

Semmering Base Tunnel

THE PROJECT OF THE CENTURY

TODAY. FOR TOMORROW. FOR US.

The Semmering Base Tunnel



History is being written in the Semmering region. Construction of the 27.3 km tunnel in the heart of Austria means a modern rail link for future generations that also instantly makes rail travel in the south of Austria considerably more appealing. As part of the Baltic-Adriatic Corridor, the Semmering Base Tunnel is also a major section within international rail networks.

Future rail traffic can travel through the mountain at a top speed of 230 km/h as a result of the tunnel being built. Freight transport is also much easier and more efficient with the Semmering Base Tunnel, as the steep inclines and narrow curve radii on the historic mountain route are eliminated so that long freight trains in the tunnel can also be towed with just one locomotive. However, the historic mountain route will be maintained.

Together with the other upgrades along the new Southern Line between Vienna

and Villach, the Semmering Base Tunnel represents an important, sustainable investment in the future. From 2030 onwards, it will be simpler and more appealing to make the switch from cars to the railway. In doing so, it will be a useful contribution to climate protection.

SEMMERING BASE TUNNEL IN FIGURES:

Construction schedule: 2012-2030

Route: Gloggnitz – Mürzzuschlag

Length: 27.3 km

Design: 2 tunnel tubes

Employed: Around 1,200 during the construction phase

Maximum speed: 230 km/h

Parts of the tunnel inner lining have already been built



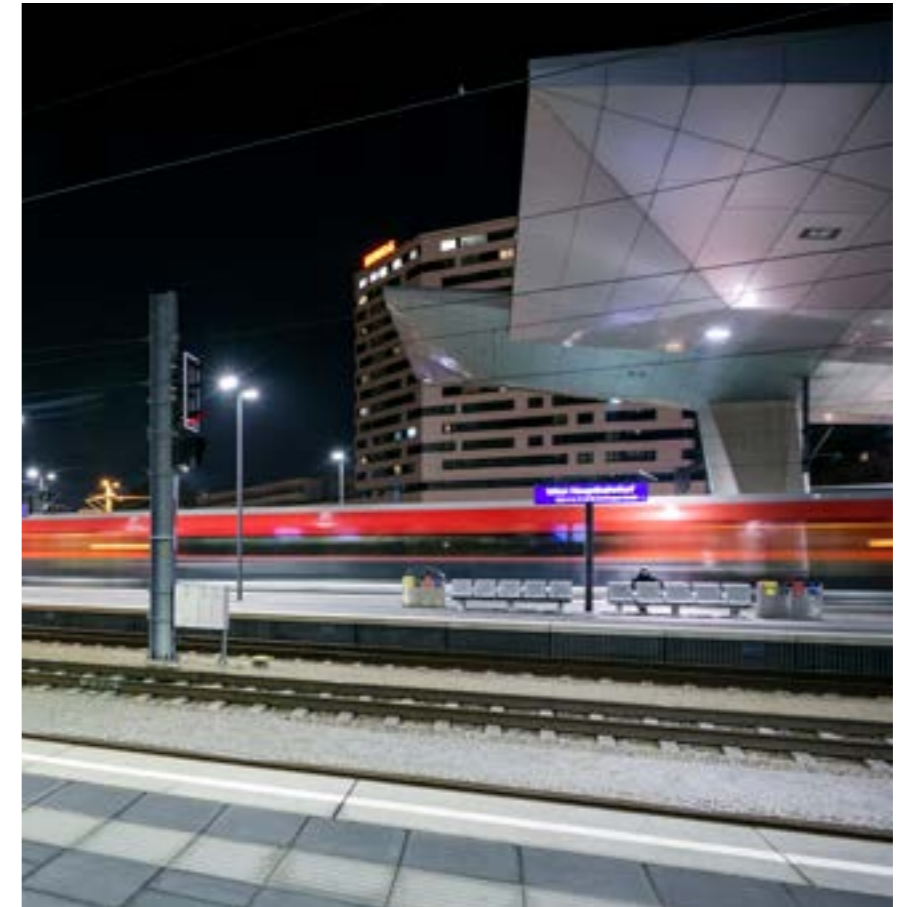
One of the two portals of the tunnels is being built in Gloggnitz

The new Southern Line

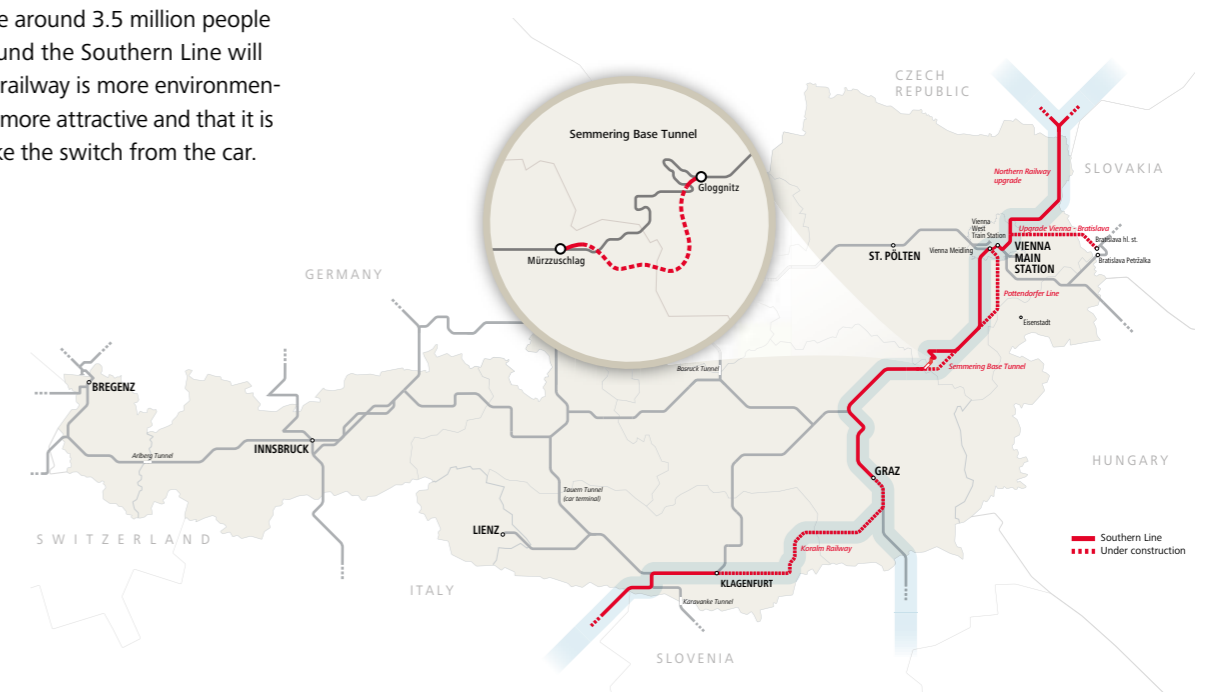
The Southern Line between Vienna and Villach is currently the ÖBB's most ambitious construction project in Austria. Far-reaching improvements are being implemented for travellers along the entire route. The goal is also to make this route as competitive as the Western Line between Vienna and Salzburg, which is even now considerably faster than making the trip by car.

For travellers, this means that many destinations can be reached quicker and more conveniently by train in future. As an example, completion of the Semmering Base Tunnel means the travel time between Graz and Vienna Main Station will be reduced by half-an-hour. In specific terms, this means it takes around an hour and fifty minutes to travel from the city centre in Graz to the centre of Vienna by train.

Around 200 km of railway line is being updated and a further 170 km is being built afresh in total, particularly the 130 km Koralm railway from Graz to Klagenfurt. However, the existing railway stations on the route will also be updated to best serve the requirements of modern travellers. The around 3.5 million people who live around the Southern Line will find that the railway is more environmentally friendly, more attractive and that it is easier to make the switch from the car.



New standards of travel in southern Austria



The new Southern Line with the Semmering Base Tunnel

The Semmering Base Tunnel is in harmony with the past



The historic Semmering route will be maintained for the future

The new Semmering Base Tunnel will provide the following:

Placing the Semmering Base Tunnel into service means travel times from Lower Austria and Vienna to Styria and on to Carinthia will fall dramatically. From 2030 onwards, it will take less than two hours to travel by train from Vienna to Graz, in modern yet comfortable carriages without traffic jams and the stress of driving in the city.

Graz is about as fast as going by plane when adding on travel time to and from the airport, as well as the time spent waiting for departure.

ensure faster connections. Excellent infrastructure also rejuvenates regional and national economies whilst enabling the settling of businesses.

On this route, the railway will become a genuine alternative to planes. With a travel time of around 2 ½ hours from Graz city centre to Vienna International Airport, the trip between Vienna and

From 2030, it will only take one hour to travel from Mürzzuschlag to the centre of Vienna. From Vienna, it takes 2 hours and 50 minutes to reach Klagenfurt, on the shores of the Wörthersee. Freight transport will also become more straightforward and offer better value for money as there is no need to go over the historic mountain route. These higher standards of travel will not just

Around 11,000 jobs are created by the Semmering Base Tunnel after it is put into service. Around 1,200 people work on building the tunnel during the construction phase.

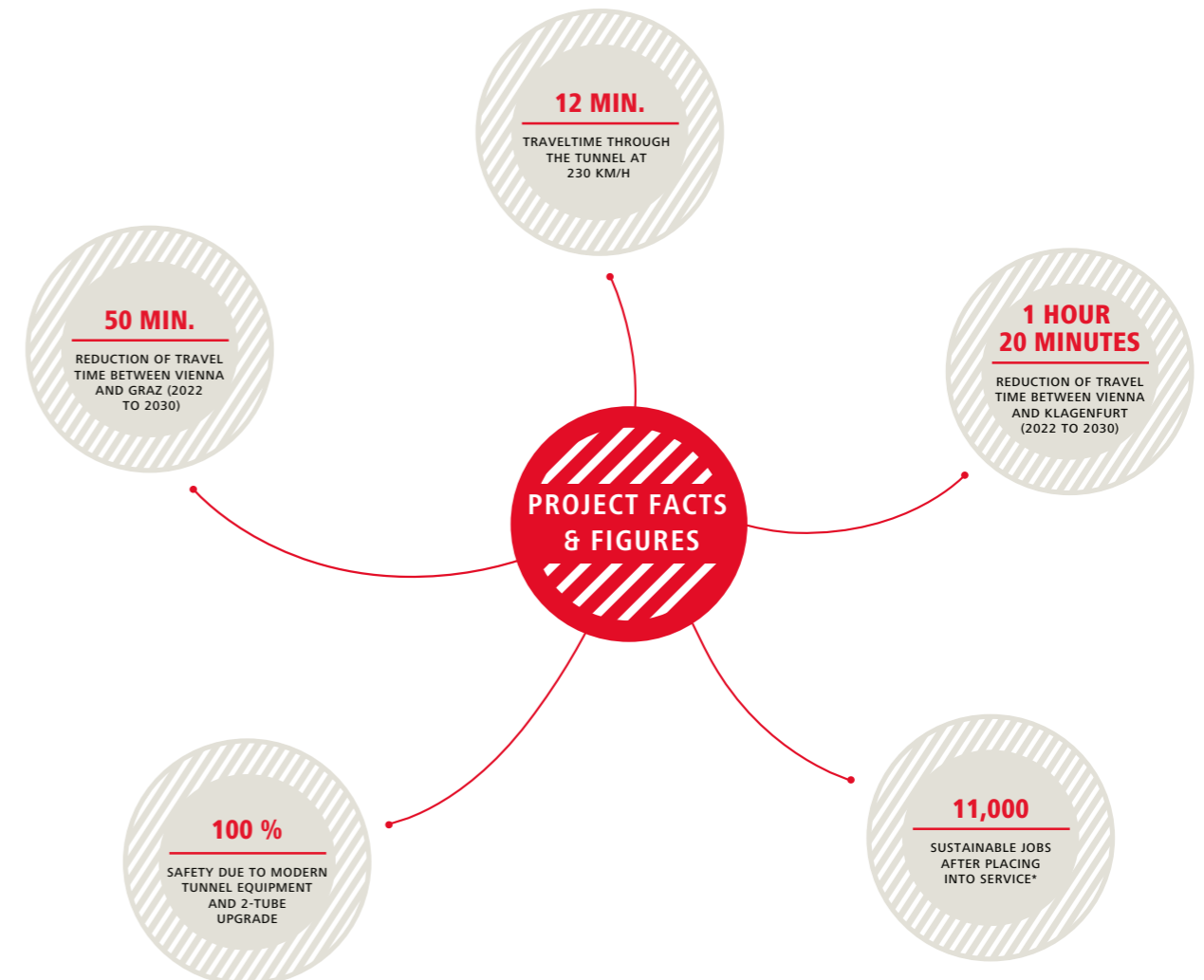
Construction of the Semmering Base Tunnel means a new route is being built through Semmering that satisfies the requirements of modern rail travel whilst easing the load on the historic Semmering Railway. It was never in doubt that the mountain route would be preserved. The route will still be required for railway operations as well as for tourism, and not just because one of the two tubes must be serviced twice per week for eight hours after the tunnel has been put into service.

The necessary renovations at Mürzzuschlag railway station were given particular emphasis. As the western portal of the Semmering Base Tunnel emerges from the mountain near the railway station, large parts of the railway systems had to be restructured. The listed railway building will be renovated and many areas will be renovated more faithfully to the original historic designs than was originally the case before starting renovations in 2019.

When designing the northern areas, particular attention is paid to ensuring that all new parts are in harmony with the entire railway station and the whole Semmering route. Amongst other things, the Park&Ride facility is being rebuilt and extended, and a new maintenance support point is being set up. The symbiotic link between historic and modern parts of the building thus always remain in focus of all considerations in how to ideally combine old and new.

THE HISTORIC SEMMERING RAILWAY

In **1854**, the historic Semmering mountain route between Gloggnitz and Mürzzuschlag **was put into operation**, which closed the gap between railway networks in Styria and Lower Austria. The approximately **42 km long route with 14 tunnels and 16 viaducts** was a marvel of engineering in its time, and remains largely unchanged even now in use on the **important Southern Line between Vienna and Villach**.



*Study about the Baltic-Adriatic corridor

The fascination of tunnelling

When construction started in 2012, it heralded the implementation of a long-sought goal, namely modernisation of the rail links between Vienna and southern Austria. The project: digging a 27.3 km tunnel from Gloggnitz to Mürzzuschlag:

Extensive preliminary investigations

Comprehensive geological and hydro-geological preliminary surveys must be carried out years before starting construction in order to dig out a tunnel of this length. Around 280 core drillings with a total boring length of around 41 kilometres were made in the Semmering area. As a result, setting out an ideal path for construction has been successful. Construction was started after completion of the extensive testing and approval procedures.

It was decided to work on several locations due to the immense length of the tunnel. Alongside the portal locations in Mürzzuschlag and Gloggnitz, three further “interim attacks” were set up in three additional sites at Göstritz, Fröschnitzgraben and Grautschenhof. Shafts up to 400 m deep were dug into the mountain in order to build the tunnel within its depths. This means a total of 14 drives can be made at the same

time in 5 locations, two of which are in Fröschnitzgraben with powerful tunnel drilling machines of around 125 m in length. All other drives were made via excavation and blasting.

Hard work in the mountain

Around 1,200 people are active in the various sites during the construction phase. From project management via the responsible companies to the miners within the mountain, everyone involved in the project is working together, combining know-how and commitment in this exceptionally challenging construction project until the first carriages travel through the mountain.

Many pieces of heavy machinery and state-of-the-art technology is being used in building the tunnels. Nevertheless, demanding physical and mental work is carried out in the planning, implementation and particularly during excavation in the mountain as the constantly changing circumstances in the mountain need to be analysed, the correct decisions regarding the course of construction must be made, and then comes arduous physical work.



Miners work their way through the mountain at depths of up to 400 metres.



Special measures in the Gloggnitz section



The first breakthrough - Göstritz meets Fröschnitzgraben



A major part of the tunnel was created via excavation and blasting.

2022: around 95% of tunnels have been dug

After construction started on the overall project in 2012, preliminary work has been gradually carried out in all construction sections so that the tunnel can be built and the tunnelling work has started in the mountain. Several years are required in all sections until construction is completed with a total length of 27,300 metres. As you would expect, completing work within a single section is a quite special, emotional moment for everyone involved.

The first drive was completed in the Fröschnitzgraben section in February

2021. The first breakthrough between two construction sections, so two sections coming together, happened in June 2022 between Göstritz and Fröschnitzgraben. By autumn 2022, 6 of the 14 drives have already been completed, and around 95% of the 27.3 km of tunnels has been dug.

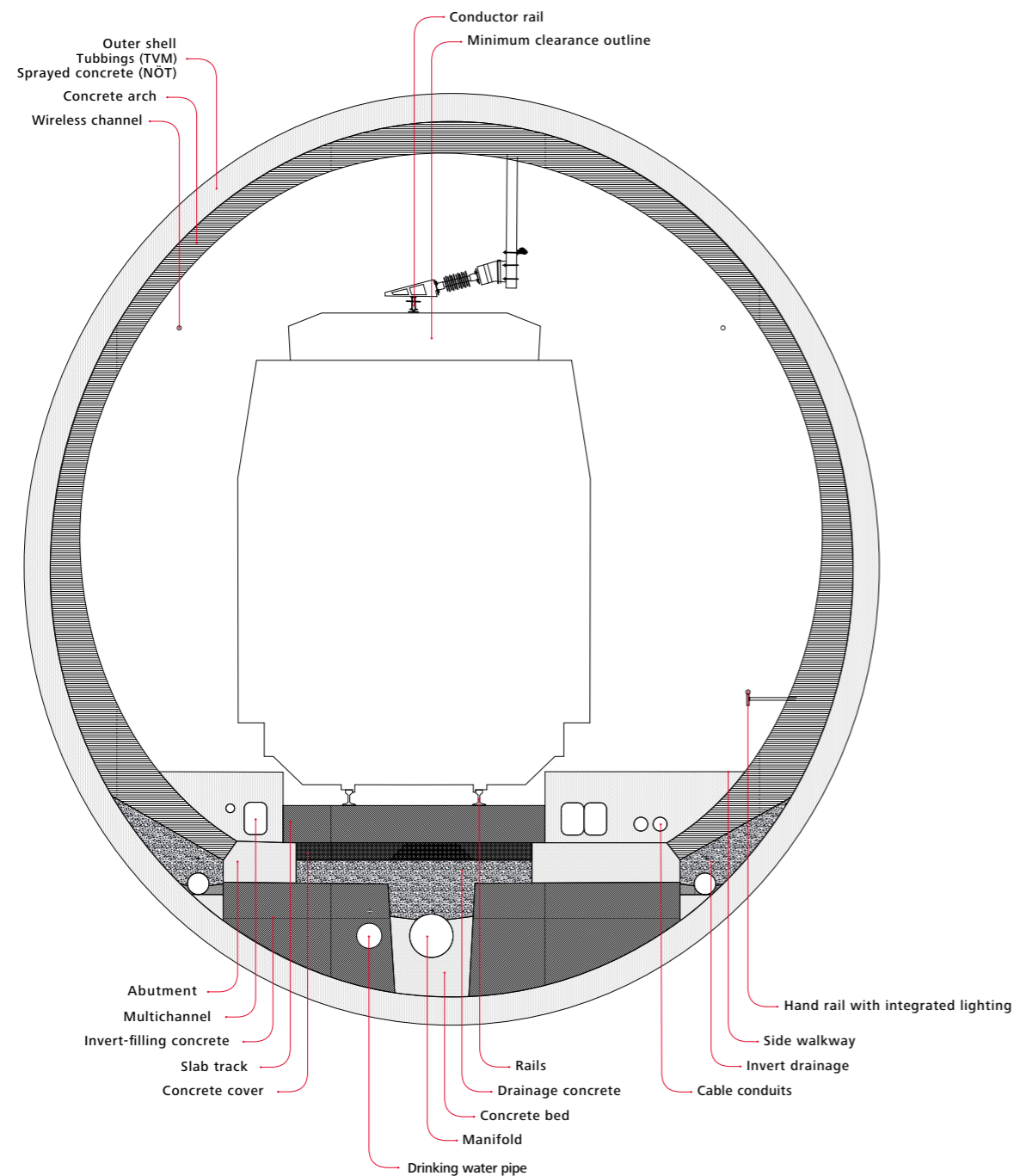
Last kilometres of drive

Preliminary geological investigations in the Semmering region made clear that the area west of Gloggnitz around the so-called Northern Grasberg Boundary Fault provided demanding conditions for tunnelling. This analysis before starting construction has proven to be ac-

curate. Extensive special measures have to be carried out in this area to make safe tunnelling through the mountain possible. In this case, concrete or plastic injections are made into the mountain to stabilise the rock, at which point it becomes possible to build the tunnel via excavation and blasting.

The final 2.5 km of tunnel will be dug out in about 2 ½ years. Afterwards, the concrete lining in the tunnel can be prepared, then technical tunnel equipment can be installed as the final step before being put into service.

Tunnel equipment - the last construction phase



After the tunnelling work is complete, the whole tunnel is fitted out with a continuous inner concrete lining. It is the foundation on which the technical tunnel equipment is installed. A modern tunnel has a large range of installations that are necessary for digitalised and internationally networked railway operations. Signalling, radio, lighting and telecommunications systems must therefore be installed in the tunnel.

Technology rooms are set up in the connecting tunnels between the tubes and cables are laid throughout the whole tunnel. Innovative conductor rails instead of traditional overhead lines are used to provide the locomotives with electricity in new tunnels. Specially designed reinforced concrete slabs are laid below the rails. These slabs are particularly durable and stable - known as a "slab track". In order

to reduce tremors and sound transmissions, parts that are relatively close to the surface and residential areas have what is known as a massspring system installed that considerably reduces the extent to which vibrations travel.

Safety in railway operations

Due to current safety standards, long tunnels are now only built with two tubes, particularly if something happens in one of the two, the second tube can then be used for evacuation and for ensuring safe rail operations. Short connecting tunnels, which are available every 500 metres, provide the option to switch from one tube to the other. An emergency stop is also located approximately in the middle of the Semmering Base Tunnel if a train has to be parked in the event of an incident.

Evacuation then readily takes place in the other tube and travellers are taken away by rescue trains. As is the case on all main railway routes, the European Train Control System (ETCS) is used in the Semmering Base Tunnel. Amongst other things, it controls the speed and travel direction of trains via a continual radio network. If the speed limit is exceeded, then the system can automatically slow the train down and bring it to a stop before a danger point.



The emergency stop in the Fröschnitzgraben area is currently under construction

A tunnel for generations

The ÖBB is investing in a multitude of projects in Austria to make it easy to switch over to environmentally-friendly rail travel. Travellers can look forward to an even more modern railway that is fit for the future and a genuine alternative to cars. The same applies to freight haulage. Every journey by rail is around 30 times more climate-friendly than by car. Every tonne of freight transported by rail instead of road produces around 30 times less CO₂.

Major projects, such as the Semmering Base Tunnel, are built to benefit many generations. They are a key part in making the environmentally-friendly railway even more attractive, making it possible for travellers to journey easily and in comfort whilst also protecting the environment.

Building in harmony with nature

As you would expect, a major project such as the Semmering Base Tunnel also heralds changes for the region in which it is built. Extensive notification conditions and verification of construction by external experts ensure that the impact on nature and the environment during the construction phase is reduced to a minimum, unavoidable level. In the case of the Semmering Base Tunnel, a landfill site was established in Longsgraben next to the construction site in Fröschnitzgraben, which was

filled in with around 4.25m cubic metres of material excavated from the tunnel (which is roughly twice the volume of the Great Pyramid of Giza). Instead of using lorries, the majority of this huge quantity of material was directly transported on conveyor belts to the landfill site from the Fröschnitzgraben section. Afforestation of the whole landfill site will start from 2023 onwards. In this case, a mixed forest is planted that is suitable for the demands posed by climate change.

Decades of observations via a comprehensive network of measuring points and measuring stations in the Semmering region have made clear that climate change is also taking place around Semmering. This measurement data makes abundantly clear that the type and quantity of precipitation has drastically changed in the Semmering area. Longer dry spells, more frequent spells of heavy rain and less snow mean that the water table has fallen across the entire region. For this reason, it is particularly important that water retention measures are ensured in sensitive areas so that only small quantities of mountain water get into the tunnel.



The Longsgraben landfill site in 2013



The completely filled in Longsgraben landfill site in the autumn of 2022



A splendid overview of the construction site can be observed from the information tower in Müzzuschlag.



The info box in Gloggnitz

Semmering Base Tunnel Info Hub

You can find info boxes and info towers at the most important points within the Semmering Base Tunnel construction sites. The accessible info box at the tunnel portal Gloggnitz (open between 9:00 and 19:00, free entry) provides a full overview of the entire Semmering Base Tunnel project. From planning to construction, you can follow all measures that were taken to professionally prepare this project and ensure its sustainability. The info box and info tower in Müzzuschlag near the second tunnel portal provide, above all, insight into those parts of the project focusing on the railway station and the western portal in

Müzzuschlag. The three info towers in Göstritz, Fröschnitzgraben and Grautschenhof are accessible whilst also providing a direct view of the 3 construction areas from which the miners worked their way into the mountain. Information boards provide an overview of the key facts about the project and the relevant construction phase. The information towers are accessible but only via wooden staircases and are therefore not barrier-free. Before setting out, please make yourself aware of short-term changes to opening times or the availability of exhibitions and visit infrastruktur.oebb.at/semmeringinfowelt.

