Reeds Creek Wetland Restoration Project

Contract #:	D05016-3
County:	Iredell
Cataloging Unit:	Catawba 03050101
Monitoring Firm POC:	Mid-Atlantic Mitigation, LLC
	Christine Cook (704) 782-4133 x 101
Prepared For:	EEP Project Manager, Guy Pearce

Year 4 Monitoring Report - July 2010

Mid-Atlantic Mitigation, LLC

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1.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

On behalf of the North Carolina Ecosystem Enhancement Program (NCEEP), Mid-Atlantic Mitigation, LLC (MAM) with technical assistance from Environmental Services, Inc. (ESI) restored 4.2 acres of riverine wetlands, enhanced 2.2 acres, and an additional 8.26 acres of enhancement and preservation areas not included in the WMU calculation are present on site. Grading of the Reeds Creek Site was completed December 2006. Planting and seeding of the site were completed in January 2007. Overall, the project will restore, enhance, and/or preserve approximately 14.66 acres of forested and emergent wetlands and upland buffer, of which 5.3 will be provided as riverine wetland mitigation units (WMUs) to the North Carolina Ecosystem Enhancement Program (EEP).

The goals and objectives of the Reeds Creek Wetland Restoration Project (Reeds Project) are to restore the hydrologic functions, the native vegetation of the degraded and drained wetlands, flood retention and water quality functions within the Reeds Creek watershed of the Catawba River Basin (HUC 03050101).

Existing berms and spoil piles adjacent to Reeds Creek were graded down to a more natural elevation and the other existing fill areas were removed. Native woody vegetation has been established in this area. Jurisdictional wetlands were preserved in the semi-permanently impounded area associated with Lake Norman. Jurisdictional wetlands were enhanced and/or restored in the area south of Reeds Creek.

2.0 PROJECT BACKGROUND

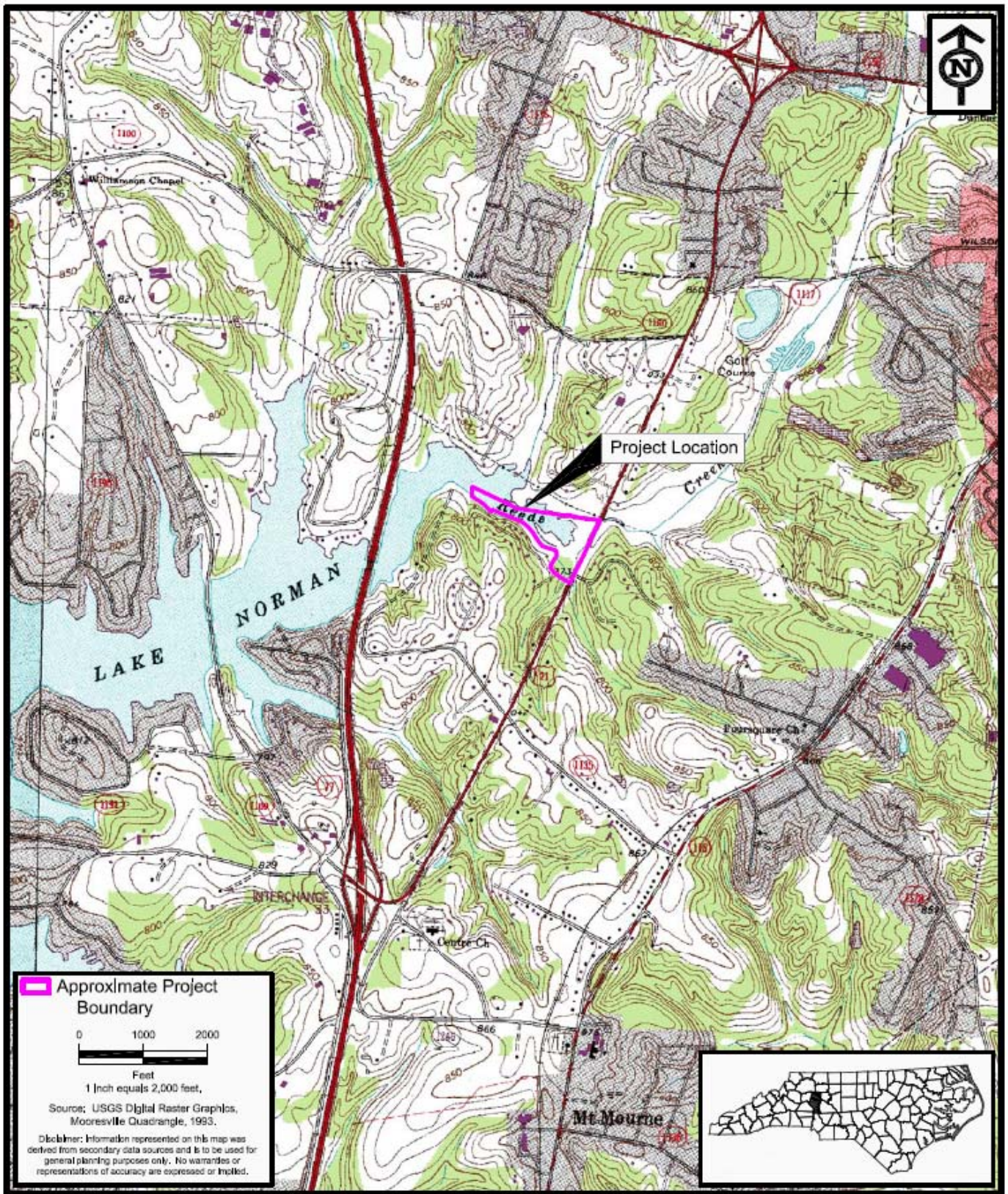
2.1 LOCATION AND SETTING

The Reeds Project is a 14.66-acre tract located southwest of Mooresville, Iredell County, North Carolina off of U.S. Highway 21, approximately 1.3 miles northeast of the U.S. Highway 21 and Interstate 77 intersection (see Figure 1). The project site is located in the Catawba River Watershed (USGS 8-digit Hydrologic Unit 03050101, and NCDWQ River Basin 03-08-32). NCDWQ has assigned Reeds Creek within the project site the Stream Index Number (SIN) of 11-104(2). The site is immediately adjacent to Lake Norman and is characterized by a variable floodplain associated with Reeds Creek. The site is currently owned by MAM with the Conservation Easement being held by the State of North Carolina.

2.2 STRUCTURE AND OBJECTIVES

The goals and objectives of the Reeds Creek Wetland Restoration Project are to restore the hydrologic functions, the native vegetation of the degraded and drained wetlands, flood retention and water quality functions within the Reeds Creek watershed of the Catawba River Basin (HUC 03050101). A Project Location Map is provided in Figure 1.

Existing berms and spoil piles adjacent to Reeds Creek were graded down to a more natural elevation and the other existing fill areas were removed. The material was graded



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Project Location Map

Reeds Creek Wetland Restoration Site

Iredell County, North Carolina

Project #: D05016-3

Drwn/Chkd: KT/CA

Figure: 1

to the surrounding landscape to provide microtopographic complexity and woody planting zones. These areas where the topography was enhanced will create diverse habitats instead of the monotypical, flat lake fringe area that previously existed. Surface hydrology will be reintroduced to the restoration areas via more frequent overbank flooding from Reeds Creek. Native woody vegetation has been established in this area.

Jurisdictional wetlands were preserved in the semi-permanently impounded area associated with Lake Norman. Jurisdictional wetlands were enhanced and/or restored in the area south of Reeds Creek. Minor grading, adjacent to the wettest areas, was done to expand the wetland hydrology and create microtopography within the contiguous floodplain and wetland area.

The riparian wetland and buffer vegetation community will transition as the system seeks its hydrologic and vegetative equilibrium. Sediments on site were initially unconsolidated and mucky with saturation due to Lake Norman water level fluctuations. While water level fluctuations are still anticipated, the areas and duration of inundation can only be determined through post-construction observation and monitoring. It was anticipated that settling and subsidence would occur throughout the initial growing season, first through evaporation and then through transpiration as the herbaceous cover (seeded and natural propagation) established. Areas that were not saturated/ponded (i.e. fringe areas and/or microtopographic mounds) were planted with bare root seedlings to establish a bottomland hardwood riparian wetland community.

In order to stabilize the newly constructed wetlands and flood plain areas, both temporary and permanent grass seed were applied to all restored areas. The types of seeds used were: *Leersia oryzoides* (Rice Cut grass); *Panicum clandestinum* (Deertongue grass); *Panicum virgatum* (Switchgrass); *Trisacum dactyloides* (Gama grass), *Juncus effusus* (soft rush) and *Secale cereale* (Annual rye). Three hardwood planting zones were established as follows: Zone 1-Swamp Forest Zone (the lowest elevations on site), Zone 2- Bottomland Forest Zone (transitional elevations), and Zone 3-Levee Forest Zone (areas associated with the tops of the microtopographic planting mounds). A density of over 750 stems per acre was planted throughout the project. Livestakes were installed in some of the wetter areas and along Reeds Creek.

Table I. Project Mitigation Structure and Objectives Table

Project Segment	Wetland Mitigation Type	Acreage	WMU's	Comment
Wetland	R	4.2	4.2	Restoration areas are located along Reeds Creek and front, center of site
Wetland	E1	2.2	1.1	Enhancement areas are located between the restored areas and the existing wetlands (preservation area)
Wetland	P and E1	8.26	-	Not included in WMU's

Table II. Project Activity and Reporting History		
Activity or Report	**Calendar Year of Completion or Planned Completion**	**Actual Completion Date**
Restoration Plan	October 2005	March 2006
Site Work Completed	February 2006	December 2006
Site Planting and installation of monitoring devices	March 2006	January 2007
Mitigation Plan	April 2006	April 2007
Year 1 Monitoring	December 2006	November 2007
Year 2 Monitoring	December 2007	October 2008
Year 3 Monitoring	December 2008	August 2009
Year 4 Monitoring	December 2009	June 2010
Year 5 Monitoring	December 2010	

Project was delayed 9 months due to issues with the Duke Power 760 Contour Lake Easement for Lake Norman. These issues had been addressed prior to proposal submittal, however Duke Power's merger with Cinergy created changes in personnel and policy which required re-application for these approvals.

Table III. Project Contacts

Project Manager Mid-Atlantic Mitigation, LLC	1960 Derita Road Concord, NC 28027 Rich Mogensen (704) 782-4133
Designer Environmental Services Inc.	9401-C Southern Pine Blvd. Charlotte, NC 28273 Paul Petitgout (704) 523-7225
Construction Contractor Environmental Services Inc.	9401-C Southern Pine Blvd. Charlotte, NC 28273 Paul Petitgout (704) 523-7225
Planting & Seeding Contractor Southeastern Tree And Mid-Atlantic Mitigation, LLC	271 Windrush Trail Walhalla, SC 29691 Bill Knowles (864) 710-5970 1960 Derita Road Concord, NC 28027 Christine Cook (704) 782-4140
Monitoring Performers Mid-Atlantic Mitigation, LLC	1960 Derita Road Concord, NC 28027 Christine Cook (704) 782-4140

Table IV. Project Background

Project Background Table	
Project County	Iredell
Drainage Area	4.9 square miles
Drainage Cover Estimate (%) Impervious area at time of Restoration Plan	10%
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont 45b
Wetland Type	Palustrine, Forested, Broad-leaved Deciduous
Cowardin Classification	PFO1Fh
Dominant soil types	Chewacla with inclusions of Wehadkee
Reference site ID	Reeds Creek
USGS HUC for Project and Reference	03050101
NCDWQ Sub-basin for Project and Reference	03-08-32; SIN 11-104(2)
% of project easement fenced	12.5 – Urban site surrounded by private residence

3.0 PROJECT CONDITION AND MONITORING RESULTS

3.1 VEGETATION ASSESSMENT

3.1.1 Soil Data

Table V. Preliminary Soil Data

Series	**Max Depth (in)**	**% Clay on Surface**	**K**	**T**	**OM %**
Chewacla	60	10 - 27	.28	5	1-4
Wehadkee	62	6 - 20	.24 - .28	3	<1

3.1.2 Vegetative Problem Areas

At this time, no vegetative problem areas or invasive species issues have been identified. The site has been stabilized and vegetated with native woody and herbaceous species. Black willows colonized the site between Year 2 and 3 at a high rate. Currently, based on the composition of the sample plots, the enhancement areas of the site are approximately 42% black willows, while the restoration areas show only about 3% black willows. The composition of the on-site preservation areas indicate that while black willow may be the dominate species it does not out compete or prevent other species from thriving as well. The black willows in the enhancement area were thinned between Year 3 and 4, but no aggressive strategies, such as herbicide treatments of willows were employed or are proposed at this time. The percentage of black willows fell from 60% in Year 3 to 42% in Year 4. It was also noted that a healthy under-story of silky dogwood, young oaks, and button bush are thriving under the willow canopy.

Large amounts of sand and sediment are occasionally deposited along the area of the removed berm. This area is approximately 0.69 acres. Annual herbaceous plants do well in this area, however the woody plants have had some difficulty establishing. Woody volunteer seedlings proliferate then become buried in sand and sediment. Therefore, rather then count on volunteers to fill in this area, MAM will perform a minor supplemental planting with approximately 150 one-gallon containerized plants of species on the original planting list, most likely River Birch, Swamp Chestnut Oak, Green Ash and Willow Oak.

3.1.3 Stem Counts

The prevalent vegetation should consist of macrophytes that typically are adapted for life in saturated soil conditions. These species should have the ability to grow, compete, reproduce, and persist in anaerobic soil conditions. A maximum of 15% nuisance vegetation in wetland areas with planted and volunteer vegetation will successfully indicate establishment of native wetland vegetation. Study plots show that the composition and density of vegetation in the restoration areas compares closely to the reference areas. Stem counts of over 320 trees per acre after 3 years, and 260 trees per acre after 5 years will be considered successful. Photos taken at established photo points should indicate maturation of the riparian vegetation community. Photographs will help to illustrate the health of the planted vegetation and the severity of the invasive or exotic species that are found within the site. Permanent vegetation sampling plots have been established at 2 random locations and sample each planting zone. Plot A is located in the restoration area, and Plot B is located in the enhancement area. The success of vegetative plantings will be measured through stems counts. These plots will be used to sample both the riparian buffer and restored wetlands. Each plot will cover 100 square meters for tree counts. During the counts, the health of the vegetation will be noted. In addition to stem counts, the samples will inventory species diversity to allow for comparison between the reference and restoration wetlands and track the percent cover of nuisance species. The vegetation survey will occur during the growing season.

On June 1st, 2010, the third year-vegetative monitoring was performed on the established vegetation sampling plots. Table VI below summarizes the results of this survey.

Exhibit Table VIa. Stem Counts for Each Species Arranged by Plot (Year 4)

Species	Plots- Actual Count		Surviving Planted Stems						Current Survival (%)
	A	B	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	
Shrubs									
Cephalanthus occidentalis Vols.	7	12	13	11	11	11	19		-
Cornus amomum	7	10	19	17	15	17	17		100%
Totals	14	22	32	32	26	28	36		
Trees									
Betula nigra	4	3	10	5	5	5	7		70%
Fraxinus pennsylvanica	5	4	11	6	6	2	9		55%
Liriodendron tulipifera	0	0	1	1	0	0	0		0%
Quercus lyrata	2	1	4	3	3	3	3		75%
Quercus michauxii	2	4	6	5	4	3	6		100%
Quercus pagodifolia	6	0	7	7	5	5	6		86%
Quercus phellos	1	3	3	3	3	1	4		100%
Salix nigra	1	3	3	3	3	3	4		100%
Ulmus Sp.Vol	1	0	1	0	0	0	1		-
Totals	21	18	46	33	29	22	39		
Woody Stems Total:	28	28	64	52	44	37	56		88%
Total w/ Vols.	41	69	78	61	55	50	110		
Stems Per Acre	1120	1120	1280	1000	880	740	1120		
Stems Per Acre w/vols.	1640	2760	1560	1220	1100	1000	2200		

Exhibit Table VIb. Stems Per Acre w/o Volunteers

	Plot A	Plot B	Site
Baseline (Jan 07)	1120	1440	1280
Mon. Y1 (07)	760	1240	1000
Mon. Y2 (08)	680	1080	880
Mon. Y3 (09)	720	760	740
Mon. Y4 (10)	1120	1120	1120
Mon. Y5 (11)			

3.1.4 Vegetation Assessment Summary

Vegetation success will be defined as tree survival to meet 320 stems per acre after 3 years and 260 stems per acre after 5 years inside the permanent vegetation sampling plots and herbaceous cover evaluated with photos showing 75% coverage, after 5 years.

In general, the site was over planted to allow for mortality. The site as a whole shows an average of 1120 planted stems per acre and demonstrates 88 percent survival of planted species. The community is diverse and rich with healthy volunteers. Large numbers of buttonbush and black willow volunteers are present on site and in plots. This year it was noted that buttonbush was not on the original planting list and therefore all buttonbush are now being calculated as volunteers. This lowers the planted stem counts presented in Table VIb above from previous years reports, however the site and both plots remain well above the success criteria of 288 for Year 4. It should also be noted that volunteer individuals of a certain size are not easily distinguished from planted individuals. Therefore, in the case of planted species where volunteers of the same species are present, volunteers may be counted. The count in any given year will not exceed the number of planted individuals from baseline/ initial counts.

The herbaceous cover plant community was monitored in a 1 m by 1 m square at one corner of each plot. Each herbaceous quadrant is at or close to 100% cover with no invasive species noted. Additional data from the vegetation sampling plots is located in Appendix A. Most notably, the polygonum population of previous years was not present. The presence of polygonum historically makes stems counts very difficult, therefore it is not surprising that several individuals not accounted for in previous years were located during the Year 4 count.

3.2 WETLAND ASSESSMENT

3.2.1 Wetland Criteria Attainment

There are three water level monitoring gages located on the Reeds Creek Project. Gages 1 and 2 are located in the restoration area and Gage 3 is located in the enhancement area in the same location as the pre-construction gage. There are both mature forested and emergent areas of preservation which were not included in the WMU calculations adjacent to the small unnamed tributary entering the site from the southeast corner and flowing into the cove for the Huntington neighborhood. There is a 4th gage located in the preservation/fringe area of the site to be used as an on site reference. The data will be downloaded once a month throughout the monitoring period. A USGS rain gage located on Lake Norman (Gage #35301408052495 CRN-42 Norman Shores) will be used to monitor the amount of rainfall. This will be correlated with the ground water data. Lake Norman lake levels will also be monitored if the site becomes inundated from high lake levels. As stated in the Mitigation Plan, jurisdictional hydrology for the site will be defined as saturation within the upper 12 inches of the surface of the soils for a period of approximately 24 consecutive days during the growing season (239 days between March and October) or approximately 10% of the growing season. Inundation periods of

between 5 and 10% of the growing season may be acceptable in a year that is on record for moderate to severe drought. The NC Cooperative Extension Service actually lists the average growing season for Iredell County as 179 days. Therefore, in a year of average precipitation hydrological success for the Reeds Creek site will be a minimum of 18 days.

Gage 1 achieved jurisdictional levels for 2010 on March 29th, 2010, and has maintained them to date, and will likely maintain jurisdictional levels throughout the growing season. Gage 2 entered the growing season within jurisdictional levels then experienced a short dry spell during the month of May achieving approximately 62 jurisdictional days between March 1st and May 1st, 2010. Gage 3 also entered the growing season within jurisdictional levels, over the past year only the months of July and August 2009 did not maintain jurisdiction levels. A similar trend will most likely be seen for 2010. To date Gage 3 has recorded approximately 93 days of continuous jurisdictional hydrology. The Reference gage (4) has been historically dryer than the other gages since Year 2, but maintained jurisdictional hydrology between March 12th, and April 5th, 2010. The reference area is thickly vegetated, including a large stand of mature Black Willows near the gage and is far removed from the inundation effect of Lake Norman. Both of these factors could affect the hydrology of this gage. Graphs showing water levels and corresponding rainfall data are located in Appendix B.

Based on the gage data for 2010, the site has achieved jurisdictional hydrology for the fourth consecutive monitoring year. The area of inundation located in the center of the site closest to the leading edge of the lake is a mapped NWI wetlands and is considered on site preservation and not included in the credit calculations for the site. This area tends to remain inundated for the better part of the year, particularly in the winter months. A line showing the 2009 – 2010 13 month lake level history has been added to the gage graphs provided in Appendix B.

Exhibit Table VII: Success Criteria Attainment

Well ID	Well Hydrology Threshold Met?	Mean	Vegetation Plot ID	Vegetation Survival Threshold Met?	Mean
Reeds 1	Y	100	Plot A	Y	100
Reeds 2	Y				
Reeds 3	Y		Plot B	Y	
Reeds Ref	Y				

Exhibit Table VIII: Wetland Criteria Attainment

Well ID			
	Well Hydrology Threshold Met?	Total days w/ Jurisdictional Hydrology	Percent of Growing Season w/ Jurisdictional Hydrology
Reeds 1	Y	65	36%
Reeds 2	Y	62	35%
Reeds 3	Y	93	52%
Reeds Ref	Y	25	14%

Exhibit Table IX: Percent of Growing Season (179 days) with groundwater continuously within 12 inches

	Gage 1 [R]	Gage 2 [R]	Gage 3 (E)	Gage 4 (REF)
Mon. Year 1 (2007)	6.7	8.9	38.0	19.0
Mon. Year 2 (2008)	100	39.7	70.4	5.6
Mon. Year 3 (2009)	100	46.9	40.8	13.4
Mon. Year 4 (2010)	36.3	34.6	52.0	14.0
Mon. Year 5 (2011)				

Below 10% but above 5%

3.2.2 Photo Reference Points

There are eight permanent photo reference points located throughout the Reeds Project included in this monitoring report. Two of the photo reference points are located in the southwest corner of each vegetation plot. All the Photographs will help to illustrate the health of the planted vegetation and the surface water hydrology (e.g. standing water). The Photo Log is located in Appendix A.

4.0 SITE SUCCESS ASSESSMENT SUMMARY

Overall, the adjacent Reeds Creek stream channel has developed and stabilized well after the berm was lowered. The herbaceous vegetative cover has also developed a healthy and diverse community. The planted trees and shrubs have done very well and are supplemented by a robust existing buffer community which provides seed source for volunteers well suited to the current site conditions. Ground water gages demonstrate favorable trends and jurisdictional wetland hydrology throughout the entire site.

Additionally, a local chapter of the North Carolina Wildlife Federation, the Lake Norman Wildlife Conservationists has taken a special interest in the Reeds Creek project. The group has worked with Boy Scouts and other local volunteers to build and install wood duck, barred owl, blue bird, and warbler nesting boxes on the site in 2008. Two Bat Boxes and constructed basking logs for the turtle population were installed in 2009. The group regularly visits the site to pick up litter and monitor for trespassing and vandalism. The group and the site have received positive local press in previous years. No more habitat structures are planned for the site, but the group continues to frequent the site to look for problems and pick up litter.

APPENDIX A. Vegetation Raw Data

Vegetation Raw Data

Site Photo Log w/ Vegetation Monitoring Plot Photos

Plot A: 6/1/2010

Shrubs		**Volunteers**
Cephalanthus occidentalis Vols	7	100%
Cornus amomum	7	3 large
Totals	14	
Trees		
Betula nigra	4	
Fraxinus pennsylvanica	10	3 small seedlings; 2 large
Liriodendron tulipifera	0	
Quercus lyrata	2	
Quercus michauxii	2	
Quercus pagodifolia	6	
Quercus phellos	1	
Salix nigra	1	
Ulmus Sp.Vol	1	100%
Totals	21	
Woody Stems Total:	28	
Total w/ Vols.	41	
Stems Per Acre	1120	
Stems Per Acre w/vols.	1640	

Herbaceaous Cover: 100%

soft rush	*Juncus effusus*
deertounge grass	*Panicum clandestinum*
swamp rose mallow	*Hibiscus moscheutos*

Invasives:
None noted

Plot B: 6/1/2010

Shrubs		**Volunteers**
Cephalanthus occidentalisVols.	12	100%
Cornus amomum	11	1 small vol
Totals	23	
Trees		
Betula nigra	5	2 small vols.
Fraxinus pennsylvanica	4	
Liriodendron tulipifera		
Quercus lyrata	1	
Quercus michauxii	4	
Quercus pagodifolia		
Quercus phellos	3	
Salix nigra	29	26 large vols.
Totals	18	
Woody Stems Total:	28	
Total w/ Vols.	69	
Stems Per Acre	1120	
Stems Per Acre w/vols.	2760	

Plot B is 42% Black Willow

Black Willows were thinned this winter
Black Willows create overstory
Oaks, SD, and BB are thriving in the understory

Herbaceaous Cover: 100%

soft rush	*Juncus effusus*
lurid sedge	*Carex lurida*
Rice Cut Grass	*Leersia oryzoides*

Exhibit Table VIa. Stem Counts for Each Species Arranged by Plot (Year 4)

Species	Plots- Actual Count		Surviving Planted Stems						Current Survival (%)	Volunteer info.
	A	B	Initial	Year 1	Year 2	Year 3	Year 4	Year 5		
Shrubs										
Cephalanthus occidentalis Vols.	7	12	13	11	11	11	19		-	100% Vols.
Cornus amomum	7	10	19	17	15	17	17		100%	3 vol plot A, 1 plot B
Totals	14	22	32	28	26	28	36			
Trees										
Betula nigra	4	3	10	5	5	5	7		70%	2 small vols plot B
Fraxinus pennsylvanica	5	4	11	6	6	2	9		82%	2 large Vols & 30 small seedlings in Plot A
Liriodendron tulipifera	0	0	1	1	0	0	0		0%	
Quercus lyrata	2	1	4	3	3	3	3		75%	
Quercus michauxii	2	4	6	5	4	3	6		100%	
Quercus pagodifolia	6	0	7	7	5	5	6		86%	
Quercus phellos	1	3	3	3	3	1	4		100%	1 vol plot A ?
Salix nigra	1	3	3	3	3	3	4		100%	1 vol plot A, 26 large vols plot B
Ulmus Sp.Vol	1	0	1	0	0	0	1		-	100% Vol (plot A)
Totals	21	18	46	33	29	22	39			
Woody Stems Total:	28	28	64	50	44	37	56		88%	
Total w/ Vols.	41	69	78	61	55	50	110			
Stems Per Acre	1120	1120	1280	1000	880	740	1120			
Stems Per Acre w/vols.	1640	2760	1560	1220	1100	1000	2200			

SPA Calcs. ea. Plot is approx. 1089 sq. ft.

Stems per plot	stems per acre
2178	43560

Success criteria 320 stems per acre after Year 3 (2009)
288 after year 4 (2010)
260 after Year 5 (2011)

Exhibit Table VIb. Stems Per Acre w/o Volunteers

	Plot A	Plot B	Site
Baseline (Jan 07)	1120	1440	1280
Mon. Y1 (07)	760	1240	1000
Mon. Y2 (08)	680	1080	880
Mon. Y3 (09)	720	760	740
Mon. Y4 (10)	1120	1120	1120
Mon. Y5 (11)			

Reeds Creek Photo Log

Photo Point 1

Photo Point 2

Photo Point 3

Photo Point 4

Photo Point 5

Photo Point 6

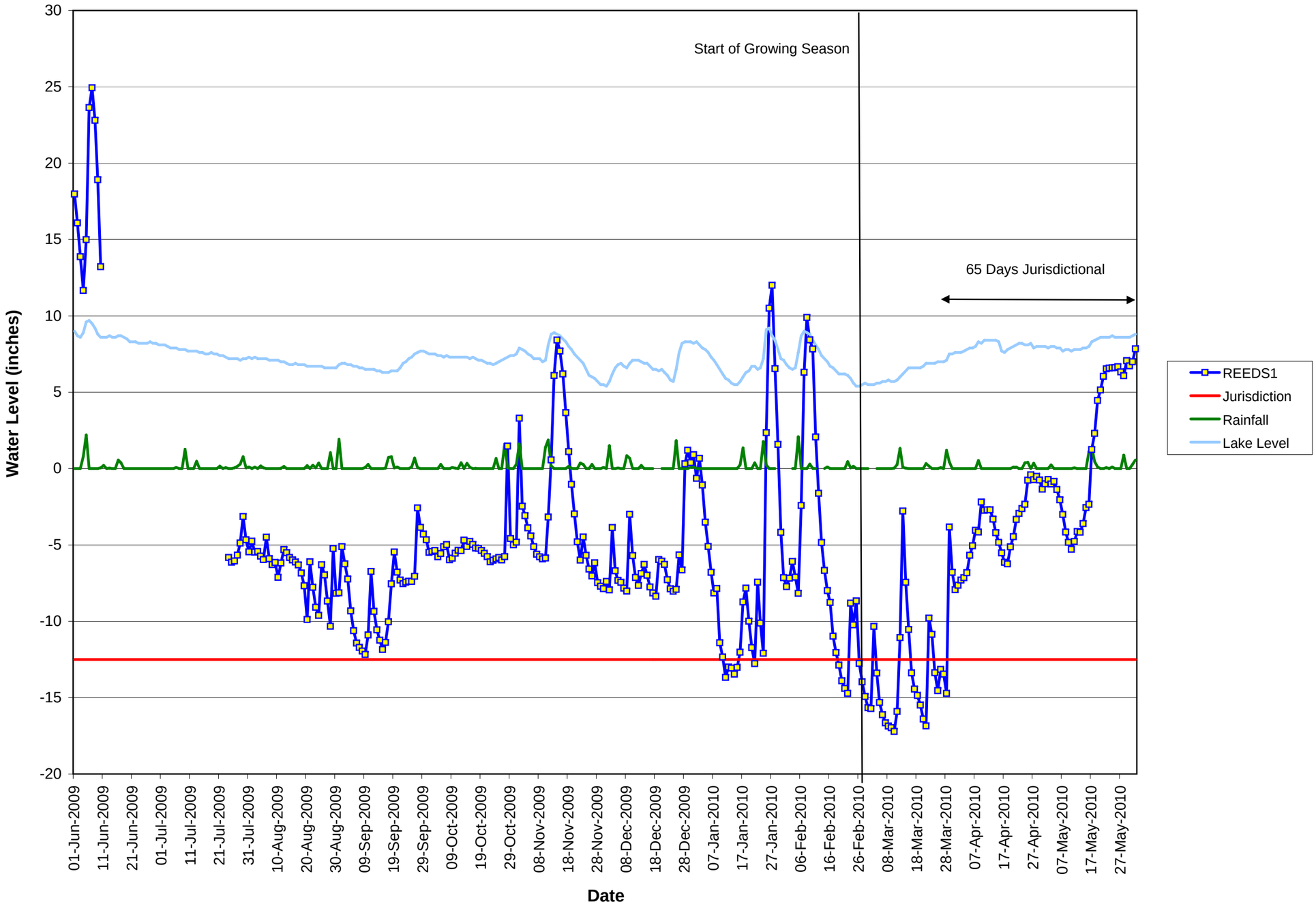
Vegetation Plot A

Vegetation Plot B

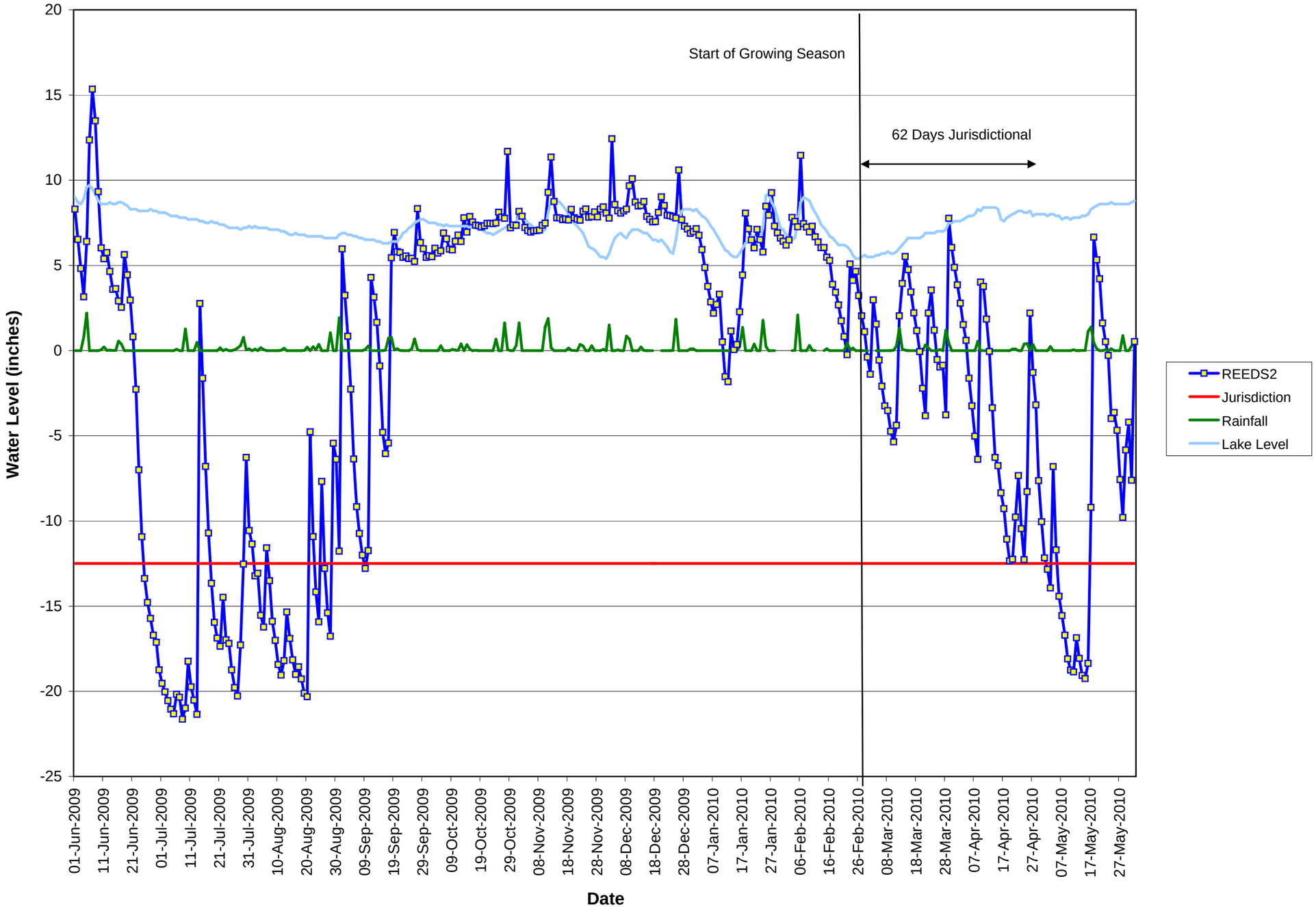
APPENDIX B: Water Level and Rainfall Data

Water Level Gage Graphs
USGS CRN 42 Rainfall Data
13 Month History – Lake Norman Lake Levels

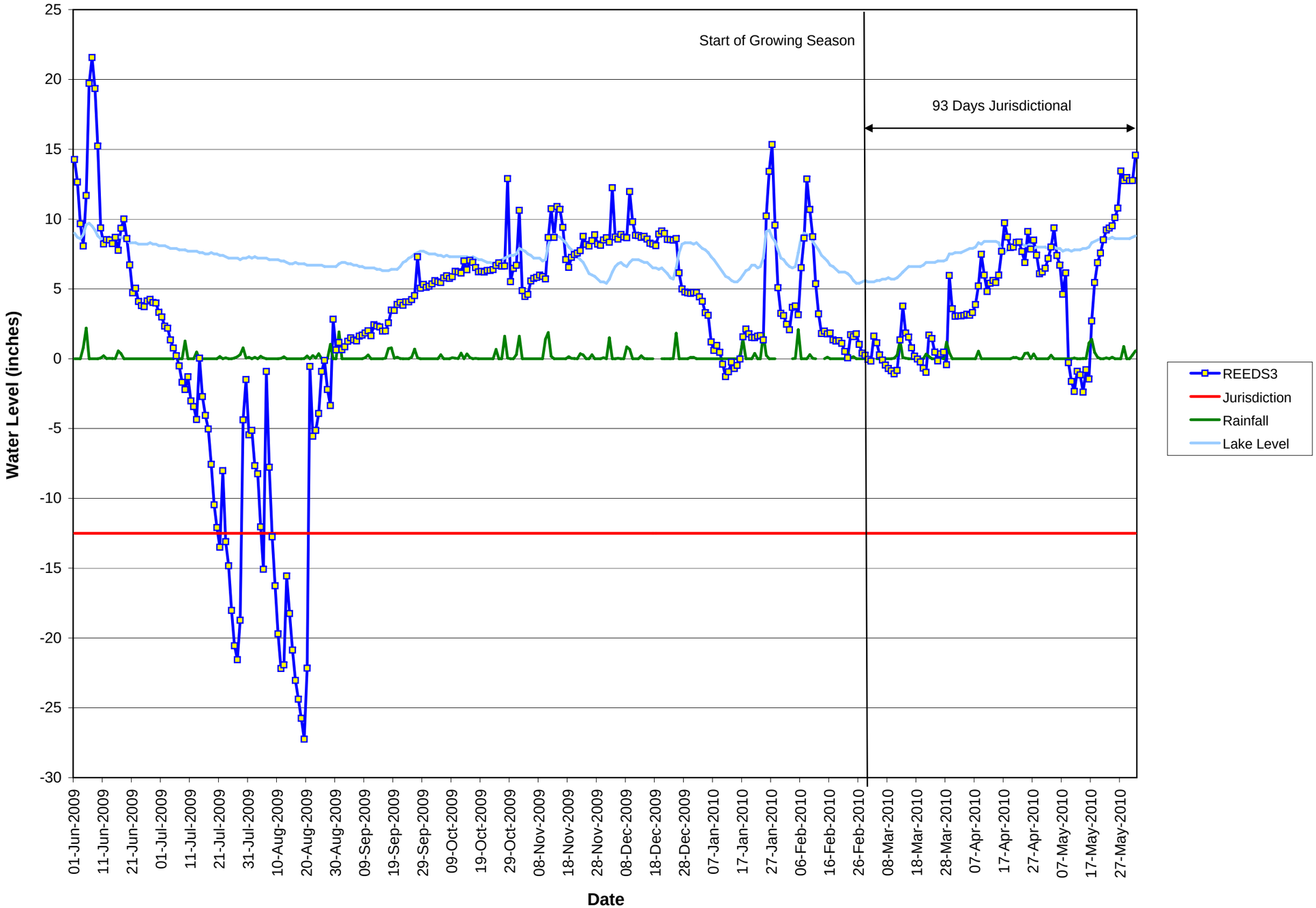
Water Level for Reeds Creek Well #1 (REEDS1)



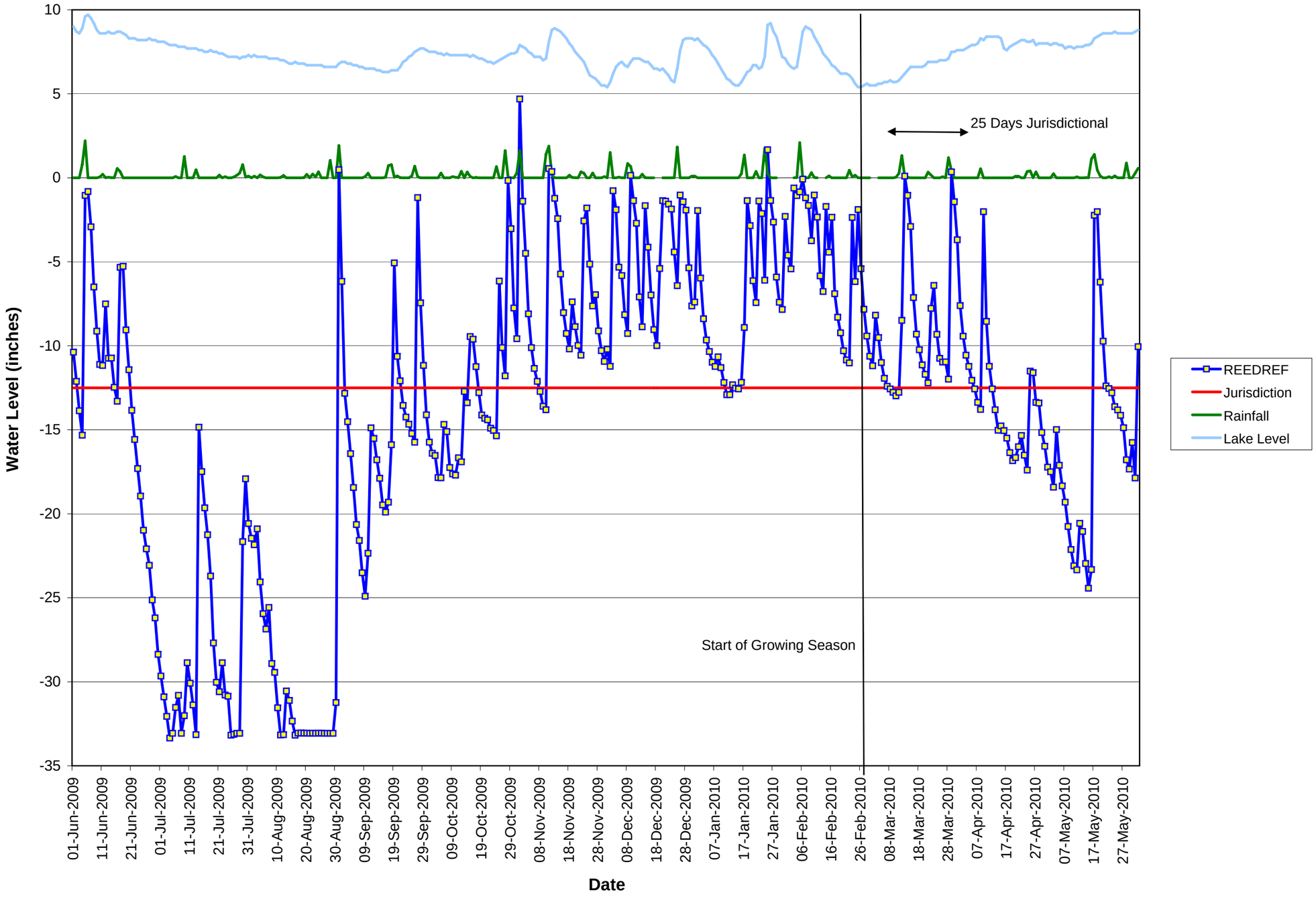
Water Level for Reeds Creek Well #2 (REEDS2)



Water Level for Reeds Creek Well #3 (REEDS3)



Water Level for Reeds Creek Reference Well (REEDREF)



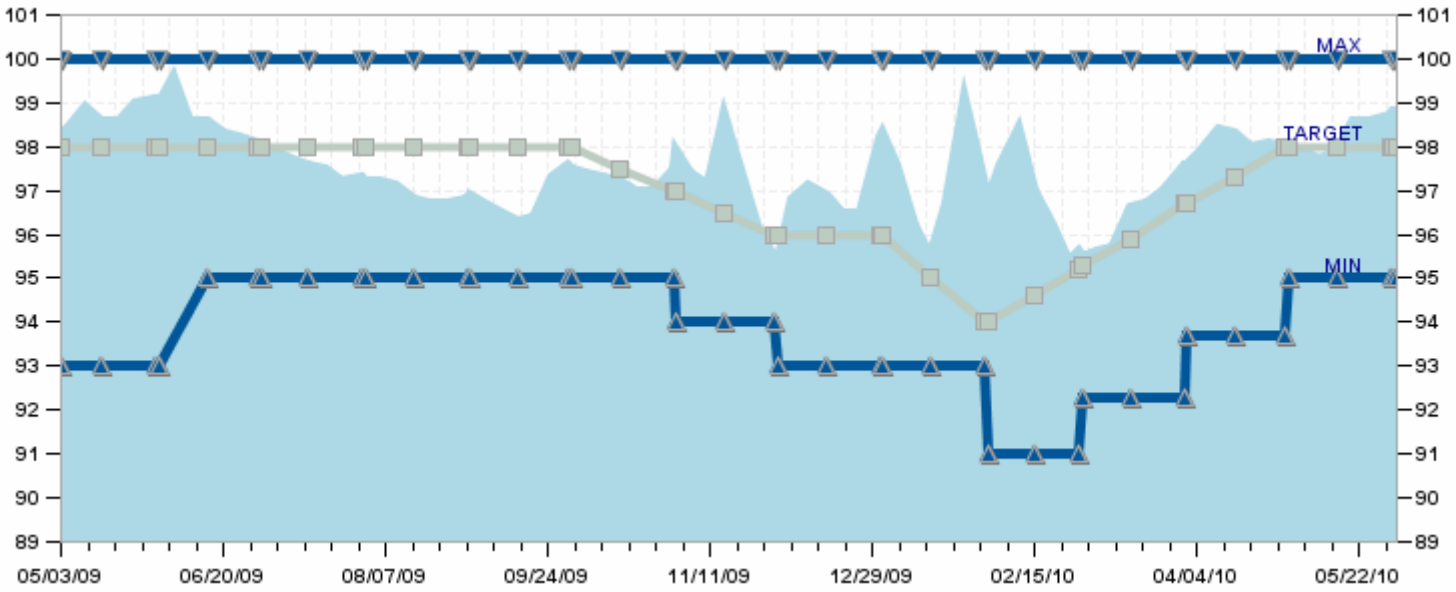
Daily Sum Precipitation, total, inches (DD 04) CRN42 Norman Shores

DATE	Jun 2009	Jul 2009	Aug 2009	Sep 2009	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	Jun 2010
1	0.00 A	0.00 A	0.00 A	0.00 A	0.00 P	1.62 P	0.00 P	0.00 P	---	0.00 P	0.00 P	0.00 P	0.57 P
2	0.00 A	0.00 A	0.10 A	0.00 A	0.00 P	0.00 P	1.50 P	0.00 P	---	---	0.00 P	0.00 P	
3	0.00 A	0.00 A	0.00 A	0.00 A	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	---	0.00 P	0.24 P	
4	0.79 A	0.00 A	0.17 A	0.00 A	0.00 P	0.00 P	0.00 P	0.00 P	0.02 P	0.00 P	0.00 P	0.00 P	
5	2.20 A	0.00 A	0.05 A	0.00 A	0.28 P	0.00 P	0.04 P	0.00 P	2.09 P	0.00 P	0.00 P	0.00 P	
6	0.00 A	0.07 A	0.00 A	0.00 A	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	
7	0.00 A	0.00 A	0.00 A	0.00 A	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	
8	0.00 A	0.00 A	0.00 A	0.00 A	0.00 P	0.00 P	0.85 P	0.00 P	0.00 P	0.00 P	0.54 P	0.00 P	
9	0.00 A	1.27 A	0.00 A	0.07 A	0.07 P	0.00 P	0.68 P	0.00 P	0.30 P	0.00 P	0.00 P	0.00 P	
10	0.05 A	0.00 A	0.00 A	0.27 A	0.03 P	1.40 P	0.00 P	0.00 P	0.02 P	0.03 P	0.00 P	0.00 P	
11	0.21 A	0.00 A	0.02 A	0.00 A	0.01 P	1.88 P	0.00 P	0.00 P	0.00 P	0.26 P	0.00 P	0.05 P	
12	0.00 A	0.00 A	0.14 A	0.00 A	0.39 P	0.17 P	0.00 P	0.00 P	---	1.32 P	0.00 P	0.00 P	
13	0.03 A	0.48 A	0.00 A	0.00 A	0.00 P	0.00 P	0.21 P	0.00 P	---	0.08 P	0.00 P	0.00 P	
14	0.01 A	0.00 A	0.00 A	0.00 A	0.34 P	0.00 P	0.01 P	0.00 P	0.00 P	0.03 P	0.00 P	0.01 P	
15	0.01 A	0.00 A	0.00 A	0.00 A	0.08 P	0.00 P	0.00 P	0.00 P	0.11 P	0.00 P	0.00 P	0.01 P	
16	0.55 A	0.00 A	0.00 A	0.03 A	0.00 P	0.00 P	0.00 P	0.24 P	0.00 P	0.00 P	0.00 P	1.12 P	
17	0.37 A	0.00 A	0.00 A	0.73 A	0.02 P	0.00 P	0.00 P	1.36 P	0.00 P	0.00 P	0.00 P	1.39 P	
18	0.00 A	0.00 A	0.00 A	0.78 A	0.00 P	0.15 P	---	0.00 P	0.00 P	0.00 P	0.00 P	0.46 P	
19	0.00 A	0.00 A	0.01 A	0.04 A	0.00 P	0.02 P	---	0.00 P	0.00 P	0.00 P	0.00 P	0.11 P	
20	0.00 A	0.00 A	0.20 A	0.11 A	0.00 P	0.01 P	0.00 P	0.00 P	0.00 P	0.00 P	0.09 P	0.00 P	
21	0.00 A	0.16 A	0.00 A	0.01 A	0.00 P	0.00 P	0.00 P	0.38 P	0.00 P	0.33 P	0.09 P	0.00 P	
22	0.00 A	0.00 A	0.22 A	0.00 A	0.00 P	0.36 P	0.00 P	0.00 P	0.45 P	0.16 P	0.00 P	0.06 P	
23	0.00 A	0.07 A	0.05 A	0.00 A	0.00 P	0.27 P	0.00 P	0.00 P	0.05 P	0.00 P	0.00 P	0.00 P	
24	0.00 A	0.00 A	0.36 A	0.00 A	0.67 P	0.00 P	0.01 P	1.77 P	0.15 P	0.00 P	0.38 P	0.11 P	
25	0.00 A	0.00 A	0.00 A	0.11 A	0.00 P	0.00 P	1.83 P	0.24 P	0.00 P	0.00 P	0.41 P	0.00 P	
26	0.00 A	0.04 A	0.00 A	0.69 A	0.00 P	0.28 P	0.00 P	0.00 P	0.00 P	0.06 P	0.01 P	0.00 P	
27	0.00 A	0.15 A	0.00 A	0.06 A	1.62 P	0.00 P	0.00 P	0.00 P	0.00 P	0.00 P	0.35 P	0.00 P	
28	0.00 A	0.29 A	1.04 A	0.00 A	0.05 P	0.00 P	0.00 P	0.00 P	0.00 P	1.20 P	0.00 P	0.88 P	
29	0.00 A	0.78 A	0.00 A	0.00 A	0.00 P	0.00 P	0.00 P	---		0.44 P	0.00 P	0.00 P	
30	0.00 A	0.05 A	0.00 A	0.00 A	0.00 P	0.07 P	0.10 P	---		0.00 P	0.00 P	0.00 P	
31		0.10 A	1.92 A		0.29 P		0.10 P	---		0.00 P		0.27 P	
COUNT	**30**	**31**	**31**	**30**	**31**	**30**	**29**	**28**	**24**	**29**	**30**	**31**	**1**
MAX	**2.20**	**1.27**	**1.92**	**0.78**	**1.62**	**1.88**	**1.83**	**1.77**	**2.09**	**1.32**	**0.54**	**1.39**	**0.57**

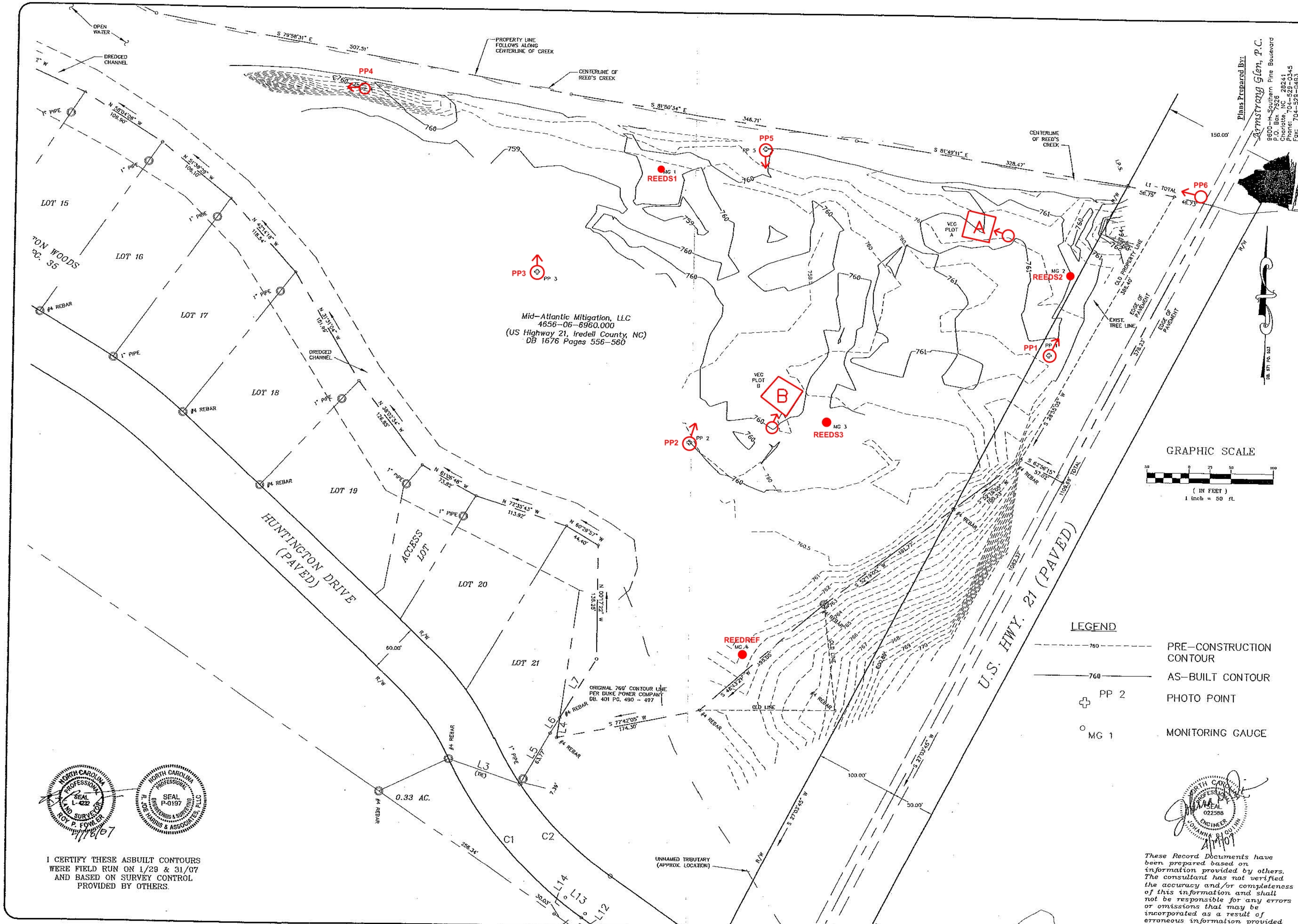
Explanation	
A	Approved for publication -- Processing and review completed.
P	Provisional data subject to revision.

MIN	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.57**

Lake Norman - 13-Month Lake Level History



APPENDIX C: Monitoring Plan View



PP4
PP5
PP6
PP1
PP2
PP3
REEDS1
REEDS2
REEDS3
REEDREF
A
B
VEG PLOT A
VEG PLOT B
OPEN WATER
DREDGED CHANNEL
PROPERTY LINE FOLLOWS ALONG CENTERLINE OF CREEK
CENTERLINE OF REED'S CREEK
LOT 15
LOT 16
LOT 17
LOT 18
LOT 19
LOT 20
LOT 21
ACCESS LOT
Mid-Atlantic Mitigation, LLC
4656-06-6960.000
(US Highway 21, Iredell County, NC)
DB 1676 Pages 556-560
HUNTINGTON DRIVE (PAVED)
U.S. HWY. 21 (PAVED)
EXIST. TREE LINE
EDGE OF PAVEMENT
OLD PROPERTY LINE
ORIGINAL 760' CONTOUR LINE PER DUKE POWER COMPANY DB. 401 PG. 490 - 497
UNNAMED TRIBUTARY (APPROX. LOCATION)
0.33 AC.
GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.
LEGEND
PRE-CONSTRUCTION CONTOUR
AS-BUILT CONTOUR
PP 2 PHOTO POINT
MG 1 MONITORING GAUGE
I CERTIFY THESE ASBUILT CONTOURS WERE FIELD RUN ON 1/29 & 31/07 AND BASED ON SURVEY CONTROL PROVIDED BY OTHERS.
These Record Documents have been prepared based on information provided by others. The consultant has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions that may be incorporated as a result of erroneous information provided by others.

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Mid-Atlantic Mitigation, L.L.C.
AN EARTHMARK COMPANY

JOB NO.	C5028
SCALE	1" = 50'
CAD FILE PATH	
SURVEYED BY	R. Joe Harris & Assoc.
CHECKED BY	Armstrong Glen, PC
APPROVED BY	
DATE	4/17/07

REID'S CREEK WETLAND RESTORATION SITE

AS-BUILT CONTOURS COMPARED TO PRE-CONSTRUCTION CONTOURS

SHEET 1 OF 2