



Canadian National St. Clair Subdivision Sarnia, ON

The Geopier GeoSpikeSM system was used to reinforce the subgrade at a consistently problematic section of track which reduced dynamic deflections of the railway by more than 60% without removing track, ties or ballast.

Description: Canadian-National (CN) maintenance crews are familiar with this section of rail in rural Ontario, south of Sarnia, due to the frequency of re-ballasting and subgrade repairs that plagued this section for many years. CN chose the Geopier GeoSpikeSM system to remediate this problem area for a 55m (180 ft) section of track. This section had chronic settlement and deflection issues resulting from very soft and wet subgrade conditions below the ballast. Deflection monitoring of this track section showed that more than 75 mm (3 in) of deflection had occurred since the previous repair. The soil stratigraphy below the track structure consists of a mixed ballast and soils stratum 1.4 to 1.8 m (4.5 to 6 ft) thick, overlying a medium stiff clay deposit becoming stiff to very stiff at depths of 2 to 3m (6.5 to 10 ft).

Geopier Solution: The Geopier solution for this project consisted of 1.2 to 2.1m (4 to 6 ft) GeoSpike elements installed so that the GeoSpike tops were 0.3 to 0.6m (1 to 2 ft) below the bottom of the existing ties. The GeoSpike elements were installed between the rails in pairs, spaced at every other tie to resist a Cooper E-80 derived working load of 15 kips (67 kN) per GeoSpike. More than 120 GeoSpikes were installed with a hi-rail mounted excavator without removing track, ties, or ballast in less than 2 days. After GeoSpike installation, the work area was re-ballasted and the rail lines were re-aligned.



[Watch Geopier GeoSpikeSM Installation](#)

PROJECT TEAM

Owner:

Canadian National

Geotechnical Engineer:

Journeaux Associates

Installer:

GeoSolv Design-Build, Inc.

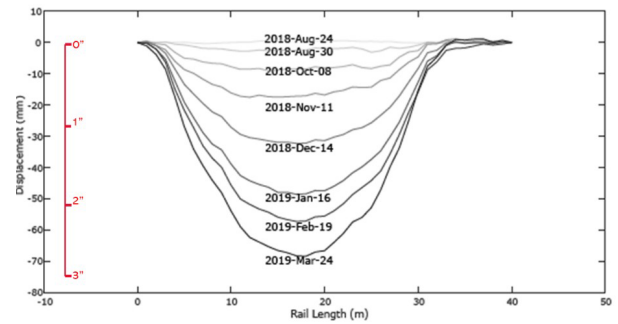
GEOSPIKESM SYSTEM

Results at the CN St. Clair Subdivision: Track monitoring at the site was performed by researchers from Queens University in Ontario, Canada. Pre-installation Shape Array (SAA) measurements revealed that this section of track was experiencing progressive, cumulative deflections, in excess of 75 mm prior to GeoSpike installations.

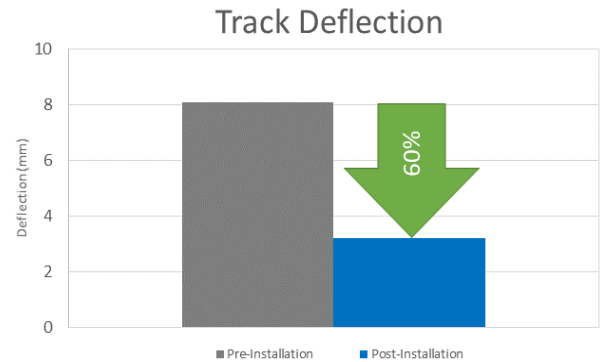
Queens University also performed a short-term deflection survey using high-speed optical survey equipment to record rail and tie deflections during passing trains. Tie deflections were reduced by 60% after GeoSpike installations.

Geopier Railway Subgrade Stabilization: The Geopier GeoSpikeSM system is a patented method for strengthening weak railroad track subgrades. Our system creates strong elements in weak subgrade soils, and are installed without removing railroad tracks, ties or ballast. The pre-manufactured polymer shells are driven in pairs between rail ties at regular intervals. The expanded top of the shell compresses between ties during insertion and expands back to its original shape after clearing the rail ties to allow for efficient load transfer from the ballast to the GeoSpike system. After driving to design depths, aggregate is placed within the confining GeoSpike shell. The dynamic loads from the passing rail cars arch through the ballast and are effectively transferred through the shell and densely compacted aggregate down to a suitable bearing layer.

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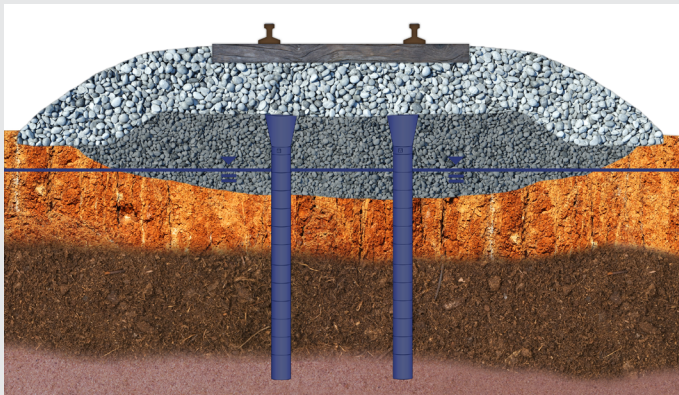


Shape Array Measurements

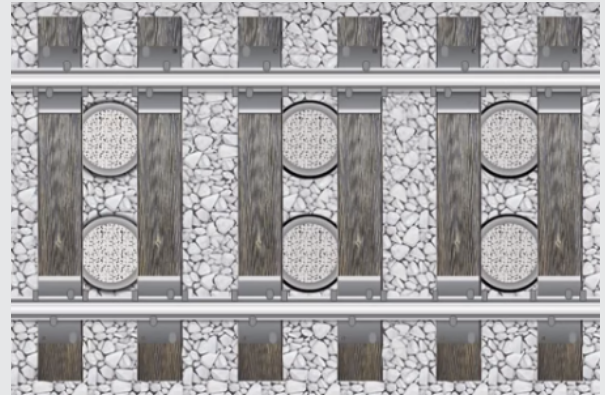


Short-Term Optical Survey Results

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Typical GeoSpike Configuration



Typical GeoSpike Spacing