ANNUAL REPORT FOR 2006

SALT Mitigation Site
Moore County
Project No. 6.569005T
TIP No. R-0210WM

Natural Environment Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2006

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SUMMARY

The following report summarizes the monitoring activities that have occurred in 2006 at the Sandhills Area Land Trust (SALT) Mitigation Site. The 2006-year represents the first year of hydrology and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the site is deemed successful. The site was constructed to serve as mitigation for impacts for R-0210 (US-1 Bypass).

Hydrologic success criteria are based on the approved mitigation plan and require that the site show saturation or inundation within one foot of the soil surface for at least 12.5% of the growing season. Alternatively, hydrology success criteria may be established through comparison of well data between the wetland restoration area and the reference wetland (i.e. depth to groundwater). The reference hydroperiod will be compared to the restoration areas which must exceed 75 percent of the hydroperiod exhibited by the reference wells, located within the same physiographic landscape area. The 2006-year represents the first year of hydrologic monitoring for the Salt Mitigation Site. For the 2006-year, ten of the eleven gauges recorded jurisdictional hydrology for greater than 12.5% of the growing season.

Of the 24.5 acres of planting on this site, approximately 15.9 acres involved bottomland hardwood tree planting. Approximately 8.6 acres of upland buffer were planted with longleaf pine. There were 4 vegetation-monitoring plots established throughout the bottomland hardwood planting area. The 2006 vegetation monitoring of the site revealed an average tree density of 440 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

Per the letter from 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. The site will be transferred to EEP February 2007 for remaining monitoring.

1.0 INTRODUCTION

1.1 Project Description

The Sandhills Area Land Trust (SALT) Mitigation Site serves (entirely) as mitigation for the R-210 (US-Bypass). The 327-acre site is located is located in southern Moore County, along the Little River, near the town of Lobelia. The 327-acre site includes restoration of both riverine hardwood and swamp forest wetlands.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetation monitoring must be conducted for a minimum of five years or until the site is deemed successful. Success criteria are based on federal guidelines for wetland mitigation and as stipulated in the approved mitigation plan. Criteria for hydrologic conditions and vegetation survival are included in this document. Also included in this report are analyses of hydrologic and vegetation-monitoring results, discussions of local climate conditions throughout the growing season and site photographs.

1.3 Project History

December 2001	Site KG Sheared and Drum Chopped
July 2002	Site Sprayed
February 2003	Site Planted
January 2006	Ditches Plugged
January 2006	Monitoring Gauges reprogrammed
March-November 2006	Hydrologic Monitoring (Year 1)
February 2007	Vegetation Monitoring (Year 1)

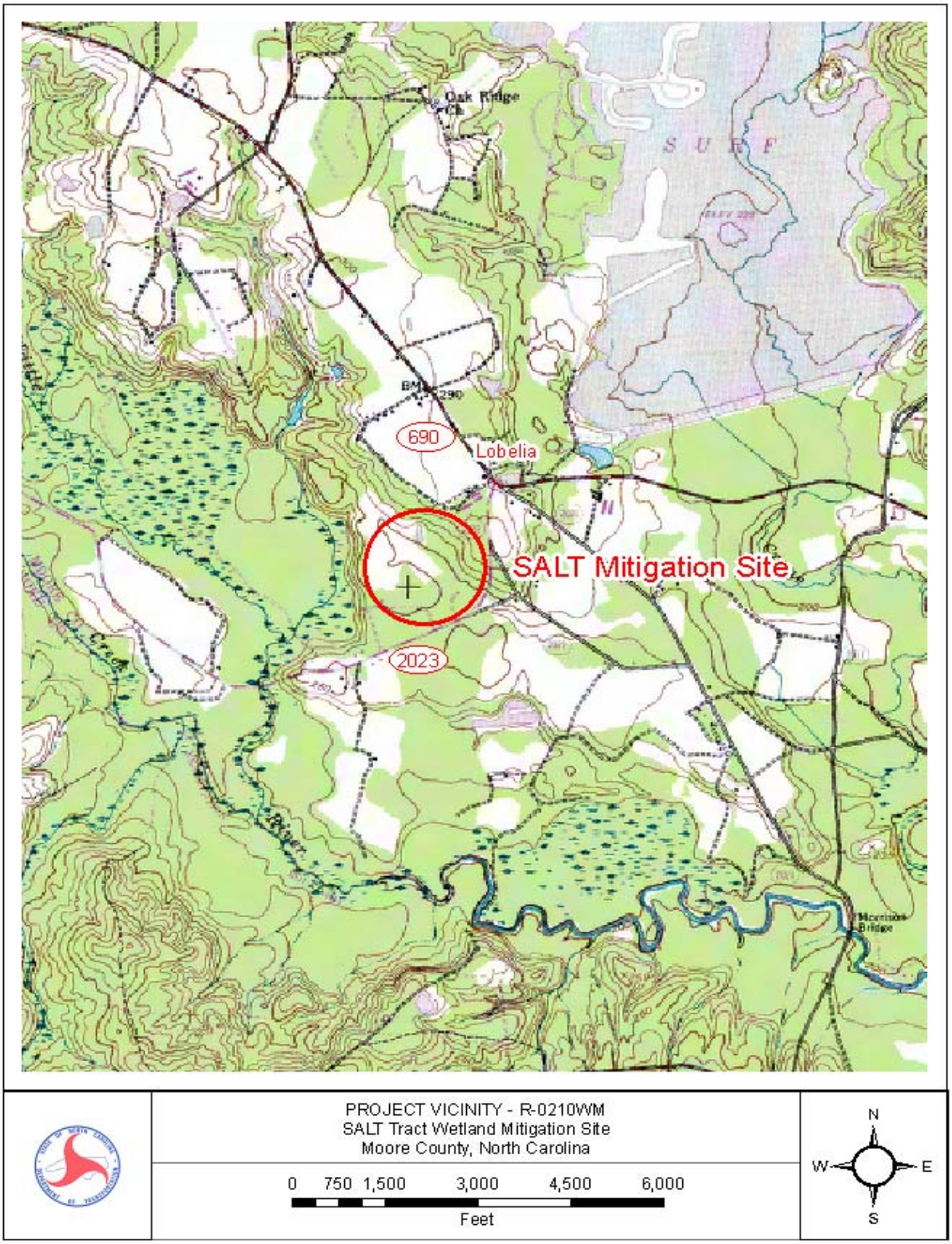


Figure 1. **Site Location Map**

2.0 HYDROLOGY

2.1 Success Criteria

The hydrologic success criteria established for the Salt Mitigation Site, as stipulated in the approved mitigation plan and subsequent revisions, require that the site show saturation or inundation within one foot of the soil surface for at least 12.5% of the growing season. Alternatively, hydrology success criteria may be established through comparison of well data between the wetland restoration area and the reference wetland (i.e. depth to groundwater). The reference hydroperiod will be compared to the restoration areas which must exceed 75 percent of the hydroperiod exhibited by the reference wells, located within the same physiographic landscape area.

The growing season in Moore County begins on March 23 and ends November 7 The dates correspond to a 50% probability that air temperature will drop to 28° after March 18 and before November 7[1]; thus, the growing season is 228 days. Local climate must represent normal conditions for the area.

2.2 Hydrologic Description

No rain gauge is located on the site, so rainfall data (supplied by the NC State Climate Office) from an official weather station in Carthage is used to compare to the site data. The groundwater gauges record water levels on a daily basis. Monitoring data for 2006 represents the first year of hydrologic monitoring for the site.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that saturation occurred within 12" of the ground surface was determined for each groundwater-monitoring gauge. This number was converted into a percentage of the 228-day growing season (March 23 – November 7). Table 1 provides the 2006 hydrologic results; Figure 3 is a graphical representation of these results. Appendix A includes graphs of the data recorded at each groundwater and surface water gauge. Daily rainfall events recorded at the official weather station in Carthage are included on each of the groundwater gauge plots.

[1] Soil Conservation Service, Soil Survey of Moore County, North Carolina, 1989.

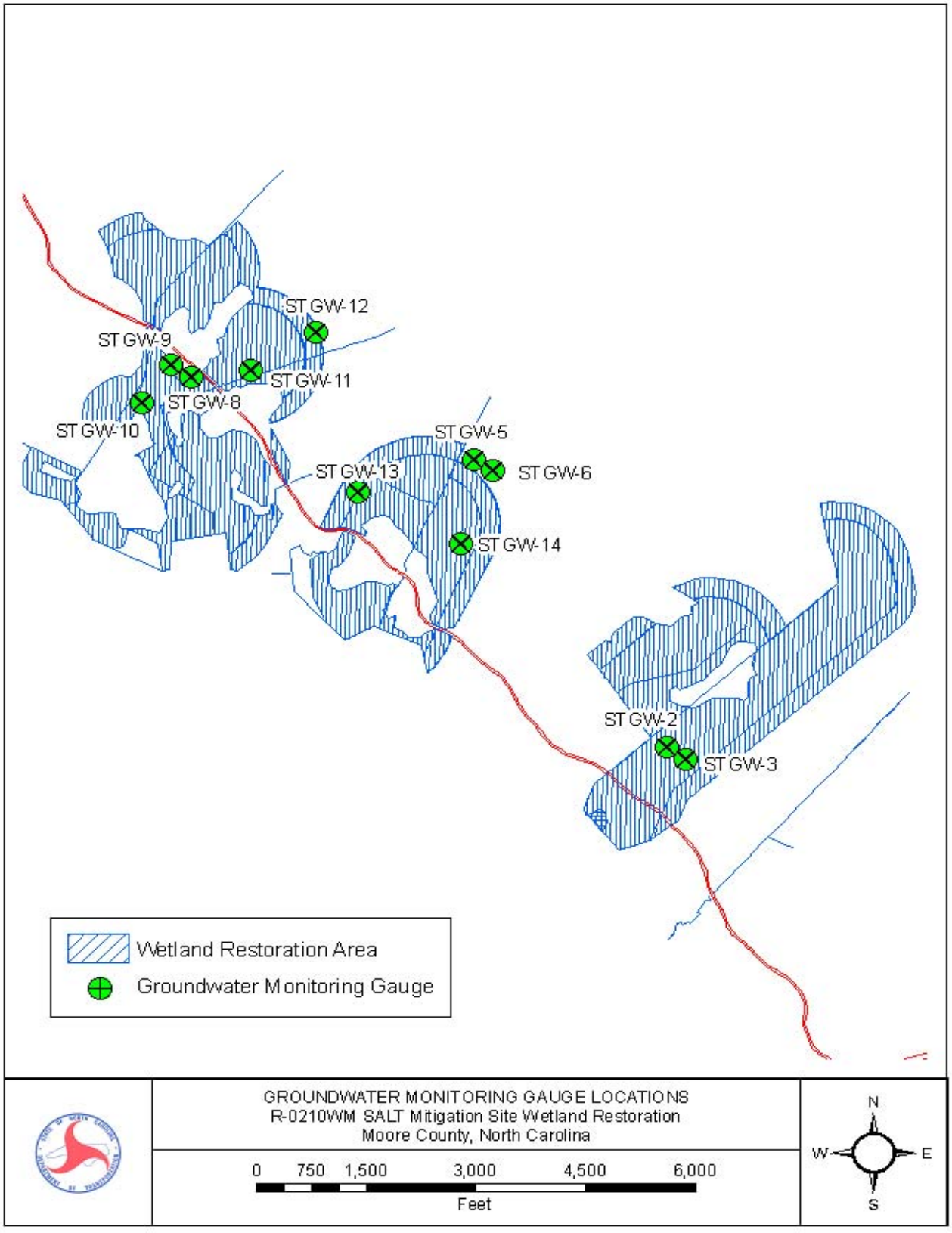


Figure 2. Monitoring Gauge Location Map

Table 1. 2006 Hydrologic Monitoring Results

Monitoring Gauge	>12.5%	Actual %	Success Dates
STGW2* (**)	✕	94.3 (100)	March 23-November 7
STGW3* (**)	✕	94.3 (100)	March 23-November 7
STGW5*	✕	50.4 (100)	March 23-November 7
STGW6*	✕	100.0 (100)	March 23-November 7
STGW8*	✕	17.4 (100)	April 18 – May 27
STGW9*		2.2 (100)	
STGW10*	✕	29.1 (100)	March 23-May 28
STGW11*	✕	30.0 (100)	August 31-November 7
STGW12*	✕	30.0 (100)	August 31-November 7
STGW13*	✕	33.5 (100)	August 30-November 7
STGW14*	✕	30.0 (100)	August 30-November 7

* Gauges were reprogrammed in February 2006.
(**)STGW2 & STGW3 calibration points have been raised 6” above ground level due to standing water in excess of 6”.

2.3.2 Climatic Data

Figure 4 is a comparison of the 2006 monthly rainfall to the historical precipitation (collected between 1976 and 2006) for Carthage, North Carolina. This comparison gives an indication of how 2006 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

This graph is used to indicate the general precipitation conditions for the surrounding area. Overall, the 2006-year exhibited below average rainfall. The data obtained for the 2006-year indicates that rainfall going into the beginning of the 2006 growing season (January to March) as well as August, September and October tended to be on the low side of normal. The rainfall for the months of April, May and July were normal while the rainfall for June and November were well above normal. Overall, 2006 was an average rainfall year.

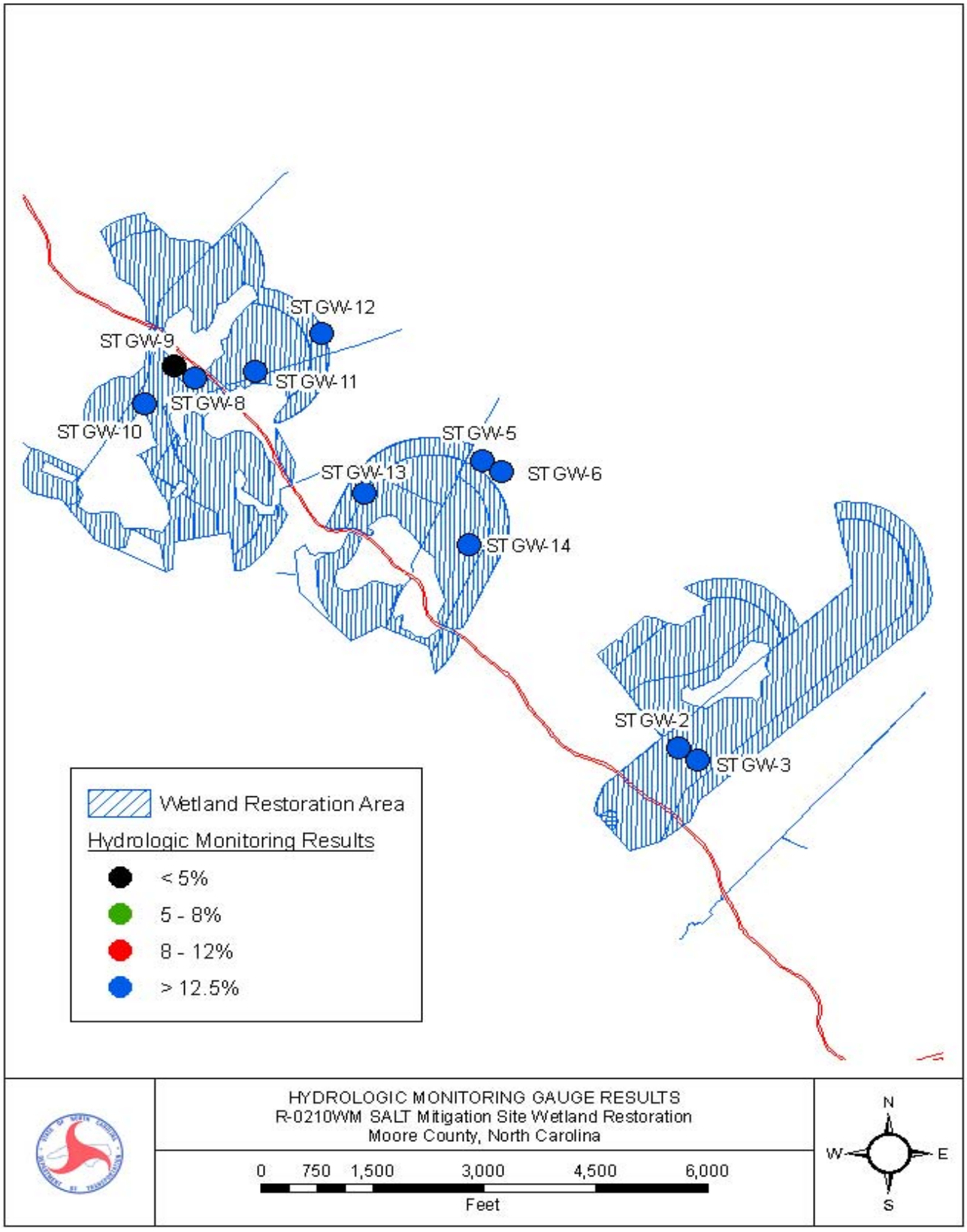


Figure 3. 2006 Hydrologic Monitoring Results Map

2.4 Conclusions

The 2006-year represents the first year of hydrologic monitoring for the Salt Mitigation Site. For the 2006-year, ten of the eleven gauges recorded jurisdictional hydrology for greater than 12.5% of the growing season. Groundwater Monitoring Gauge 9 is the only monitoring gauge that has not been successful in 2006. Due to the location in a localized area. Hydrologic monitoring has indicated that the site has met the success criteria for 2006.

EEP will continue monitoring the hydrology at the SALT Mitigation Site for the 2007 monitoring year.

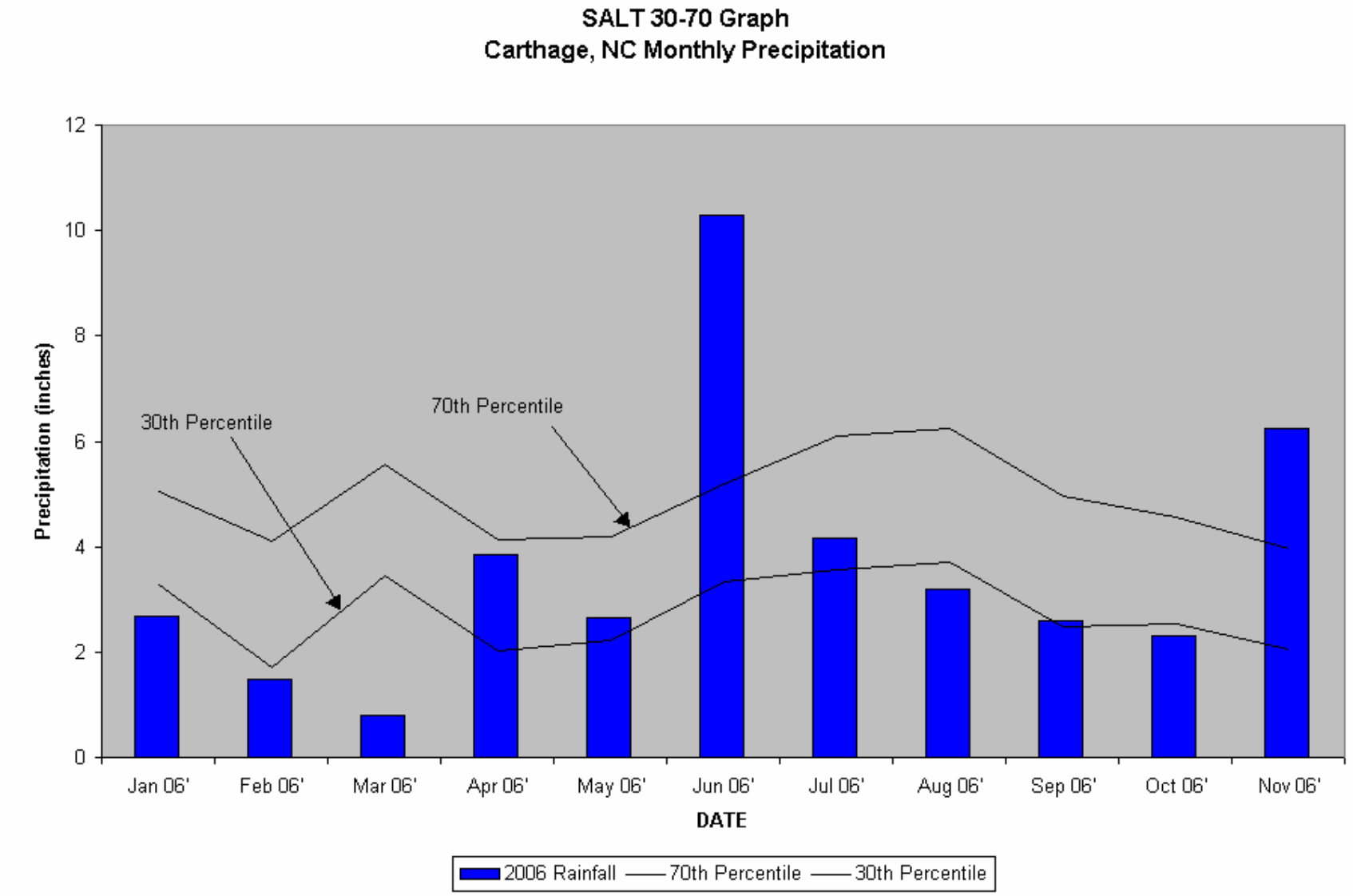


Figure 4. 30-70 Percentile Graph, Carthage, NC

3.0 VEGETATION: SALT MITIGATION SITE (YEAR 1 MONITORING)

3.1 Success Criteria

NCDOT will monitor the site for five years or until success criteria is met. 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). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

3.2 Description of Species

The following species were planted in the Wetland Restoration Area:

Chamaecyparis thyoides, Atlantic White Cedar

Taxodium distichum, Baldcypress

Quercus laurifolia, Laurel Oak

Nyssa sylvatica var. *biflora*, Swamp Blackgum

Quercus nigra, Water Oak

Quercus phellos, Willow Oak

The following specie was planted in the Upland Restoration Area:

Pinus palustris, Longleaf Pine

3.3 Results of Vegetation Monitoring

Plot #	White Atlantic Cedar	Baldcypress	Laurel Oak	Swamp Blackgum	Water Oak	Willow Oak	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1	7				7	8	22	27	554
2	6		2			3	11	39	192
3	5	4	2	6	7	4	28	46	414
4	17	7	5	4	6	5	44	50	598
							AVERAGE DENSITY		**440**

Site Notes: Vegetation Plot #2 had a low density (trees/acre) due to the landowner conducting some mowing in this area.

3.4 Conclusions

Of the 24.5 acres of planting on this site, approximately 15.9 acres involved bottomland hardwood tree planting. Approximately 8.6 acres of upland were planted with longleaf pine. There were 4 vegetation-monitoring plots established throughout the bottomland hardwood planting area. The 2006 vegetation monitoring of the site revealed an average tree density of 440 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

EEP will continue monitoring the vegetation at the SALT Mitigation Site for the 2007 monitoring year.

4.0 Overall Conclusions/Recommendations

The 2006-year represents the first year of hydrologic monitoring for the Salt Mitigation Site. Ten of the eleven reinstalled monitoring gauges recorded jurisdictional hydrology for 100% of the growing season. The ten-groundwater restoration gauges indicated that jurisdictional hydrology was met for wetland hydrology.

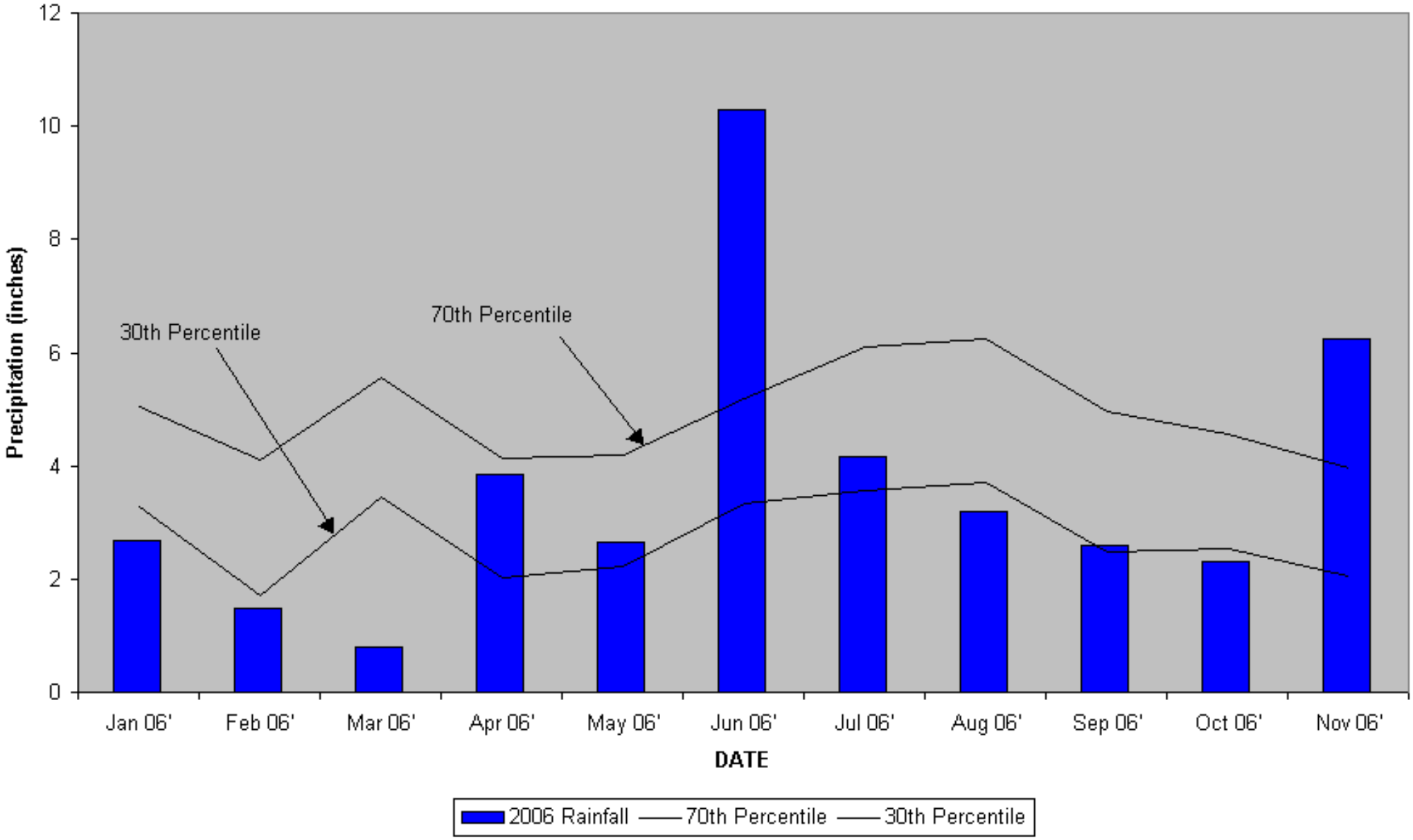
This stem count yielded an average tree density of 440 trees per acre. This average is above the minimum success criteria of 320 trees per acre.

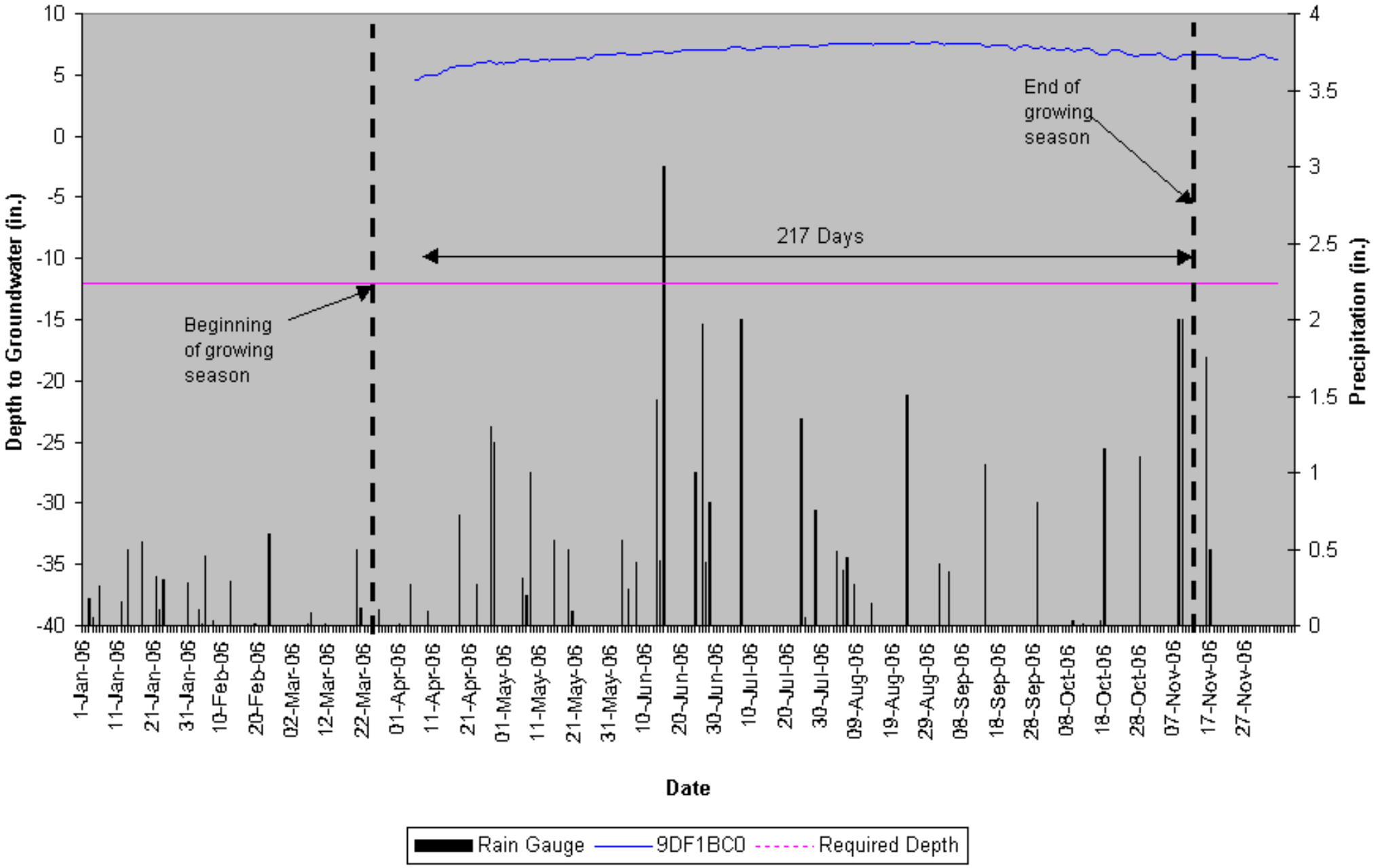
Per the letter from Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004 the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future

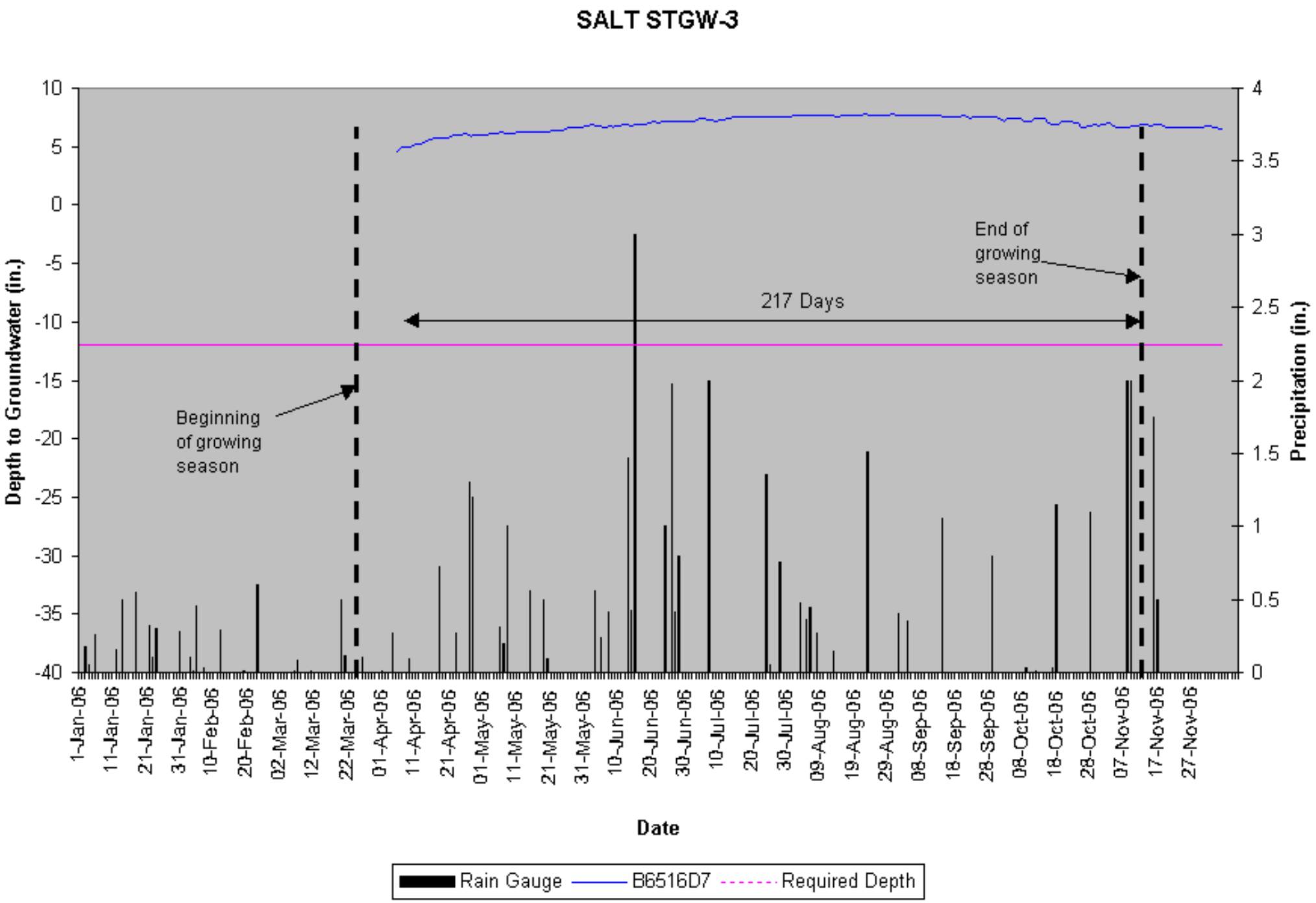
remediation for this project. The site will be transferred to EEP February 2007 for remaining monitoring.

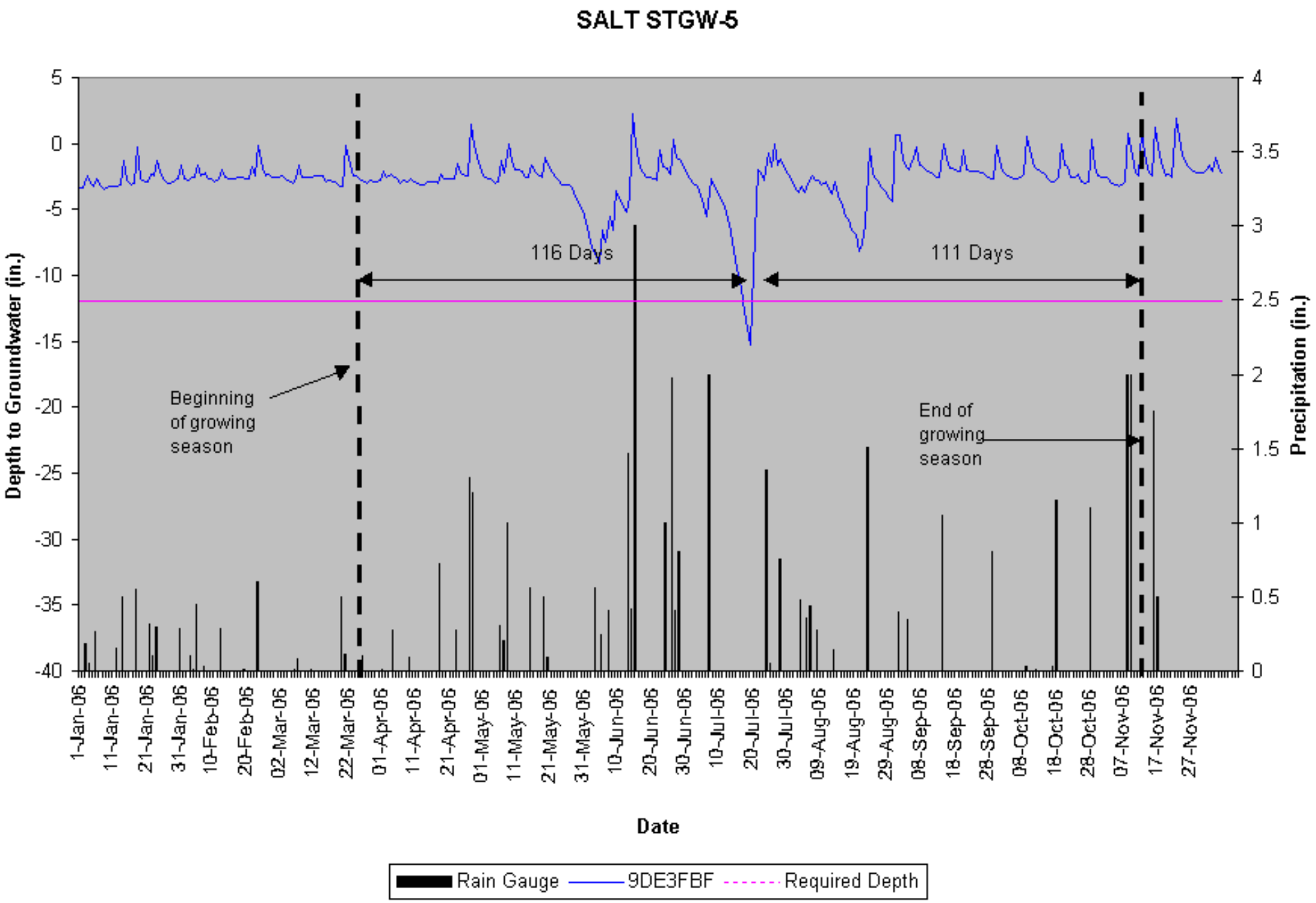
APPENDIX A

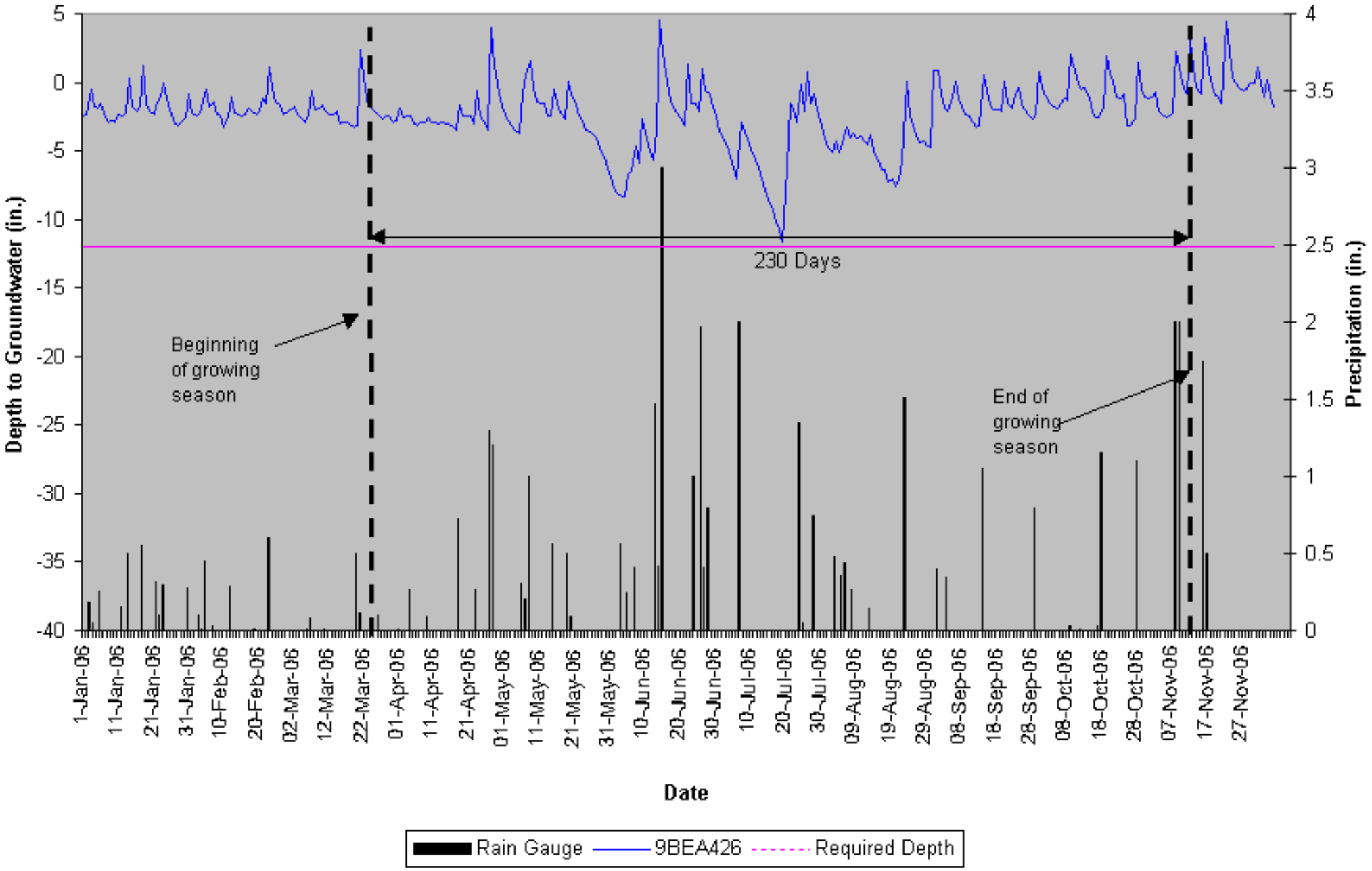
GAUGE DATA GRAPHS

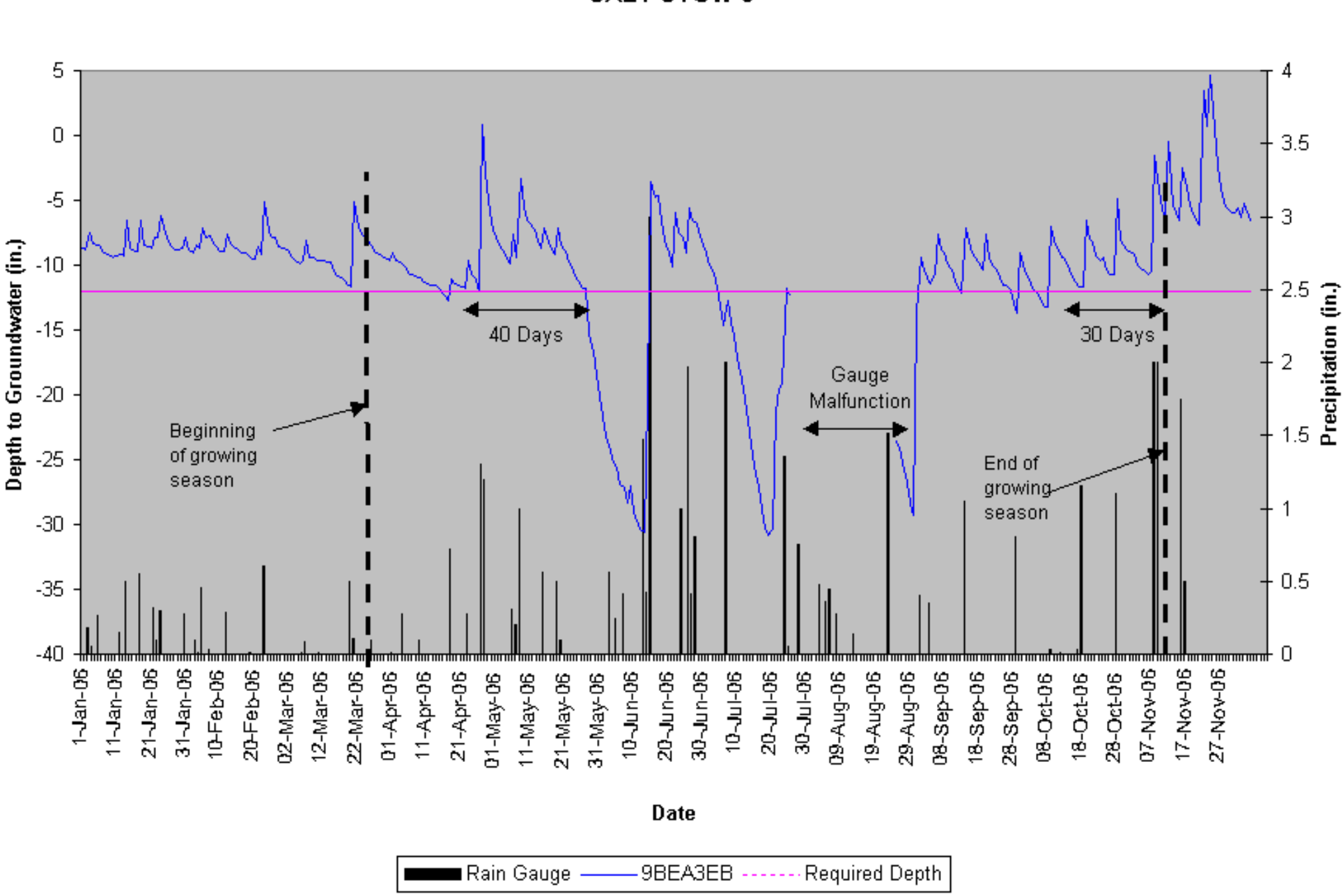

SALT 30-70 Graph
Carthage, NC Monthly Precipitation
Precipitation (inches)
12
10
8
6
4
2
0
30th Percentile
70th Percentile
Jan 06'
Feb 06'
Mar 06'
Apr 06'
May 06'
Jun 06'
Jul 06'
Aug 06'
Sep 06'
Oct 06'
Nov 06'
DATE
2006 Rainfall
70th Percentile
30th Percentile


SALT STGW-2
Depth to Groundwater (in.)
Precipitation (in.)
Date
End of growing season
217 Days
Beginning of growing season
Rain Gauge
9DF1BC0
Required Depth

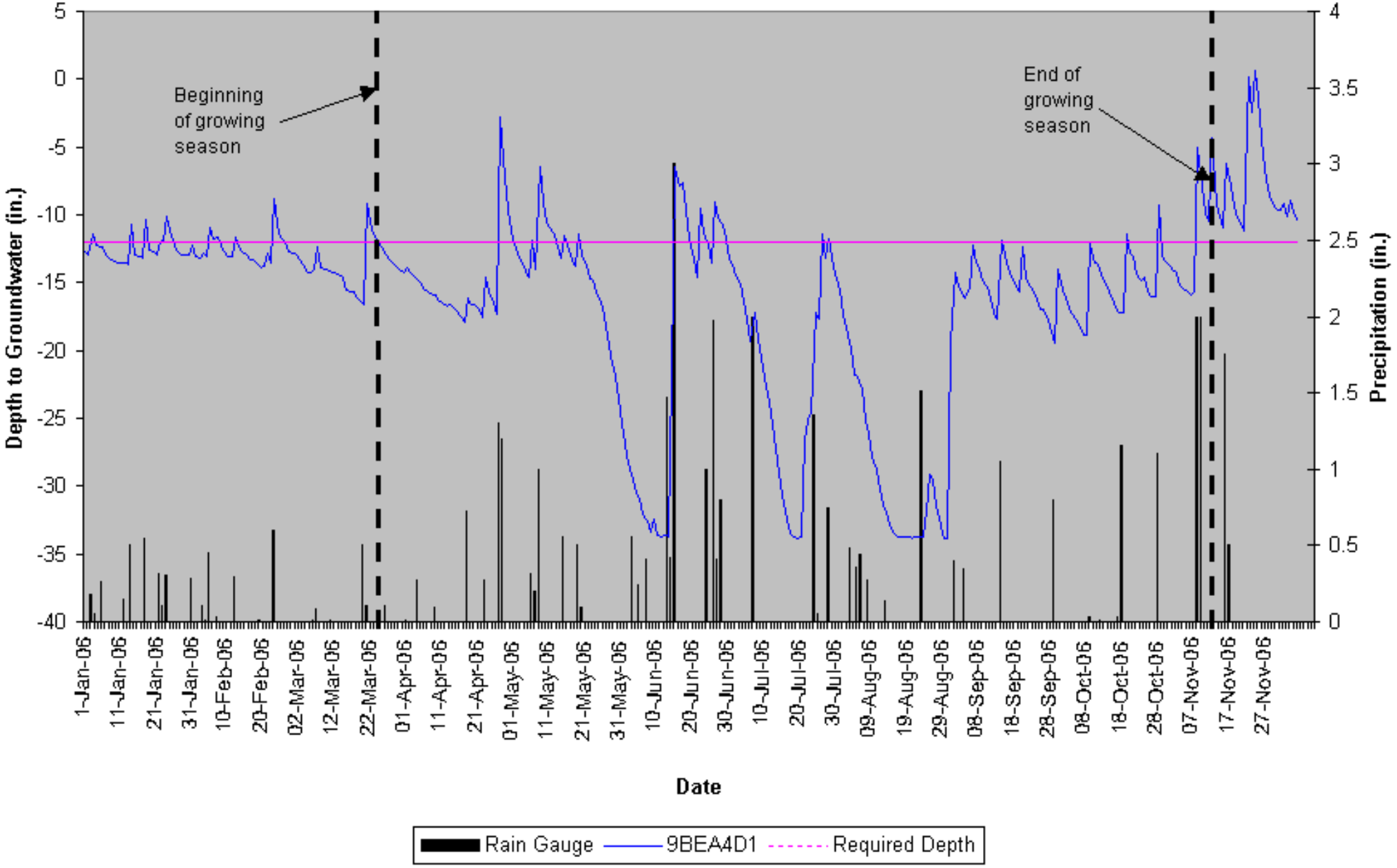

SALT STGW-3
Depth to Groundwater (in.)
Precipitation (in.)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
End of growing season
217 Days
Beginning of growing season
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
B6516D7
Required Depth

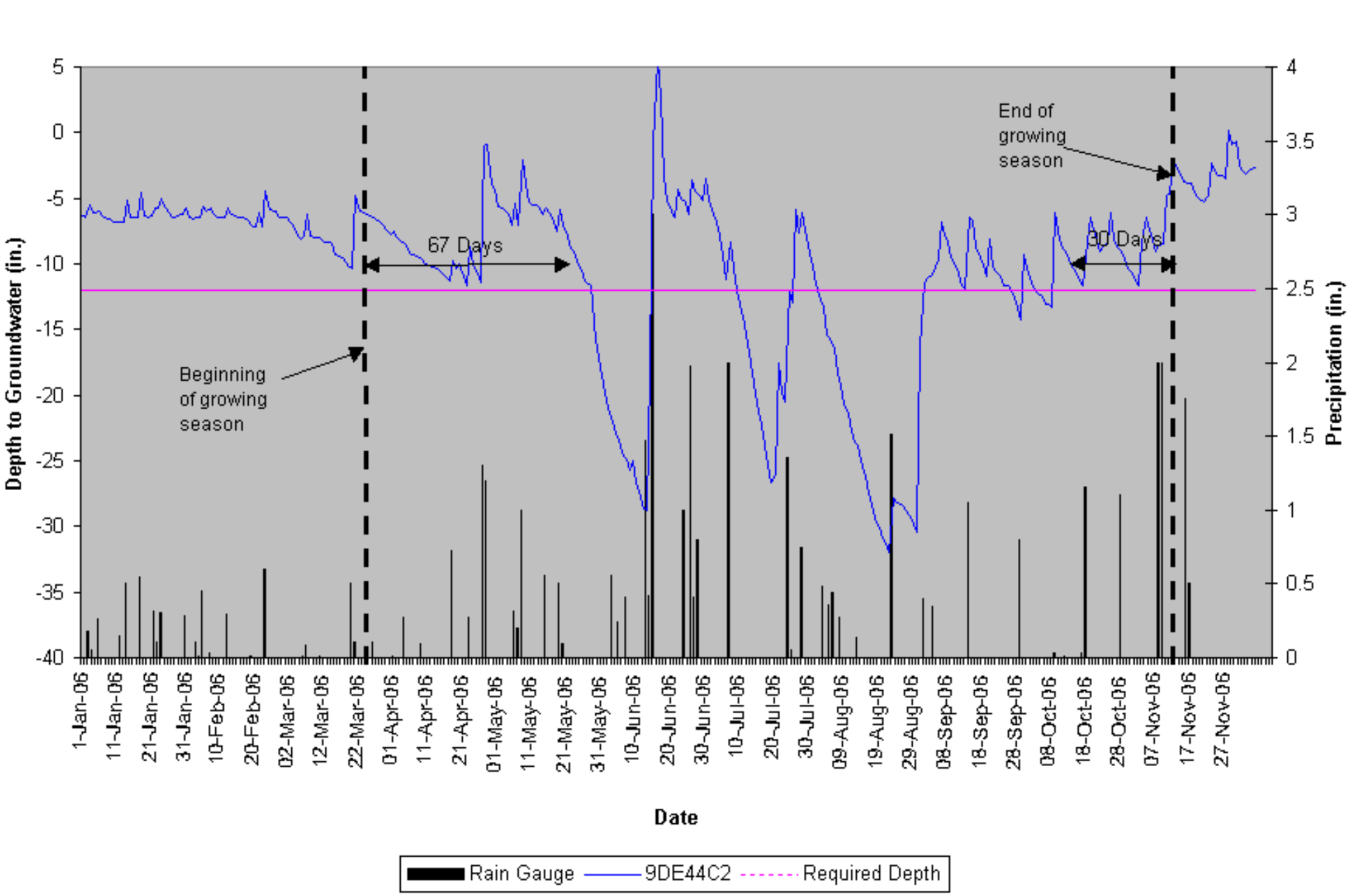

SALT STGW-5
Depth to Groundwater (in.)
Precipitation (in.)
116 Days
111 Days
Beginning of growing season
End of growing season
Date
Rain Gauge
9DE3FBF
Required Depth

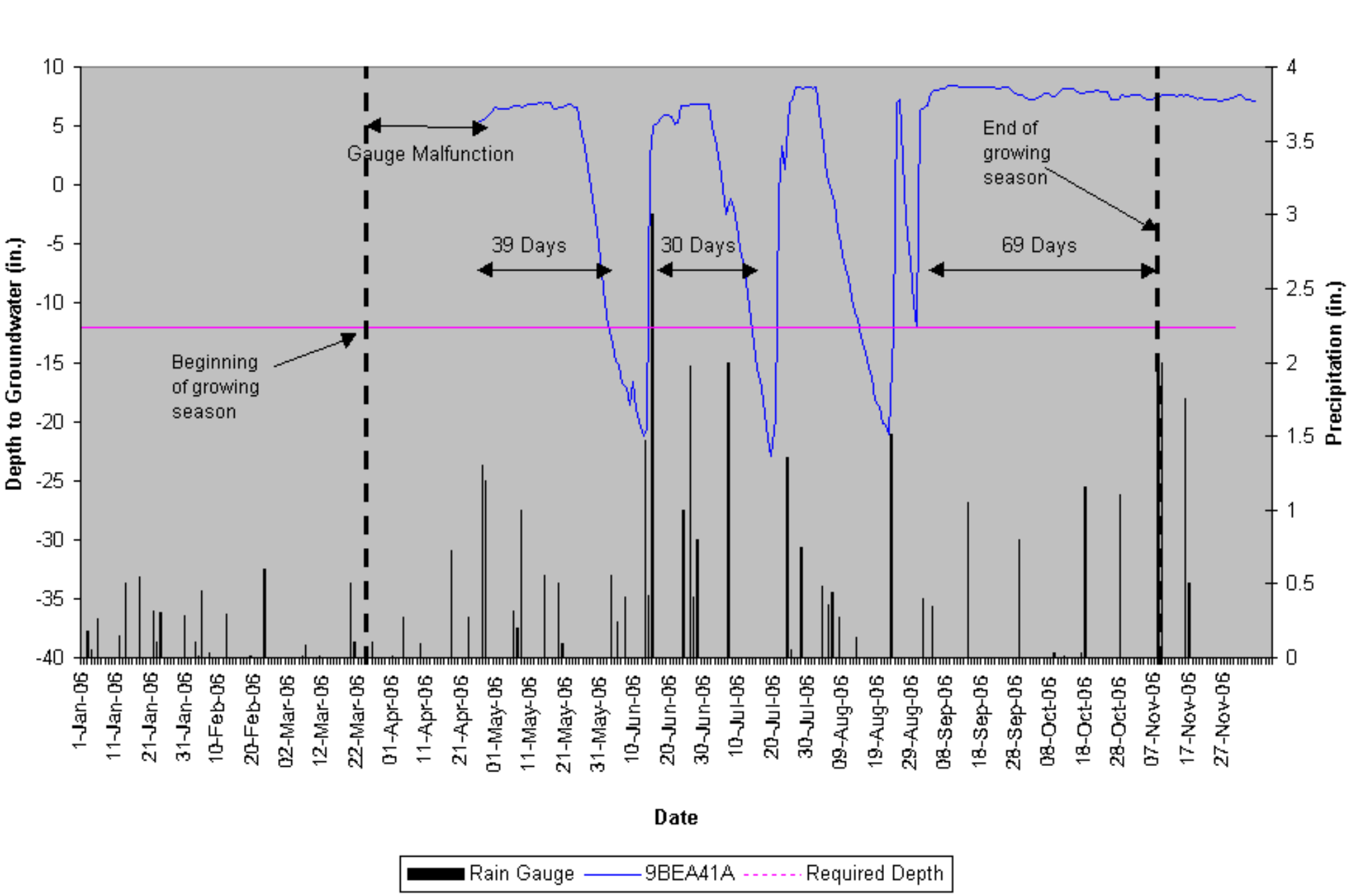

SALT STGW-6
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
230 Days
Beginning of growing season
End of growing season
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
9BEA426
Required Depth

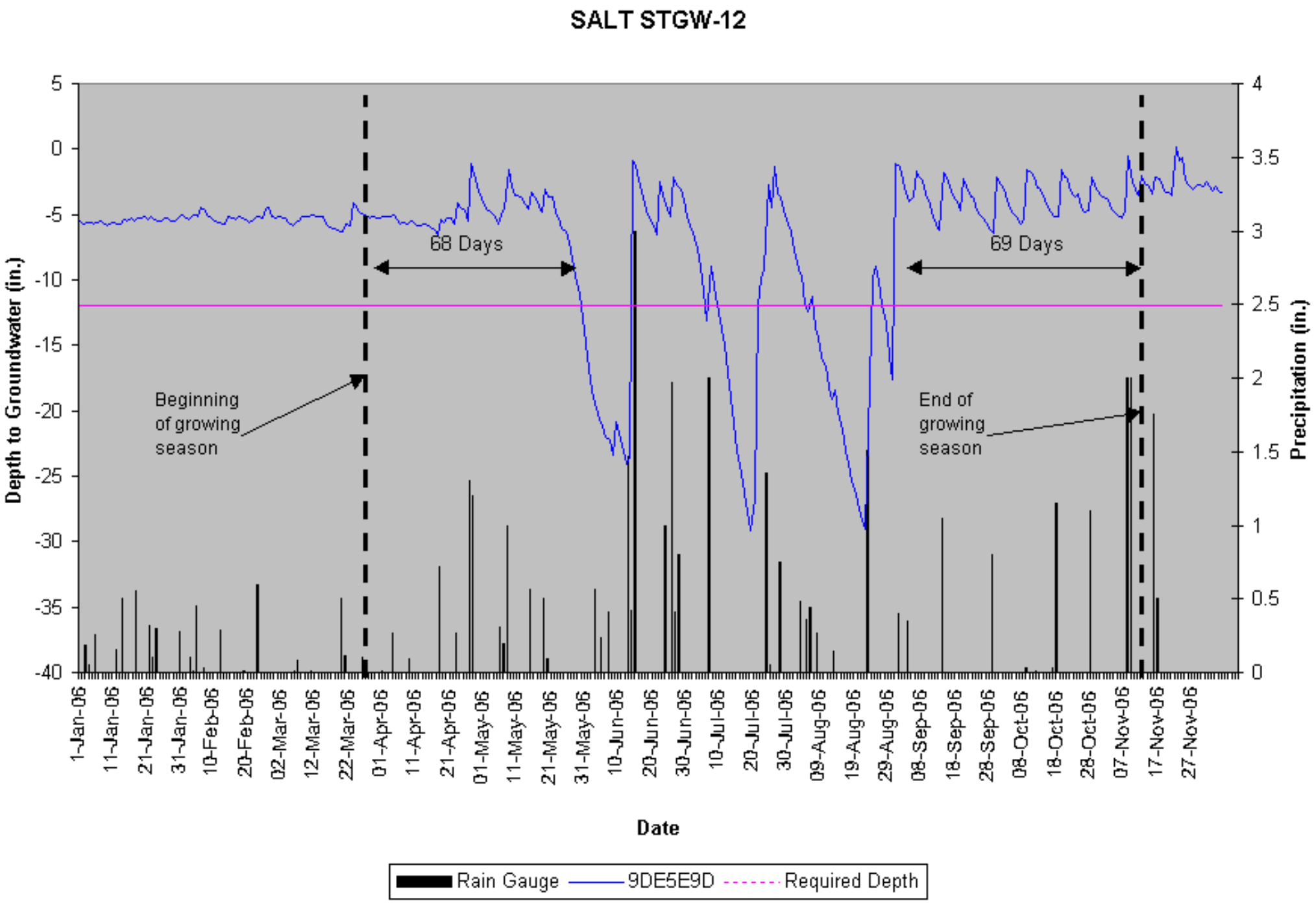

SALT STGW-8
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
40 Days
30 Days
Gauge Malfunction
Beginning of growing season
End of growing season
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
9BEA3EB
Required Depth

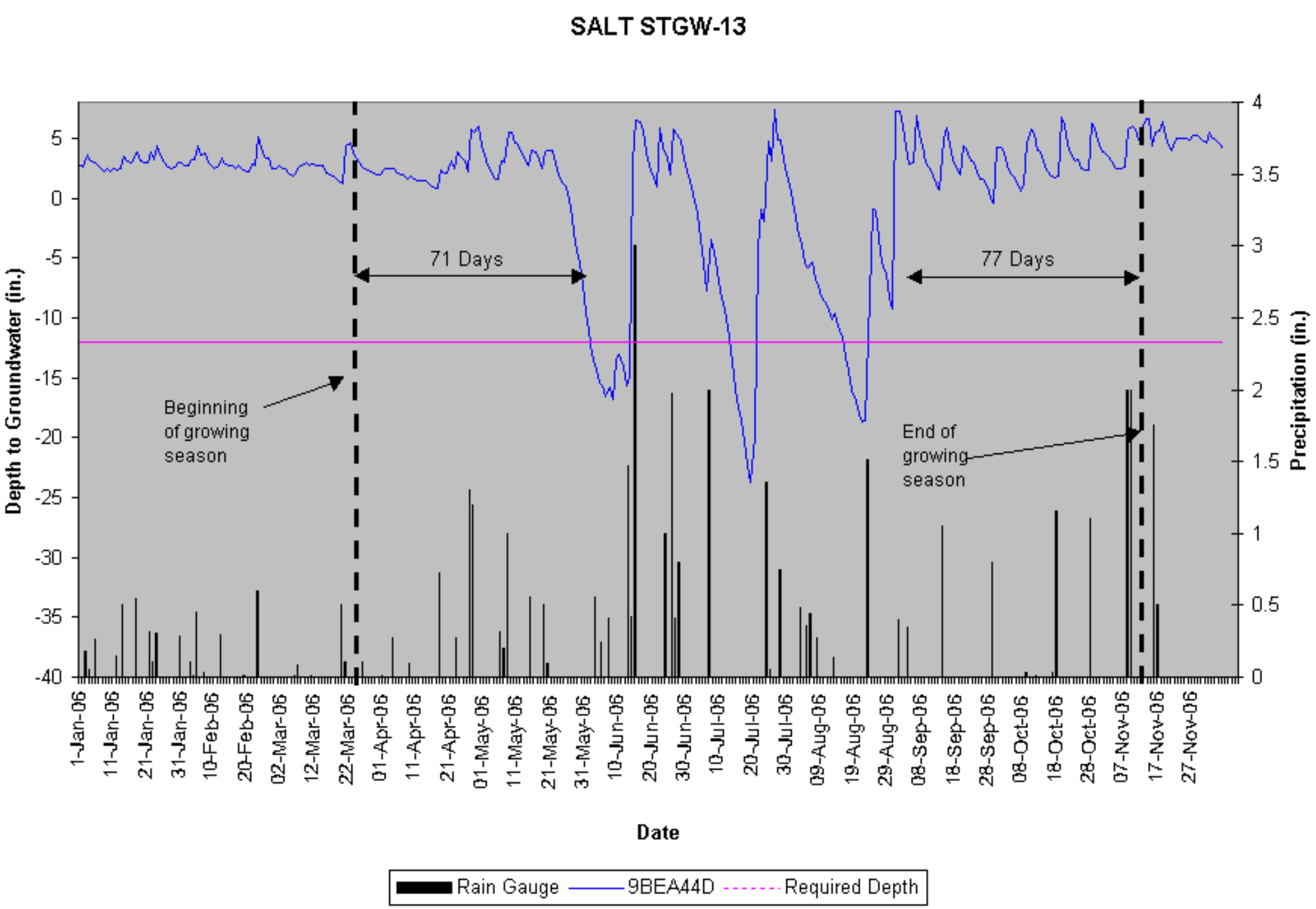
SALT STGW-9

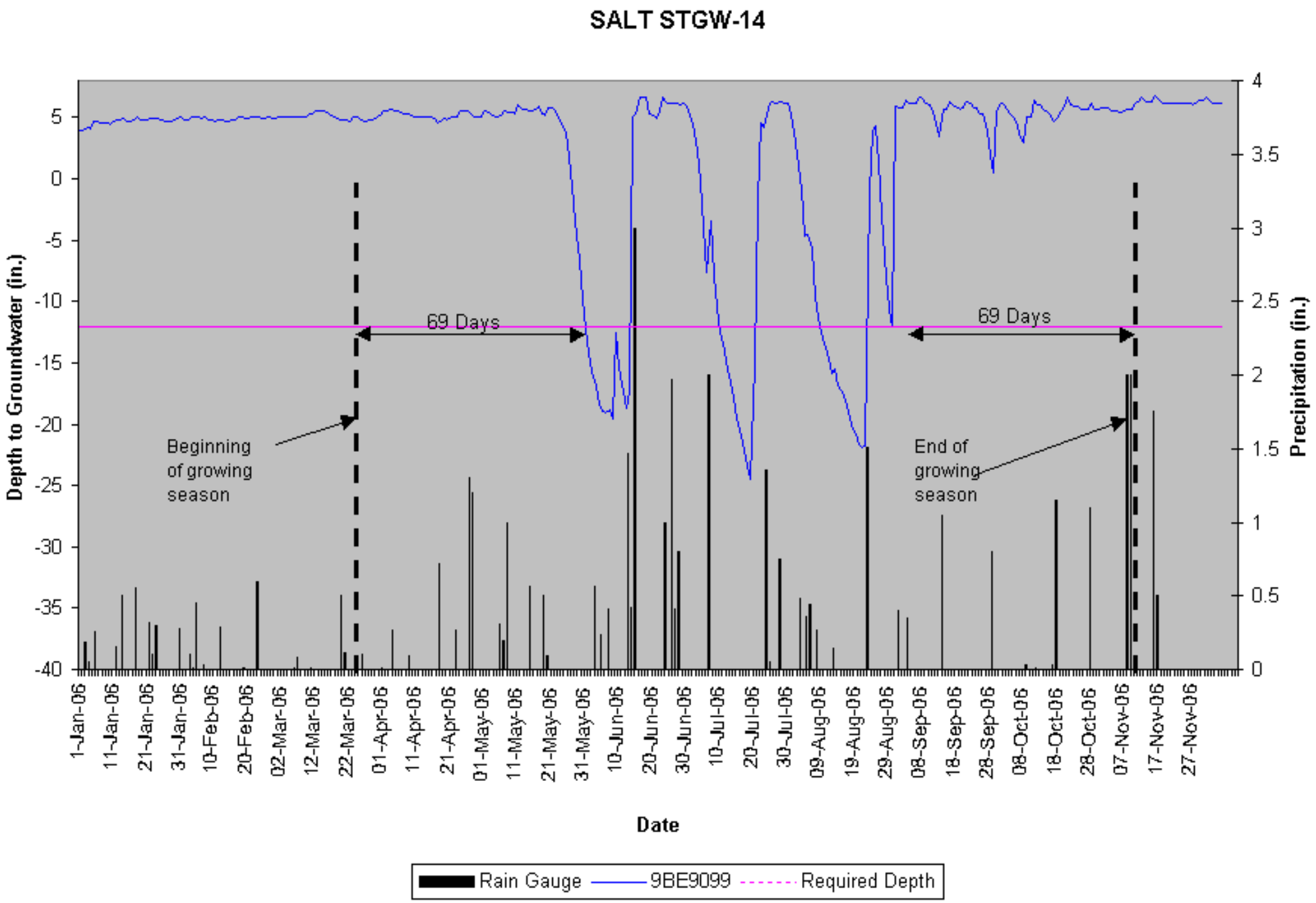

Beginning of growing season
End of growing season
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
9BEA4D1
Required Depth


SALT STGW-10
Depth to Groundwater (in.)
Precipitation (in.)
Date
End of growing season
67 Days
30 Days
Beginning of growing season
Rain Gauge
9DE44C2
Required Depth


SALT STGW-11
Depth to Groundwater (in.)
Precipitation (in.)
Gauge Malfunction
End of growing season
39 Days
30 Days
69 Days
Beginning of growing season
Date
Rain Gauge
9BEA41A
Required Depth


SALT STGW-12
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
68 Days
69 Days
Beginning of growing season
End of growing season
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
9DE5E9D
Required Depth


SALT STGW-13
Depth to Groundwater (in.)
Precipitation (in.)
71 Days
77 Days
Beginning of growing season
End of growing season
Date
Rain Gauge
9BEA44D
Required Depth


SALT STGW-14
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
69 Days
69 Days
Beginning of growing season
End of growing season
1-Jan-06
11-Jan-06
21-Jan-06
31-Jan-06
10-Feb-06
20-Feb-06
02-Mar-06
12-Mar-06
22-Mar-06
01-Apr-06
11-Apr-06
21-Apr-06
01-May-06
11-May-06
21-May-06
31-May-06
10-Jun-06
20-Jun-06
30-Jun-06
10-Jul-06
20-Jul-06
30-Jul-06
09-Aug-06
19-Aug-06
29-Aug-06
08-Sep-06
18-Sep-06
28-Sep-06
08-Oct-06
18-Oct-06
28-Oct-06
07-Nov-06
17-Nov-06
27-Nov-06
Date
Rain Gauge
9BE9099
Required Depth

APPENDIX B

PHOTO AND VEGETATIO PLOT LOCATIONS, SITE PHOTOS

SALT

Photo 1

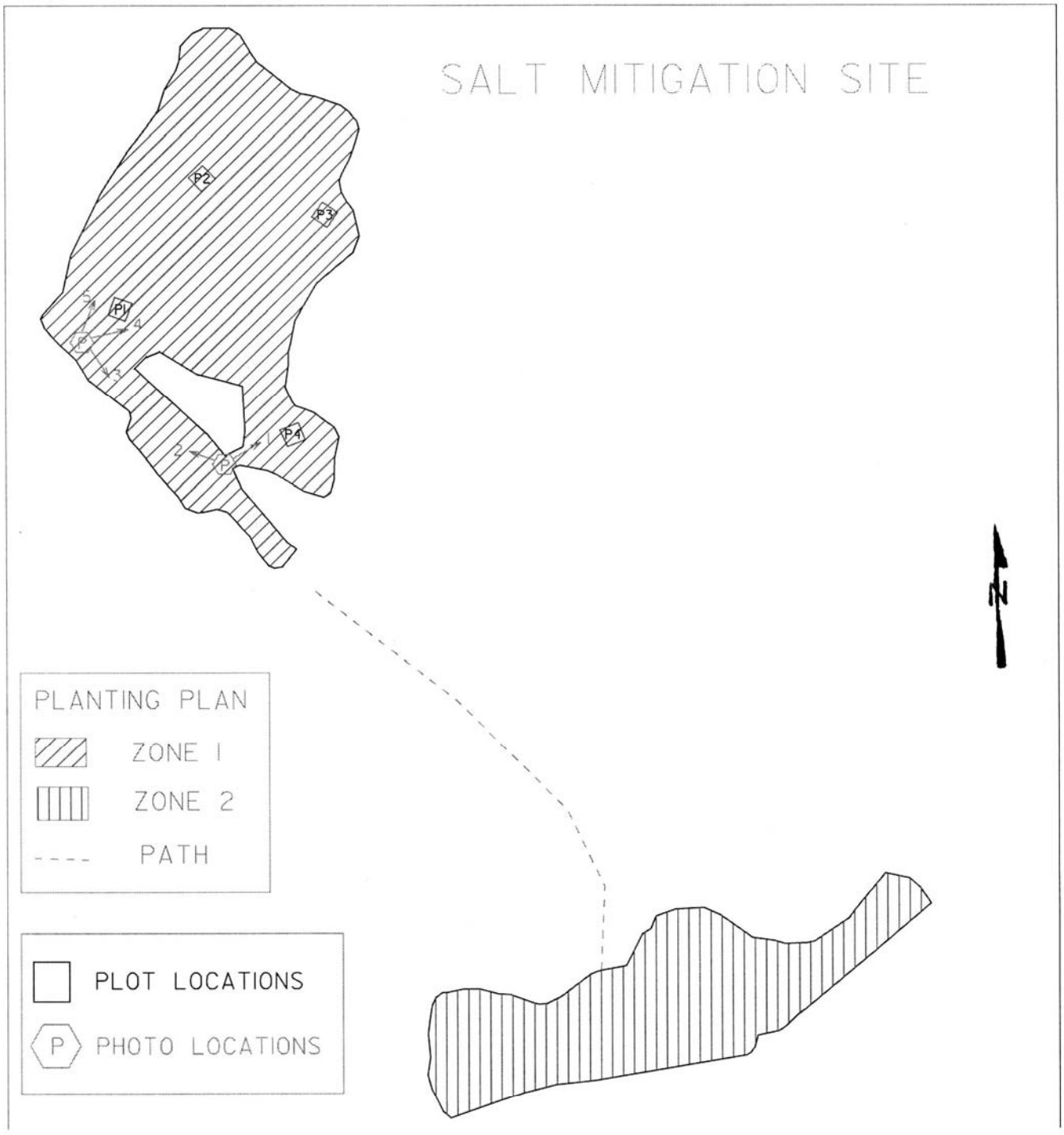
Photo 2

Photo 3

Photo 4

Photo 5

February 2007


SALT MITIGATION SITE
P1
P2
P3
P4
PLANTING PLAN
ZONE 1
ZONE 2
PATH
PLOT LOCATIONS
P PHOTO LOCATIONS
N