# ANNUAL REPORT FOR 2004

**Waste Water Treatment Mitigation Site**

**New Hanover County**

**Project No. 8.2250109**

**TIP No. U-92 A/B**

Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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## SUMMARY

The following report summarizes the monitoring activities that have occurred in 2004 at the Waste Water Treatment Mitigation Site. The 2004-year represents the first year of hydrology and vegetation monitoring following construction. The site must demonstrate success for a minimum of five years or until the site is deemed successful. The site was constructed to serve as mitigation for impacts associated with the construction of U92-A/B for the Smith Creek Parkway.

A tidal gauge was installed at the Bridge Maintenance site in July 2000 and was used as a reference for the Smith Creek, Waste Water Treatment, and County Sites. Tidal data was collected from July 2000 to July 2004. These sites were graded to elevations based on this tidal data.

Hydrologic monitoring utilizes four surface water gauges located on the adjacent County Mitigation Site and a reference gauge located on the Bridge Maintenance Mitigation Site. These gauges monitor the tidal regime to confirm the site's flooding period.

An onsite agency meeting was held in July 2004. At this time, it was agreed to remove the surface water gauge at the Bridge Maintenance Site since there was sufficient past tidal data. The available tidal data for the Bridge Maintenance gauge revealed inundation for 25.6% from February to July (2004). The four surface water gauges at the County Site were compared to the reference gauge. Three of the four surface gauges indicated that the site was inundated 100% of the growing season (hourly readings), while one gauge revealed 94.8%. For the gauge data provided, all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

Vegetation monitoring is required for five years. Vegetation monitoring of the baldcypress area revealed an average tree density of 108 trees per acre. This average is above the minimum success criteria of 50 trees per acre. For the marsh grass area, the target species and scale values were 96% and 4.4, respectively; the marsh grass area is on track for the first year of monitoring.

During the July 2004 onsite agency meeting, it was agreed that NCDOT could propose to remove the four surface water gauges at the County Site if there was successful tidal data during the 2004-monitoring season. Based on the hydrology and vegetation success for the 2004-monitoring year, NCDOT proposes to remove the gauges and discontinue monitoring.

# 1.0 INTRODUCTION

## 1.1 Project Description

The Waste Water Treatment Mitigation Site is located in New Hanover County, adjacent to Bridge Maintenance and the U-92B project in Wilmington (Figure 1). Totaling 0.71 acre in size, the site provides tidal swamp forest creation mitigation for a portion of the wetland impacts associated with U-92A/B (Figure 2).

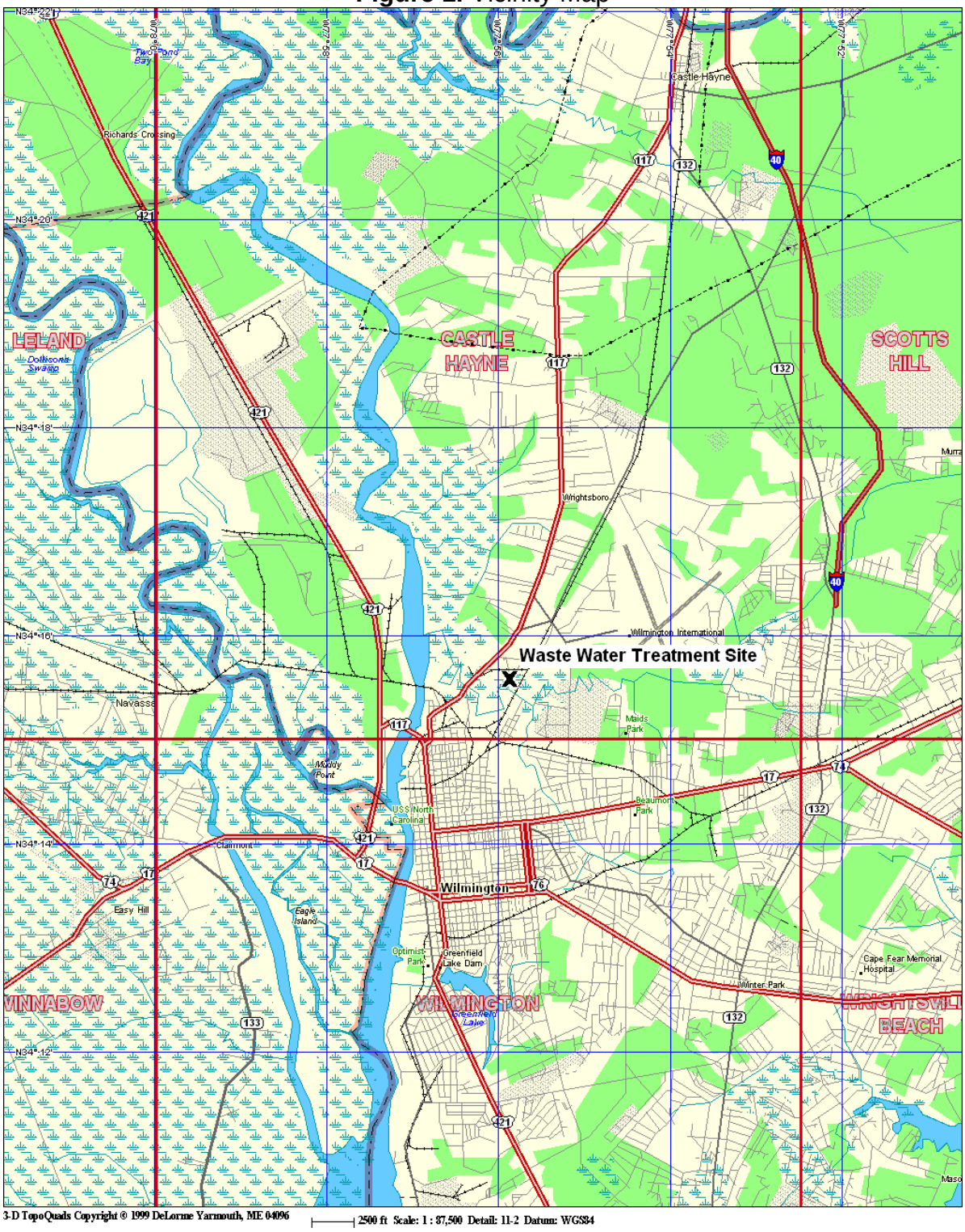
## 1.2 Purpose

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. The following report describes the results of both hydrologic and vegetation monitoring for the 2004-year (the first year of monitoring).

## 1.3 Project History U-92 Wastewater Treatment Site

| | |
|---|---|
| February 2004 | Baldcypress Planted |
| April 2004 | Marsh Grass Planted |
| March-November 2004 | Hydrology Monitoring (1 yr.) |
| August 2004 | Vegetation Monitoring (1 yr.) |

**Figure 1.** Vicinity Map



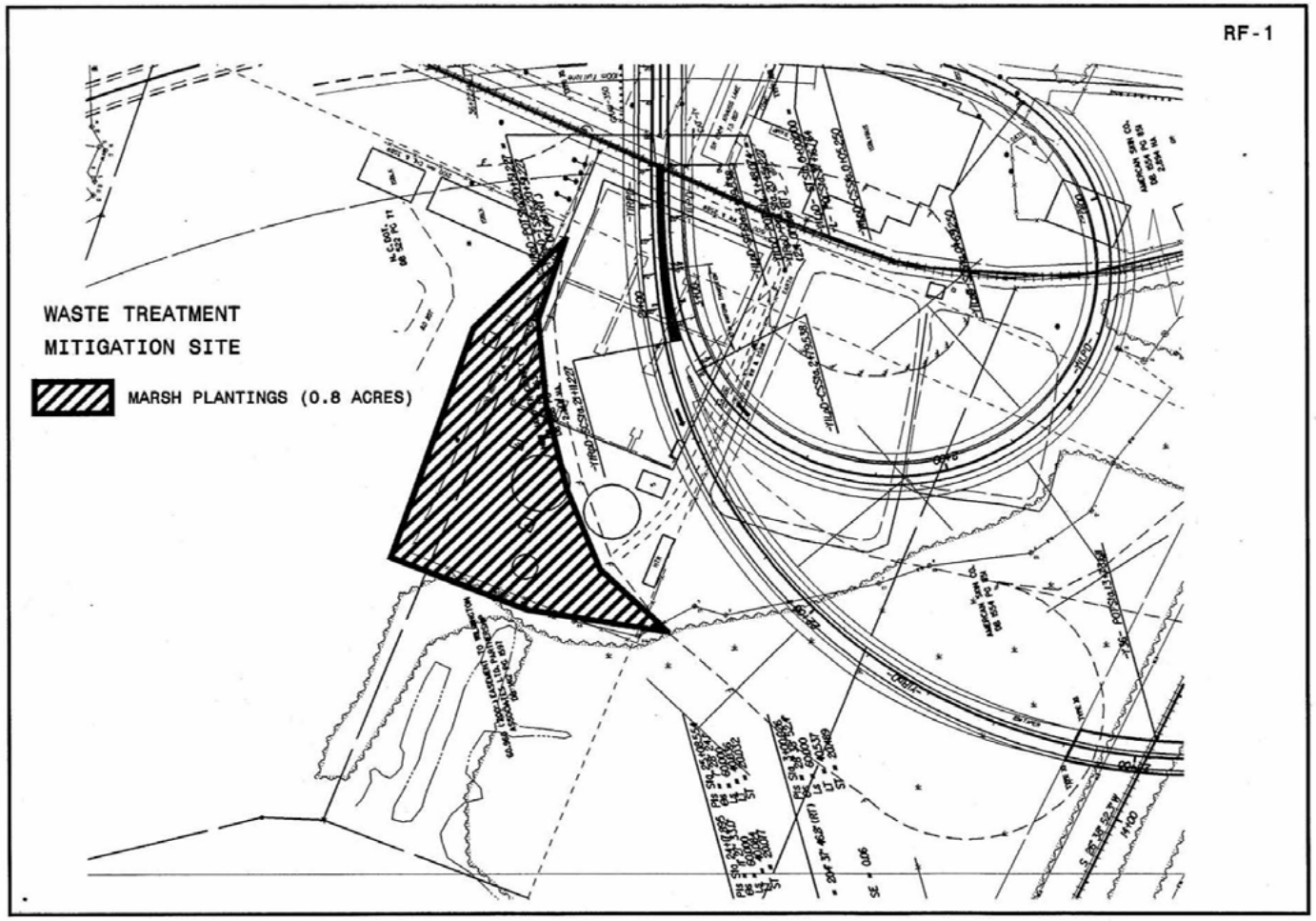



**Figure 2.** Site Location Map

# 2.0 HYDROLOGY

## 2.1 Success Criteria

Hydrology monitoring for the Waste Water Mitigation Site is conducted at the adjacent County Mitigation Site. Data from an offsite tide gauge located at the adjacent Bridge Maintenance Site (collected 02-27-04 through 07-14-04) was used as a baseline to estimate the percentage of time that the site should remain flooded, at specific elevations. A target elevation of 2.5 feet above mean sea level was selected for the Waste Water Mitigation Site. Using the baseline data and the proposed elevation, the Waste Water Site will be considered hydrologically successful if the adjacent County Site is inundated for 25.6% of the growing season, from February 27 to November 26 (271 days).

## 2.2 Hydrologic Description

Appendix A contains a plot of the water depth for each surface gauge at the County Mitigation Site. Monitoring results are shown for the 2004-growing season. The actual average elevation across the site is 2.5'. It was calculated from the as-built drawings provided by Division Construction personnel.

## 2.3 Results of Hydrologic Monitoring

### *2.3.1 Site Data*

Appendix A includes graphs of the data recorded at each surface water gauge at the County Mitigation Site. Since the site is a tide-driven system, groundwater and rain gauges were not installed.

### *2.3.2 Climatic Data*

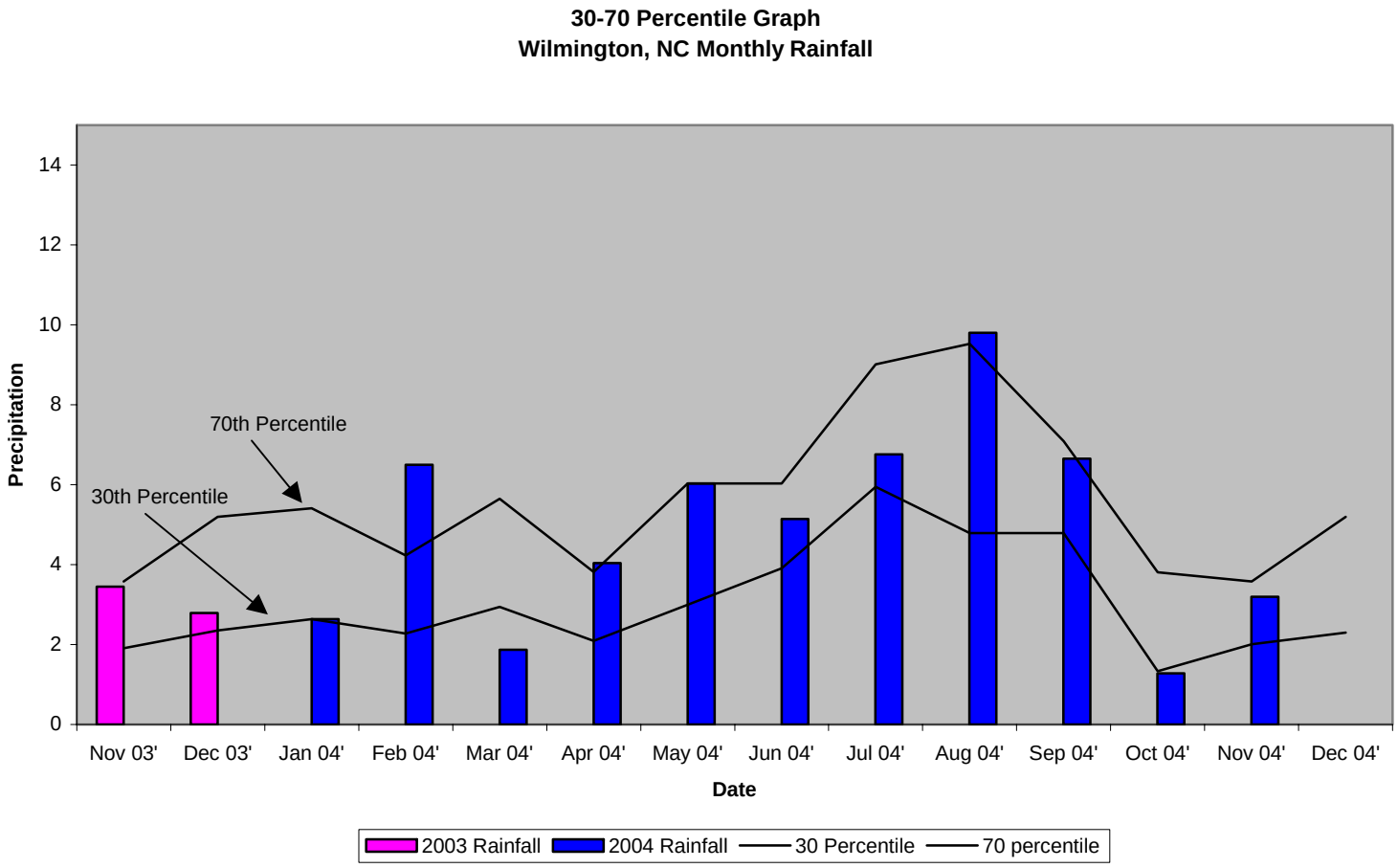
Figure 3 examines the local climate in comparison with historical data in order to determine whether 2004 was "average" in terms of climate conditions. The two lines represent the 30$^{th}$ and 70$^{th}$ percentiles of monthly precipitation for Wilmington, NC. The bars are monthly rainfall totals for 2003 and 2004. The historical data was collected from the State Climate Office of North Carolina.

For the 2004-year, February and August experienced above average rainfall. The months of March and October recorded below average rainfall for the site. November (03'), December (03'), January, April, May, June, July, September, and November experienced average rainfall. Overall, 2004 was an average rainfall year at the Waste Water Mitigation Site.

## 2.4 Conclusions

The 2004-year represents the first year of hydrologic monitoring for the Waste Water Treatment Mitigation Site. The four surface water gauges located at the County Mitigation Site were compared to the reference gauge located at the Bridge Maintenance Site. Three of the four surface gauges at the County Site indicated that the site was inundated for 100% of the growing season (hourly readings), while one gauge revealed 94.8%. For the data provided, all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

**FIGURE 3:** 2004 30-70 Percentile Graph



# 3.0 VEGETATION: U-92 WASTE WATER TREATMENT SITE (YEAR 1 MONITORING)

## 3.1A Success Criteria (Baldcypress Area)

One 50' x 50' plot has been set and will be counted as part of the vegetation monitoring for the site.

> The site will be considered a success for the baldcypress if there are 50 five-year old trees per acre after the end of the fifth growing season….changes in the hydrology of Smith Creek have caused the decline in natural baldcypress populations, and it is uncertain if the planted baldcypress trees will survive. If the baldcypress survivorship declines to below the success criteria, then the Department of Transportation will consult with the Corps of Engineers to determine appropriate action.
>
> Establishment of cypress trees over the restoration area of the Waste Water Treatment Site is proposed, although there is evidence that they may not survive because of increases in salinity, tidal amplitude, and sea level (Hackney and Yelverton, 1990). Consequently, if cypress mortality occurs and the area develops into an emergent marsh community, the vegetational success criteria will be based on emergent marsh vegetation.

## 3.1B Success Criteria (Marsh Grass Area)

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 to 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.

### 3.2A & B Description of Planted Areas

The following plant communities were planted throughout the Waste Water Treatment Site: Approximately 0.71-acre.

*Spartina cynosuroides*, Big Cordgrass

*Cladium jamaicense*, Sawgrass

*Taxodium distichum*, Baldcypress

### 3.3A Results of Vegetation Monitoring (Baldcypress Area)

| Plot # | Baldcypress (1 Year) | Total (at planting) | Density (trees/acre) |
|---|---|---|---|
| 1 | 9 | 9 | 108 |
| AVG. DENSITY | | | 108 |

## 3.3B Results of Vegetation Monitoring (Marsh Grass Area)

| ZONE | Plot # | Scale Factor | *Spartina cynosuroides* | *Cladium jamaicense* | Frequency | Notes |
|---|---|---|---|---|---|---|
| 1 | 1 | 3.0 | | | | |
| | 2 | 5.0 | | | | |
| | 3 | | | | | Open Water |
| | 4 | 5.0 | | | | |
| | 5 | | | | | Open Water |
| | 6 | 5.0 | | | | |
| | 7 | 5.0 | | | | |
| | 8 | 5.0 | | | | |
| | 9 | 5.0 | | | | |
| | 10 | 4.0 | | | | |
| | 11 | 5.0 | | | | |
| | 12 | 4.0 | | | | |
| | 13 | 5.0 | | | | |
| | 14 | 3.0 | | | | |
| | 15 | 3.0 | | | | |
| | 16 | 5.0 | | | | |
| | 17 | | | | | Open Water |
| | 18 | 5.0 | | | | |
| | 19 | 5.0 | | | | |
| | 20 | 3.0 | | | | |
| | 21 | 5.0 | | | | |
| | 22 | 5.0 | | | | |
| | 23 | 5.0 | | | | |
| | 24 | 4.0 | | | | |
| | 25 | 2.0 | | | | |
| | 26 | 5.0 | | | | |
| | 27 | 4.0 | | | | |
| | 28 | 5.0 | | | | |
| | 29 | 5.0 | | | | |
| | 30 | 4.0 | | | | |
| | | | | | | |
| **Freqency (Percentage of Plots with Desired Species)** | | | | | **96%** | |
| **Sum Scale Value** | | | | | **119** | |
| **Total Number of Plots Counted** | | | | | **27** | |
| **Vegetative Cover (Scale Value)** | | | | | **4.4** | |

**Site Notes**: The following species were also noted in the monitoring plots. The percentage of plots the species were found in is following the species in parentheses (i.e. 8% of the plots contain *Scirpus* sp.): *Scirpus* sp. (8), *Hypericum* sp. (13), *Sagittaria* sp. (4), cattail (25), and *Pluchea* sp. (3).

### 3.4A Conclusions (Baldcypress Area)

Baldcypress trees were planted on 20' centers throughout the approximately 0.71-acre site. One 50' x 50' plot was established in the planting area. The vegetation monitoring of the planted area revealed an average of 108 baldcypress trees per acre.

### 3.4B Conclusions (Marsh Grass Area)

- Percent Frequency of Target Species (Big Cordgrass and Sawgrass)

  Frequency of 70% required. **96%**

- Vegetative Cover Scale Value

  Scale Value of 5 required for year 5. **4.4**

Approximately 0.71-acre of this site involved marsh grass plantings. There were thirty random plots established throughout the planting area. These plots were located with GPS. Based upon the percent frequency and the scale value, the marsh grass area is on track for the first year of monitoring.

## 4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

An onsite agency meeting was held in July 2004. At this time, it was agreed to remove the surface water gauge at the Bridge Maintenance Site since there was sufficient past tidal data. The available tidal data for the Bridge Maintenance gauge revealed inundation for 25.6% from February to July (2004). The four surface water gauges at the County Site were compared to the reference gauge. Three of the four surface gauges indicated that the site was inundated 100% of the growing season (hourly readings), while one gauge revealed 94.8%. For the gauge data provided, all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

Baldcypress trees were planted on 20' centers throughout the approximately 0.71-acre site. Vegetation monitoring of the baldcypress area revealed an average tree density of 108 trees per acre. This average is above the minimum success criteria of 50 trees per acre. Approximately 0.71-acre of this site involved marsh grass plantings. For the marsh grass area, the target species and scale values were 96% and 4.4, respectively; the marsh grass area is on track for the first year of monitoring.

During the July 2004 onsite agency meeting, it was agreed that NCDOT could propose to remove the four surface water gauges at the County Site if there was successful tidal data during the 2004-monitoring season. Based on the hydrology and vegetation success for the 2004-monitoring year, NCDOT proposes to remove the gauges and discontinue monitoring.

# APPENDIX A

# GAUGE GRAPHS

# APPENDIX B

# SITE PHOTOS

# &

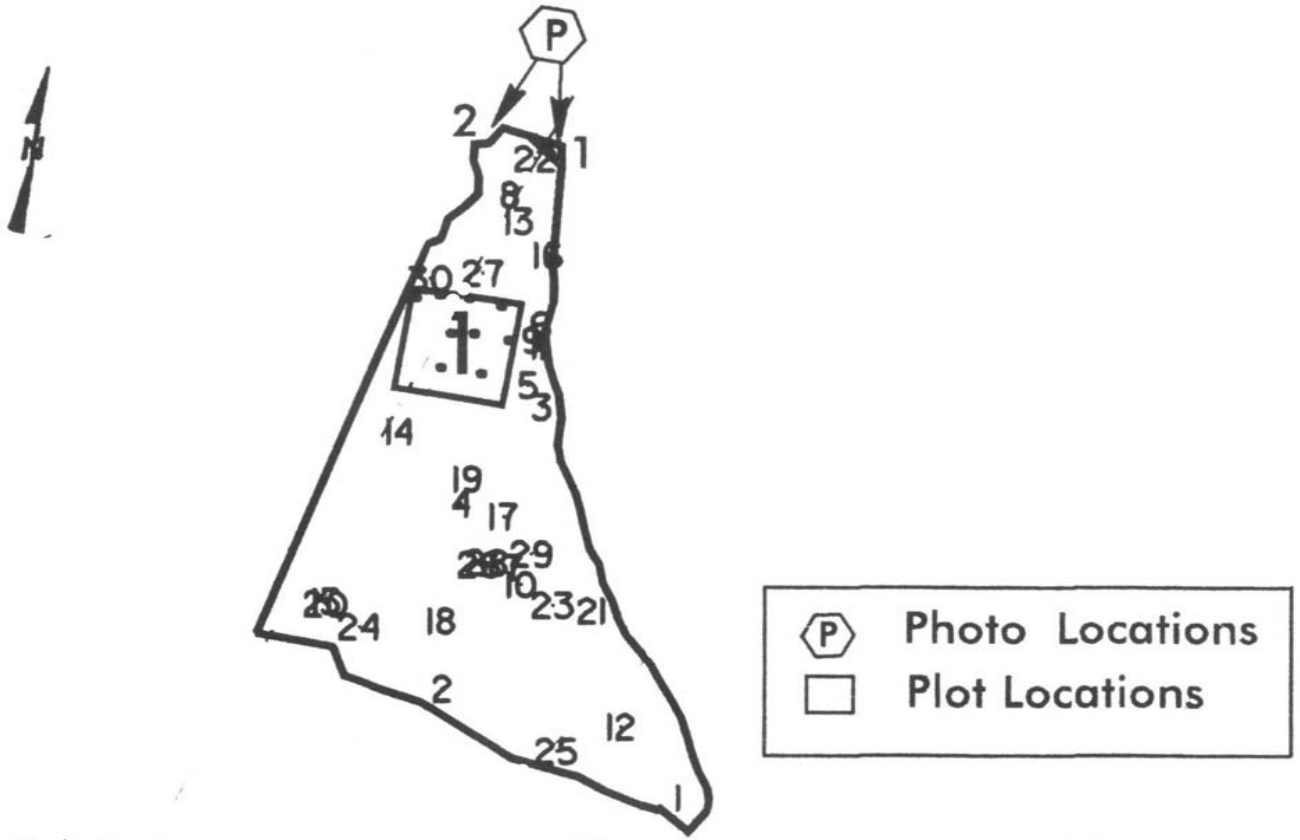
# PLOT AND PHOTO LOCATIONS MAP

# Waste Water Treatment Site

Photo 1

Photo 2

2004




# Wastewater Treatment Site

Photo, Plot, and Random Point Locations