

## **Statement on Environmental Effects in the Operation of the Designed Facility**

The planned activity is a construction of double-track Beskyd tunnel located on the V Cretan international transport corridor at the Beskyd – Skotarske section. A new tunnel will replace an old single-track one built in 1886.

The aim of planned activity is an enhancement of railway traffic between Eastern and Western Europe, execution of “Program for development of national network of international transport corridors in 2006 – 2010” approved by the Decree No.496 of the Cabinet of Ministers of Ukraine dated 12 April 2006, Implementation plan of comprehensive program up to 2010 for Ukraine to be established as the transit state in 2002 – 2010 approved by the Order No.606-p of the Cabinet of Ministers of Ukraine dated 1 August 2007.

The way for aim implementation is the construction of Beskyd tunnel.

In compliance with the Order No.582-p of the Cabinet of Ministers of Ukraine dated 22 June 2011 the land plots located outside the population centers of Lviv and Carpathian regions to be assigned in permanent use and leased with the change of designated purpose by the State Regional Territory Branch Society ‘Lviv Railway’ in order to construct and arrange Beskyd tunnel, the total area is 6.18 ha of forest (with the change of forest designated purpose at the territory of railway transport), including:

- Lviv region, Skoliv district – 5.05 ha based on the lands of Slavskiy forestry subsidiary enterprise “Halsillis” : 1.41 ha to be used permanently, 3.64 ha to be leased for construction period;
- Carpathian region, Volovets district – 4.14 ha based on the lands of the state enterprise “Volovets forestry” to be used permanently.

The area of construction site of Eastern tunnel portal is 29,130 m<sup>2</sup>. The area of construction site of Western tunnel portal is 2,970 m<sup>2</sup>.

The possibility of environmental emergency

Design has been developed in compliance with current regulations and rules and foresees the measures ensuring fire and explosion safety during the tunnel operation.

Essential factors influencing natural environment

During construction:

- disfunction of biosystems (biocenosis etc.), removal of green planting;
- temporary land withdrawal;
- industrial noise;
- environment polluted by construction waste;
- Emissions of NO<sub>2</sub> nitrogen dioxide, CO carbonic oxide, C<sub>12</sub>-C<sub>19</sub> carbon and other contaminating agents emitted by construction machinery and production equipment.
- Emergency emissions of cement dust as well as dust caused by inert aggregate transshipment;
- Disposal of sewage water with weighed materials (from the construction site and settling basins for wheels washing) by purification equipment and its further outlet upon purification to the brooks available in the vicinity of construction site

- Purification of domestic water at EKO19 purification plants
- It is foreseen to remove hard domestic waste during construction according to specific agreements;
- In the event of execution of design solutions justified in compliance with current regulatory documents and recommendations during construction, the probability of occurrence and development of dangerous geologic processes along the tunnel to be constructed and its adjacent territory shall be forecasted, measures for their elimination shall be developed in the project. Essential changes in hydrogeologic situation are not foreseen.
- Application of technologies and materials adversely influencing the environment are not foreseen.

#### During operation:

- Noise and vibration during electrical multiple unit train running; all design structures located within the railway influence area are calculated for temporary load of rolling stock. All structures to be probably influenced by rolling load during construction and operation period are calculated on concentrated four-axle load.
- Closed waterproofing with disposal of drainage water to the prepared drainage is foreseen in order to protect tunnel against underground water and release from hydrostatic pressure. Atmosphere precipitation and drainage water from interception part of retaining walls are disposed by cast-in-situ reinforced concrete gutters.
- To divert brooks and Vecha river it is foreseen to use collecting prefabricated reinforced concrete pipes for water discharge into cast-in-situ well as well as cast-in-situ reinforced concrete inclined drop structure and cushioning pools.
- Land improvement

#### Evaluation of environmental risk levels

In compliance with clause 16 “Construction of airports, railway junctions and station buildings, bus stations, river and marine harbours, motor and railway trunk roads, underground railways” of Annex E, ДБН А.2.2-1-2003 (DBN A.22-1-2003) the designed Facility is an environmentally hazardous.

In compliance with clause 5.20 of ДСП 176-93 (DSP 176-93) “Residential building shall be separated from railway tracks by 100 m sanitary protection zone from the axle of outer railway track on conditions that standard noise level is provided at the adjacent facilities and building area. The nearest residential building is located at the distance of 700 m.

If the railway is located in excavation and special noise-protective measures are taken C33 dimensions are set (not less than 50 m) with account of standard noise level provision at the territory of residential building. In this respect not less than 50% of C33 area shall be landscaped.

Distance from garden plot boundary to the axle of outer railway track shall be not less than 50 m with compulsory application of 25-30 m width noise control plantings or other noise protection measures.

The designed Facility is under sanitary classification of Annex 9, ДСП 176-93 (DSP 176-93) with regulatory C33 of 100 m.

Operation of the Facility does not foresee the hazardous substances to be produced in the air. Owing to the optimization of design solutions during execution of environmental protection measures and sanitary codes the Facility will not have in fact any hazardous influence on the environment.

Selected land plot is acceptable for Beskyd tunnel construction.

#### Noise impact on the community

Beskyd tunnel and the plot to be designed are located along the railway connecting Lavochna station at the north-east side of portal and Volovets station at the south-west side of the tunnel. Intermediate stations from each Beskyd tunnel side are Beskyd station at the north-east side and Skotarske at the south-west side of the tunnel. There are no population aggregates except several military guard posts, military barracks and small constructions for railway workers in the vicinity of near-portal areas of the tunnel.

The railway single track Beskyd tunnel is operated on this section and new double-track tunnel is foreseen to be constructed. Existing Beskyd tunnel will be run during the whole construction period until the new tunnel is put into operation and will be used as an emergency tunnel during operation of the new one.

In compliance with calculations the expected level of noise at near-portal area is L.A. equivalent day/night = 55.4 / 55.4 dBA at 100 m distance (C 33 boundary) that meets regulatory permissible level of equivalent day/night = 70 / 60 dBA.

#### Impact on surface water

Oprets river starts from the range above tunnel at the eastern slope and Vicha river starts from the western slope. These rivers are mainly fed by precipitation and flood water as well as underground water of alluvial-deluvial water-bearing layer (perched ground water).

#### Water supply

During tunneling the water supply sources are utility networks of Eastern and Western sites. Drinking quality water is transported. The design foresees tunnel fire-fighting water supply system, networks and structures, which provide water supply for indoor fire extinguishing in the tunnel. Water supply has been calculated with an allowance for maximum water consumption during fire extinguishing.

#### Drainage

In order to divert existing brooks at the Eastern portal the design foresees buried pipeline and wells. The drainage pipes shall be extended by reinforced concrete blocks. Water shall be drained into the existing stream flow.

In order to collect and drain atmospheric precipitates from the front slope of the Eastern portal the design foresees cast-in-situ reinforced concrete duct with water discharge into the existing stream flow. In order to collect and drain water from the tunnel and prepared drainage at the Western portal the design foresees buried pipeline and wells.

Water shall be discharged to the closed part of Vicha river bed to be arranged during construction period. In order to collect and drain atmospheric precipitates from the front slope of the Western portal the design foresees cast-in-situ reinforced concrete duct with water discharge into the existing gallery and then into the relevant duct located along the designed railway.

The project provides the usage of the sewage treatment plants of the aerial water of the Poland Company JPR SYSTEM SWOK-100 during the construction – the coalescent oil separator with the capacity of 100 l/s with separator boot (3 units) and SWK-20 SWK-25 by 1 unit.

The calculation of the aerial water was made in accordance with SNIP (CHII) 2.04.03-85 clause 2.11-2.18. Based on the estimated cost of the aerial water, the overcut of gutter was chosen. The calculated filling and speed in the gutters are in compliance with SNIP (CHII). The overcut of the conduit pipes at the East and West portals was accepted on the ground of the hydrological data in accordance with the Employer's Terms of Reference.

Furthermore, the project provides the equipment of the sewage treatment plants of the domestic sewage EKO – 19 for the period of construction. The devices are intended for cleaning of the domestic sewage from the objects of the general economic purpose. EKO – 19 has the capacity (stream flows) – 19m<sup>3</sup>/day, the number of the servicing conditional residents – 125 people.

### **Impact on the geological environment and soils**

In accordance with the Annex to SNIP (CHII) 1.02.07-87 «Engineering investigations for construction» the research territory relates to the third category of difficulty of the geological engineering conditions.

Tunnel passes along the primary rocks of the paleogene formation which are inhomogeneous according to physical and mechanical properties. Either fractured areas or areas with increased soil strength (quartz bearing sand stone) can occur during tunneling. From the dangerous geological processes that can make a negative impact on the designed structure, the increased seismic magnitude of the area should be noted.

It is necessary to provide the following measures to protect facilities:

- during cutting-in the portals on the slope surface it is necessary to foresee measures to prevent sliding of surface loamy formations as well as block sliding of bedding rock during earth undercutting and excavation. It is necessary to observe the technology of the sectional cutting of slopes; installation of the advance landslide protection works to be provided with the organized drainage and showery systems for capture of surface and subterranean waters coming to the boundaries of the construction territory. It is recommended to conduct the geodetic and hydro geologic monitoring;
- Under construction of the portals and tunnel in the solid mass of primary rocks, the tunneling will be the most difficult: a) part of mass is characterized by the reduced strength; b) tunneling of the tectonic zone within which the part of mass is strongly fractured, in separate places is flooded. To avoid inrush and rock slide according to the tunneling the support roof and walls is recommended.

Disposal areas for which plots are allotted shall be foreseen to locate excavated soil:

at the West portal in accordance with the «Land Project on the land allotment to the State Territorial Branch Society «Lviv Railway» for construction and arrangement of the Beskyd tunnel beyond the settlement of Skotarske village council, Volovetsk district of Carpathian region with the area of 2.1 ha at the distance of 2000 m from the portal;

at the East portal in accordance with the «Land Project on the land allotment to the State Territorial Branch Society «Lviv Railway» for construction and arrangement of the Beskyd tunnel at the territory of Opolets village council, Skoliv district of Lviv region with the area of 2.5 ha at the distance of 800 m from the portal.

The project provides building roads with the precast concrete roof to deliver excavated soil during tunneling. Stockpile filling is conducted with earth compacting by layers of up to 0.25 m for 16 passes with the roller, the weight of which is 25 tons.

### **Impact on the growth**

The project area is mostly covered by forest, the East slope is covered by conifer forest (spruce and fir), and the West slope is covered by deciduous forest (beech). In the forests you can find small lands and meadows.

Land Project of land allotment for construction of the East tunnel portal with the change of the designated purpose of the State Territorial Branch Society «Lviv Railway» was agreed by the all interested parties in accordance with the article 149 of the Land Code of Ukraine with the following pronouncing on its approval by the Cabinet of Ministers of Ukraine (permanent use of the area of 1.14 ha forests of the first group) and Carpathian Regional State Administration (short-term lease for the period of construction up to the end of 2016 year with the area of 2.1 ha).

Land Project of land allotment for construction of the West tunnel portal with the change of the designated purpose of the State Territorial Branch Society «Lviv Railway» was agreed by the all interested parties in accordance with the article 149 of the Land Code of Ukraine with the following pronouncing on its approval by the Cabinet of Ministers of Ukraine (permanent use of the area of 5.05 ha forests of the first group, where 1.41 ha is in permanent use, 3.64 ha is in short-term lease for the period of construction up to the end of 2016) and Lviv Regional State Administration (3.82 ha of pasture, where 0.56 ha is in permanent use, 3.26 ha is in short-term lease for the period of construction up to the end of 2016).

Upon completion of construction the landscaping plan and plan of landscape gardening are foreseen.

### **Security evaluation for human life**

Security for human life in accordance with the levels of chemical and noise impacts is guaranteed the performance of the above mentioned protection measures.

The placement of the project facility provides the rational use of land for the fulfillment of the «Development Program of the nationwide network of the international transport corridors for 2006 – 2010» is approved by the Order of the Cabinet of Ministers of Ukraine No.496 dated 12 April 2006, Action plan for the period up to 2010 of the integrated approval program for Ukraine as the transit country in 2002 – 2010 was approved by the Cabinet of Ministers of Ukraine No.606-p dated 01 August 2007 and has minimal environmental impact.

### **Measures to ensure the implementation of planned activities**

The following measures to ensure the implementation of planned activities were taken in accordance with the ecological standards and regulations:

- The project has been developed in accordance with the current rules and regulations and shall ensure explosion and fire safety under the tunnel operation.

- All constructions which could be influenced by wheel pressure during the construction period as well as the operating period are calculated for the concentrated four-wheeled pressure.
- The closed-loop hydro isolation with dropping drainage water to the prepared drainage is foreseen. Atmospheric drain from the side of the retaining walls shall be carried out by the usage of the monolithic rock-solid gutters system.
- For diversion of streams and Vicha River the use of the precast square concrete pipes with dropping water to the monolithic wells is foreseen. The monolithic reinforced-concrete runners and water cushions is also foreseen.
- Recultivation and land improvement of the construction area.
- Land improvement and planting of surrounding territory is stipulated in accordance with the dendro-plan.

### **List of the residual impacts**

- Noise and vibration during the electrical multiple unit trains running.
- Drainage discharges.

### **Measures taken to inform the public regarding the planning activity, goals and ways of its implementation. The public was inform by the mass media**

The public benefits from the implementation of planned activities are as follows: the improvement of rail traffic, the creation of the additional workplaces.

### **Obligations of Employer concerning implementation of design options**

The following measures shall be taken at all stages of construction and operation of the facility in accordance with the norms and regulations for environmental protection and the environmental safety requirements.

- Publication of the Statement of environmental effects in the mass media;
- Construction and operation of the Facility in accordance with the norms and regulations for environmental protection and the environmental safety requirements;
- Implementation of the protective measures in accordance with the above mentioned list in the volume of the environment impact assessment;
- Construction waste disposal in accordance with the limits;
- Landscape in accordance with the landscaping sheet.

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the SRTBS 'Lviv Railway'

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