# Expedited Repair of Railroad Track Subgrade Failure Using a Column Supported Geosynthetic Reinforced Load Transfer Platform

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## INTRODUCTION

BNSF Railway (BNSF) completed construction of a new second main line near Little Falls, Minnesota to accommodate significant traffic growth. The new second main line was constructed adjacent to the existing main line, with a 0.8 mile segment constructed through a marsh area. Within a month of being placed in service, an approximately 300-foot long section of the new second main line constructed within the marsh area began experiencing settlement and cross-level issues. This presentation discusses the original construction, observed distress, geotechnical investigation and design of the geosynthetic reinforced LTP, as well as summarizes the lessons learned during the construction activities.

## ORIGINAL TRACK SUBGRADE DESIGN AND CONSTRUCTION

In order to confirm subgrade conditions for design for this segment of new second main line, one boring was drilled at the northern edge of the marsh area. No design borings were drilled within the marsh area due to accessibility issues. Thus, due to the limited subsurface information in this area, an additional field investigation comprised of test pit being excavated at about 300 foot intervals was conducted during the initial construction process. The test pits revealed soft organic clays over sand to depths averaging about three feet below planned subgrade elevation. Based on this information, the subgrade in this area was stabilized by undercutting the material about 12 inches below subgrade and surging about two feet of “24 inch minus shot rock” into the soft materials until it stabilized and passed a proof roll with a loaded tandem axle dump truck.

## OBSERVED TRACK MOVEMENT

Settlement and cross-level track issues were reported within one month of construction completion along a 300 foot section of track. The track movement was noted after a two-week period of heavy rainfall and very wet conditions. Weekly survey monitoring of the track and shoulder indicated horizontal and vertical movements of 0.11 feet within the first few weeks, with the rate of movement decreasing as ground temperatures decreased heading into winter.

## SUBGRADE REPAIR DESIGN

To better define the subsurface conditions within the track movement area, additional test pits were excavated at 100 foot center-to-center spacing and borings were conducted from the track level. The additional investigation revealed a relatively steep channel filled with soft organic clays and peat to depths of 5 to 18 feet below the 3-foot thick shot rock stabilized subgrade that coincided with the 300-foot length of observed track movement.

The column-supported geosynthetic reinforced LTP was chosen for track support in the identified zone of distress due to its cost, flexibility, and speed of installation. Helical piles were used as the columns because conventional driven pile were anticipated to have driving difficulties through the shot rock section, which would likely require predrilling. The LTP was 2.5 feet thick and was constructed of 3-inch minus crushed granite reinforced with multiple layers of biaxial geogrid, see Figure 1.

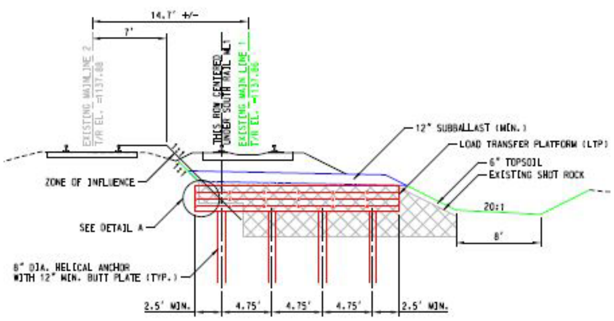


**Figure 1. Typical Load Transfer Platform Section**

## CONCLUSION

The column support geosynthetic reinforced LTP for the new 2$^{nd}$ main line repair was completed during a 104-hour continuous track window in which 480 feet of track and 1,100 cubic yards of ballast/subballast and embankment were removed; then 256 helical piles, a 2.5 foot thick geosynthetic reinforced LTP and subballast/ballast were installed prior to replacement of the track. The repair activities were completed without injuries and on time despite initial inclement weather. No track movement has been observed since the LTP installation.