NYSDOT SOIL BIOENGINEERING AND BIOTECHNICAL ENGINEERING DESIGN GUIDANCE AND SPECIFICATIONS

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The Problem Statement

Highway construction activities often entail stripping of the topsoil, removal of existing vegetation, slope modification and other disturbances of the natural landscape that increase erosion of highway embankments and streambanks. In addition, suburban development is increasing the amount of impermeable surfaces throughout the natural landscape and a lack of adequate stormwater management has lead to higher amounts of water draining into streams, speeding up erosion to a point of destruction to the stream environment. Engineers have typically addressed these problems with hard structural solutions, such as rip-rap and concrete, which often lead to negative impacts to the environment and stream instability. There is, however, increasing pressure from regulatory agencies and citizen environmental groups to address the above issues with other more environmentally friendly and aesthetically pleasing methods.

The Project Objective

On July 15, 2002, NYSDOT issued Soil Bioengineering and Biotechnical Engineering Design Guidance and Specifications in order to provide designers with alternative techniques for erosion control and stabilization of disturbed sites, including cut/fill slope stabilization, small gully repair, earth embankment protection and streambank stabilization. Benefits of bioengineering/biotechnical engineering systems are their natural appearance, habitat development and potentially lower cost. In areas that have aesthetic and environmental concerns, soil bioengineering/biotechnical methods offer designers tools to address these concerns. Additional benefits associated with streams include more natural, productive riparian habitats, shade, addition of organic mater, cover for aquatic species and improved water quality.

Funding Sources and Total Budget

The funding source is from within the New York State Department of Transportation, Design and Construction Divisions.

Methodology

The Department's Design Guidance procedures for Soil Bioengineering and Biotechnical Engineering will be discussed. In addition, examples of several NYSDOT projects will be discussed and a description of the following methods will be presented:

Soil Bioengineering

- Live cuttings/Live stakes
- Brushlayering
- Live fascines
- Brushmattressing
- Branchpacking
- Tree revetment
- Rootwad revetment
- Fiber roll

Biotechnical Engineering

- Vegetated gabion
- Vegetated crib wall

Implications for Future Research/Policy Development

Post construction monitoring and assessments will focus on the evaluation of vegetative and structural components of soil bioengineering/biotechnical practices and their effectiveness to stabilize stream and highway embankments and reduce sediment and erosion. The assessments will also include a cost analysis comparing traditional hard structural systems to vegetation and natural structures for erosion control and slope protection. The overall objective is to reduce the reliance on hard structural solutions for future stream and highway bank stabilization projects.

To:		*New York State Department of Transportation* **ENGINEERING BULLETIN**	**EB 02-037**	
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Title: **SOIL BIOENGINEERING/BIOTECHNICAL ENGINEERING - DETAILS**

Distribution:		Approved:	
☐ Manufacturers (18) ☒ Main Office (30) ☐ Local Govt. (31) ☒ Regions/ Agencies (32)	☐ Surveyors (33) ☒ Consultants (34) ☐ Contractors (39) ☐ _____( )	/s/ David H. Fasser D. H. Fasser, Director, Landscape Architecture Bureau	07/16/02 Date

ADMINISTRATIVE INFORMATION:

- This Engineering Bulletin (EB) is effective with projects submitted for letting of 01/16/03.
- This EB does not supersede any previous issuance.
- The attached details are available in a cell library, nybioed.cel. Refer to Chapter 2 of the CADD Standards and Procedure Manual for guidance on the location and availability of NYSDOT's Standard Cell Libraries.

PURPOSE: The purpose of this EB is to issue details to compliment special specifications issued concurrently with Engineering Instruction 02-020.

TECHNICAL INFORMATION:
The details attached to this EB should be incorporated in contract documents when using the corresponding special specifications issued in EI 02-020, Soil Bioengineering/Biotechnical Engineering - Special Specifications.

Additional guidance and resources are available to designers in EI 02-019, Soil Bioengineering/Biotechnical Engineering - Design Guidance.

CONTACT. Direct questions regarding this EB to Gary Glath in the Landscape Architecture Bureau at (518) 457-4460 or by e-mail at gglath@gw.dot.state.ny.us

Additional documents pertaining to this project can be found at: http://www.dot.state.ny.us/

Biographical Sketches: *Stephen Radzyminski:* In 1986, Steve received a B.S.degree in environmental science and forest biology from SUNY at Syracuse College of Environmental Science and Forestry. In 1994, he started work for NYSDOT Region 1 in Albany, New York, in the Environmental Services Unit, specializing in office evaluations and field investigations related to water quality and wetland impact analyses, hazardous waste assessments, asbestos remediation and preparing and processing State and Federal environmental permits and regulatory documents. For the past two years, Steve has been working at the Environmental Analysis Bureau at NYSDOT's Main Office in Albany as an aquatic biologist specializing in a variety of aquatic habitat assessment, restoration and enhancement techniques. Prior to his employment with NYSDOT, Steve worked for the Great Lakes National Program Office in Chicago, Illinois (87-89), as an aquatic biologist conducting Great Lakes Water Quality Studies for U.S. and Canada. He also worked for Harza Engineering Company, Chicago, IL (89-93) as a field operations leader conducting water quality studies on Ft. Edward PCB Remnant Area Remediation Project on the Hudson River, New York, and participated in the FERC Relicensing Downstream Passage Study for Atlantic Salmon Smolt and Juvenile Clupeids on the Connecticut River in Massachusetts.

Gary Glath, graduated from Cornell University in 1973 with specialization in landscape architecture. He worked for Edward D. Stone & Assoc. from 1973 to 1974 as a site planners & landscape architects-designer. He then went on to work for Syracuse/Onondaga County Planning Agency in 1974 to 1979 as a landscape architect. In 1979, he went to work for the NYS Office of General Services as a landscape architect-designer until 1993. Presently, Gary is the senior landscape architect in the Landscape Architecture Bureau at the NYS Department of Transportation.

Robert Lohse received his degree in environmental planning and design from Cook College, Rutgers University. He has been with the NYS Department of Transportation since 1993 and is currently working in the Landscape Architecture Bureau.