

October 15, 1991

MEMORANDUM

TO:Files

FROM:FRSP, Natural Resource Mgmt. Specialist, John Perez

SUBJECT:Soil/Slope Stabilization Projects, FY91

Attached is a copy of the 1991 Slope/Soil Stabilization Project Report for Fredericksburg & Spotsylvania National Military Park.

The project went extremely well thanks to the help of protection rangers and the hard work of an excellent MWC college intern. The report will mention the terribly hot and dry weather we experienced during the summer of 1991. We would have preferred to start the project under more favorable weather conditions, but as we all know, projects are completed when monies are available and rarely when the conditions are optimal.

REPORT

FRSP NATIONAL CEMETERY SLOPE STABILIZATION PROJECT SUMMER 1991

INTRODUCTION

During the summer of 1991, the park completed work on stabilizing the slope of the Fredericksburg National Cemetery. This report is a summary of the work accomplished and monies spent for services and supplies.

In March 1984, Mike Johnson, Chief Ranger, initiated a monitoring program of slope subsidence and developed a package proposal (10-238) recommending a detailed engineering study. A procession of experts visited the park including personnel from the NPS Branch of Mining & Minerals, and other engineering consultants, all of which made several recommendations for mitigation. After early attempts to stabilize the slope failed, the park sought funding for an engineering study and stabilization effort that came to fruition in FY91.

Project Participants

Schnabel Engineering Associates, Bethesda, MD, received the contract to complete a thorough geotechnical assessment of the slope, including recommendations for construction and stabilization. Specific responsibilities included: mapping and describing the site geology and structure; estimating probability of slumping or slope movement of the high wall; describing the extent of the land which could be affected should slope movement occur; and, preparing slope stabilization & monitoring plan. Final reports were submitted to the park in April 1991. Most recommendations of the firm were implemented with some modification to the materials used in soil erosion matting and vegetation planting/seeding, i.e. only native species or hybrids were used.

NPS Personnel: John Karish, Chief Scientist, Mid-Atlantic Regional Office

Sylvia Arbelbide, Geologist, Mining & Minerals Branch, Denver Service Center

Philip Cloves, Mining Engineer, Mining & Minerals Branch, DSC

Mike Johnson, Chief Ranger, FRSP

John Perez, Natural Resource Management Specialist, FRSP

M. Greenfield, L. Shackleford, S. Davis, K. Beepler, C. Lochart,
Park Rangers, FRSP

Contractor: Pat Newchok, Hydroseeder Contractor

John Karish, was responsible for coordinating the assistance of expert geologists and soil stabilization professionals. Personnel from the Mining & Minerals Branch coordinated the contracting of Schnabel Engineering. They also compiled a chronological summary of pertinent documents concerning the slope stability problem.

Mike Johnson, was the agent responsible for successful completion of the project, and coordinated the activities of consultants and technicians. Johnson assigned personnel from the Ranger Division to implement the recommendations of the Engineers and Denver Service Center.

John Perez, ordered all supplies & materials, and contracted the services of a hydroseeding company. He developed work schedules and directly supervised the placement of erosion matting on the slope. Following the stabilization, Perez supervised a college intern who installed the long-term monitoring system.

Pat Newchuk, provided hydroseeding services following slope stabilization. Hydroseed was applied through a 100 ft. hose. Mulch and water were provided by the contractor.

Supplies and Materials

Several different types of erosion mats were ordered to test their effectiveness on the varying conditions of the slope. ENKAMAT was the product recommended by Schnabel Engineering, and was used on the vertical portion of the slope. This permanent matting with its unique physical properties held the hydroseed better than other mats, and it also had the necessary strength to withstand the weight of the hydroseed. DEKOWE, a biodegradable, coconut fiber mat, was used on the toe of the slope. This mat required that the slope be hydroseeded first before application of the mat. JUTE matting was used to fill in gaps along the margins of the slope and where workers had disturbed the forest floor. Various methods were tried to attach the mat to the vertical face. Nails and staples provided by suppliers were either too flimsy and bent in the hard conglomerate soil, or didn't penetrate deep enough to hold the matting. After trial and error, 9" gutter nails with washers proved more effective.

A suitable hydroseed mixture was probably the most difficult problem to overcome. Approximately 50% of the slope was exposed to extreme daytime temperatures. The lack of overhead canopy and the sandy soils combined to create a very harsh dry environment. The remainder of the slope was 75-95% shaded. A seed mix consisting of HybriTech Hybrid Wheat and Red Clover was applied with lime and fertilizer.

A generous amount of seed and fertilizer were used on the slope for two reasons. First, because of the steep slopes, much of the material simply flowed off the matting down the slope. Secondly, a high rate of mortality was expected due to the extremely hot and

dry conditions. The following is a list of supplies and materials:

DEKOWE 900 Fiber Mat 60 sq. yards
ENKAMAT 100 sq. yards
JUTE Mat 80 sq. yards

Metal Pins w/washers 200

Lime, pellets 200 lbs.
Fertilizer, 50% organic 10-6-450 lbs.

Red Clover 50 lbs.
REGREEN, Wheat x Wheatgrass Hybrid 50 lbs.

Application of Matting and Hydroseed

Placement of the ENKAMAT began on 9/9/1991. Three workers began nailing matting under the lip of the slope just below the root layer.

Mats were custom fitted to the vertical face around large boulders and roots, with the mat running downslope. Nails were placed about 2 ft. apart. Each mat overlaid another by 3 inches. It took approximately 72 manhours to put in place the ENKAMAT. It was decided to apply hydroseed over the entire slope to test its results and to also place a layer of hydroseed on the toe of the slope before application of the DEKOWE mat. Hydroseeding was very difficult because we lacked a platform on which to work from. The hydroseed couldn't be shot from the top because of the slight overhang and the area below the slope was made inaccessible by a thick cover of vines and shrubs. The contractor literally had to cling to the slope face while handling the hydroseeder hose.

Because the contractor was forced to work so close to the face, the hydroseed shot with such force that much of the mixture went through the ENKAMAT and ran down the slope under the mat, thus making its application ineffective. This problem was solved by placing more nails to the mat to eliminate the space between the mat and the slope face. Approximately 70 manhours were spent placing the DEKOWE and JUTE matting along the toe of the slope. A final application of hydroseed was placed over the entire project.

Monitoring

College Intern, Pam Criser, established a monitoring system using 8 transects running from the cemetery wall to the lip of the slope.

Compass bearings and distance were recorded and will be monitored for any changes. The success of vegetative growth will be monitored with photo points.

Discussion

Due to the extreme conditions associated with the slope, i.e. southwest aspect, gravelly soils, extreme summer temperature, drought, and varying canopy cover, we'll be fortunate to get any

vegetation growing on the vertical portion of the slope. The mat will provide some protection to the slope from the elements. There are slight ledges on the face that may provide micro-habitats for some plant growth. I feel the best chance for success is the growth of trees on the margins of the slope that will provide a canopy over the exposed face. These trees would help reduce the erosion of unabated rain drops pelting at the exposed surface and should help provide shade for plants in the understory.

The use of a hybrid wheat was chosen over species of Lespedeza and Weeping Love Grass recommended by Schnabel Engineering. Research and consultation with other NPS personnel proved unsuccessful in finding suitable quantities of native seeds that would grow under such harsh conditions. REGREEN showed promising growth soon after application, and is expected to provide a bed of mulch for the seeds of surrounding native plants. REGREEN is short lived and should die within two years.

During the project period the area of northern Virginia experienced one of the worst droughts in years. Very little soil moisture was available to the seedlings on the slope, and a high rate of mortality can be expected before next years spring rains. The park used part of the project money to purchase a hydroseeder which can be used to reseed the slope next year, possibly under more favorable climatic conditions.

Enclosed in the park files is a pictorial history of the stabilization project.

Estimated CostsManhours

Engineering7400.00140
Labor2500.00(overtime)200
Supplies/Materials4600.00
Hydroseeding 800.00
John Karish visit 874.00
Hydroseeder purchase8000.00

Total 24174.00