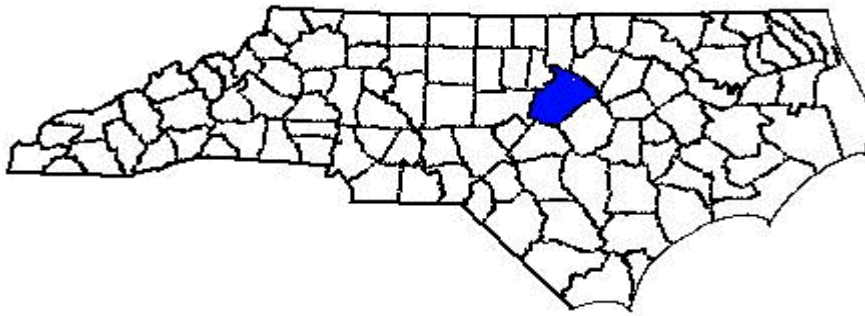


ANNUAL REPORT FOR 2001



New Light Creek 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 New Light Creek Mitigation Site. This site was originally constructed in 1998. Monitoring activities in 2001 represent the third year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success for a minimum of five years.

The site contains six monitoring gauges and four vegetation plots.

This report utilizes rainfall data from both a local weather station and from on-site rainfall gauges. Beginning in May 2000, rainfall has been recorded by two on-site rainfall gauges. Historical data is provided by the NC State Climate Office.

Three of the six monitoring gauges indicate saturation for more than 12.5% of the growing season. Three gauges, GW-2, GW-3, and GW-5, have met the success criteria of consecutive days exceeding at least 12.5% of the growing season. Gauge GW-5 indicates ponding has occurred in the area during part of the growing season.

Based on the monitoring results from the 2000 and 2001 growing season, NCDOT will be re-evaluating the problems associated with this site.

NCDOT will continue monitoring at this site.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The New Light Creek Mitigation Site is located east of Magnum Dairy Road (SR 1911) adjacent to New Light Creek in Wake County near the Granville county line (Figure 1). This site was constructed to provide mitigation for wetland impacts associated with the Raleigh Outer Loop (R-2000).

The site, totaling 19.8 acres in size, consists of the creation and restoration of a bottomland hardwood forest. The site was constructed in 1998 and planted in 1999.

1.2 PURPOSE

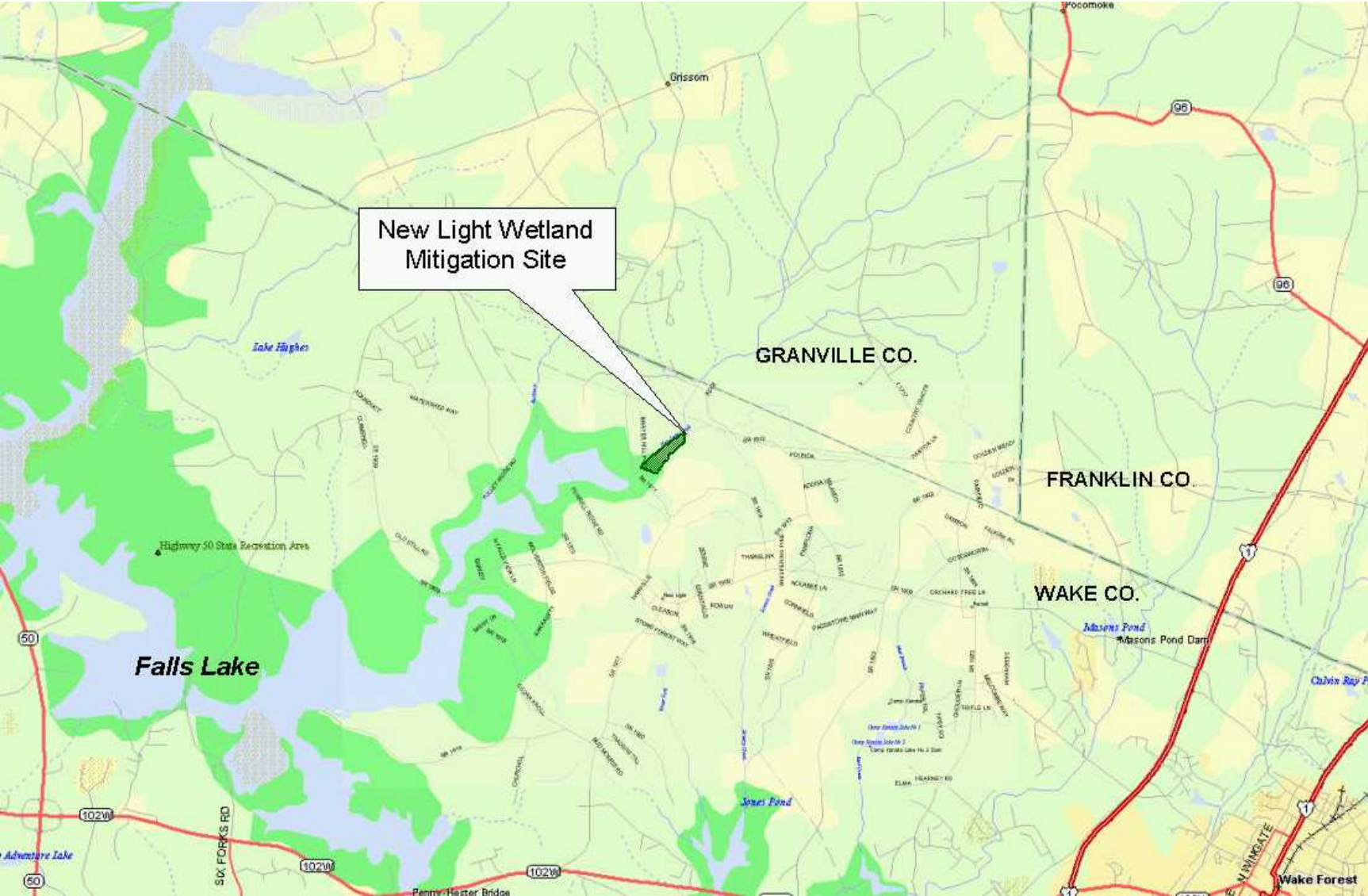
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival.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

Activities in 2001 reflect the third year of monitoring following the restoration efforts. Included in this report are analyses of both hydrologic and vegetative monitoring results as gauge as local climate conditions throughout the growing season and site photographs.

1.3 PROJECT HISTORY

October 1998	Site grading commenced
February 1999	Site Planted
March 1999	Monitoring Gauges Installed
March- November 1999	Hydrologic Monitoring (1 yr.)
September 1999	Vegetation Monitoring (1 yr.)
March- November 2000	Hydrologic Monitoring (2 yr.)
November 2000	Vegetation Monitoring (2 yr.)
March- November 2001	Hydrologic Monitoring (3 yr.)
July 2001	Vegetation Monitoring (3 yr.)

Figure 1. Site Location Map



1.4 DEBIT LEDGER

Table 1. New Light Creek Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			TIP Debit
	Acres at Start	Acres Remaining	% Remaining	R-2000EA & EB
	20.00	0.00	0.00	20.00

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. Area inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated 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 Wake County begins March 26 and ends November 10. These dates correspond to a 50% probability that temperatures will 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.

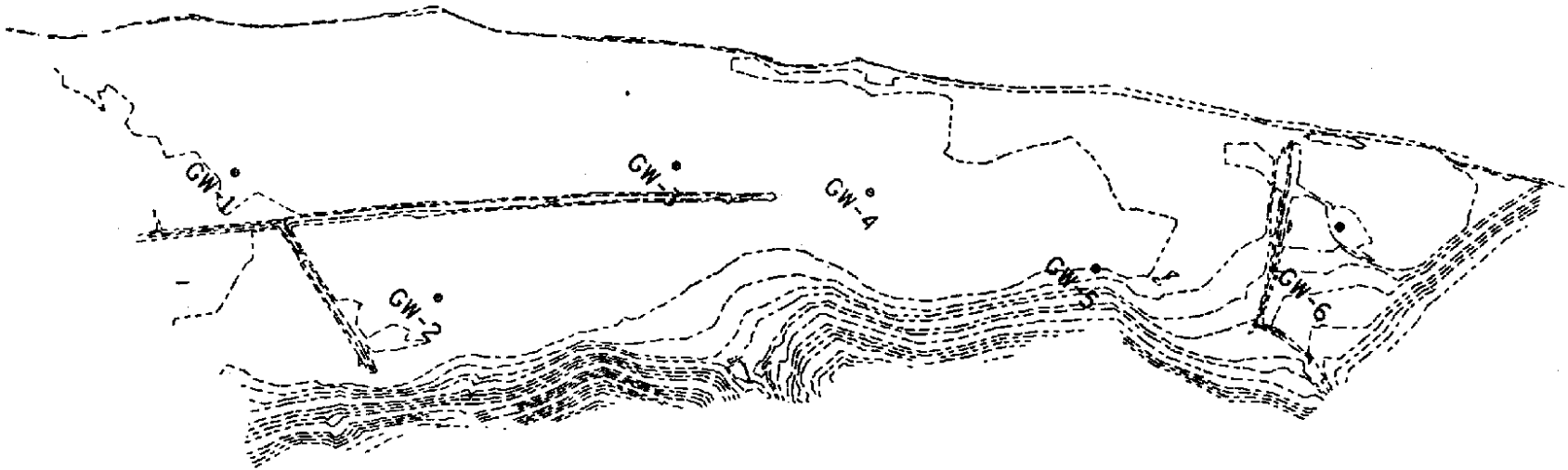
2.2 HYDROLOGIC DESCRIPTION

In March of 1999, six monitoring gauges were installed across the site (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This represents the third full growing season that the monitoring gauges have been in place.

The New Light Creek site was designed to receive hydrologic input from rainfall. 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.

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 gauge. This number was converted into a percentage of the 229-day growing season (March 26 – November 10). The results are presented in Table 1.

Appendix A contains a plot of the groundwater depth for each monitoring gauge 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, shown on the monitoring gauge graphs as bars, represent an average of two on-site rain gauges.

Specific gauge problem: GW-1 experienced mechanical problems from June 5 through replacement on August 17.

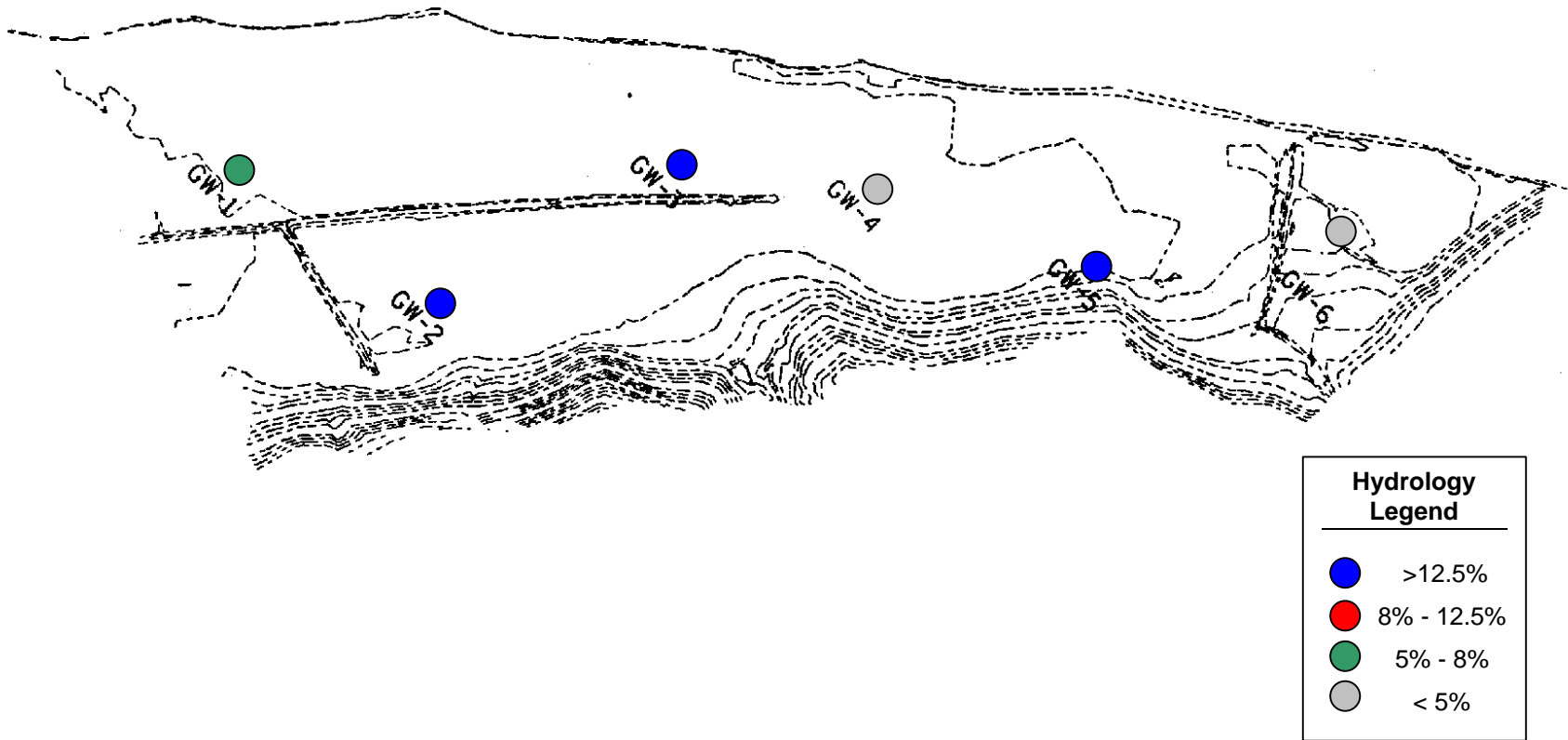
Figure 3 represents a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red indicate saturation between 8 and 12.5% of the season, while those in green indicate saturation between 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. If 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. New Light Creek Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
GW-1		✓			7.0	Mar 26 – Apr 10
GW-2				✓	50.2	Jul 19 – Nov 10
GW-3				✓	17.9	Mar 26 – May 5
GW-4	✓				4.4	Mar 26 – Apr 7
GW-5				✓	43.2	Mar 26 – Jul 2
GW-6	✓				3.1	Jun 21 – Jun 27

Figure 3. Monitoring Gauge Hydrologic Results



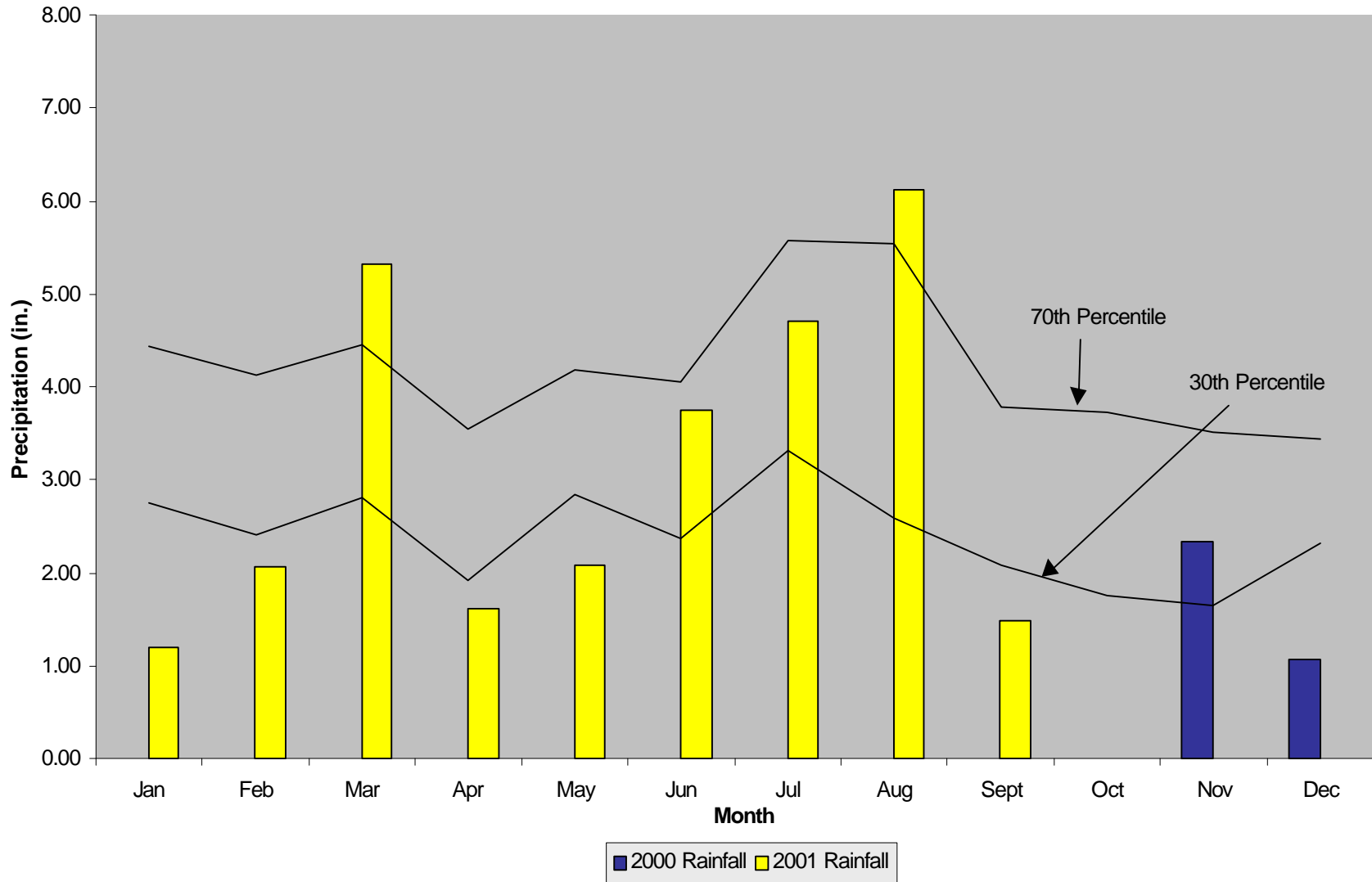
2.3.2 Climatic Data

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 climate conditions. The two lines represent the 30th and 70th percentiles of monthly precipitation for Raleigh. The bars are the monthly rainfall totals for October 2000 through September 2001. The historical data was collected by the National Climatic Data Center, while the on site gauges provided the recent rainfall data. Months with below average rainfall include: October (2000), December (2000), January, February, April, May, and September. November (2000), June and July experienced normal rainfall. March and August experienced above normal rainfall. Gauge 1 meet the success criteria from March 26 through April 10 which may be associated with the above normal rainfall in March. Overall the site experienced below average rainfall in 2001 which may be associated with two of the gauges decrease success rating from the 2000 monitoring year.

2.4 CONCLUSIONS

2001 represents the third full growing season that the hydrologic data has been examined. Three gauges, GW-2, GW-3, and GW-5, have met the success criteria of consecutive days exceeding at least 12.5% of the growing season. Gauge GW-5 indicates ponding has occurred in the area during the growing season. GW-1 indicates saturation between 5 to 8% of the growing season. Gauge GW-6 does not indicate successful hydrology.

Figure 4. New Light Creek 30-70 Percentile Graph, Raleigh, NC



3.0 Vegetation: New Light Creek Mitigation Site (Year 3 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 Enhancement/Preservation Area:

Bottomland Hardwood Area (12.2 Ac.)

Quercus phellos, Willow Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Fraxinus pennsylvanica, Green Ash
Nyssa sylvatica, Blackgum
Quercus lyrata, Overcup Oak
Quercus michauxii, Swamp Chestnut Oak

Levee Area (1.0 Ac.)

Betula nigra, River Birch
Quercus lyrata, Overcup Oak
Quercus phellos, Willow Oak
Platanus occidentalis, Sycamore
Juglans nigra, Black Walnut

3.3 RESULTS OF VEGETATION MONITORING

Table 3. Vegetation Monitoring Statistics, by plot

Plot # (Type)	Blackgum	Cherrybark Oak	Green Ash	Overcup Oak	Swp. Chestnut Oak	Willow Oak	Black Walnut	Total	Total (at planting)	Density (Tree/Acre)
1 (BLH/Levee)	1	3		2	11	5	7	29	37	533
2 (BLH)		6	2	15	5	4		32	38	573
3 (BLH)	3	10	11	2				26	34	520
4 (BLH)	2	2	6	4	15	2		31	37	570
AVERAGE DENSITY										549

Site Notes: Volunteer green ash and sycamore found throughout site. Heavy grasses and ground cover exist throughout the site including fescue, smartweed, horse-nettle, *Juncus* sp., *Carex* sp., poison ivy, and pokeweed.

The swale in the middle of the site with a slightly lower elevation contains various wetland species including *Juncus* sp., *Scirpus* sp., *Cyperus* sp., black willow, and cattail. Standing water is present throughout this middle swale. This swale was established during construction of the site and is described and shown in the attached page and map taken from the June 1998 mitigation plan.

3.4 CONCLUSIONS

Of the 19.8 total acres on this site, approximately 13.2 acres involved tree planting. There were 4 vegetation monitoring plots established throughout the site. The 2001 vegetation monitoring of the site revealed an average tree density of 549 trees per acre, gauge above the minimum required by the success criteria.

NCDOT and USACE personnel inspected the washout along the streambank in June 2000. It was agreed that NCDOT would repair the washout. This work was not done. A site inspection in September 2000 revealed this washout to be stabilizing on its own. NCDOT has continued to monitor this area to determine if this slope will stabilize in given time. The streambank was inspected and photographed during the 2001 monitoring visit and no other signs of erosion were observed (see pictures 7, 8, 9, and 10).

4.0 Overall Conclusions

All of the vegetation monitoring plots have indicated an average tree density of over 320 trees per acre.

2001 represents the third full growing season that the hydrologic data has been examined. Three gauges, GW-2, GW-3, and GW-5, have met the success criteria of consecutive days exceeding at least 12.5% of the growing season. Gauge GW-5 indicates ponding has occurred in the area during the growing season. GW-1 indicates saturation between 5 to 8% of the growing season. Gauge GW-6 does not indicate successful hydrology.

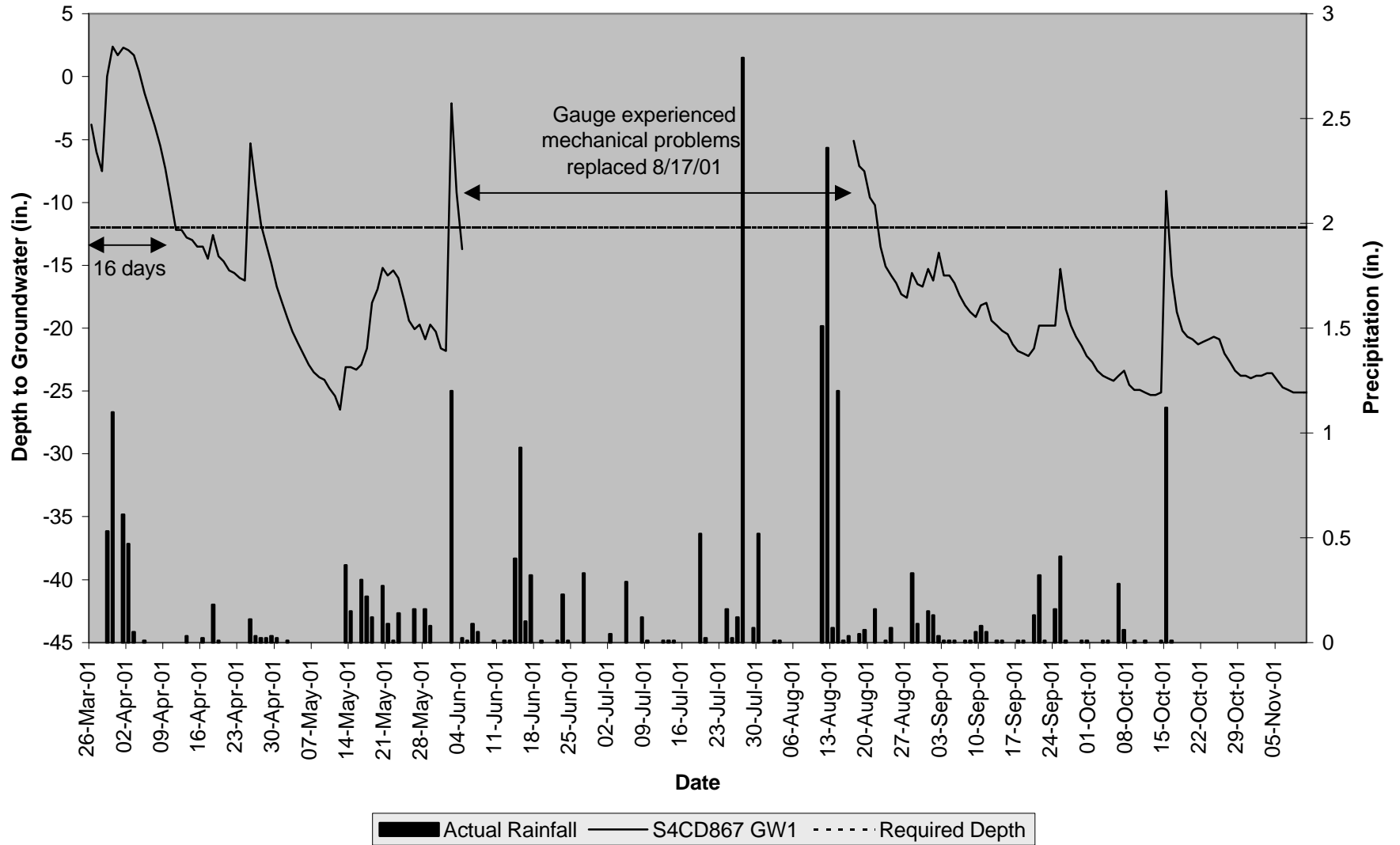
Based on the monitoring results from the 2000 and 2001 growing season, NCDOT will be re-evaluating this site.

Monitoring of site hydrology and vegetation will continue in 2002.

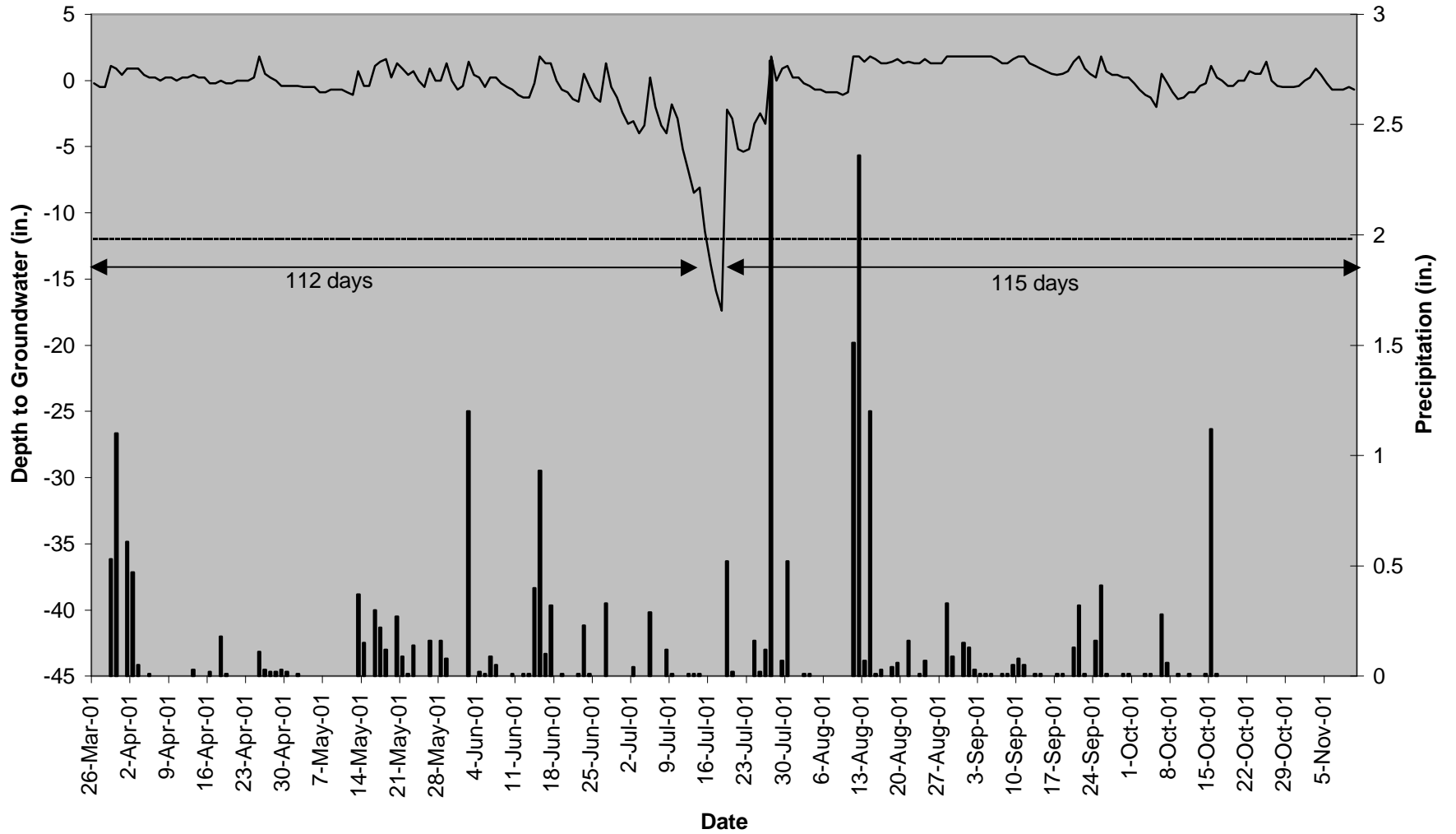
APPENDIX A

DEPTH TO GROUNDWATER GRAPHS

New Light Creek GW-1

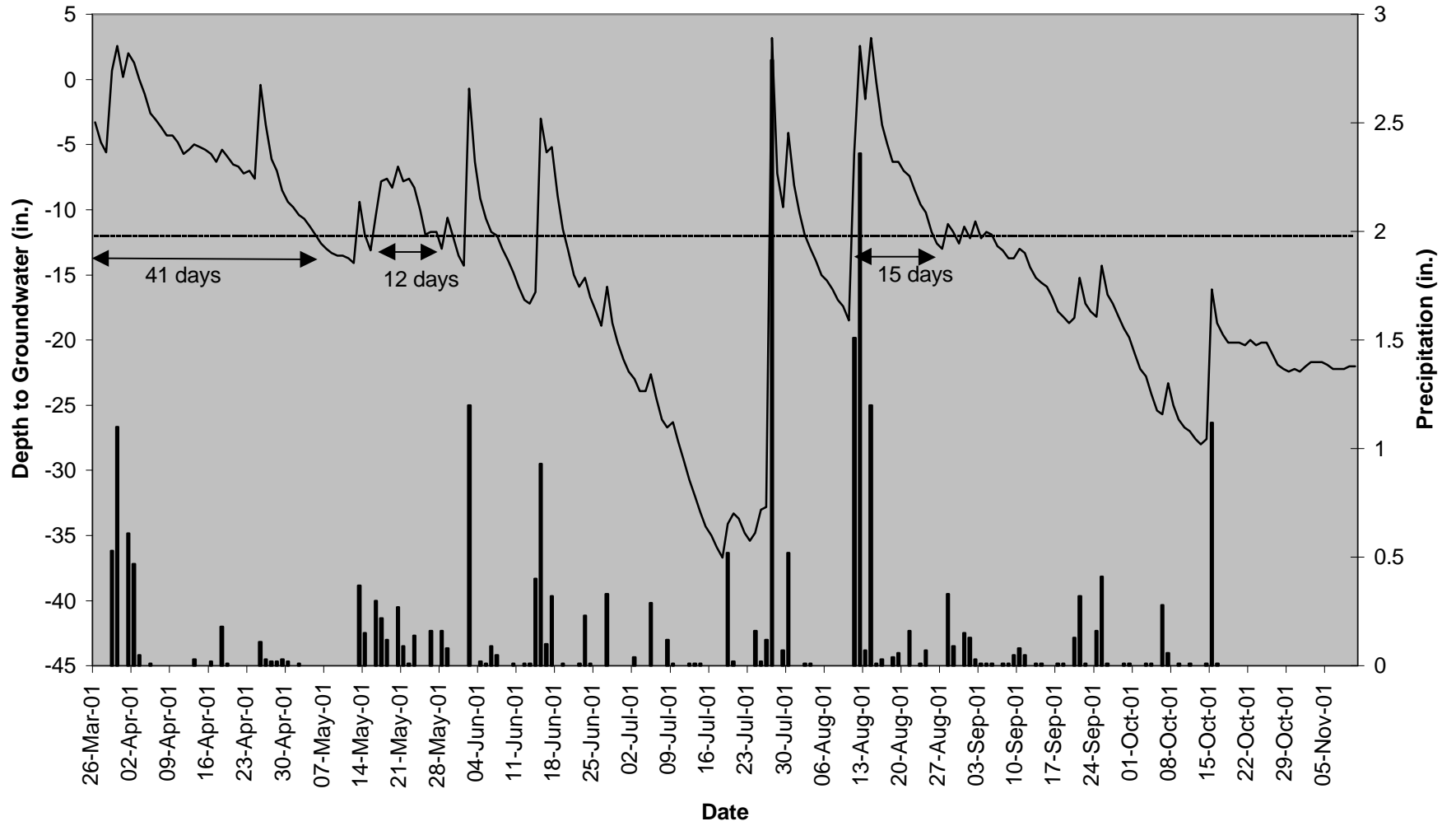


New Light Creek GW-2



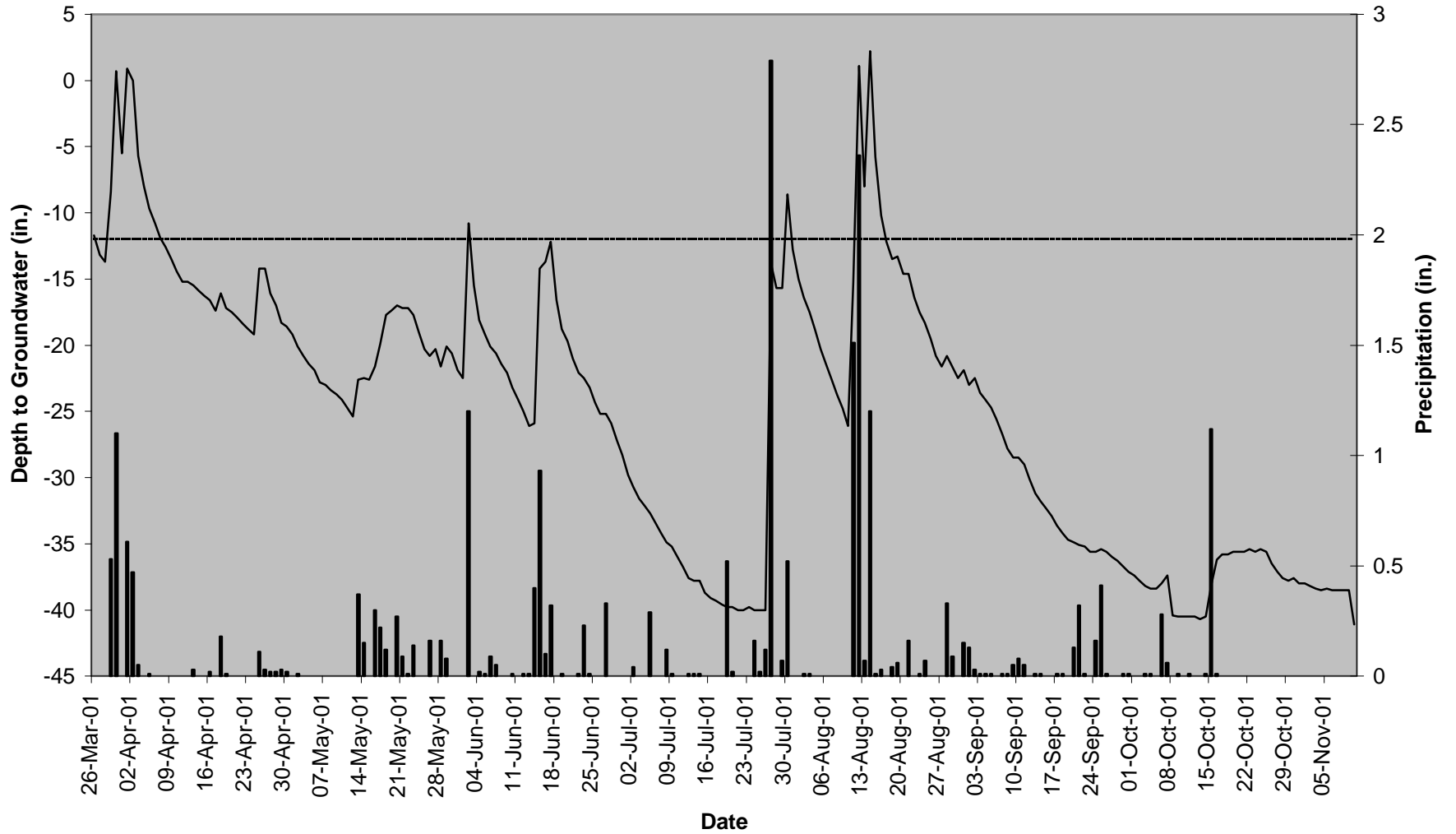
Actual Rainfall S2b082c GW2 Required Depth

New Light Creek GW-3



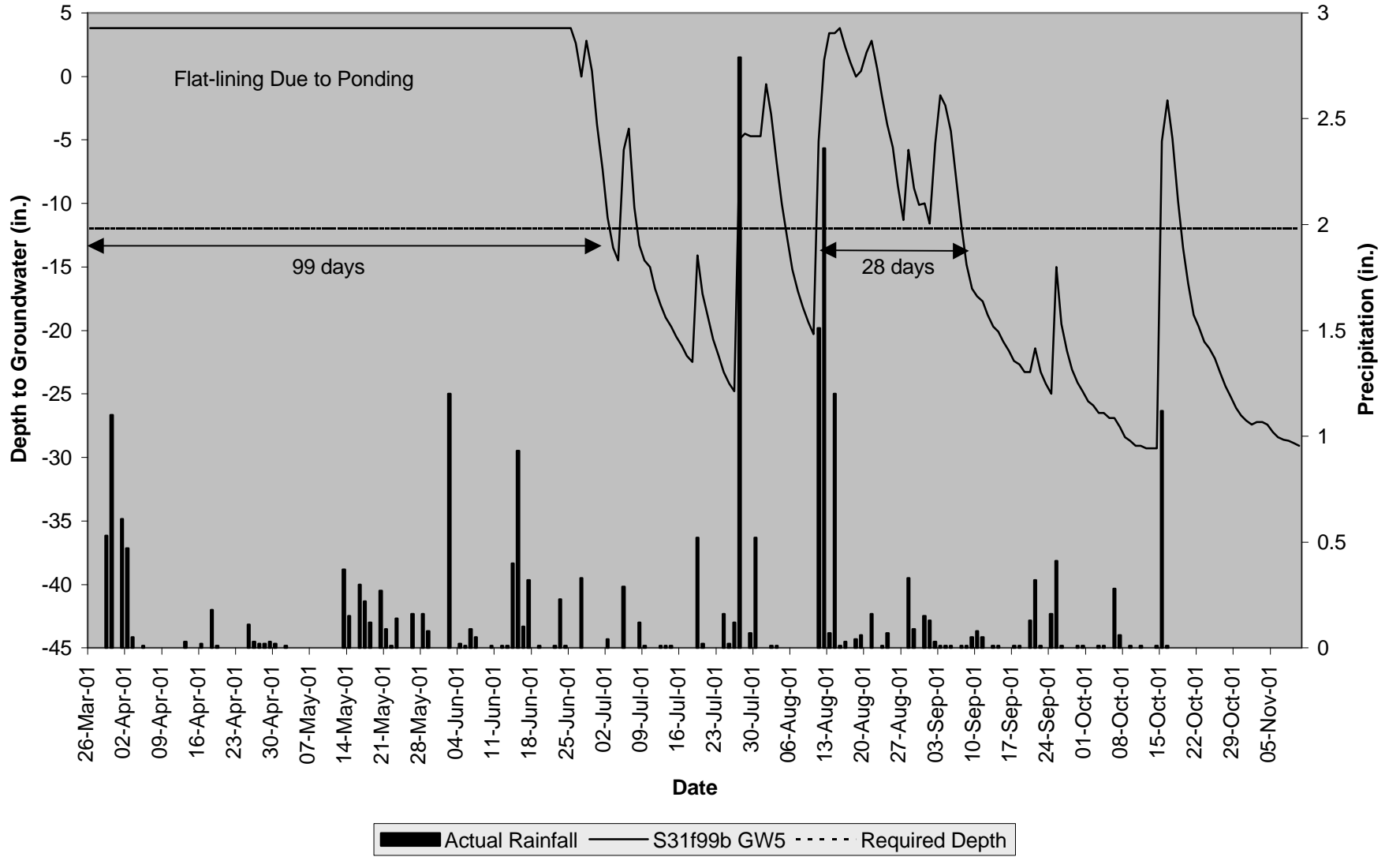
Actual Rainfall — S2eaa6e GW3 - - - - Required Depth

New Light Creek GW-4

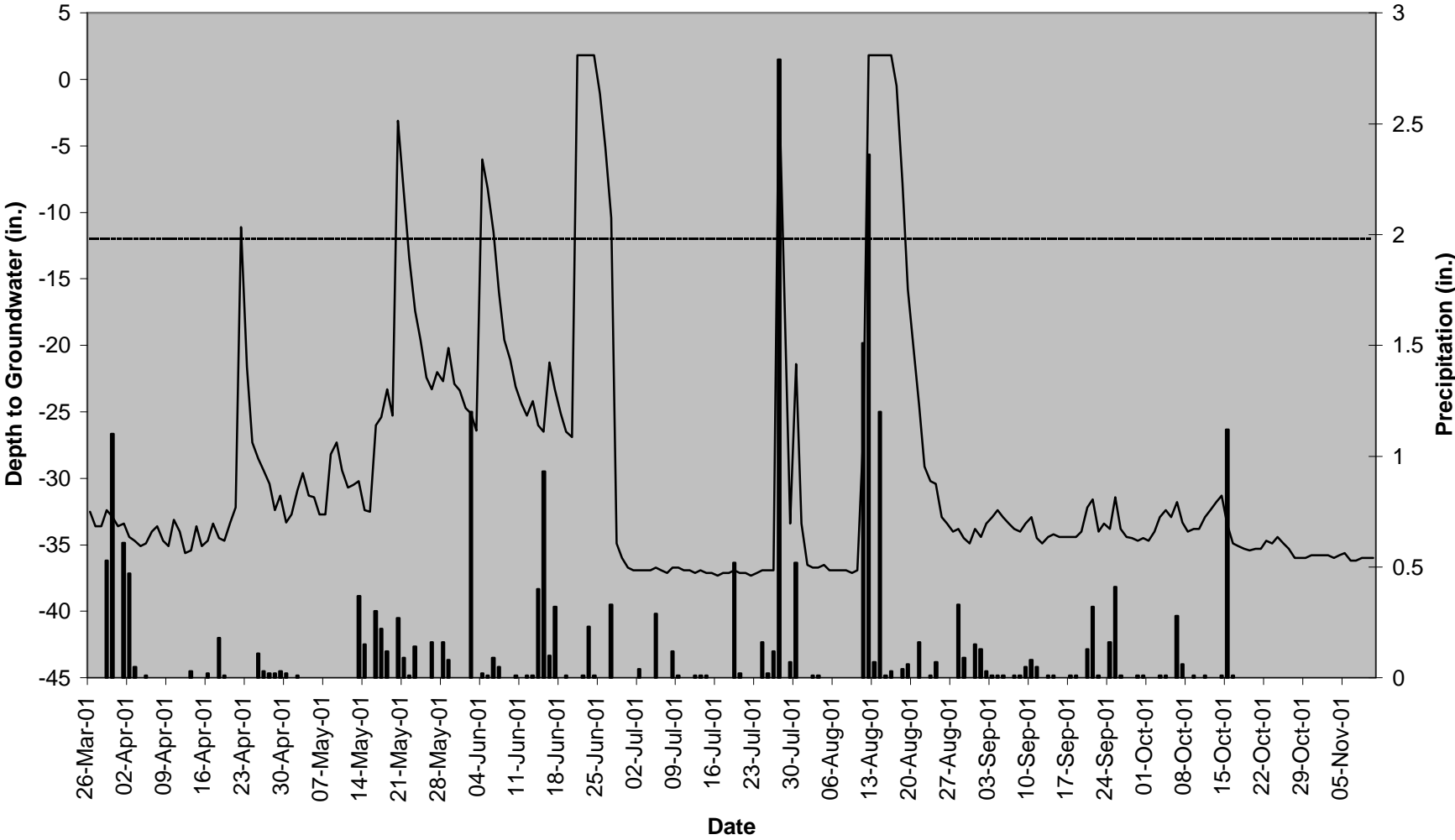


Actual Rainfall — S2b23ff GW4 - - - - Required Depth

New Light Creek GW-5



New Light Creek GW-6



Actual Rainfall — S317628 GW6 - - - - - Required Depth

APPENDIX B
SITE PHOTOS

NEW LIGHT CREEK



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

NEW LIGHT CREEK



Photo 7 (streambank)



Photo 8 (streambank)



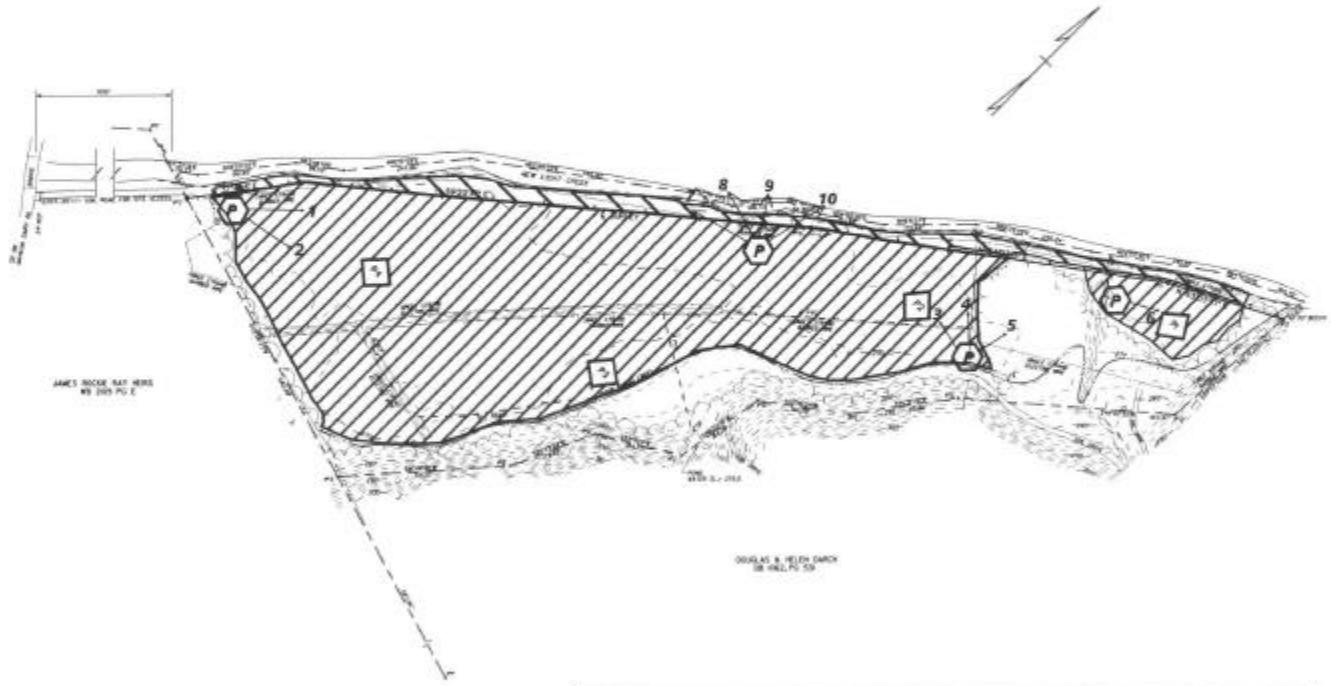
Photo 9 (streambank)



Photo 10 (streambank)

**NEW LIGHT CREEK MITIGATION SITE
VEGETATIVE PLOT AND PHOTO POINT LOCATIONS
2001 MONITORING**

0	400	N 2000W	
SCALE 1" = 100'			
DATE			
DRAWN			
CHECKED			
APPROVED			



JAMES BROCK BAY WEST
WB 2005 PG 2

DOUGLAS BAY WEST BAY
WB 2005 PG 2

	PHOTO POINTS		Bottomland Hardwood Area
	VEGETATION MONITORING PLOTS		Levee Area

Filling of the central ditch and removal of the drain tiles will be performed in September and October while the site is relatively dry. Five groundwater monitor wells will be installed across the site to monitor site hydrology and assist with final design. Observed water elevations during November and December will be used to help evaluate whether the proper hydrology has been restored, prior to planting of the hardwood seedlings in January and February.

4.2 TOPOGRAPHIC MODIFICATION

Prior to conversion to pasture, a number of swales/depressions were present across the site. Minor grading is proposed to reestablish microtopographic relief across the site and establish several swales or depressions to help retain surface water on the site. The general configuration of these proposed swales are shown on Figure 6. The swales will be 6 to 18 m (20 to 50 ft) wide and 30 to 90 m (100 to 300 ft) long. The middle of the swale will be about 15 to 30 cm (0.5 to 1.0 ft) below the elevation of the swale edge. Small deeper 30 cm (1.0 ft) depressions will be constructed in the downstream end of several of the swales to provide an area that experiences temporary ponding and a diverse habitat.

The location, shape, and elevations of the swales was based on the depressions within a bottomland forest area located about one-half mile south of the mitigation site. This wetland area is located on similar soils and a similar landscaped position as the mitigation site. The location of this wetland is shown on Figure 6. The general shape and dimensions of these depressions were measured using a transit and level and 100-foot tape measure. In general the swales in this area were roughly parallel to the stream irregular in shape but tending towards long and narrow. Measurements in this reference area indicated that the maximum elevation differences between the tops of hummocks and the bottom of swales is 1 foot. The average difference in elevation was 0.47 feet. The swales varied in width from 4 feet to 26 feet, and in length from 30 feet to over 300 feet.

In addition, some soil and tree trunks have been placed along the tops of the banks of New Light Creek to help reduce overtopping of the banks. This material will be removed to allow natural overbanking to occur.

It is anticipated that initial site grading and removal of all tile, ditches, and pipes will occur in September of 1998. During late fall/early winter, and prior to planting, elevations of the swales and other site features may be modified. Modification will be based upon observed conditions such as water levels in on-site monitor wells and observed surface water condition.

Excerpt from June 1998 Mitigation Plan

