

# ANNUAL REPORT FOR 2005



**Deer Creek Mitigation Site  
Carteret County  
Project No. 6.16901T  
TIP No. R-2105 WM**



Prepared By:  
Natural Environment Unit & Roadside Environmental Unit  
North Carolina Department of Transportation  
December 2005

TABLE OF CONTENTS

SUMMARY ..... 1

1.0 INTRODUCTION ..... 2

    1.1 Project Description ..... 2

    1.2 Purpose ..... 2

    1.3 Project History ..... 2

2.0 HYDROLOGY ..... 4

    2.1 Success Criteria ..... 4

    2.2 Hydrologic Description ..... 4

    2.3 Results of Hydrologic Monitoring ..... 6

        2.3.1 Site Data ..... 6

        2.3.2 Climatic Data ..... 6

    2.4 Conclusions ..... 6

3.0 VEGETATION ..... 8

    3.1 Success Criteria ..... 8

    3.2 Description of Species ..... 8

    3.3 Results of Vegetation Monitoring ..... 9

    3.4 Conclusions ..... 10

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS ..... 10

FIGURES

FIGURE 1. SITE LOCATION MAP ..... 3

FIGURE 2. GAUGE LOCATION MAP ..... 5

FIGURE 3. DEER CREEK ON-SITE RAINFALL DATA ..... 7

TABLES

TABLE 1. GAUGE DESCRIPTION AND EXPECTATIONS ..... 4

TABLE 2. VEGETATION MONITORING RESULTS ..... 9

APPENDICES

- APPENDIX A. GAUGE DATA GRAPHS
- APPENDIX B. SITE PHOTOGRAPHS
- APPENDIX C. VEGETATION PLANTING PLAN AND RANDOM PLOT LOCATIONS

## SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Deer Creek Mitigation Site. Located in Carteret County, the Deer Creek Site serves as mitigation for impacts associated with the widening of NC 24. The site was originally designed to serve as integration between an onsite stormwater detention facility and the surrounding environment. The site was constructed and planted in Spring 2001; however, an initial vegetation failure led to a replanting of the site in the spring of 2002. Monitoring activities in 2005 represent the fifth year of hydrologic monitoring and the fourth year of vegetation monitoring.

The site must be monitored for five years following site construction or until success criteria are met. Monitoring criteria include the percent cover of planted herbaceous vegetation and the hydrologic conditions at the site. The site is monitored with thirty vegetation plots, three surface water gauges, and one rain gauge. Data analysis includes an examination of all recorded site data as well as an assessment of local climate conditions throughout the growing season.

Hydrologic monitoring was conducted for a fifth year. The three surface water-monitoring gauges on the site show consistent inundation throughout the growing season. An examination of the water levels over a two-day period illustrates that the site floods twice a day under average climatic conditions (as required in the permit conditions). The two days in the plot were chosen at random and represent typical conditions during the growing season.

For 2005, the fourth vegetation monitoring event revealed a frequency of target species at 96.2% and the vegetative coverage scale value at 4.65. The vegetation data for 2005 met the 70% required frequency of target species and is on track to meet the scale value of 5 for the vegetative coverage that is required in year five.

Based on successful monitoring results, NCDOT recommends discontinuing hydrologic monitoring for this site. NCDOT will continue vegetation monitoring on the Deer Creek Mitigation Site.

## 1.0 INTRODUCTION

### 1.1 Project Description

The Deer Creek Mitigation Site is located in Carteret County on the north side of NC 24 at the northeast quadrant of the crossing of Deer Creek (see Figure 1 Location Map). The mitigation site is approximately 4.25 acres in size. Approximately 1.5 acres of the site had previously been allocated as a stormwater detention facility designed for the NCDOT to treat runoff from the improvements associated with the widening of NC 24 (TIP No. R-2405AB). The existing Section 404 permit for widening NC 24 involves a commitment by NCDOT to better integrate the original 1.5-acre storm water detention basin into the existing natural environment. To accommodate this, the NCDOT purchased the remaining 2.75 acres of land with the intent of utilizing the area to provide compensatory mitigation for wetland impacts associated with this TIP project.

### 1.2 Purpose

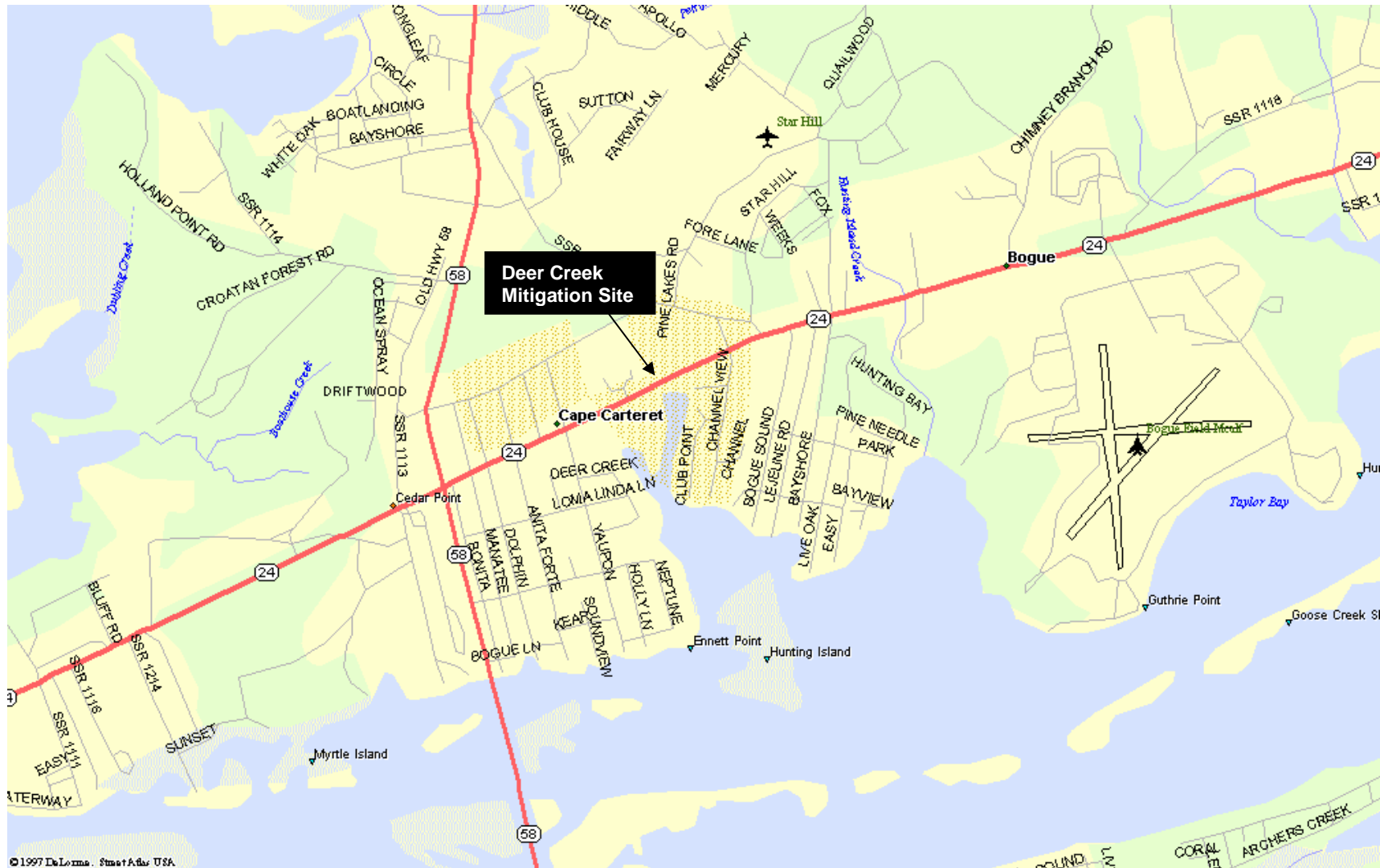
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted. Vegetation will be monitored for five years following the completion of planting and vegetative marsh success is determined in accordance with NMFS guidelines. The site will be considered hydrologically successful when the hydrologic data shows that the site floods twice daily. The following report details the results of hydrologic and vegetative monitoring during 2005 at the Deer Creek Mitigation Site.

### 1.3 Project History

|                          |                                       |
|--------------------------|---------------------------------------|
| March 2001               | Construction Completed                |
| May 2001                 | Site Planted                          |
| June 2001                | Gauges Installed                      |
| June –November 2001      | Hydrologic Monitoring (1 yr.)         |
| August 2001              | Vegetation Monitoring (1 yr.)         |
| April 2002               | Site Tilled and Replanted             |
| February – November 2002 | Hydrologic Monitoring (2 yr.)         |
| August 2002              | Vegetation Monitoring (Restart 1 yr.) |
| December 2002            | Spillway Modifications                |
| February – November 2003 | Hydrologic Monitoring (3 yr.)         |
| August 2003              | Vegetation Monitoring (2 yr.)         |
| February – November 2004 | Hydrologic Monitoring (4 yr.)         |
| July 2004                | Vegetation Monitoring (3 yr.)         |
| February – November 2005 | Hydrologic Monitoring (5 yr.)         |
| August 2005              | Vegetation Monitoring (4 yr.)         |



Figure 1. Site Location Map



## 2.0 HYDROLOGY

### 2.1 Success Criteria

The success of this site is correlated to the planting elevations and to planting success. If the plantings are successful, then the grading will have been correctly correlated to the tidal fluctuations. The hydrologic monitoring aspect will involve the use of surface water monitoring gauges. Groundwater monitoring is not required at this site since it is a tidal system. The site will be considered hydrologically successful when the site is flooded twice daily. Success is determined from data taken at the Gauge 1 location (SG-1), as the other gauges are located within channels and are used for comparison of tidal elevations. It is expected that the surface water flooding will be the same as that measured for the biological benchmarks for *Spartina alterniflora*, since the grading was done to an elevation that is known to be periodically flooded. Table 1 describes each gauge and the hydrologic expectations of each. See Figure 2 for the precise location of each gauge.

**Table 1.** Gauge Description and Expectations

| Gauge | Elevation | Location                                  | Hydrologic Expectation             |
|-------|-----------|---|------------------------------------|
| SG-1  | 1.20 ft   | Low marsh between channel and high marsh. | Flood twice daily                  |
| SG-2  | -0.64 ft  | Within constructed channel of site.       | Remain flooded, daily fluctuations |
| SG-3  | -0.54 ft  | In Deer Creek adjacent to site.           | Remain flooded, daily fluctuations |

The site is monitored during the growing season. The growing season in Carteret County begins February 27 and ends November 29 (274 days). These dates correspond to a 50% probability that temperatures will drop to 28° F or lower after February 27 and before November 29.

### 2.2 Hydrologic Description

Three surface water monitoring gauges and one rain gauge were installed onsite in June 2001 (Figure 2). The surface water gauges record surface water readings every hour. The Infinity rain gauge records rainfall amounts on a daily basis.

Appendix A contains plots of the data at each surface gauge location. The set of plots shows the surface water recorded against the actual gauge elevation surveyed relative to mean sea level. Also included in Appendix A is a plot of two days of surface water data recorded at each gauge location; this plot is to illustrate that flooding occurs twice daily as required in the permit conditions. The two days in the plot were chosen at random and are representative of conditions throughout the growing season.

Figure 2. Gauge Location Map

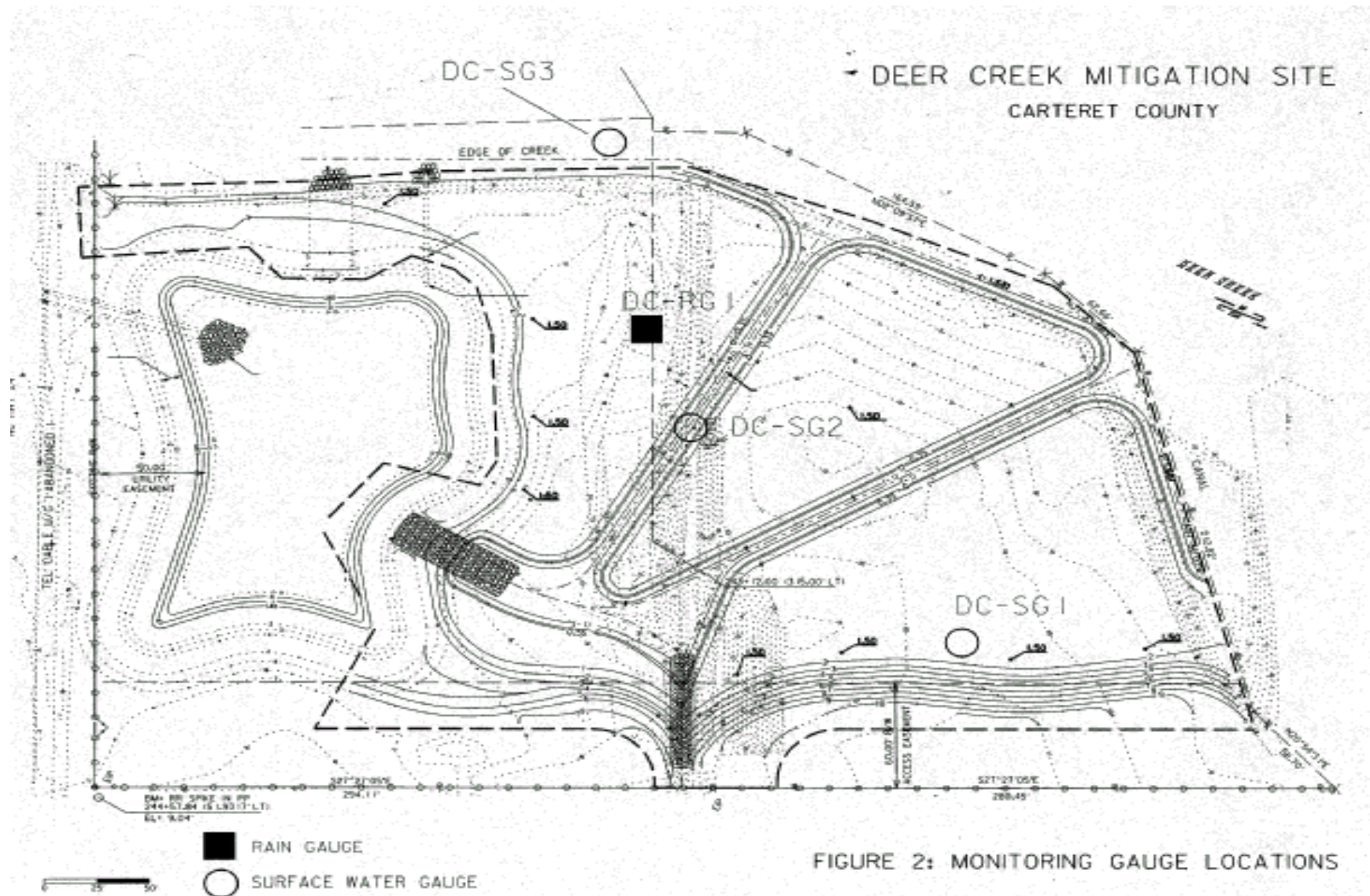


FIGURE 2: MONITORING GAUGE LOCATIONS

## **2.3 Results of Hydrologic Monitoring**

### **2.3.1 Site Data**

Gauge 1 was evaluated to determine if the site was being flooded twice daily. Tide data from Gauges 2 and 3 were evaluated for comparison.

Due to the relatively small size of the site, high tide elevations should be consistent between the three gauges. Appendix A shows both the true elevation plots for all three gauges, as well as a plot of two days of surface water data recorded at each gauge location. This graph demonstrates the twice daily heightened water levels common throughout the growing season.

### **2.3.2 Climatic Data**

Figure 3 is a depiction of the monthly on-site rainfall for 2005. In 2005, the Morehead Climate Station did not collect rainfall data, therefore no comparison between historic rainfall data and on-site rainfall data can be made. There is no on-site rainfall data available for November 2004 through March 2005. The on-site rain gauge was installed mid-April 2005. The on-site rain gauge was destroyed during Hurricane Ophelia and data is incomplete for August and September 2005.

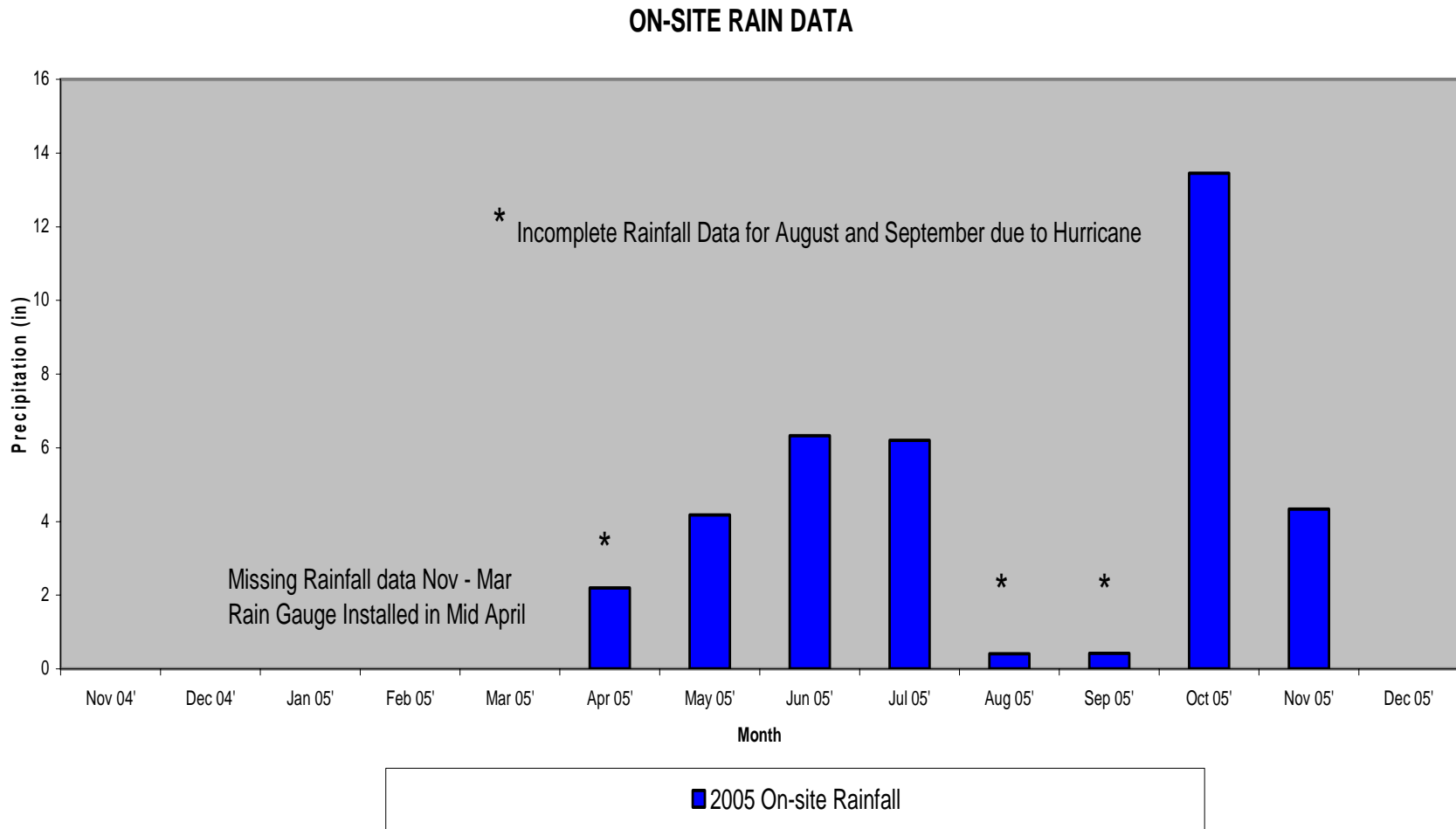
Precipitation is not the primary hydrologic input for the site; therefore, it is expected that the site would show the required flooding regardless of area rainfall totals.

## **2.4 Conclusions**

Based on the hydrology analysis for Gauge 1, the data indicates that the gauge location is flooding twice daily, as is required. The surface water elevations for Gauge 1 are comparable with Gauge 2 and Gauge 3.

Based on successful monitoring results, NCDOT recommends discontinuing hydrologic monitoring for this site.

**Figure 3. Deer Creek On-site Rainfall Data**



### **3.0 VEGETATION: DEER CREEK (YEAR 4 MONITORING)**

#### **3.1 Success Criteria**

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met:

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

#### **3.2 Description of Species**

The following marsh grass species were planted in the Wetland Restoration Area:

*Spartina patens*, Saltmeadow Cordgrass

*Spartina alterniflora*, Smooth Cordgrass

### 3.3 Results of Vegetation Monitoring

**Table 2.** Vegetation Monitoring Results

| Plot #  | Scale Factor | <i>Spartina patens</i> | <i>Spartina alterniflora</i> | Frequency | Comments                      |
|---|--------------|------------------------|------------------------------|-----------|-------------------------------|
| 1   | 5.0          |                        | ■                            | ■         |                               |
| 2   | 5.0          |                        | ■                            | ■         |                               |
| 3   | 5.0          | ■                      | ■                            | ■         | pennywort                     |
| 4   | 5.0          |                        | ■                            | ■         |                               |
| 5   | 4.0          |                        | ■                            | ■         |                               |
| 6   | 5.0          |                        | ■                            | ■         | glasswort                     |
| 7   |              |                        |                              |           | Open Water                    |
| 8   | 5.0          |                        | ■                            | ■         |                               |
| 9   | 5.0          |                        |                              |           | <i>Juncus</i> sp., wax myrtle |
| 10  | 5.0          |                        | ■                            | ■         |                               |
| 11  | 5.0          | ■                      | ■                            | ■         |                               |
| 12  | 5.0          |                        | ■                            | ■         |                               |
| 13  | 2.0          | ■                      |                              | ■         | <i>Juncus</i> sp.             |
| 14  |              |                        |                              |           | Open Water                    |
| 15  | 5.0          |                        | ■                            | ■         |                               |
| 16  | 5.0          |                        | ■                            | ■         |                               |
| 17  | 5.0          |                        | ■                            | ■         |                               |
| 18  | 5.0          |                        | ■                            | ■         | glasswort                     |
| 19  | 5.0          |                        | ■                            | ■         |                               |
| 20  | 5.0          |                        | ■                            | ■         |                               |
| 21  | 4.0          | ■                      | ■                            | ■         | pennywort                     |
| 22  |              |                        |                              |           | Open Water                    |
| 23  | 5.0          |                        | ■                            | ■         |                               |
| 24  | 5.0          |                        | ■                            | ■         |                               |
| 25  | 5.0          |                        | ■                            | ■         |                               |
| 26  | 4.0          | ■                      |                              | ■         | cattail, pennywort            |
| 27  | 2.0          |                        | ■                            | ■         | glasswort                     |
| 28  | 5.0          |                        | ■                            | ■         |                               |
| 29  |              |                        |                              |           | Open Water                    |
| 30  | 5.0          | ■                      |                              | ■         |                               |
| Frequency (Percentage of Plots<br>with Desired Species) |              | 23.1%                  | 84.6%                        | 96.2%     |                               |
| Sum Scale Value   |              |                        |                              | 121.0     |                               |
| Total Number of Plots                                   |              |                        |                              | 26        |                               |
| Vegetative Cover (Scale Value)                          |              |                        |                              | 4.65      |                               |

### 3.4 Conclusions

Percent Frequency of Target Species      **96.2 %**

Frequency of 70% required.

Vegetative Cover Scale Value              **4.65**

Scale Value of 5 required for year 5.

Site was tilled for compaction and replanted with 7,300 Smooth Cordgrass plants in April 2002. Vegetation on site has improved greatly. Frequency and coverage are on track for year 4. Site was monitored in 2005 during high tide.

NCDOT will continue vegetation monitoring at the Deer Creek Mitigation Site.

### 4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The 2005-monitoring year represents the fifth year of hydrology monitoring and the fourth year of vegetation monitoring following replanting of the site.

Hydrologic monitoring of the three surface water gauges indicated that the site was consistently inundated, with surface water levels varying with the tides. Vegetation monitoring yielded a successful 96.2% frequency of target species and 4.65 vegetative coverage. Field observations have shown that the site floods regularly.

Based on successful monitoring results, NCDOT recommends discontinuing hydrologic monitoring for this site. NCDOT will continue vegetation monitoring on the Deer Creek Mitigation Site.

**APPENDIX A**  
**GAUGE DATA GRAPHS**

**APPENDIX B**  
**SITE PHOTOGRAPHS**

# Deer Creek



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5  
August 2005



Photo 6




# Deer Creek



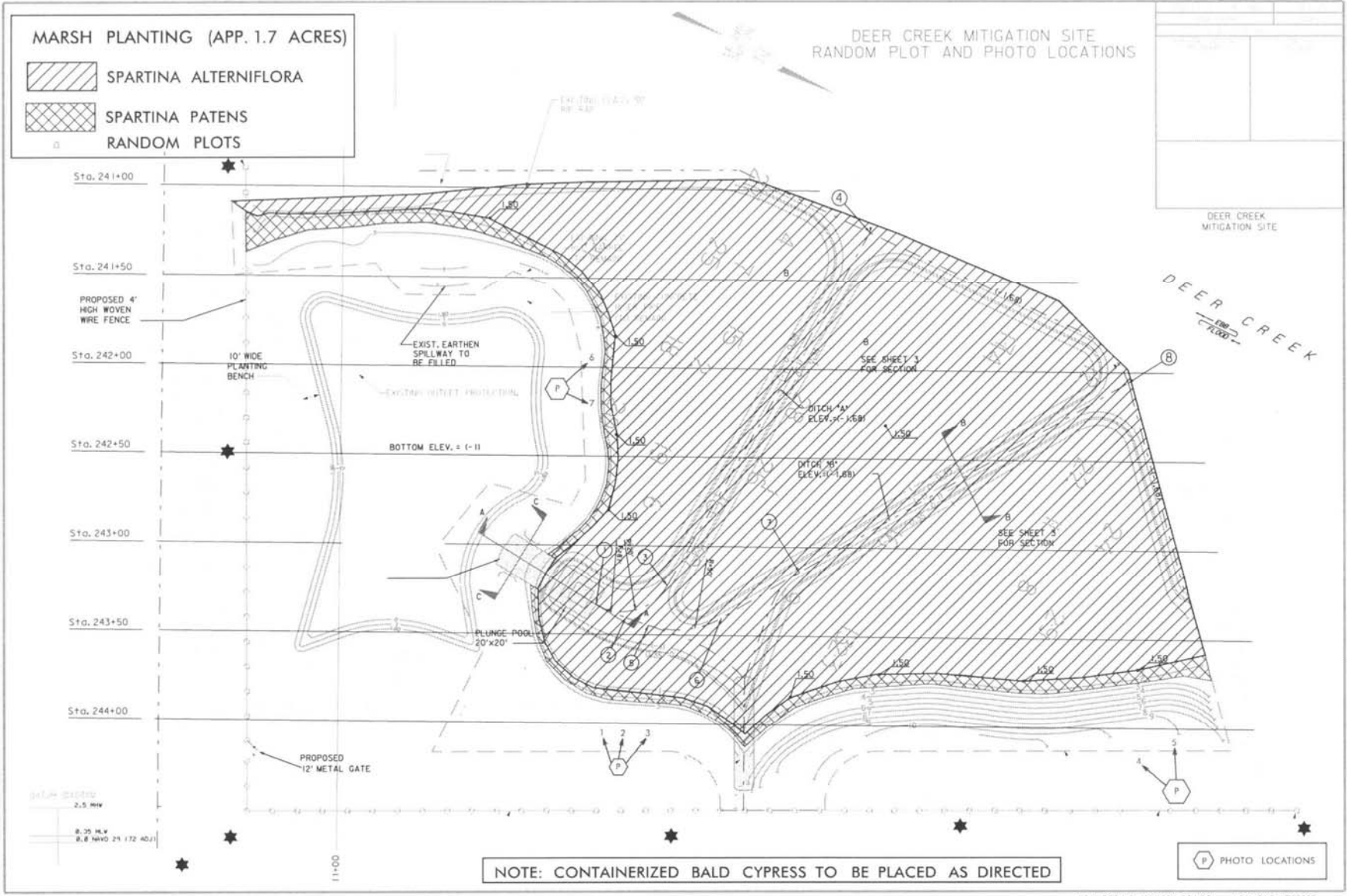
Photo 7

**APPENDIX C**  
**VEGETATION PLANTING PLAN**  
**&**  
**RANDOM PLOT LOCATIONS**

MARSH PLANTING (APP. 1.7 ACRES)

-  SPARTINA ALTERNIFLORA
-  SPARTINA PATENS
-  RANDOM PLOTS

DEER CREEK MITIGATION SITE  
RANDOM PLOT AND PHOTO LOCATIONS



NOTE: CONTAINERIZED BALD CYPRESS TO BE PLACED AS DIRECTED

 PHOTO LOCATIONS

Deer Creek  
2005 Monitoring  
Random Plot Locations

