



# Toronto Subway System

## Geotechnical Investigation and Design of Tunnels

### Geographical location

Toronto, Ontario

### When it began or was completed

Construction began in 1949 and continues today.

### Why a Canadian geotechnical achievement?

Construction of the Toronto Transit Commission (TTC) subway system, the first in Canada, began in 1949 and currently consists of four subway lines. In total there are currently approximately 68 km of subway tracks and 69 stations. Over one million trips are taken daily on the TTC during weekdays.

The subway system has been expanded in several stages, from 1954, when the first line (the Yonge Line) was opened, to 2002, when the most recently completed line (the Sheppard Line) was opened. Currently the Toronto-York Spadina Subway Extension is under construction.

The subway tunnels have been constructed using a number of different technologies over the years including: open cut excavation, open/closed shield tunneling under ambient air pressure and compressed air, hand mining and earth pressurized tunnel boring machines. The subway tunnels range in design from reinforced concrete box structures to approximately 6 m diameter precast concrete segmental liners or cast iron segmental liners.

The tunnels have been advanced through various geological formations: from hard glacial tills to saturated alluvial sands and silts, and from glaciolacustrine clays to shale bedrock. Extensive geotechnical investigations and insitu and laboratory testing have been carried out to characterize these deposits, with hundreds of laboratory triaxial tests and over a thousand pressuremeter tests completed.

### Submitted by

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### Key References

Wong, JW. 1981. **Geotechnical/geological aspects of the Toronto subway system**. Toronto Transit Commission.

Walters, DL, Main, A, Palmer, S, Westland, J, and Bihendi, H. 2011.

**Managing subsurface risk for Toronto-York Spadina Subway extension project**. 2011 Pan-Am and CGS Geotechnical Conference.

### Photograph and Map



Looking east inside newly constructed TTC subway tunnel, 1968. (City of Toronto Archives)



Current TTC Subway System Map. (Courtesy TTC).