ANNUAL REPORT FOR 2003

Bridge Maintenance Mitigation Site

New Hanover County

Project No. 8.2250109

TIP No. U-92 WM

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North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in 2003 at the Bridge Maintenance Mitigation Site, representing the fourth year of monitoring on the Phase One section.

This site will be constructed in two phases. Phase One, which will encompass the majority of the site (5.76 acres), involved grading and planting up to the right-of-way limits for the proposed Section A of the Smith Creek Parkway. Phase Two will involve the remainder of the site (0.63 acre) inside of the right-of-way boundary, up to ten feet outside of the fill slope. It will be completed during construction of Section A of the Smith Creek Parkway.

The site is equipped with one surface water gauge that was installed in July 2000. Since the site is a tide-driven system, groundwater and rain gauges were not installed. The surface gauge indicated that the site was inundated on a daily basis for 49.3% of the growing season; therefore, it did not technically meet the 56% inundation criteria (due to interruptions in the data collection). The data interruptions were caused by limitations in the storage capabilities of the surface gauge. Currently, the surface gauge is set to record hourly water levels. Future downloads will reflect 3-hour intervals, thus alleviating the data interruption problem.

Based on the 2002 vegetation-monitoring results, three-gallon bald cypress trees were supplementary planted in February 2003. The 2003 vegetation monitoring of the bald cypress area revealed an average tree density of 103 trees per acre. This average is above the minimum success criteria of 50 trees per acre.

Due to the significant coverage of cattails in the marsh grass area, there were no random GPS points calculated. Based on a visual evaluation, it was estimated that there is approximately 80% coverage by cattails, 15% coverage by sawgrass, and 5% coverage by other marsh grass species. A small area of phragmites was noted in the marsh grass area. This area will be further evaluated to determine what remedial actions, if any, are necessary.

Based on monitoring results for 2003, NCDOT recommends that monitoring continue at the Bridge Maintenance Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Bridge Maintenance Mitigation Site is located in New Hanover County, adjacent to Smith Creek and the U-92A project in Wilmington (Figure 1). Totaling 6.4 acres in size, the site provides compensatory mitigation for a portion of the wetland impacts associated with U-92C. Phase One of the site (5.76 acres) has been constructed and planted and Phase Two will be constructed concurrent with construction of U-92A. The site consists of tidal Cypress-Gum Swamp Forest restoration and contains a system of swales to facilitate drainage as the tide goes out and to help prevent ponding.

1.2 Purpose

In order to demonstrate successful mitigation, the Bridge Maintenance Site is monitored for both hydrology and vegetation. The following report describes the results of both hydrologic and vegetation monitoring for the 2003-year (the fourth year of monitoring).

1.3 Project History

March- May 2000	Site Constructed – Phase 1
May 2000	Site Planted – Phase 1
July 2000	Surface Water Gauge Installed
July- December 2000	Hydrologic Monitoring (Year 1)
August 2000	Vegetation Monitoring (Year 1)
February – November 2001	Hydrologic Monitoring (Year 2)
September 2001	Vegetation Monitoring (Year 2)
February-November 2002	Hydrologic Monitoring (Year 3)
October 2002	Vegetation Monitoring (Year 3)
February 2003	Site Supplemental Planting (3 gal. Baldcypress)
February-November 2003	Hydrologic Monitoring (Year 4)
August 2003	Vegetation Monitoring (Year 4)

1.4 Debit Ledger

The Bridge Maintenance Mitigation Site serves entirely (6.4 acres) as onsite restoration mitigation for U-92.

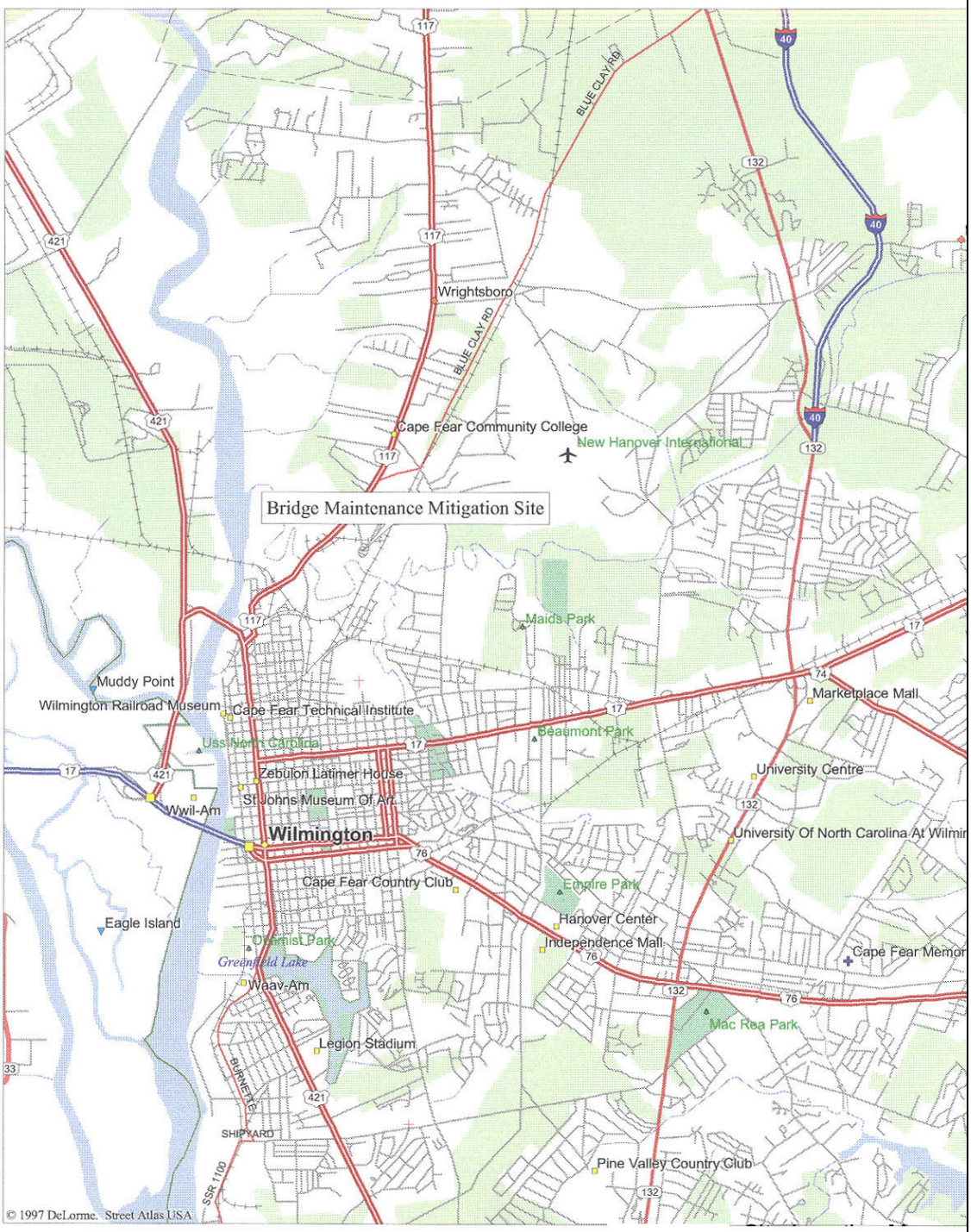


FIGURE 1. Site Location Map

2.0 HYDROLOGY

2.1 Success Criteria

Groundwater monitoring is not required at this site because it is a tidal system. Instead, data from an onsite tide gauge (collected 10-10-96 through 11-21-97) 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 based on elevations of desired vegetation communities at the adjacent proposed Smith Creek Mitigation Site. Using the '96/'97 data, this would result in the site being inundated for 37% of the growing season.

Subsequently, but prior to construction, it was decided that an elevation of 2.5 feet was too high, based on the elevation of the adjacent wetland to the east. An onsite meeting was held with the Corps of Engineers in January 2000 to discuss this issue. They agreed that lowering the proposed grade to an elevation of approximately 1.0 foot above mean sea level at the edge of the creek (match to existing mudflat) and then gradually sloping up to an elevation of approximately 1.8 feet above mean sea level at the upper edge of the site would be acceptable.

Revised calculations of the inundation time, based on the '96/'97 data, yielded an inundation result of 56% for the proposed average elevation of the site (1.4 feet). Therefore, the site will be considered hydrologically successful if it is inundated for 56% of the growing season, from February 27 to November 26 (271 days).

2.2 Hydrologic Description

One 40-inch surface gauge, set to record hourly readings, was installed in July of 2000 (Figure 2). The elevation of the calibration point of the gauge was located using survey equipment, and was found to be at 33 inches above sea level. On November 6, 2000, the gauge was raised 12 inches on the pole to avoid being submerged during high water, making it 45 inches above sea level.

Appendix A contains a plot of the water depth for the surface gauge. Monitoring results are shown for the 2003-growing season. The actual average elevation across the site (16.8 inches) is also shown on this graph. It was calculated from elevation data taken on the same day that the elevation of the surface water gauge calibration point was determined.

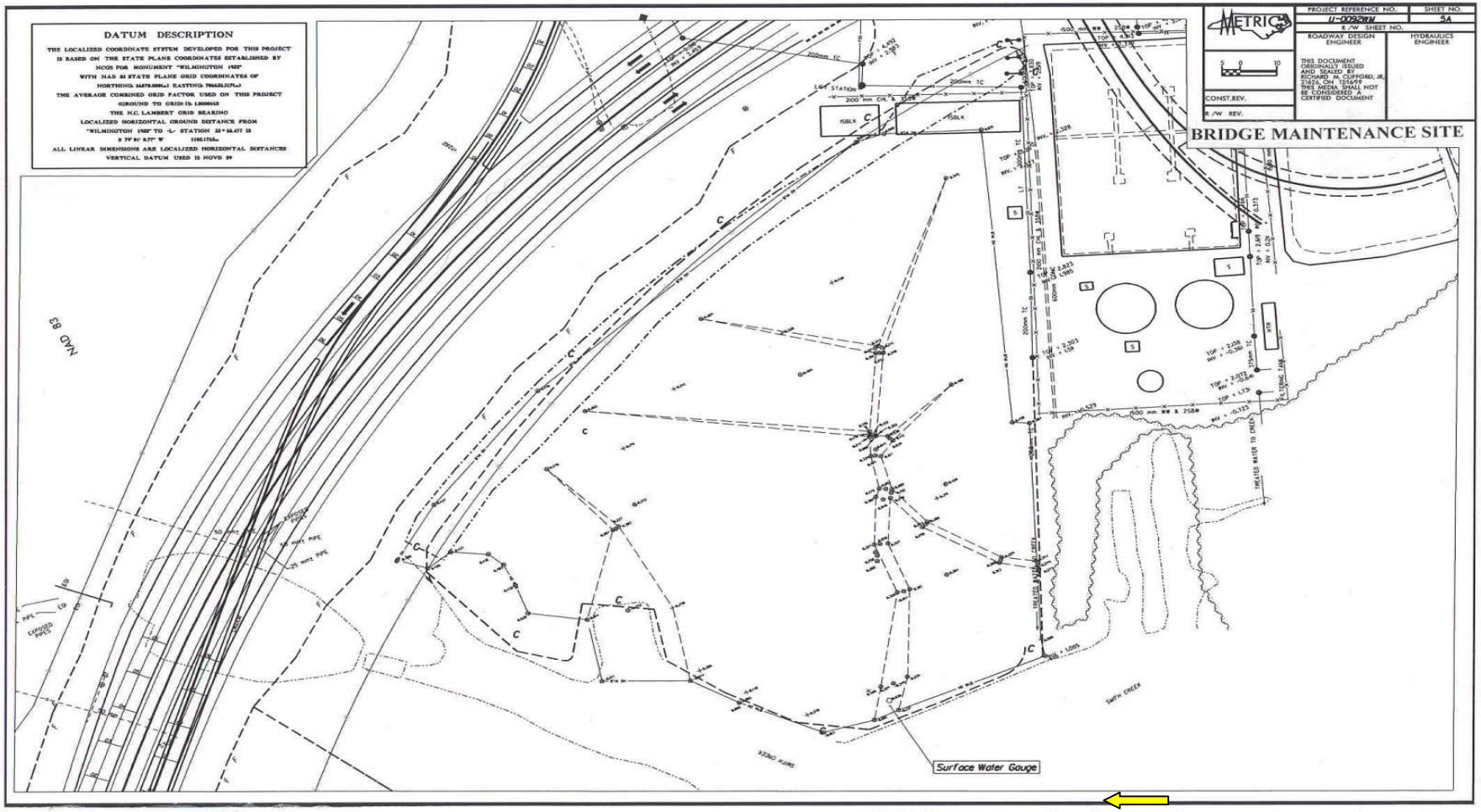


FIGURE 2. Surface Gauge Location Map

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The surface gauge indicated that the site was inundated on a daily basis for 49.3% of the growing season. Appendix A contains a plot of data recorded at the surface gauge on the Bridge Maintenance Site. Since the site is a tide-driven system, groundwater and rain gauges were not installed.

2.3.2 Climatic Data

Figure 3 represents an examination of the local climate in comparison with historical data in order to determine whether 2003 was “average” in terms of climate conditions. The two lines represent the 30th and 70th percentiles of monthly precipitation for Wilmington, NC. The bars are monthly rainfall totals for 2002 and 2003. The historical data was collected from the State Climate Office of North Carolina.

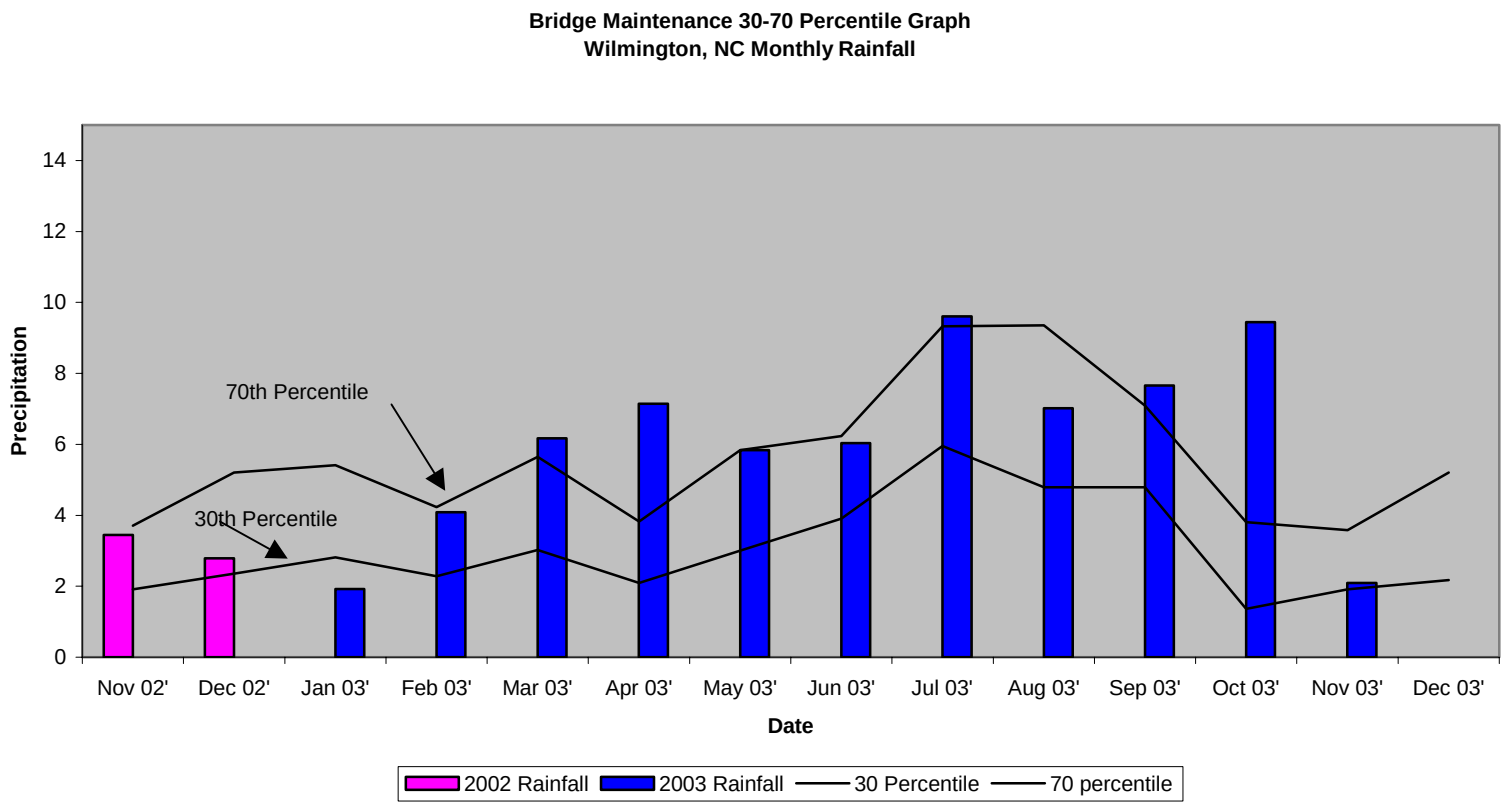
For the 2003-year, March, April, July, September, and October experienced above average rainfall. The month of January recorded below average rainfall for the site. November (02’), December (02’), February, May, June, August, and November experienced average rainfall. Overall, 2003 experienced an average rainfall year.

2.4 Conclusions

The surface gauge indicated inundation (daily) for 49.3% of the growing season; therefore, it did not technically meet the 56% inundation criteria (due to interruptions in the data collection). The data interruptions were caused by limitations in the storage capabilities of the surface gauge. Currently, the surface gauge is set to record hourly water levels. Future downloads will reflect 3-hour intervals, thus alleviating the data interruption problem.

NCDOT will continue to monitor the Bridge Maintenance Site for hydrology.

FIGURE 3: 2003 30-70 Percentile Graph



3.0 VEGETATION: BRIDGE MAINTENANCE MITIGATION SITE (YEAR 4 MONITORING)

3.1A Success Criteria (Baldcypress Area)

Two 100' x 100' plots have been set and will be counted as part of the vegetation monitoring for the site.

The revised mitigation plan for the Bridge Maintenance Site dated November 30, 1999 states:

> 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.

The plan also states:

> Establishment of cypress trees over the restoration area of the Bridge Maintenance 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 species were planted throughout the Bridge Maintenance Site:

Approximately 5.7 acres

Spartina cynosuroides, Big Cordgrass

Spartina alterniflora, Smooth Cordgrass

Cladium jamaicense, Sawgrass

Taxodium distichum, Baldcypress

3.3A Results of Vegetation Monitoring (Baldcypress Area)

Plot #	Baldcypress (4 year)	Total (at planting)	Density (trees/acre)
1	28	30	101
2	27	28	104
AVG. DENSITY			103

Site Notes: Three-gallon baldcypress trees were supplementary planted at the Bridge Maintenance Site in February 2003.

3.3B Results of Vegetation Monitoring (Marsh Grass Area)

Based on a visual evaluation of the site, it was estimated that there is approximately 80% coverage of cattails, 15% coverage of sawgrass, and 5% coverage of other marsh grass species.

3.4A Conclusions (Baldcypress Area)

Baldcypress trees were planted on twenty feet centers throughout the 5.7-acre site. Two 100' x 100' plots were established in the planting area. Based on the 2002 vegetation-monitoring results, three-gallon bald cypress trees were supplementary planted in February 2003. The 2003 vegetation monitoring of the site revealed an average tree density of 103 trees per acre. This average is above the minimum success criteria of 50 trees per acre.

NCDOT will continue vegetation monitoring of the baldcypress area on the Bridge Maintenance Mitigation Site.

3.4B Conclusions (Marsh Grass Area)

Due to the significant coverage of cattails in the marsh grass area, there were no random GPS points calculated. Based on a visual evaluation, it was estimated that there is approximately 80% coverage by cattails, 15% coverage by sawgrass, and 5% coverage by other marsh grass species. A small area of phragmites was noted in the marsh grass area. This area will be further evaluated to determine what remedial actions, if any, are necessary.

NCDOT will continue visual vegetation monitoring of the marsh grass area at the Bridge Maintenance Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

During this fourth year of monitoring, the surface gauge indicated that the site experienced inundation (daily) for 49.3% of the growing season; therefore, it did not technically meet the 56% inundation criteria (due to interruptions in the data collection). The data interruptions were caused by limitations in the storage capabilities of the surface gauge. Currently, the surface gauge is set to record hourly water levels. Future downloads will reflect 3-hour intervals, thus alleviating the data interruption problem.

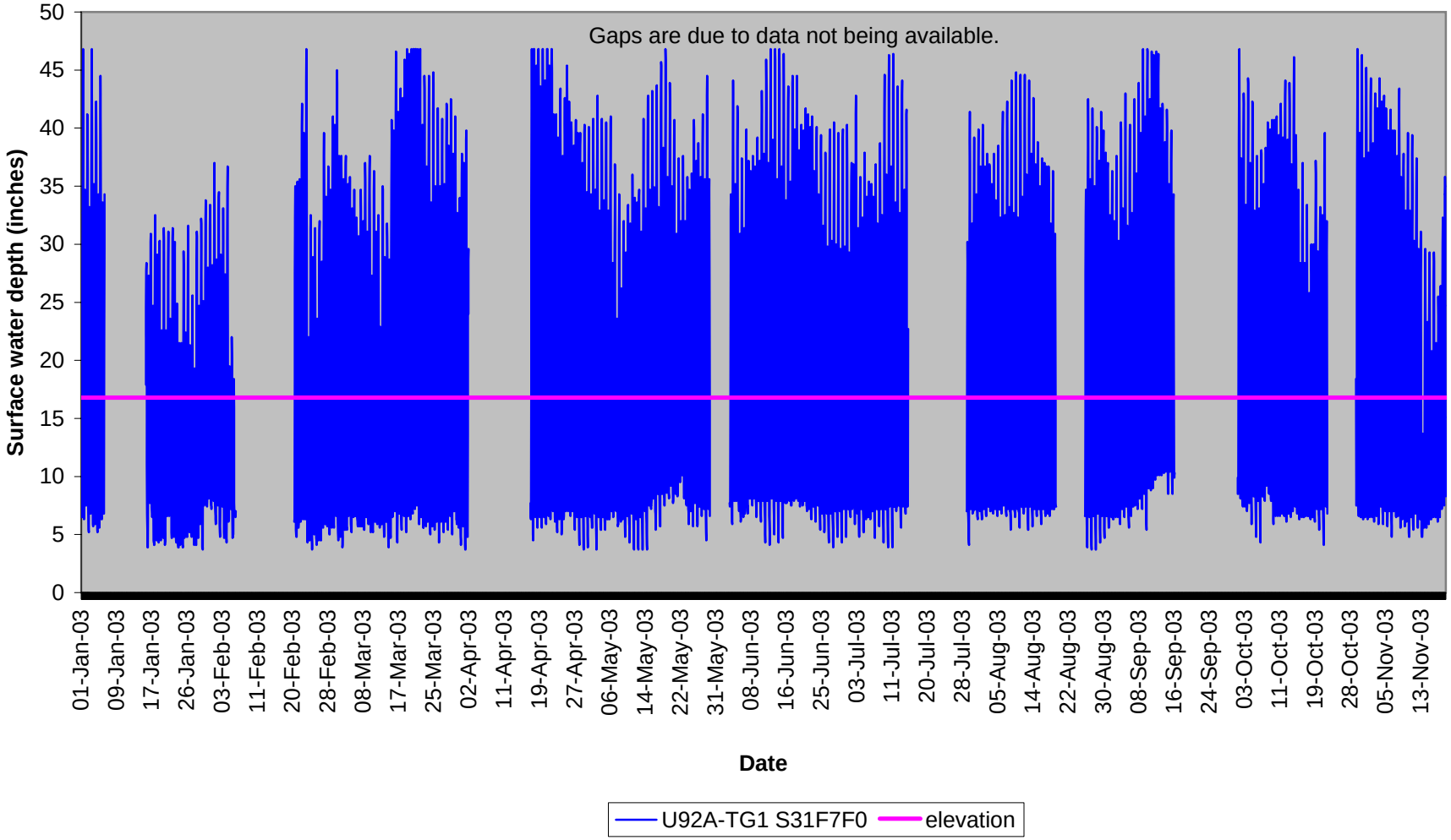
The 2003 vegetation monitoring of the bald cypress area revealed an average tree density of 103 trees per acre. This average is above the minimum success criteria of 50 trees per acre. Due to the significant coverage by cattails, a visual evaluation was performed in the marsh grass area. It was estimated that there is approximately 80% coverage by cattails, 15% coverage by sawgrass, and 5% coverage by other marsh grass species. A small area of phragmites was also noted in the marsh grass area. This area will be further evaluated to determine what remedial actions, if any, are necessary.

Based on the 2003 monitoring results, NCDOT will continue to monitor the Bridge Maintenance Mitigation Site for vegetation and hydrology.

APPENDIX A

GAUGE DATA GRAPHS

Bridge Maintenance Tide Gauge
U92A-TG1



APPENDIX B

SITE PHOTOS

&

PLOT AND PHOTO LOCATIONS MAP

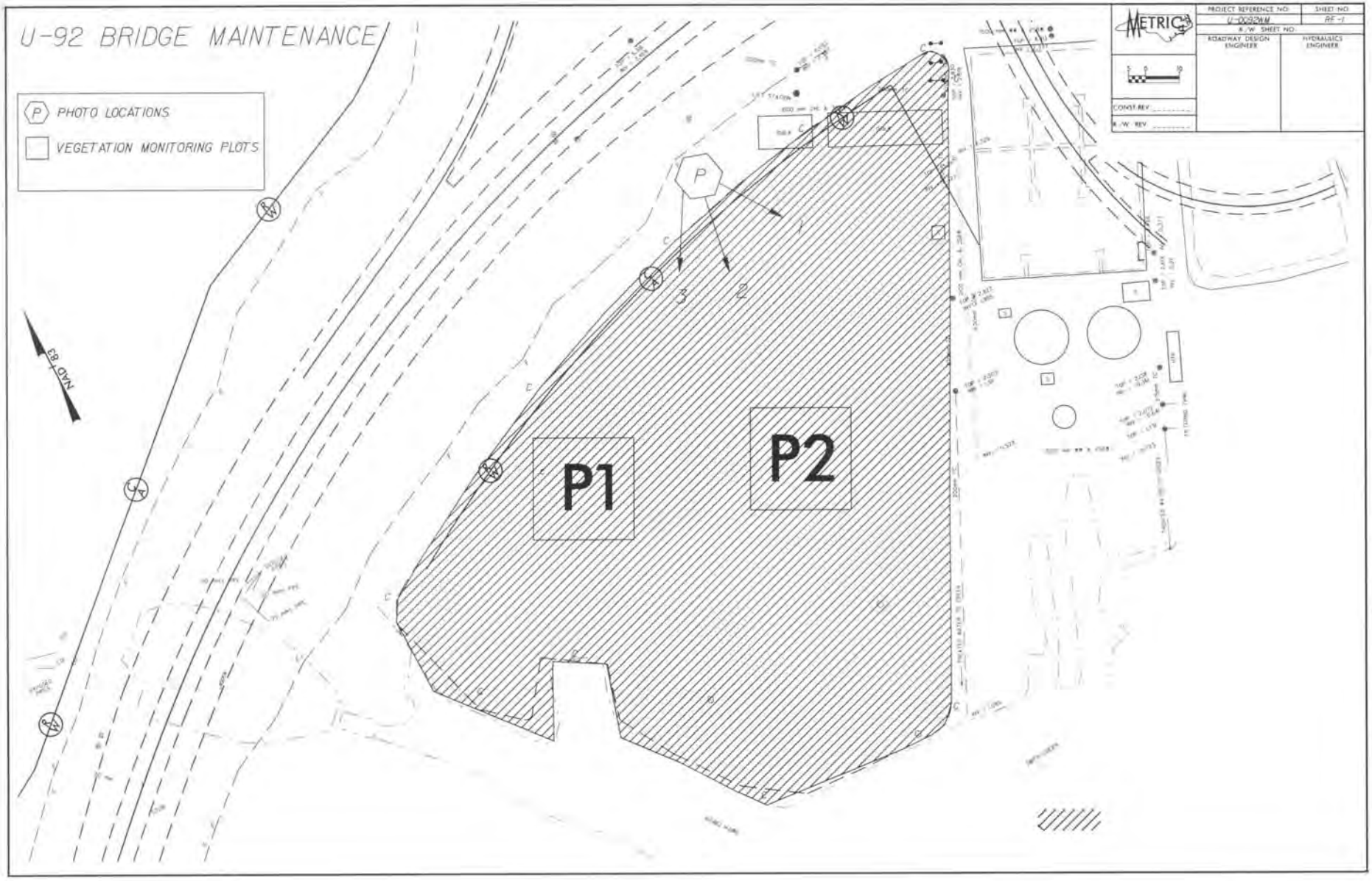
Bridge Maintenance

Photo 1

Photo 2

Photo 3

2003


U-92 BRIDGE MAINTENANCE
PHOTO LOCATIONS
VEGETATION MONITORING PLOTS
NAD 83
P1
P2
METRIC
PROJECT REFERENCE NO.
U-0092WM
SHEET NO.
RF-1
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
CONST. REV.
R/W REV.