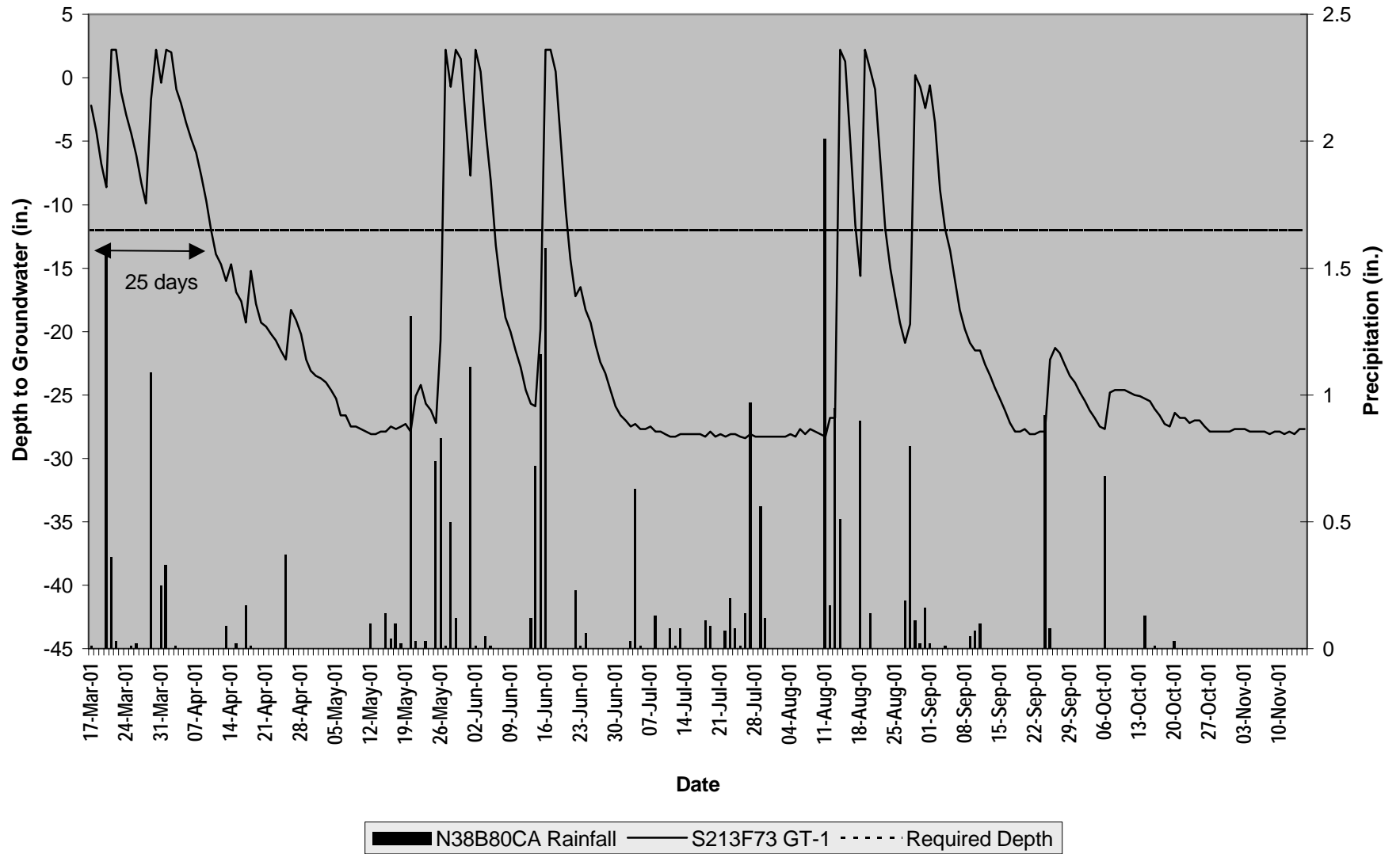
4.0 Overall Conclusions/Recommendations

- Monitoring of site hydrology and vegetation will continue in 2002.

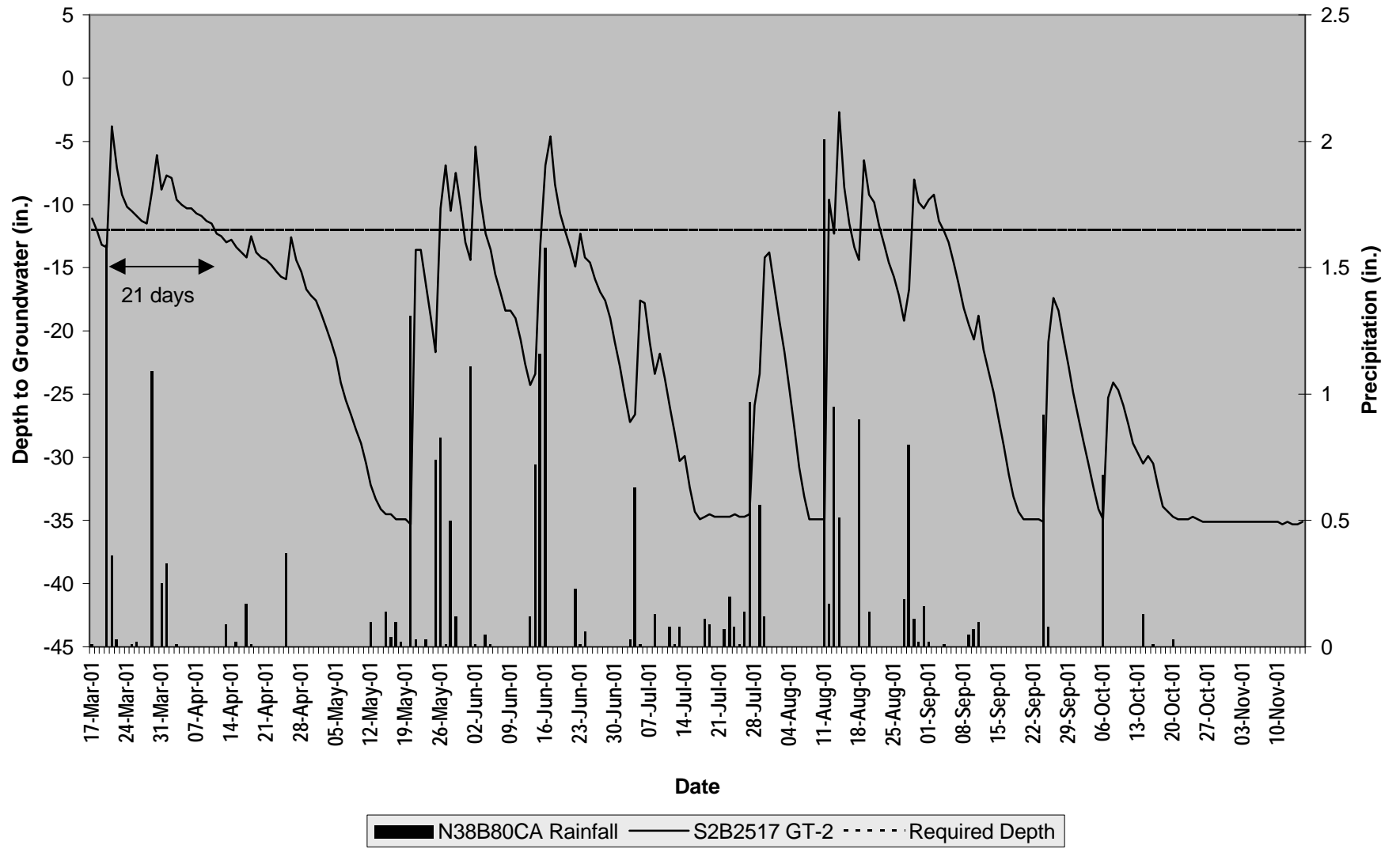
APPENDIX A

DEPTH TO GROUNDWATER PLOTS

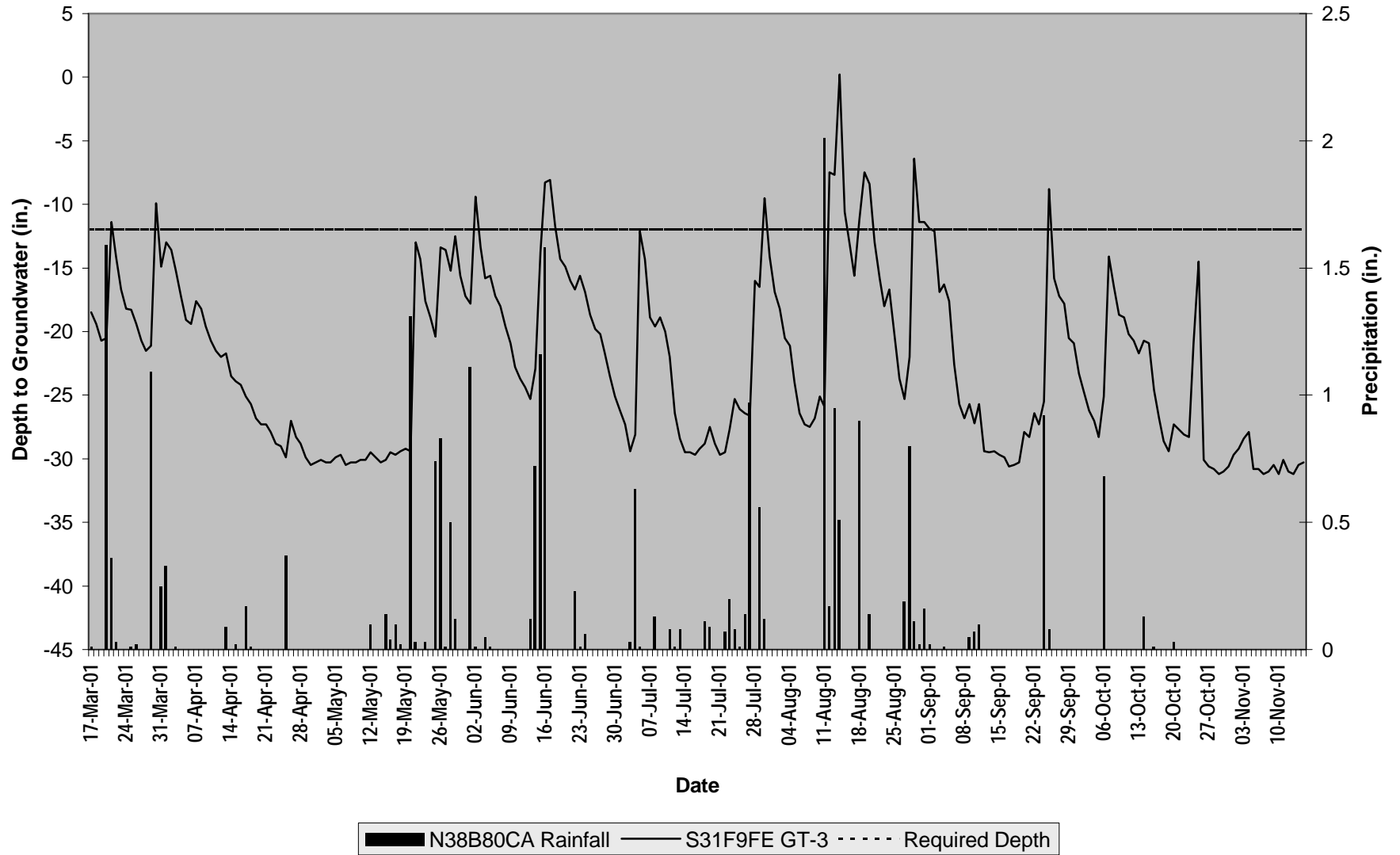
Gurley Tract GT-1



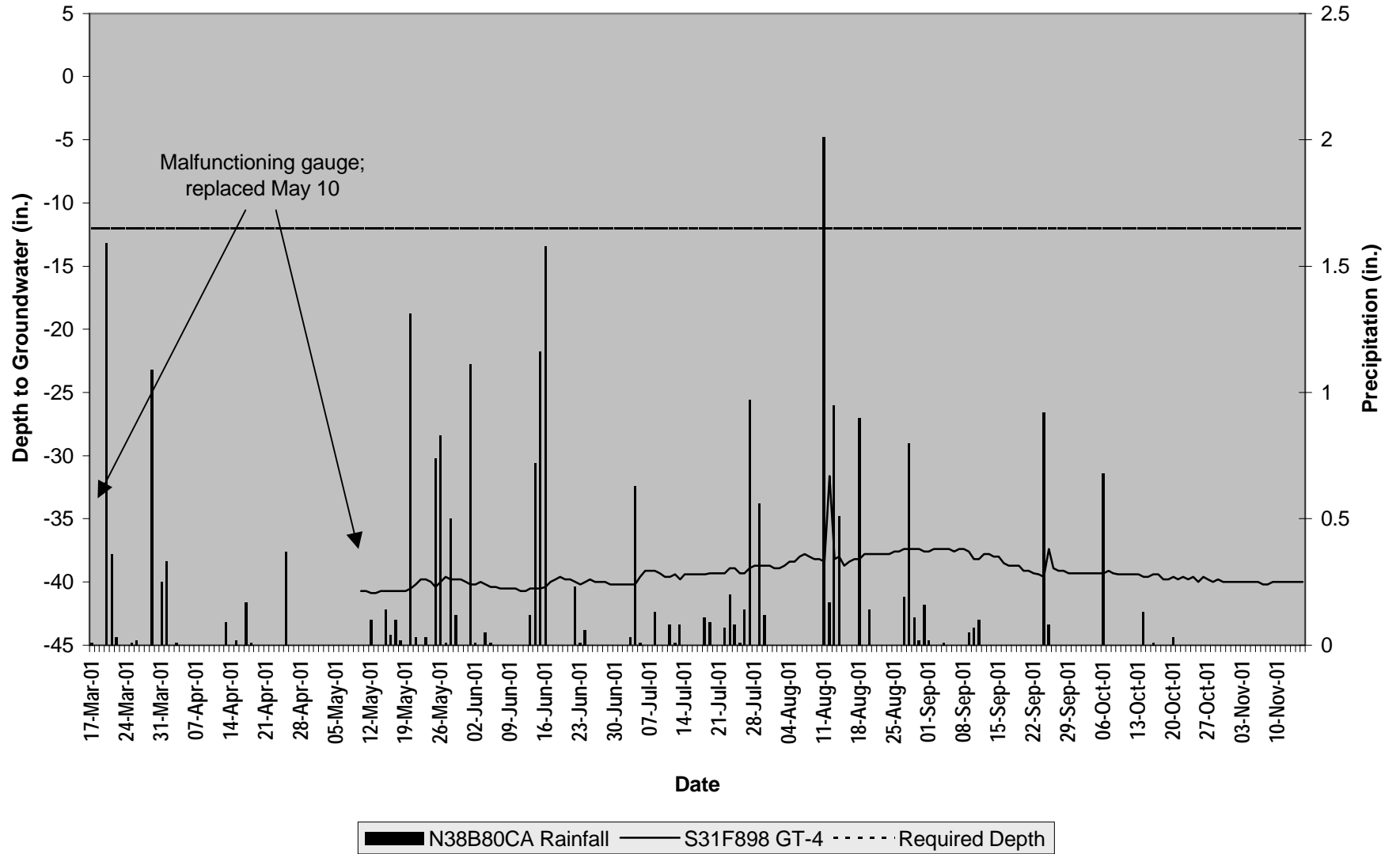
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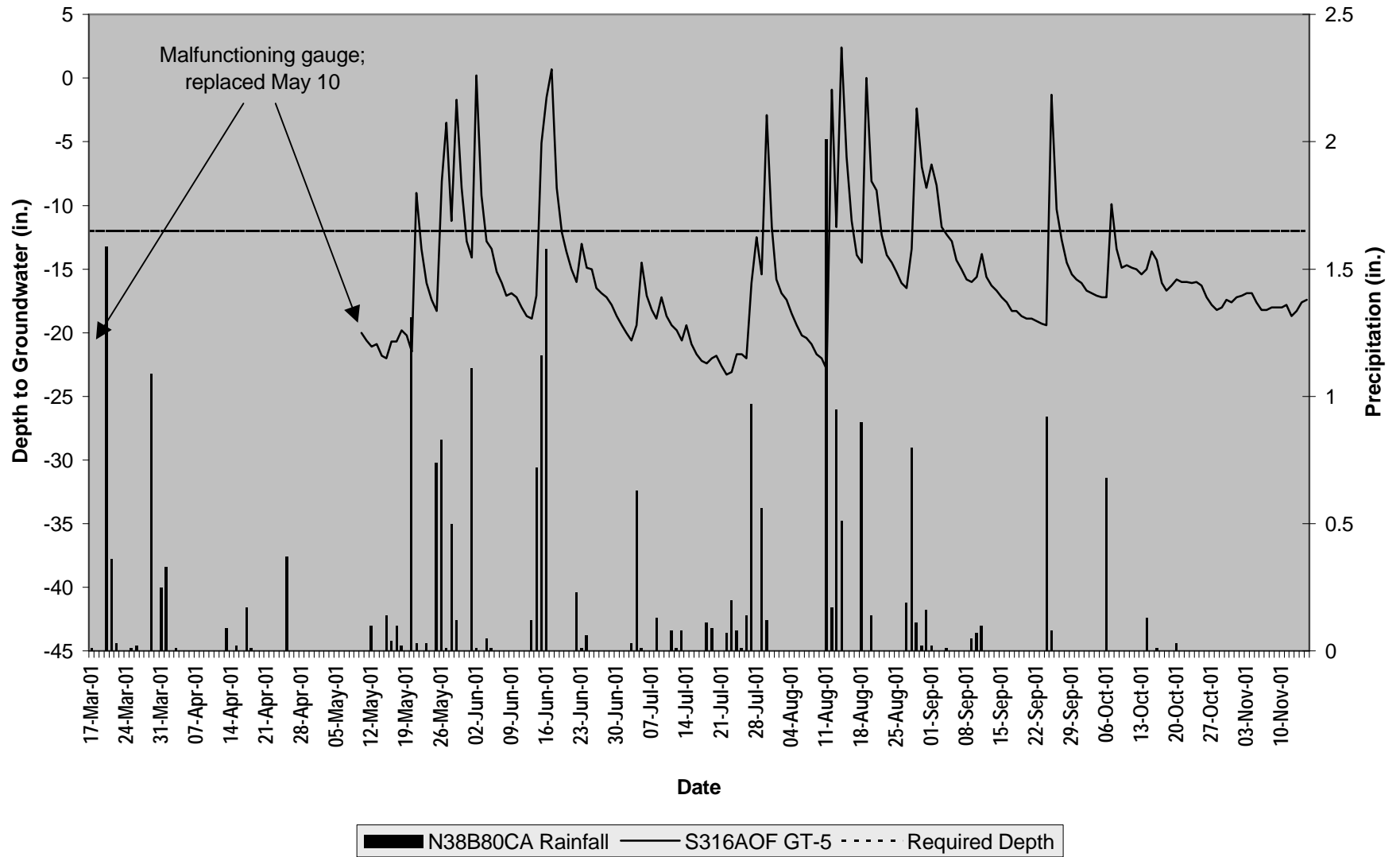
Gurley Tract GT-3



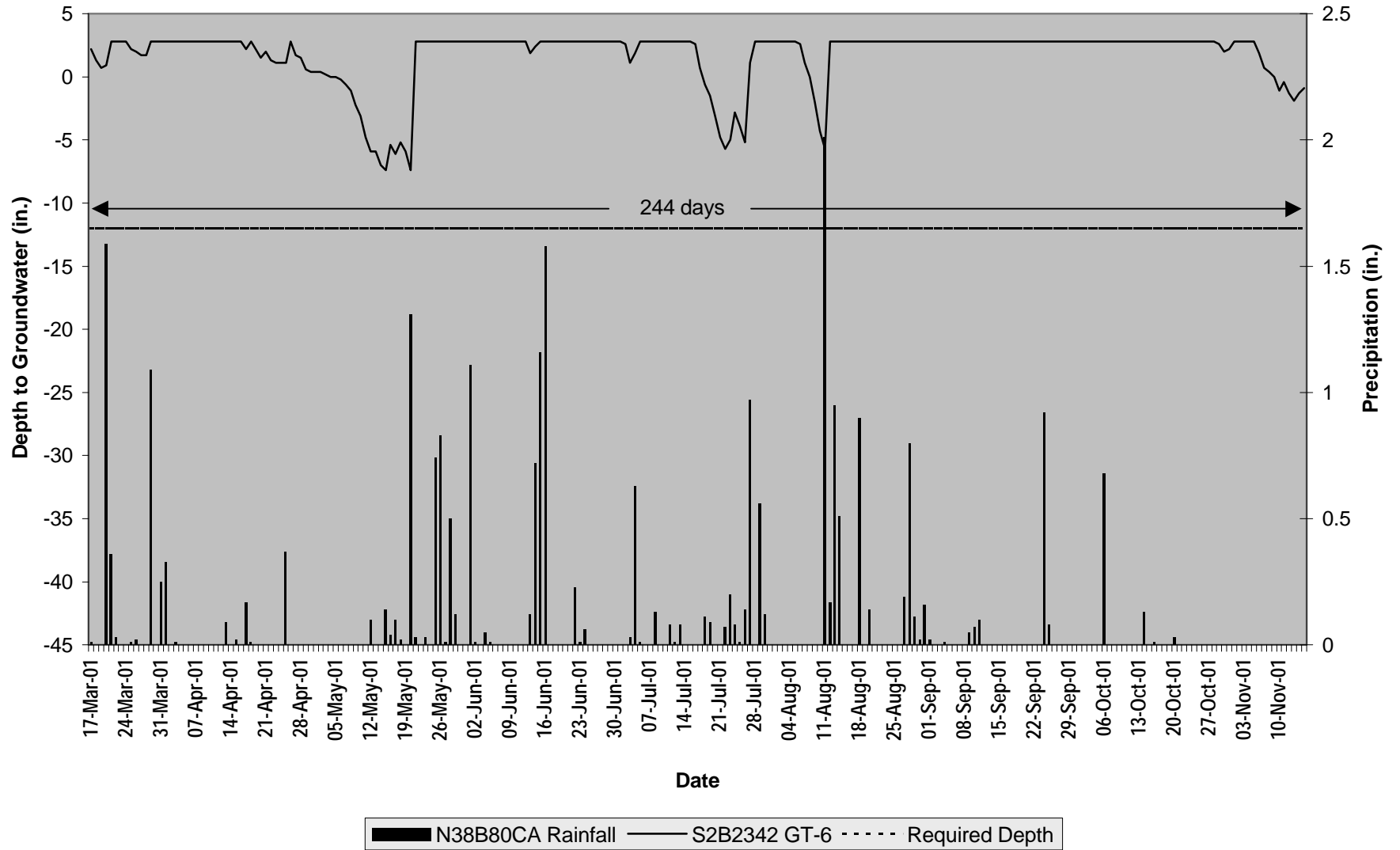
Gurley Tract GT-4



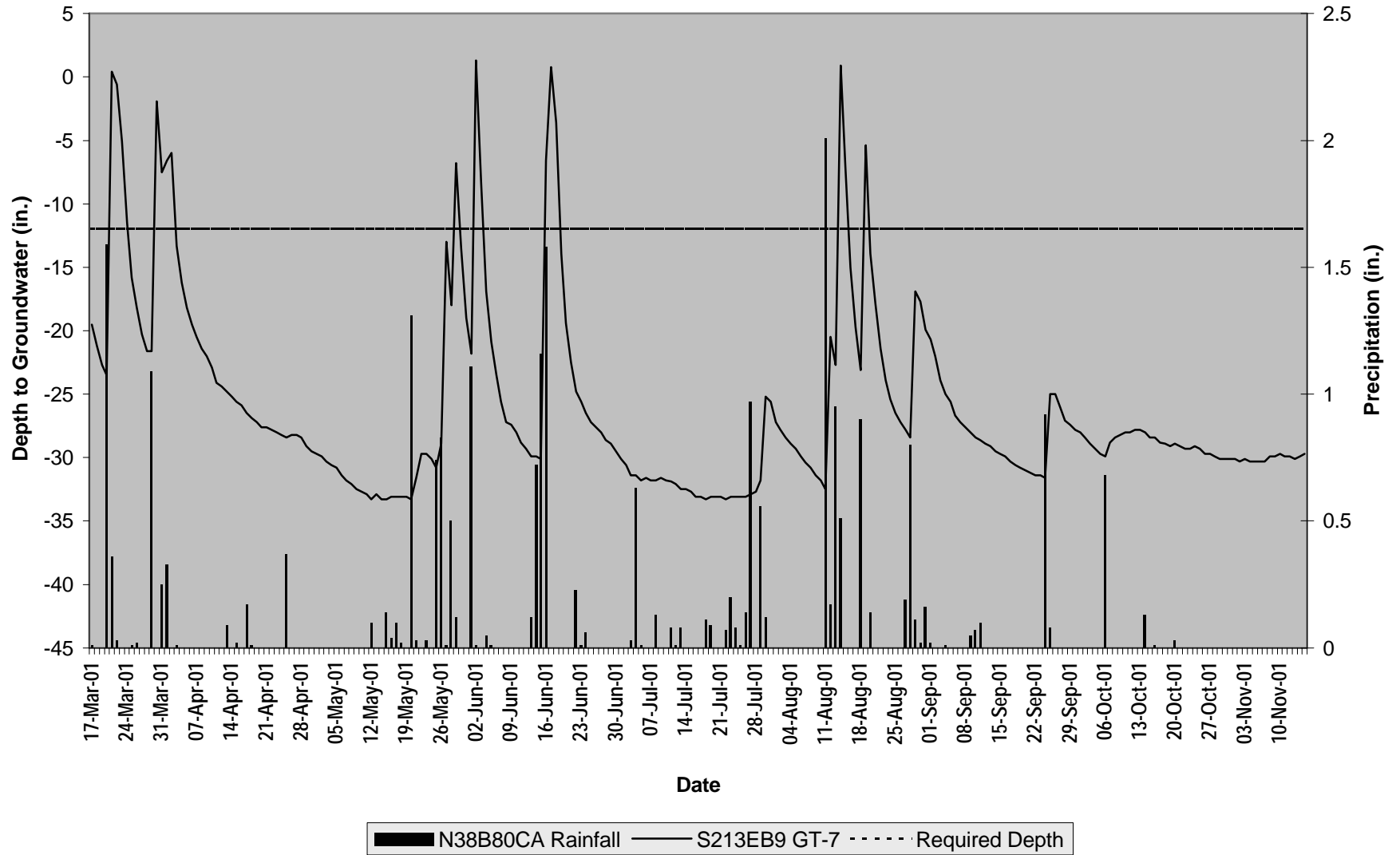
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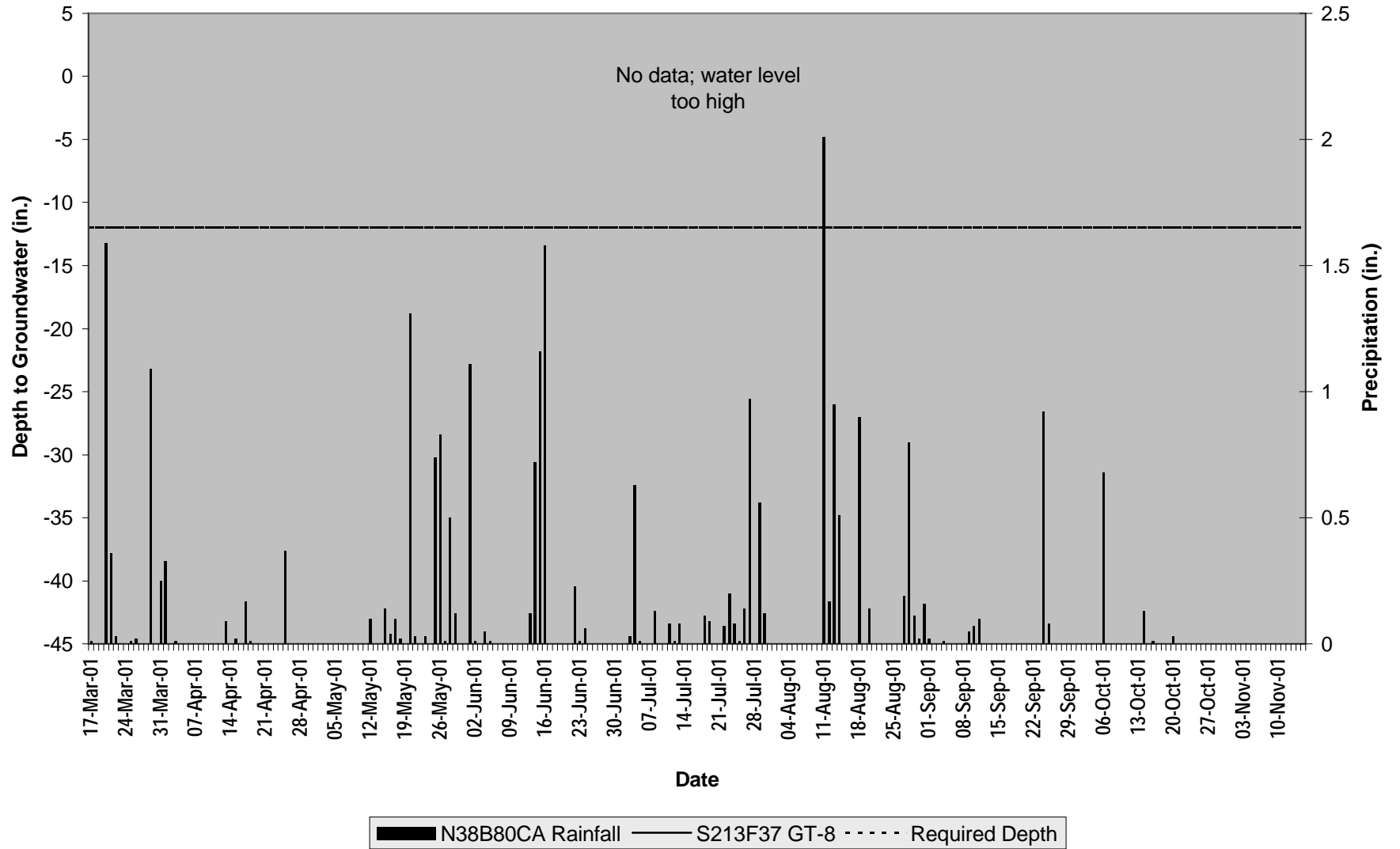
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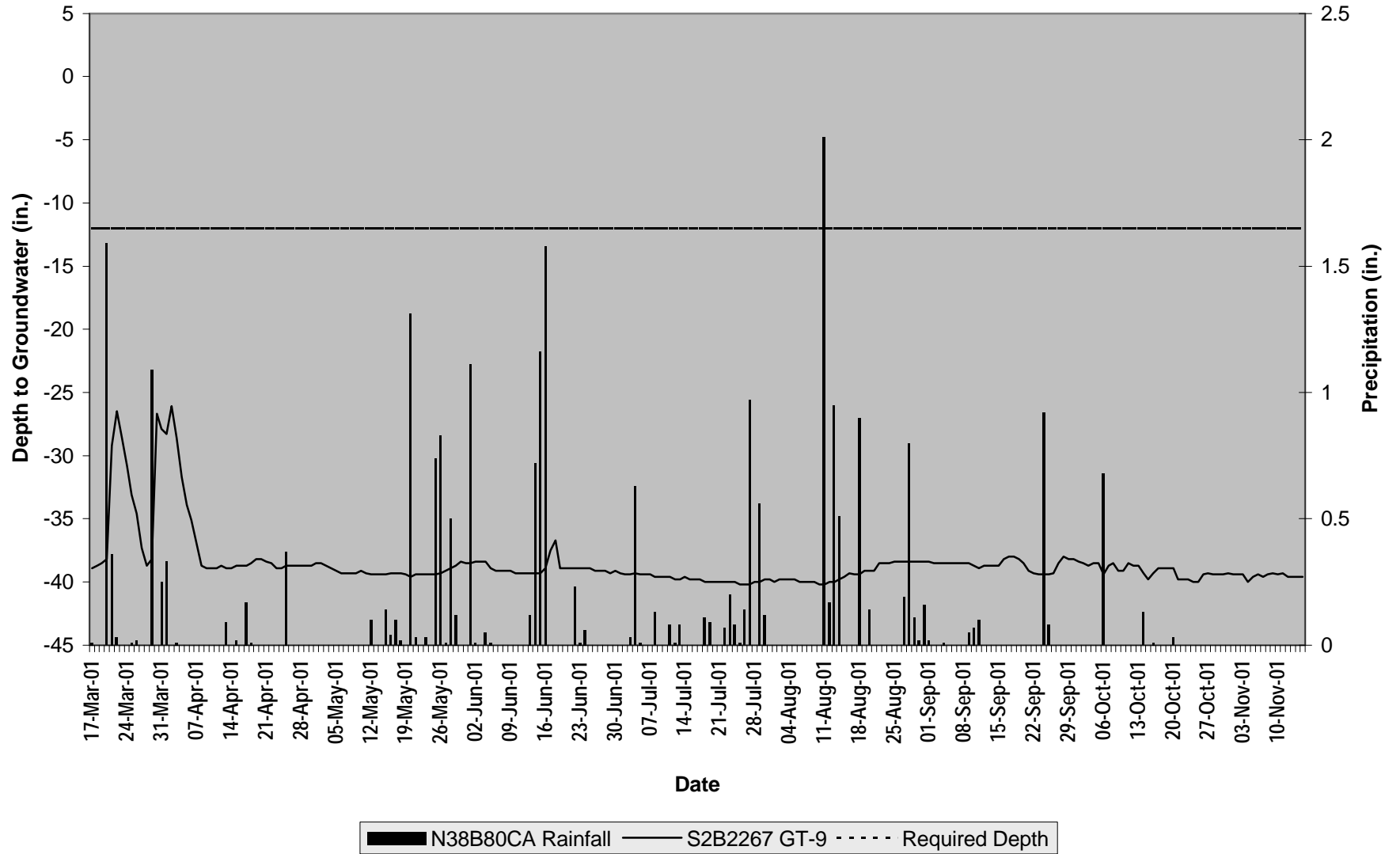
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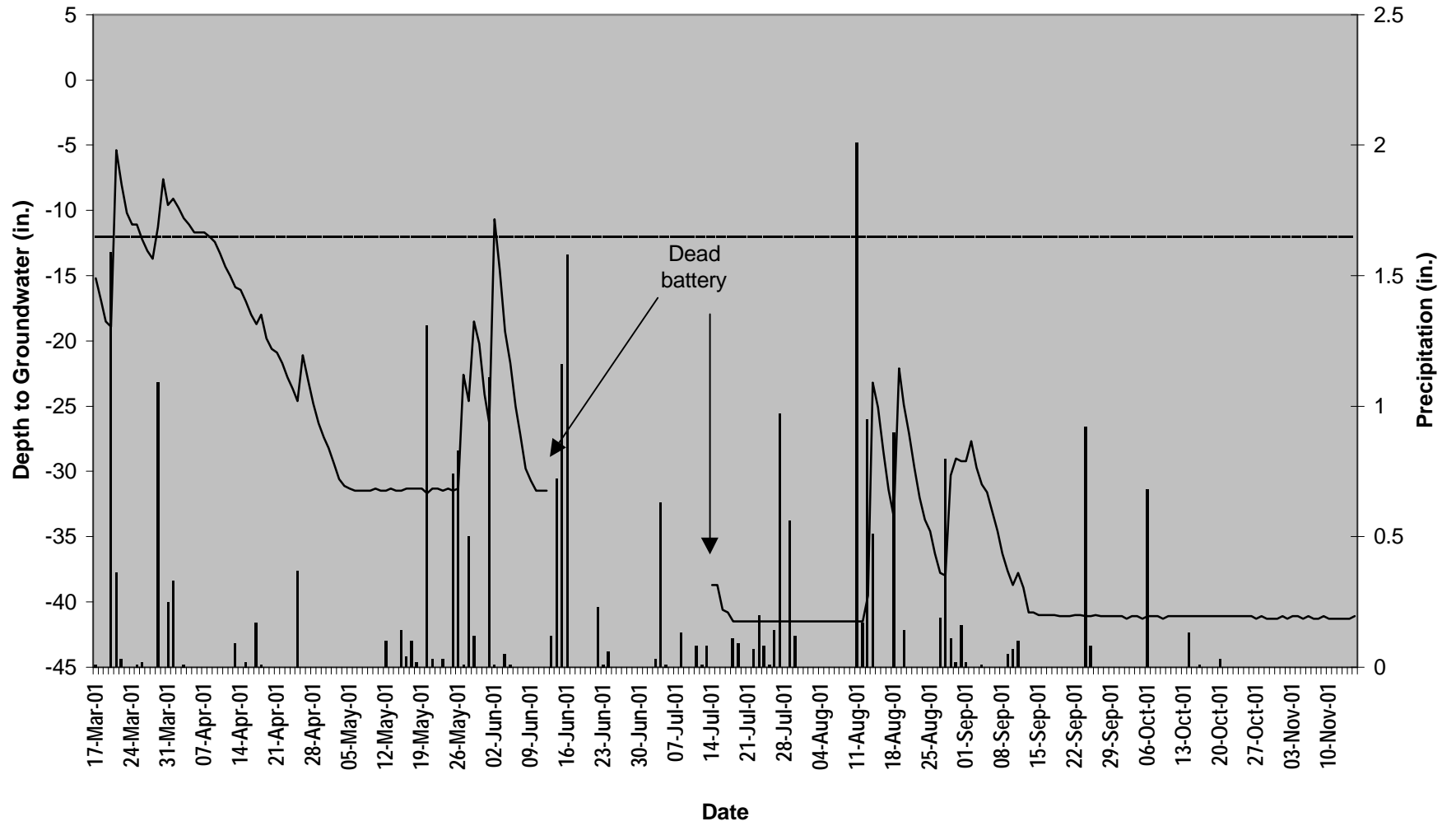
Gurley Tract GT-8



Gurley Tract GT-9

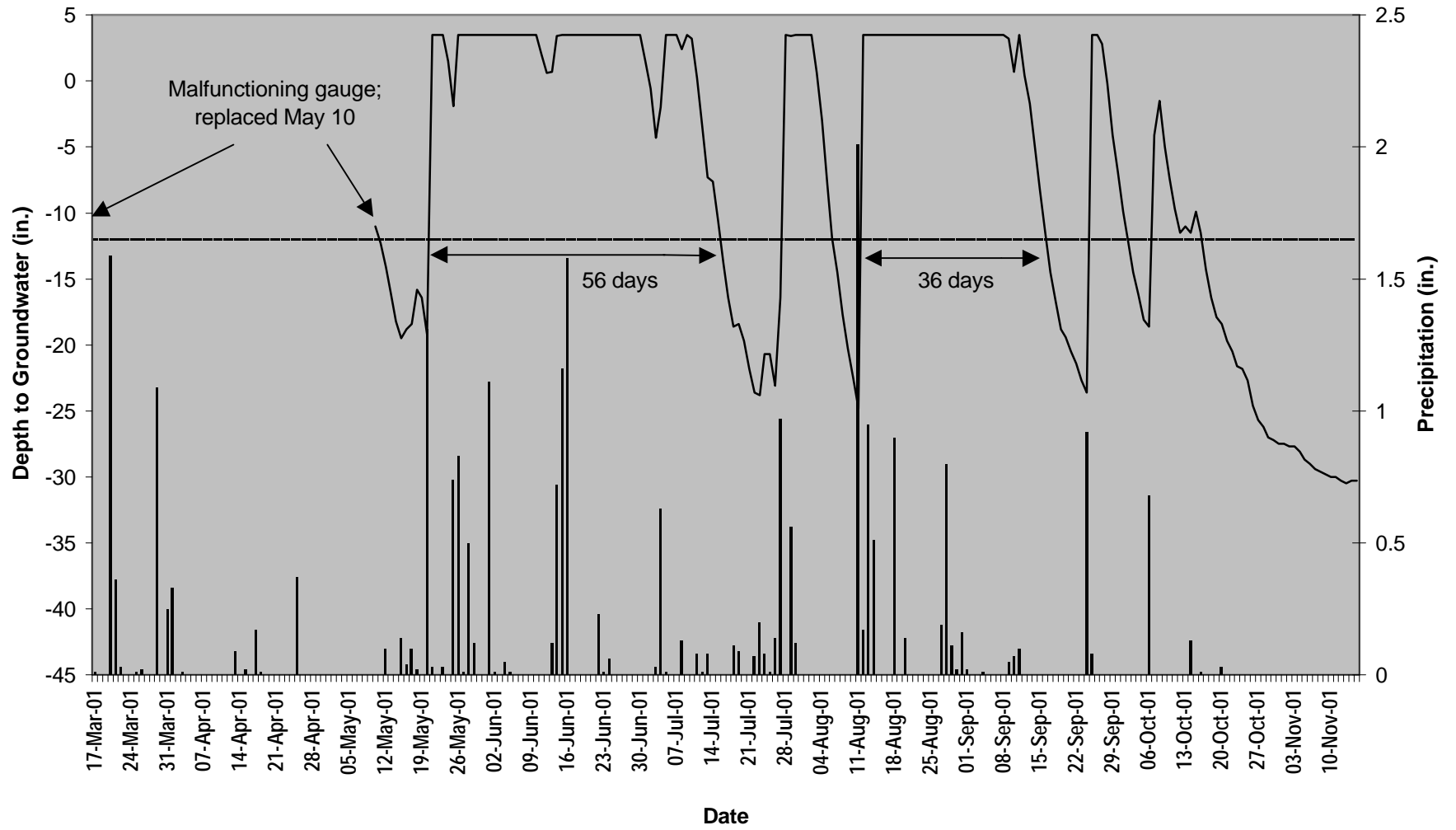


Gurley Tract GT-10



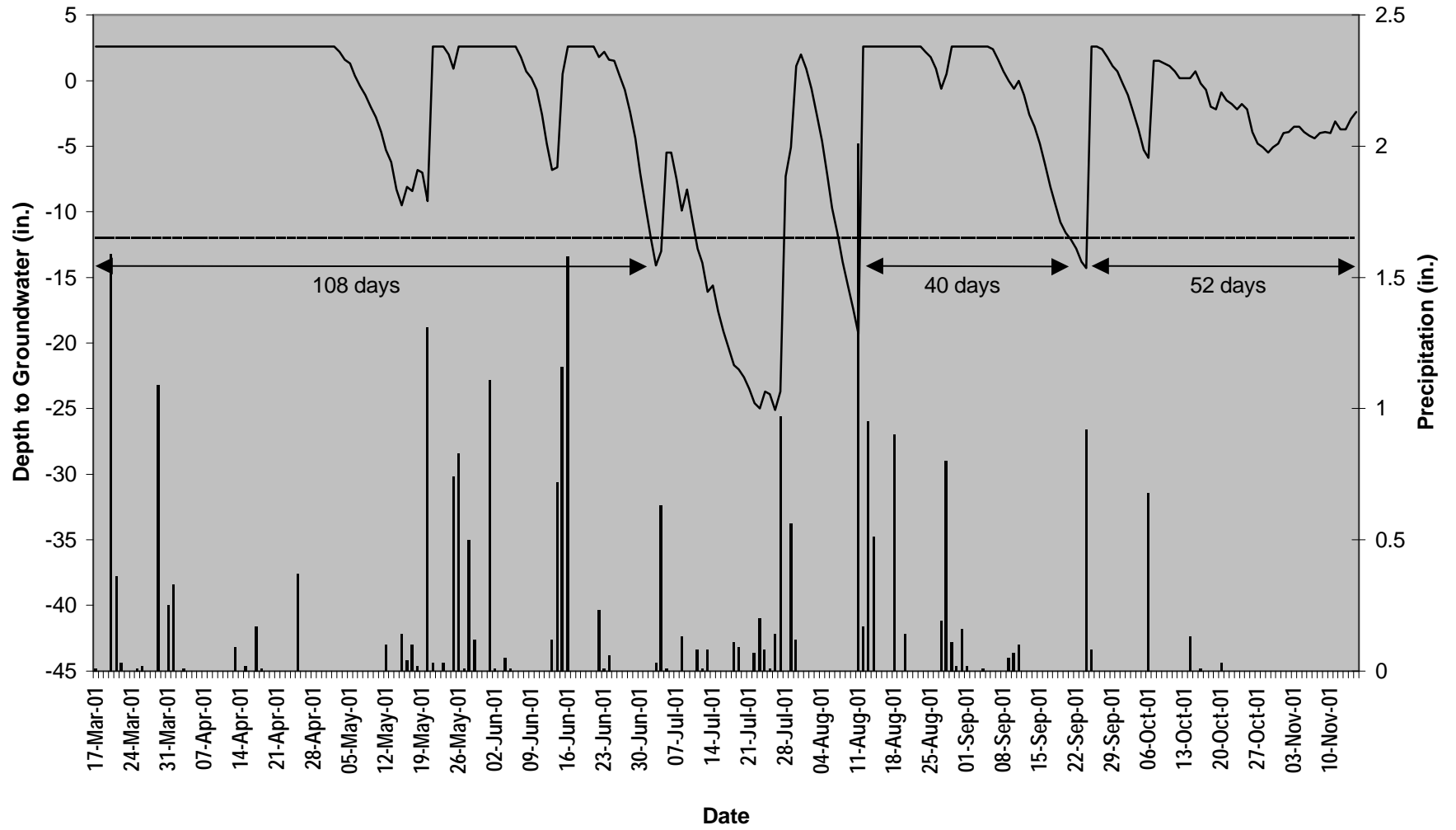
■ N38B80CA Rainfall — S3173AA GT-10 - - - - - Required Depth

Gurley Tract GT-11



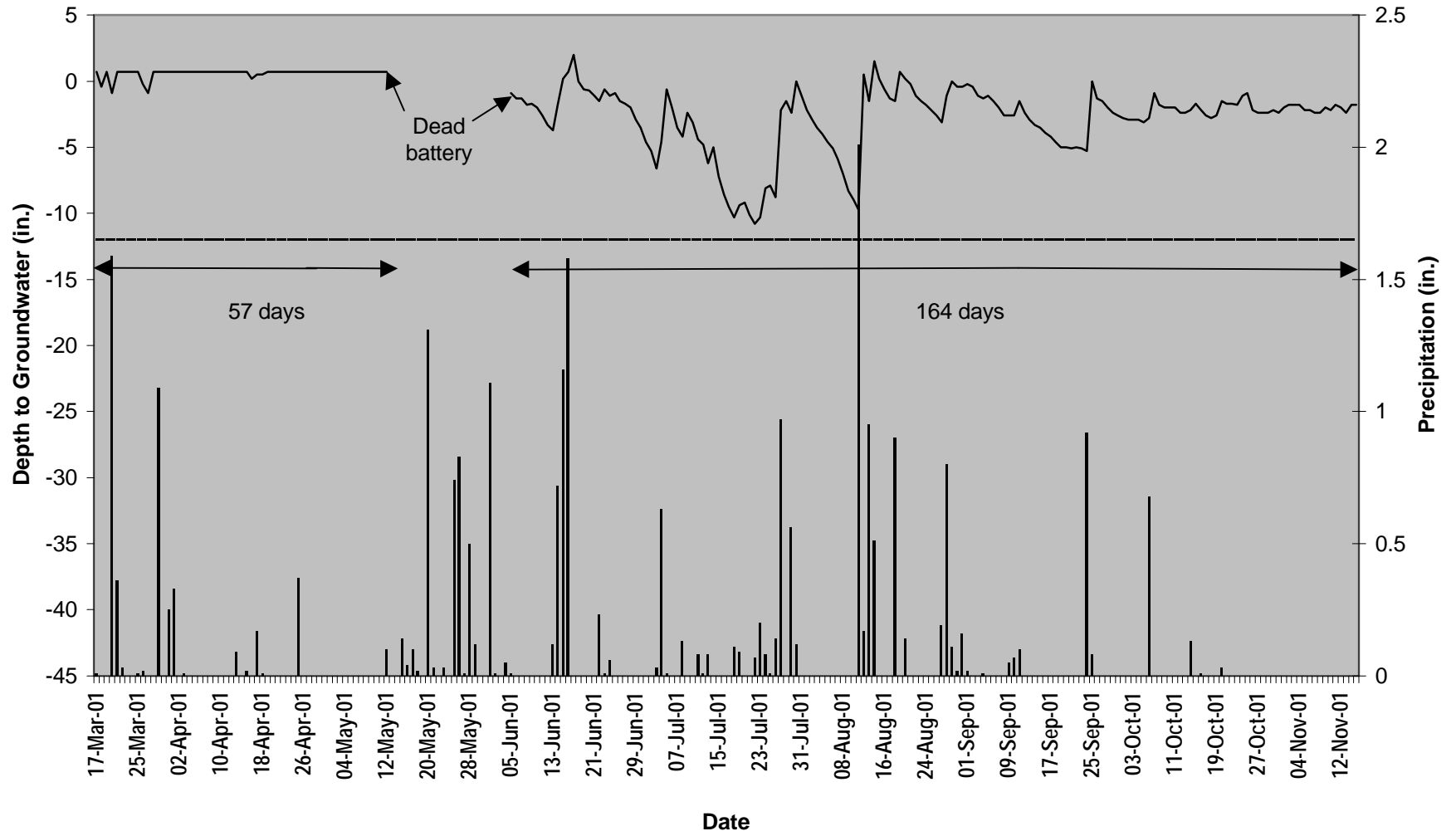
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Gurley Tract GT-12



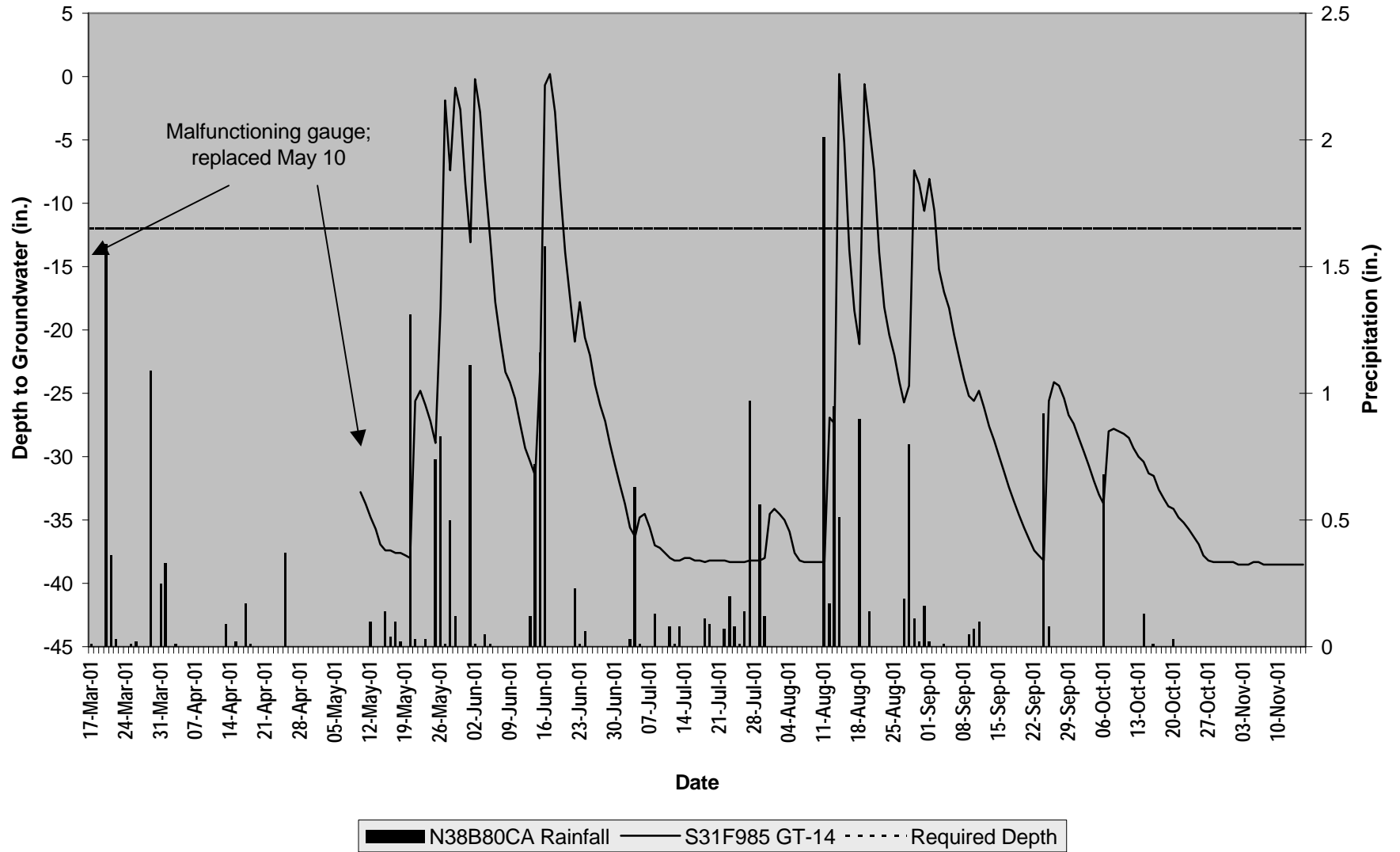
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Gurley Tract GT-13

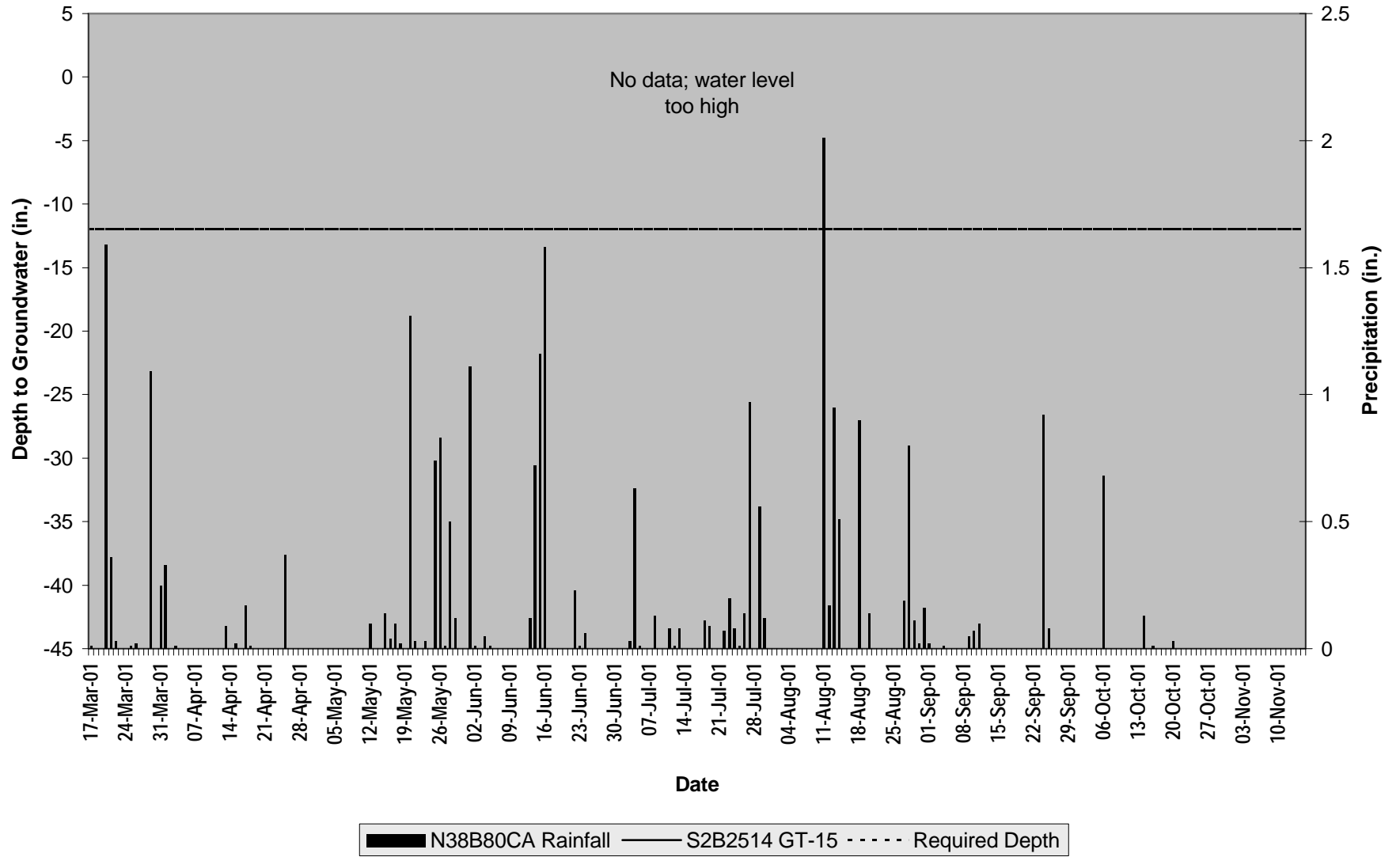


■ N38B80CA Rainfall — S317410 GT-13 - - - - Required Depth

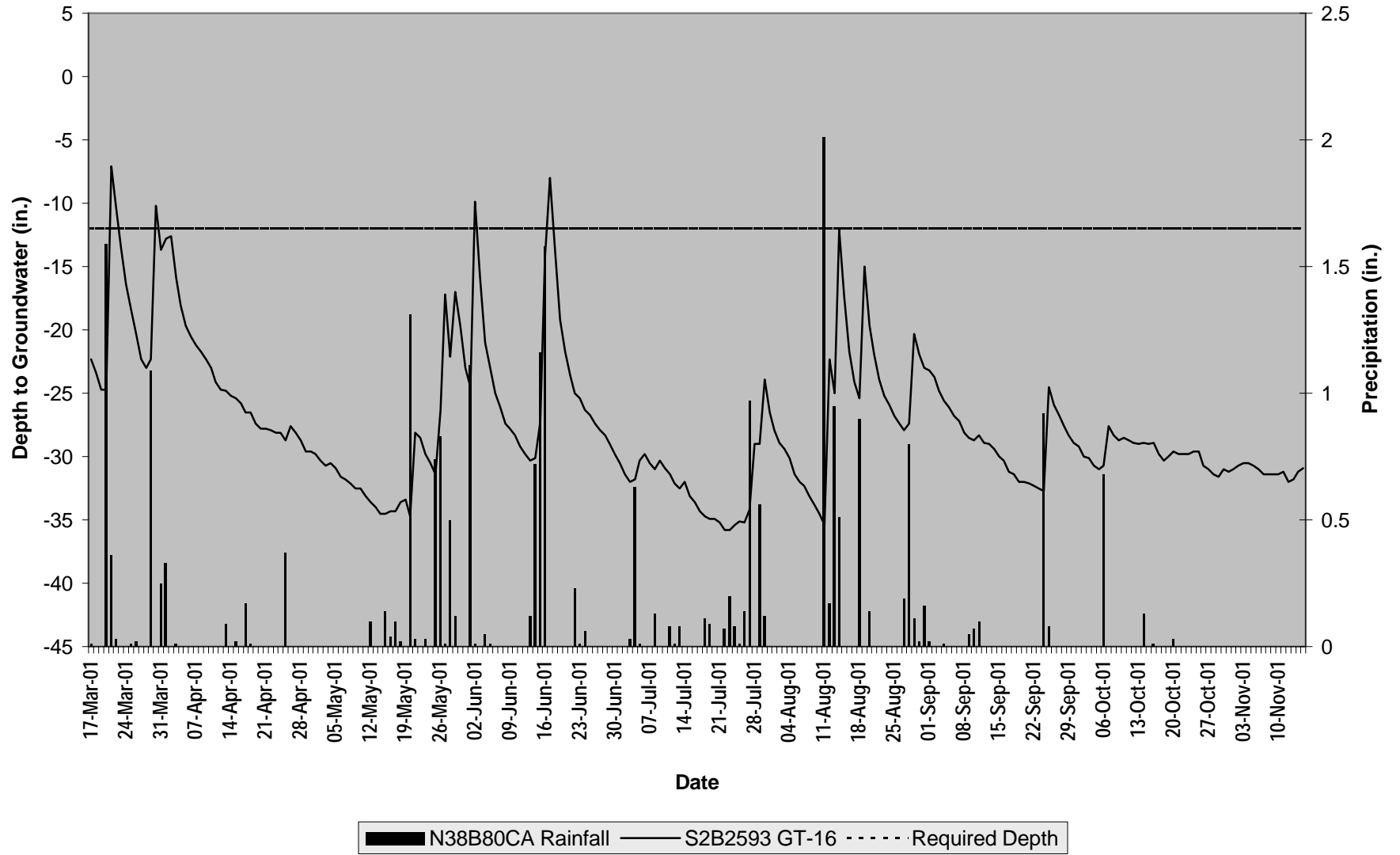
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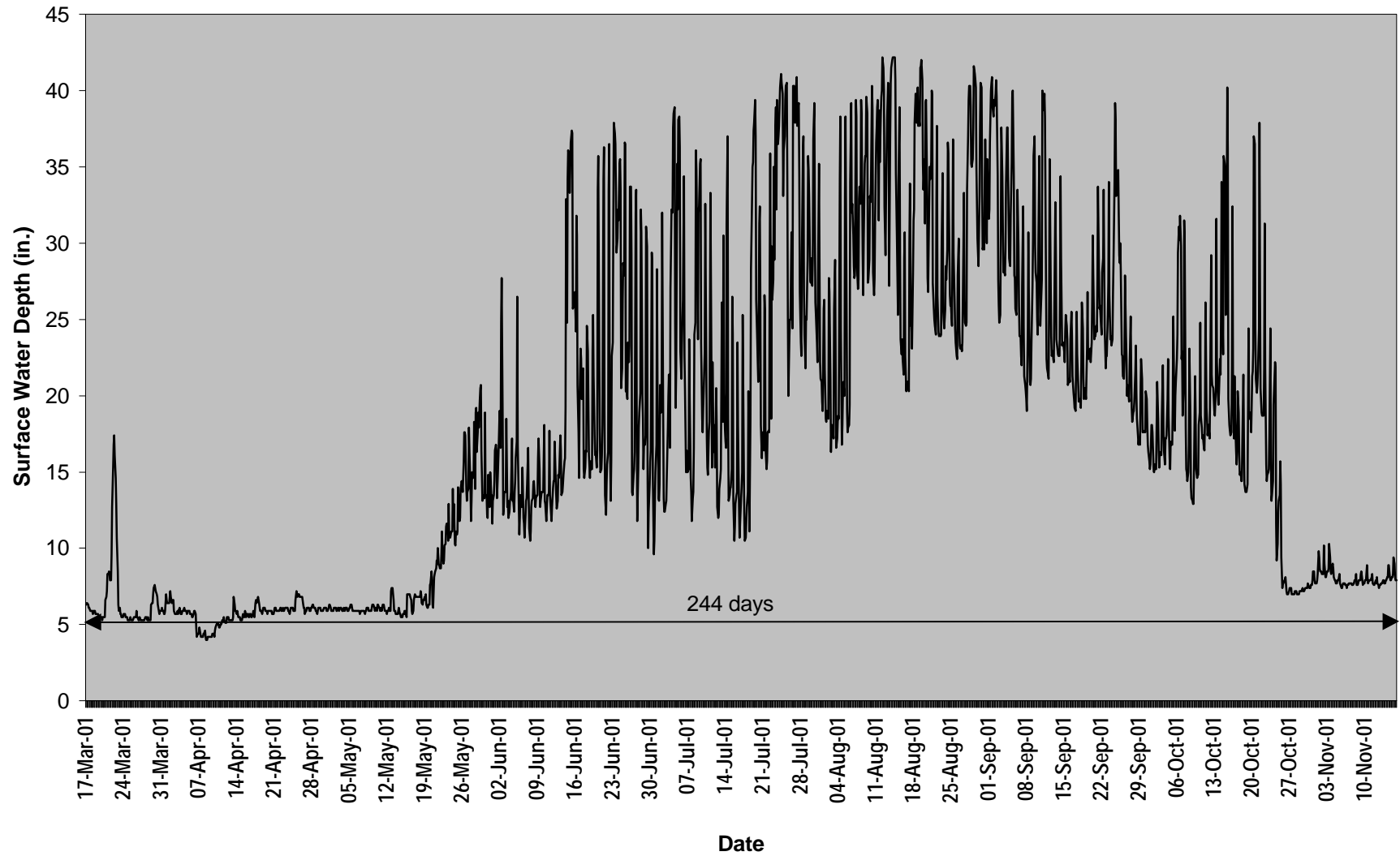
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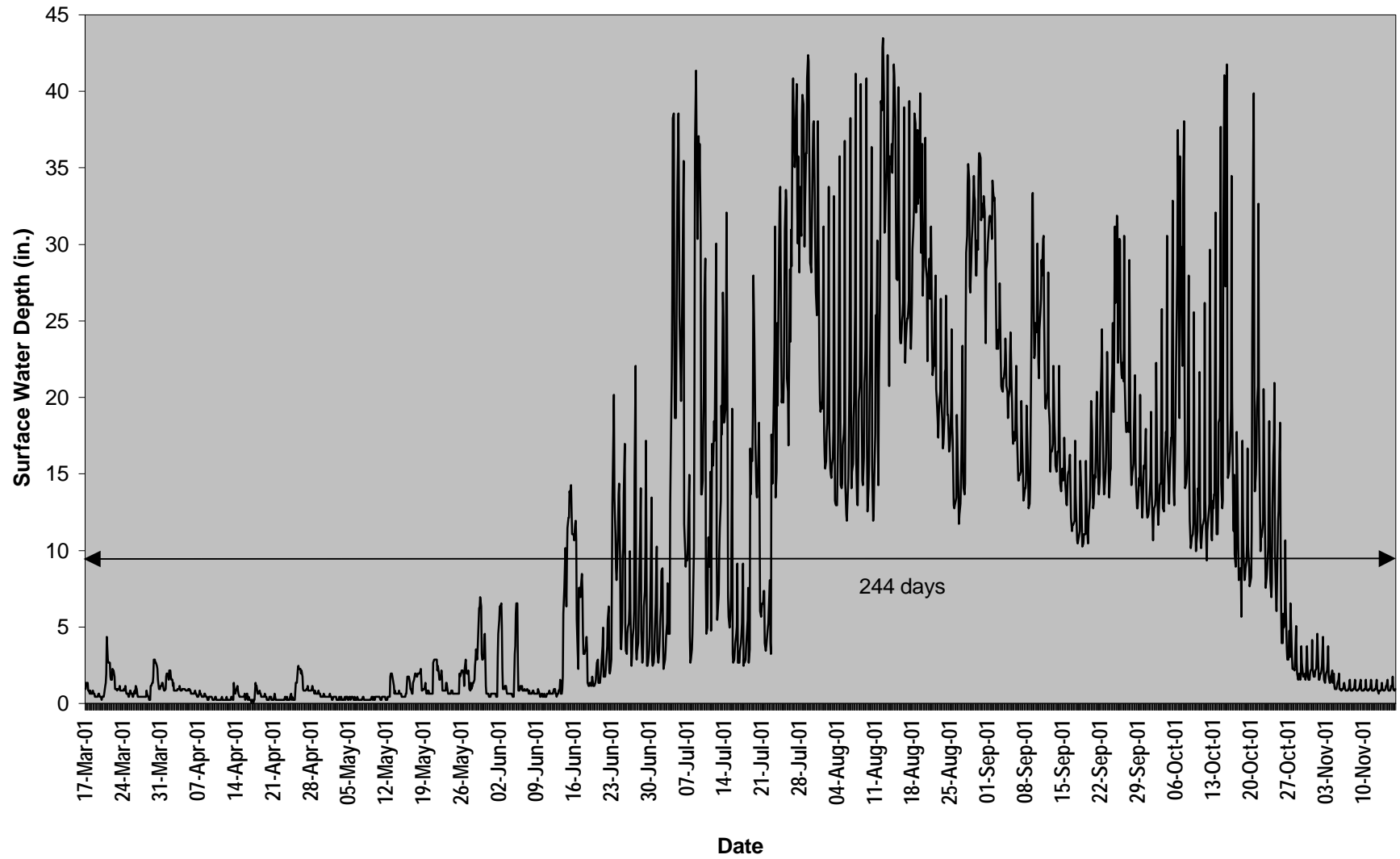
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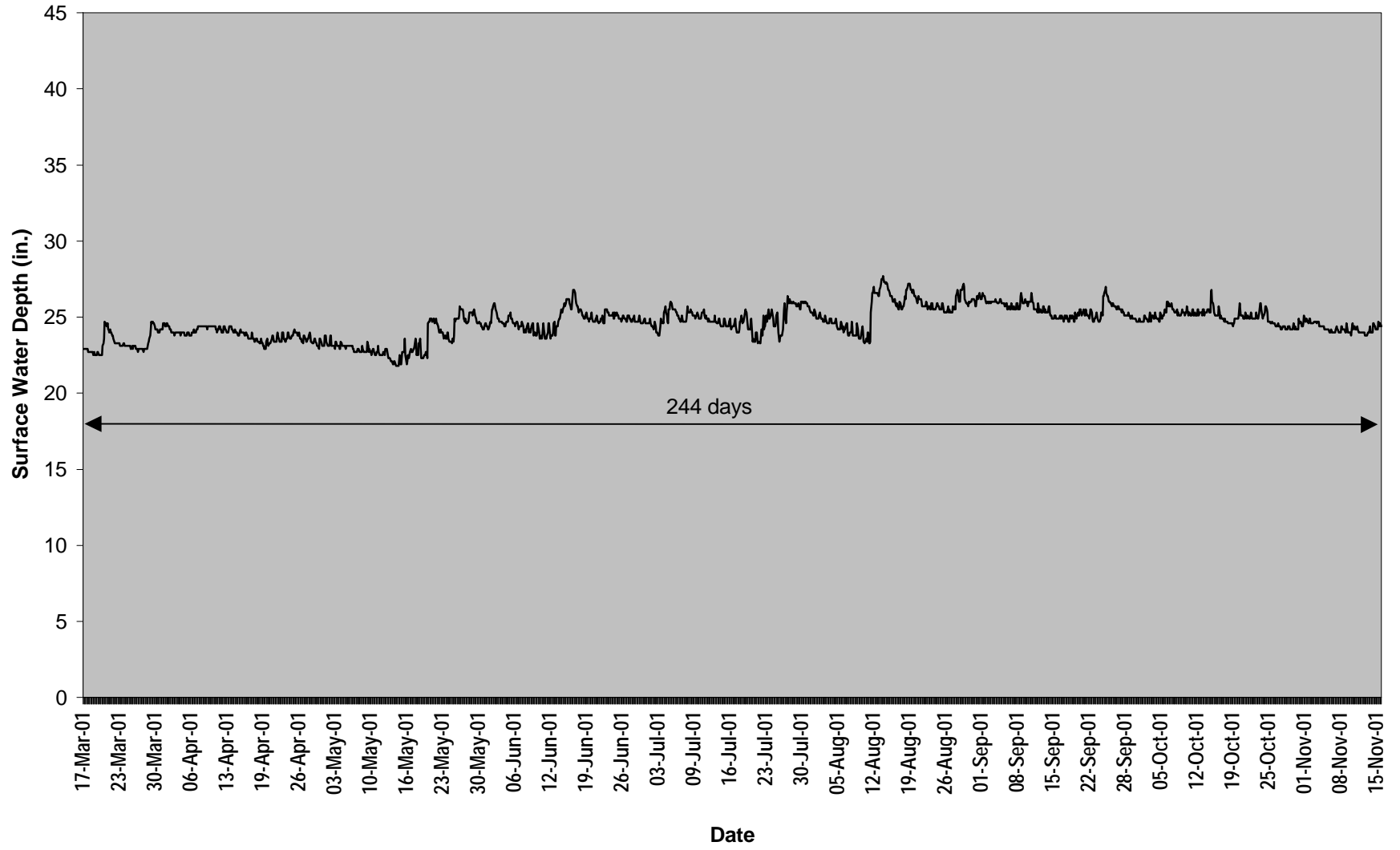
Gurley Tract GTSG-1



Gurley Tract GTSG-2



Gurley Tract GTSG-3



APPENDIX B

SITE PHOTOS

GURLEY TRACT



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

GURLEY TRACT



Photo 7



Photo 8

