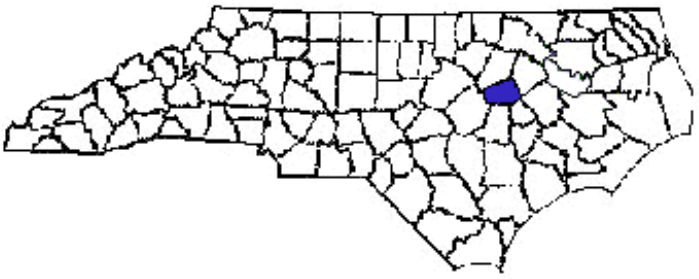
ANNUAL REPORT FOR 2004



Wiggins Mill Mitigation Site
Wilson County
Project No. 8.1330509
TIP No. R-1030WM

Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2004

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SUMMARY

The following report summarizes the monitoring activities at the Wiggins Mill Mitigation Site. This site was constructed in the fall of 2000 to provide wetland mitigation for U-3472 and R-1030. Planting activities were completed in March 2001. The 2004-year reflects the fourth complete year that monitoring has taken place on the site.

The daily rainfall data depicted on the gauge data graphs is recorded by an onsite rain gauge installed prior to the 2001-growing season. Additional rainfall data from a rain gauge located in Wilson, NC was provided by the NC State Climate Office and was used to determine the average rainfall range for the site. Based on this data, Wilson experienced an average to above-average rainfall year.

The site was monitored using eighteen hydrologic monitoring gauges. In early Spring 2002, four additional gauges were added to the original eighteen. During the 2004 monitoring season, all 22 groundwater-monitoring gauges indicated saturation within 12" of the surface for more than 5% of the growing season, as stated in the mitigation plan.

Eleven vegetation plots were established to monitor the 83.7 acres planted in trees on the site. The 2004 vegetation monitoring revealed an average density of 413 trees per acre, with only two of the eleven plots not meeting the success criteria. The overall average density is above the minimum success criteria of 290 trees per acre.

Following an onsite agency review meeting, it was determined that remedial measures would be implemented in the stream section (Thread "A") that is immediately downstream of the US 264 outfalls. Several other gully repair and re-vegetation areas were identified during the field meeting. NCDOT performed remediation activities in the Fall 2004, in accordance with recommendations outlined in the Wiggins Mill Remedial Action Plan (Appendix C). The remedial work addressed each of the resource agency concerns. In addition, a new open water feature that had been requested by the USFWS and NCWRC representatives was established in the north-central portion of the mitigation site near WM-G9. Planting in non-vegetated areas is scheduled to occur in March 2005.

The NCDOT proposes that vegetation and hydrology monitoring be continued at the Wiggins Mill Mitigation Site.

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Wiggins Mill Mitigation Site is located in Wilson County, south of the Wiggins Mill Reservoir and southwest of the City of Wilson. It encompasses approximately 89 acres (Figure 1). The site grading was completed in October 2000 and planting in March 2001.

The site serves as mitigation for U-3472 and R-1030. It includes 84 acres of small stream swamp hardwood (1st and 2nd order streams), bottomland hardwood, swamp hardwood, and headwater forest/low elevation seep wetland communities restoration, 5.3 acres of bottomland hardwood enhancement, 7,020 linear feet of stream restoration, and 11.31 acres of buffer restoration.

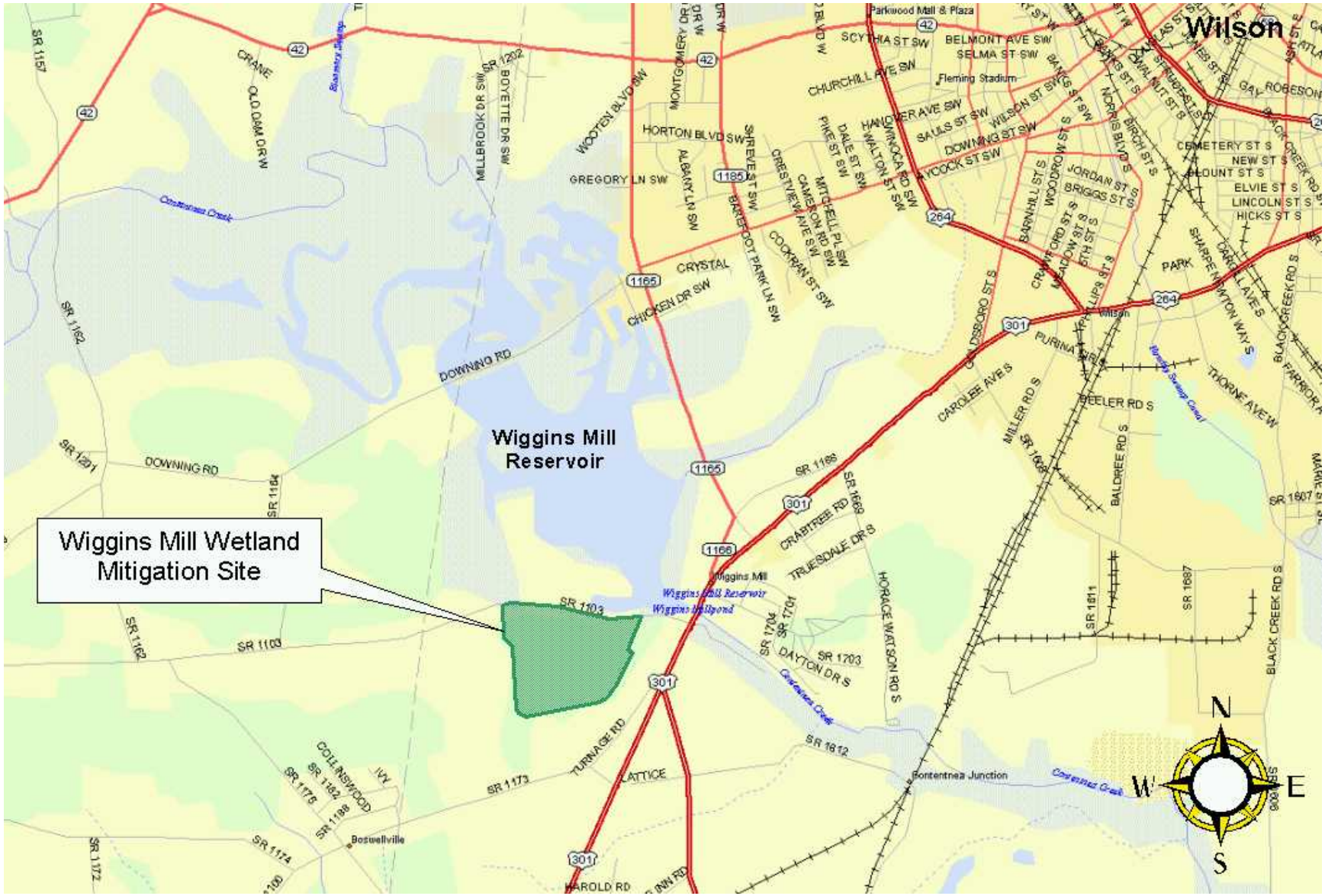
1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until the site is deemed successful. 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 the 2004-growing season at the Wiggins Mill Mitigation Site. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season, and site photographs.

1.3 PROJECT HISTORY

October 2000	Site Grading Completed
February 2001	Herbicide Application
March 2001	Monitoring Gauges Installed
March 2001	Site Planted
March - November 2001	Hydrologic Monitoring (1 yr.)
July 2001	Vegetation Monitoring (1 yr.)
March - November 2002	Hydrologic Monitoring (2 yr.)
June 2002	Vegetation Monitoring (2 yr.)
March - November 2003	Hydrologic Monitoring (3 yr.)
July 2003	Vegetation Monitoring (3 yr.)
March - November 2004	Hydrologic Monitoring (4 yr.)
September 2004	Vegetation Monitoring (4 yr.)
November 2004	Remediation Thread A

Figure 1. Site Location Map



2.0 HYDROLOGY

2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation and the wetland mitigation plan (entitled "North Carolina Department of Transportation (NCDOT) Wiggins Mill Mitigation Plan Wilson County, North Carolina", dated February 1, 1999), the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 5% of the growing season. This success criteria was agreed upon as part of the special conditions set forth by the Corps of Engineers (COE) through their issuance of permits for NCDOT's TIP projects U-3472 and R-1030.

The growing season in Wilson County begins March 20 and ends November 12. These dates correspond to a 50% probability that temperatures will remain above 28° F or higher after March 20 and before November 12.[1] The growing season is 236 days; therefore, the minimum duration for 5% of the growing season is 12 consecutive days.

2.2 HYDROLOGIC DESCRIPTION

Eighteen monitoring gauges were installed on the site in March 2001 (Figure 2). Four additional groundwater gauges were installed in Spring 2002 (WM-G19, WM-G20, WM-G21, WM-G22). These gauges were installed, based on comments from the agency review meeting, in between marginal gauges and gauges that failed to meet the success criteria in 2001.

The automatic monitoring gauges record daily readings of the groundwater depth.

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 236-day growing season (March 20 – November 12). Table 1 shows the hydrologic results for 2004.

Figure 3 provides 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 show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%.

[1] Soil Conservation Service, Soil Survey of Wilson County, North Carolina, p.79.

Figure 2. Wiggins Mill Site Gauge Location Map

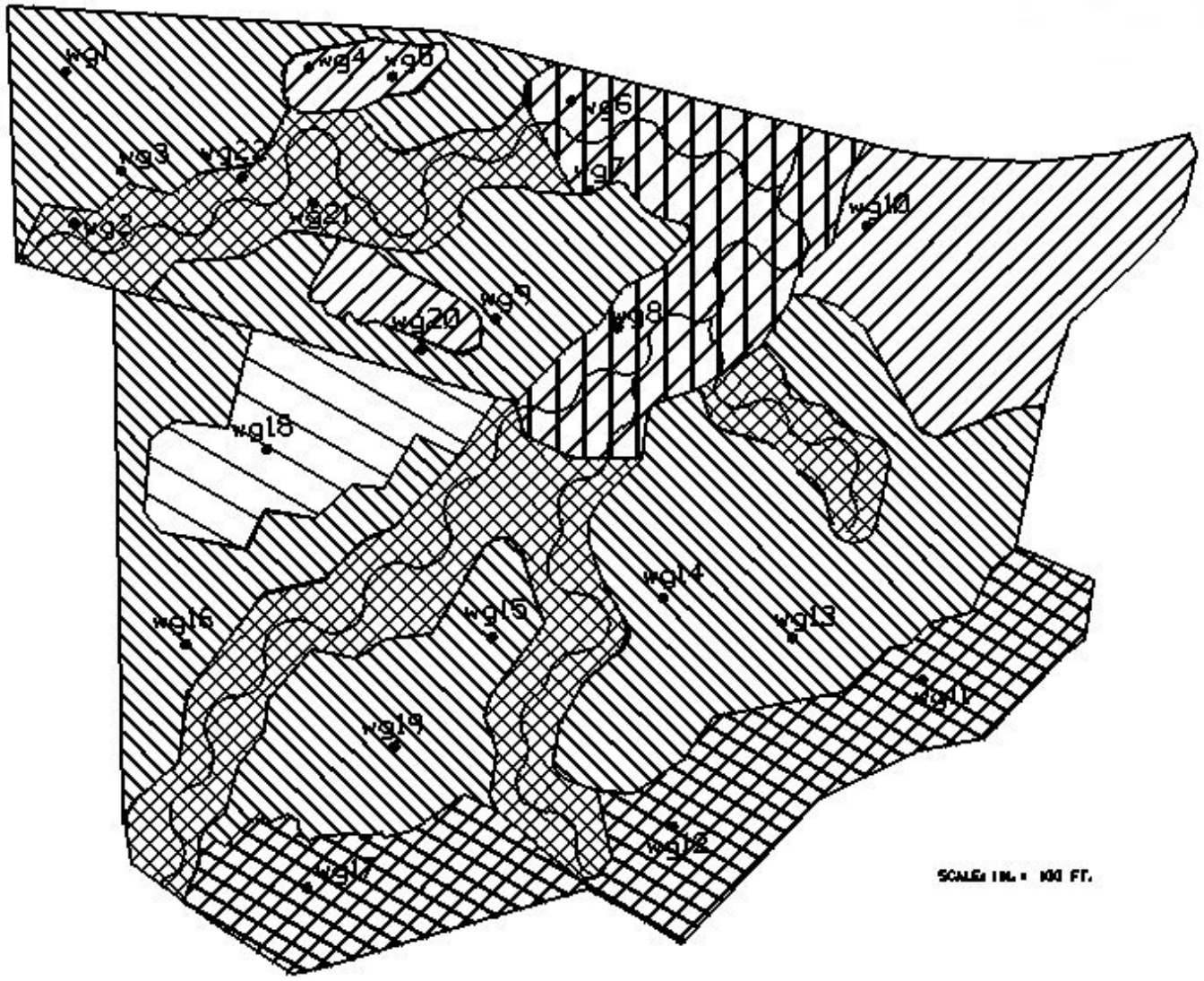


Table 1. 2004 Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5 – 8%	8 – 12%	> 12.5%	Actual %	Success Dates
WM-G1			×		10.2	March 20-April 4 Aug 31-Sept 23
WM-G2			×		6.4	June 26-July 7 Aug 30-Sept 13
WM-G3			×		10.6	March 20-April 8 Aug 30-Sept 23
WM-G4				×	42.4	March 20-April 9 Aug 3-Nov 10
WM-G5				×	14.4	March 20-April 5 Aug 22-Sept 24
WM-G6				×	16.1	March 20-April 5 Aug 30-Oct 6
WM-G7				×	23.7	March 20-May 14 Aug 30-Oct 6
WM-G8				×	47.0	March 20-June 3 June 5-July 17 July 23-Nov 10
WM-G9				×	25.4	March 20-April 2 June 26-July 15 Aug 13-Oct 11
WM-G10				×	29.2	March 20-May 27 Aug 30-Nov 2
WM-G11				×	100	March 20-Nov 10
WM-G12				×	40.3	April 11-May 11 June 26-July 13 Aug 6-Nov 8
WM-G13				×	42.4	March 20-May 14 June 5-July 15 Aug 3-Nov 10
WM-G14			×		10.6	March 20-April 5 Aug 31-Sept 24
WM-G15			×		11.0	Aug 30-Sept 24 Oct 14-Oct 31
WM-G16			×		9.7	March 20-April 4 Aug 31-Sept 22
WM-G17				×	47.0	April 2-May 18 July 23-Nov 10
WM-G18				×	30.9	March 20-April 30 Aug 30-Nov 10
WM-G19				×	41.1	March 20-May 14 Aug 6-Nov 10
WM-G20			×		10.2	Aug 31-Sept 23
WM-G21				×	42.4	March 20-April 22 Aug 3-Nov 10

WM-G22				✕	38.1	March 20-April 5 Aug 13-Nov 10

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2003 through November 2004 to historical precipitation (collected between 1973 and 2004) for Wilson, North Carolina. This comparison gives an indication of how 2004 relates to historical data in terms of average rainfall. The NC State Climate Office provided all historical data.

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

2.4 CONCLUSIONS

The 2004-year is the fourth successful year of hydrologic monitoring on the Wiggins Mill Mitigation Site. All twenty-two groundwater-monitoring gauges met the success criteria and indicated saturation within 12" of the surface for more than 5% of the growing season. Fifteen of the twenty-two gauges (68%) resulted in saturation for greater than 12.5% of the growing season during an average to above average rainfall year.

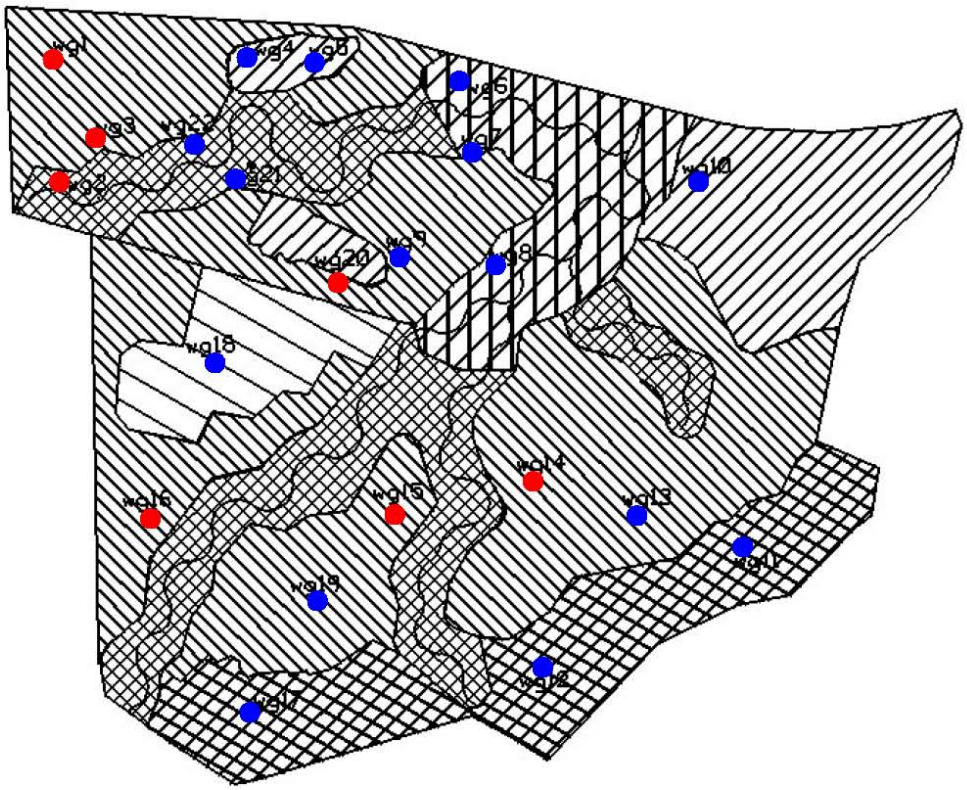


Figure 3. 2004 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

Rain Gauge

Surface Gauge

N

Not to Scale

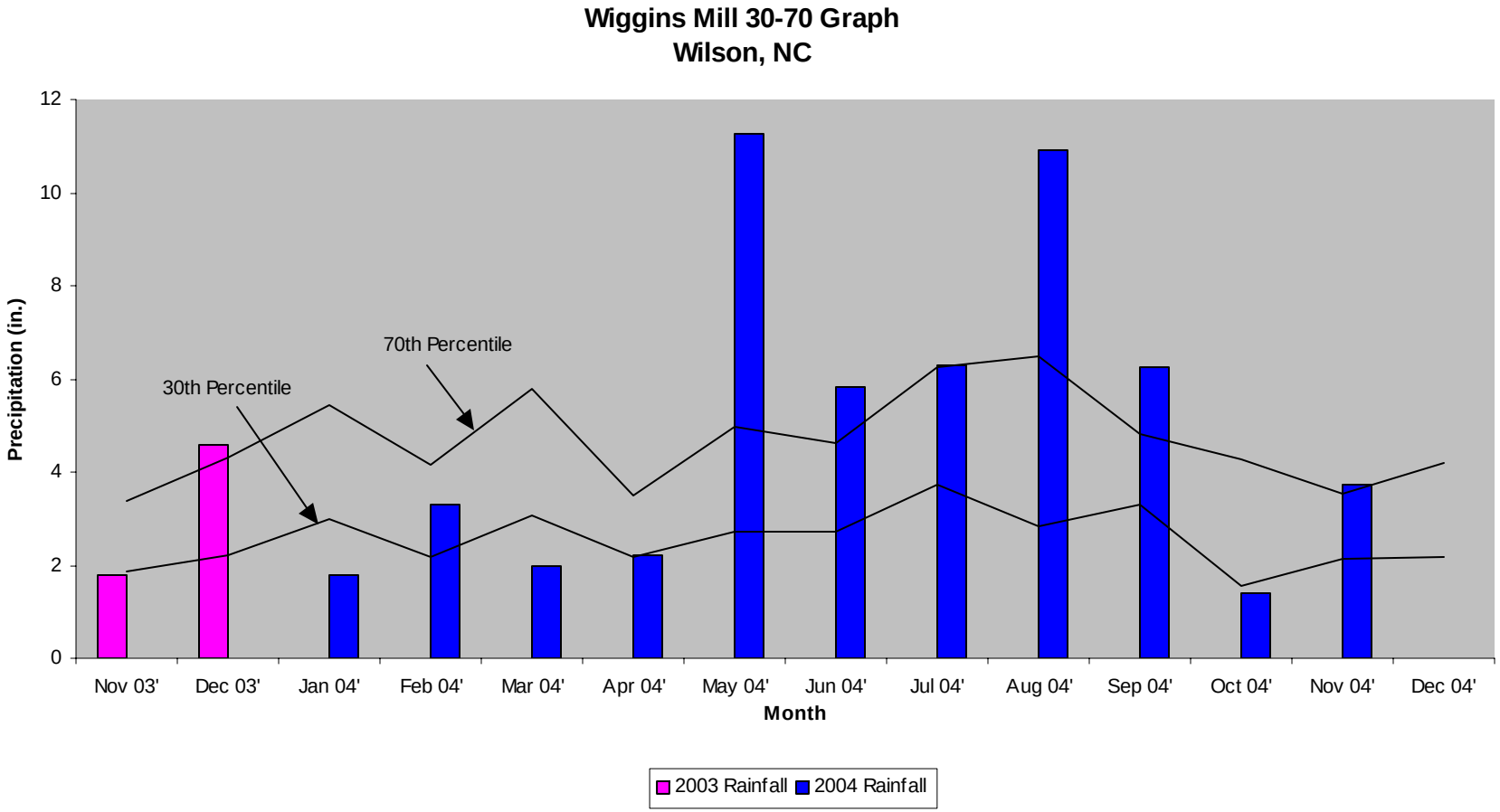


Figure 4. 30-70 Percentile Graph

3.0 VEGETATION: WIGGINS MILL MITIGATION SITE (YEAR 4 MONITORING)

3.1 SUCCESS CRITERIA

The success criteria state that at least 320 stems per acre must survive after the completion of the third growing season and 240 stems per acre after the fifth growing season. If desired vegetation has not been established, NCDOT will notify the appropriate agencies and will implement corrective measures.

3.2 DESCRIPTION OF SPECIES

The following tree species were planted in the Wetland Restoration Area:

Zone 1: Headwater Forest (12 acres)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Betula nigra, River Birch
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Quercus nigra, Water Oak
Quercus phellos, Willow Oak

Zone 2: Bottomland Hardwood (39 acres)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Liriodendron tulipifera, Tulip Poplar
Quercus nigra, Water Oak
Quercus phellos, Willow Oak
Quercus lyrata, Overcup Oak

Zone 3: Swamp Hardwood (10 acres)

Taxodium distichum, Baldcypress
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Black Gum
Nyssa aquatica, Water Tupelo
Quercus laurifolia, Laurel Oak
Quercus phellos, Willow Oak

Zone 4: Small Stream Swamp (1st order)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Quercus nigra, Water Oak
Quercus phellos, Willow Oak
Liriodendron tulipifera, Tulip Poplar

Zone 5: Small Stream Swamp (2nd order)

Taxodium distichum, Baldcypress
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Quercus phellos, Willow Oak

3.3 RESULTS OF VEGETATION MONITORING

Table 2. 2004 Vegetation Monitoring Results

ZONE	Plot #	Green Ash	Laurel Oak	River Birch	Swamp Blackgum	Water Oak	Willow Oak	Tulip Poplar	Baldcypress	Overcup Oak	Water Tupelo	Total (4 year)	Total (at planting)	Density (Trees/Ac
1	10		7			1	21	2				31	38	555
	11	6	6		1	1	11					25	32	531
								Zone 1 Average						**543**
2	1	1	1		1		1	7		7		18	36	340
	7		3			4	15					22	41	365
	9	2	1				4					7	39	122
								Zone 2 Average						**367**
3	2		2		2		1		6	22		33	38	591
	5				5				2			7	42	113
								Zone 3 Average						**369**
4	3	2			8	1	9	9				29	29	680
	8	1	7		11	9	3			1		32	42	518
								Zone 4 Average						**599**
5	4	3	5		1		10			4		23	38	412
	6	6	2		2		10			2		22	48	312
								Zone 5 Average						**362**
								Total Density Average						**413**

Site Notes:
Zone 1: Other species noted: fennel, trumpet creeper, morning glory, horse-nettle, hickory, holly, *Juncus sp*., and pokeberry.
Zone 2: Other species noted: horse-nettle, fennel, bitter sneezeweed, broomsedge, goldenrod, *Baccharis sp*., trumpet creeper, swamp chestnut oak, pine, and pokeberry. 2-4 inches of water in plot 9. A large number of trees noted living outside of plot 9.
Zone 3: Other species noted: horse-nettle, fennel, bitter sneezeweed, pokeberry, trumpet creeper, *Juncus* sp., poison ivy, broom sedge, and winged sumac. Trees planted in areas surrounding Plot 5 appear to have a much higher survival rate than those in Plot 5. Plot 5 does not provide an adequate representation of the survival within Zone 3. 2 - 4 inches of water in more than 50% of plot 5.
Zone 4: Other species noted: Same as above. Plot 3 had various grasses that cover approximately 30% of the plot. Plot 3 also contained volunteer tulip poplar and sweetgum. Gully erosion has formed a new channel in plot 8. One plot post and possibly some trees were washed out.
Zone 5: Baldcypress were noted around plot 4.

3.4 CONCLUSIONS

Of the 89 acres on this site, approximately 83.7 acres involved tree planting. There were eleven vegetation-monitoring plots established throughout the planting areas. The 2004 vegetation monitoring of the site revealed an average tree density of 413 trees per acre. This average is well above the minimum success criteria of 290 trees per acre.

NCDOT performed remediation activities in the Fall 2004, in accordance with recommendations outlined in the Wiggins Mill Remedial Action Plan. Planting of approximately ten non-vegetated areas is scheduled for March 2005.

NCDOT will continue vegetation monitoring at the Wiggins Mill Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

For the fourth year of hydrology monitoring, all twenty-two groundwater gauges exceeded the success criteria by showing saturation within 12" of the surface for greater than 5% of the growing season (fifteen gauges exceeded 12.5%).

Eleven vegetation plots were established to monitor the 83.7 acres planted in trees on the site. The 2004 vegetation monitoring revealed an average density of 413 trees per acre, with only two of the eleven plots not meeting the success criteria. The overall average density is above the minimum success criteria of 290 trees per acre.

Following an onsite agency review meeting, it was determined that remedial measures would be implemented in the stream section (Thread "A") that is immediately downstream of the US 264 outfalls. Several other gully repair and re-vegetation areas were identified during the field meeting. NCDOT performed remediation activities in the Fall 2004, in accordance with recommendations outlined in the Wiggins Mill Remedial Action Plan (Appendix C). The remedial work addressed each of the resource agency concerns. In addition, a new open water feature that had been requested by the USFWS and NCWRC representatives was established in the north-central portion of the mitigation site near WM-G9. Planting in non-vegetated areas is scheduled to occur in March 2005.

NCDOT will continue monitoring the Wiggins Mill Mitigation Site for hydrology and vegetation.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

SITE PHOTOS AND
PHOTO AND PLOT LOCATIONS MAP

Wiggins Mill

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2004

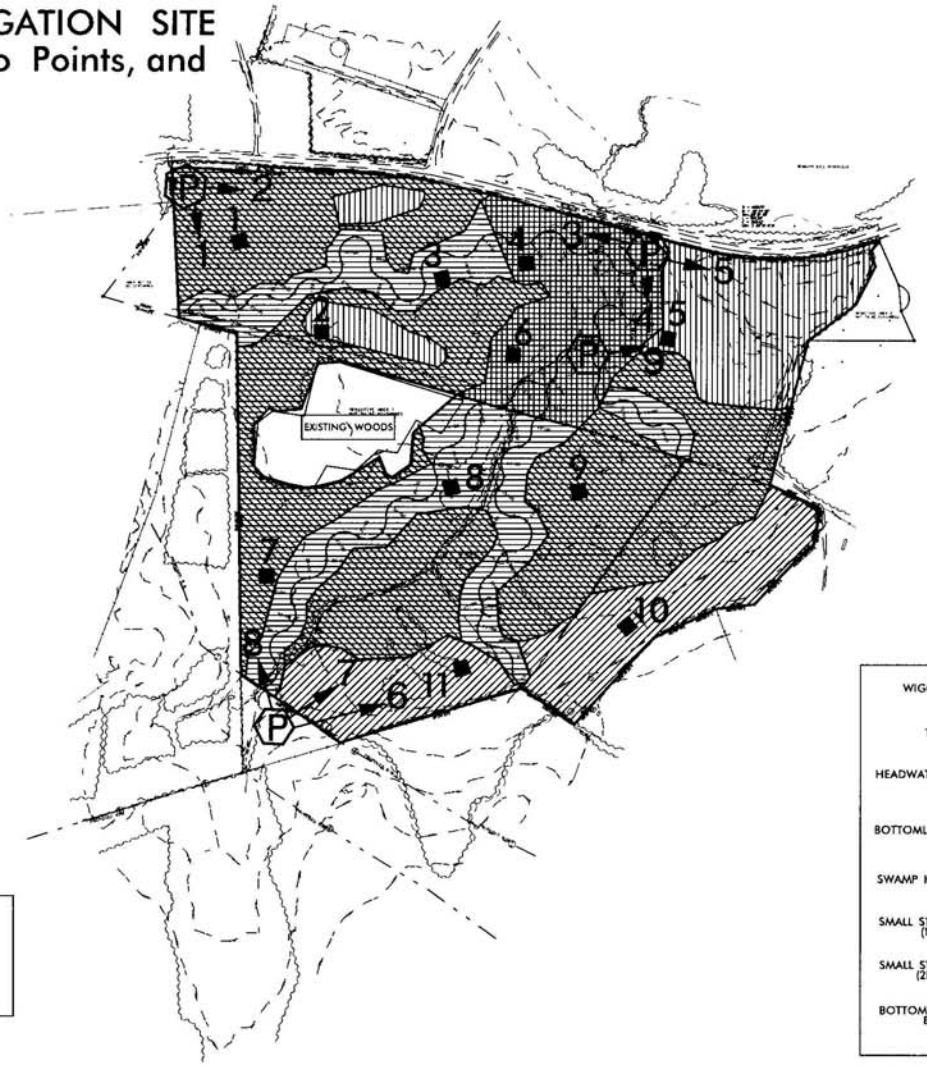
Photo 7

Photo 8

2004

WIGGINS MILL MITIGATION SITE
Planting Zones, Photo Points, and Vegetation Plots

PROJECT REFERENCE NO.	SHEET NO.
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



■ Vegetation Plots
Ⓟ Photo Points

WIGGINS MILL PLANTING COMMUNITY LEGEND

TYPE	SYMBOL
HEADWATER FOREST	
BOTTOMLAND HARDWOOD	
SWAMP HARDWOOD	
SMALL STREAM SWAMP (1ST ORDER)	
SMALL STREAM SWAMP (2ND ORDER)	
BOTTOMLAND HARDWOOD ENHANCEMENT	EXISTING WOODS

APPENDIX C

REMEDIATION PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-1023WM	3
R/W SHEET NO.	
ENGINEER	

REVISIONS

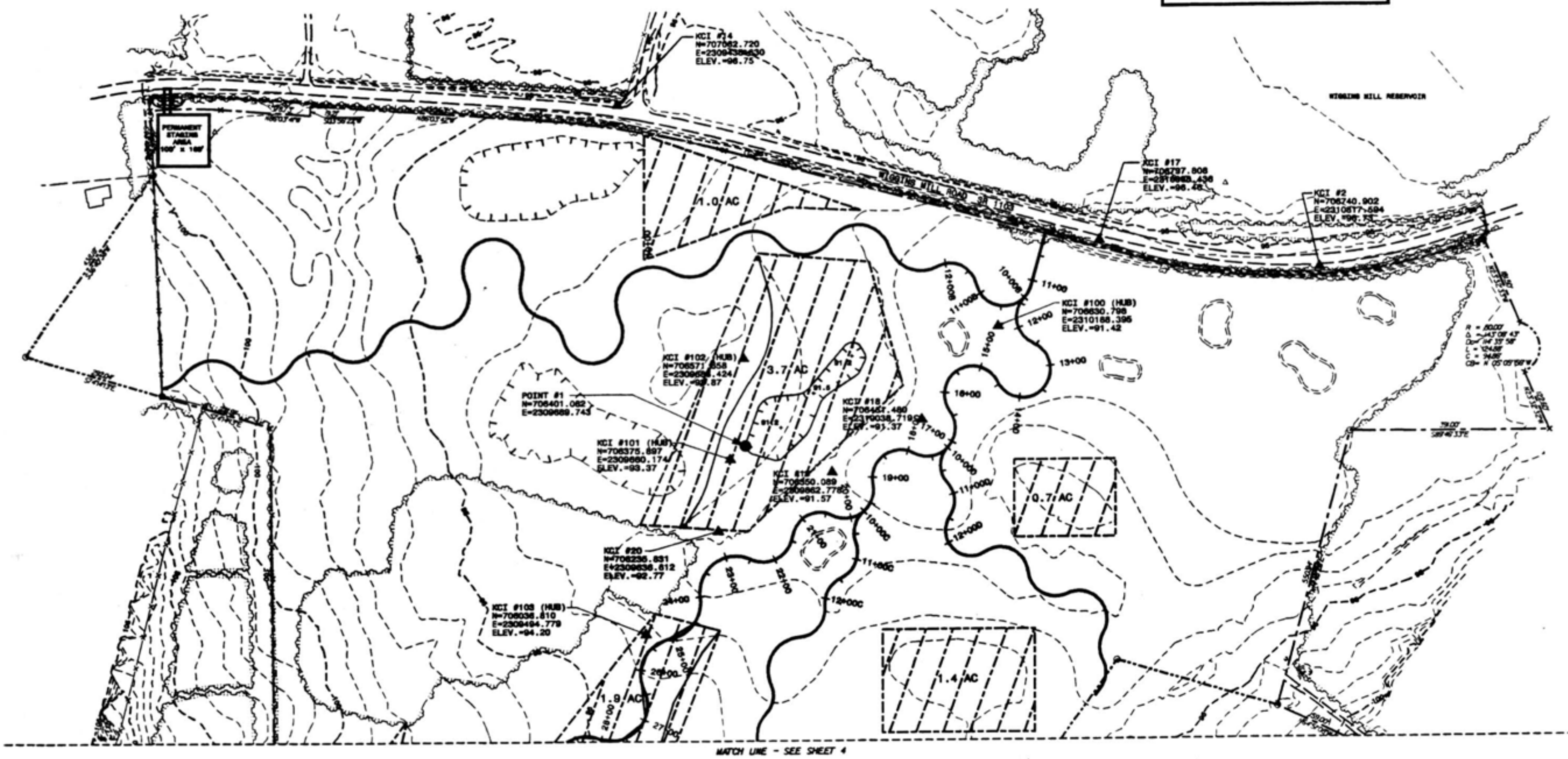
PONDED AREA (BOUNDARY COORDINATES):

FROM POINT #1 (N=706401.062, E=2309689.743)

N 19° 48' 38" E FOR 99.41'
N 82° 29' 01" E FOR 88.32'
N 41° 15' 09" E FOR 135.49'
S 39° 51' 58" E FOR 45.78'
S 25° 53' 36" W FOR 37.46'
S 56° 22' 53" W FOR 87.81'
S 22° 25' 51" W FOR 71.87'
S 47° 59' 48" W FOR 78.99'
N 75° 01' 24" W FOR 53.84'
N 37° 49' 29" W FOR 20.11' (BACK TO POINT #1)

PLAN LEGEND

- MITIGATION BOUNDARY
- EXISTING STREAM CHANNEL
- EXISTING CONTOUR LINES
- PROPOSED CONTOUR LINES
- EROSION/GULLY REPAIR SECTION
- RE-VEGETATION (SEEDING) AREAS
- SURVEY CONTROL POINT
- LOG GRADE CONTROL
- ROCK CROSS VANE
- TREE LINE
- EXISTING PROPERTY LINE



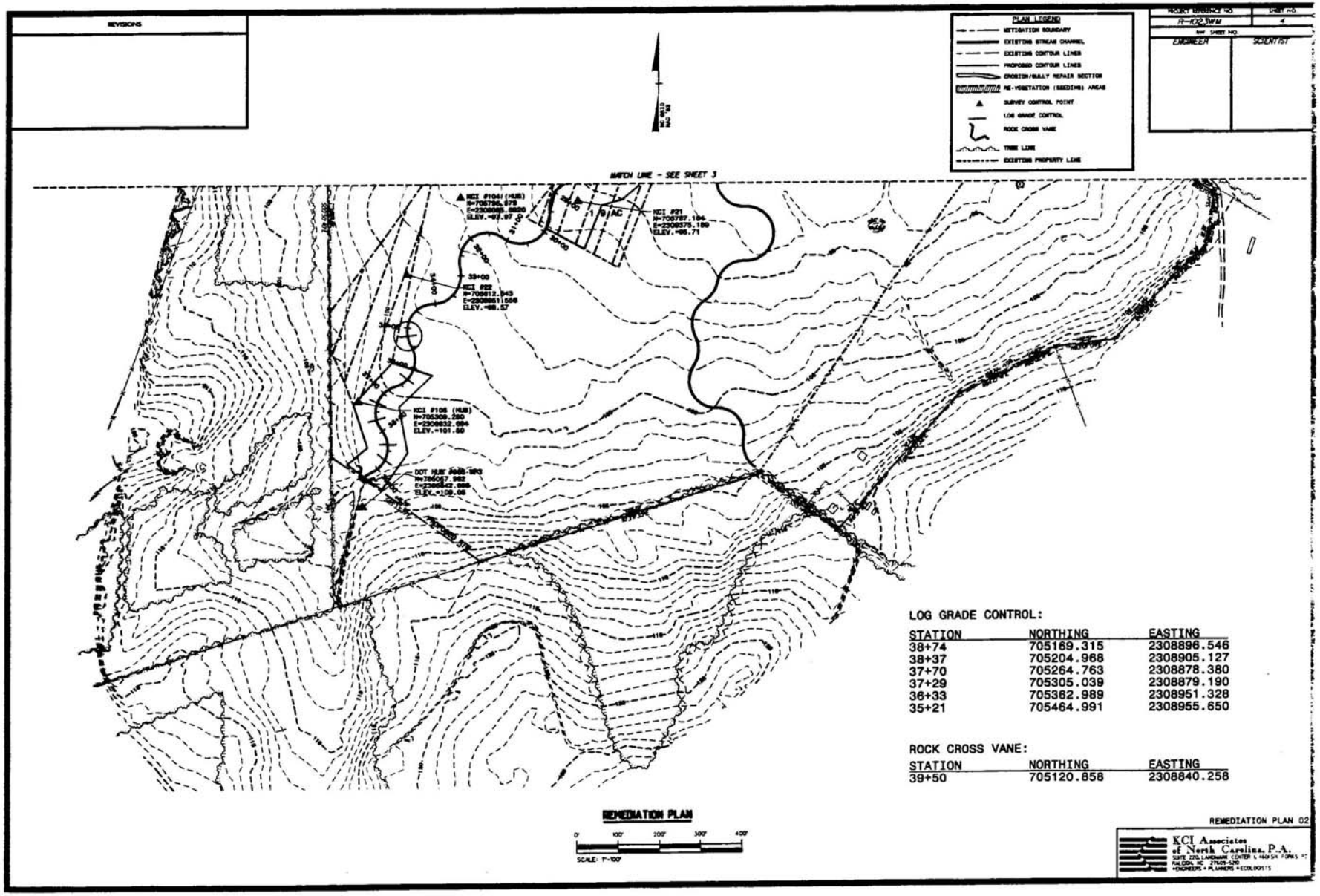
REMEDIATION PLAN

0' 100' 200' 300' 400'

SCALE: 1"=100'

REMEDIATION PLAN 01

KCI Associates of North Carolina, P.A.
SUITE 220, LANDMARK CENTER I, 4601 SIX FORKS RD.
RALEIGH, NC 27609-5210
• ENGINEERS • PLANNERS • ECOLOGISTS


REVISIONS
PLAN LEGEND
MITIGATION BOUNDARY
EXISTING STREAM CHANNEL
EXISTING CONTOUR LINES
PROPOSED CONTOUR LINES
EROSION/GULLY REPAIR SECTION
RE-VEGETATION (SEEDING) AREAS
SURVEY CONTROL POINT
LOG GRADE CONTROL
ROCK CROSS VANE
TREE LINE
EXISTING PROPERTY LINE
PROJECT REFERENCE NO.
R-402 3WM
SHEET NO.
4
NW SHEET NO.
ENGINEER
SCIENTIST
MATCH LINE - SEE SHEET 3
KCI #21
KCI #22
39+00
39+50
LOG GRADE CONTROL:
STATION NORTHING EASTING
38+74 705169.315 2308896.546
38+37 705204.968 2308905.127
37+70 705264.763 2308878.380
37+29 705305.039 2308879.190
36+33 705362.989 2308951.328
35+21 705464.991 2308955.650
ROCK CROSS VANE:
STATION NORTHING EASTING
39+50 705120.858 2308840.258
REMEDIATION PLAN
0' 100' 200' 300' 400'
SCALE: 1"=100'
REMEDIATION PLAN 02
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