Ship Canal
WATER QUALITY PROJECT

Seattle Public Utilities
King County

Building the Storage Tunnel

Tunnel Boring Machine

The machine used to build the tunnel, called a tunnel boring machine or "TBM", will be about 22-ft tall and 65-ft long. The TBM is expected to begin digging in summer 2021 and take about a year to reach its destination in Wallingford.

Fun fact: The TBM parts were shipped all the way from Germany and will be re-assembled in Seattle.

The front of the TBM is known as the **cutterhead**. It has different tools to get through the dirt (technically called soil or glacial deposits) that it will meet underground. These tools include **double disc cutters** to dig through hard soil and boulders, **scrapers** to loosen materials such as sand and gravel, and **bucket cutters** around the outside to keep the edge of the tunnel clean. Thanks to its mighty toolbox, the TBM can travel up to 50 feet per day!

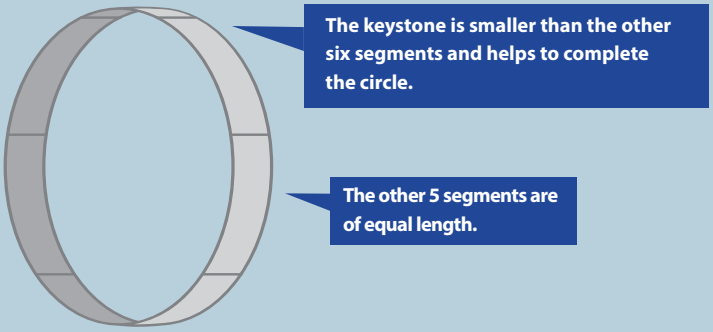
These are key pieces of the TBM that will be used to build the Ship Canal storage tunnel.

Building the Tunnel

If you look closely, you can see the rings that were placed by this TBM to form the "Lee Tunnel" in London.

As the TBM advances, it will place six concrete **segments** that fit together to form a tunnel ring. This ring will form the wall of the tunnel. The TBM will also use the rings it builds as traction to keep moving forward. While it moves, the TBM pulls a **500 ft-long trailing gear** of essential equipment, including the control room (where a machine operator sits), grout, ventilation equipment, and other essential tools. At any given time, there are 8-10 people in the TBM to keep it going.

What Makes Up a Tunnel Ring?*



**This is a graphic representation of a ring and is not an exact replica of what will be built by our TBM.*

What Happens to the Dirt?

Excavated soil is removed by a conveyor, and dumped into cars running on a narrow railroad track through the completed tunnel back to Ballard. The soil is then lifted to the surface with a gantry crane and loaded into trucks for disposal.

Fun fact: This TBM will remove roughly 400,000 tons of dirt in the process of building the new storage tunnel

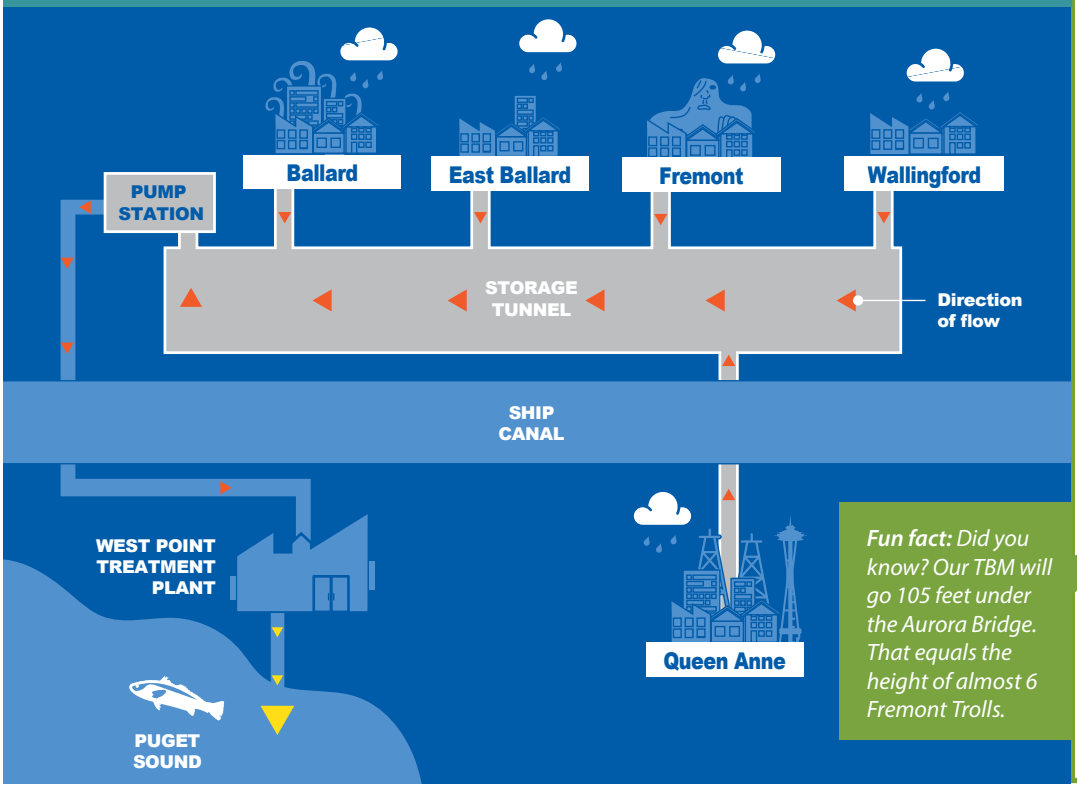
Monitoring and Safety

To maintain a safe environment underground, there is a protective barrier, called the cutterhead shield, that isolates the tunneling machine, equipment, and crew from the surrounding ground which can become unstable if exposed.

Ground monitoring around the tunnel boring machine is done from both inside the machine and on the surface. While we do not expect significant ground movement, we will be monitoring over 200 structures along the tunnel path before, during, and after tunnel construction as a precaution. The TBM's journey is tracked underground by survey points linked to satellite maps, and crews inside the machine measure the amount of soil that is excavated to make sure the machine is moving at the expected rate. Isn't technology cool? Learn more by reading out Ground Monitoring Factsheet.

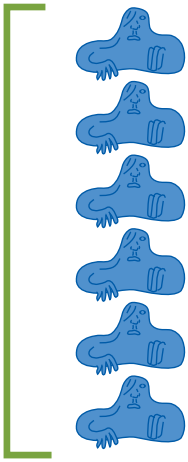
The Tunnel - How it works

Seattle Public Utilities and King County Wastewater Treatment Division are building an underground storage tunnel to significantly reduce the amount of polluted stormwater and sewage that flows into the Lake Washington Ship Canal, Salmon Bay, and Lake Union from our sewer system.



Fun fact: *Did you know? Our TBM will go 105 feet under the Aurora Bridge. That equals the height of almost 6 Fremont Trolls.*

The tunnel will be 2.7-miles long, running from Ballard to Wallingford, and approximately 18-ft, 10-in wide. It will temporarily hold more than 29 million gallons of sewage and stormwater during heavy rains. When the storm passes, the stored sewage and stormwater will be sent to King County's West Point Wastewater Treatment Plant.



Sewage and polluted stormwater (red arrows) will flow into the tunnel during heavy rain until there is capacity to pump the flows to the treatment plant. Although the flows will travel from Wallingford to Ballard, the TBM will tunnel from Ballard to Wallingford and will take approximately a year to complete.

Contact

For questions or comments about this project:

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This project is funded in part by the Washington State Department of Ecology and Environmental Protection Agency through State Revolving Fund and Water Infrastructure Finance and Innovation Act loans

EPA United States Environmental Protection Agency

DEPARTMENT OF ECOLOGY State of Washington

For interpretation services please call **206-486-6180**

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Para servicios de interpretación por favor llame al **206-486-6180**

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