



### **#7 SUBWAY LINE EXTENSION**

Keville's portion of this project is to provide inspection services to the Metropolitan Transportation Authority (MTA) of New York City. The contractor is a joint venture of JF Shea, Skanska, and Schiavone.

The project is an extension of the existing #7 (Flushing) Line subway coming from Queens, providing much needed public transportation to the west side of Manhattan. This project is part of a 50 year development plan sponsored by the Hudson Yards Development Corporation. Currently, there is no subway service to the west side of this part of Manhattan.

Shaft, starter and tail tunnel excavation was performed using traditional drill and shoot operations. Temporary ground support consists of rockbolts and a 6" application of highly accelerated shotcrete. Tunnel excavation is being provided by two Herrenknecht double shield tunnel boring machines (TBMs) excavating 22.5' diameter tunnels running side by side. The tunnels will travel north under 11th Avenue from 25th Street, past the Jacob Javits Center, turning right and entering the Port Authority Bus Terminal on 41st St and 8th Ave.

The very first 400' of the tunnels is through mixed face ground conditions. This area has been frozen using brine, cooled to -20°C and pumped to 140' below street level to solidify this mixed face. This ground freezing operation makes it possible for the tunnel boring machines to bore through the area.

The Herrenknecht TBMs are laser guided and computer directed, allowing for progress to be tracked and reported electronically. Also, modifications to the segmental lining sequence are possible using information from the guidance system and suggestions made by the on-board computer.

Precast concrete segmental liners have been designed and manufactured to fit together within very tight tolerances. This is in an attempt to keep water infiltration to a minimum. The segments have 2 separate gaskets on each piece. There is a traditional rubber gasket as well as a hydrophilic gasket that surrounds each segment piece. If this hydrophilic gasket gets wet, it expands to create a watertight seal. Even with these design considerations, additional grouting will be required.