

# BULLETIN

News from SubTerra, Inc.®

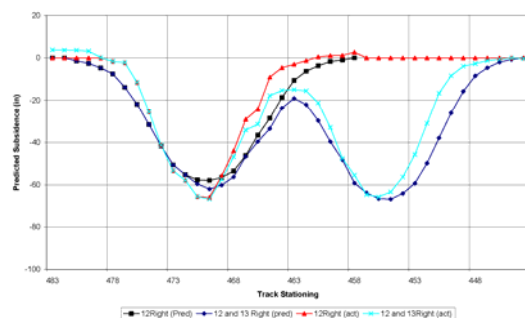
## *Subsidence Analysis and Railroad Re-Ballasting Steamboat, Colorado*

*SubTerra, Inc has provided Subsidence Engineering services to the Twentymile Mine for almost two decades. The project covered by this Bulletin covers re-ballasting of the railroad track during sequential longwall undermining by seven 1,000-ft panels. Daily train service carrying 140 car coal trains was maintained throughout the decades long period of undermining.*

SubTerra's scope of work included:

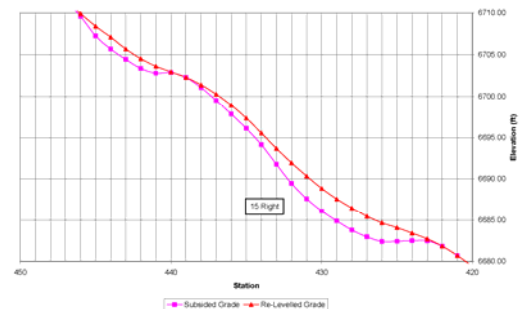
1. Predicting subsidence, strain, and tilt from initial and subsequent panels.
2. Predicting track subsidence on an annual basis.
3. Engineering a track re-ballasting program which minimized ballast placement while maintaining track serviceability.
4. Engineering advanced re-ballasting of the track so that this work could be accomplished prior to the onset of winter when the track would be covered in snow.

Subsidence predictions were confirmed by precise survey of transverse and travelling subsidence profiles.



Predictions of vertical subsidence, tilt, and strain were typically within 5% or better of actual movements.

We interacted with the owner of the Energy Spur track to schedule track re-ballasting which occurred well in advance of mining.



Spreadsheets were prepared to model the dynamic response of the track and estimate the elongation or compression of rail segments for 100-ft increments of coal mine face retreat. These predictions determined the required frequency for elevating the track and tamping the ballast.

The track remained “flooded” with ballast throughout the undermining period as an added precaution and to allow adjustments to be made during undermining.

Conventional track maintenance equipment was employed throughout the project.

SubTerra's innovative approach to track re-ballasting saved the mine on the order of \$1 million per panel.