



UPDATED Tunnel Boring Machine Maintenance & Subsurface Work

Background

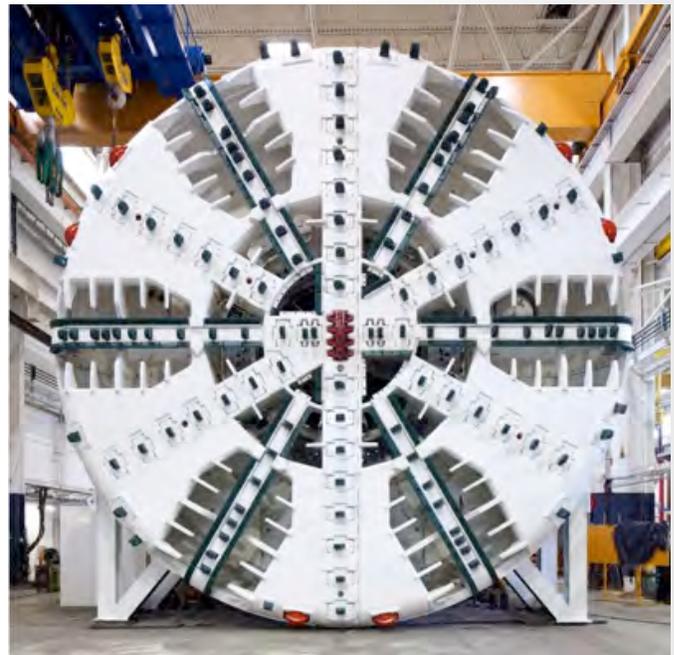
Construction for the Evergreen Line includes a two kilometre bored tunnel with tunnel portals located in Port Moody and Coquitlam. The single bore tunnel is being constructed using a 10 metre-diameter tunnel boring machine (TBM).

Tunnel Boring

The TBM is an earth pressure balance (EPB) machine. This means that when the TBM is boring, the soil and water pressure within the chamber behind the TBM cutterhead is balanced with the soil and water pressure in front of the cutterhead, which ensures ground stability at all times. During boring, the cutterhead chamber is never empty, as the process of boring continuously fills the chamber with soil. As the TBM bores the tunnel, it also installs the concrete tunnel liner rings which make up the walls of the tunnel. As soil is removed and the tunnel rings are installed, grout is injected between the exterior of the tunnel and the earth around it to ensure ground stability around and above the tunnel.

Regular Maintenance

TBMs need maintenance on a regular basis; part of that maintenance includes replacing worn cutterhead tools. To perform maintenance, soil within the chamber is removed to allow crews to go in and replace the worn tools. Occasionally, as crews prepare for the maintenance cycle, soil can enter the chamber causing an air pocket in front of and above the cutterhead. This air pocket may, depending on ground conditions, work up to the surface and cause a localized hole at the surface, above the cutterhead. This can only happen when the TBM is stopped and the cutterhead chamber emptied. It cannot occur when the TBM is boring as the chamber is always full. For that reason, the machine is stopped in a planned location. The Evergreen Line tunnel boring machine has not stopped, and will not be stopped, for maintenance under buildings as the tunnel is being constructed.



Front of the TBM showing the material handling chamber behind the rotating cutterhead, and the cutter tools on the face of the TBM.



New cutter tool on the left. Worn-out cutter tool on the right.

Subsurface Work – Worker Safety

To change the TBM cutterhead tools, crews must enter the chamber behind the cutterhead. Prior to entering the cutterhead chamber, the chamber is emptied and stable ground in front of the cutterhead is required so no soil falls into the chamber. This ensures that conditions are safe for workers to inspect the cutter tools. Depending on the type of ground conditions, additional subsurface work may be required to ensure stable ground at the cutterhead. One example of subsurface work is jet grouting, where a cement mix is injected into the ground ahead of the TBM to strengthen the soil.

Public Safety

Safety is the first priority on the Evergreen Line project and precautionary measures are taken to ensure the public is safe as the TBM continues its progress. Maintenance locations are planned in advance and the surface area above the cutterhead may be fenced off as a precaution depending on subsurface ground conditions. Additional monitoring is conducted at these locations. If an air pocket forms in front of the cutterhead and makes its way to the surface, crews immediately fill in the resulting hole and continue to monitor for additional settlement, adding top-up fill if required. Air pockets are always localized near the cutterhead.

Ground Improvements

Ground improvements in advance of the TBM have been required at three locations: Cecile Drive, Clarke Road and Seaview Drive in Port Moody and Clarke Road south of Robinson Street in Coquitlam. Ground improvements include jet grouting (injecting cement grout to strengthen the soil ahead of the TBM cutterhead), and localized dewatering.

If you would like to learn more about the Evergreen Line Project or have your name added to the information email subscription list, please visit the Project Office (2900 Barnet Highway, Coquitlam) weekdays from 8:30 am to 4:30 pm or contact us:

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