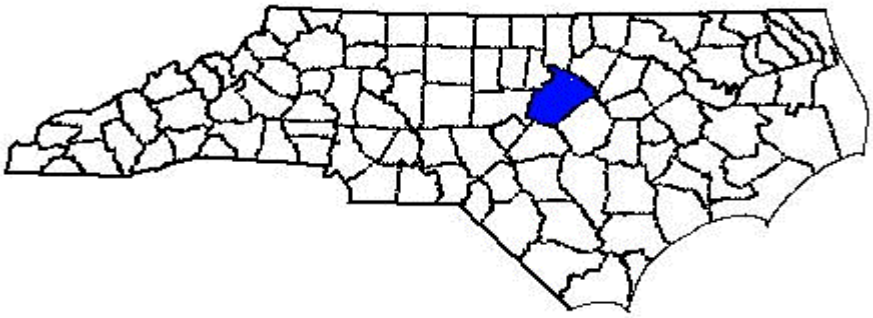
ANNUAL REPORT FOR 2001



Dutchman's Mitigation Site
Wake County
Project No. 8.U401721
TIP No. R-2000 WM

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

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Summary

The following report summarizes the monitoring activities that have occurred in the past year at the Dutchman's Creek Mitigation Site. This site was originally constructed in 2000. Monitoring activities in 2001 represent the first year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success for a minimum of three years.

The site contains six monitoring gauges and vegetation plots.

This report utilizes rainfall data from both a local weather station and from on-site rainfall gauges. Historical data is provided by the NC State Climate Office.

Four of the six monitoring gauges indicate saturation for more than 5% of the growing season. Due to heavy natural regeneration of herbaceous species, the vegetation monitoring did not show success.

Based on the monitoring results from the 2001 growing season, NCDOT is re-evaluating options for remediation and recommends that monitoring continue.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The Dutchman's Creek Mitigation Site is located between SR 1386 (Graham Newton Road) and SR 1377 (Blaney Franks Road) immediately above the confluence with Lake Wheeler in Wake County. This site mitigates for wetland impacts associated with the Raleigh Outer Loop (R-2000).

The site, totaling 87 acres in size, consists of shrub-scrub wetland restoration, bottomland hardwood creation, marsh (littoral zone) and open water creation, and floodplain wetland preservation components. The site was constructed in 2000 and planted in 2001.

1.2 PURPOSE

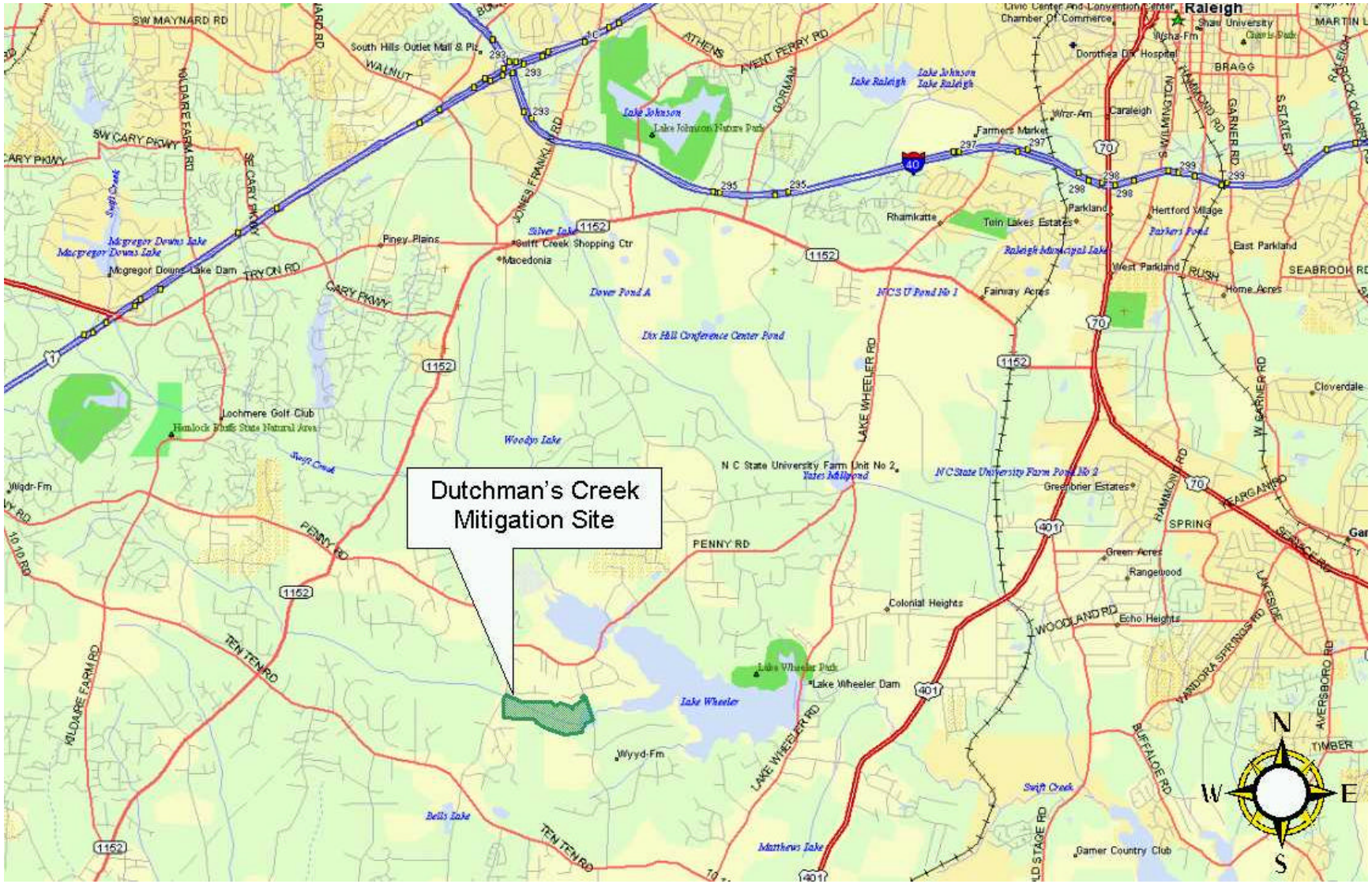
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2001 growing season at the Dutchman's Creek Mitigation Site.

Activities in 2001 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

December 2000	Construction Completed
Spring 2001	Site Planted
March 2001	Monitoring Gauges Installed
March- November 2001	Hydrologic Monitoring (1 yr.)
October 2001	Vegetation Monitoring (1 yr.)

Figure 1. Site Location Map



1.4 DEBIT LEDGER

Table 1. Dutchman's Creek Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			TIP Debit
	Acres at Start	Acres Remaining	% Remaining	R-2000 D & CB
SPH/BLH Restoration, Enhancement, & Preservation	90.00	0.00	0.00	90.00

SPH: Swamp Hardwood BLH: Bottomland Hardwood

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 5% of the growing season during a normal precipitation year. Area 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 substantially the same.

The growing season in Wake 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 5% of this season, or at least 12 consecutive days. Local climate must also represent average conditions for the area.

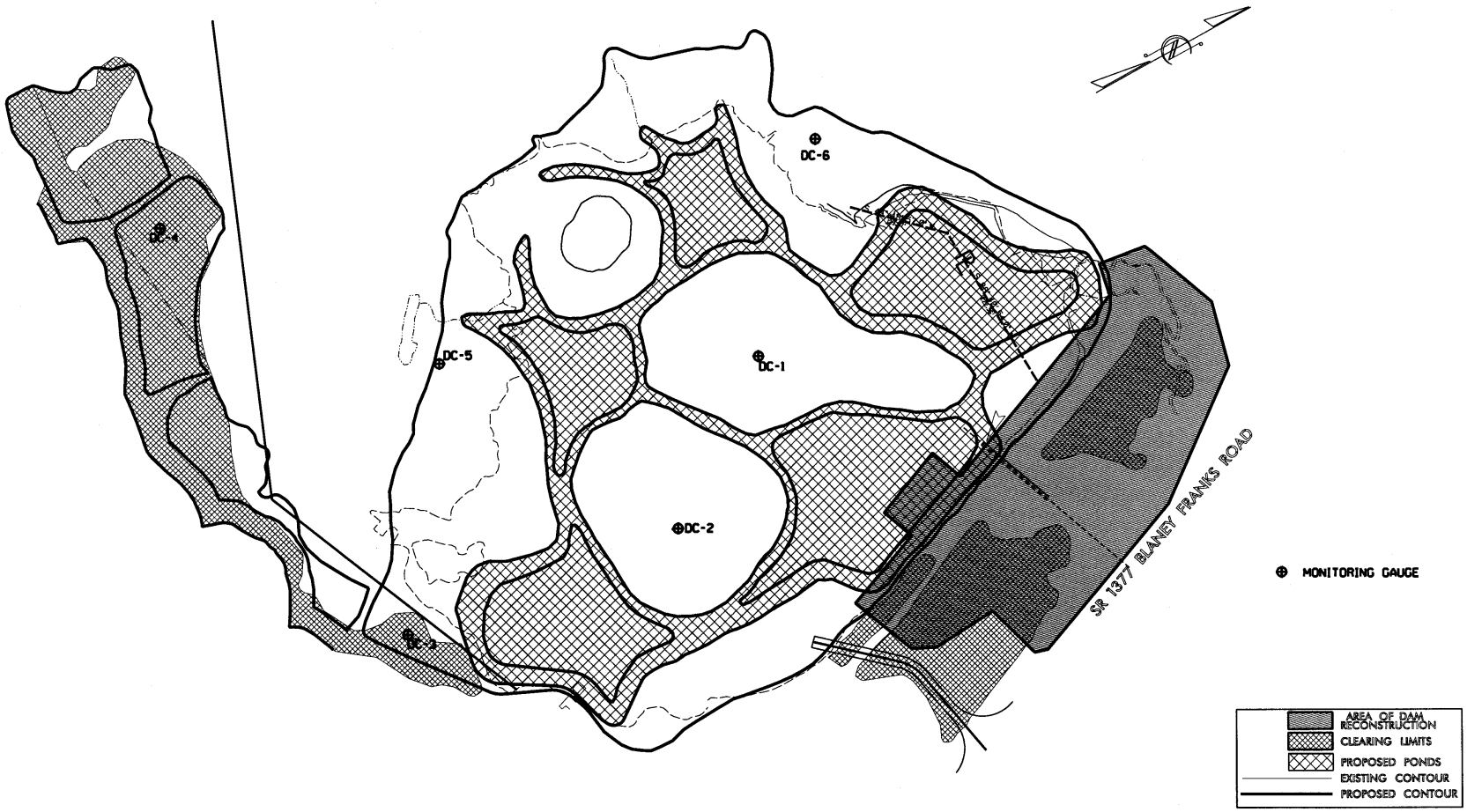
2.2 HYDROLOGIC DESCRIPTION

In March of 2001, six 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 Dutchman's 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 and the surface water depth recorded by the surface gauge. If the gauge shows saturation for greater than 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.

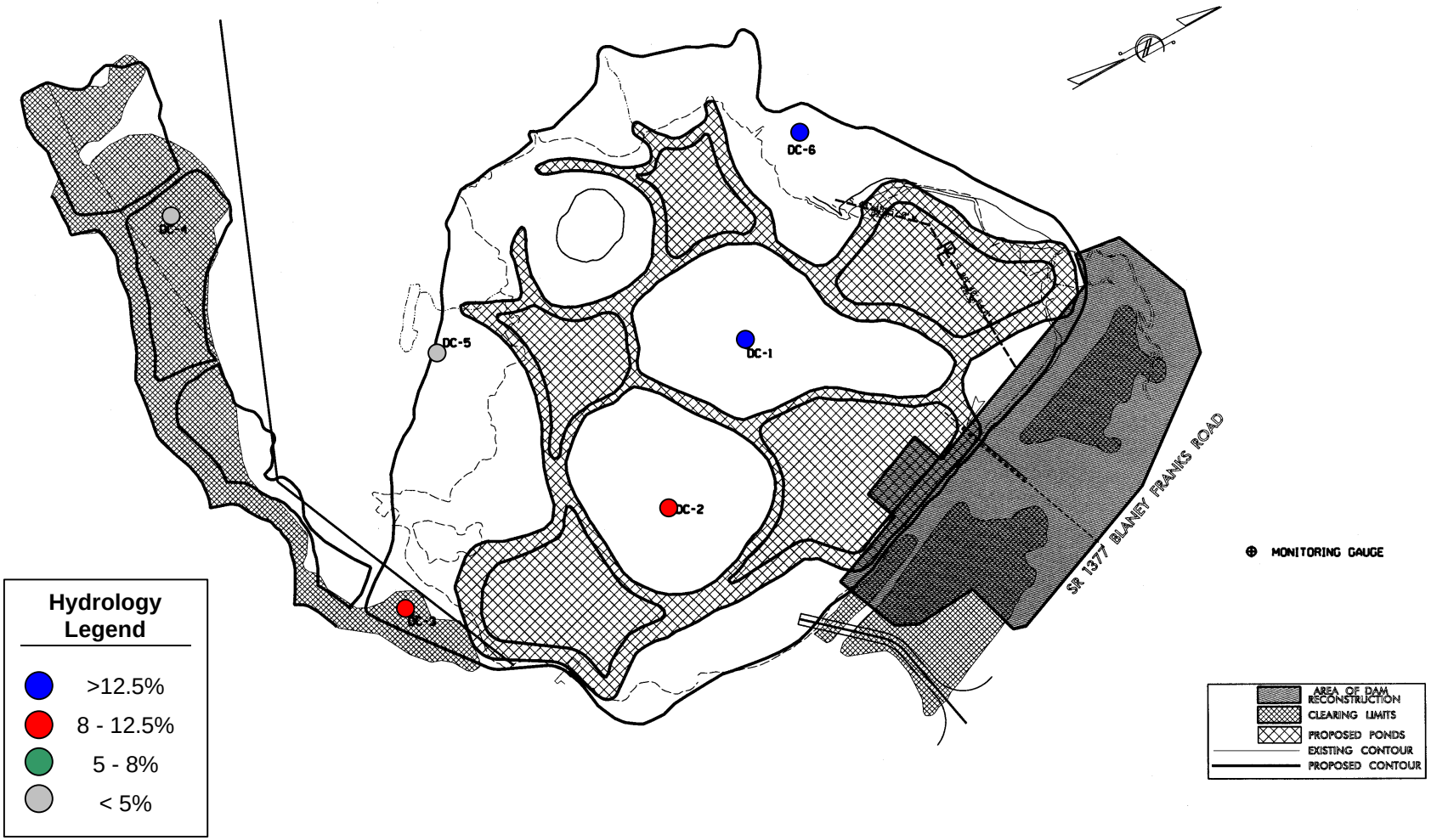
Figure 3 represents a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in green show hydrology between 8% and 12.5% of the season, while those in red indicate hydrology between 5% and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

Appendix A contains charts of the groundwater depth for each monitoring gauge during 2001. These monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. It the gauge shows saturation for 5% or greater of the growing season, the maximum number of consecutive days is noted on each graph.

Table 2. Dutchman's Creek Hydrologic Monitoring Results

Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
DC-1				✓	18.3	Mar 26 – May 6
DC-2			✓		9.6	Mar 26 – Apr 16
DC-3			✓		9.2	May 16 – Jun 5
DC-4	✓				3.5	Mar 30 – Apr 6
DC-5	✓				0.9	Jun 16 – Jun 17
DC-6				✓	99.6	Mar 28 – Nov 10

Figure 3 . Monitoring Gauge Hydrologic Results



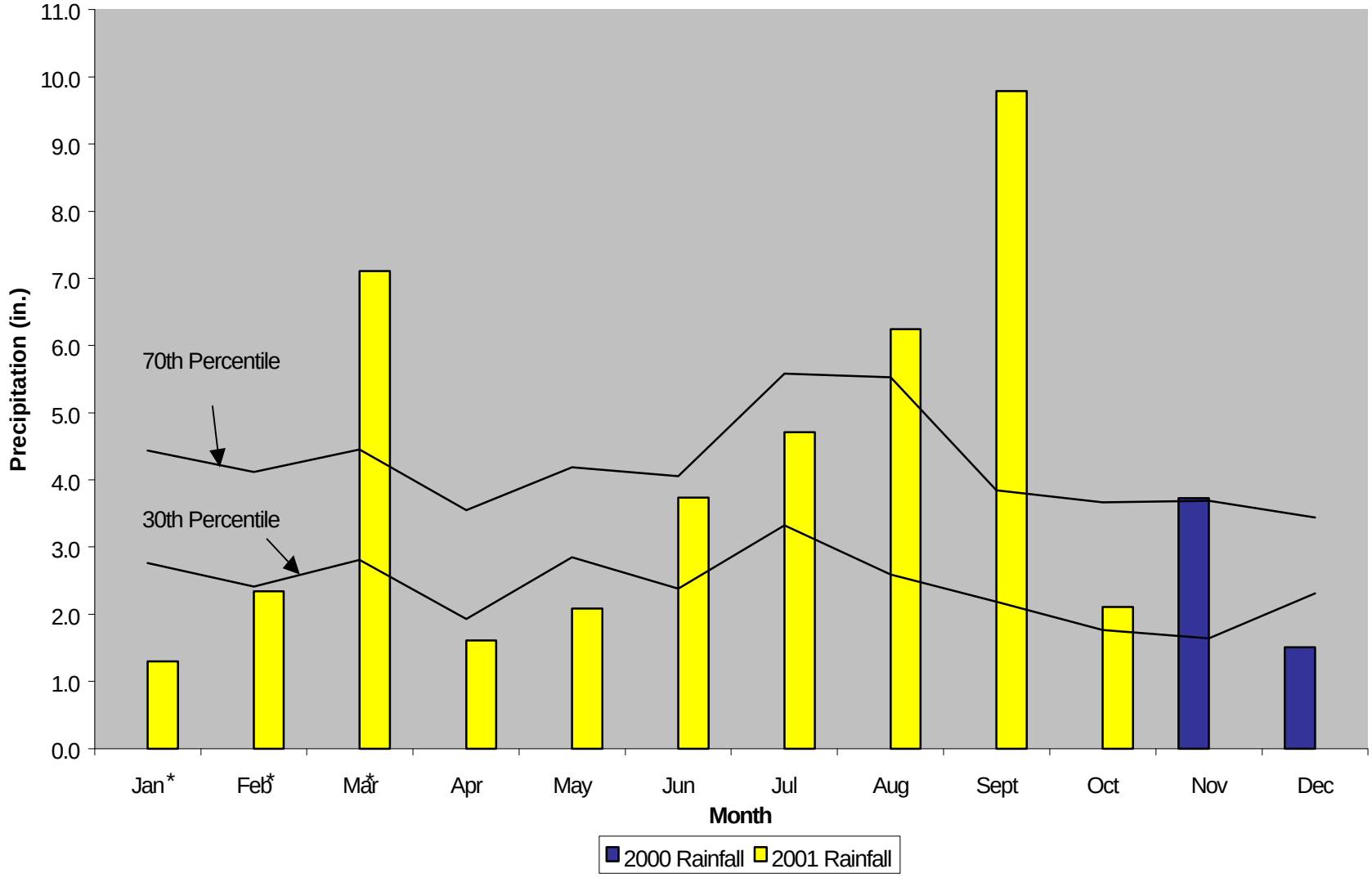
2.3.2 Climatic Data

Figure 4 represents an examination of the local climate in comparison with historical data in order to determine whether 2001 was “average” in terms of rainfall. The two lines represent the 30th and 70th percentiles of monthly precipitation for Raleigh. The bars are the monthly rainfall totals for parts of 2000 and 2001. The historical data was collected by the National Climatic Data Center, while the onsite rain gauge provided the recent rainfall data. Months with below average rainfall include January, February, April, and May. June, July, and October experienced normal rainfall. March, August, and September experienced above normal rainfall.

2.4 CONCLUSIONS

2001 represents the first full growing season that the hydrologic data has been examined. Four of the six gauges showed saturation within 12” of the ground for greater than 5% of the growing season.

Figure 4. Dutchman's Creek 30-70 Percentile Graph, Raleigh, NC



3.0 VEGETATION: DUTCHMANS CREEK MITIGATION SITE (YEAR 1 MONITORING)

3.1 Success Criteria

Success criteria are defined, as 320-tree species/acre of the target species must be surviving for at least five years after initial planting. In interior floodplains, at least five character tree species must be present, and no species can comprise more than 20% of the 320 stem/acre total. In unconsolidated sediment areas, the 320-stem/acre total may be achieved by a combination of tree and shrub species.

3.2 Description of Species

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

(Bottomland Hardwood Area)

Quercus falcata var. *pagodaefolia*, Cherrybark Oak

Quercus falcata, Southern Red Oak

Fraxinus pennsylvanica, Green Ash

Carya cordifornis, Bitternut Hickory

Quercus phellos, Willow Oak

Nyssa sylvatica, Blackgum

The following shrub species were planted in the Wetland Restoration Area:

(Shrub Area)

Cornus amomum, Silky Dogwood

Cornus stricta, Swamp Dogwood

Cornus sericea, Redosier Dogwood

Alnus serrulata, Tag Alder

Salix purpurea, Streamco Willow

Cephalanthus occidentalis, Buttonbush

Celtis laevigata, Sugarberry

3.3 Results of Vegetation Monitoring

Site Notes: Species noted: briars, *Juncus* sp., *Carex* sp., broomsedge, fennel, cattail, black willow, japanese grass, *Baccharis* sp., *Panicum* sp., and woolgrass. A few green ash, oaks, and volunteer tag alder were noted in the Bottomland Hardwood Area. Black willow and alder noted in shrub area.

3.4 Conclusions

Site was monitored in October 2001 and there was minimal planted vegetation counted. Site does not currently meet vegetative success criteria. NCDOT has concerns that heavy herbaceous competition is affecting the survivability of the planted hardwood seedlings and shrubs. NCDOT is investigating possible solutions to this problem and will replant the site 2002.

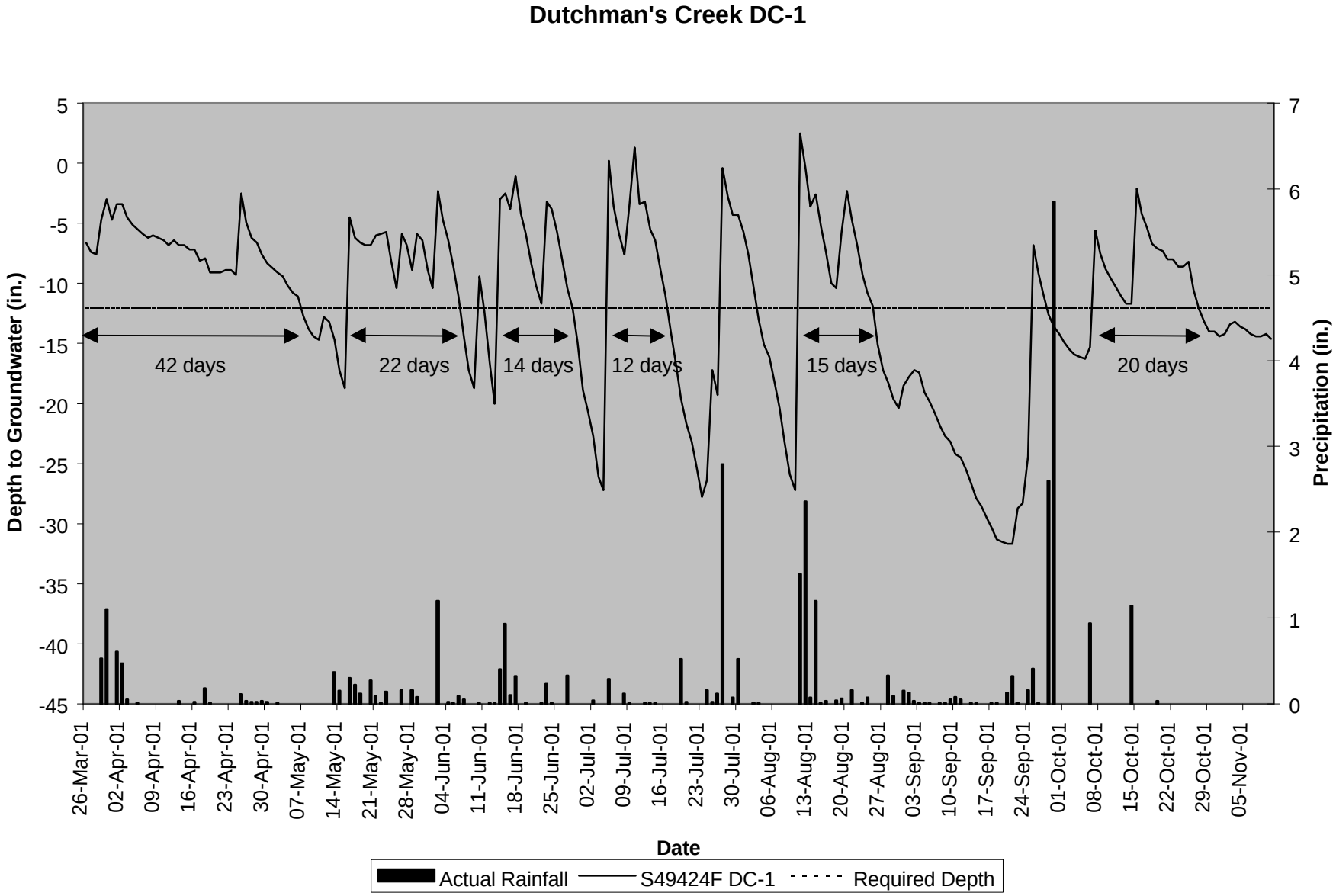
4.0 Overall Conclusions/Recommendations

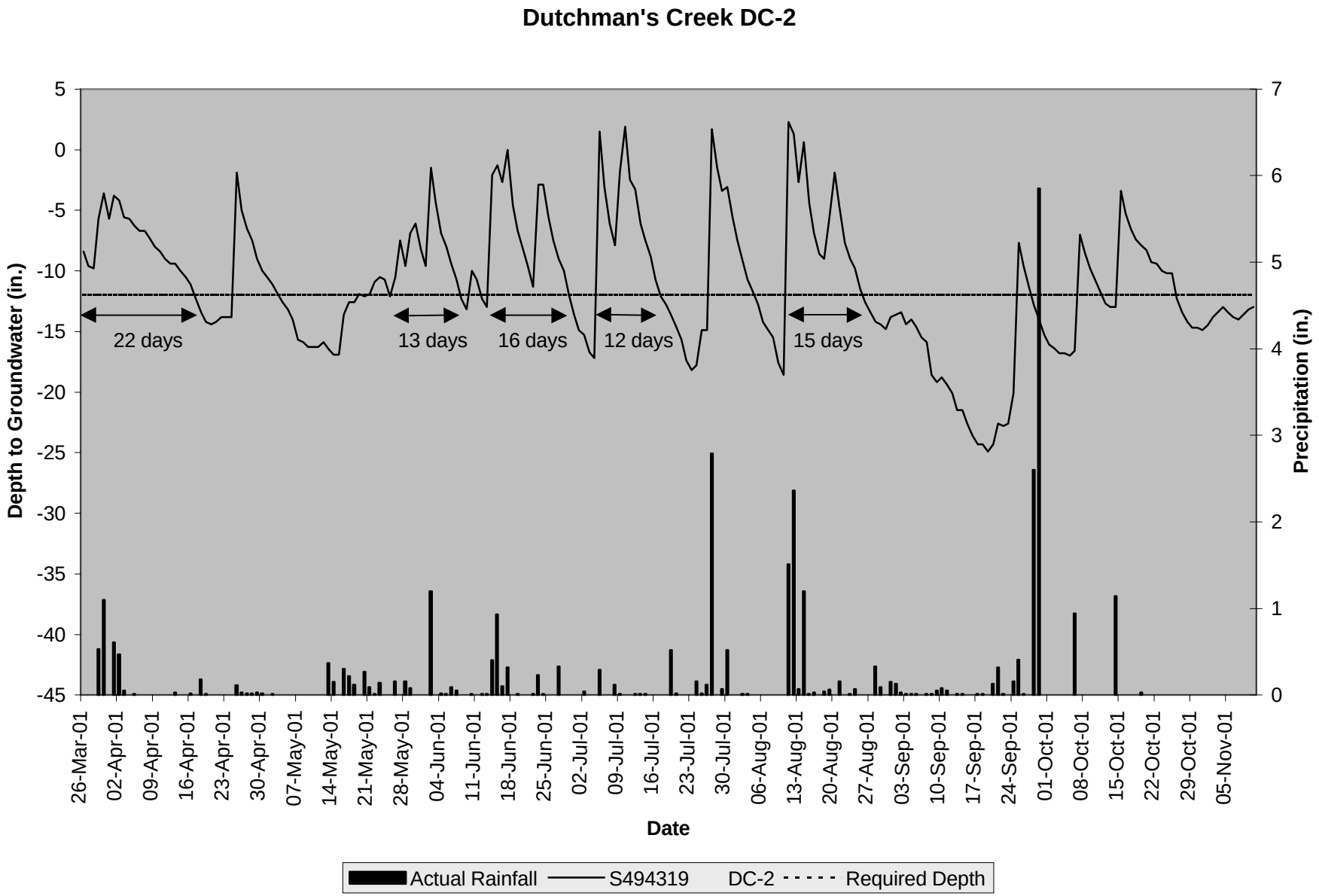
NCDOT will assess all options and report to resource agencies possible solutions to the low survival rates within the hardwood tree and scrub shrub areas. The Department plans to implement a plan this fall and replant seedlings next winter.

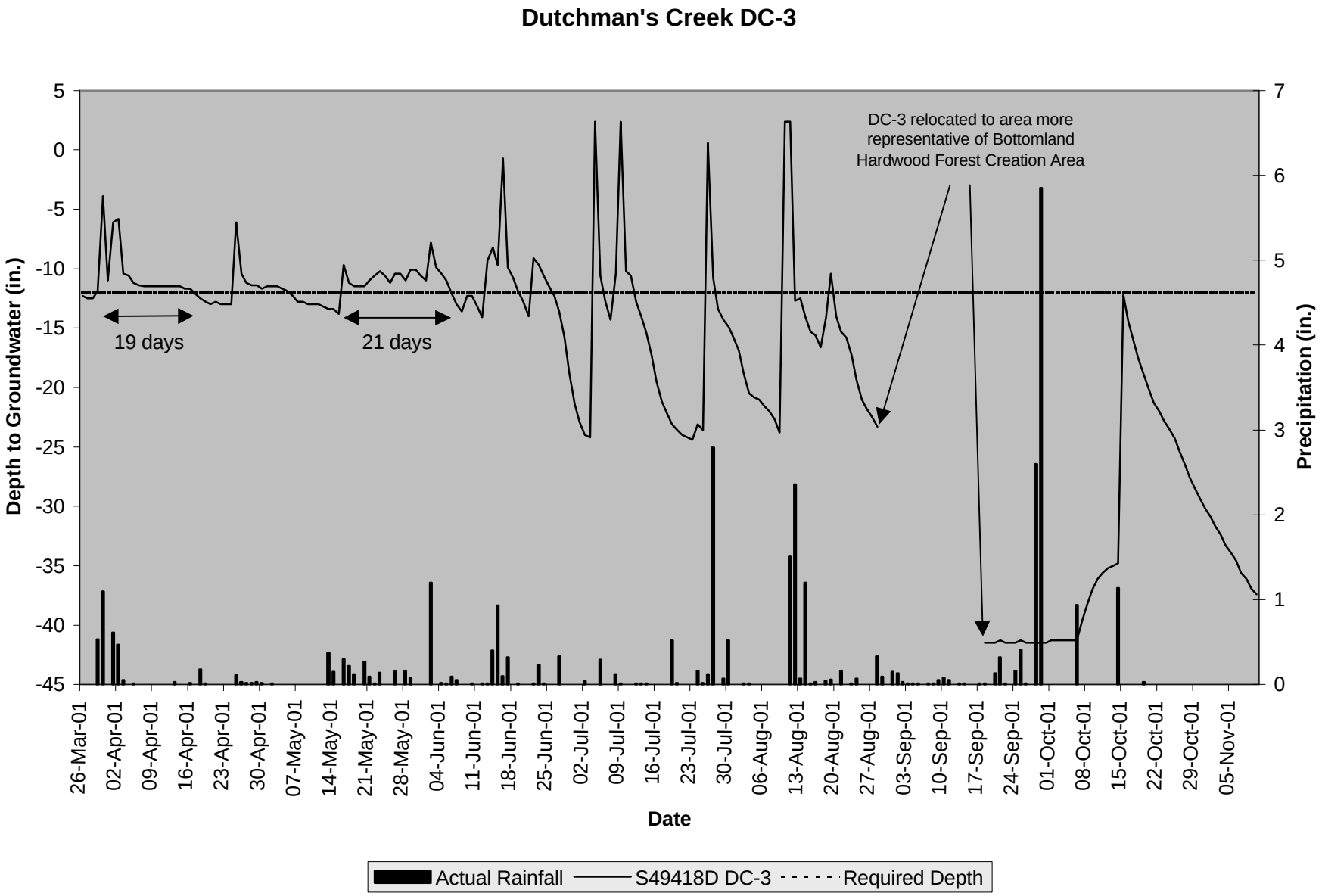
NCDOT proposes to continue monitoring at the site.

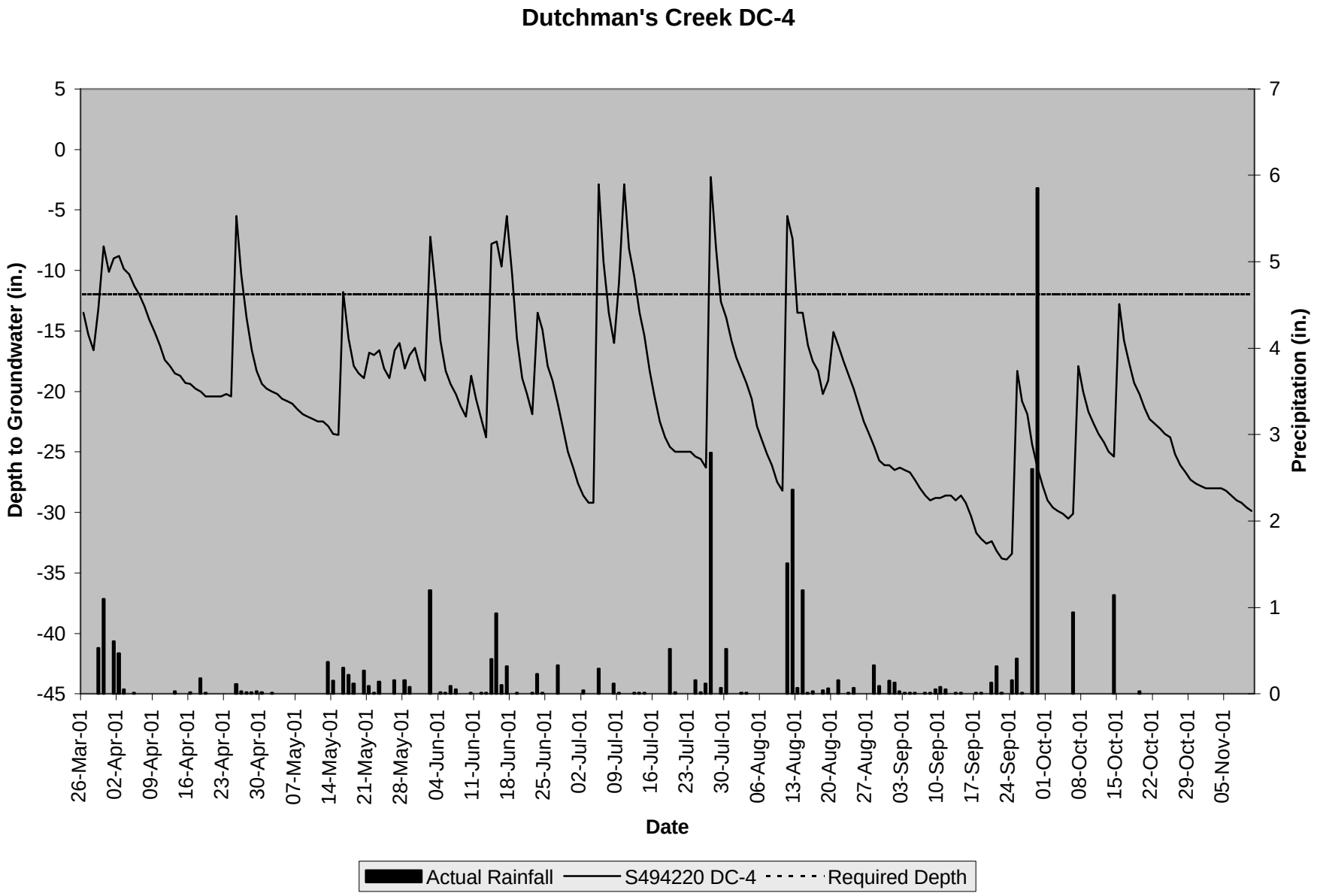
APPENDIX A

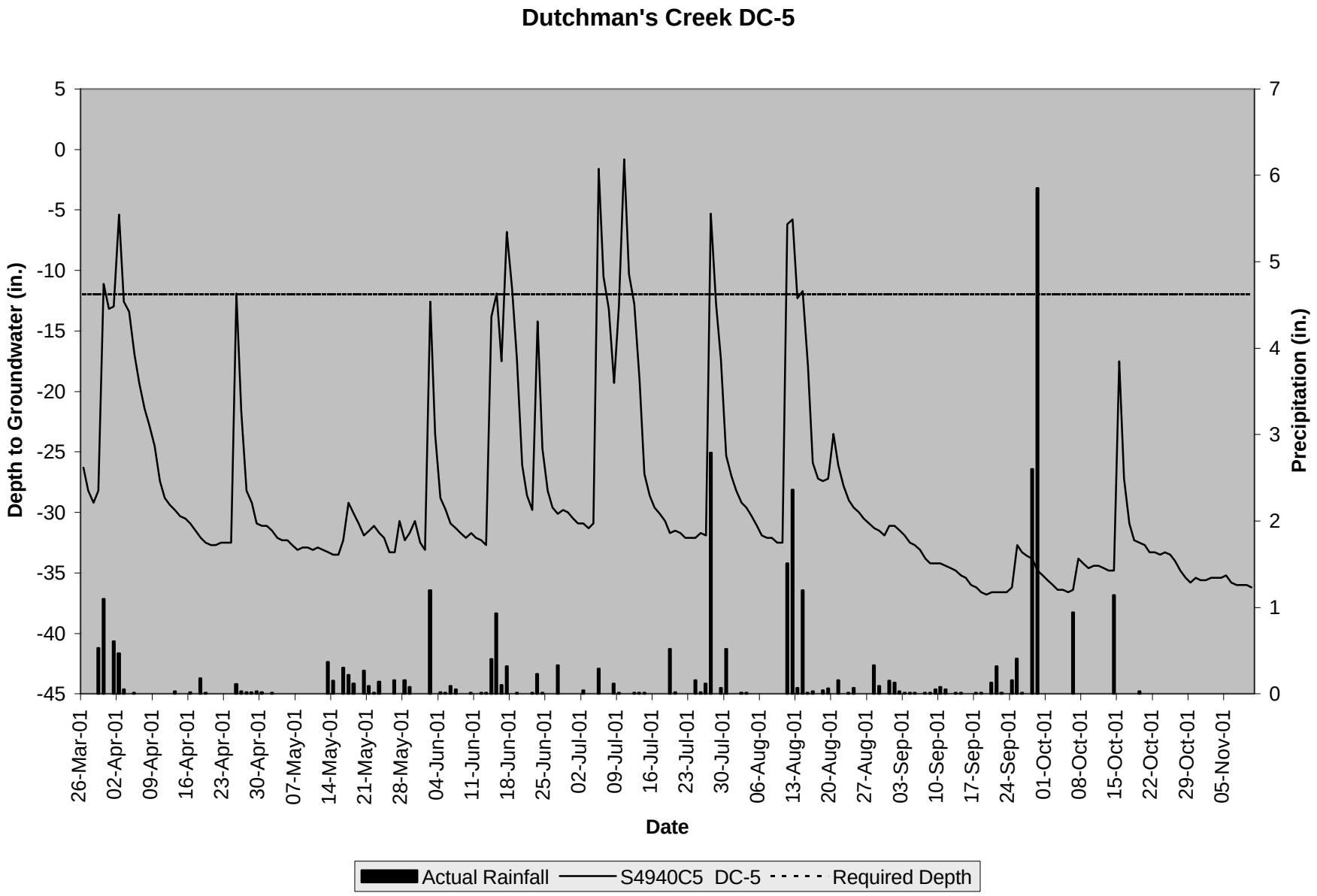
DEPTH TO GROUNDWATER GRAPHS

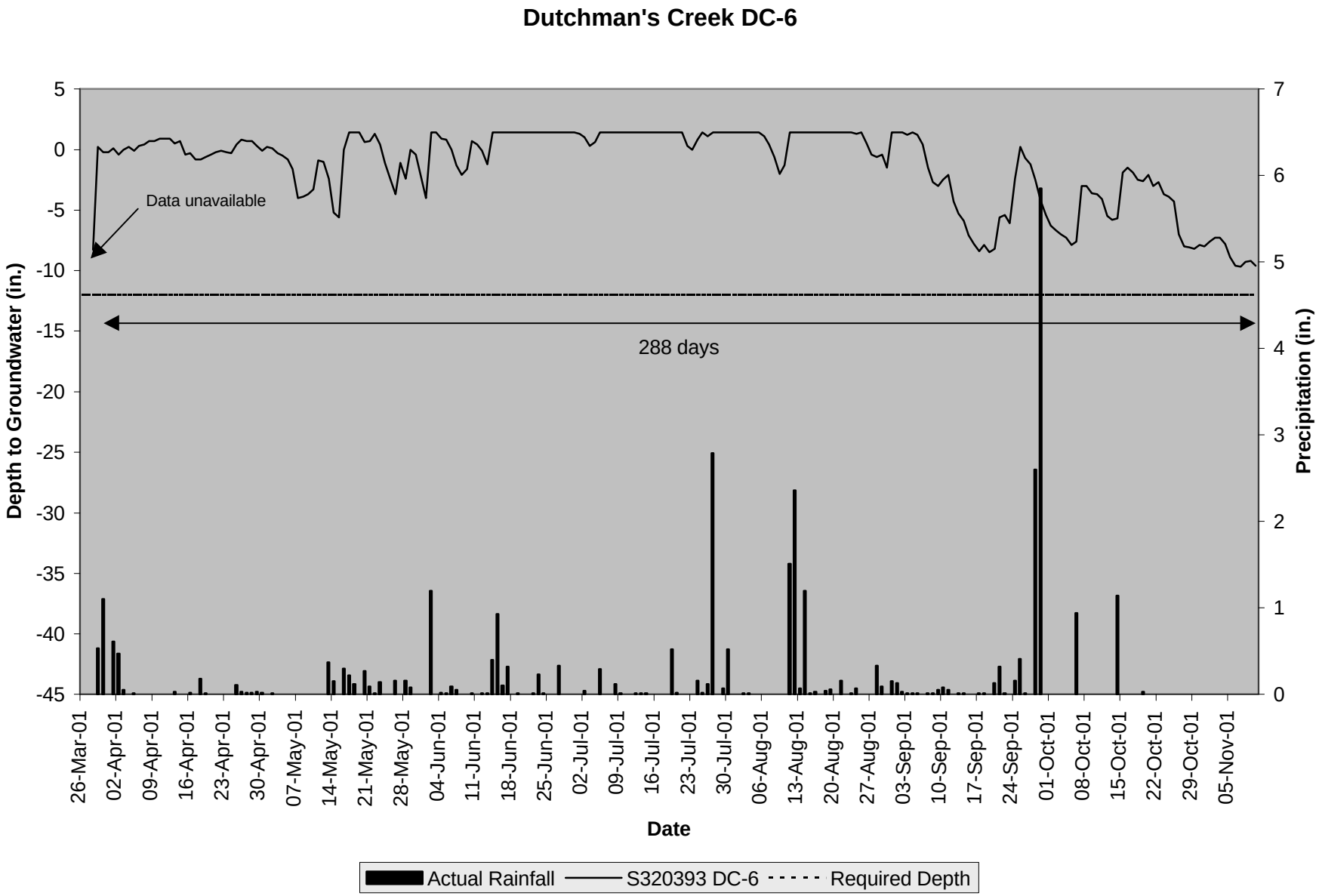

Dutchman's Creek DC-1
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
7
6
5
4
3
2
1
0
42 days
22 days
14 days
12 days
15 days
20 days
26-Mar-01
02-Apr-01
09-Apr-01
16-Apr-01
23-Apr-01
30-Apr-01
07-May-01
14-May-01
21-May-01
28-May-01
04-Jun-01
11-Jun-01
18-Jun-01
25-Jun-01
02-Jul-01
09-Jul-01
16-Jul-01
23-Jul-01
30-Jul-01
06-Aug-01
13-Aug-01
20-Aug-01
27-Aug-01
03-Sep-01
10-Sep-01
17-Sep-01
24-Sep-01
01-Oct-01
08-Oct-01
15-Oct-01
22-Oct-01
29-Oct-01
05-Nov-01
Date
Actual Rainfall
S49424F DC-1
Required Depth


Dutchman's Creek DC-2
Depth to Groundwater (in.)
Precipitation (in.)
Date
22 days
13 days
16 days
12 days
15 days
Actual Rainfall
S494319
DC-2
Required Depth


Dutchman's Creek DC-3
DC-3 relocated to area more representative of Bottomland Hardwood Forest Creation Area
19 days
21 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Actual Rainfall
S49418D DC-3
Required Depth


Dutchman's Creek DC-4
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
7
6
5
4
3
2
1
0
26-Mar-01
02-Apr-01
09-Apr-01
16-Apr-01
23-Apr-01
30-Apr-01
07-May-01
14-May-01
21-May-01
28-May-01
04-Jun-01
11-Jun-01
18-Jun-01
25-Jun-01
02-Jul-01
09-Jul-01
16-Jul-01
23-Jul-01
30-Jul-01
06-Aug-01
13-Aug-01
20-Aug-01
27-Aug-01
03-Sep-01
10-Sep-01
17-Sep-01
24-Sep-01
01-Oct-01
08-Oct-01
15-Oct-01
22-Oct-01
29-Oct-01
05-Nov-01
Date
Actual Rainfall
S494220 DC-4
Required Depth


Dutchman's Creek DC-5
Depth to Groundwater (in.)
Precipitation (in.)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
7
6
5
4
3
2
1
0
26-Mar-01
02-Apr-01
09-Apr-01
16-Apr-01
23-Apr-01
30-Apr-01
07-May-01
14-May-01
21-May-01
28-May-01
04-Jun-01
11-Jun-01
18-Jun-01
25-Jun-01
02-Jul-01
09-Jul-01
16-Jul-01
23-Jul-01
30-Jul-01
06-Aug-01
13-Aug-01
20-Aug-01
27-Aug-01
03-Sep-01
10-Sep-01
17-Sep-01
24-Sep-01
01-Oct-01
08-Oct-01
15-Oct-01
22-Oct-01
29-Oct-01
05-Nov-01
Date
Actual Rainfall
S4940C5 DC-5
Required Depth


Dutchman's Creek DC-6
Depth to Groundwater (in.)
Precipitation (in.)
Data unavailable
288 days
Date
Actual Rainfall
S320393 DC-6
Required Depth
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
7
6
5
4
3
2
1
0
26-Mar-01
02-Apr-01
09-Apr-01
16-Apr-01
23-Apr-01
30-Apr-01
07-May-01
14-May-01
21-May-01
28-May-01
04-Jun-01
11-Jun-01
18-Jun-01
25-Jun-01
02-Jul-01
09-Jul-01
16-Jul-01
23-Jul-01
30-Jul-01
06-Aug-01
13-Aug-01
20-Aug-01
27-Aug-01
03-Sep-01
10-Sep-01
17-Sep-01
24-Sep-01
01-Oct-01
08-Oct-01
15-Oct-01
22-Oct-01
29-Oct-01
05-Nov-01

APPENDIX B

SITE PHOTOS & PLANTING PLAN

Photo 1

Photo 2

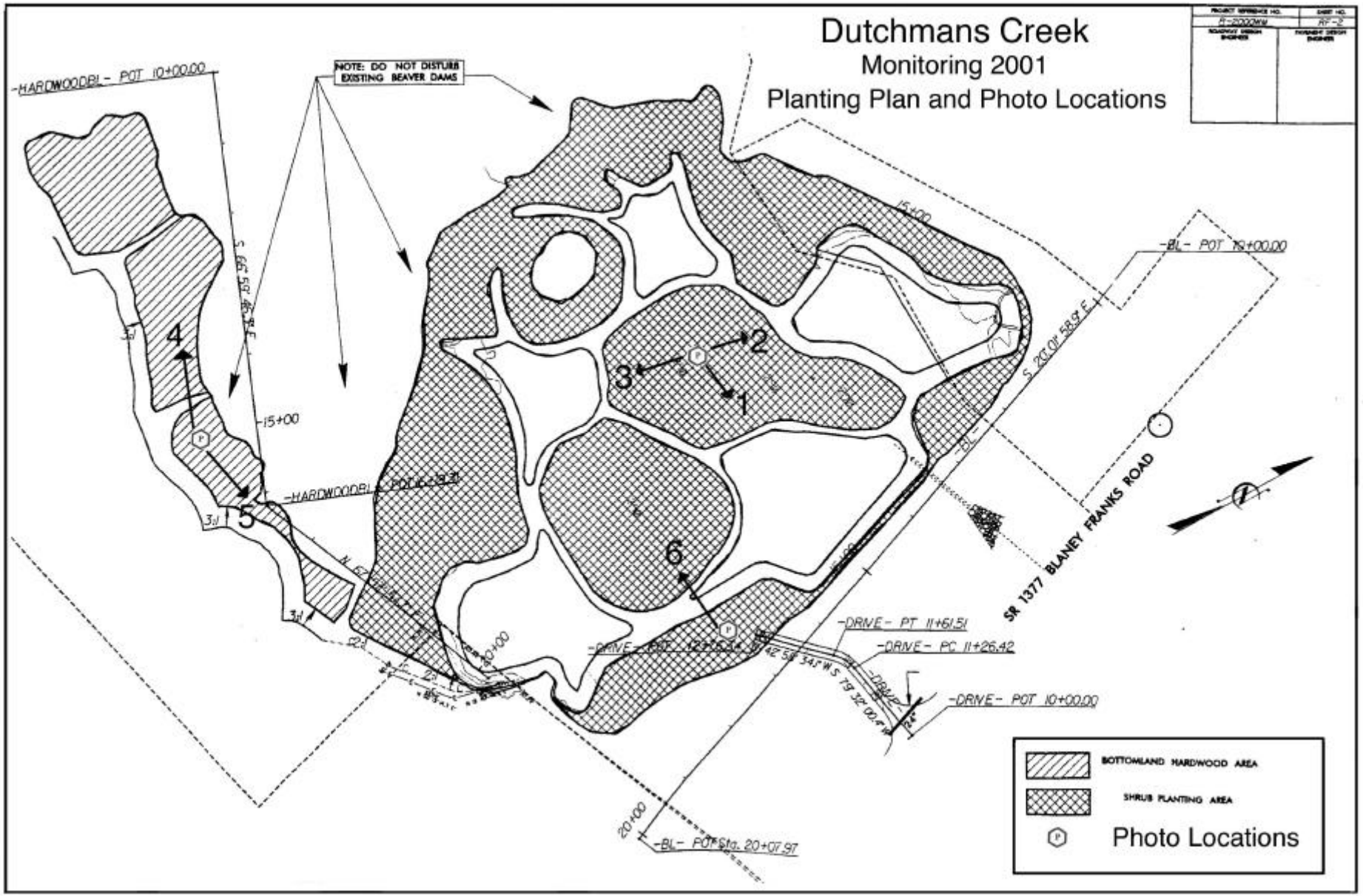
Photo 3

Photo 4

PHOTO 5

PHOTO 6

2000


Dutchmans Creek
Monitoring 2001
Planting Plan and Photo Locations
NOTE: DO NOT DISTURB EXISTING BEAVER DAMS
-HARDWOODBL- POT 10+00.00
-HARDWOODBL- POT 15+00.00
-BL- POT 15+00.00
-BL- POT Sta. 20+07.97
-DRIVE- PT 11+61.51
-DRIVE- PC 11+26.42
-DRIVE- POT 10+00.00
SR 1377 BLANEY FRANKS ROAD
BOTTOMLAND HARDWOOD AREA
SHRUB PLANTING AREA
Photo Locations