

# Sweden



**Name:** Swedish Rock Engineering Association

**Type of Structure:** non-profit, open association

**Number of Members:** 87 corporate members from public and private clients, contractors, suppliers, mining companies, consulting firms, institutions and research organizations

## ASSOCIATION ACTIVITIES DURING 2019 AND TO DATE

Four permanent working groups constitutes the backbone of the Swedish Rock Engineering Association (Svenska Bergteknikföreningen). These working groups are Yearly Congress, International, Competence Development and Young Members. The association works towards a sustainable use and development of Swedish underground space. The main activity has been the annual Swedish congress. 2019 the two-day congress gathered approximately 530 delegates. Young Members continued its second year with the successful mentor program that was launched in 2018. The International group work towards an increased Swedish participation in ITA activities. In December a national WG meeting was held where the representatives presented each group's ongoing work. Within ITACUS National Action Programs, Think Deep Sweden continued their work. The Competence Development group arranged a webinar on the Swedish publication Design of rock structures in May and in September an international advanced grouting design course was held. The first theoretical part was held in Finland and the second practical part was held in Sweden. The course was very well received by the 46 participants and we are looking into the possibilities of arranging this course again during 2020.

## CURRENT TUNNELLING ACTIVITIES E4 Förbifarten, Stockholm (Stockholm By-pass)

This project includes an 18km long road tunnel with an excavation volume of 6,500,000m<sup>3</sup>. During 2019 construction activities have been ongoing. The tunnel is now halfway complete (52%), with current excavation speeds of approximately 900m/month. (see image 1).

## Västlänken, Gothenburg (West Link)

This is a large railway project in the

centre of Gothenburg to convert the present terminus into a through station for commuter trains. The project is built in a dense urban environment with complex geotechnical conditions of a mix of loose clay and hard rock. Tunnel length will be 6km. During 2019 work is ongoing in all four major construction contracts.

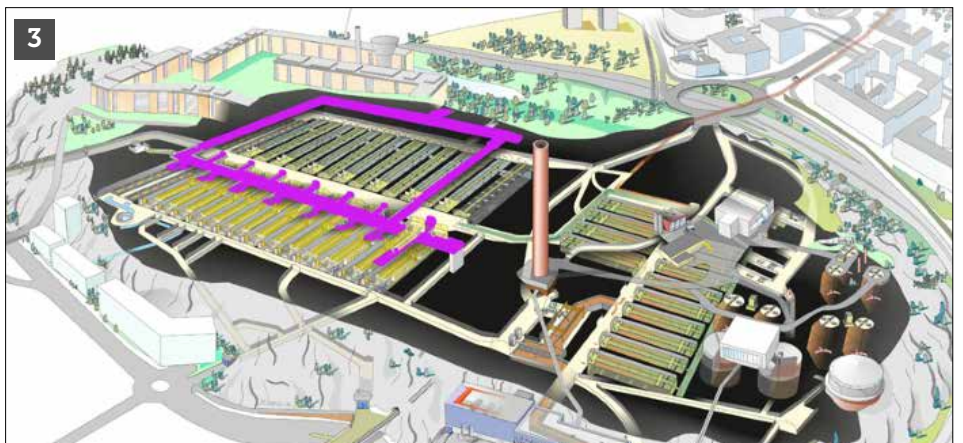
## Extensions of the subway in Stockholm

The extension of the Stockholm subway is a large tunnelling project (approx. 4Mm<sup>3</sup>) that will be ongoing in different parts of the city for some years. It will result in 11 new stations and 20km new tunnels by 2030.

The construction of the three work tunnels on the first stage, Akalla - Barkarby, started in April 2019. 160m of work tunnel has been drill and blasted by end of 2019. The construction of the 4.1km main tunnel and two underground stations has started. The first stage of this project will be ready 2026.

## Reconstruction of Slussen Stockholm incl new underground bus terminal

Slussen is a central area by the lock between lake Mälaren and the Baltic sea. This is an important hub in Stockholm and a very busy area which





is now being re-constructed with new bridges, water works etc. In addition, a large underground bus station is under construction in the same area. The tunnelling works were ongoing during 2019 and will be finished in 2023. (see image 2).

#### Varberg railroad tunnel

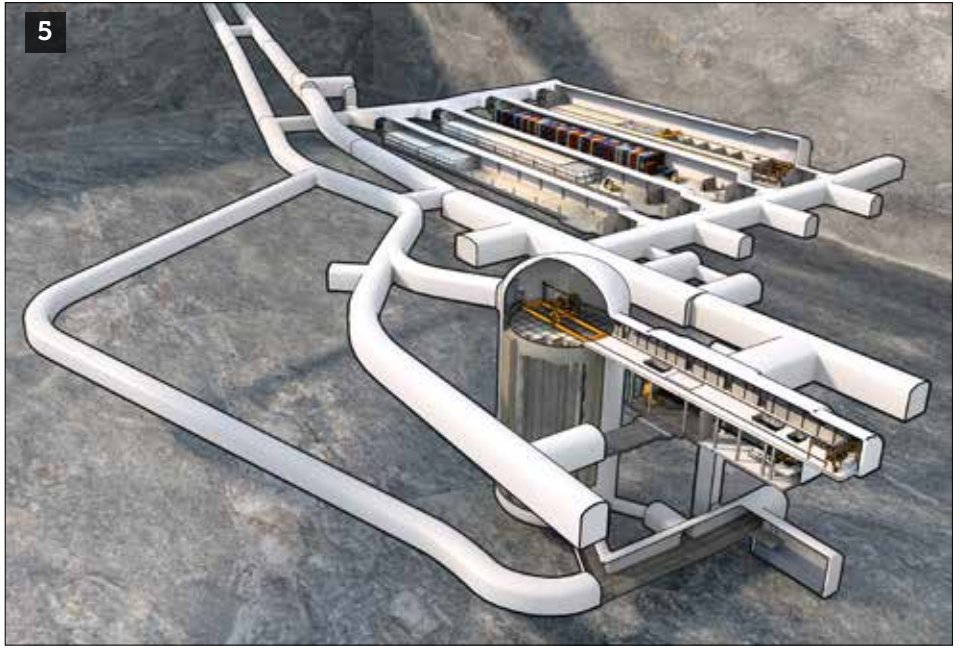
The West coast link is being upgraded with double tracks through the city of Varberg. 3km of rock tunnel and 300m concrete tunnel will be built. The project will create better opportunities for commuting and to be able to transfer freight transportation to the railway. Preparation for the tunnel mouth started in December 2019. The project is planned to be finished in 2024.

#### Sewage tunnel under Stockholm

Due to decommissioning of the Bromma treatment plant in the western part of Stockholm, wastewater will be conveyed to the extended Henriksdal plant in a new 14km tunnel blasted in the rock under Stockholm. Construction works started in September 2019.

#### Henriksdal sewage plant

In the Stockholm future wastewater project, an existing plant, Henriksdal, is extended to double the treatment capacity to serve 1.6M people to comply with more stringent treatment requirements. The expansion includes a new underground facility for pre-treatment under the Hammarbybacken ski slope and a complete upgrade of the Henriksdal plant. The project includes several complicated rock constructions, and blasting must be carefully controlled



to ensure continuous operation of the treatment process and minimize disturbance to surrounding infrastructure and housing. (see image 3).

#### FUTURE TUNNELLING ACTIVITIES

##### Extensions of the subway in Stockholm

Continued construction of tunnels for the subway extension in Stockholm. Four more stages including a depot will be started during 2020.

##### City Link tunnel

A tunnel with a length of 13.4km and a diameter of 5m will be built 50-100m below central parts of Stockholm. The purpose of the project is to connect northern and southern parts of Stockholm with a new electricity supply. The project will include 6 ventilation shafts, elevator systems and construction of technical buildings for electrical equipment. The work on a 100m deep shaft started in February 2020. From this shaft a 250m long tunnel will run under the Stockholms ström lake. After this work is done a TBM will arrive on site. Tunnelling will proceed for 4 years with a planned completion in 2024. (see image 4).

##### Oslänken, the East Link high speed rail

New high-speed rail south of Stockholm. Design and planning ongoing.

##### SKB Forsmark, a final repository for nuclear fuel

Planning is continuing regarding Sweden's final repository for spent nuclear fuel. Process of getting the necessary permits is on-going. (see image 5).

## STATISTICS

### 1. Length or volume excavated - % mechanized/% conventional during 2019

- Volume excavated 2019 is 1,530,000m<sup>3</sup> with 100% conventional.

### 2. List of tunnels under construction

- Stockholm By-pass; West link – Gothenburg; Extended Stockholm subway; New bus terminal at Slussen Stockholm; Varberg railroad tunnel; Sewage tunnel Bromma-Henriksdal; Henriksdal sewage plant.

## EDUCATION ON TUNNELLING IN THE COUNTRY

**Bergsskolan** – Polytechnical education (3yrs) with Engineering Mining and construction technology/ Rock engineering Mining and construction industry Civil Engineering 3yrs (BSc) or 5yrs (MSc) as well as PhD studies is offered at several technical Universities. Courses are e.g. engineering geology, site investigation, rock mechanics, hydrogeology and risk analysis:

**Chalmers University of Technology** (Gothenburg), KTH (Stockholm), Luleå University of Technology (Luleå), and Lund University (Lund).

**Uppsala University (Uppsala)** courses are focused on geology, engineering geology and geophysical investigations.