

ANNUAL REPORT FOR 2003



Grimesland Sand Pit Phase I Site
Pitt County
Project No. 8.T221801
TIP No. R-2510 WM



Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2003

TABLE OF CONTENTS

SUMMARY.....	1
1.0 INTRODUCTION.....	2
1.1 PROJECT DESCRIPTION.....	2
1.2 PURPOSE.....	2
1.3 PROJECT HISTORY.....	2
1.4 DEBIT LEDGER.....	2
2.0 HYDROLOGY.....	4
2.1 SUCCESS CRITERIA.....	4
2.2 HYDROLOGIC DESCRIPTION.....	4
2.3 RESULTS OF HYDROLOGIC MONITORING.....	4
2.3.1 Site Data.....	4
2.3.2 Climatic Data.....	8
2.4 CONCLUSIONS.....	8
3.0 VEGETATION: GRIMESLAND PHASE I MITIGATION SITE.....	10
3.1 SUCCESS CRITERIA.....	10
3.2 DESCRIPTION OF SPECIES.....	10
3.3 RESULTS OF VEGETATION MONITORING.....	11
3.4 CONCLUSIONS.....	11
4.0 OVERALL CONCLUSIONS.....	12

LIST OF FIGURES

Figure 1.	Grimesland Phase I Site Location Map.....	3
Figure 2.	Grimesland Phase I Gauge Location Map	5
Figure 3.	2003 Grimesland Phase I Site Hydrologic Monitoring Results.....	7
Figure 4.	Grimesland Phase I 30-70 Percentile Graph	9

LIST OF TABLES

Table 1.	2003 Phase I Hydrologic Monitoring Results	6
Table 2.	Vegetation Monitoring Statistics.....	11

APPENDICES

APPENDIX A	DEPTH TO GROUNDWATER & SURFACE WATER CHARTS
APPENDIX B	SITE PHOTOS AND PHOTO AND PLOT LOCATIONS MAP

SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year for Phase I of the Grimesland Sand Pit Mitigation Site. This site is being constructed to serve as a wetland mitigation site for road projects taking place in the Lower Tar River portion of the Tar-Pamlico River Basin in North Carolina. The site is to be constructed in three phases, with Phase I construction activities completed in January of 2000 and planting occurring in February of 2000. In March 2002, the Phase I area was replanted.

The site is monitored for hydrology using five groundwater-monitoring gauges, two surface water gauges, and one rain gauge. The site is monitored for vegetation using four vegetation plots that are representative of the 7.8 acres planted in trees.

The 2003-year represents the second year of hydrology and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful.

Results for both hydrologic and vegetation monitoring indicate that the site is meeting success. The hydrologic data for 2003 shows that the Phase I site was saturated and met jurisdictional success with all five groundwater gauges meeting the 12.5% success criteria. Vegetation monitoring for the second year yielded 541 trees per acre, which is above the minimum requirement for the second year of monitoring.

NCDOT recommends that monitoring continue at the Grimesland Sand Pit Phase I Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The 550-acre Grimesland Sand Pit Mitigation Site (herein after referred to as “the site”) is located in Pitt County near the community of Grimesland. The site is currently owned and mined by NCDOT. It is bounded on the north and the east by Grindle Creek, on the west by croplands and pine plantation, and on the south by the floodplain of the Tar River and the Tar River itself (Figure 1). The site serves as a regional wetland mitigation site for NCDOT roadway projects that would impact similar sites located in the Lower Tar River Sub-Basin. The site includes the creation of 58 acres of forested riverine wetlands (cypress-gum swamp and coastal plain bottomland hardwoods), the creation of 2 acres of emergent wetlands on submerged benches, the preservation of 348 acres of riverine wetland ecosystem, the preservation of 29.59 acres of riparian buffer and the enhancement of aquatic habitat within 80 acres of flooded abandoned borrow pits.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are satisfied. 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 2003-growing season at the Grimesland Sand Pit Site.

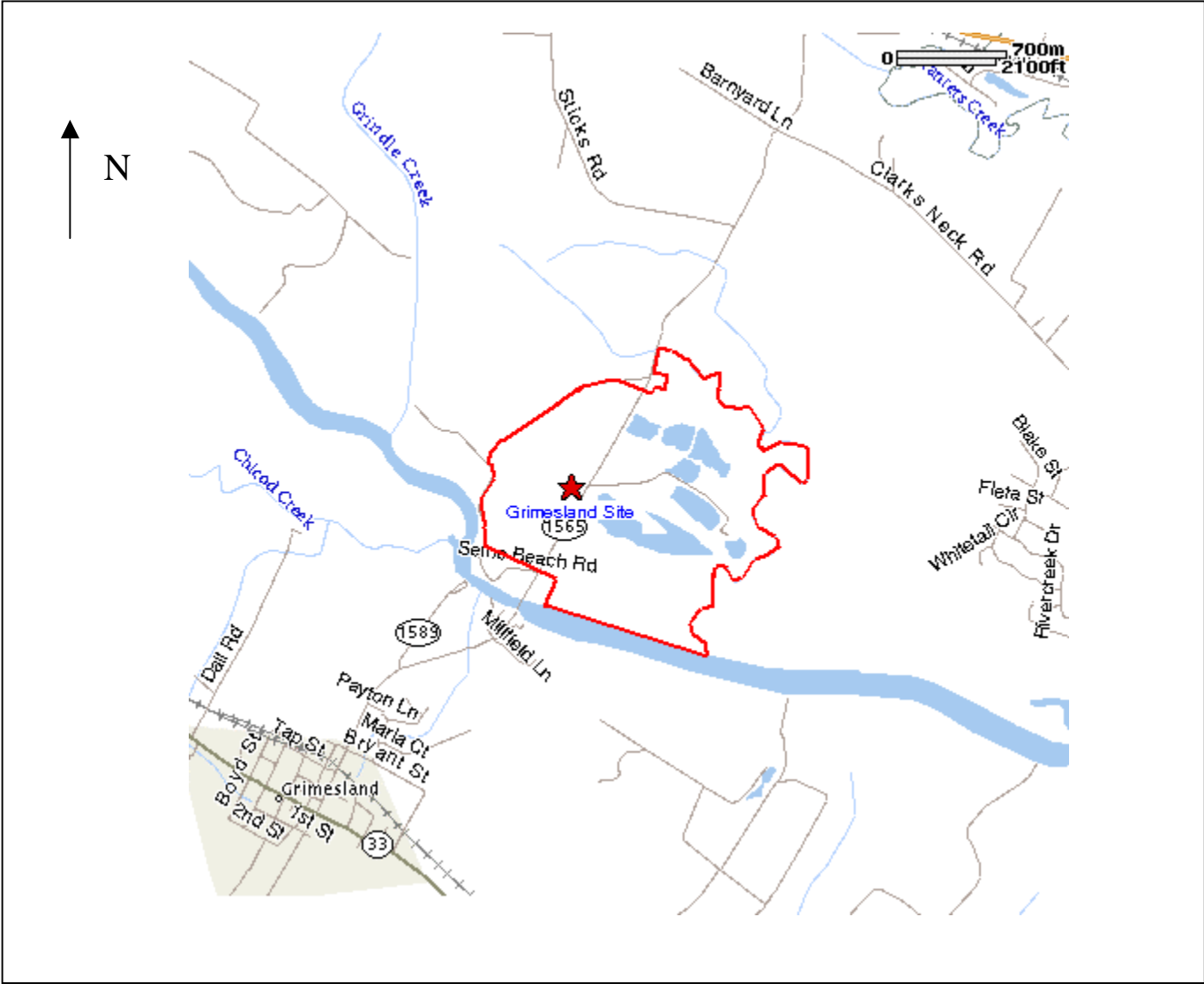
1.3 Project History

January 2000	Construction- Phase 1
March 2000	Phase I Planted
August 2001	Vegetation Monitoring (1 yr.)
March 2002	Phase I Replanted
March- November 2002	Hydrologic Monitoring (1 yr.)
June 2002	Vegetation Monitoring (1 yr. Restart)
March- November 2003	Hydrologic Monitoring (2 yr.)
June 2003	Vegetation Monitoring (2 yr.)

1.4 Debit Ledger

There have been no debits to this site to compensate for impacts to projects.

Figure 1. Grimesland Phase I Site Location Map



2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon other factors, such as the presence of hydrophytic vegetation and hydric soils.

The growing season in Pitt County begins March 15 and ends November 16. These dates correspond to a 50% probability that temperatures will remain above 28° F or higher after March 15 and before November 16.¹ The growing season is 247 days; therefore, the optimum duration for wetland hydrology is 31 days. Also, local climate must represent average conditions for the area.

2.2 Hydrologic Description

Five groundwater and two surface water gauges were installed in the Phase I section in March of 2000 (Figure 2). The automatic monitoring gauges record daily readings of the groundwater depth, while the surface water gauges record water depth every three hours. A rain gauge installed onsite records daily rainfall totals; these rain events are incorporated into the monitoring results to examine how the site's groundwater level responds to rainfall.

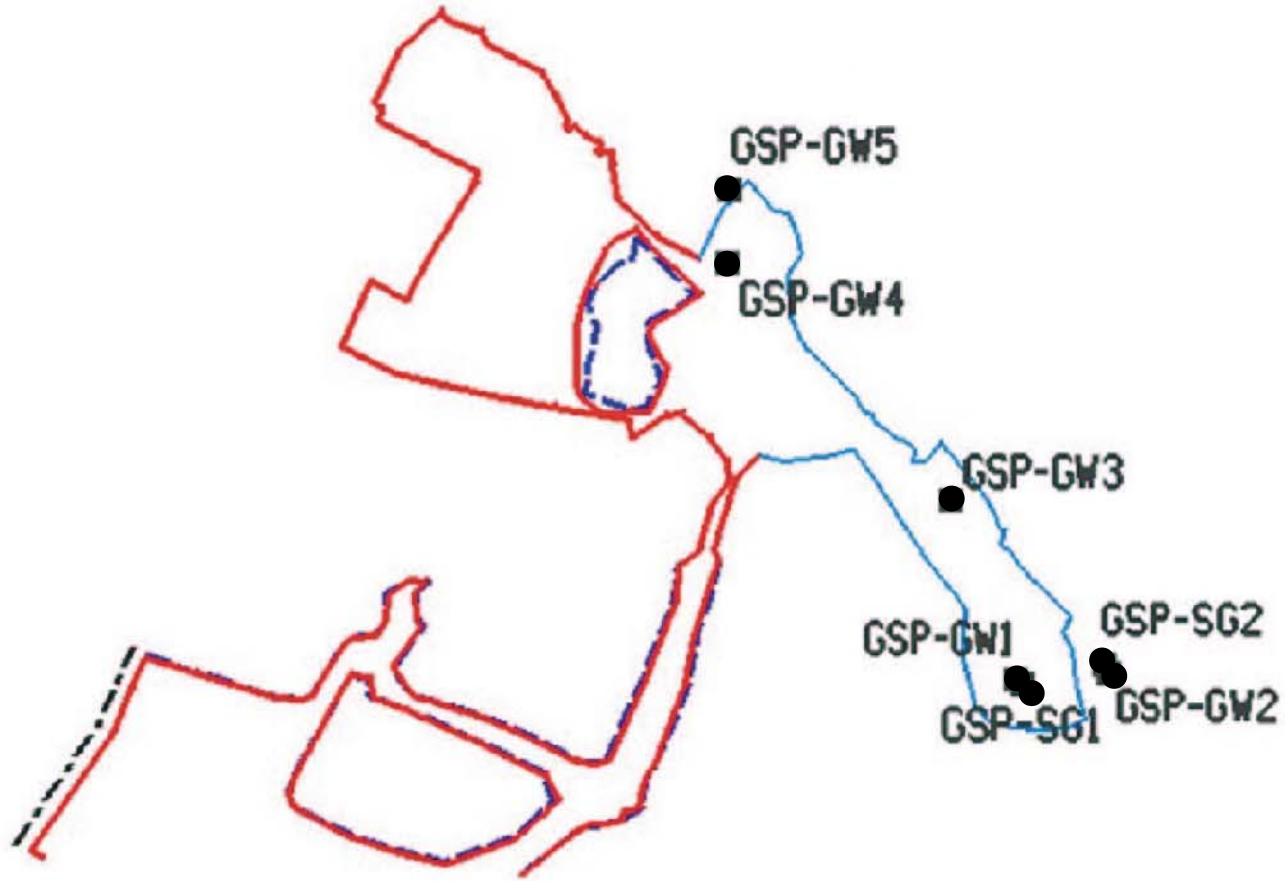
2.3 Results of Hydrologic Monitoring

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 groundwater-monitoring gauge. This number was converted into a percentage of the 247-day growing season (March 15 – November 16).

Table 1 shows the hydrologic results for 2003; Figure 3 is a graphical representation of these results. In Figure 3, a blue dot indicates the gauge showed success for more than 12.5% of the growing season; a red dot, between 8 and 12.5%; a green dot, between 5 and 8%, and a black dot, less than 5%.

¹ Soil Conservation Service, Soil Survey of Pitt County, North Carolina, p.71.



Phase I

Figure 2. Gauge Location Map



Not to Scale

Table 1. 2003 Phase I Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5 – 8%	8 – 12%	> 12.5%	Actual %	Success Dates
GSP-GW1+				×	100	March 15-Nov 16
GSP-GW2+				×	46.6	April 30-August 22 Sept 18-Nov 16
GSP-GW3+				×	81.4	April 30-Nov 16
GSP-GW4+				×	100	March 15-Nov 16
GSP-GW5*				×	36.4	June 20-Sept 17
GSP-SG1						
GSP-SG2						

* Gauge was inundated with 10” of standing water for approximately 2 months.

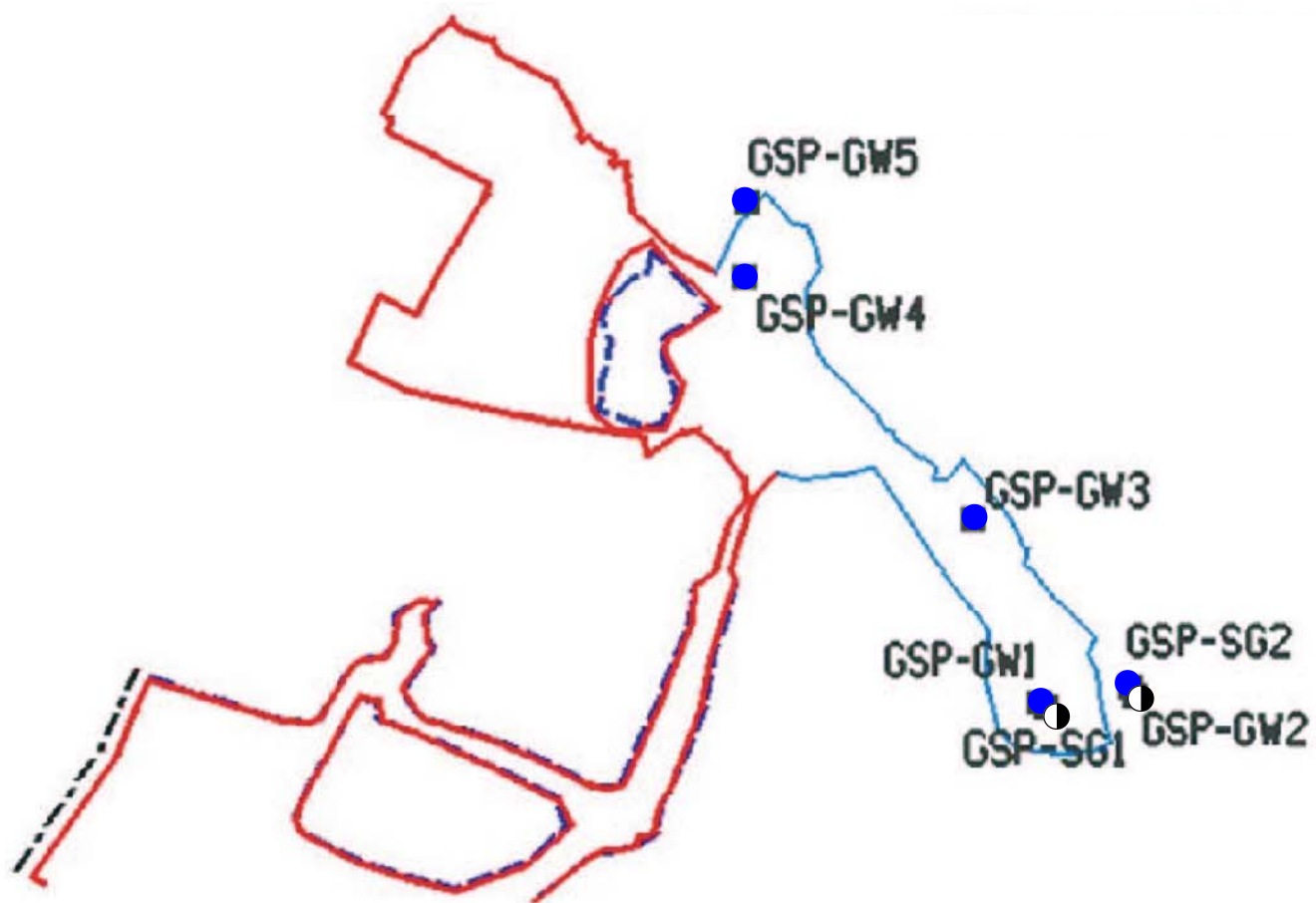
+ Gauge met the success criterion during an average rainfall month (March, June and August).

Specific Gauge Problems:

- GW5 experienced gauge malfunctions and stopped recording data (April 1-June 20) and (September 18-December 1). During the period from June 20-August 20, the gauge was inundated with 10” of standing water.

During the growing season in 2003, all five groundwater gauges in the Phase I area experienced approximately 1”- 4” of inundation. All five groundwater gauges met the jurisdictional success criteria of 12.5% of the growing season.

Appendix A contains plots of the groundwater depth at each monitoring gauge location during 2003. In addition to documenting the groundwater level relative to the ground surface (within 12”), these monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. The maximum number of consecutive days that the gauge indicates successful hydrology is noted on each graph. Precipitation events recorded by the onsite rain gauge are included on each graph. Plots of the data recorded at each of the two surface water gauges are also included in Appendix A.



Phase I

Figure 3. 2003 Hydrologic Monitoring Gauge Results

Hydrology Results

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

- ⊕ Rain Gauge
- ⊙ Surface Gauge

N

 Not to Scale



2.3.2 Climatic Data

Figure 4 is a graph of monthly rainfall for the period of November 2002 through October 2003 compared to historical precipitation data (collected between 1972 and 2003) for Washington, North Carolina. Rainfall data from the onsite rain gauge was used for the months of (September 03' - November 03'). The NC State Climate Office provided the rainfall data. The comparison of 2003 rainfall versus historical values gives an indication of how 2003 compares to historical climate conditions.

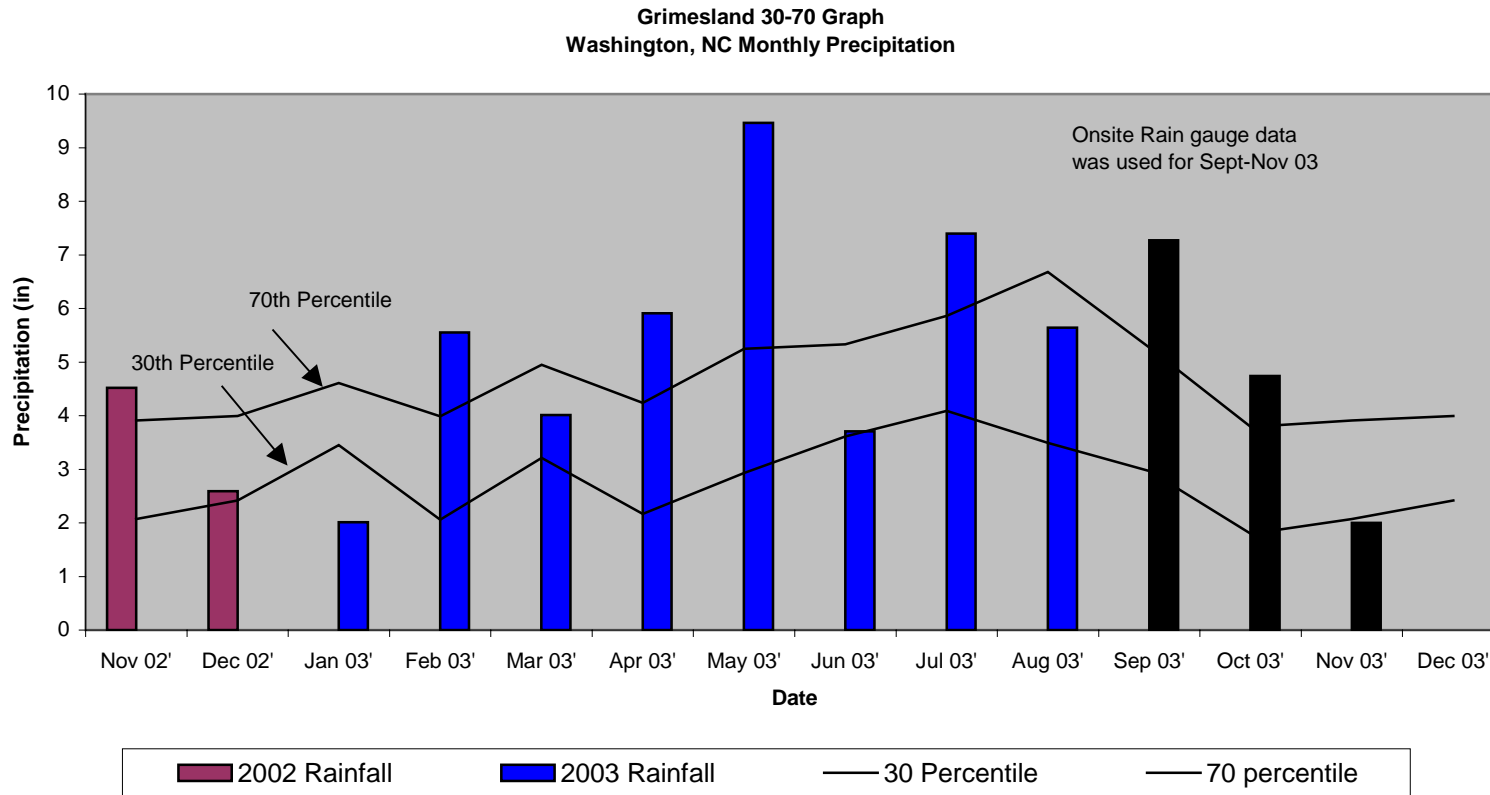
For the 2003-year, November (02'), February, April, May, July, September, and October experienced above average rainfall. The months of January and November recorded below average rainfall for the site. December (02'), March, June, and August experienced average rainfall. Overall, 2003 experienced an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

2.4 CONCLUSIONS

In 2003, the Phase I area experienced inundation throughout the growing season with 1" - 4" of standing water observed at all gauges. All five groundwater-monitoring gauges indicated success of at least 12.5% for the 2003-monitoring year. The two surface gauges provide data showing the consistent presence of surface water throughout the growing season.

NCDOT will continue to monitor for hydrology at the Grimesland Phase I area.

Figure 4. Grimesland Phase I 30-70 Percentile Graph, Washington, NC



3.0 VEGETATION: GRIMESLAND PIT MITIGATION SITE PHASE I (YEAR 2 MONITORING)

3.1 Success Criteria

Success criteria states that there must be a minimum mean density of 320 trees per acre within three years of initial planting and a minimum count of 260 trees per acre must be achieved within five years of initial planting.

3.2 Description of Species

The following species were planted in the Wetland Restoration Area:

Phase I:

Nyssa sylvatica var. *biflora*, Swamp Blackgum

Fraxinus pennsylvanica, Green Ash

Nyssa aquatica, Water Tupelo

Quercus phellos, Willow Oak

Quercus nigra, Water Oak

Taxodium distichum, Baldcypress

Carpinus caroliniana, American Hornbeam

3.3 Results of Vegetation Monitoring

TABLE 2: Vegetation Monitoring Statistics

Plot #	Baldcypress	Green Ash	Swamp Blackgum	Water Tupelo	Water Oak	Willow Oak	Hornbeam	Total (Year 2)	Total (at planting)	Density (Trees/Acre)
1	7	6	8	8				29	40	493
2	27	1	7	8	6	3	2	45	45	680
3	3	13	10	9		3	2	40	47	579
4	1	8	12				5	26	43	411
AVERAGE TREE (BLH) DENSITY									541	

Site Notes: Other species noted: black willow, *Juncus* sp., woolgrass, cattail, *Cyperus* sp., *Scirpus* sp., smartweed, sycamore, volunteer swamp blackgum, and various grasses.

3.4 Conclusions

Of the 550 acres on this site, Phase I consisted of approximately 7.8 acres of tree planting. There were 4 vegetation-monitoring plots established throughout the Phase 1 planting areas. The site is well vegetated in a variety of wetland grasses. The 2003 vegetation monitoring of the site revealed an average tree density of 541 trees per acre in Phase I. This average is significantly above the minimum success criteria of 320 trees per acre.

NCDOT will continue vegetation monitoring at the Grimesland Pit Phase I Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The Grimesland Sand Pit Phase I Mitigation Site was monitored for the second year in 2003. Hydrologically, the Phase I area experienced inundation throughout the growing season with 1" - 4" of standing water observed at all gauges. All five groundwater - monitoring gauges indicated jurisdictional success of at least 12.5% for the 2003-monitoring year. The two site surface water gauges indicated the consistent presence of surface water throughout the entire growing season. An analysis of rainfall in nearby Washington, NC shows that the region experienced average to above average rainfall for the year. Thus, the site met jurisdictional success criteria in average climatic conditions.

Approximately 7.8 acres of the site were planted; four vegetation plots within this area are used for vegetation monitoring. The established success criteria stated that the minimum survival rate in the first three years following planting was 320 trees per acre. Monitoring results showed an average survival rate of 541 trees per acre in the second year. Therefore, the vegetation exceeds the minimum required success criteria.

Based on the results from the 2003-monitoring season, NCDOT recommends that both hydrologic and vegetation monitoring continue at the Grimesland Phase I site.

APPENDIX A

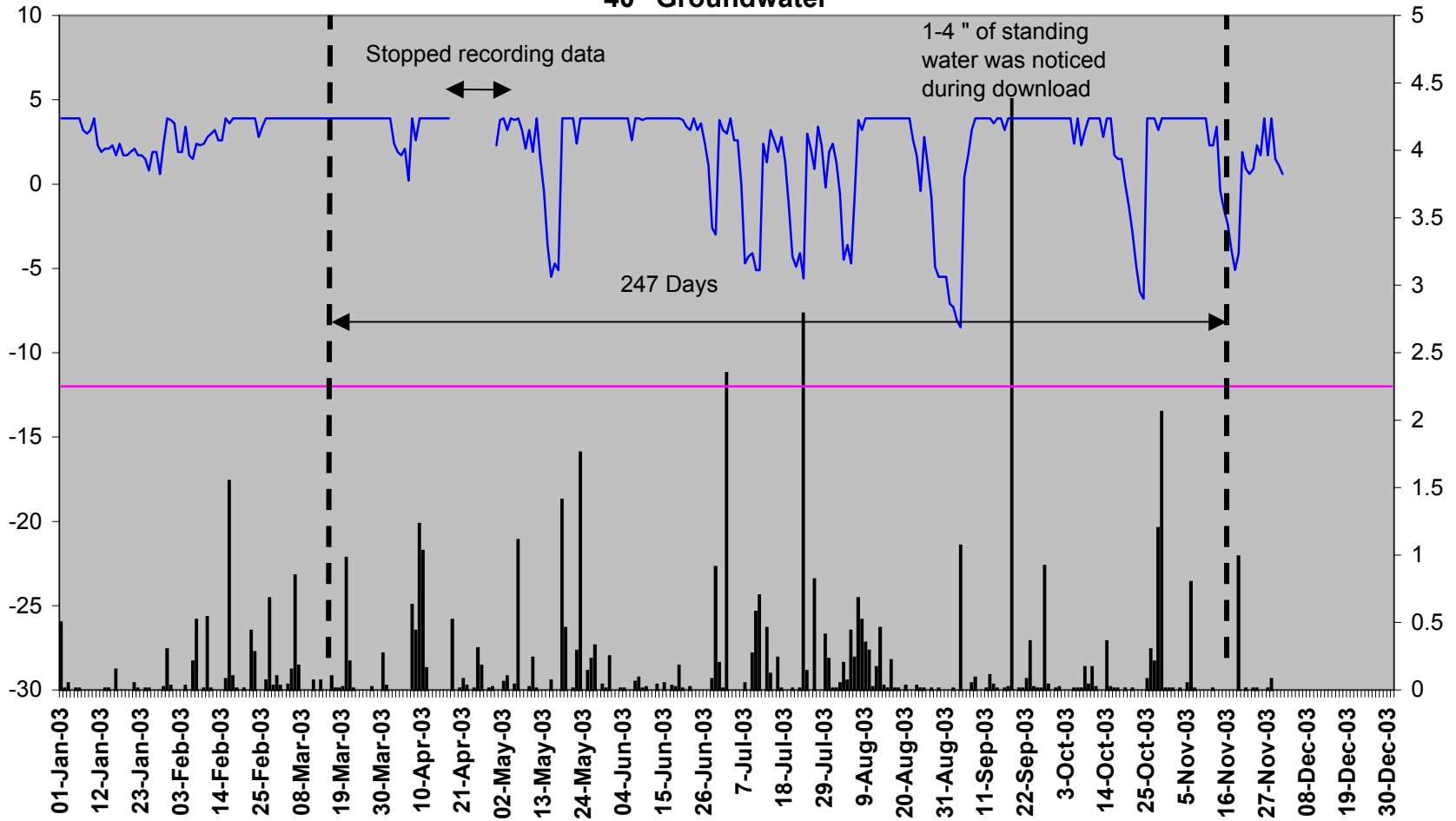
DEPTH TO GROUNDWATER

&

SURFACE WATER CHARTS

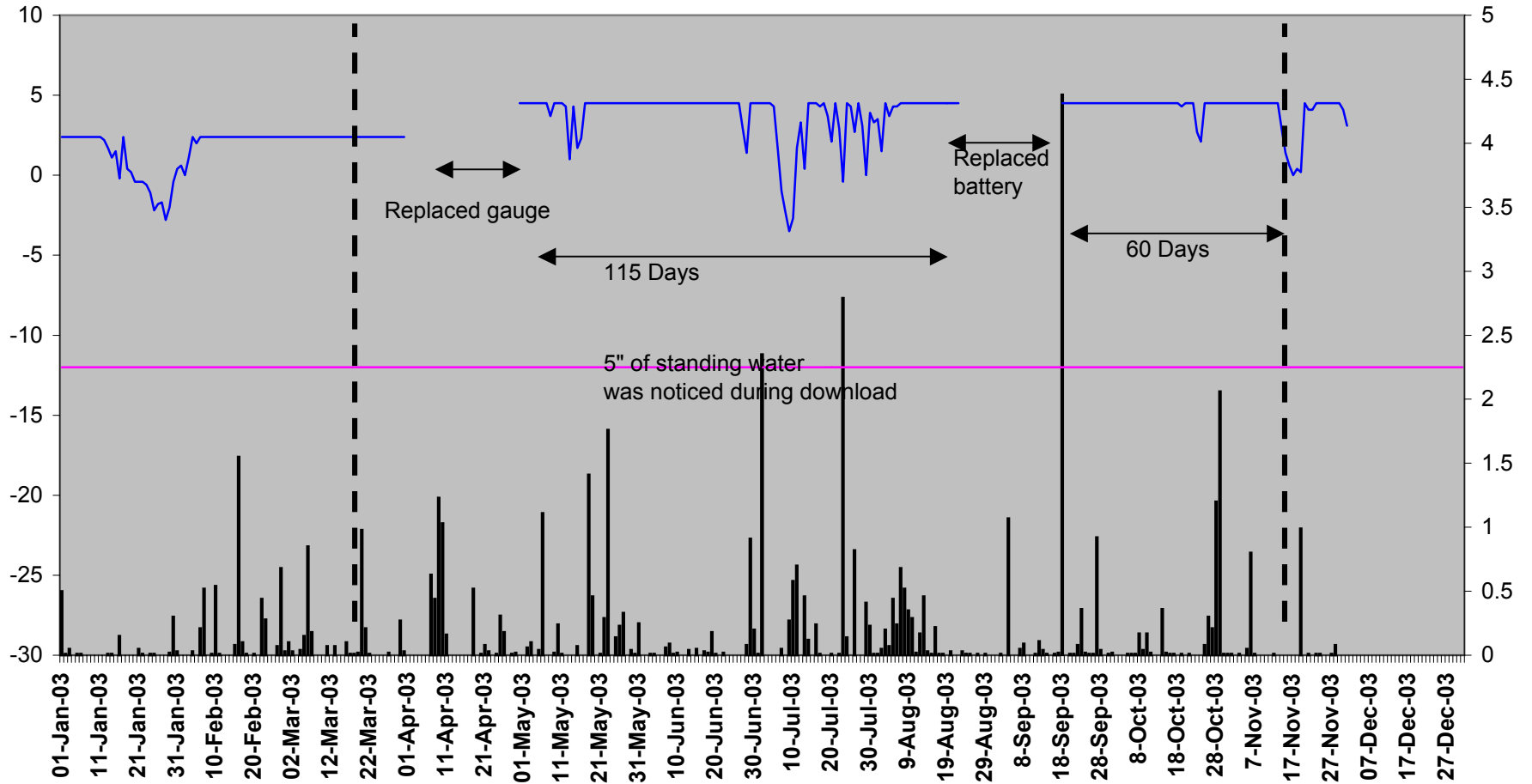
GROUNDWATER GAUGE GRAPHS

**Grimesland GSP-GW1
Phase I
40" Groundwater**



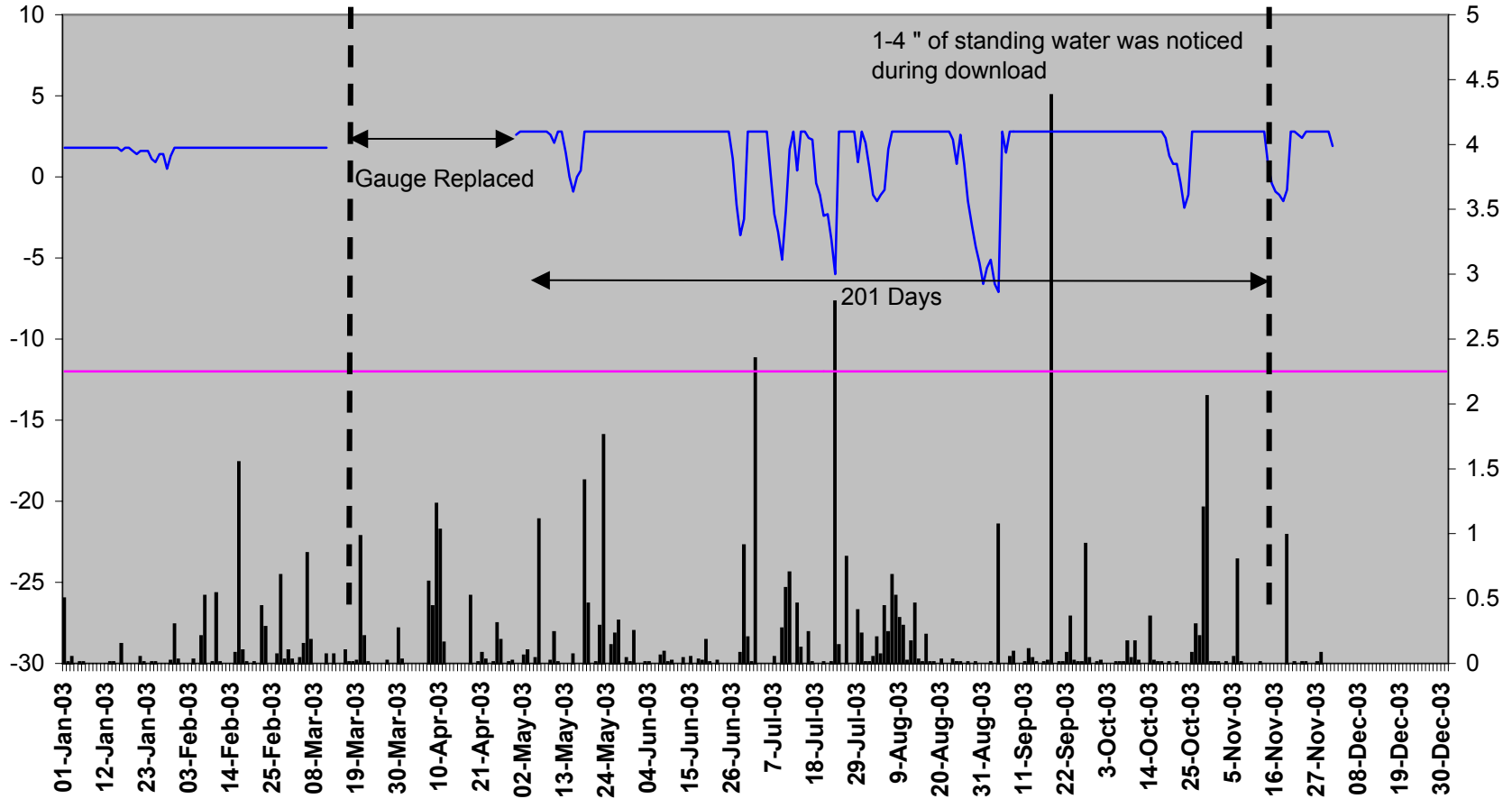
■ N38B817B — S316700 GSP-GW1 Phase I — Required Depth

**Grimesland GSP-GW2
Phase I
40" Groundwater**



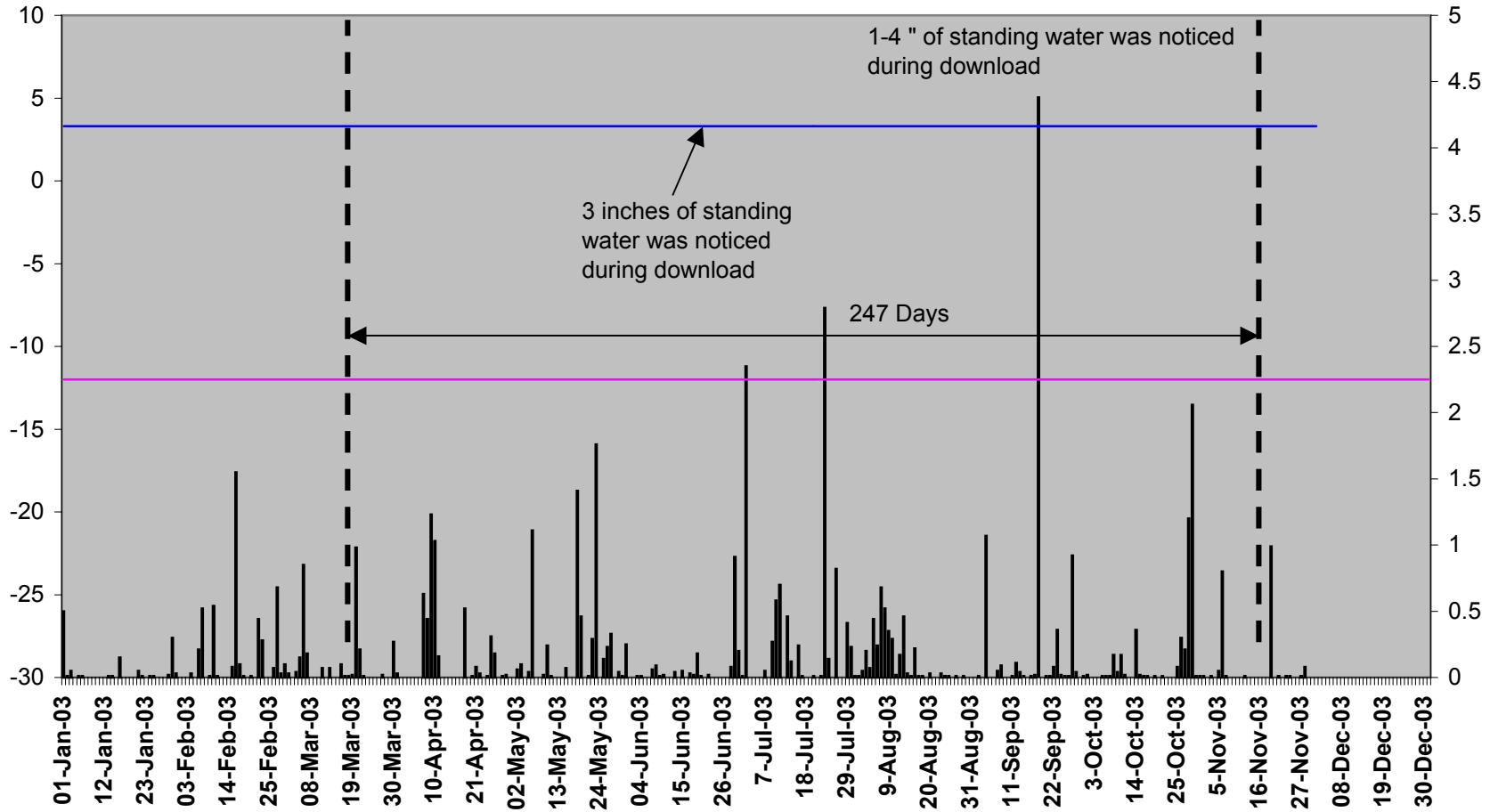
N38B817B
 S5176B3 GSP-GW2 Phase I
 Required Depth

**Grimesland GSP-GW3
Phase I
40" Groundwater**



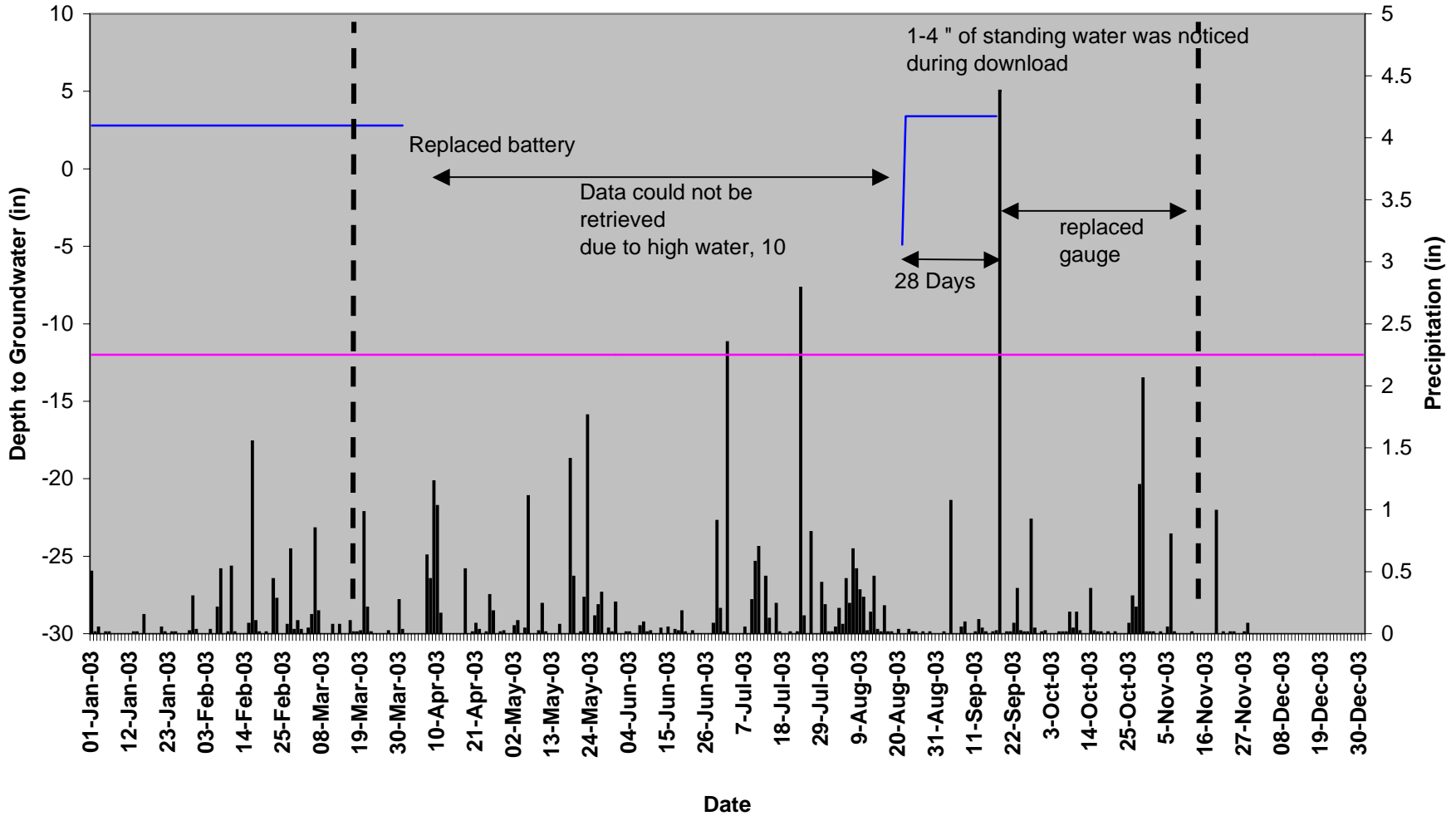
■ N38B817B — S517455 GSP-GW3 Phase I — Required Depth

**Grimesland GSP-GW4
Phase I
40" Groundwater**



N38B817B
 S51705B
 GSP-GW4 Phase I
 Required Depth

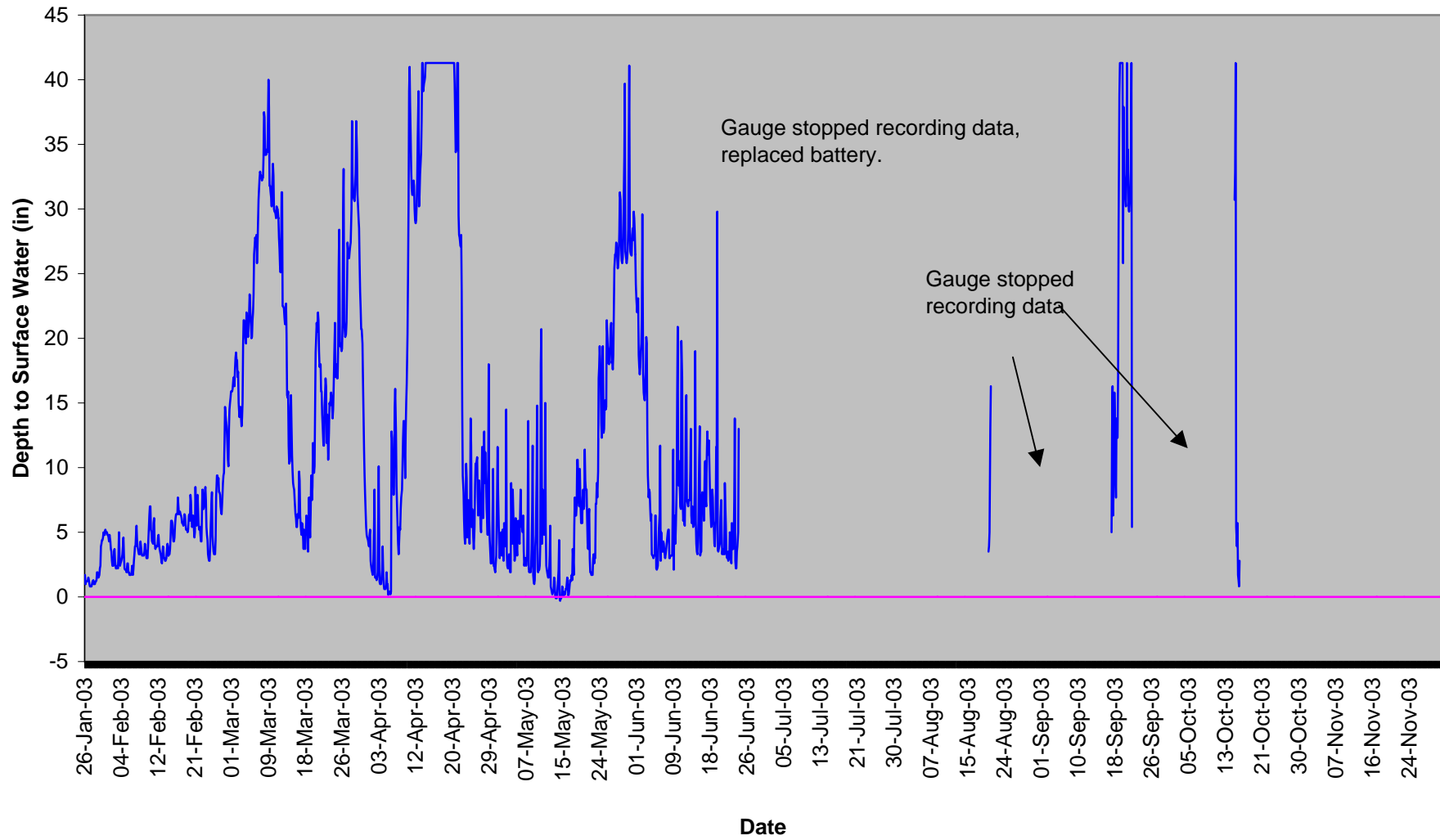
**Grimesland GSP-GW5
Phase I
40" Groundwater**



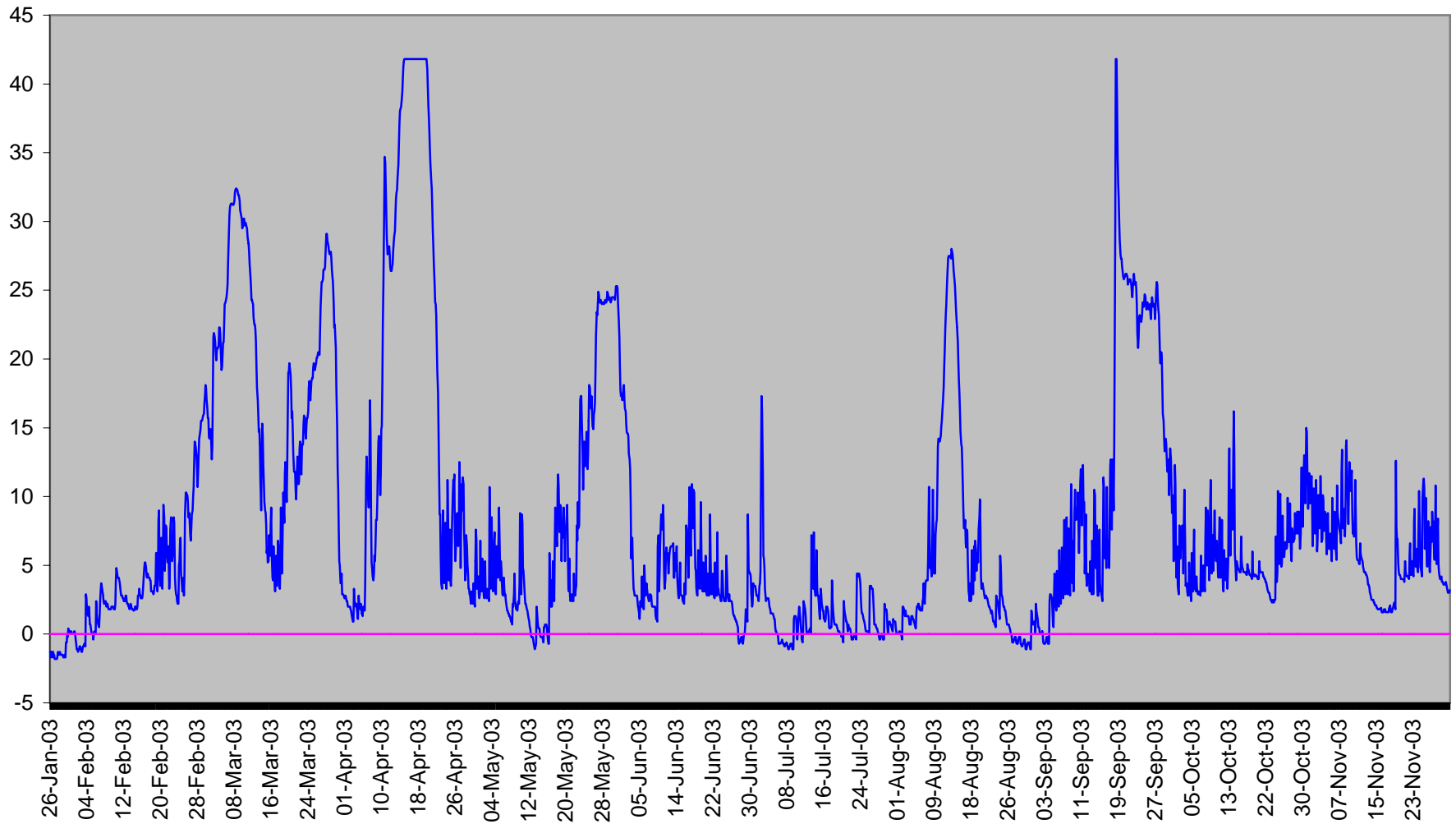
N38B817B
 S317481
 GSP-GW5 Phase I
 Required Depth

SURFACE WATER GAUGE GRAPHS

Grimesland GSP-SG1 40" Surface Gauge



**Grimesland GSP-SG2
40" Surface Gauge**



APPENDIX B

SITE PHOTOS AND PHOTO AND PLOT LOCATIONS MAP

Grimesland Pit – Phase I



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Grimesland Pit Mitigation Site

Photo and Plot Locations

Phase 1

