



## GEOTECHNICAL COMPLETED RESEARCH PROJECT

PROJECT NAME: BIOPOLYMERIZED SLOPE/SUBGRADE STABILIZATION AND ADVANCED FIELD MONITORING

PROJECT NUMBER: SPR-P1(20)M110

### RESEARCHER(S)

Chung R. Song, Richard, L. Wood,  
Yong R. Kim, and Jongwan Eun

### TECHNICAL ADVISER

#### COMMITTEE (TAC) MEMBERS

**NDOT Leader:** Nikolas Glennie

**NDOT Members:** Alex Silvey, Bruce Barrett, Kellie Troxel, and Mick Syslo

**Industry Member:** Cameron Whitney, Jungbunzlauer, Inc

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### FINAL REPORT

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### NDOT RECOMMENDATIONS BASED OFF RESEARCH

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### PROJECT ABSTRACT

“The slightly over consolidated glacial tills and weathered shales in Midwestern states of the USA often show substantial strength degradation after construction. This strength reduction often causes time dependent slope failures along the roadside. This study investigated the possibility of applying biopolymer based soil modification techniques to mitigate the strength reduction phenomenon of these soils. For this research, several different biopolymers were evaluated through laboratory tests, two biopolymers were selected for extensive weathering tests, then a higher-performing biopolymer, Xanthan, was applied to a test slope in Verdigre, Nebraska with heavy instrumentation. The followings are the summary of the results.

The unweathered laboratory shear strength of the weathered shales from Verdigre was improved by 20%, 30%, and 40% by mixing 0.5%, 1.5%, and 2.5% of Xanthan gum, respectively. On the other hand, the weathered shear strength of the weathered shales at Verdigre treated with 1.5% of Xanthan gum after 8 wet-freeze-thaw-dry cycles still retained 83% of the untreated unweathered ones. A similar result was obtained for glacial tills, manifesting that the Xanthan based polymerization method may be used as a new ecofriendly method to enhance the strength of weathered shales and glacial tills in Midwestern states. The field applied Xanthan treated soils showed similar behavior to laboratory test results based on pressure meter and vane shear test results so far. However, further monitoring is required to fully verify the findings.”

*As quoted by P.I. Chung Song, in the April 2021 final report abstract*



EMAIL

[NDOT.RESEARCH@NEBRASKA.GOV](mailto:NDOT.RESEARCH@NEBRASKA.GOV)



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