Charles Creek Park
Wetland Restoration
Year One Monitoring Report

Pasquotank County, North Carolina

March 2008

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Cataloging Unit – 03010205 Pasquotank County
EEP Project No. 79

Prepared For:

Ecosystem Enhancement PROGRAM

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I. Executive Summary / Project Abstract

The Charles Creek Park Wetland Restoration project is located in the Pasquotank River Basin, Hydrologic Cataloging Unit 03010205. The site consists of approximately 2.13 acres along the southeast bank of Charles Creek near its confluence with the Pasquotank River. Of this acreage, a total of 1.93 acres is comprised of restored wetlands, enhanced wetlands, or open water areas. The restoration site is located within Charles Creek Park in downtown Elizabeth City, NC. The property is currently owned by the City of Elizabeth City; the conservation easement is owned by NCDENR-Ecosystem Enhancement Program (EEP).

The Charles Creek Park Wetland Restoration project restored wetland hydrology and the targeted cypress-gum swamp plant community onsite (Schafale and Weakley, 1990). The restoration of this riverine wetland commenced in July 2007 and consisted of re-grading previously filled wetlands in order to lower the site elevation to bring it closer to the water table and the mean water surface elevation of the adjacent Charles Creek thereby restoring wetland hydrology. The site was planted in July 2007 with native woody (tree and shrub) and herbaceous vegetation, and seeded with a native herbaceous seed mix.

Monitoring of the vegetated buffer was performed by Soil & Environmental Consultants, PA (S&EC) during the growing season of 2007 (from April 7 to November 1). Stem counts were performed within the established vegetation monitoring plots, resulting in an average woody live stem density of approximately 1,073 stems per acre.

Only two (2) of the four (4) installed groundwater gauges achieved the desired success criteria. This most likely due to the sever drought which was documented across the State of North Carolina in 2007. However, based on site observations, including inundation (or evidence thereof to include wrack lines, etc.), vegetative success, and overall site conditions it appears that the site has performed successfully.

Year 2 Monitoring (coordinated by NCEEP) will commence in January of 2008.

II. Project Background

The Charles Creek Park Wetland Restoration Site is located in downtown Elizabeth City in Pasquotank County, NC. The site is approximately 2.13 acres and is located along the southeastern bank of Charles Creek near its confluence with the Pasquotank River in the Pasquotank River basin (Cataloging Unit 03010205). Of this acreage, a total of 1.93 acres is comprised of restored wetlands, enhanced wetlands, or open water areas.

The project site is located within a property owned by the City of Elizabeth City, in an urban residential area comprised primarily of single family homes. NCEEP owns a conservation easement on the property. Charles Creek Park is bordered by a paved basketball court and Southern Avenue to the west, Dawson Street to the south, Hunter Street to the east and Tuscarora Avenue and Charles Creek itself to the north.

The majority of the site surface was filled an unknown number of years ago in order to create the city park. Most of the usable surface was maintained as turf grass (for recreational purposes) with some remnant areas of cypress-gum swamp along Charles Creek and the two unnamed tributaries to Charles Creek within the project site. These unnamed tributaries enter the site through culverts under surrounding streets. One tributary flows west under Hunter Street and across the north edge of the site until its confluence with Charles Creek. The other tributary flows north into Charles Creek through the center of the property essentially bisecting the property. The natural areas onsite contained many large bald cypress trees.

A. Project Goals and Objectives

The specific goals and objectives of the Charles Creek Park wetland restoration as described in the Restoration Plan (March 2005) are to:

1) Restore and enhance wetland function, vegetative structure, and wildlife habitat to approximately 2 acres of lower coastal plain bald cypress-gum swamp,

2) Incorporate the restoration effort into the site's surrounding areas in an aesthetically pleasing manner that does not mark a significant departure from similar nearby cypress-gum swampland,

3) Retain valuable natural onsite assets (i.e., large existing bald cypress individuals) and incorporate them into the site restoration, and

4) Incorporate the site into the Elizabeth City community in a manner that is conducive to fostering public interest in wetland restoration.

B. Project Structure, Restoration Type, and Approach

The restoration design for the site was based on qualitative assessment, species lists for vegetative strata and techniques utilizing reference data sets and existing wetland

conditions survey data. Reference data utilized in our design included the previously described reference data in the Charles Creek Park Wetland Restoration Plan (March 2005).

The implementation of the Restoration Plan resulted in the restoration of a previously impacted riverine wetland and the enhancement of natural habitat through the removal of fill, the removal of exotic invasive vegetation, and the planting of native vegetation based on reference wetland conditions. This restoration also provided a more appropriate hydraulic connection of the pre-existing hydrologic regime and the local historic floodplain.

Hand auger borings and visual site assessment indicated varying depths of fill material overlaying the residual site soils. This was confirmed based on a review of the Pasquotank County Soil survey, which indicates the presence of primarily Mattapex fine sandy loam in upland areas as well as Bibb and "Swamp" mapped soils to lesser degrees.

Restoration operations included removal of this fill material to expose residual soils. The resultant presence of groundwater closer to the soil surface in conjunction with the planting of appropriate vegetative species (tree, shrub, and herbaceous) supports the restoration approach.

C. Location and Setting

The Charles Creek Park Riverine Wetland Restoration Site is located in downtown Elizabeth City in Pasquotank County, NC. The site is located along the southeastern bank of Charles Creek near its confluence with the Pasquotank River in the Pasquotank River basin (Cataloging Unit 03010205).

The restoration site is located within a property owned by the City of Elizabeth City, in an urban residential area comprised primarily of single family homes. The conservation easement on the property is owned by EEP. Charles Creek Park is bordered by a paved basketball court and Southern Avenue to the west, Dawson Street to the south, Hunter Street to the east and Tuscarora Avenue and Charles Creek itself to the north.

D. Project History and Background

The following tables summarize the project history and background:

Exhibit Table I. Project Restoration Components Charles Creek Park Wetland Mitigation Site						
Project Segment or Reach ID	**Existing Feet/Acres**	**Type**	**Approach**	**Footage or Acreage**	**Stationing**	**Comment**
Restoration	1.16	R	N/A	1.16	N/A	
Enhancement	0.60	E	N/A	0.60	N/A	
Open Water	0.17	N/A	N/A	0.17	N/A	

Mitigation Unit Summations					
Stream (lf)	Riparian Wetland (Ac)	Nonriparian Wetland (Ac)	Total Wetland (Ac)	Buffer (Ac)	Comment
N/A	1.93	N/A	1.93	N/A	

Site construction and planting were completed in July 2007. Additional information regarding the project history and schedule are shown in Table II.

Exhibit Table II. Project Activity and Reporting History Charles Creek Park Wetland Mitigation Site		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan		Mar-05
Construction		Jul-06
Planting / Permanent seed mix applied		Jul-06
Mitigation Plan / As-built (Year 0 Monitoring - baseline)		Mar-07
Year 1 Monitoring	Nov-07	Dec-07
Year 2 Monitoring		Dec-08
Year 3 Monitoring		Dec-09
Year 4 Monitoring		Dec-10
Year 5 Monitoring		Dec-11

Exhibit Table III. Project Contacts Table Charles Creek Park Wetland Mitigation Site	
Designer Primary Project Design POC	Soil & Environmental Consultants, PA 11010 Raven Ridge Rd Raleigh, NC 27614 Patrick K. Smith (919) 846-5900
Construction Contractor Construction Contractor POC	North State Environmental, Inc. 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Planting Contractor Planting Contractor POC	North State Environmental, Inc. 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Seeding Contractor Seeding Contractor POC	North State Environmental, Inc. 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Monitoring Performers	Soil & Environmental Consultants, PA 11010 Raven Ridge Rd. Raleigh, NC 27614
Vegetation Monitoring POC	Jessica Regan (919) 846-5900
Wetland Monitoring POC	Jessica Regan (919) 846-5900

Exhibit Table IV. Project Background Table Gray Farm Stream Restoration Site/EEP Project # 92219	
Project County	Pasquotank
Drainage area	21.3 ac
Drainage impervious cover estimate (%)	< 20%
Stream Order	N/A
Physiographic Region	Coastal Plain
Ecoregion	Middle Atlantic Coastal Plain
Rosgen Classification of As-built	N/A
Cowardin Classification	Estuarine
Dominant soil types	Mattapex, Bibb, “Swamp”
Reference site ID	Charles Creek
USGS HUC for Project and Reference	03010205
NCDWQ Sub-basin for Project and Reference	03-01-50
NCDWQ classification for Project and Reference	C;Sw
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	No Fence

E. Monitoring Plan View

Four (4) vegetation monitoring plots were established across the restored wetland area. Monitoring plots consist of 10m x 10m squares with a groundwater monitoring gauge serving as one corner of the plot. The remaining plot corners are marked with 1.5-inch diameter PVC pipes. A corner of each vegetation monitoring plot was established as a permanent photo point for vegetation monitoring photos.

The locations of all monitoring devices are shown on Sheet 1 (Monitoring Plan View).

III. Project Condition and Monitoring Results

A. Vegetation Assessment

The vegetative success of the restored riparian wetland will be based on the combined survival of tree and shrub species for the five-year monitoring period. Survival of woody (tree and shrub) species planted within the restored wetland will be at least 320 stems/acre through year three, 288 stems/acre through year four, 260 stems/acre through year five. The stem count will be based on an average of the stem counts of the evaluated vegetation plots. The taxonomic standard used for the counts is "Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas" by Alan S. Weakley.

In Year 1 (2007), vegetation monitoring shows an average density of 1,073 live stems per acre (trees and shrubs). Future vegetation monitoring data will be compared with baseline monitoring data to determine survival rates and stem densities for woody vegetation planted within the restored wetland. Vegetation monitoring data for buffer plots is presented in Appendix A.

1. Problem Areas Plan View (Vegetation)

There are currently no vegetative problem areas.

2. Vegetative Problem Areas Plan View

There are currently no vegetative problem areas.

B. Wetland Assessment

Four (4) Infinities, USA groundwater monitoring gauges along with one (1) Infinities, USA rain gauge were installed onsite after construction was completed. The groundwater gauges record daily readings of groundwater depth. The rain gauge records daily rainfall depths.

The growing season in Pasquotank County typically begins April 7 and ends November 1 (209 days). Success criteria for wetland hydrology require that the area be inundated or saturated within 12-inches of the ground surface for a period of 8.5% of the growing season or approximately 18 consecutive days. This duration is selected as the mean and

generally desired percentage, however, an individual gauge is deemed successful if it falls within the range of 5 to 12% of the growing season or approximately 10 to 26 days.

1. Problem Areas Plan View (Wetland)

An assessment of the stability of the wetland was preformed on during monthly visits that occurred from January through November 2007, by S&EC. Groundwater gauges were downloaded quarterly.

As shown on the Problem Area Plan View (Sheet 2), two (2) of the four (4) gauges on-site achieved wetland success criteria of saturation for 8.5% of the growing season (18 days). CCP 2 and CCP3 experienced 50 and 51 consecutive days of saturation, respectively. The two (2) gauges that did not meet criteria are CCP1 and CCP4 which experienced a maximum of 4 and 7 consecutive days, respectively. However, based on site observations, including inundation (or evidence thereof to include wrack lines, etc.), vegetative success, and overall site conditions it appears that the site has performed successfully.

Based on data collected from the onsite rain gauges a total of 20.36 inches of rainfall was measured during the growing season. Based on data from the State Climate Office (NC SCO), normal rainfall during the growing season in Elizabeth City is 28.04 inches. It should be noted that much of the State of North Carolina was in a severe drought for a majority of 2007 and that onsite rainfall was well below normal. In fact, observed onsite rainfall equates to less than 75% of that expected during a normal year.

And considering gauges CCP1 and CCP4 were relatively close to achieving saturation within the desired range of 5 to 12% of the growing season, it would be expected that during a normal rainfall year, all gauges would likely meet hydrologic success criteria.

2. Wetland Criteria Attainment

Table V: Wetland Criteria Attainment
Charles Creek Park Wetland Mitigation Site

Well ID	Well Hydrology Threshold Met?	Transect Mean	Vegetation Plot ID	Vegetation Survival Threshold Met?
CCP1	N	**50%**	Plot 1	Y
CCP2	Y		Plot 2	Y
CCP3	Y		Plot 3	Y
CCP4	N		Plot 4	Y

IV. Methodology Section

No deviations from initially prescribed methodologies were implemented as a part of monitoring Year 1 (2007) activities. Vegetation counts were completed according to EEP 2004 Stem Counting Protocol.

References

Weakley, Alan S. 2004. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas.

APPENDIX A –

Vegetation Survey Data Tables

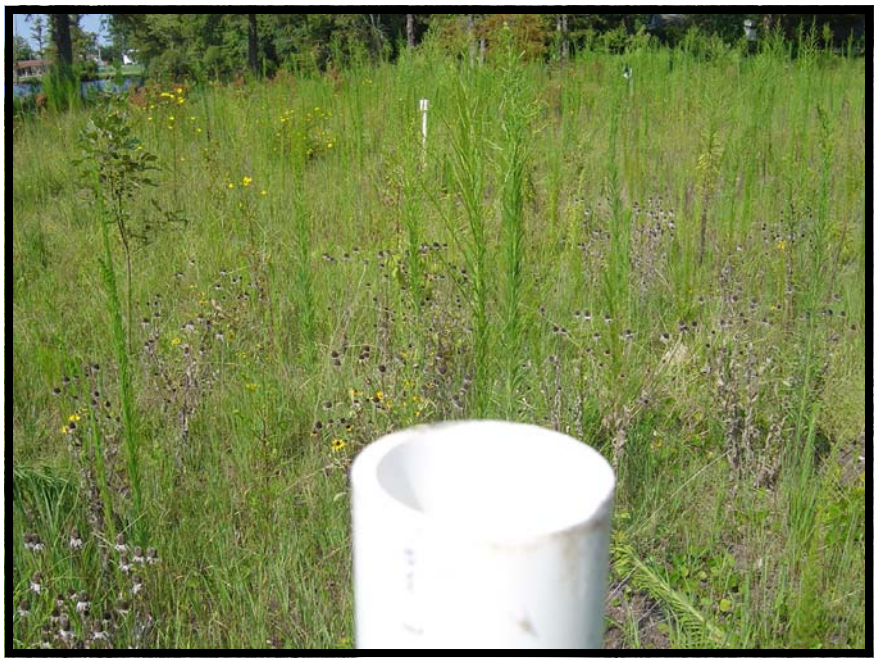
Table XIII: Wetland Criteria Attainment
Charles Creek Park Wetland Mitigation Site

Species	Type	Plot Number & Year 2007				Species Total 2007
		1	2	3	4	
Viburnum dentatum Arrowwood	Shrub	4		2		6
Cyrilla racemiflora TiTi	Shrub	1	2		2	5
Perea borbonia Red Bay	Tree	3		1	5	9
Cephalanthus occidentalis Buttonbush	Shrub	2		3	9	14
Lyonia lucida Fetterbush	Shrub	3		2	2	7
Fraxinus pennsylvanica Green Ash	Tree	2		1	2	5
Viburnum nudum Possum Haw	Shrub	3	1	5	8	17
Magnolia virginiana Sweet Bay	Tree				1	1
Taxodium distichum Bald Cypress	Tree	1	4	4	4	13
Vaccinium corymbosum Highbush Blueberry	Shrub				3	3
Clethra alnifolia Sweet Pepperbush	Shrub	4		3	7	14
Nyssa aquatica Water Tupelo	Tree		3	3	3	9
Quercus phellos Willow Oak	Tree	2			1	3
Totals		25	10	24	47	106
Live Stem Density		1012	405	971	1902	**1073**

APPENDIX A –

Vegetation Monitoring Plot Photos

Plot #1—2006—As-Built (August 9, 2006)



Plot #1—2007—Year One Monitoring (August 30, 2007)

Plot #2—2006—As-Built (August 9, 2006)

Plot #2—2007—Year One Monitoring (August 30, 2007)

Plot #3—2006—As-Built (August 9, 2006)

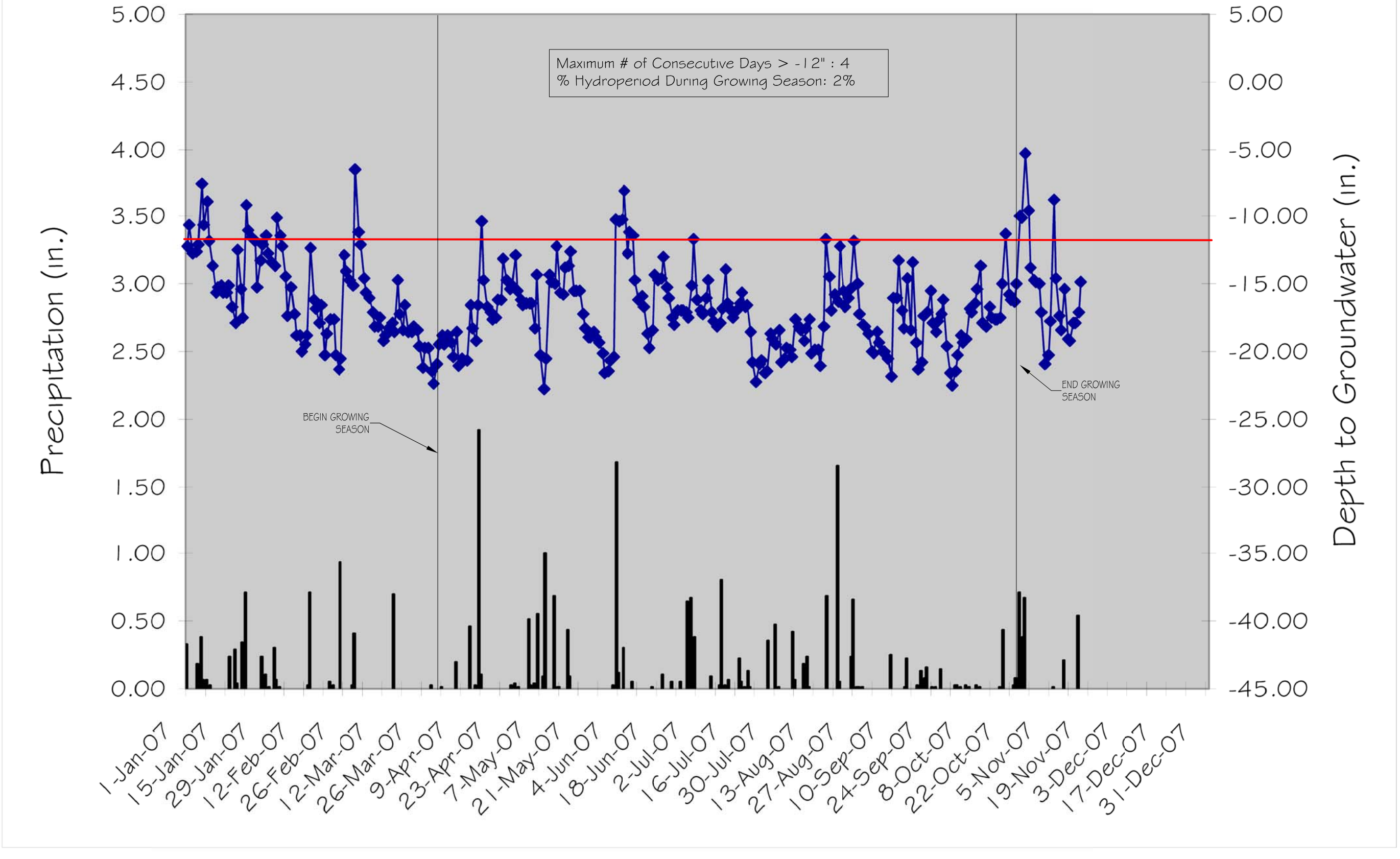
Plot #3—2007—Year One Monitoring (August 30, 2007)

Plot #4—2006—As-Built (August 9, 2006)

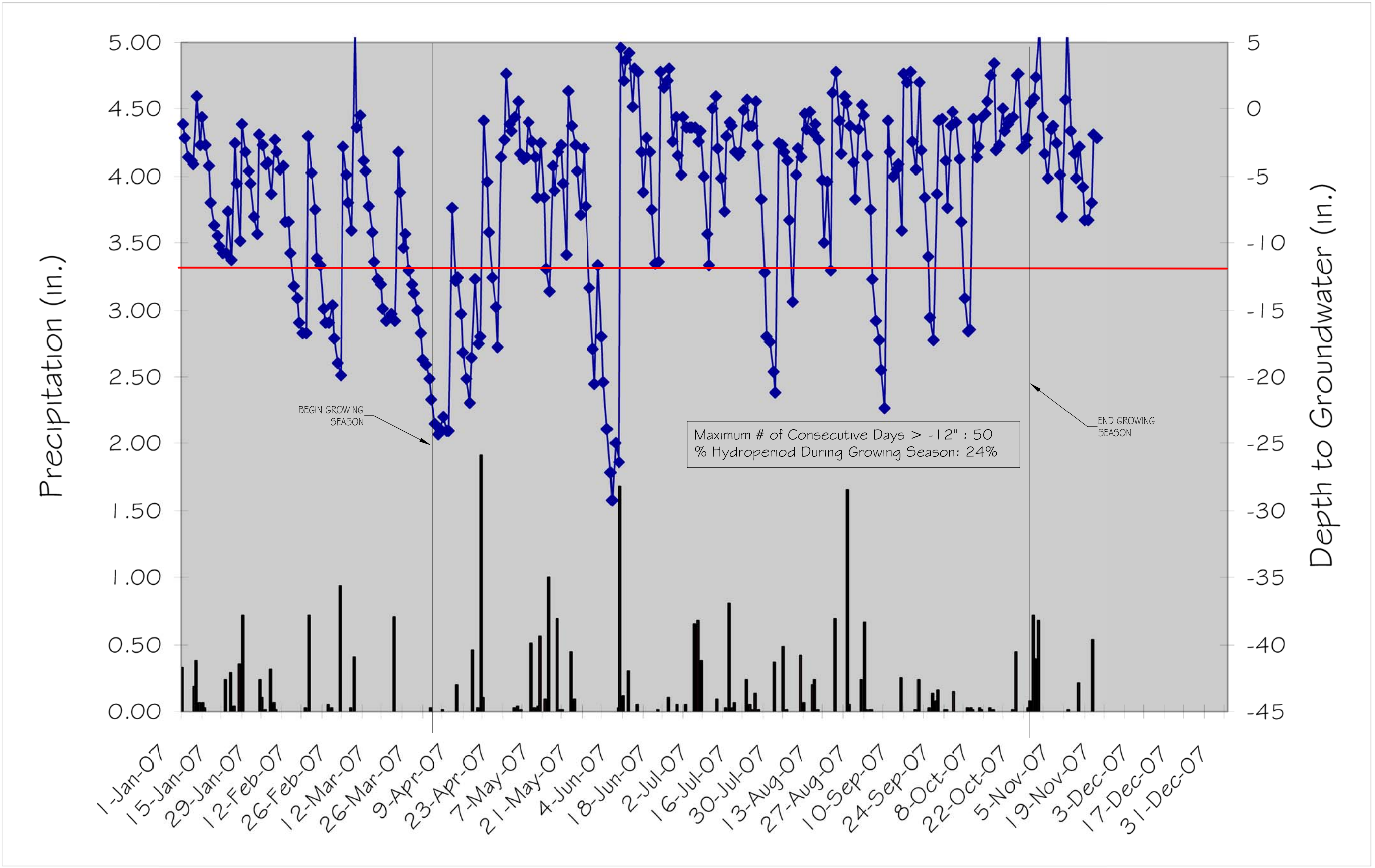
Plot #4—2007—Year One Monitoring (August 30, 2007)

APPENDIX B

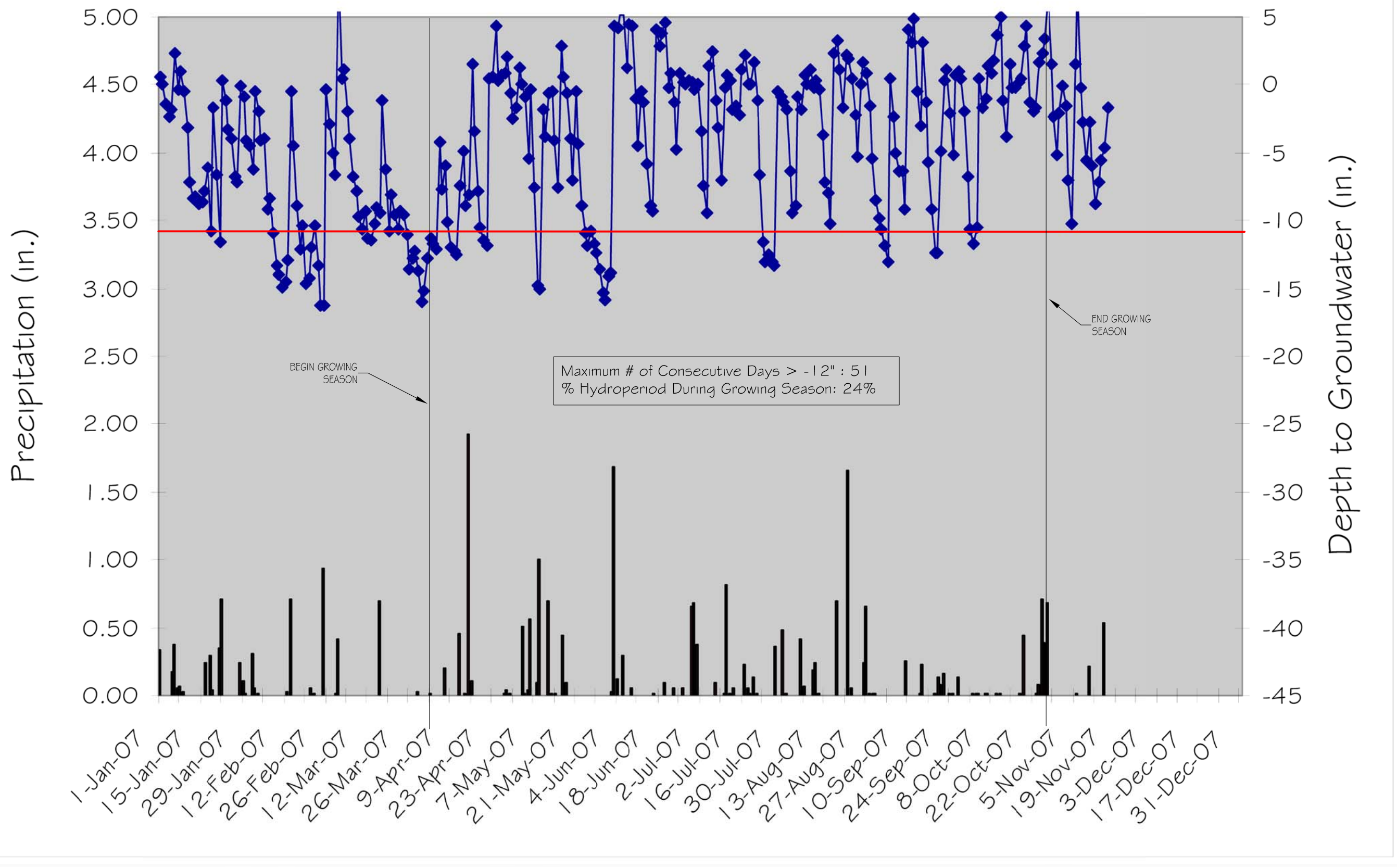
Charles Creek Park Wetland Restoration Site
Groundwater Gauge CCP1



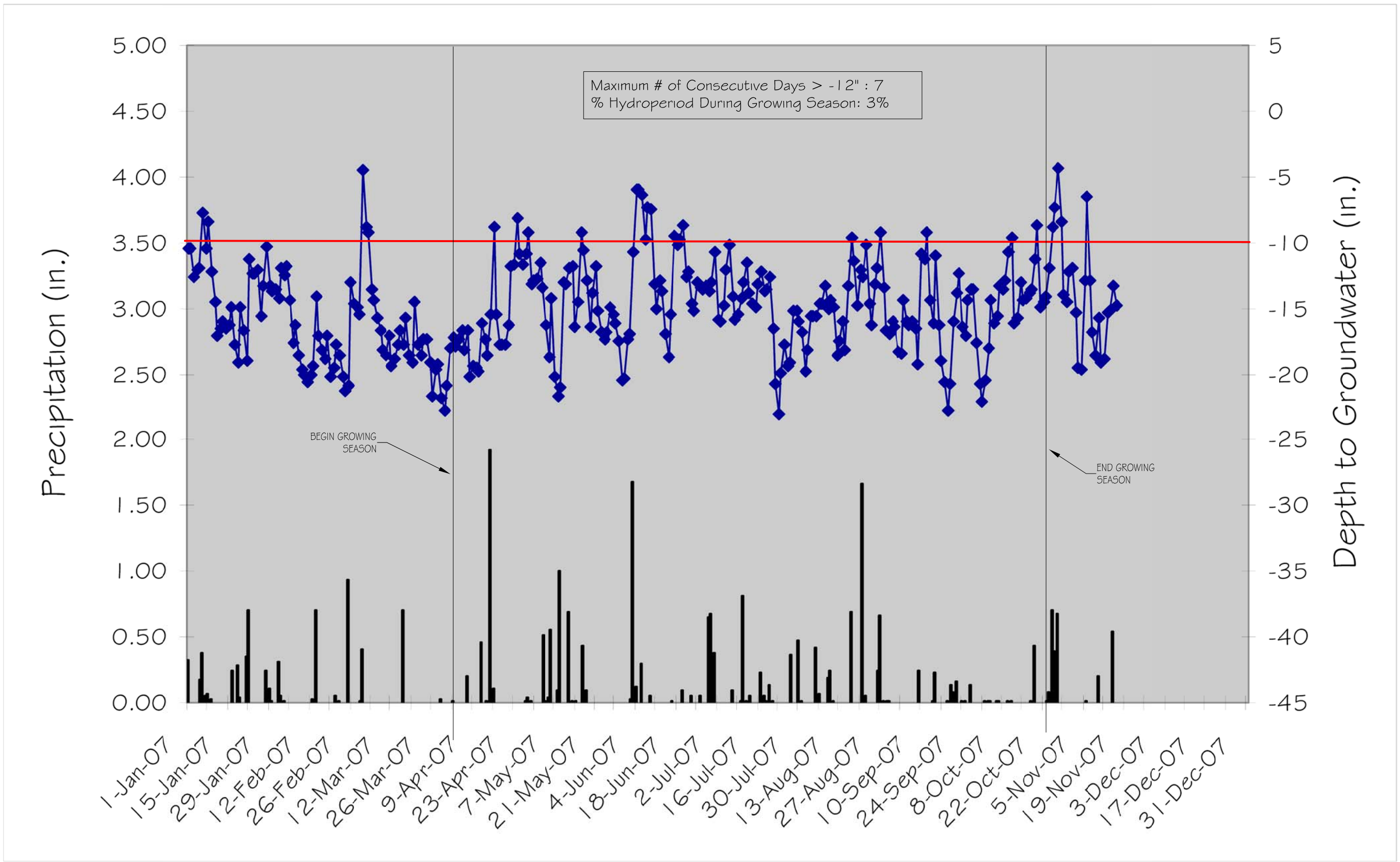
Charles Creek Park Wetland Restoration Site
Groundwater Gauge CCP2



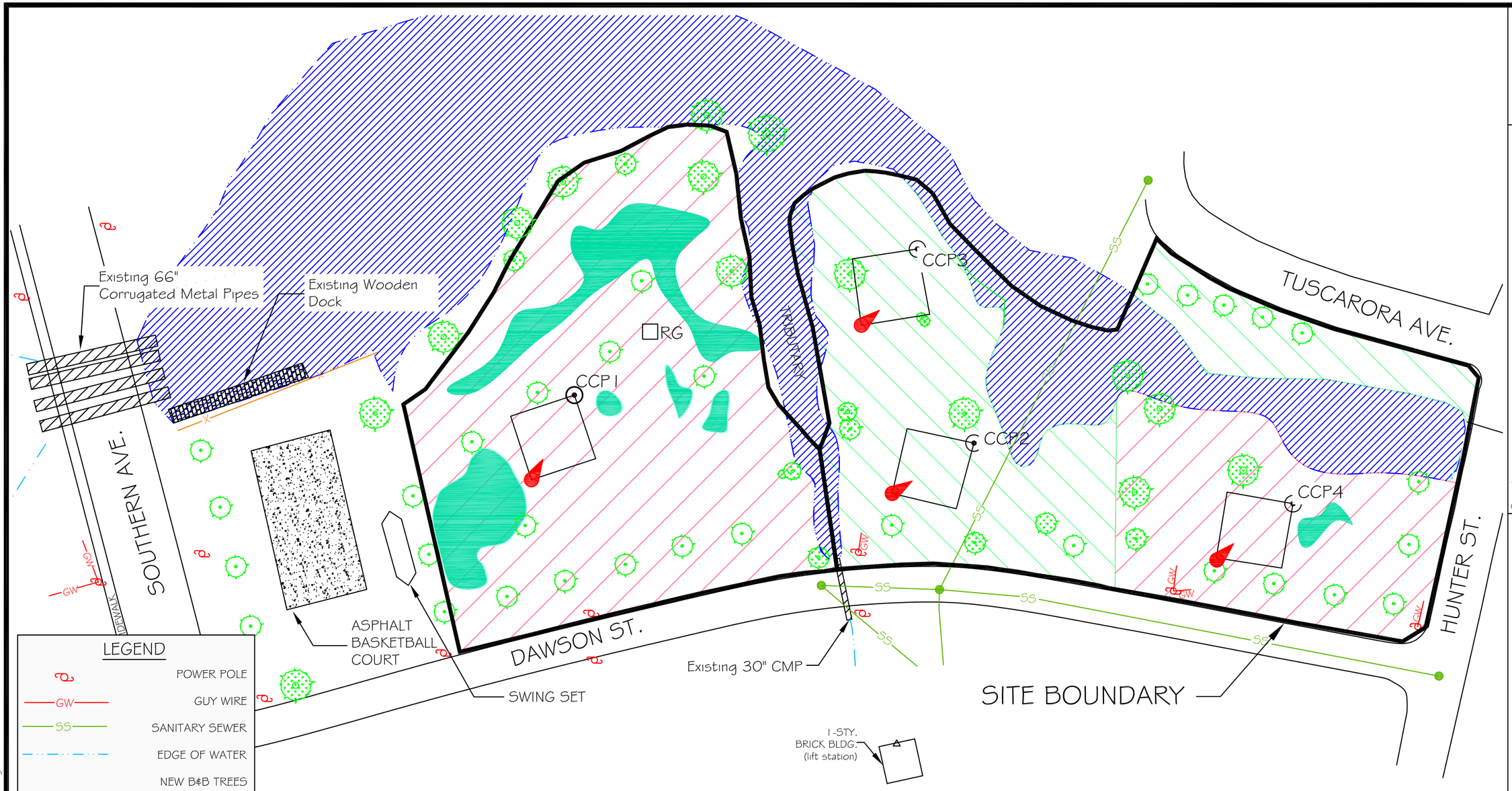
Charles Creek Park Wetland Restoration Site
Groundwater Gauge CCP3



Charles Creek Park Wetland Restoration Site
Groundwater Gauge CCP4



APPENDIX C



NOTES:

1) SITE FEATURES SHOWN WERE FIELD IDENTIFIED BY LIMITED ENGINEERING SURVEY USING TOTAL STATION EQUIPMENT PERFORMED ON AUGUST 9, 2006.

2) THE LOCATION OF SITE FEATURES IS APPROXIMATE.

SCALE

50 25 0 50

MONITORING PLAN VIEW

File: Secl/obs7-9k7281.02/Monitoring Data/Drawings/Year 1 - 2007.dwg

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Project No.: 7281.02 | Drawn: NMM | Designed: JMO, PKS | Scale: 1" = 50' | Sheet No.: 1 OF 2

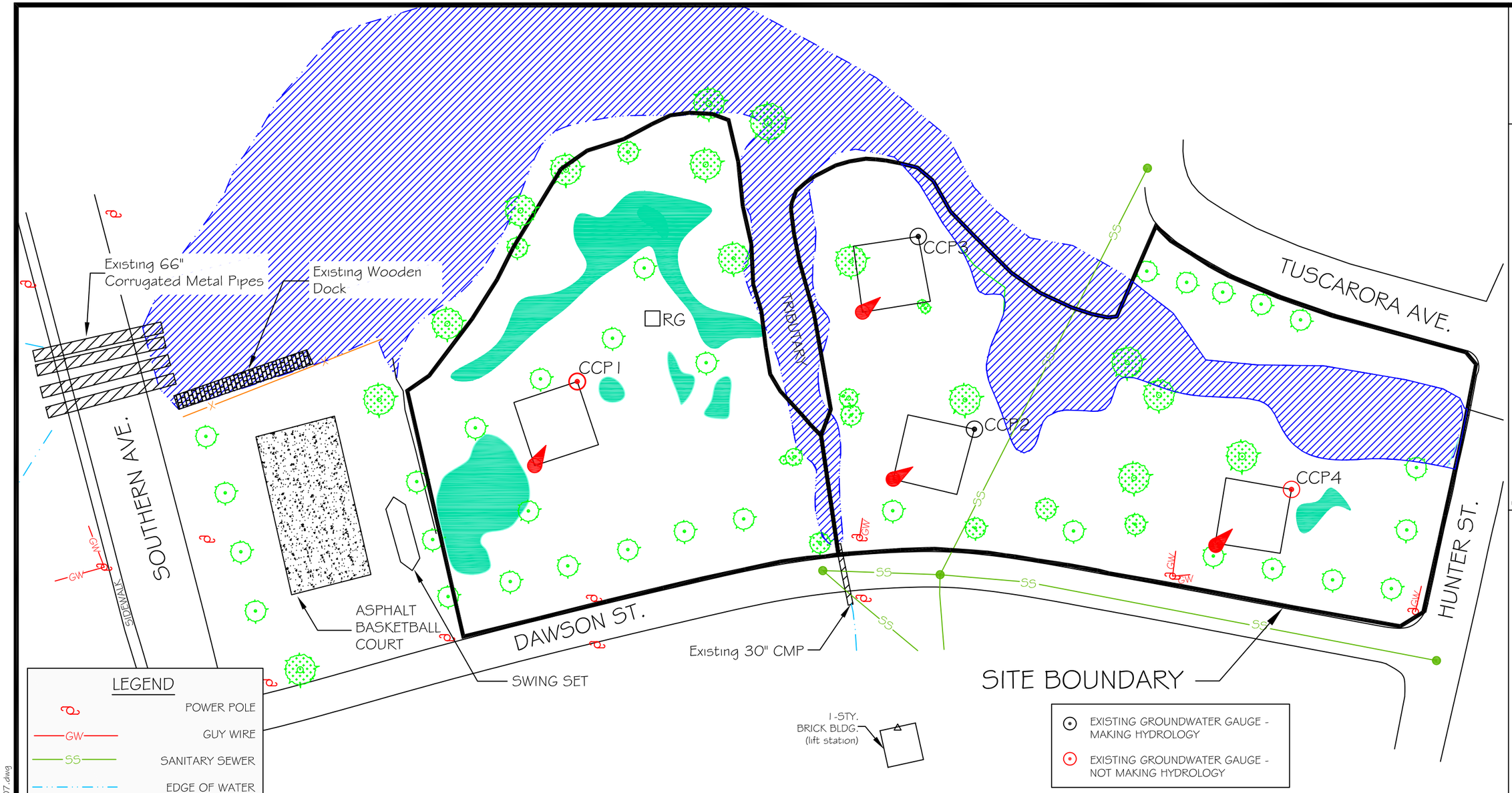
Sheet Title: MONITORING PLAN VIEW

Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

REV.	DESCRIPTION	DATE	APPROVED
0	Issued for Construction	07-06-04	JMO
	REVISIONS		

S&EC

PROBLEM AREA PLAN VIEW



LEGEND

- POWER POLE
- GUY WIRE
- SANITARY SEWER
- EDGE OF WATER
- NEW B&B TREES
- PRE-EXISTING TREE
- FENCELINE
- CCP2 — MONITORING GAUGE
- RG — RAIN GAUGE
- VEG PLOT
- SLOUGH
- PHOTO POINT

NOTES:

1) SITE FEATURES SHOWN WERE FIELD IDENTIFIED BY LIMITED ENGINEERING SURVEY USING TOTAL STATION EQUIPMENT PERFORMED ON AUGUST 9, 2006.

2) THE LOCATION OF SITE FEATURES IS APPROXIMATE.

SCALE

50 25 0 50

Project: CHARLES CREEK PARK WETLAND RESTORATION

Location: PASQUOTANK CO., NC

Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Sheet Title: PROBLEM AREA PLAN VIEW

Project No.: 7281.02 | Designed: JMO, PKS | Drawn: NMM | Scale: 1" = 50' | Sheet No.: 2 OF 2

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0	Issued for Construction	07-06-04	JMO

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