

# BULLETIN

News from SubTerra, Inc.®

## *Differing Site Condition Evaluation Pipe Jacking Using a 51-in Ackerman Open Spoke TBM*

**SubTerra, Inc** was retained to evaluate a Differing Site Condition where large diameter boulders significantly affected progress and caused excessive wear on the cutterhead, jacking system and backup of a 51-in, Ackermann TBM.

The Contractors planned operation, under the geotechnical conditions defined in the specifications (i.e., *silty, sandy gravel with scattered cobbles and boulders, or till*), included conventional pipe jacking with moderate skin friction and removal of up to five boulders through the TBM cutterhead.



However, significantly more boulders were encountered both individually and nested with other boulders and cobbles resulting in impacts to TBM operation and significant delays. Impacts included, but were not limited to:

1. Excessive wear and tear on the cutterhead, TBM, jacking system, and backup systems.
2. Steering problems leading to pipe binding, increased skin friction, and excessive jacking pressures.

3. The need to install intermediate jacking stations as intermediate solutions to increased skin friction and increased jacking pressures.
4. Extremely slow progress associated with consistently encountering ground with nested cobbles and boulders.

Significant delays were attributable to:

1. Removing numerous boulders.
2. Digging out a greater than 4-ft diameter boulder.



3. Re-setting the pipe back to line and grade after removal of the greater than 4-ft diameter boulder.
4. Drilling and hydraulic splitting another boulder that could not be removed whole through the cutterhead.
5. Cutterhead repairs and pick replacements.
6. Installing Intermediate Jacking Stations.