ANNUAL REPORT FOR 2001

Bridge Maintenance Mitigation Site

New Hanover County

Project No. 8.2250109

TIP No. U-92 WM

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SUMMARY

The following report summarizes the monitoring activities that have occurred in 2001 at the Bridge Maintenance Mitigation Site, representing the second year of monitoring of 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 the right-of-way boundary up to approximately ten feet outside of the fill slope, and will be completed during construction of Section A of the Smith Creek Parkway.

The site is equipped with 1 surface gauge. Since the site is a tide-driven system, groundwater and rain gauges were not installed. The surface gauge was installed on July 20, 2000. The surface gauge showed that during the 2001 monitoring period the site was inundated on a daily basis for 58% of the time for the growing season from February 27 to November 26 (271 days). This exceeds the success criteria requirement of 56%.

Two tree monitoring plots and eighty-five herbaceous vegetation monitoring plots are located on the site. Tidal cypress swamp and herbaceous marsh were the two plant communities restored on the site. Two 100' x 100' plots have been set and will be counted as part of the bald cypress vegetation monitoring for the site. The success criteria for the cypress swamp requires 50 five-year old cypress trees per acre surviving after the end of the fifth growing season. During the planning phase of the project, it was noted that the cypress 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 vegetated success criteria will be based on emergent marsh vegetation (see Section 10.0 Contigency Plans, Bridge Maintenance Site, Compensatory Mitigation Plan, (Revised) November 30, 1999).

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) specie.

Based on vegetative monitoring results, there was an average density of 108 bald cypress trees per acre, which exceeds the required success criteria of 50 trees per acre after the fifth year of monitoring. The percent frequency of target species for the marsh grass area is at 31.4% with a vegetative cover scale value of 1.0. As expected, the marsh grass area did not meet the success criteria, but it has continued to increase since planting.

Based on monitoring results of 2001, NCDOT recommends that monitoring continue on this 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 help prevent ponding.

1.2 Purpose

In order to demonstrate successful mitigation, the Bridge Maintenance site is monitored for both hydrology and vegetation. 2001 marks the second year of monitoring for the site. The following report describes the results of both hydrologic and vegetation monitoring for 2001.

1.3 Project History

March- May 2000	Site Constructed – Phase 1
May 2000	Site Planted – Phase 1
July 2000	Surfacewater 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)

1.4 Debit Ledger

	Tidal Cypress-Gum Swamp and Tidal Freshwater Marsh
Bridge Maintenance	4 acres restoration 2.4 acres creation
Total	6.4 acres credit
Total Site debited for TIP Project U-92C	

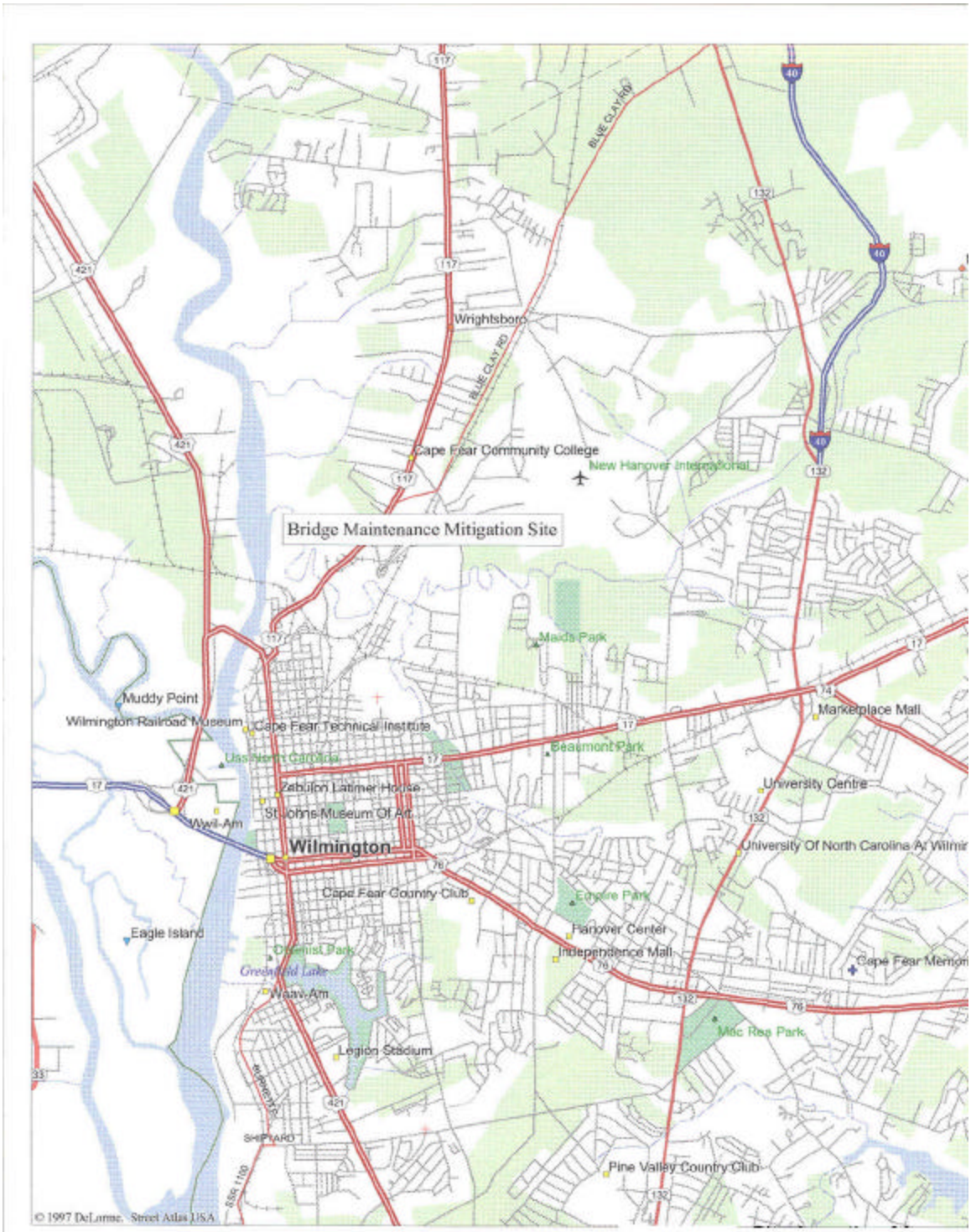


FIGURE 1. Site Location Map

2.0 Hydrology

2.1 Success Criteria

Because this is a tidal system, groundwater monitoring is not required at this site. Instead, data from an on-site tide gauge (collected 10-10-96 through 11-21-97) was used to estimate the percent of time the site would 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, it was calculated that this would result in the site being inundated 37% of the time.

However, 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 on-site 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 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 a 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 56% of the time for 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.

Appendix A contains a plot of the water depth for the surface gauge. Monitoring results are shown for the growing season for the 2001 monitoring period. The actual average elevation across the site (14.3 inches) is also shown on this graph, calculated from elevation data taken on the same day that the elevation of the surface water gauge calibration point was determined.

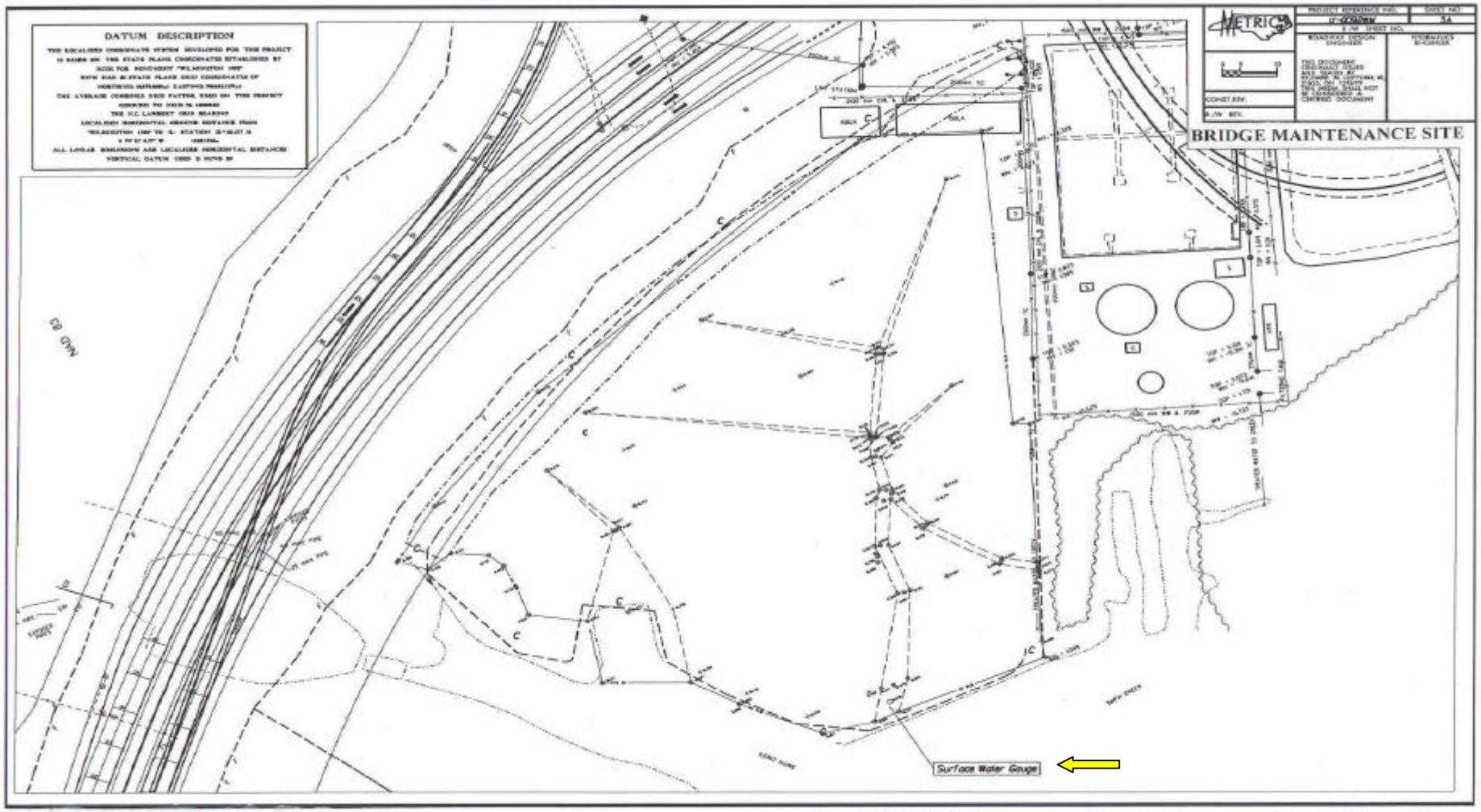


FIGURE 2. Surface Gauge Location Map

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The surface water gauge on the site recorded water levels greater than the actual average site elevation (14.3 inches above sea level) for 58% of the monitoring period (February through November, excluding missing data intervals).

2.3.2 Climatic Data

Figure 3 represents an examination of the local climate in comparison with historical data to determine if 2001 rainfall falls within the normal rainfall range of the area. The historical data was provided by the National Climatic Data Center; the recent rainfall data was provided by the rain gage at the Spring Branch Mitigation site.

January, October, and November were the only months with below normal rainfall for the Wilmington area. Monthly rainfall totals for the majority of the growing season were within the normal monthly range. The success of the hydrology on site is not based on rainfall, and the rainfall data is presented for information purposes only.

2.4 Conclusions

The Bridge Maintenance Mitigation Site met the hydrologic success criterion during the 2001 monitoring period.

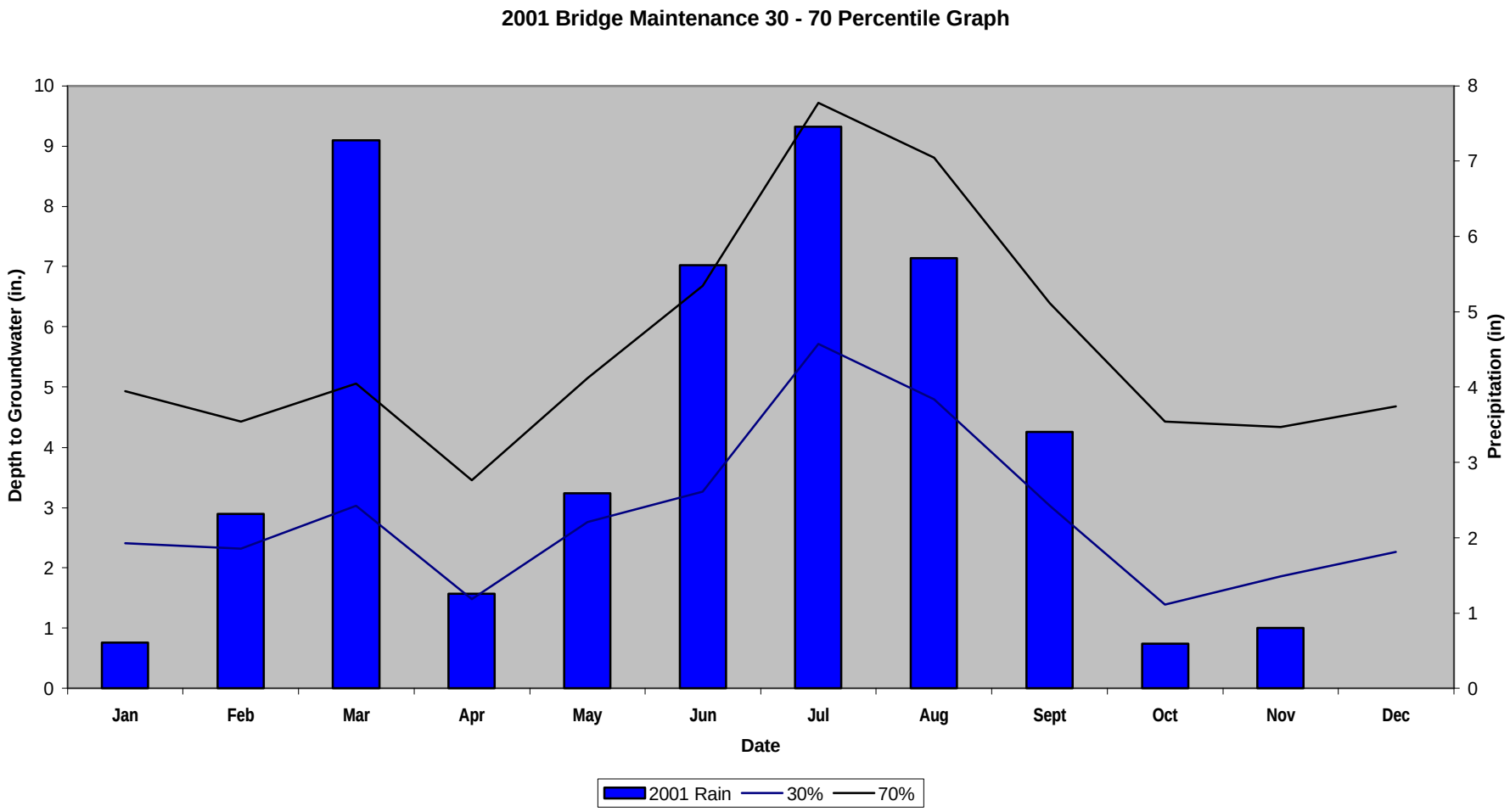

2001 Bridge Maintenance 30 - 70 Percentile Graph
Depth to Groundwater (in.)
Precipitation (in)
10
9
8
7
6
5
4
3
2
1
0
8
7
6
5
4
3
2
1
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
Date
2001 Rain
30%
70%

FIGURE 3

3.0 Vegetation: Bridge Maintenance Mitigation Site (Year 2 Of 5)

3.1A Success Criteria (Bald cypress Area)

Two 100' x 100' plots were set and surveyed 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 bald cypress 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 bald cypress populations, and it is uncertain if the planted bald cypress trees will survive. If the bald cypress 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 vegetation 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) specie.

3.2A & B Description of Planted Areas

The following plant communities were planted throughout the Bridge Maintenance site:

Approximately 5.7 acres

Spartina cynosuroides, Big Cordgrass

Spartina aterniflora, Smooth Cordgrass

Cladium jamaicense, Sawgrass

Taxodium distichum, Bald cypress

3.3A Results of Vegetation Monitoring (Bald cypress Area)

Plot #	Baldcypress at planting		Density (trees/acre)
1	26	26	108
2	15	15	108
AVG. DENSITY			108

3.3B Results of Vegetation Monitoring (Marsh Grass Area)

ZONE	Plot #	Scale Factor	Cynosuroides	Alterniflora	Sawgrass	Frequency	Notes
1	1						Cattail
	2						Cattail
	3	2.0			✓	✓	Cattail
	4						Cattail
	5						Cattail
	6						Cattail
	7						Echinochloa walteri, Cattail
	8	2.0					Cattail
	9						Cattail
	10	1.0					Sedge
	11	4.0			✓	✓	Cattail
	12	2.0	✓			✓	Cattail
	13	2.0			✓	✓	Cattail
	14	2.0					Lanced-leaved Sagittaria, Cattail
	15						Cattail
	16						Cattail
	17	3.0			✓	✓	Cattail
	18						Cattail
	19						Cattail
	20						Cattail
	21						Cattail
	22	3.0			✓	✓	Cutgrass
	23	3.0			✓	✓	Cattail
	24	2.0			✓	✓	Cattail
	25						Cattail
	26						Cattail
	27						Cattail
	28						Cattail
	29	1.0					Lanced-leaved Sagittaria, Cattail
	30	2.0					Echinochloa walteri, Pickerel, Cattail
	31						Cattail
	32						Cattail
	33						Cattail
	34	2.0	✓			✓	Cattail
	35	3.0			✓	✓	Cattail
	36						Cattail
	37						Cattail
	38						Cattail
	39	3.0			✓	✓	Cattail
	40						Cattail
	41						Cattail
	42						Cattail
	43						Cattail
	44						Lanced-leaved Sagittaria, Cattail
	45						Cattail
							Cattail

	45						Cattail
	46						Cattail
	47	3.0	✓			✓	Cattail
	48	3.0	✓			✓	Cattail
	49	4.0			✓	✓	Scirpus robustus, Lance-leaved Sagittaria, Cattail
	50						Cattail
	51						Open water
	52	2.0			✓	✓	Cattail
	53						Cattail
	54						Cattail
	55	3.0			✓	✓	Lance-leaved Sagittaria Cattail
	56						Cattail
	57						Open water
	58	3.0			✓	✓	Lance-leaved Sagittaria, Cattail
	59						Open water
	60						Cattail
	61	3.0			✓	✓	Cattail
	62						Cattail
	63						Cattail
	64						Cattail
	65	1.0					Cutgrass
	66	1.0	✓			✓	Cattail
	67						Cattail
	68	4.0			✓	✓	Scirpus robustus, Bidens, Cattail
	69						Cattail
	70						Cattail
	71						Cattail
	72						Cattail
	73						Cattail
	74						Cattail
	75	3.0			✓	✓	Cattail
	76						Cattail
	77						Cattail
	78	4.0			✓	✓	Smartweed, Cattail
	79						Cattail
	80	3.0			✓	✓	Cutgrass, Cattail
	81						Cattail
	82						Cattail
	83						Cattail
	84	3.0			✓	✓	Cattail
	85	3.0	✓		✓	✓	Cattail
	86						Cattail
	87						Open water
	88	2.0			✓	✓	Cattail
	89	4.0			✓	✓	Cattail
	90	2.0					Lance-leaved Sagittaria, Cattail
Frequency (Percentage of Plots with Desired Specie)			6.9%	0.0%	25.5%	**31.4%**	
Sum Scale Value						**88.0**	
Total Number of Plots Counted						**86.0**	
Vegetative Cover (Scale Value)						**1.0**	

Site Notes: There is 100% frequency of cattails noted throughout the site where there was not open water.

3.4A Conclusions (Bald cypress Area)

Bald cypress was planted on 20’ centers throughout the approximately 5.7 acre site. Two 100’ x 100’ plots were established in the planting area. The vegetation monitoring of the planted area revealed an average of 108 bald cypress trees per acre.

3.4B Conclusions (Marsh Grass Area)

- Percent Frequency of Target Species (Big Cordgrass, Smooth Cordgrass, Sawgrass) 31.4**%**

  Frequency of 70% required.

- Vegetative Cover Scale Value 1.0

  Scale Value of 5 required for year 5.

Approximately 5.7 acres of this site involve marsh grass plantings. As expected for the second monitoring year, vegetative coverage does not meet the success criteria; however, it has increased since planting. NCDOT will continue to monitor the progress of the marsh. If cattails become a problem to the success of the mitigation site, remedial actions will be coordinated with the regulatory agencies

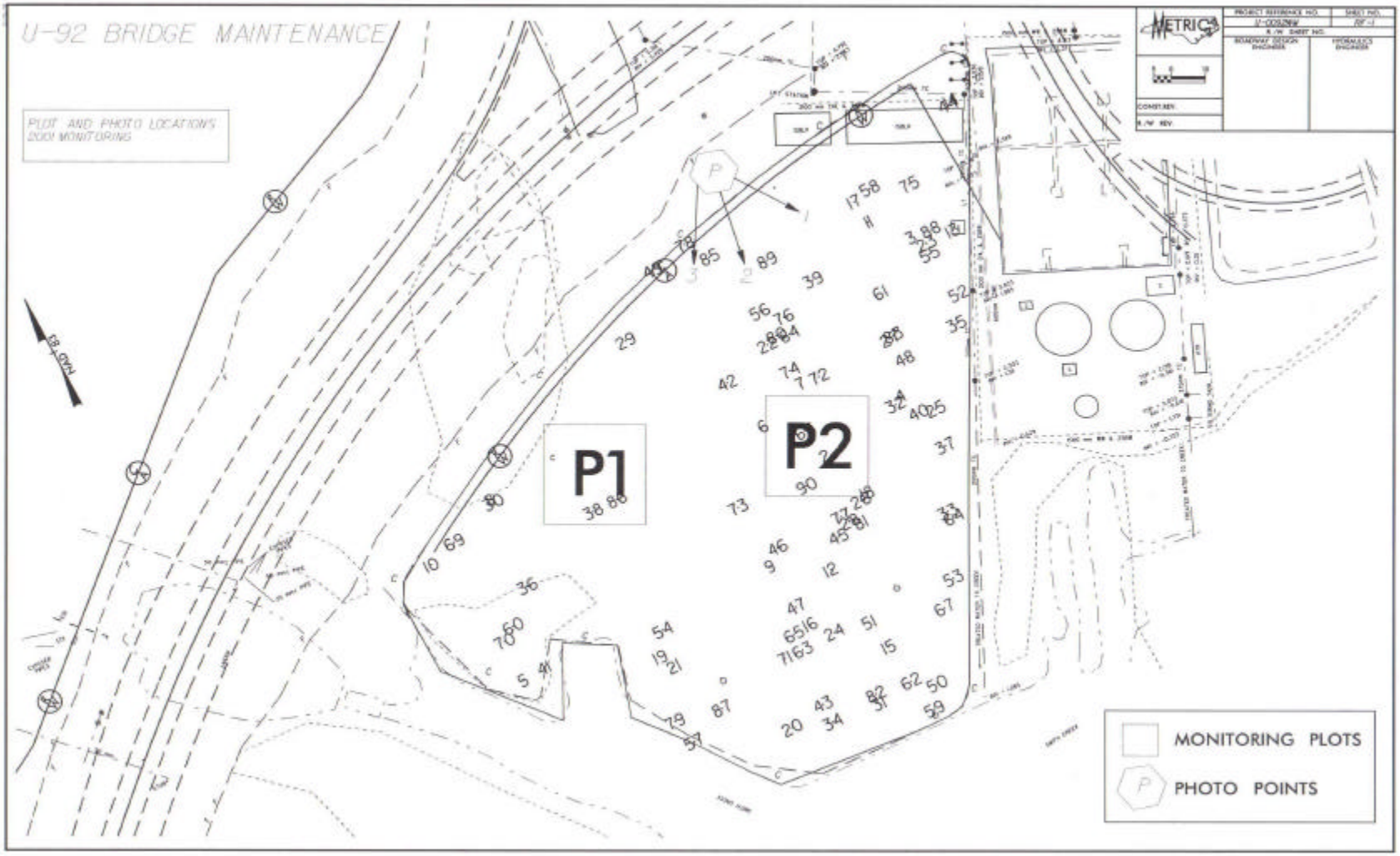


Figure 4. Plot and Photo Locations Map

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

During the second year of monitoring, the Bridge Maintenance Site (Phase One) was inundated on a daily basis for entire time it was operational. The site exceeded the hydrologic success criterion, since it was inundated 58% of the monitoring period.

There was an average density of 108 cypress trees per acre surveyed after the second year of monitoring which exceeds the required number of 50 trees per acre at year 5. As expected for the second monitoring year, herbaceous vegetative coverage does not meet the success criteria; however, it has significantly increased since planting. The percent frequency of target species is at 31.4% (70% required at year 5), and the vegetative cover scale value is 1.0 (5.0 required at year 5). NCDOT will monitor the cattails and coordinate with agencies if any action is to be taken.

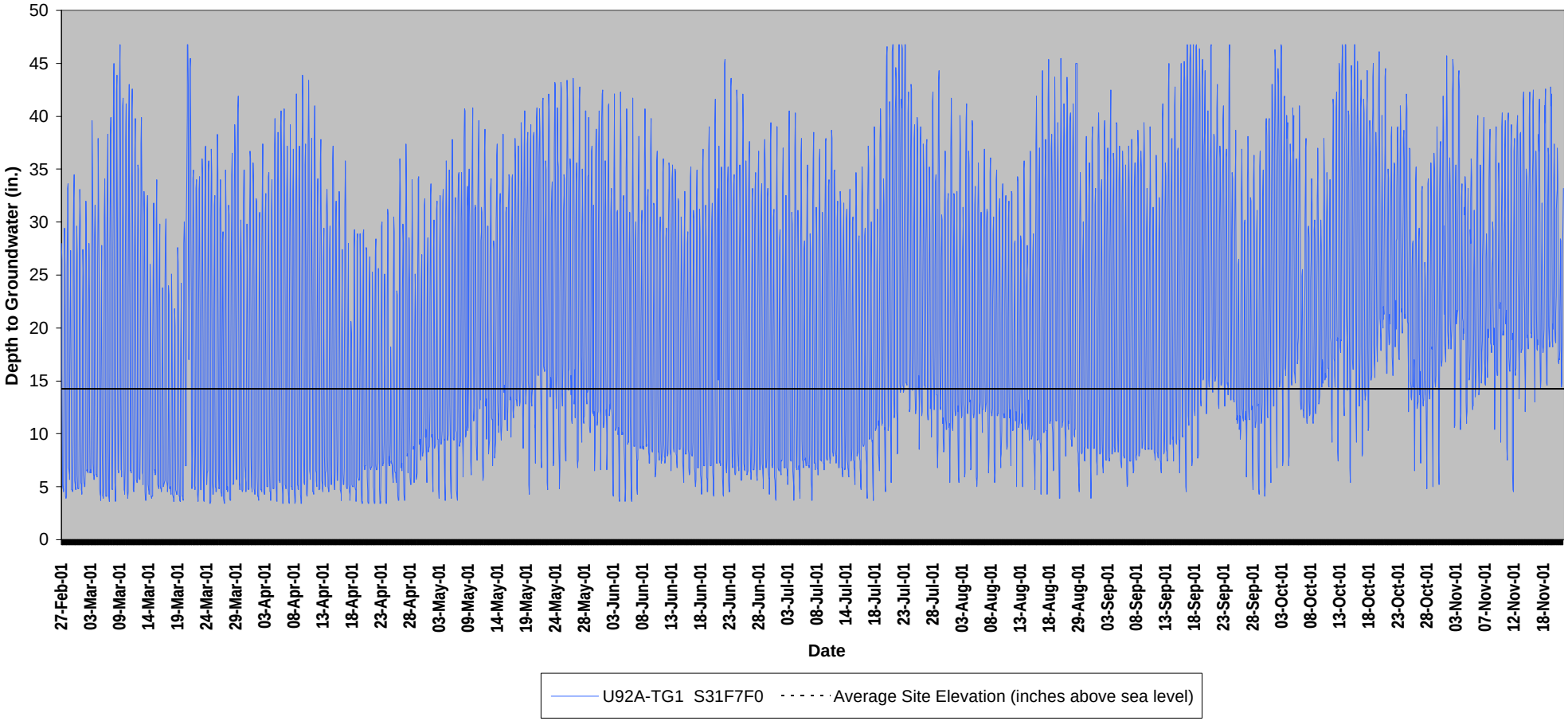
There is also evidence that the site is functioning to increase wildlife habitat in the area. At various times during the summer of 2001, many species were observed using the area, including fiddler crabs, blue crabs, various shorebirds and wading birds, turtles, alligators, and insects. There are also naturally-regenerating cypress seedlings along the upper edge of the site.

Based on monitoring results of 2001, NCDOT recommends that monitoring continue on this site for a third year in 2002.

APPENDIX A

SURFACE WATER DEPTH PLOT

2001 Bridge Maintenance Surface Gauge



U-92 Bridge Maintenance

APPENDIX B

SITE PHOTOS

2001

Photo 1

Photo 2

Photo 3