

## **C. COMPREHENSIVE CHARACTERISTICS AND ASSESSMENT OF IMPACTS ON THE ENVIRONMENT, INCLUDING HEALTH**

### **C.I. DEFINITION OF BOUNDARIES OF AFFECTED AREA**

Due to the scope and characteristics of the project in all the assessed alternatives it is not possible to define the boundaries of the affected area. The scope of the area that will be most affected by the plan is obvious from Graphical Annex 1.

### **C.II. CHARACTERISTICS OF THE CURRENT STATE OF THE ENVIRONMENT OF THE AFFECTED AREA**

#### **C.II.1. GEOMORPHOLOGICAL CONDITIONS**

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##### *Type of relief, slope, division.*

In the western part of the examined area the Borská lowland stretches out as part of the Záhorská lowlands. The relief is formed by wide terraces created by the Morava River cutting into the Neogene base. The lowest part of the Morava River Floodplain, it has flat relief and consists of fluvial deposits like all the terraces, which are partially covered with drifting sand. Winds have blown them from river sediments and the calcareous materials with soft sandy dunes (up to 30 m) covered, except for part of terraces, also a significant part of the Neogene layer. It was created as a large area of drifting sand (Bor) overgrown with pine, oak and pine and acacia forests, from which protrudes Lakšárska Hills. Along the foothills of the Small Carpathians there stretches a considerably marshy tectonic depression, where Small Carpathian streams have made deposited alluvial deposits. The Borská lowland has mostly flat terrain with isolated hills.

At the centre of the assessed area are the core mountains of the Small Carpathians. The narrow, very elongated range runs along a fault in NE-SW direction and is broken into large sections by transverse faults. The granite core is uncovered in the southeastern part from Bratislava to Modra and there is a large crystalline island in the area of Časta. On the complexes of carbonate rocks there are karst features including caves. This most complex central part of the Pezinok Carpathians with abundant remains of old flattened hills has a mountainous character with extensive beech forests.

The eastern part of the territory extends into the Danubian lowlands in the north formed by the Danubian upland, divided by rivers into partial uplands (Trnava, Nitra, Zittau, Hronská, Ipeľská) separated by river flood plains built of river sediments bordered by wider river terraces, which have planar relief. The partial uplands are formed from loose lake sediments and andesite tuffs and in places by travertine formed from mineral springs rising along faults. Typical is alternating wide, shallow, wide, shallow, valleys with deposited flat valleys and plateaus which affected the character sheets, particularly where thick loess has helped preserve planar relief from upper Pliocene (Trnava table and others). They tend to have dry shallow deposits. .

The Danubian plain as the second part of the Danube lowland forms its southern part. It occupies the floodplain of the Danube and its tributaries have formed the terraced area. The Danube formerly flowed through the centre of Rye Island, where it created a massive aggradation wall, which from the end of the Ice Age slipped and divided, creating today's Rye Island. The Little Danube and Danube deposit their aggradations; the highest part of the old aggradation bulwark is less waterlogged, with overgrown remnants of river basins and with part covered by small formations of thin loess material. The flocs droop so that the area downstream of the Danube is lowered, thus increasing waterlogging, to the largest extent in the lower part of the Rye Island at the interface of the aggradation mounds where groundwater is near the surface. The relief is mostly flat here.

The assessed territory belongs to the Fatra-Tatra geomorphological area. An overview of the geomorphological units is as follows.

- Alpine-Himalayan system
  - Western Pannonian basin (province)
    - Vienna basin (sub province)
      - Záhorie lowland (area)
        - Borska lowland (whole)
          - Sub Small Carpathian depression (sub whole)
  - Little Danube basin (sub province)
    - Danubian lowland (area)
      - Danubian upland (whole)
        - Trnava upland (sub whole)
          - Sub Small Carpathian upland (part)
    - Danubian plain (whole)
      - Šúr(part)
- Western Carpathians (province)
  - Inner Western Carpathians (sub province)
    - Fatra-Tatra (area)
      - Small Carpathians (whole)
        - Pezinok Carpathians (sub whole)
          - Homoľa Carpathians (part)
          - Stupava foothills (part)

## **C.II.2. GEOLOGICAL CONDITIONS**

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*The geological characteristics of the territory, the engineering-geological features, the geodynamic activity (e.g. Landslides, seismicity, erosion, etc.), mineral deposits, the state of pollution of the rocks.*

Geological conditions are described as individual tunnel and non-tunnel sections in the assessed variants 2a, 2b, 7a, 7b, 7c and SPL.

### **Section – Ivanka north junction – portal of the Carpathian tunnel (variants 2a, 2b, 7a, 7b, 7c)**

According to engineering geological classification the territory of the region is considered as Neogene tectonic lowland, in the area of the inner Carpathian lowlands - Danubian Lowland, its western edge, at the foot of the Little Carpathians.

In this section the subsoil of the D4 highway is built on the border sections of the alluvial plain of the Danube, which is unevenly covered with proluvia, at the foot of diluvial sediments with a thickness of 2-5 metres. The reach of coverage of the fluvial sediments at the mouth of the more significant streams is 1.0 to 1.5 km from the foot of the slopes. The diluvial sediments are developed in a continuous layer at the bottom of the slope on the level of the road Raca - Jur near Bratislava. The head of the proluvial sediments are always pronounced in the foreground at the bottom of the slope. The thickness of the quaternary layer can be expected to be 2-10 metres.

The subsoil formation of quaternary sediments is, up to the level of the road II/502 Rača - Jur by Bratislava built from Neogene, in the direction towards the Small Carpathians by a crystalline massif. The interface of the two units is tectonic with a fault dipping steeply towards the Danubian plain. In the foothills of the Small Carpathians the section it is mostly made up of rock mass of loose weathered Crystalline, with more emphasis in the diluvial earth. The section crossing the Vajnory stream valley is filled with fluvial sediments of the mountain stream filled with clayey-gravelly and sandy soils.

### **Carpathian Tunnel, variants 2a, 2b**

The Small Carpathian Mountain Massif lies along the tunnel route under variants 2a, 2b and is formed in the dominant eastern part of Bratislava by a crystalline massif, which in terms of engineering-geological classification is part of the territory of the region of core mountains.

The area of the eastern portal represents the right bank of the Vajnory stream, which at the foot is evenly covered with a thick layer of earth of a diluvial talus nature, local anthropogenic sediments (landfills) inside an abandoned quarry. The area of the eastern portal and eastern part of the tunnel route, according to geological map survey are built of a crystalline nature rock, consisting of medium to coarse-grained muscovite biotitic granodiorite and with abundant pegmatite veins and biotitic fine to middle- and dual type granite to grandiorite. The portal area is not expected to be a significantly powerful zone of weathering.

In the massif between the valley of the Borin stream and the valley of the Marianka stream there overloaded Devonian weakly to moderately metamorphosed shale rock of the nature of green slate and amphibolites with deposits of marley slate and crystalline limestones, graphitic slate, quartzite and shale metaquartzite laminated with metapelites with deposits of metapsamites. These are steeply sloping to the NE, E and SE.

Towards the west there continue Palaeozoic rocks with the character of biotitic gneisses and mica schistous papir, phyllites, schists, metapelites biotitic - garnet zone in which there are fine-grained to medium-grained amphibolites. Finally, the western side of the tunnel consists mainly Mesozoic rocks of Jurassic sandstone and truly carboniferous rocks of Borin Tatricum units, of which the most prominent representative of marl and sandstone include tabular slate (i.e. Borin slate), with a slope of 20-30 degrees to the east and northeast, towards the west and more moderate to the SW. Near the interface of the metamorphic rocks, near Bratislava, the slope is steeper to the SE and E. Towards the western portal the Mesozoic sedimentary strata are represented the greatest extent by exfoliated Jurassic limestones.

The portal part of the western section of the tunnel section there is an alternative presence of Neogene sediments with the character of gravel, sand, locally a few paved marley clays (Marian strata), covered by diluvial sediments of loose earth.

In the surface part of the massif there occurs in almost continuous slope, debris cover with a thickness from 1 m to 10 m at the foot of the slope and depression. In the vicinity of the western portal there are landslides in the slope of rubble with an assumed power up to 5 m.

#### Carpathian tunnel, variants 7a, 7b, 7c

The tunnel routes for variants 7a, 7b, 7c is located in the eastern section of the portal to the km 13.5 in the more northern corridor across the Small Carpathian Mountains. The basic geological structure of the rock mass is similar to option 2a, 2b. The sub-interfaces of the allocated tectonic units are comparable to variants 2a, 2b in a slightly shifted position.

The difference in the geotechnical conditions of implementation can be expected in the area from the eastern portal around 7.3 to 7.5 km for the following anticipated geological and tectonic reasons:

- The eastern portal is located at the foot of the eastern slope, on the north side of the salient parts, rather at the foot of the right slope pronounced lateral depression orientation NW - SE. Because the portal is near the boundary of the fault in a NE - SW direction and is in the zone anticipated transverse faults in NW - SE the assumption is that stronger disturbance and stronger weathering of the massif than under variant 2a, 2b. The horizontal alignment is riskier with the right slope orientation. In the section of the portal cross-section it will be difficult to cut deeper and longer along the slope (south variants 2a and 2b are oriented more deeply in the massive and almost perpendicular to the slope)
- Up to km 7.8 the massif of the tunnel will probably be more significantly disturbed in the section of kms:

- 5.3 – 5.5 km by a system of transverse and parallel faults,
  - 6.0 – 6.3 km and at km 6.6 – 6.8 by a system of NW-SE and N-S faults,
  - 7.2 – 7.6 km by a significant system of listric faults running NE – SW, which limit the zone of loosening of the eastern slope of the massif toward the eastern edge,
  - 7.3 – 8.0 km by almost parallel systems connected to the lateral tectonic zone NE-SW on which the Vajnory valley is formed.
- From km 8.0 one can predict very similar geological, but particularly tectonic conditions, as in the corridor of variants 2a, 2b. The corridor in the section km 8.0 – 13.5 is situated in the upper central part of the Small Carpathians massif, which from km 10.3 to the north is bounded by a significant parallel fault in the Borin valley belt.

#### Tectonic structure of the Carpathian Tunnel, variants 2a, 2b, 7a, 7b, 7c

The tectonic structure, which is a result of the great heterogeneity of the massif, is very complex. It alternates between several overthrusts of the Variscan and Alpine orogenic cycle. The thrust zones of the Variscan orogenic cycle are within the crystalline and do not show the violation of stronger rocks, so attention will not be paid to them.

From alpine orogenic cycle there is particularly expected a thrust of the Bratislava granodiorite Massif of the Borin Mesozoic unit in the western part of the massif. This had a ductile nature, particularly evident in breccia and metamorphosis and the adjacent part of the Mesozoic, but also sub-emergence, places of frequent disturbances in a NE-SW direction with a moderate to steep slope to the SE. The contact between granitoids and the Devonian crystalline having a fault nature.

The tunnel route runs between the two steeply dipping faults in the NW-SE direction across the Small Carpathians with the anticipated shift to the north wing break JV (right-hand) with crushed zone and exhibiting significantly level relief. On them are based the Borin stream valley and the Mariánky stream valley. Based on morphological analysis of the surface of massif in the zone between the two steeply dipping regional faults, a certain requirement is also the disturbance of the massif with shear zones of shale between the faults. Their presence indicates systems of interlinked erosion furrows, depression, stream valleys with an orientation NW - SE, NNW - SSE.

For a disturbance of the massif along the tunnel route, however, the crucial factor is the parallel faults along the Small Carpathians. They were probably originally as shear fractures with shift.

During the period of the rising of the Small Carpathians in the Neogene, however, they were followed by listric breaks with a drop to the Danubian and the Záhorie plains. More significant is the impact of the decline in the lowland, which reached all the way to the Prepadly valley. The subsidence faults necessitated the disintegration of the massif to a system of tectonic blocks separated by broken zones as a result of selective erosion manifested in relief as depressions.

#### **Section of the western portal – junction of Záhorská Bystrica (variants 2a, 2b, 7a, 7b, 7c)**

The section of highway D4 with the mouth of the Carpathian tunnel (variants 2a, 2b, 7a, 7b, 7c) is situated in four sections, which have their own characteristic engineering-geological and hydrogeological conditions.

- The section from the western portal of the Carpathian tunnel, north and northwest of the village of Borinka, the corridor up to the state road I / 2 Záhorská Bystrica - Stupava is built on a region of Neogene sediments coated diluvial sediments. Diluvial power is up to 5 m. Diluvia are of a predominantly sandy character and are cohesive sediments. The Neogene massif is built of sandy sediments. The water table in the corridor of the

highway is at the level of 2-5 metres below ground level towards the national road up to the level of 2 m below the surface.

- The following section (junction of D2 Stupava South) represents about 2.5 to 3 km of the wide, flat alluvial floodplain of Stupava stream and its tributaries or drainage channels. In addition to the mouth of the Stupava stream, the whole wide floodplain in the level of Záhorská Bystrica to Devínska Nová built formation of fluvial sediments. The surface layer is built on up to 2 m thick layer of cohesive soils (alluvial facia), which are covered by a continuous layer of alternating gravely and sandy soils. The whole power of fluvial sediments is not greater than 5 m. The water table is at the level of 2 m from the surface area near the surface. It is in direct hydraulic connection with the water levels in surface recipients; at its maximum it has a tensile character. On the Neogene bedrock there is built a complex of cohesive soils - clays.
- The section of rising floes with a width of 2.5 to 2.8 km consists of a gentle level between the alluvial floodplain of the Stupava stream and the river Morava. The surface section is built on a formation of fluvial terraced sediments with representation of the surface layer of sandy sediments up to 2 m, a layer of gravel sediments in thickness from 2 to 5 meters. On Neogene bedrock at a depth of 5-10 metres is built a complex of cohesive soils. Diluvia form the edge of a terrace of sediments in a thickness from 3 to 5 metres. The water table is in the central part of the "floes" at a depth of 5-10 metres, at the edge to a depth of 2-5, in places less than 2 m below ground level.
- The section representing the left side of the alluvial floodplain (inundation area) of the Morava River. The fluvial sediments are covered almost continuously by cohesive and non-cohesive sediments in a thickness of 2 m, which covers the 3-5 m thick layer of gravel sediments, locally alternating between gravely and sandy sediments with a thickness of 5 m. The water table is at a level of up to 2 under the ground. Neogene is formed of mostly sandy layers.

### **Junction of Chorvátsky Grob – Eastern portal of the Carpathian Tunnel (variant SPL)**

The D4 highway corridor section to the eastern portal of the Carpathian tunnel, like the south variant, is part of the region of Neogene tectonic depressions, Inner-area lowlands - Danubian Lowland, its western edge, in the foothills of the Small Carpathians. Along the corridor railway line is an area built of complex fluvial sediments of the Limbach stream and proluvial sediment flows. They are represented by sand to gravel plains clays and clay pebbles on a Neogene base.

The foot of the slope is covered with a complex of slope sediments, clayey, loamy gravel. The groundwater level is directly dependent on the level of water in the recipients, and it is expected that in the course of the year there can be a high level of ground water. The south side of the highway corridor is bordered on the north side by the Šúr wetlands. In the area of the corridor, the alluvial plains section has constructed drains - the Chlebnický channel and the Viničianska channel.

### The Carpathian Tunnel and Katušina, variant SPL

The area of the eastern portal will probably build into weathered loosened granitoid rocks.

The rock mass tunnel corridor of the Carpathian and Katusina and is situated across the Small Carpathian Mountains, between the municipalities of Jur near Bratislava and Lozorno. From a geological perspective, the massif has three main tectonic units:

- Crystalline Bratislava massif,
- Mesozoic area of the Small Carpathians,
- Neogene strata of the Devín series.

The tunnel section in the Carpathian massif crystalline is built on a corridor from the eastern tunnel portal to about 17.1 km.

In the eastern part of the tunnel there are rocks containing medium to coarse-grained muscovite - biotitic granodiorite to the fine to middle- and biotitic dual type granite to grandiorites. The eastern part of the corridor, after about 15.5 km contains abundant pegmatite veins. Granitoid massif changes to biotitic granite to dual type granodiorite (after about 17.2 km).

In the section km 16.5 to 17.2 there interpreted a complex tectonic zone of tectonic of a breccia character with granite and limestone, and “Donkey” strata. It is expected that rocks in this zone will be cataclazed intensely, with sub-zones of degraded rocks, with a deep zone of weathering and clay-filled fissures. At the edge of the zone there can be presumed to be intensive aquifer activity.

At the western edge of the zone from about 17.2 km to 21.8 km along the massif of Mesozoic rocks with representation of layered limestones with inserts of manganolites and massif limestone clasts of Triassic carbonates and local sandstone. From km 21.3 there are likely to occur formations of Marian slates, which are immersed in falling blocks (West, tectonic boundaries of the Small Carpathians) under the Neogene sediments. The entire Mesozoic complex includes the Small Carpathian series – area round the Small Carpathians. The interface with the crystalline core is tectonic. The massif in terms of engineering geological zoning represents a zone of clastic and carbonate rocks (Sk) and clay - dust rocks (Si).

In the whole area of crystalline and Mesozoic rock at the surface of the massif there occurs an almost continuous slope of debris cover of thickness from 1 m to 10 m, especially at the foot of the slopes and the depressions of the massif. The scope of weathering of the massif is most pronounced on the slopes of the eastern foothills of the Small Carpathians and tectonically disturbed zones with reaching a depth over 10 m.

The Mesozoic massif of limestone can be locally broken with karst processes, particularly in sections of contact zones and zones of tectonic disturbance. Given the type of limestone and development together with layers of marl, marley limestone we do not expect significant development of karst. Of karst manifestations there will be a domination particularly of corrosive karst.

From km 21.8 the rock massif consists of complex Neogene rock strata with representation of Devin layers, in the development of erodible sands and sandstone, granite, breccia disintegration, as well as gravely and sandy soils. The massif is markedly covered by quaternary soil formation with representation of gravely, sandy soil to a thickness of 5-10 metres. In the valley, the watercourses are developed from fluvial soil to a thickness of 5 m. The massif, in terms of engineering geological zoning, represents turf Neogene rocks (NK) with alternating cohesive and non-cohesive sediments.

The rock mass of the Katusina tunnel is formed only on Neogene strata of the Devinska series. The surface area is almost continuously covered with a canopy cover of Quaternary diluvia representing alternating gravely and sandy soils up to 2-5 metres, with only sporadically emerging surface layers of the Neogene base. Given the same type of sediments it is very difficult to subdivide the quaternary and Neogene sediments.

On the basis of the map produced we assume that the massif is built in a region of gravely sediments (Ng) – the massif of Ohek (372 m) and its projections facing NW - SE. The massifs of the region of gravel sediments are formed predominantly of coarse clastic sediments of the Carpathians and Baden and emerge on the surface of the NW foothills of the Small Carpathians.

The predominant rock types are sandy or clay or silty-sandy gravel with a variable content of gravel fraction (50-80%). Gravels are medium to coarse-grained, sometimes boulders. The

layers may include an irregular position of sands generally with a 20-50% content of gravel. Sands and gravels are mainly bound together; sometimes there are also layers of cemented calcareous - sandy or kaolin – arkose cement. A typical feature is a quick vertical transition between different types of sediments. The water table in that area is deeper than 5 m and in the higher parts of the area more than 10 m. Groundwater, according to the archives of maps is often quite aggressive.

The north-western slopes of the Ohek (massif of the Katusina tunnel) are significantly broken down by valleys, depressions and erosions of gullies in the same direction. The actual massif is bounded by the steeper NE side, left slopes of the stream and the SE side's significant erosion and depression. It is expected that it is predisposed the direction of ridges and the depression in NW - SE direction is based on a tectonic fault in the same direction.

#### Tectonic structure of the Carpathian Tunnel, Katušina tunnel in the SPL variant

The tectonic structure, which is based on the great heterogeneity the massif, is very complex. It alternates between several overthrusts of the Variscan and Alpine orogenic cycle. From the alpine orogenic cycle it is in particular expected a thrust of Bratislava granodiorite onto the Mesozoic area of the unit (section km 16.6 to 17.2). This thrust has become too cataclation budination and adjacent metamorphosis of the Mesozoic, emergence of partial common disorder with fault development in a NE - SW direction with moderate to steep slope to the SE.

On the eastern foot of the slope there is expected a massive disturbance of the fault zone that borders the eastern side of the massif (faults NE - SW with a decrease to the SE).

In the central part of the mountain massif there pass less striking, steeply dipping faults in the NW – SE direction. The system of faults in this direction can influence the massif in the sections km 11.9 to 12.2; 12.8 to 13.1; 13.2 to 13.5; 14.1 to 14.3. In the section km 16.6 to 17.2 there is an expected disturbance in the N-S system of faults.

The most significant breach in the N-S system is in section of tectonic contact between metamorphosed Palaeozoic and Mesozoic rocks at km 19.0 to 19.3, where the corridor intersects with the significant morphological depression of the Stupava stream valley. In addition to these zones there is the assumption that the massif sub-system will be broken by shear zones of fault development in direction NE - SW, NW - SE. Their presence indicates systems of interlinked erosion gullies and depressions on the surface of the massif and predicts a stronger power of quaternary soils and greater power of weathering.

In the Mesozoic section, in the southern slopes of the Spálenisko basin, we predict an impact of the massif in the direction of the faults in the NW – SE direction (southern valley of suchý stream, which continues through the saddle between the Spálenisko and Ostrovec basins and the valley of the Stupava stream).

During the period of rising of the Small Carpathians in the Neogene, however, this lead to the development of listric faults break and a drop to the Danube and the Záhorie plains. More significant was the impact of the decline in the lowland, which reaches to the Prepadly valley mugged (Stupava stream valley). Subsidence of faults necessitated disintegration of the massif into a system of tectonic blocks separated by broken zones as a result of selective erosion manifested in relief as depression. Therefore it can be assumed that the entire massif is very uneven, broken and loosened with the appearance of zones of force of few centimetres to several meters, among which they may be present in relatively few large blocks of fractured rock.

#### **West Portal of Katusina Tunnel – Lozorno Intersection (Variant SPL)**

The highway stretch is situated on two main lithological types of quaternary sediment formations.

- The west portal of Katusina tunnel up to approx. national road I/2 Stupava – Lozorno has been set into the eastern edge of the face formed by deluvial sediments with alternating gravel and sandy sediments comprising a 5 m thick layer, laid on the Neogene series of strata of a similar lithological structure. The substratum up to the national road I/2 comprises alternating patches of sandy and gravel sediments from the significant proluvial cone of streams running down the western slopes of Little Carpathians. These quaternary soils are 5 to 10 m thick. The subsoil comprises proluvial layers containing mainly sandy sediments.
- The massif towards highway D2 is cut through the left area on the aluvial plain of the Morava River. The lateral part contains fluvial sediments with mainly sandy sediments with interim coherent and incoherent rocks layers with 5 m in thickness. The Neogene Neogene series of strata is varied, built of incoherent and coherent sandy sediments. The ground water level runs up to the level 2.0 meters below ground surface.

### **Deposits of Mineral Resources**

The area assessed includes the following deposits of mineral resources:

The eastern side of Little Carpathians, south of the town of Pezinok (north of the Pezinok flyover) contains a deposit of brick raw materials used by the company Pezinske tehelne – Panelaren, a.s., (brickworks and slab production plant), the deposit has been in use since 1960's.

There is also a deposit of quarry stone (limestone) in the Stupava Creek valley, east of the Borinka village. The deposit is managed by the company Terraton, a.s. The surface mining activities are currently suspended.

There is another deposit of quarry stone east of the Marianka village, this is a siliceous filite deposit managed by Ing. Karol Pavlovič – GEOPA. Mining at this location has been also reduced.

The area north-west of Pezinok also has several deposits of silver and gold ore, registered as sites under construction, managed by the government enterprise Rudne bane (Ore Mines Corp). These are adjacent to deposits of antimony ores managed by SGUDS Bratislava.

### **Old Mining Sites**

Mining and extraction of minerals has had a long-term tradition in this region and that is why the area assessed is fairly rich in historical remnants of these activities.

The village of Marianka has been famous for shale extraction and remnants of these activities can be found east of the Marianske Valley. There is also one stone quarry registered as a deposit still, situated more easterly.

The surroundings of Borinka village in the Stupava Creek Valley still shows certain remnants of manganese ore mining, together with some reminders of limestone mines (this location is still registered as a deposit).

Remnants of manganese mining activities (drifts and dumps) can be also found in cadastral areas of Lozorno and Stupava in the Little Carpathians massif.

Extensive mining activities were previously developed in the area of Limbach Creek and the Blatina Creek, north-west of the town of Pezinok and the Limbach village. There is a variety of old mining structures as shafts, drifts, air flues and dumps (several tens of those). Besides gold and silver ores, these locations are famous mining sites for lead, zinc, iron and pyritic ores.



### C.II.3. SOIL CONDITIONS

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*Culture, soil type, soil category and quality, inclination to mechanical and chemical degradation, quality and level of soil pollution.*

Soil is an outcome of activities of soil-forming factors that determine its development and properties. Soil categories, or types respectively, have evolved as a product of collaboration between the base rock, the land topography, the weather, the biota, water, activities of man and time.

The area concerned is fairly varied, it is situated at the west edge of the Danube Basin, the eastern edge of Zahorska Basin, both separated with the massif of Little Carpathians forming the largest part of the area concerned.

#### SOIL CATEGORIES AND TYPES

As far as **soil categories** are concerned, the variety of base rock led to development of clayey, loamy, sandy loam or loamy sand soils. Locations set at the highest altitudes within the area concerned also include certain medium skeletal soils.

**Soil types** within the area concerned:

**Black soil** develops mainly on loess loam and similar substrates. Its characteristics are dominated by almost 70 cm thick brownish-dark grey humus horizon merging with the base rock gradually. The black soil is one of the top quality soils for farming, it is a medium-density soil with a very convenient fine clod structure (very good air and water processing characteristics). Its reaction oscillates around the neutral point, the absorption complex is saturated to fully saturated with Ca and Mg ions. This is a soil found in tall-grass prairies and forest steppe lands. It developed during the warmer period in our country. Its share on the area concerned comprises a small part close to the Vajnory municipality and it is defined as *carbonate arable black soil*.

**Phaozems** are usually formed on aluvial sediments in river basins free from flood damage. These are significant for dark-grey humus horizon (even 100 cm thick sometimes) changing into a significantly lighter brownish substrate with ginger brown patches. The humus horizon boasts with premium structure, its reaction oscillates around the neutral point and absorption complex is saturated. The initial vegetation comprised hydrophilic cultures with significant accumulation of humus in depth. Some subtypes of Phaozems are our most fertile soils. The area concerned contains *the carbonate arable Phaozem and the light arable Phaozem*. These can be found in the vicinity of Vajnory municipality, Cierna voda, south of Pezinok and south of Stupava.

**Fluvisoil** is a basin soil found in younger river deposits with more or less developed humus horizon on brown substrate merging into the G-horizon at various depths. The properties of these soils depend on the granular and chemical composition of the sediments, the groundwater and flood water regime. These soil-forming factors often changes even at short distances. That is why quality of Fluvisoil differs. The area concerned comprises the *Fluvisoil with gley* found at the eastern foot of the Little Carpathians.

**Brown soil** develops mainly on loess loam and similar substrates. The humus horizon is thicker than in brown forest soils and its could would range from greyish-brown to brownish-grey. It is based on the ginger brown horizon B, merging with the base rock at the depth of 70 – 100 cm. Prior to deforestation, these soils were covered mainly by thermophilic oak-wood or oak with European hornbeams. The arable layer is of granulated structure, placing it among regularly arable fertile soils. The area concerned contains the *arable brown soil* close the town of Stupava.

**Combisoil**, also known as the forest brown soil, develops usually on siliceous rocks. Brownish-grey to dark-grey humus horizon grows into thickness from several centimetres at

lower altitudes to 20 cm at higher altitudes. B horizon of yellowish to ginger-brown colour is fairly skeletal and merges with the base rock at the depth within 1m. The reaction of these soils is ranges from slightly to strongly acidic, the absorption complex ranges from slightly to fully saturated. The humus content rises in proportion with the altitude up to the max. of 15% and its quality is low. These soils are typical for our mountain ranges with silicate subsoil. The area concerned contains several soil units, including *modal Cambisoil and saturated to acidic arable soils, modal acidic Cambisols*. Their occurrence within the area concerned is limited to the Little Carpathian Mountains and their slopes.

**Marly soils** develop on carbonate rocks. The typical example would have a several decimetres thick skeletal profile with humus of greyish-brown to dark-grey colour containing calcium carbonate. This is then merging right into the carbonate substrate (limestone or dolomites). These soils are mostly strongly skeletal, often shallow and well aired with rapid drying characteristics. The soil reaction is neutral, the absorption complex is saturated. Marly soils range among low-fertility soils. These are spread over a large portion of the area concerned as marly soils and Cambisoil marly soils. Soils of this type are inherent to the area concerned and bound to the carbonate rocks of Borina Karst.

**Regosols** develop on unconsolidated non-alluvial sediments (wind-borne sands) without any skeleton. The so called "ochric horizon" merges right into the base rock. The reaction of Regosols is slightly acidic to neutral, their humus content is low and they are barely able to retain any water. That is why these range among less fertile soils used mainly in forestry. These are typical for the western part of the area concerned, contained within units of *modal Regosols and light silicate arable soils*. Their occurrence within the area concerned is limited to wind-borne sands from the Zahorska Lowland (south of Stupava).

#### QUALITY AND PROTECTION OF FARM LAND

The Act No. 220/2004 Coll. defines classification of all farming land depending on the rating within the BPEJ (soil quality ecological units) classed within 9 categories of soil quality. Soils placed in categories 1 to 4 are identified as premium soils and protected in accordance with §12 of the act on protection of farming land and these can be used for agricultural purposes on temporary or permanent basis in emergency cases only, if there is no alternate solution available. Soils classed in categories 5 to 7 are identified as medium-quality soils and those classed in categories 8 and 9 are identified as low-quality soils. The area concerned contains soils of each quality rating and category, except for category 5.

#### DEGRADATION AND CONTAMINATION OF SOILS

As far as the **potential degradation** is concerned, soils found within the area concerned are prone to erosion, potential compaction with subsequent depreciation of the soil structure (especially in black soil). Soils founds at the foot of Little Carpathians face the risk imposed mainly by water erosion and even gley processes in locations with higher ground water level. Soils on silicate rocks within the area concerned are subject to risk of acidification due to natural process as well as the accumulation of acidic fertilizers and atmospheric pollutants.

**Contamination** of soils, resp. threshold values of hazardous substances in farm lands, is defined by the Act No. 220/2004 Coll. on protection and utilisation of farm land (Appendix No. 2) that determines the limit thresholds for hazardous substances in farm land (As, Cd, Co, Cr, Cu, Hg, Ni, Pb, Se, Zn, F, polycyclic aromatic hydrocarbons, chlorohydrocarbons, other pesticides and non-polar hydrocarbons).

Contamination is indicated by exceeding the limit threshold of at least one of the hazardous substances. Such excess over the threshold limit value is considered by the soil service to determine the critical value of farm land contamination and elaborate the risk assessment with respect to farming production within the affected land, with further respect to ground and

surface water and potential health hazard for population, livestock and game, as well as vegetable ecosystems.

Referring to the data from "Partial Monitoring System - Soil" and its subsystem themed "Area Survey on Soil Contamination" with monitoring of contaminating substances performed in soils found within selected cadastral areas (this selection of cadastral areas was performed pursuant to exceeding the limits for contaminants in soil found during previous measurements), the area concerned shows above-limit content of zinc in the Pezinok District, that is over 40 hectares of the monitored land (the total area of land monitored in this district amounted to 1,863 ha on 34 plots). There have been no other limits exceeded and indicated within the area concerned so far.

#### **C.II.4. CLIMATIC CONDITIONS**

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*Rainfall (e.g., average annual rainfall totals and duration), temperature (e.g., average annual temperature and duration), wind (e.g., direction and strength of prevailing winds).*

Climatic conditions of the assessed territory, included but not limited to, are perceived as a long term weather mode with all its particularities, diversity, and instability, through which it becomes evident in a specific place. A mountain massif of the Little Carpathians has a significant impact on the nature of the climate in the assessed territory, with its relief and orientation which influence its climatic elements, mainly, air temperature, atmospheric rainfall, air humidity, cloudiness, sunshine, and winds in the territory. The climate in the assessed territory is also significantly influenced by an urbanised peripheral territory of Bratislava, the capital, which brings along the existence of so-called heat island<sup>1</sup>.

Considering the varied geomorphology of the territory, the assessed territory is included in warm temperature climatic zone divided in districts T2, T4, T6 and mild-warm temperature climatic zone, out of which districts M1 and M3 reach the assessed territory. (Lapin, M. et al. Atlas krajiny Slovenskej republiky, 2002)

The warm zone with its districts is characterised by the number of summer days being 50 and more (maximum daily temperature  $\geq 25$  °C). The higher locations of the Little Carpathians belong to the mild-warm zone with the number of summer days being under 50, the average July temperature is  $\geq 16$ °C.

The amount of sunshine in the assessed territory varies depending on the altitude. Areas of lowlands in the eastern and western part of the Little Carpathians receive in average between 1,200 and 1,250 kWh.m<sup>-2</sup>; as the altitude increases, the sunshine total decreases. The highest positions bring it under the value of 1,150 kWh.m<sup>-2</sup> (the average of the period 1961 – 1990). The point value of relative sunshine duration is for the weather station Bratislava – Koliba 43%.

The average annual temperature in lowlands is between 8 and 10°C in the warm temperature climatic zone, in the mild-warm temperature climatic zone of the Little Carpathians massif is between 6 and 8 °C. In the year 1992, the average annual temperature in the region of Bratislava was at the level of 12 °C. The coldest month is January with its average temperature from -2 °C in lowlands to -4 °C at the ridge of the Little Carpathians. The warmest month in the region of Bratislava is July with its average temperature 20 °C, in the highest positions the average temperature is 16 °C. During years 1961 – 1990 the weather station in Bratislava –

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<sup>1</sup> A **heat island** is a city area that is significantly warmer than its surrounding rural areas due to a change in shape (geometry) of active surface, change in thermal characteristics of active surface (it is not able to use the received sunshine and change it to chemical or other energy), and change in hydrological balance (non-soaking of rainfall waters and its faster discharge from the territory). Due to a change in the original surrounding countryside the temperature in centres of heat islands increases.

airport recorded 69 summer days and 88 frost days (with the minimum temperature below 0 °C).

The average annual value of atmospheric rainfall increases as the altitude increases (50 – 60 mm each 100 m of the altitude). The lowlands of the assessed territory receive 600 mm of precipitation a year in average, the bottom of the Little Carpathians receives about 700 mm of precipitation a year, and the highest positions even 800 mm a year. The highest precipitation is in summer, in months between June and August (40%), in spring it is about 25% of yearly total, in autumn about 20%, and the lowest precipitation is in winter, the remaining 15%. Duration of snow cover is between 40 days in lowlands and more than 80 days in highlands of the Little Carpathians.

The territory of Bratislava, the capital, along with the adjacent region of the Podunajská nížina lowlands belong among the most windy territories of Slovakia (in average there are only 29 days without wind a year). North-west, south-east, and north winds prevail.

The situation in the western part of the assessed territory (the Záhorská nížina lowlands) is a little bit different, there is less wind (in average about 80 days without wind a year), south and north winds prevail.

In terms of occurrence of temperature inversions, low inverse and mild inverse locations in areas of the Little Carpathians and the Podunajská nížina lowlands occur in the territory. The region of the Záhorská nížina lowlands belong among mild inverse locations.

Selected climatic data from the below closest weather stations shall be used for better description of the climate in the surrounding of variants of the assessed territory:

- 11811 Stupava
- 11812 Malý Javorník
- 11813 Bratislava – Koliba
- 11816 Bratislava – airport

**Table C.II.1: Survey of Selected Climatic Parameters at Selected Weather Stations**

<i>climatic parameters</i>	<b>11811</b>	<b>11812</b>	<b>11813</b>	<b>11816</b>
Average number of summer days a year (Tmax ≥ 25.0 °C)	74.1	37.3	71	76.5
Average number of tropical days a year (Tmax ≥ 30.0 °C)	22.5	5.7	20.3	23.9
Average number of days a year with Tpr ≥ 10.0 °C)	194.9	167.4	193.2	198.0
Average number of frost days a year (Tmin < 0.0 °C)	80.3	103.6	80.7	81.2
Average number of icy days a year (Tmax < 0.0 °C)	22.7	43.9	27.2	21.9
Average annual rainfall total in mm	605.1	776.6	681.9	564.4
Average number of days a year with precipitation ≥ 0.0 mm	173.2	176.9	209.9	199.2
Average number of days a year with permanent snow cover of 1cm and more	31.5	75.8	54.3	31.2
Number of sunshine days a year	40.7	53.5	39.0	30.2
Number of cloudy days a year	109.5	126.5	111.8	112.4
Average air temperature in January (°C)	0.2	-1.8	-0.3	0.2
Average air temperature in April (°C)	10.7	8.6	10.9	11.1
Average air temperature in July (°C)	20.6	18.4	20.7	10.3
Average air temperature in October (°C)	10.6	8.4	10.3	10.5
Average annual air temperature (°C)	10.5	8.3	10.3	10.8

## **C.II.5. AIR**

*The air quality significantly contributes to the general condition of the environment and influences human health. Air pollution is pollution of the ground layer (boundary layer) of atmosphere reaching from the surface*

up to the height of about 1,000 m. The amount of pollutant concentrations depends on the amount of produced emissions and their ability to disperse in the environment. The dispersion is directly influenced by geomorphology of the terrain (relief) and wind conditions of the territory.

Dispersion conditions in Bratislava and its surrounding are influenced by slopes of the Little Carpathians, which due to orographic effect increase the wind speed from prevailing directions (north-west winds prevail) which results in better ventilation of the city and its surrounding.

The city is therefore suitably located as far as the biggest stationary air polluters (chemical industry and power industry located in the south-east part of the city) are concerned, there are also good conditions for dispersion of pollutants from traffic and other medium-sized and small sources, being formed mostly by heating units of households and supply units of hot water.

The significant secondary source of air pollution is secondary dustiness, the level of which is apart from meteorological aspects directly influenced by ground and agricultural work and traffic in the assessed territory.

The air quality in Slovakia is monitored within the national monitoring network consisting of 37 automated monitoring stations (AMSs), out of which 4 are designed for monitoring of regional air pollution and chemical composition of rain waters. All the stations are administered by the Slovak Hydrometeorology Institute (SHMÚ). Bratislava is assessed as an agglomeration separately within the monitoring system. AMSs are located on streets: Mamateyova, Jeséniova, Kamenné námestie, and Trnavské mýto. In Bratislava region, there is another AMS located in Malacky on the Sasinkova street. Other measuring stations administered by the company Slovnaft a.s. are located in Bratislava Vlčie hrdlo, Podunajské Biskupice, and Rovinka. The following table includes data from selected stations, which are necessary for characterisation of the territory in terms of air quality.

**Table C.II.2: Pollutant Concentrations Measured in AMSs of Bratislava Region (concentrations in the year 2008)**

Pollutant	SO <sub>2</sub>		NO <sub>2</sub>		CO	PM <sub>10</sub>		C <sub>6</sub> H <sub>6</sub>
	1 hr.	24 hrs.	1 hr.	1 year	8 hrs. <sup>1)</sup>	24 hrs.	1 year	1 year
<b>Averaging period</b>	1 hr.	24 hrs.	1 hr.	1 year	8 hrs. <sup>1)</sup>	24 hrs.	1 year	1 year
<b>Threshold value (µg.m<sup>-3</sup>)</b>	350	125	200	40	10 000	50	40	5
BA, Kamenné námestie	-	-	-	-	-	16	21.4	-
BA, Trnavské mýto	-	-	0	33.1	2 419	30	25.4	1.1
BA, Jeséniova	-	-	0	16.4	-	24	23.1	-
BA, Mamateyova	0	0	0	25.3	-	20	21.6	-
Malacky, Sasinkova	0	0	0	26.0	1 553	40	32.6	1.5

1) Maximum eight-hour concentration

“0” – the value is given in the table in case the result of measuring may not be published

All AMSs of Bratislava region are located in distance between 9 and 12 km from the assessed variants and are located in places with high automobile traffic, high density, or eventually placed in locations with industrial production. The concentration of pollutants is the highest here mostly due to urban type of the environment, placement of sources of air pollution, variability of the surface, which complicates dispersion of pollutants in the ground layers of the atmosphere.

In the territory of Bratislava region, according to published data in the year 2007, there were 10 and more t.km<sup>-2</sup> of SO<sub>2</sub> emissions produced in the district of Bratislava, in other districts it was less than 2 t.km<sup>-2</sup>. No hourly and daily threshold values specified for human health protection were exceeded in any of AMSs.

Simultaneously, in the year 2007, over 10 t.km<sup>-2</sup> of **NO<sub>x</sub>** emissions were recorded in Bratislava, in other districts it was up to 5 t.km<sup>-2</sup>. But the hourly and annual threshold value for nitrogen oxides was not exceeded in any of AMSs in the vicinity of the assessed territory.

**CO** emissions were in all districts of Bratislava region up to 5 t.km<sup>-2</sup> and measured pollutant levels in AMSs did not exceed any of threshold values.

In the AMS Malacky (Sasinkova street) one of the highest levels of **benzene (C<sub>6</sub>H<sub>6</sub>)** was recorded in the year 2008, which is, however, deeply under the threshold value for human health protection.

The biggest problem of the air quality represents **PM<sub>10</sub>** concentrations in the air, despite the fact that in the year 2008 there was a decrease in measured values in AMSs in Bratislava agglomeration compared to the year 2007. In the year 2008, **PM<sub>10</sub>** concentration daily limits were exceeded in the station in Malacky (Sasinkova street).

## **C.II.6. HYDROLOGIC CONDITIONS**

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*Surface waters (e.g., streams, water bodies), underground waters including geothermal and mineral waters, springs and spring zones including thermal and mineral springs (capacity, quality, chemical composition), water management areas, hygienic protection zones, degree of pollution of underground and surface waters.*

### **Surface Waters**

The present situation of surface waters in the assessed territory reflects vast intervention of a man, namely melioration adjustments made at the end of the 19<sup>th</sup> century. Streams are adjusted and regulated in a way to divert water from slopes of the Little Carpathians and from adjacent plains. The network of original streams is completed by a network of artificially built drainage canals in a way to enable as much as possible to exploit the adjacent territory for agricultural and other purposes. The main streams on the eastern side of the Little Carpathians are Čierna Voda and Šúrsky kanál. Two canals on the western side of the Carpathians are Malina and Stará mláka.

The entire assessed territory belongs to the below mentioned watersheds and is drained by the below mentioned streams.

The hydrologic order numbers are taken from the hydrologic map (as of 2002)

#### I. The Danube Watershed Territory

The Morava Subwatershed 4-17

1. The Morava River from the mouth of the Dyje River (incl.) to junction with the Danube River 4-17-02

#### II. The Váh Watershed Territory;

The Váh Subwatershed 4-21

15. The Little Danube River to the mouth of Čierna voda (incl.) 4-21-15

#### The Suchý potok brook

– hydrologic order number: 4-17-02-090

– the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration

– it starts in the Little Carpathians south of the Ostrovec hill, west of the village of Lozorno it meets the Lozorno reservoir, then it runs through the village and continues westward

– up to the reservoir it is characterised as a naturally winding stream, then it is regulated

– it drains the western part of the assessed territory with the SPL variant

- under the ME of the SR Notification No. 211/2005 Coll. as amended and its Annex No. 1 it is classified as a significant stream along in terms of the water management.

*A nameless brook*

- hydrologic order number: 4-17-02-090
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it starts in the inter-portal section of the tunnels of Katusiná and Carpathians (SPL variant)
- it starts between the Ohek and Spálenisko peaks in the Little Carpathians, and flows into the Lozorno reservoir
- a naturally winding stream, rocky and mud bottom
- it drains the western part of the assessed territory (the inter-portal section) with the SPL variant

*the Matejkov kanál canal*

- hydrologic order number: 4-17-02-092
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it is an artificially built drainage canal SE of the crossing D2 and road I/2, without year-long flow, it flows into the Rakytov stream
- it drains the western part of the assessed territory with the SPL variant, the crossing of Lozorno

*the Rakytov stream*

- hydrologic order number: 4-17-02-092
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it starts SE of the Rakytovec peak in the Little Carpathians and continues westward
- it is a naturally winding stream without regulation with a bank vegetation out of a forest
- it drains the western part of the assessed territory with the SPL variant, the crossing of Lozorno

*the Podhájsky potok brook*

- hydrologic order number: 4-17-02-104
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it starts under the Vrchná hora mountain, the south slopes of which it also drains and flows into the Mástský potok brook
- without year-long flow with a bank vegetation
- it drains the western part of the assessed territory with variants 2a, 2b, 7a, 7b, 7c near the village of Marianka

*the Mástsky potok brook*

- hydrologic order number: 4-17-02-104
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it flows out south of the town of Stupava, it flows into the Mariansky potok brook (right tributary)
- it drains the western part of the assessed territory with variants 2a, 2b, 7a, 7b, 7c near the village of Marianka

*the Mariánsky potok brook*

- hydrologic order number: 4-17-02-103
- the administrator of the stream is SVP š.p., OZ Bratislava, the Morava Watershed Administration
- it starts south of the Svätý vrch mountain above the village of Marianka
- it flows through the village as a regulated brook, it is without any regulation behind the village, with a bank vegetation
- it drains the western part of the assessed territory with variants 2a, 2b, 7a, 7b, 7c near the village of Marianka

*the Šúrsky kanál canal*

- from the Račiansky potok brook up to the mouth it belongs to hydrologic order: 4-21-15-011, from the Limbašský potok brook up to the Račiansky potok brook to the watershed 4-21-15-009
- the administrator of the stream is SVP š.p. OZ Danube Watershed, Internal Waters Administration in Šamorín
- a drainage and irrigation canal artificially built during the Second World War, which is used for collecting waters from the Little Carpathians
- the canal is connected with the Blatina stream near the neighbourhood of Pezinok - Grinava (Myslenice) and flows into the Little Danube behind the village of Ivanka pri Dunaji
- the stream is maintained on regular basis, with a sporadic occurrence of bank vegetation (poplars, etc.), the stream bed is overgrown with water plants
- under the ME of the SR Notification No. 211/2005 Coll. as amended and its Annex No. 1 it is classified as a significant stream along in terms of the water management

*The Javorník brook (called also the Račí potok brook)*

- hydrologic order number: 4-21-15-009
- the administrator of the stream is SVP š.p, OZ Danube Watershed, Internal Waters Administration in Šamorín
- the stream starts between the Malý Javorník and Veľký Javorník mountains in the Little Carpathians and it flows into the Šúrsky kanál canal
- the upper stream is not regulated and is like a swift, in the part under road II/502, in the section Rača – Pezinok the stream is regulated and narrowed. It flows into the Šúrsky kanál canal trough a stabilisation object.

*The Račiansky potok brook*

- hydrologic order number: 4-21-15-010
- the administrator of the stream is SVP š.p, OZ Danube Watershed, Internal Waters Administration in Šamorín
- it starts under the Krásny vrch mountain (411 m asl) in the Little Carpathians, and flows through the neighbourhood of Rača and flows into the Šúrsky kanál canal north of the neighbourhood of Vajnory
- without a bank vegetation, bushes and trees are behind the bottom of the reservoir, edges of the stream are covered by rush, the stream bed is overgrown by water plants
- in the assessed territory (in the lower stream) the stream is artificially fenced by both sides

*The Struha stream*

- hydrologic order number: 4-21-15-013
- the administrator of the stream is Hydromeliorácie, š.p. Bratislava



- the stream starts in a cabin resort between vineyards north of Rača and flows into the Vajnorský potok brook
- the stream is along regulated, directed to collect waters from vineyards, it has no year-long flow
- it receives waste waters in its lower part
- the stream is behind the proposed area of Cepit, which is from the crossing with the Račiansky potok brook called after its administrator the Dolnoračiansky stream, it is administered by SVP š.p, OZ Danube Watershed, Internal Waters Administration in Šamorín, it is welled, it contains a bend<sup>2</sup> under the Šúrsky kanál canal (bypass) and flows into the Čierna Voda stream

#### *The Vajnorský potok brook<sup>3</sup>*

- hydrologic order number: 4-21-15-013
- it starts in the Little Carpathians under the Biely Kríž hill and flows into the Struha brook
- the administrator of the stream is SVP š.p, OZ Danube Watershed, Internal Waters Administration in Šamorín
- the stream starts in the Little Carpathians under the Biely kríž hill, in its upper part as a swift, while in vineyards it is regulated

#### *The Vajnorský kanál canal*

- hydrologic order number: 4-21-15-013
- it was built as a drainage canal south of the neighbourhood of Vajnory
- it is a right tributary of the Struha brook

#### *The Mahulianka stream*

- hydrologic order number: 4-21-15-004
- the administrator of the stream is SVP š.p, OZ Danube Watershed, Internal Waters Administration in Šamorín
- the canal starts under the railway south of Pezinok, and it flows into the Viničniansky kanál canal
- it was artificially built to collect waters from the industrial zone south of Pezinok

#### *The Viničniansky kanál canal*

- hydrologic order number: 4-21-15-004
- it starts north of Pezinok and collects waters from the flat parts east and south of the city
- it flows into the Šúrsky kanál canal between the village of Slovenský Grob and Pezinok's neighbourhood of Grinava
- under the ME of the SR Notification No. 211/2005 Coll. as amended and its Annex No. 1 it is classified as a significant stream along in terms of the water management

#### *The Grobský kanál canal*

- hydrologic order number: 4-21-15-004
- the administrator of the stream is Hydromeliorácie, š.p. Bratislava

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<sup>2</sup> a band – a short pipe designed for diverting of a stream under the below placed obstacles

<sup>3</sup> The Vajnorský potok brook is plotted in some water management maps up to its flow in to the Čierna voda stream, i.e., also behind the junction of the Struha and Vajnorský potok brooks it continues as the Vajnorský potok brook.

- an artificially built canal collecting waters from fields north-east of the village of Slovenský Grob and flowing into the Viničiansky kanál canal

#### The Stará Blatina canal

- hydrologic order number: 4-21-15-013,
- the administrator of the stream is Hydromeliorácie, š.p. Bratislava
- the canal between the Čierna voda stream and the Šúrsky kanál canal without a year-long flow

#### The Mlynský potok brook

- hydrologic order number: 4-21-15-013,
- an artificially built canal between villages of Slovenský Grob and Chorvátsky Grob collecting excess water from surrounding fields, without a year-long flow

#### a nameless canal

- hydrologic order number: 4-21-15-014,
- an artificially built canal between the Šalaperska hora mountain and the town of Bernolákovo, which flows into a reservoir without any discharge south of Bernolákovo

### **Water Bodies**

#### The Lozorno reservoir

- built at the bottom of the Little Carpathians on the eastern border of the village of Lozorno
- it is used as a flood-protection reservoir, in summer months it is also used for irrigation, at present it is also used for fish farming

#### The Viničné reservoir

- built on the Vyničiansky kanál canal, west of the village of Viničné

#### The Šúrsky rybník pond and swimming pools

- part of the Šúr National Reservation, one of reservoirs is a former gravel pit
- water surfaces are used for fish farming and recreational purposes

#### The Na Lysom pond

- in the vicinity of crossing of the Vajnorský potok brook and the Šúrsky kanál canal
- overgrown by a flood-plain forest and used for fish farming

### **Underground Waters, Thermal and Mineral Springs**

According to hydrogeological regionalisation of Slovakia (SHMÚ 1984), the following hydrogeological regions are specified in the assessed territory:

QN 007 – post-Tertiary and Neogene of Carpathian south and SE part of the Borská nížina lowland

Q 051 post-Tertiary of the western border of the Podunajská rovina plain

N 049 Neogene of the Trnavská pahorkatina highlands

MG 055 Bedrock and Mesozoic of the south-east part of the Carpathians of Pezinok

MG 008 Bedrock and Mesozoic of the SW part of the Little Carpathians

In the vicinity of the proposed tunnel routes there are survey wells and springs by SHMÚ, the list of which is given in the tables below (SHMÚ 2008):

**Table C.II.3: Monitored SHMU probes**

Catalogue number	Location	Hydrogeological zone	Terrain	H max	H min	H avg
<b>Morava River Basin</b>						
32	Stupava – Mást	QN 007	168.92	168.38	165.61	167.29
2035	Záhorská Bystrica	QN 007	160.90	160.87	159.01	159.89
<b>Váh River Basin</b>						
109	Pezinok - Grinava	MG 055	138.65	138.56	136.57	137.36
710	BA - Kujovičovo Hradlo (SDS)	MG 055	133.04	132.74	128.31	131.30
712	Vajnory - playground	Q 051	131.15	130.45	128.18	129.03
713	Vajnory - gravel deposit	Q 051	130.06	129.71	126.57	127.96
720	Vajnory - airport	Q 051	131.80	130.79	128.04	129.06
5010	Chorvátsky Grob N-10	N 049	136.40	131.85	129.00	130.45

Note: Terrain, H min - minimum level of groundwater, H max - maximum level of groundwater, H avg - average level of groundwater are given in m above sea level

Observations of SHMU probes shows that that groundwater in the Vajnory borough flows from the Malé Karpaty range in SE direction in parallel with the Šúrsky kanál (Šúr Channel). The groundwater level at average hydrological conditions is located approximately 2 m below the surface (maximum level variation at the probe 710 is between 0.3 to 4.7 m below the surface).

**Table C.II.4: Monitored SHMU springs**

Catalogue number	Location	Spring name	Hydrogeological zone	Terrain	Q max	Q min	Q avg
<b>Morava River Basin</b>							
124	Lozorno	Pod Žľabom	MG 008	272	26.10	0.00	3.53
136	Borinka	Pod Hradom	MG 008	290	20.00	4.33	7.07
<b>Váh River Basin</b>							
207	Jur pri Bratislave	Kľčovanka 2	MG 055	360	40.00	0.22	3.12

Note: Terrain, Q min - minimum yield of groundwater – flow rate, Q max - maximum yield of groundwater, Q avg - average yield of groundwater are given in m above sea level

### Hydrogeological Characteristics of Crystalline Complex

The crystalline complex of the area of interest contains virtually no major springs. Documented springs in the area have a maximum yield of a few tenths of  $l.s^{-1}$ . They are bound either to a surface zone of a deformation or to a locally strong mantle rock. Springs with a yield of  $0.5 - 1.0 l.s^{-1}$  are rare. More significant outputs of groundwater (several  $l.s^{-1}$ ) are found only from old mining shafts.

The most significant characteristics from the hydrogeological point of view are transversal cracks and breaks that are more open, thus more permeable. Transverse tectonics in granitoid rocks has more intense effects than in crystalline schist. There are three aquifers distinguished in rock mass of crystalline complex: granitoids ( $\gamma$ ), gneisses, migmatites, amphibolites (g) and

metapelites, phyllites, mica slate (f). The yield of most springs from breaks and scree-breaks is between 0.01 to 0.3 l.s<sup>-1</sup>.

The near-surface zone disintegration and weathering represents the zone of increased permeability, with spring yields up to 10 l.s<sup>-1</sup>. Similar conditions can be found also in the migmatite, gneiss and amphibolite environments. Average runoff for granitoids, but also for gneisses, migmatites and amphibolites was determined to be  $q = 3.0 - 6.0 \text{ l.s}^{-1} \cdot \text{km}^{-2}$ . Water-logging of crystalline schist - metapelites, phyllites and mica slates is very small, with average runoff of  $q = 1.5 - 3.0 \text{ l.s}^{-1} \cdot \text{km}^{-2}$ .

Groundwater is pooled to a greater extent in old underground works, for example at the upper section of Limbašská dolina (Limbach valley). Old mineshafts create extensive drains that allow pooling of groundwater in crystalline complex rocks with yields of several l.s<sup>-1</sup> at the opening of the shafts. The pattern of groundwater effluent from the shafts is characterised by a relatively strong influence of precipitation on their yield and good runoff balance in the unaffected period.

#### Hydrogeological Characteristics of Mesozoic Rock

The tunnel route incorporates a specific subzone with the most significant part composed of Mesozoic rock, consisting primarily of Jurassic sediments in this area. Considering these strata, heavily disturbed and karstified Borina limestones with dolomite, marl and breccia positions are of primary importance from hydrogeological point of view. The result of the most complicated tectonics of the territory - the shift of Crystalline complex through Mesozoic rock and the erosive cut of the Mesozoic rock under the Crystalline complex in Limbašská dolina valley - is a complex of cracked and karstified limestone, forming a very significant drain for groundwater from adjacent Crystalline and Mesozoic strata, which is drained mainly by two significant seeps in addition to some minor springs. These seeps are in the Borinka valley with yield over 100 l.s<sup>-1</sup> and in the Mesozoic slot in Limbašská dolina with yield ranging from zero to a few l.s<sup>-1</sup>.

In terms of water-logging, Mesozoic rocks can be divided into two main groups – hydrogeological insulators and aquifers. Important insulators are mainly slates, sandstones, clays, cherts, marl limestone, marl, marlstones and alternating sandstones and claystones, with an average specific runoff of  $q < 1.5 \text{ l.s}^{-1} \cdot \text{km}^{-2}$ .

Major aquifers are found in the packaging unit, in the complex of Jurassic sediments in Borinská succession between Borinka and Pernek. Hydrogeological structure consists of carboniferous strata of Krížňanský and higher nappes (Chočský, Veternický and Havranický). The most important aquifers are black Jura Borina limestones of Prepadlý strata, which are significantly karstified. The structure is demarcated by a Crystalline complex from the east, a boundary between Turecký vrch and Pernek from the north, and tectonically by Neogene sediments in the valley Stupava stream (Stupavský potok) from the west.

According to Kullman's classification, the structure is considered to be open, with flow-through. The total area of the Mesozoic structure up to the Limbach seep is 40.6 km<sup>2</sup>. Hydrogeologically significant rock of this structure includes Borina limestone, biotrititic and breccia limestone of black Jura of the Prepadlý strata together with Triassic limestones and dolomites. These highly disturbed and karstified rock occurs mainly in the Prepadlé valley (dolina Prepadlé) from Medené Hámre up to the area west of Somár. In NW direction, they are laterally transposed in finger-like rays to the flysch sediments of the Korenec strata. They create a favourable drain that collects all surface water and groundwater from the wider area of the Prepadlé valley. The structure is drained by springs and hidden transfers of groundwater to surface waters.

The springs located in the Borina strata have different yields. The highest yield is documented for:

Pajštún seep (Pajštúnska vyvieracia) (No. 221), with yield varying between 9.0 to 871.0 l.s<sup>-1</sup>! examples of a spring from the Borina strata include Limbach seep (Limbašská vyvieracia) (0 to 493.8 l.s<sup>-1</sup>)

Borinka – Pod hradom (4 – 13.3 l.s<sup>-1</sup>)

Medené Hámre (4.2 – 6.56 l.s<sup>-1</sup>).

The average surface runoff is  $q = 6.0 - 9.0 \text{ l.s}^{-1}.\text{km}^{-2}$ . Pattern of wells has been observed to characterise patterns in the structure of the Borina unit. Groundwater level was observed in wells PKH-1 Košarisko and PHK-2 Borinka, with the level ranging between 27 to 70.36 meters below the surface for the PKH-1 well with well opening at the altitude of 394.82 m above sea level. This is because the well is drilled in the middle of the hydrogeological structure in intensively karstified Borina limestones with a permeable layer of Quaternary sandy sediments of above these limestones. Natural groundwater resources in the hydrogeological structure of the Borina unit were quantified in 1992 at 223.1 l.s<sup>-1</sup>. Assessment of balance of the structure shows that the hidden runoff of groundwater from the structure in 1992 was 39 l.s<sup>-1</sup>. Geological structure of the area makes it possible to assume that the structure is probably drained in the SW direction into Neogene sediments, or their bedrock in the adjacent part of the Záhorie Lowland (Záhorská nížina), in the broader area of Devínska Nová Ves.

#### Hydrogeological Characteristics of the Neogene Sediments

Neogene strata is represented only to a small extent in the area of interest. Middle Badenian conglomerates, sandstones, sand and gravel are surfaced at SW slopes and foot of the Pezinské Karpaty range as a part of marginal thrusts of the Malé Karpaty from Borinka up to the Pernek area. The estimated flow capacity index is  $Y = 5.42$  and estimated flow capacity coefficient is  $T = 2.63 \cdot 10^{-4} \text{ m}^2.\text{s}^{-1}$ .

In hydrogeological terms, the Neogene strata is unfavourable and little watered, with yields of 0.5 to 3.0 l.s<sup>-1</sup> per well. However, wells with yields of several l.s<sup>-1</sup> (Šenkvice 5 and 7 l.s<sup>-1</sup>, Bernolákovo 5 l.s<sup>-1</sup>, Cífer 4 l.s<sup>-1</sup>) have been drilled at the southern part of the territory. Among Quaternary sediments, only alluvial deposits of streams are watered. The yields are very low given the strong earth content of these gravels.

#### Hydrogeological Characteristics of Quaternary Sediments

Quaternary sediments occur in the eastern part of the territory (eastern part - the area of the Ivanka North junction and Chorvátsky Grob junction), from the influx of the Danube from the Devínska brána (Devín Gate), joining route of Jarovce - Rovinka - Tomášov - Tureň - V and the outskirts of Senec. This boundary is formed by fractures demarcating the Rovinka block at the Žitný Ostrov territory and the subarea between Jarovce and Rusovce, which runs partly on the territory of Žitný Ostrov in the Slovnaft area. Watered environment is formed by the alluvial deposits of the Danube. Their permeability is high, of the order of  $10^{-3} \text{ m.s}^{-1}$ . Sedimentary Neogene, significantly sandy in some parts of the territory, is formed in the bedrock of alluvial deposits.

The marginal block formation of the Western area of the tunnels is an unprolapsed relic of the former edge, which has been preserved behind the peripheral fractures. The marginal block formation of Malé Karpaty forms an elevated adjacent part of the Záhorská depression, extending between the depression and the Malé Karpaty range. It is drained into the Záhorská depression. Stabilization of the Tertiary bedrock in the Quaternary allowed formation of Quaternary sediments in small thicknesses only (proluvium of alluvial cones of Malé Karpaty streams, diluvial and deluvium-proluvium loamy-rocky sediments, several meters thick, in max. 5 - 6 m). From Quaternary sediments, alluvial cones of Malé Karpaty streams in hydrologically favourable sections serve as collectors for direct transfer of groundwater from the mountains to the lowland.

The Zohor-Marchegg Reservoir of Quaternary groundwater covers an area of 37.7 km<sup>2</sup>. Its Quaternary core is made of sandy gravel and sands. Their documented maximum thickness in the central part is 88 m. The thickness decreases in the NW direction down to 48 m. The thickness towards Marchegg is about 75 m. Filtration coefficients of these sediments are as follows:  $5.7 \cdot 10^{-4} - 8.6 \cdot 10^{-4} \text{ m} \cdot \text{s}^{-1}$  in the central part; filtration coefficients drop down to  $4.1 \cdot 10^{-4} - 5.1 \cdot 10^{-4} \text{ m} \cdot \text{s}^{-1}$  towards the Pernek reservoir and Marchegg and they are even lower in areas with a primary sandy content ( $3.6 - 4.1 \cdot 10^{-4} \text{ m} \cdot \text{s}^{-1}$ ).

Proluvial sediments (pQ) - sandy gravel with fragments in the form of alluvial cones are represented most frequently in the peripheral part of the mountain, in the estuaries of mountain streams to the Danube Lowland (Podunajská nížina) and Záhorie Lowland (Záhorská nížina). Their average thickness is 12 - 15 meters. In hydrogeologically favourable sections they are used as aquifers through which groundwater from the mountains is directly transferred to the Záhorie Lowland. Hydraulic properties in the western part are: average flow capacity index  $Y = 6.33$ , the estimated flow capacity coefficient  $T = 2,13 \cdot 10^{-3} \text{ m}^2 \cdot \text{s}^{-1}$ . In the eastern part: average flow capacity index  $Y = 4.78$ , the estimated flow capacity coefficient  $T = 6,02 \cdot 10^{-5} \text{ m}^2 \cdot \text{s}^{-1}$ .

Diluvial sediments (dQ) - loamy rocky and rocky debris, weathering crust (unclassified Quaternary), together with elluvial weathered crust in a Crystalline complex between Pezinok and Bratislava are the most extensive type of Quaternary sediments in terms of volume and surface area. The average thickness is 8.0 m at western slopes, with a thickness of 10-15 m found often in the eastern part. The average flow capacity index is  $Y = 4.77$ , the estimated flow capacity coefficient is  $T = 5.88 \cdot 10^{-5} \text{ m}^2 \cdot \text{s}^{-1}$ .

Fluvial sediments (fQh, fQp) have only a small spatial extension.

The following tables show an overview of different tunnel routes with hydrogeological complexes demarcated (ŠGÚDŠ map server) and hydrogeological zones.

### **Sanitary Protection Zones**

The assessed area contains level 2 sanitary protection zones (PHO-2) for groundwater springs (see Graphic Annex 3).

This concerns the PHO-2 of the Pajštúnka vyvieracia spring, located on the southern slope of the castle hill, now a ruin of the Pajštún castle. The spring (see the description above) is connected to the joint water supply in the Borinka village.

The second PHO-2 zone is very close to the northern edge of residential buildings in the Borinka village. This is a protection zone for the Borinka spring – Pod Hradom. The spring (see the description above) is connected to the joint water supply in the Borinka village.

The third and largest PHO-2 zone is located on the north and northeast of the Úboč point near the Stupava stream (Stúpavský potok). This is a protection zone for the Medené Hámre spring area.

**Table C.II.5: Groundwater zones along the route of the SPL variant assessed**

Variant	Tunnel route		HG index	Description	HG zone
	From (m)	To (m)			
<b>Carpathians and Katusina Tunnels, SPL variant (12.4 km and 1.85 km long)</b>	27,800	22,800		Small patches of water bearing soils with intergranular or joint permeability type or locations with almost no groundwater content; sands, marine	QN 007
		21,600	dQ	deluvial sediments: clays, stony debris, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		20,900	J1-2MS	slates, clayey slates, black slates, managnolites; coating sequence, insulator	MG 008
	<b>19,400</b>			<b>Sanitary zones for groundwater streams of II level (indiscriminate)</b>	
		19,300	J1-3MS	polymict breccia and sandstone, calcium breccia, limestones; coating sequence, collector	
		19,000	J1MS	<b>Limestones; coating sequence, collector</b>	
		18,900	fQh	fluvial sediments, sandy clays, collector, $T = 3 \cdot 10^{-4}$ to $1 \cdot 10^{-3}$	
		18,700	J1MS	<b>Limestones; coating sequence, collector</b>	
		18,500	J1-3MS	polymict breccia and sandstone, calcium breccia, limestones; coating sequence, collector	
		18,300	dQ	deluvial sediments: clays, stony debris, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		17,500	J1-3MS	polymict breccia and sandstone, calcium breccia, limestones; coating sequence, collector	
		17,200	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		16,800	J1-3MS	polymict breccia and sandstone, calcium breccia, limestones; coating sequence, collector	
		<b>16,600</b>		<b>Sanitary zones for groundwater streams of II level (indiscriminate)</b>	
		16,400	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		16,100	dQ	deluvial sediments: clays, stony debris, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		14,300	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	MG 055
		14,100	dQ	deluvial sediments: clays, stony debris, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		10,300	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		10,100	dQ	deluvial sediments: clays, stony debris, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
	9,800	fQh	fluvial sediments: sands, sandy clays, collector, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	N 049	
	6,800	fQp	Aeolian (wind-borne) sand, limeless with porous permeability characteristics and free groundwater level		
	0	fQp	Aeolian (wind-borne) sand, limeless with porous permeability characteristics and free groundwater level		

**Table C.II.6: Groundwater zones along the route of the variants 7a,7b,7c assessed**

Variant	Tunnel route		HG index	Description	HG zone
	From (m)	To (m)			
<b>Carpathians Tunnel – Variant 7a, 7b, 7c</b>	18,200	14,200		Small patches of water bearing soils with inter-granular or joint permeability type or locations with almost no groundwater content; sands, marine	QN 007
		14,100	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	MG 008
		13,600	pQp	proluvial sediments: sandy gravels in alluvial cones, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		12,400	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		12,200	Nm	gravels, collector, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		12,000	A	amphibolites, metabasalts, zalty, metagabbro	
		11,500	f	phylites, mica slots, metapelites, black slates, insulator	
		10,900	g	migmatites, gneiss, collector	
		10,200	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	MG 055
		9,500	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		8,600	G	dtto (8900-9000 superposed fQh, fluvial sediments: sands, sandy clays, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$ )	
		7,800	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		7,000	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		6,900	dQ + fQh	dtto as dQ + superposed fluvial sediments: sands, sandy clays, collector, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		4,300	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		3,700	dQ + fQh	dtto as dQ + superposed fluvial sediments: sands, sandy clays, collector, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		0		gravels, sandy gravels and pleistocene gravels on most of the area covered with sandy loam	Q 051



**Table C.II.7: Groundwater zones along the route of the variants 2a,2b assessed**

Variant	Tunnel route		HG index	Description	HG zone
	From	To (m)			
<b>Carpathians Tunnel – Variants - 2a, 2b</b>	10,700	10,600	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	MG 008
		10,100	pQp	proluvial sediments: sandy gravels in alluvial cones, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		9,800	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		9,500	J1-2MS	slates, clayey slates, black slates, managnolites; coating sequence, insulator	
		9,300	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		8,800	Nm	gravels, collector, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		8,400	A	amphibolites, metabasalts, zalty, metagabbro rocks, collector	
		8,300	F	phylites, mica slots, metapelites, black slates, insulator	
		7,900	G	migmatites, gneiss, collector	MG 055
		7,200	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		7,100	dQ + fQh	dtto as dQ + superposed fQh, fluvial sediments: sands, sandy clays, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		6,900	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		6,600	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$	
		2,600	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
		2,300	dQ + fQh	dtto as dQ + superposed fQh, fluvial sediments: sands, sandy clays, $T = 1 \cdot 10^{-4}$ to $3 \cdot 10^{-4}$	
		900	G	Varisan plutonites; granodiorites, diorites, granites, aplites, pegmatites, collector	
	0	dQ	deluvial sediments: clays, stony debris, collector, $T = 3 \cdot 10^{-5}$ to $1 \cdot 10^{-4}$		

### Thermal and Mineral Streams

Borehole at the south-east edge of the built-up area of the municipality **Slovensky Grob**. The groundwater survey has revealed the extraction volume of  $0.5 \text{ l.s}^{-1}$ . The thermal water drawn from the borehole shall be drawn for leisure purposes (construction of a small aqua park).

Tow closely adjacent boreholes situated in the vicinity of the Mlynsky Creek, wets of the municipality **Chorvatsky Grob**. The regular groundwater analysis reports show the temperature inside borehole FGB-1 is up to 47 or 49 °C with the output exceeding  $2.0 \text{ l.s}^{-1}$ . The Palmer-Gazda classification of this water emphasizes the quality of this stream as significant NaCl. The borehole FGB-1/A is characteristic for the lower temperature from

approximately 24 °C, as well as lower mineral content (520 mg/l), the maximum permitted output is 9.5 l.s<sup>-1</sup>.

The municipality of **Svaty Jur**, next to the building of the former Svaty Jur Spa adjacent to the railway station (between the railway track and the Sur Channel) has four sulphuric streams with the water temperature from 10.7 to 23.2 °C.

## **C.II.7. FAUNA AND FLORA**

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### *Qualitative and Quantitative Characteristics, Habitat Characteristics, Protected Rare and Endangered Species and Habitats, Significant Migration Corridors of Animals*

**Fauna** and its composition today is the result of a long development. From the zoogeographic point of view, it can therefore be generally distinguished the following main components: the cosmopolitan, holarctic, palaeartic, Euro-Siberian, Carpathian, as well as endemic and relict.

From the zoogeographic point of view (Čepelák, 1980), the territory concerned is included in two provinces, namely Carpathians and Inner Carpathians Lowlands. The Carpathian province outreaches here through the area of the West Carpathians with the inner periphery (West District) and Inner Carpathian Lowland province outreaches here through the Pannonian area with Thaya-Moravian Circuit (Záhorie district), South Slovakia district (Danubian alluvial and upland district).

Framework inventory investigations and population monitoring were conducted throughout the whole territory being solved on selected locations. Fauna can be characterized as representative of the entire territory being solved.

The most important groups to indicate the quality of the territory are butterflies and beetles from the family of invertebrates. In the territory being solved, 459 species of beetles and 411 species of butterflies has been found by now. From amply represented birdlife, the saker falcon, European honey buzzard, middle spotted woodpecker, Eurasian eagle-owl, European nightjar, black stork, white-backed woodpecker, syrian woodpecker, black woodpecker, peregrine falcon, collared flycatcher, red-breasted flycatcher, red-backed shrike, grey-headed woodpecker, barred warbler, common quail, Eurasian wryneck, spotted flycatcher, common redstart, European stonechat, European turtle dove, eastern imperial eagle are nesting here. To protect these species, the Protected avian area (PAA) Malé Karpaty (Little/Lesser Carpathians) has been declared here. Likewise, there is also ample presence of considerable numbers of game animals. It is mainly deer, fallow deer, moufflon, roebuck, wild boar, pheasant, hare, partridge, duck, rabbit, badger, fox.

### **Migration potential of the territory**

Migration potential expresses the assumptions of a given territory in order to allow the migration. Its evaluation is based on the current state of the country and its legal protection (protected areas, territorial systems of ecological stability). Part of it is also to identify species or groups of animals that are active in migration in the affected area and their migratory routes.

After executing of framework field investigation, the route variants were divided into single sites, including route sections, on which the migration potential of one or more animal categories was expected. The division was made on the basis of landscape current state, habitat conditions and the occurrence of migrant animals. Sections, on which the migration potential has not been detected during investigation (in the vicinity of buildings, leading through impassable landscape) have not been included in the evaluation.

Concerning the condition of migration routes, the affected area can be divided into two different parts – intact tunnel part and fragmented non-tunnel part.

The tunnel part leads through the territory of the Little/Lesser Carpathians, whose forests provide suitable conditions for maintaining the stable population of different animal species, which then extensively migrate to the peripheral parts of the forests for food, provided by field crops and vineyards. These migrations are mainly of local extent and of seasonal duration (at the time of greatest attractiveness of the food source and during periods with high snow cover, where animals meet in the lower positions). The most common migrant animal on most of the monitored sites is the wild boar and fallow deer. Given that the fallow deer is not a native species, naturalised to enrich the assortment of game animals, can be free migration and the spread of this species for the protection of biodiversity considered as undesirable and risky. The clash of its migration routes with the proposed communication is therefore necessary to assess as a threat to traffic safety and increase of population mortality and adapt the proposed measures to these facts.

The non-tunnel sections of variants run through a unimportant area which is currently fragmented and disturbed by intense traffic and by growing construction area. This territory provides conditions for permanent occurrence of small animals up to the fox size and limited conditions for temporal occurrence of larger animals (roebeek, wild boar).

Protection of species is ensured in the sense of Act of the NC SR No. 543/2002 Coll. on nature and landscape protection, as amended, or by its implementing decree of the Ministry of Environment of SR No. 24/2003 Coll., as amended, which determines details on specific protection of animals and contains a list of them.

According to phytogeographical division (Futák, 1980), **the flora** in the objective territory belongs to the area of Pannonian flora (*Pannonicum*) and the western Carpathian flora (*Carpaticum occidentale*). More detailed phytogeographical division is present in the following table.

**Table C.II.8:** Phytogeographic division of Bratislava county

<b>Phytogeographic area</b>	<b>Phytogeographic township</b>	<b>Phytogeographic region</b>	<b>District</b>
Pannonian flora (Pannonicum)	Eupannonian xerothermic flora (Eupannonicum)	4. Záhorská nížina (Záhorie Lowland)	Bratislava IV, Malacky
		5. Devínska Kobyla	Bratislava IV
		6. Podunajská nížina (Danube Lowlands)	Bratislava I., II., III., V., Senec, Pezinok
western Carpathian flora (Carpaticum occidentale)	pre-Carpathian flora (Praecarpaticum)	10. Malé Karpaty (Little/Lesser Carpathians)	Bratislava III., IV., Malacky, Pezinok

The potential natural vegetation is the vegetation that would have been, under the weather, soil and hydrological conditions, developed in a particular place (habitat), if the impact of human activity stopped immediately. Knowledge of the natural potential vegetation of the territory is important particularly from the point of view of reconstruction, recovery, and further natural development of vegetation (forest and non-forest) in order to bring it closer to or complete the return to their natural condition, so as to ensure the ecological stability of the territory. According to the map of potential vegetation (Landscape Atlas of SR, 2002), on the territory, investigated by us, occur:

- willow-poplar forests in the flooded areas of large rivers (soft alluvial forests)
- ash-elm-oak forests in catchment areas of large rivers (hard alluvial forests)

alder forests on moorlands  
lowland hydrophile oak-hornbeam forests  
peri-Pannonian oak-hornbeam forests  
Carpathian oak-hornbeam forests  
Carpathian oak-hornbeam forests  
tormentil oak forests  
xerothermic oak forests with downy oak and communities of grasses on the rocks  
oak forests with tatarian maple and downy oak  
oak forests on acidic substrates  
maple-lime forests at lower positions  
submontane beech forests  
beech forests  
beech forests on limestone and dolomite substrates

The real vegetation is characterized within the phytogeographic regions intervening in the assessed area:

**Záhorská nížina** (Záhorie Lowlands) with typical, nutrient-poor sands of postglacial period provided peculiar, in Slovakia unique conditions for flora research. Original communities of coniferous forests with Scots pine (*Pinus silvestris*) overlap with communities of pine-oak forests (*Pino-Quercion*) and oak-tormentil forests (*Potentillo-Quercion*). The incidence of native plant communities is islet-like, because forests have already been economically exploited in the past. Their replacement communities after their degradation or removal are either different stages of acidophile pine forests with grey hair-grass/gray clubawn grass (*Corynephorus canescens*) or commercial pine monoculture. In interdune depressions and hollows of Záhorie Lowlands it is possible to find the boggy birch groves, which do not have large surface dimensions, but they form a significant refuges for wetland species in this territory. The temperature contrast between the cold interdune depressions and the heated sandbanks underlies the rich specific diversity of plants, where the mountain species and the remnants from the colder period alternate with the species, typical for warm and dry habitats. From non-forest communities, as an important element here are the flooded alluvial meadows with preserved rich vegetation, which – by their extensiveness – do not currently have any comparable equi-valent in Slovakia. Meadows are harmoniously spread adjacent to alluvial forests, which with their woody plant composition are close to the original forests. The broken borders of forests with meadows are densely laced with a network of old arms, river lakes, and seasonal wetlands. Along the Moravia river, the fragments of poplar-willow alluvial forests are preserved, in which in addition to the willows mainly white poplar (*Populus alba*) and narrow-leafed Danubian ash (*Fraxinus angustifolia subsp. danubialis*) dominates.

The **Podunajská nížina** (Danube plain) ranks among most fertile areas in the territory of Slovakia and therefore it is understandable that the majority of the area has been previously transformed into areas with productive function and the natural stands of hard alluvial forests and Pannonian oak woods were replaced by agrocenoses. Around the channel of the Danube river are found remnants of willow-poplar alluvial forests with generic representation of following woody plants: white poplar (*Populus alba*), black poplar (*Populus nigra*), spreading elm (*Ulmus laevis*), field elm (*Ulmus minor*), narrow-leafed Danubian ash (*Fraxinus angustifolia subsp. danubialis*), various species of willow (*Salix sp.*), but also another tree species. Only in the Danube alluvial forests grows the climber – wild grapevine (*Vitis*

*vinifera subsp. silvestris*), as well as Hungarian/black hawthorn (*Crataegus nigra*). Boggy forests with predominant common alder (*Alnus glutinosa*) are rare; one of the best known is in Jurský Šúr (National nature reserve Šúr) near Bratislava.

**Malé Karpaty** (Little/Lesser Carpathians) have varied vegetative cover, on which diverse geological composition participates. The territory is largely covered by deciduous forests with beech, oak, hornbeam, common ash, sycamore maple and lime. Of non-native tree species, the sweet chestnut occurs here. In the thermophilic grass-herbaceous communities occur spring pheasant's eye (*Adonis vernalis*), southern bunchgrass (*Chrysopogon gryllus*), greater pasque flower (*Pulsatilla grandis*), early carnation (*Dianthus praecox subsp. lumnitzeri*). To the species that occur within Slovakia here only belong mouse thorn (*Ruscus hypoglossum*), rock buckthorn (*Rhamnus saxatilis*). By use of the territory, the original forest communities were transformed into vineyards, orchards and semi-natural forests. In the wider surroundings of Bratislava, on the granite background grows a rare non-native sweet chestnut (*Castanea sativa*). In the surrounding of Jur pri Bratislave (Jur near Bratislava) grows also rose campion (*Lychnis/Silene coronaria*).

### **Ecologically most important locations according to results of the perennial monitoring of biota**

**Šalaperská hora – Lk I** [Šalaperská mount] (*year-round monitored location No. 3*) is situated at the beginning of the SPL route variant near the highway D1. It is important for its structure and variety of habitats. Thanks to the high proportion of line greenery with numerous old solitary fruit, but also forest trees, this location belongs to the most important for the life of the birds on the whole proposed route of assessed alternatives of D4 highway in the section I-vanka nord – Záhorská Bystrica. The following species of birds were detected: northern goshawk (*Accipiter gentilis*), western marsh harrier (*Circus aeruginosus*), European turtle dove (*Streptopelia turtur*), red-backed shrike (*Lanius collurio*), European stonechat (*Saxicola rubicola*).

Despite not very high botanical value of the location, from the point of view of occurrence of protected and endangered plant species, this location can be included to the more remarkable locations. The value of the area lies primarily in its habitat importance and in the favourable development in the future, with the possibility of formation of high quality habitat and refuge for a range of organisms in the surrounding heavily anthropically adversely affected landscape. Now it is about a young undeveloped habitat which forms in the place of abandoned vineyards and orchards. In the vicinity are known the particular cases of the incidence, e.g. critically threatened species three-toothed orchid (*Orchis tridentata*) in the areas of abandoned vineyards. For this reason (possible potential for the future in the event that the location will not be otherwise destroyed or negatively influenced) we consider this area at a given location for botanically important.

Due to the greater heterogeneity of environment occurs here also a greater number of insect or invertebrate species. Despite the negative processes that take place at the location (mainly overgrowing of territory), ascertained community is still rich. A large number of species, belonging to this habitat, spread into the surrounding landscape where they do not have adequate conditions for life, but they use the hinterland of this location. Species from the identified communities of insects belong with their mixture into groups of grass, and ruderal species, or species, linked to shrubby vegetation. Due to the nature of the location, and despite its isolation, the location represents an important habitat for insects. One of the important species observed at the location, is European oil beetle (*Meloe proscarabeus*).

**Interportal section between Carpathian tunnel and Katušiná – Lk II** (*year-round monitored location No.5*) forms another important location for SPL alternative. The location

is long-time known as the breeding habitat of birds, the black stork with another species, typical for the beech forests, is observed here.

Botanically interesting location in terms of species composition and structure of forest stands. In terms of ecological significance, again it does not matter the occurrence of protected and endangered species of plants here, but important is the habitat as a whole. Compactness of the whole forest complex, which is of very high quality in this location, creates very good conditions for life and migration of hoofed game and deer, which in the large numbers also resides here.

From the entomological point of view, it is a question of uniquely most valuable habitat, important in terms of incidence a number of xylophagous (necrotizing wood feeding), saproxylic (by its development bound to dead wood) and mycophagic (dependent on fungi) beetle species. The importance of the location also confirms the incidence of significant European species such as Rosalia longicorn (*Rosalia alpina*), great capricorn beetle (*Cerambyx cerdo*), soldier beetle (*Cucujus cinnaberinus/Cantharis sanguinolentus*), stag beetle (*Lucanus cervus*) and ground beetle (*Carabus variolosus*).

**The section behind the west portal of the Kātušiná tunnel – Lk III** (year-round monitored location No. 6) is the third important location on the route of SPL alternative, south of Lozorno municipality. The importance of the location consists in fact, that the major part occupies the ecotone zone. The diversity of habitats and high proportion of ecotone zones is reflected in the species incidence of forest and non-forest bird species such as northern goshawk (*Accipiter gentilis*), red-backed shrike (*Lanius collurio*), corn bunting (*Miliaria/Emberiza calandra*), garden warbler (*Sylvia borin*), European turtle dove (*Streptopelia turtur*).

The botanical value of the location at this place consists in the quality of forest stand again. The quality of the non-forest habitats in terms of incidence of important species, as well as in terms of habitats as a whole is of small account, it is about ruderal acacia forest edges, cultural sown meadows and fields.

The identified species of insects in the monitored location consists of a mixture of eurytopic species without greater conservation importance. The majority of species has been found in the edges of mown and fertilized meadows. From important species on the location, the stag beetle (*Lucanus cervus*) was observed on forest edges. From entomological point of view, the location is equally considered as less important.

**„Na Lysom“ – Lk IV** (year-round monitored location No. 10), an important location (former gravel deposit) today used for fish breeding near route of alternatives (variants) 2a, 2b, 7a, 7b and 7c. The value of this location from ornithological viewpoint consists mainly in the water area and the remnants of the alluvial forest located in the immediate vicinity of the lake. There is thus created an important nesting habitat for several species of water, at the water and in the cavities living birds, e. g. river kingfisher (*Alcedo atthis*), tufted duck (*Aythya fuligula*).

Relatively valuable botanic location due to presence of rare plants, such as flowering/grass rush (*Butomus umbelatus*), shining meadow-rue (*Thalictrum lucidum*). The site has a much higher value as a habitat. It is about valuable refuge not only for plants in urban and agricultural landscape. The location should be as far as possible preserved as irreplaceable biocentre in the surrounding landscape.

From the entomological point of view, the whole range of xylophagous and microphagous species has been observed here. Also thanks to the presence of important species of insects such as grain support beetle (*Megopis/Aegosoma scabricornis*), soldier beetle (*Cucujus cinnaberinus*), ground beetle (*Carabus clathratus*), the location seems to be valuable (for invertebrate species, it is necessary that location water regime should not be destroyed).

With its diversity, the nature of the spread of greenery and the presence of water flow, this location provides suitable nesting and foraging habitats for open landscape bird species, as well as for species, bound to the forest stands.

**Vinice – Lk V** (*year-round monitored location No. 13*). Very important location on the boundary line of the vineyards and the forest complex to the north of Rača ward. This ecotone location is important as a food source (feeding habitat) for birds, nesting in the surrounding forests. The following important species, such as European turtle dove (*Streptopelia turtur*), lesser spotted woodpecker (*Dendrocopus/Dryobates minor*), Syrian woodpecker (*Dendrocopos syriacus*), black woodpecker (*Dryocopus martius*), Eurasian wryneck (*Jynx torquilla*) and spotted flycatcher (*Muscicapa striata*) were observed here.

It is a matter of botanically interesting location, particularly thanks to overlapping of different types of habitats. Without marked occurrence of significant plant species. It is a matter of marginal part of the forest complex of the Little/Lesser Carpathians with strong urban influence. Interesting and valuable vegetation areas occur rather also here. The following species occur here, such as Pannonian thistle (*Cirsium pannonicum*), blue daisy (*Jastone montana*), owl head clover (*Trifolium alpestre*) and stolonate valerian (*Valeriana excelsa*).

Although the location progressively degrades, there is here a very rare preserved thermophilic community of insects, rarely out of the forest as well as on the edge of the oak stand. The European important species such as stag beetle (*Lucanus cervus*), European oil beetle (*Meloe proscarabeus*) were recorded here. Compared with other locations, this location seems to be as quite significant entomological territory.

By using of appropriate measures, it is possible to create several science-oriented very interesting locations.

### **Habitats**

In the territory under consideration, in corridors of assessed alternatives (variants) are the following habitats:

#### ***In the corridor of variants 2a, 2b, 7a, 7b, 7c***

- Ls 1 Alluvial forests:
- Ls 2 Oak-hornbeam forests
- Ls 5 Beech and mixed forests
- Vo 2 Natural eutrophic and mesotrophic standing waters
- Br 4 Mountain watercourses
- Br 8 Herbaceous bank vegetation of flowing waters
- Lk 10 Vegetation of high bent-grasses
- Kr 7 Blackthorn and hazel shrubs
- Tr 6 Thermophilic edges

#### ***In the corridor of SPL variant***

- Kr 7 Blackthorn and hazel shrubs
- Kr 9 Willow scrublands on the flooded riverbanks
- Ls 2 Oak-hornbeam forests
- Ls 5 Beech and mixed forests
- Ls 6 Xerophilic pine forests
- Lk 1 Lowland and submontane mown meadows

Represented are the habitats of national and European importance (in bold text); the most valuable are the habitats Ls 1 (lake on the Lysý), Ls 5 (Little/Lesser Carpathian forest massif) and Lk 1 (meadows southeast of Lozorno municipality).

In both corridors are further abundantly represented ruderal habitats X (X 4, 5, 7, 8, 9, 10, 13).

Protection of species is ensured by Act of the NC SR No. 543/2002 Coll. on nature and landscape protection, as amended, or by its implementing decree of the Ministry of Environment of SR No. 24/2003 Coll., as amended, which determines details on specific protection of animals and contains a list of them.

## **C.II.8. LANDSCAPE**

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### *Structure of landscape, landscape image, scenery, stability, conservation*

We perceive a landscape structure as the horizontal and vertical layout of landscape elements characteristics that -by the impact of differentiating factors- are specifically combined in a particular space, thereby creating various landscape-ecological potential for exploitation.

Within the Report on Activity Assessment "D4 Highway Bratislava junction Ivanka North - Záhorská Bystrica" , the elements of selected landscape structure have been processed and described.

#### *Elements of physical-geographic complex (Primary Landscape Structure - PLS)*

In the basic breakdown the PLS is formed from elements such as relief, rock base and substrate, soils, climate, air and waters. The part of PLS is also the original potential vegetation of the territory that often does not exist any longer in the assessed territory, or it has been significantly altered by humans.

The primary landscape structure elements are listed and described in detail in Chapters C.II.1, C.II.3, C.II.4, C.II.5, C.II.6, C.II.7.

#### *The structure of landscape cover (Secondary Landscape Structure - SLS)*

SLS is formed by a number of elements affected, partially or totally altered by humans , or newly created as artificial landscape features. The main categories of SLS in the referred territory:

- forest communities – forestland
- non-forest woody vegetation - solitary trees, accompanying vegetation of line elements in the country - bank growth of rivers and areas, stands near roads, balks, surface NDV - hedgerows, niches, groves and forests, orchards and vineyards,
- permanent grasslands - meadows, pastures and fallow land,
- arable land (fields) - intensively cultivated large-scale fields, small-scale arable land, private plots,
- rocks and uncovered raw substrate
- rivers and lakes
- transport lines, transport networks - highways, expressways, roads of I<sup>st</sup>, II<sup>nd</sup>, III<sup>rd</sup> class, local roads, railways
- residential settlements - seats of urban and rural type, recreational areas, gardening settlements, settlement greenery
- manufacturing units - industrial areas, agricultural areas, technical objects, ruderal areas and landfills, etc.



The assessed territory, following the wider landscape framework, may be characterized in terms of SLS as the urbanized cultural landscape, with a strong representation of arable land cultivated in large-scale, vast complex of forest units, with the balanced proportion of the non-forest woody vegetation. In order to assess the extensive landscape unit, it is necessary to describe the above general description of the landscape in terms of SLS in detail. The western part of defined area of the assessed territory consists of urbanized area with residential settlements of rural type such as Lozorno, Borinka, Marianka, and of urban type such as Stupava, Bratislava - Záhorská Bystrica. The area between the residential settlements is created by a mosaic of arable fields cultivated in large-scale, with fragments of permanent grassland and adequate representation of non-forest woody vegetation in the form of alleys and avenues along roads and local roads, hedgerows, balks, abandoned orchards, vineyards and solitary woody plants. Forest communities are represented in the form of small forests between the blocks of arable land. Watercourses in the area are represented rather in the form of large and small streams/creeks/, channels and spring areas. The biggest river systems include Stupavský creek with right-hand stream tributaries, Vápeničný creek and Marianský creek. Water bodies in the form of small water reservoirs are represented in the country in small quantities. The only significant and also the largest water body in the area is Lozorno reservoir. Sloppy and waterlogged territories occur in the assessed landscape in small amounts; they usually accompany the springs in the forest units of the Little Carpathians. In terms of line formations, the territory is interwoven with the road network, consisting of roads of all categories. The main transport lines in the area consists of D2 highway with an international code E65, the I/2 road and II/501 and II/505 roads. In the territory there is major area urbanizing of country visible, in the form of large halls with different functions (industrial areas, production, storage, transshipment facilities, etc.), and agricultural sites on the outskirts of residential settlements.

Eastwards, the assessed territory constitutes of forest unit complex of PLA Little Carpathians. The structure of forest units is subordinate to the type of protected landscape area and to the subject of territorial protection. The PLA Little Carpathians is declared a single large protected area of vineyard character. The territory landscape mosaic is on the border of residential settlements (urbanized environment) and forest stands, formed by the typical small-scale wine-growing structure, smoothly flowing into the units of deciduous forests. Forest complexes are broken by the fragments of meadows, and in terms of historical landscape structure (HLS), preserved original pastures can be seen. Natural line elements of territory include small streams; technical line elements are then formed by forest roads and HV lines. A significant component of the landscape, manifested primarily in the territory of Marianka, Borinka and surrounding, are rock formations, exposed when quarrying the stone. The exposed rock formations and the territories of the former quarries look due the passage of time semi-natural, as the part of natural landscape. PLA border and a peripheral boundary of the eastern part of the assessed territory are formed by the structure of small-scale cultivated fields in Limbach, a typical small-scale wine-growing structure of vineyards in Pezinok and Svätý Jur, and geometric mosaic of vineyards in Vajnory.

The eastern part of the assessed territory and SLS shows the signs of expansion of Bratislava urban residential agglomeration. The housing structure consists of rural type formations such as Čierna Voda, Slovenský Grob, Chorvátsky Grob, Viničné, Limbach, and urban type ones such as towns Pezinok, Svätý Jur, Bratislava, municipal district Vajnory and Rača. The area between the residential settlements is formed by the mosaic of geometric, large-scale, intensively farmed blocks of arable land. There are very few grasslands in this area. Meadows occur on wet soils that are bound to the floodplain of the rivers, and on NNR Šúr site or nearby ponds. On dry hillsides there were pastures that are now, with some minor exceptions, abandoned and overgrown by self-seeding, and thus they are subject to natural succession. Watercourses in the area are represented in the form of small and larger streams, and they are

usually accompanied by waterlogged territories. Small streams form an irregular network. The biggest river systems include Blatina (later Stará Blatina), Čierna Voda, with stream tributaries, and the most important semi-natural water line element is Šúrsky channel with several tributaries. In the urbanized landscape mosaic it is the locality Šúr that is extraordinary in the assessed territory, as it is a unique natural phenomenon of boggy-fen forest (alder forest), and Šenkvičský grove locality with a pheasantry, composed mainly of deciduous forest vegetation. Line structures in the country are represented by the transport lines of roads and railways that pervade agriculturally cultivated areas and lines of technical lines of HV and LV. The main important lines in the territory are the D1 highway with international code E 58, E 75, E 571 and II/502 road. The manifestation of urbanization on the landscape structure modification in recent decades has been the area urbanization of the landscape in the outskirts of towns and villages. In the territory there are areas with large halls, mostly of production character, as well as the residual sites of agricultural cooperatives.

#### *Socio-economic phenomena (Tertiary Landscape Structure - TLS)*

TLS can be expressed as a phenomena expression of interests and intentions of human society in the territory, landscape, such as territorial and administrative division, protection of area in terms of its usability, protection of natural and cultural heritage with regard to the appreciation of their cultural, historical and natural values.

The urbanized landscape of assessed territory according to the type of land use, with a characteristic predominance of agrocoenoses, falls within the agricultural landscape. This type is formed in the landscape secondarily; it is based on plant communities, and in case of small fragmentation of arable land it does not seem to be artificial. The geometric arrangement of large blocks of arable land in the country look unnatural.

The agricultural landscape of the referred territory includes also its subtypes:

- the landscape of arable land - occurring mainly in areas between residential settlements,
- the landscape of permanent grasslands, pastures - on the border of forest complexes of PLA Little Carpathians, in the small-scale structure of arable land blocks the areas of arable land and pastures alternate,
- the landscape of orchards and vineyards - a typical type of land use in this area is vineyard landscape mostly with small vineyard areas but also with larger vineyards that look geometric; the accompanying land use in the assessed landscape are orchards,
- the residential rural landscape - cultural landscape with the type of residential rural settlements, with typical urban layout and partially preserved architectural values of the territory; farmyards with a rectangular ground plan layout, small vineyard buildings are typical for this area.

However, it is impossible to describe the assessed landscape through one type of land use. In terms of other types of landscape, there can be found the types of urbanized residential landscape of urban settlement, in the peripheral zone of growing Bratislava agglomeration, when the gradual urbanization of space between the city outskirts themselves and neighbouring municipalities occurs.

Another type of TLS directly linked to the material elements of SLS is the forest landscape with recreational function, the landscape of forest complexes PLA Little Carpathians with dominant natural groups of landscape elements and components.

Transitional zones between different types of land use can be found at the type borders, and they mostly bear characteristics of both landscape types.

### ***Landscape image, scenery, stability, conservation***

Spatial characteristics and structural elements of the landscape define the *landscape image*; and same as landscape structures they convey information about the landscape. The landscape image is an external manifestation of geographical conditions, relationships and processes of landscape structure; the forms of land use and its perception can be considered the first spontaneous manifestation of observer's contact with a specific area, a specific landscape. In the landscape image there is the landscape structure projected (the arrangement of elements in the landscape area).

When assessing the landscape in the referred landscape, outside the *landscape image*, we identify and allocate the following terms:

- *Landscape scenery* represents changes in the landscape. It includes *landscape image* (spatial-visual perception, shape, colour), all the sensory-physical landscape features (feelings, scents, air movement, temperature, humidity, etc.), and also visual sensations, weather phenomena (clouds), period of the day and year seasons (dawn, spring, summer aspect). The scene of landscape means the segment of landscape space, image, which is visible only from one point or few points of that space.
- *Outlook range of landscape space* – it directly relates to the number of factors and limits in the perception of landscape elements and landscape space; these are both elements of natural character and also of anthropogenic character.

### ***Landscape image***

The landscape image of the assessed territory is composed of the signs of cultural, historic and natural character. The wide assessed territory is to be divided into smaller, usually developmentally identical units, cities. From the morphological point of view, the assessed territory represents two different types. The centre of territory is formed by the emerging core mountain of the Little Carpathians that spread in a northeast direction and separate the Záhorská Lowland from the Danubian one, that are typical by flat landscape with little rugged or slightly undulating topography type.

The territory of Vajnory and Rača city wards is in today's perception of the country closely tied to the development of peripheral areas of Bratislava, and it has the character of urban agricultural landscape, with a predominance of semi natural features. An observer perceives the landscape image by subjective feelings as a typical cultural landscape, in proximity to a large agglomerate unit, with distinct features of vineyard character, in the background with preserved natural forest stands of the Little Carpathians.

With the increasing distance from the Bratislava capital, the landscape image nearby Svätý Jur, Pezinok gets touch of more independent urban units of agricultural and viticultural character. Southwards to Slovenský Grob a Chorvátsky Grob municipalities, the features of the vineyard character disappear, and the territory is typically used for agricultural purposes with rural character. In recent years the pattern of individual municipalities has been influenced by a significant increase in the population, associated with the proximity of Bratislava capital city, and by a trend towards the migration of population to villages and commuting into the city for work. The housing structure of village in a typical image vanishes, and municipalities development is designed with the character of urban-type buildings.

The landscape around Záhorská Bystrica and then Stupava bears similar features of settlement development close to the large agglomeration unit of Bratislava. Original separate settlements of rural type have been attached to the capital as city wards, and their residential development relates thereto. The landscape image around Záhorská Bystrica, and then Marianka and Stupava is strongly marked by the development of the production sector and related storage services. A crucial element that creates the overall character of the area is geo-relief, formed

by a plain with a slightly rugged type of relief to which the residential development is adjusted .

The image of rural character settlement of Marianka has been in recent years going through a distinct change in the rural settlement character, thanks to the enormous development of residential buildings, and significant elements of urban development have been introduced in a urban structure. The rural nature of Lozorno landscape image has been retained despite the convenient location towards the capital.

The preserved vineyard structure is the unique and unrepeatable representative feature of landscape image of the whole area, which is reflected not only in the character of landscape but also in the housing structure. The identification of the vineyard type is possible based on original identifiers.

*The outlook range of landscape space* is in the area affected by morphology, with a strong transition of territory emerging from the Danubian and Záhorská Lowlands to the core mountain of the Little Carpathians, and on the other hand, by visual barriers in the country that form urban units (cultural features of the country), forest complexes and preserved fragments of forests (elements of the natural characteristics).

The landscape area potentially affected by D4 highway depends in the lowland area on the visual zone and determined outlook range of territory which affects the visual range of plan within the area. In case of line structure located in flat terrain, this zone may be defined up to 3.5 km from the highway, or depending on the visual barriers also closer. On the slopes of the Little Carpathians it is necessary to establish distance of territory visual range differently, whereas the territory opens up and becomes more exposed, it is possible to observe the effects on the individual characters of the landscape to greater distance of about 3-5 km, depending on the visual barriers.

*The landscape scenery* depends on several factors; in case of assessed territory, especially on natural conditions and related changes during the year. The perception of landscape scene in the assessed territory depends on the location, observer's point of observation. The point of observation is also the place where you can see the final number of features of the landscape. In the landscape of assessed territory it is possible to determine the certain number of observation points so that the landscape scenery could be perceived. These stations depend on the morphology of the terrain which means that in order to perceive the landscape scenery, it is necessary for the observer to take up the observation point with higher altitude than the majority of the area. Alternatively, in the second case of the observation point selection, the observer would take up such observation point in urban areas (building, mast, tower, chimney, etc.) the height of which is higher than the height of the previous visual barrier.

In the case of Rača and Vajnory wards surrounding, the observer has to ascend to the slopes of the Little Carpathians, in local vineyards, wherefrom he can see the scenery of urbanized country, represented by the features of cultural characteristics formed by residential development, production sector and the vast area of farmed arable land, and it is complemented by natural characteristics features represented in the form of dispersed greenery - line, flat, and point, the vast natural unit of ŠŮR with Šúrsky channel. The semi natural features, molding the overall impression of landscape scenery, should include vineyards and small orchards located on the slopes of the Little Carpathians, which are perceived despite the almost identical observation point at the landscape scenery. Depending on the season, this semi-natural feature complements the typical look of landscape scenery. In winter, the observer sees the vineyards as a cultural symbol whereas poles with wires to which tenuous vine stems are attached become dominant. In the spring, the observer's perceptions are focused on fresh green of sprouting vines, twining around the stretched wire. In the middle of summer, vine leaves the most natural impression. In autumn the observer's attention is drawn to the changing colour of the leaves, complementing the overall melancholic atmosphere of landscape scenery. The sweetish smell of mellow grapes may be

considered the secondary sensation when perceiving the landscape scenery in autumn. The perception of landscape scenes can be extended to more distant visual zones, and the landscape scene of Rača and Vajnory city wards may be seen similarly. The longer is the distance from the vineyards, the more cultural features appear which, in the southwest sector, outweigh the natural features. In the southeast sector the greenery of NNR Šúr prevails, and partly also accompanying greenery of Šúrsky channel. In a more distant visual zone, under favourable climatic conditions, the buildings of Čierna Voda can be seen against a background of Šúr greenery.

It is similar also near Marianka and Stupava. If the observer is at the level of Marianka settlement, he/she perceives landscape elements only in its immediate vicinity. In order to perceive the landscape scenery, the observer has to take up a higher lying observation point on the vineyard slopes, and only then he can see the landscape, and the scenery of urbanized country, represented by the features of cultural characteristics consisting of residential development, production sector, productive agricultural areas in the form of large-scale plantations and vast areas of arable land, opens to him.

This landscape scenery is complemented by the features of natural character, in the form of flat greenery, represented mainly by groves and greenery along the local roads. The typical appearance of landscape scenes is, depending on the season, created mainly by the changeability of cultivated field areas. In the spring time, the observer is impressed by fresh colourful tones of crops; together with lush green colours of landscape greenery they significantly mitigate the negative effect of large buildings of manufacturing sector. In summer, the areas change and earthy colour tones become dominant, depending on the cultivated crop.

In autumn and winter, the observer may perceive these areas as a significant and monotonous cultural symbol, without definite colour diversity. The diversity of impact of vineyards in this area, concerning their location and openness to the landscape scene, is not perceived by the observer so clearly as in Rača and Vajnory city wards. In the near visual zone the line greenery of local roads, separating the blocks of arable land, can be seen in the background of fields. With increasing distance the large-scale orchards are visible. In a more distant visual zone, under favourable conditions, the D2 highway line element can be partially perceived in the background of orchard greenery. The whole landscape scene is positively complemented by the elements of dispersed landscape greenery, showing up variously in the overall perception of landscape in different seasons.

In the perception of the scenery, the local vineyards at the foothills of the Little/Lesser Carpathians over the Svätý Jur and Pezinok municipalities territory evoke partly similar impression as on the territory of Marianka. The overall perception of the landscape scenery by the observer is possible in the case only, if he stays in elevated position. From the territory of local vineyards over the Pezinok city, the observer can have a look at the urbanized landscape, characterized by predominance of cultural landmarks in the form of residential build-up area, large blocks of arable land and the typical semi-natural attributes – vineyards. Seasonal expression of landscape scenes, however, create the varying blocks of arable land, depending on the cultivated crop. In terms of visual areas, the observer first perceives views within the territory of vineyards and along with this sensation, the linear element – 2. Class state road No. 502 – applies to their background. In more distant zones in the eastern sector, the build-up area of Slovenský Grob and Viničné villages, and under favourable conditions also with the greenery of Šenkvice grove on the background, can be seen.

Landscape scenery of Lozorno village may not be directly dependent on the one location. Due to the slightly undulating terrain, also the territory orientation is favourable, mainly in direction to the west. From the edge of the local forests, and partly also from the territory of the vineyards, the observer sees the scenery of urbanized agricultural landscape with fairly balanced

representation of natural elements in the form of diffused punctual, linear and planar extrasilvan greenery. The cultural landmarks are represented by rural residential buildings, blocks of arable land and the manufacturing sector. Markedly perceived linear element in the landscape is the highway D2, which the observer perceives in the further visual zone of the western sector. Due to the seasons and depending on the observer location it is possible to perceive the semi-natural landmark of the vineyards as the typical appearance of landscape scene. The vineyards in the eastern sector of the territory make strong cultural impression in the winter-time, in spring- and summer-time acts the fresh green colour of the vine by natural impression. Looking into western sector, in the near visual zone manifest cultural landmarks of managed field with linear green of local road in the background. Due to the favourable visual conditions, the observer in the distant visual zone perceives the linear corridor of D2 highway and spacious production facilities in the background. The observer perceives the buildings of the Lozorno village in the north-western and northern sector, with grown greenery in the background.

*For a stable country we may consider such a country, in which the possibility of production and non-production functions is permanently assured and in which there is no irreversible (inconvertible) distortion of the functional potential of the landscape as a consequence of human activities. The stability of the landscape is also closely related to ecological stability, „the ability of the ecological system to persist also during the action of the disturbing influence and to reproduce its substantial characteristics in terms of violation from the outside.“ (Michal, I.: Ecological stability).*

The overall landscape ecological stability of the evaluated territory depends on the ratio and share of significant eco-stabilizing elements against the elements without ecological importance or with little importance. The evaluated landscape in the surrounding of town section Rača and Vajnory is formed mainly by elements of very little or small importance for the ecological stability, i. e. by fields with arable soil, small-area vineyards with scattered gardens and areas without ecological significance, which are built-up areas of urban settlements. Significant eco-stabilizing element of large up to exceptionally large importance in assessed territory is the area of wetland in the ŠÚR National nature reserve, extending on the area of 370 ha, which contributes to the overall stability of the territory and in the vicinity of location increases the resistance of the landscape against changes. The arteficial drainage channel Šúr knots on this important eco-stabilizing area, which over time turns into semi-natural, nature-close element with medium importance for the territory ecological stability. Significant areas are also another nature-close water courses in the territory. Another important element involved in creating of landscape ecological balance are the areas of forest units in Little/Lesser Carpathians (Protected Landscape Area [PLA] Little/Lesser Carpathians – widespread protected territory of viticultural nature), formed primarily by deciduous forests with beech, common ash, sycamore maple and lime; of non-native tree species, the sweet chestnut occurs here.

The landscape in the surrounding of Stupava and Marianka villages is with its composition in terms of ecological stability almost identical with the evaluated landscape in the surrounding of town sections Rača and Vajnory. The landscape is formed mainly by elements of very little or small importance, such as fields with arable soil and small-area vineyards; the large-area element is orchard near Marianka village, stretching up to the Stupava part Mást, which subject to natural succession and becomes more important element (refuge). In the surrounding of Marianka village more often occur areas of meadows and pastures with medium importance for ecological stability. The most important element in evaluated part of landscape with great importance for the ecological stability are the forests in Little/Lesser Carpathians formed by mixed forests with prevalence of beech. In the overall perception of the landscape near Marianka village, as well as in the surrounding of town section Rača, the significant part of landscape form elements of built-up areas of urban settlements. These elements by their impact significantly disturb the ecological balance of the landscape.

The next evaluated territory (landscape) is the surroundings of the Lozorno village, which in terms of elements of ecological stability consists mostly of fields with arable soil and scattered areas of small-scale vineyards (elements of minor importance), further small-scale gardens next to the settlements – the Lozorno village and semi-cultural meadows (elements of middle importance). The small part of territory is formed by water surfaces and water courses and on the edge delimited by excessive area of mainly deciduous forest units of the Little/Lesser Carpathians (elements of major importance). The significant area of the landscape in the Lozorno village surrounding occupies itself built-up area of Lozorno village (elements of no importance), which is, depending on the nature of the settlement, completed by private and public green spaces and part of the settlement bind on the elements of cultural and semi-cultural forests and groves (elements of middle importance), which participate in formation of ecological balance of the landscape.

In terms of ecological stability, the least valuable territory is the territory in the surroundings of Slovenský Grob and Chorvátsky Grob villages, where the landscape consists of large areas of fields with arable soil (elements of very small importance) with small representation of scattered scenic greenery (elements of middle importance), adapted arteficial water courses – channels (elements of small to middle importance) and urban settlements (elements of build-up areas without importance), completed by private gardens with small-scale productive nature (elements of small to middle importance). The territory between urban settlements Pezinok city and Svätý Jur village are formed mostly by small vineyards (elements of small importance) complementarily by small-scale orchards (elements of middle importance), and build-up areas of urban settlement (elements of no importance). Forest units, consisting mainly of deciduous trees with prevalence of beech forms on the territory of the Svätý Jur village and Pezinok city, as well as on the previously assessed territories the important eco-stabilizing element.

Part of the landscape structure are socio-economic phenomena (associated with the activity of man, the development of manufacturing industries and secondarily emerging attendant phenomena, such as pollution of air, water, soil, area of protection and security of planar and linear elements in the landscape), markedly acting mainly in the surrounding of urban settlements, which by the different ways threaten or limit the ecologic stability and balance in the landscape. They manifest by planar, linear or punctual intervention, threaten the functionality, but also the very existence of the individual eco-stabilizing elements. For positive socio-economic phenomena can be considered the human activities, focused on protection of nature, stability, biodiversity and on protection of individual natural resources, with the aim of ensuring their rational use. For example, the protection of the National nature reserve Šúr, PLA Little/Lesser Carpathians, etc.

The most threatened elements of the evaluated territory are the elements of water courses, scattered scenic greenery, partially preserved small-scale vineyards, which are often found in parallel with public roads or come into direct collision with thickened concentration of inhabitation and production, which these elements marginalizes to protected territories. These eco-stabilizing elements give way to the expanding construction on the periphery of Rača and Vajnory town sections and to planned constructions of several multifunctional projects.

### ***Landscape protection***

The Act of the NC SR No. 543/2002 Coll. on nature and landscape protection, as amended, in the legislative form regulates, and determines the degrees of protection of the landscape. The purpose of the act is to contribute to the preservation of natural heritage, to the protection of characteristic appearance of the landscape and contribute to the achievement and maintenance of ecological stability. The act also defines the territorial and specific protection and the protection of the woods.

***Table C.II.9: overview of protected territories in the assessed landscape with levels of protection***

Category of protected territory	Level of protection
PLA Little/Lesser Carpathians	2. grade
PR Svätøjurské hradisko	4. grade
NNR Šúr	5. grade (zone A) 4. grade (zone B)
NR Jurské jazero	4. grade
NR Pod Pajštúnom	5. grade (zone A) 4. grade (zone B)
NR Strmina	5. grade
NR Zlatá studnička	5. grade
NP Limbašská vyvieračka	5. grade
Another territory	1. grade

*Explanation of abbreviations in the above table – grade of protection (pursuant to the Act of the National Council of the Slovak Republic No. 543/2002 Coll. on nature and landscape protection).*

## C.II.9. PROTECTED TERRITORIES UNDER SPECIAL REGULATIONS AND THEIR PROTECTION AREAS

*Protected territories under special regulations and their protection areas (such as national parks, PLO, proposed protected bird territories, territories of European importance, NATURA 2000, protected trees).*

### COHERENT EUROPEAN NETWORK OF PROTECTED AREAS (NATURA 2000)

*The Coherent European network of protected territories is defined in the section 28 of the Act No. 543/2002 Coll. on nature and landscape protection, as amended. Its objective is to maintain the favourable status of habitats of european importance and the favourable status of species of european importance. The Natura 2000 network consists of „protected bird areas (PBA)“ and „territories of european significance (TES)“.*

#### SKCHVU014 Little/Lesser Carpathians

- established by the decree of the Ministry of environment of the Slovak Republic No. 216/2005 Coll., as amended, effective from 1. 6. 2005,
- all assessed variants in the areas of tunnel portals marginally touch this protected area, as well as in the places of location of the tunnel exhaust chimneys; the rest of the territory (central part) pass below tunnel,
- declared for the purpose of preserving the habitats of bird species of european importance and habitats of migratory species of birds: saker falcon (*Falco cherrug*), European honey buzzard (*Pernis apivorus*), middle spotted woodpecker (*Dendrocopos medius*), Eurasian eagle-owl (*Bubo bubo*), European nightjar (*Caprimulgus europaeus*), black stork (*Ciconia nigra*), white-backed woodpecker (*Dendrocopus leucotos*), Syrian woodpecker (*Dendrocopus syriacus*), black woodpecker (*Dryocopus martius*), peregrine falcon (*Falco peregrinus*), collared flycatcher (*Ficedula albicollis*), red-breasted flycatcher (*Ficedula parva*), red-backed shrike (*Lanius collurio*), grey-headed woodpecker (*Picus canus*), barred warbler (*Sylvia nisoria*), common quail (*Coturnix coturnix*), Eurasian wryneck (*Jynx torquilla*), spotted flycatcher (*Muscicapa striata*), common redstart (*Phoenicurus phoenicurus*), common stonechat (*Saxicola torquata*), European turtle dove (*Streptopelia turtur*) and eastern imperial eagle (*Aquila heliaca*).



### **SKUEV0104 Homol'ské Karpaty**

- by regulation announcement of Ministry of Environment of Slovak Republic no. 3/2004-5.1 of 14 July 2004,
- versions 7a, 7b, 7c go passes tunnel Karpaty; this area from 7.500<sup>th</sup> km in the section of 1.000 m, as well as in a similar version SPL; it passes tunnel Karpaty from 13.000<sup>th</sup> km in the section of 6.000 m
- pronounced with the purpose of protection of habitats of European significance: birch, pine and spruce woods in peatbogs (91D0), bottomland willow-poplar and alder forests (91E0), lime-maple scree forests (9180), beech and fir flowery forests (9130), Luzulo-Fagetum beech forests (9110), inaccessible cave formations (8310), calcicolous beech forests (9150), sub-Pannonic steppic grasslands (6240), Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi (6110), Lowland hay meadows (6510), Calcreous rocky slope with chasmophytic vegetation (8210), xerothermic shrubs (40A0), Carpathian and Pannonic oak-hornbeam forests (94G0), Euro-Siberian steppic woods with *Quercus* spp (91I0) and species of European significance: *Rosalia alpina*, *Limoniscus violaceus*, *Lucanus cervus*, *Graphoderus bilineatus*, *Callimorpha quadripunctaria*, *Polyommatus eroides*, *Leucorrhinia pectoralis*, *Myotis myotis*, *Myotis dasycneme*, *Myotis blythi*, *Myotis bechsteini*, *Miniopterus schreibersii*, *Barbastella barbastellus*, *Bombina bombina*, *Austropotamobius torrentium* and *Rhinolophus hipposideros*.

### **SKUEV0279 Šúr**

- by regulation announcement of Ministry of Environment of Slovak Republic no. 3/2004-5.1 of 14 July 2004,
- approx. 500 m to the north of the versions 7a, 7b, 7c and 2a, 2b between 1.500<sup>th</sup> km to 3.500<sup>th</sup> km (the area is smaller than NPR Šúr)
- pronounced with the purpose of protection of habitats of European significance: bottomland willow-poplar and alder forests (91E0), Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers of the Atlantic and Middle-European provinces (*Ulmion minoris*) (91F0), *Molinia* meadows (6410), Inland salt meadows (1340) and species of European significance: *Cirsium brachycephalum*, *Cerambyx cerdo*, *Limoniscus violaceus*, *Lycaena dispar*, *Lucanus cervus*, *Polyommatus eroides*, *Bombina bombina*, *Castor fiber*, *Microtus oeconomus mehelyi* and *Triturus dobrogicus*.

### **SKUEV0388 Vydrlica**

- by regulation announcement of Ministry of Environment of Slovak Republic no. 3/2004-5.1 of 14 July 2004,
- approx. 6,500 km to the south of the tunnel duct in versions 2a, 2b, its area being 7.1 ha, starts at Železná studienka and ends behind Tretí kameňolom,
- pronounced with the purpose of protection of habitats of European significance: bottomland willow-poplar and alder forests (91E0), Luzulo-Fagetum beech forests (9110), beech and fir flowery forests (9130) and species of European significance: *Limoniscus violaceus*, *Dioszeghyana schmidtii*, *Leptidea morsei*, *Austropotamobius torrentium*.

### **SKUEV0089 Martinský les**

- by regulation announcement of Ministry of Environment of Slovak Republic no. 3/2004-5.1 of 14 July 2004,
- approx. 2,200 km to the north of the eastern part in version SPL on the eastern border of the area of Viničné municipality (the area being 574.59 ha)
- pronounced with the purpose of protection of habitats of European significance: Carpathian and Pannonic oak-hornbeam forests (94G0), Euro-Siberian steppic woods with *Quercus* spp (91I0), Pannonian-Balkan turkey oak sessile oak forests (91M0) and species of European significance: *Osmoderma eremita*, *Cerambyx cerdo*.

### **PROTECTED AREAS**

*Locations with habitats of European significance and habitats of national significance, habitats of species of European significance, habitats of species of national significance, and habitats of birds including migratory species which are protected by means of pronouncing protected areas, significant features in the landscape or areas of international significance, can be pronounced protected areas with regard to § 17 Act no. 543/2002 Coll., on protection of nature and landscape, as currently amended.*

*Large protected areas:*

- *National park - NP*
- *Protected landscape area - CHKO*

*Small protected areas:*

- *National natural reservation - NPR*
- *Natural reservation - PR*
- *National natural monument - NPP*
- *Natural monument - PP*
- *Protected region - CHA*
- *Significant feature in the landscape - CHKP*

### **CHKO Lesser Carpathians**

- by regulation announcement of the Ministry of Culture SSR no. 64/1976 Coll. of 5 May 1976,
- in the places of tunnel portals, all the assessed versions touch this protected area marginally as well as in places of locations of the output flues from the tunnels, the rest of the area (the central part) passes under the tunnel,
- the scope and conditions of protection are determined by § 18 Act no. 543/2002 Coll., on protection of nature and landscape, as currently amended. In the area of Protected landscape area, if this act does not state otherwise, second grade of protection is effective (§ 13).
- CHKO Lesser Carpathians is the only large protected area of vinicultural character. The only accessible cave in this CHKO is Driny cave in Smolenický kras. To a large extent, the area is covered by deciduous forests with beech, common ash, Sycamore maple and lime tree. In thermophilic steppic grasslands, we can find *Adonis vernalis*, *Chrysopogon gryllus*, wind flower, *Dianthus Lumnitzeri*. In Slovakia, the following species are only found in this location: *Ruscus hypoglossum*, *Cornilla emerus*, *Rhamnus saxatilis*. Lesser Carpathians have a large variety of species (insects, birds and other).

### **NPR Šúr**

- by regulation announcement of the county environmental authority (KÚŽP) in Bratislava no. 1/2009 of 25 May 2009 which pronounces the Natural reservation Šúr and its protected zone - effective since 1/6/2009

- protected zone pronounced in accordance with § 17 - article 3 Act no. 543/2002 Coll.
- is located to the north in the versions 7a, 7b, 7c and 2a, 2b; the nearest is the highway found in the vicinity of about 50 m from the border of the protected area (to the north of Šúr channel)
- the subject of protection is the last and the greatest part of the high boggy alder forest, with remains of wetlands and peaty meadows on its border. Xenothermal biocenosis is located here as well. Abundant biodiversity in a small area, a lot of endangered taxons.

#### **PR Jura lake**

- by regulation of the Ministry of Culture SSR no. 1160/1988-32 of 30/6/1988, grade of protection: 4 - Regulation KÚŽP in Bratislava no. 1/2004 of 12/5/2004 - effective since 15/5/2004
- protected zone not pronounced, effective in accordance with § 17 - article 7 Act no. 543/2002 Coll.
- located approximately 2,000 m in the north of tunnel Karpaty in versions 7a, 7b, 7c on approx. 8.000<sup>th</sup> km
- the subject of protection are communities of birch alder trees and mountain peatbogs in Lesser Carpathians.

#### **PR Pod Pajštúnom**

- by regulation of KÚŽP in Bratislava no. 8/2007 of 19/11/2007 - effective since 1/12/2007, zone A – protection grade: 5 – 136.9531 ha, zone B – protection grade: 4 4,4666 ha
- protected zone not pronounced, effective in accordance with § 17 - article 7 Act no. 543/2002 Coll.
- located approximately 1,660 m to the north of version 7a, 7b, 7c and 2a, 2b on 14.000<sup>th</sup> km
- the subject of protection are communities of beech flowery forests, oak-hornbeam forests, Carpathian and lime-maple scree forests in their natural species constitution and structure and protection of pioneer and Sub-Pannonic steppic grasslands on carbonate substrate.

#### **PR Strmina**

- by regulation announcement of Ministry of Culture SSR no. 1160/1988-32 of 30/6/1988 on ŠPR - effective since 1/9/1988
- protected zone not pronounced, effective in accordance with § 17 - article 7 Act no. 543/2002 Coll.
- located approximately 450 m in the north of version 7a, 7b, 7c on 10.000<sup>th</sup> km
- the subject of protection are karst formations and well-preserved botanical and animal species of Lesser Carpathians

#### **PR Zlatá studnička**

- by regulation announcement of the Ministry of Environment SSR no. 83/1993 Coll. of 23/03/1993 – effective since 1/5/1993
- protected zone not pronounced, effective in accordance with § 17 - article 7 Act no. 543/2002 Coll.
- located approximately 160 m of the Karpaty tunnel on 16.500<sup>th</sup> km in version SPL
- the subject of protection is the only locality within Lesser Carpathians with one type of geobiocenosis. Apart from this, there are fragments of extreme fir beechwood with

oak tree. The area provides many possibilities of botanical as well as zoological research.

#### **CHA Svätajurské hradisko**

- by regulation announcement of KÚŽP in Bratislava no. 8/2001 Coll. of 17/09/2001 – effective since 01/01/2002
- protected zone is not defined according to the law
- located approximately 230 m in the south of tunnel Karpaty in version SPL on approx. 13.600<sup>th</sup> km
- the subject of protection is the significant population of endangered species *Ruscus hypoglossum* L.

#### **PP Limbašská vyvierajúčka**

- by regulation announcement of the Ministry of Culture SSR no. 1165/1988-32 of 30/6/1988 of 30/6/1988
- protected zone not pronounced, effective in accordance with § 17 - article 8 Act no. 543/2002 Coll.
- located approximately 1.300 km to the north of the tunnel duct in version SPL on approx. 16.000<sup>th</sup> km
- the subject of protection is the significant karst phenomenon which documents the specific development of the karst hydrography in Borinský kras. CHÚ has a great significance for speleological research as well as for educational application.

#### **PROTECTED TREES**

*Exceptionally significant trees or their groups, including lines of trees in terms of culture, science, environment, landscape or aesthetics which were pronounced by means of generally obligatory regulation by the county environmental authority KÚŽP. Also trees within the forest ground fund can be pronounced protected.*

The assessed versions do not interfere with the protected trees pronounced within the monitored area. The nearest protected tree is in the area of Grinava, "Poplar tree Grinava", which is located approximately 1.300 km from version SPL.

### **C.II.10. TERRITORIAL SYSTEM OF ENVIRONMENTAL STABILITY**

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#### *Supra regional, regional, local.*

*With regard to § 2 Act no. 543/2002 Coll., on protection of nature and landscape, as currently amended, the territorial system of environmental stability is also considered to be the whole areal structure of the mutually interconnected ecosystems, their components and features, which secures variety of conditions and forms of life in the landscape. The elements of this system are given by biocentres, biocorridors and interactive features of supra regional, regional or local significance.*

The area contains features of all levels. Their layout is plotted in the *Graphic attachment no. 3.*

Names and numbers of the features ÚSES is given by the document Feature updating of regional ÚSES of the city of Bratislava (2005) which was the basis for the territorial plan of Bratislava city at the same time. They are also given by the territorial plan of the autonomy county of Bratislava as well as territorial plans of the affected locations and municipalities.

#### ***Supra regional level***

Terrestrial supra regional biocorridor NRBK 82 passes on the ridge of Lesser Carpathians and connects the supra regional biocentre NRBC 90 Biele Hory in the northern part of Lesser Carpathians and the supra regional biocentre NRBC 120 Devínska Kobyla, in the east of Bratislava, in a separate part of CHKO Lesser Carpathians on the border with Austria.

In the assessed area, the NRBC 116 Šúr (including NPR Šúr) is located and is connected with the hydric supra regional biocorridor NRBK 23 which goes along the watercourses of Little Danube and Šúr channel. In the north-east part of the assessed area, the NRBC 115 Martinský les is located.

### ***Regional level***

In the area of CHKO Lesser Carpathians, within the assessed area, the regional biocentre *RBC 8 Zbojnička – Panský les* is located, including forest communities, as well as *RBC Zlatá studnička*. The regional biocorridor *RBK VIII Vydrica s prítokmi* goes across the area of CHKO.

In the western part of Lesser Carpathians, the following are documented: the hydric biocorridors *RBK IX Suchý potok (Ondriašov potok)* which flows through Lozorno in the west, and *RBK Stupavský potok* flowing through Stupava as well as Borinka municipality. To the west of Záhorská Bystrica, there is the regional biocorridor *RBK II Stará Mláka s prítokmi*.

On the opposite side of Lesser Carpathians in the north of the city part of Bratislava – Rača, on the south-east slopes of Lesser Carpathians, the regional biocentre *RBC 7 Vajnorská dolina* is located as well as the interconnected regional biocorridor *RBK XVIII Potok Strúha*. This one is connected to the regional biocentre *RBC 28 Šprinčov Majer* which contains water and wetland communities. Little biocentres of regional significance are documented in the area of Pezinka in the north of Grinava (part Pezinka), then locations Nad Jurom and Gaštanica in the area of Svätý Jur municipality. Fofovský and Fanglovský potok and biocorridor Duby, which is located between these two watercourses, are regional biocorridors. Furthermore, ecotonal biocorridor on the border of a forest complex and vineyards on the eastern slopes in the area of Svätý Jur municipality is also documented as a regional biocorridor.

In the south of MČ Rača, from the border of CHKO Lesser Carpathians in the direction of MČ Vajnory, there is a regional biocorridor *RBK XVII Račiansky potok s prítokmi*. This is connected to the regional biocorridor *RBK Šúrsky kanál*, which passes the north-west and south-west border of *NRBC 116 Šúr*.

*RBK Čierna voda* is also a significant biocorridor, it is delimited by D1 Highway and continues up to the confluence with Little Danube.

### ***Local level***

There are several features of the local system ÚSES within the assessed area. Their existence and names are given by the territorial plans of the affected municipalities and divided according to the cadastral areas.

#### *cadastral area Lozorno*

Three biocentres of local significance are defined in the cadastre. MBC1 represents afforested projection of Balgava and the whole southern part of the reservoir Lozorno (meadows, river mouth of the steram into the reservoir, Včelíny location), its function being fauna and flora as well as bank vegetation protection. MBC2 represents the whole forest area Suchý potok with the connection to the regional biocorridor in the surroundings of Suchý potok (Ondriašov potok), its function being protection of forest with sand dunes as well as watercourse and bank vegetation protection. A local biocorridor MBK1 Suchý potok goes through the whole municipality, its function being protection and revitalization. Another local biocorridor MBK2 goes through the southern part of the city in the western direction; it represents meander of the former watercourse Suchý potok and former millruns, its function being protection and revitalization. MBK3 assembly of landscape green vegetation from the margin of the municipality with connection to the wetland habitat location and connection to the dust road around the former fruit orchard to the forest complex around Rakytov stream.

*cadastral area Pezinok*

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ÚSES on the local level is determined by a network of streams springing in Lesser Carpathians and draining channels with follow-up lines of ruderalized bank vegetation, not wider than several metres. These biocorridors' function is protection and revitalization, they interconnect the biocentre localities on the borders of the forest complex of Lesser Carpathians and RBK Šúr channel which is connected to NRBC 116 Šúr. In particular, the following watercourses and bank vegetations are included: Viničnianský channel, Mahulianka channel and Blatiná channel.

*cadastral area Viničné*

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Within the cadastre of this municipality, the following local biocentres are documented: reservoir Viničné and a local biocorridor Viničniansky channel with insignificantly developed bank vegetation (alternation of grasslands, shrubs and trees). Also with the function of protection and revitalization with regard to the local fauna and flora in the predominantly agricultural landscape.

*cadastral area Slovenský Grob*

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Within the cadastre of this municipality, there is a small local biocentre (local fauna refugium) along Mlynský potok with the local biocorridor along Viničniansky channel which also has the same characteristics and significance as in the other sections.

*cadastral area Stupava*

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The cadastral area of the municipality includes four local biocentres of predominantly forest character (Malgrunty, Dúbravy, Stupavský park, Lingraby); the nearest to the assessed versions is local biocentre Lingráby which is located in the forest complex in the east of the city area. Local ÚSES network is completed by a hydric biocorridor of Záhorský potok and biocorridors connecting local biocentre Dúbravy with the forest complex in the east. These are delimited along the dust roads on the border of the forest complex.

*cadastral area BA - Záhorská Bystrica*

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Marianský potok as a local hydric biocorridor continues through the cadastral area of Záhorská Bystrica to the south where it is connected to RBK II Stará Mláka. It is a watercourse with non-complex, ruderalized bank vegetation.

*cadastral area Marianka*

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The local ÚSES is made of three biocentres: Háj (forest complex), Nad kameňolomom (it is a border of the forest complex and meadows), and a biocentre of a conversation area – forest park. The connecting point of the biocentres is the local biocorridor which goes in the surroundings of Mariánský potok. Two other biocorridors have been proposed as a connecting point with the local biocentres; these go on the border of the forest vegetation (forest park – Háj and Mariánský potok – Háj).

*cadastral area Svätý Jur*

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ÚSES of the cadastral area of the municipality on the local level is completed in the vicinity of the assessed versions by Júrsky potok (it has partially preconditions to meet the functions of biocorridor in the built-up area), biocentre Háj (around the pond on the crossing of Šúr channel and Strúha stream, a significant floristic location), Myší vrch and Kamenný kopec along Javorník stream (Račí potok) as a significant location of avifauna, and other smaller biocentres within the viniculturally applied landscape: biocentre Dubníky is made up of vineyards and gardens, Kulky represents a refugium for wildlife and is made up of tree and

shrub vegetation, a similar refugium being created by biocentres Stapáky – Krajčire, Panciere, and Pitvory. Neštich camp is a significant floristic location as well as the locality of Biely Kameň nad Neštichom.

## **C.II.11. POPULATION**

*Demographic data (for ex. number of inhabitants involved, age structure, health condition, employment, education), settlements, activities (agriculture, industry, forest management, services, recreation and tourism), infrastructure (traffic, product-lines, telecommunications, waste and waste disposal).*

In all the assessed variants the proposed highway D4 in the section Ivanka North – Záhorská Bystrica is situated at the edge of Bratislava, the capital city of Slovakia, and its municipal districts of Vajnory, Rača, Záhorská Bystrica, and other municipalities of Marianka, Borinka, Svätý Jur, Ivanka pri Dunaji, Stupava, Lozorno, Pezinok, Viničné, Slovenský Grob, Chorvátsky Grob, and Bernolákovo.

Bratislava, as the capital city, is the administrative centre. 428 791 residents with permanent residence live in its territory with acreage of 367.7 km<sup>2</sup>. The suburban area of the capital city forms the whole of Bratislava region, where another approx. 190,000 residents live. The number of people present in the city increases by 40 % during the day. It results from the fact that people commute to work, school, for tourism purposes and from the fact that Bratislava is the administrative and economic centre and the destination of the transit transport.

In terms of territorial and administrative arrangement, the municipal districts of Vajnory and Rača belong to the district of Bratislava III, Záhorská Bystrica to Bratislava IV. The municipalities of Borinka, Lozorno, Marianka, Stupava belong to the Malacky district. Pezinok, Slovenský Grob, Svätý Jur, Viničné are part of the Pezinok district. The municipalities of Bernolákovo, Chorvátsky Grob, Ivanka pri Dunaji belong to the Senec district.

Basic statistical indicators on permanent residents are shown in the following tables:

**Table C.II.10: Population of the municipalities involved and population density in 2008**

Municipality	Number of permanent residents			Population density (inhab./km <sup>2</sup> )
	Total	male	female	
Bratislava *	428,791	201,318	227,473	1,166
Bratislava - Vajnory	4,869	2,442	2,427	360
Bratislava - Rača	20,481	9,646	10,835	866
Bratislava – Záhorská Bystrica	3,071	1,496	1,575	95
Borinka	586	287	299	37
Lozorno	2,935	1,477	1,458	66
Marianka	1,226	604	622	380
Stupava	8,940	4,290	4,650	132
Pezinok	21,839	10,492	11,347	300
Slovenský Grob	2,037	997	1,040	200
Svätý Jur	5,012	2,386	2,626	126
Viničné	1,849	900	949	192
Bernolákovo	5,257	2,529	2,728	185
Chorvátsky Grob	2,859	1,406	1,453	189

Ivanka pri Dunaji	5,877	2,817	3,060	412
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Source: Statistical Office of the Slovak Republic

\* number of residents in all municipal districts of the capital city of Bratislava

**Table C.II.11: Population productivity and increase in 2008**

Municipality	Pre-productive age (0-14) together	Productive age together**	Post-productive age together**	Total population increase together
Bratislava *	50,930	276,935	100,926	1,864
Bratislava - Vajnory	645	3,200	1,024	210
Bratislava - Rača	2,349	12,563	5,569	43
Bratislava – Záhorská Bystrica	458	1,918	695	219
Borinka	82	349	155	29
Lozorno	446	1,897	592	34
Marianka	182	781	263	35
Stupava	1,316	5,655	1,969	195
Pezinok	3,198	14,636	4005	183
Slovenský Grob	281	1,267	489	43
Svätý Jur	743	3,189	1080	40
Viničné	287	1,201	361	54
Bernolákovo	764	3,248	1,245	108
Chorvátsky Grob	602	1,825	432	411
Ivanka pri Dunaji	888	3,572	1,417	100

Source: Statistical Office of the Slovak Republic

\* number of residents in all municipal districts of the capital city of Bratislava

\*\* productive age (15-54 women), (15-59 men)

\*\* post-productive age (55+ women), (59+ men)

The state of health of the population is a result of several factors – economic and social situation, nutritional habits, lifestyle, level of health care and environment. The medium life expectancy at birth (or also the so called expected length of life) is a basic indicator of the level of living conditions of the inhabitants as well as death conditions. It means an average number of years of a newly-born baby life expectancy which may be achieved while taking into account specific death rate in the respective period. The mortality development has been positive, since the early 1990s. The medium life expectancy at birth has increased in both genders, reaching a national value of 70.85 years for men and 78.73 years for women. (Source: The Statistical Office of the Slovak Republic). Medium life expectancy in the territory of the Bratislava region reaches over 72% in men and 79% in women, which represents more than the national average, despite the relatively heavy pollution in the area and the city problems, such as dependences, prostitution, etc. The health condition of the population appears as better, also due to higher education of the Bratislava region inhabitants, which implies a rational attitude to lifestyle (nutrition, movement, stress management, etc.)

There is the largest number of higher education institutions in the Slovak Republic. In the school year 2008/2009, there were 11 universities' with rector's offices and faculties situated in Bratislava.



The Bratislava region is the wealthiest and economically most prosperous region in Slovakia, despite being the smallest of the regions by area and the third smallest in terms of residents. This fact is also documented by the unemployment rate (4,7 % for all the Bratislava region) which is well below the national average (the national average reached 12,1 % in 2009). The employment in the given territory in 2009 is described in more detail in the following table.

**Table C.II.12:** *Economic activity of the population in the given territory in 2009*

	Economically active persons	Unemployed	Unemployment rate
Bratislava Region	340,934	15,853	4.36 %
Bratislava III	33,030	1,192	3.39 %
Bratislava IV	54,420	1,951	3.39 %
Malacky	34,436	3,009	8.02 %
Pezinok	30,826	1,856	5.68 %
Senec	28,161	1,517	5.05 %

**Bratislava** is the capital city of Slovakia as well as the biggest city in the country. Urban arrangement of the city has been gradually developing for centuries since the ancient times. The oldest settlement of urban type originated in the Bratislava territory in the 2<sup>nd</sup> century BC (Celts settled there). The position stabilised with the help of the morphology of the territory as well as of the ford across the Danube river. Due to its strategic location, the city has always possessed an important position among other cities. Bratislava originated in a location where important traffic routes used to meet - the Danubian, connecting the east and southwest Europe with the west, and the Amber route, connecting the south Adriatic area with the north, Baltic area. The Slavs settled in Bratislava in the 6<sup>th</sup> century. The first written mention dates back to 907. The settlement gained the town privileges in 1291 from the Hungarian king Andrew III. Between 1526 and 1784 Bratislava became the capital of Hungary. Hungarian state administration was seated in Bratislava. The gothic cathedral of St.Martin hosted the coronations of the Austro-Hungarian kings.

In 1465, the first university in Slovakia, Academia Istropolitana was founded in Bratislava. It was founded by King Matthias Corvinus with the approval of Pope Paul II. Two years later, it began to operate at 4 faculties: theological, law, medical and artistic (philosophical).

At the turn of the centuries, 17<sup>th</sup> to 18<sup>th</sup>, the medieval centre merges with the outskirts into a unit enclosed by palisades (internal fortification was demolished) and in terms of structure and operation the city begins to develop in a radial-circular the sense. The industry development in the second half of the 19<sup>th</sup> century left its mark of sprawl of industrial objects on the perimeter of the city. In this time period, the development of the settlement structure according to the social stratification of the population begins to be applied. New residential areas arise, as well as worker colonies related to industrial development.

Until 1918, Bratislava was part of Hungary, later of the Habsburg monarchy. Since 1919, Bratislava has been the capital of the Slovak Republic.

After the war, in 1946, the territory of the city was extended by eight adjacent municipalities (Petržalka, Vajnory, Prievoz, Devín, Karlova Ves, Dúbravka and Lamač). In the 1950s and 1960s, there were great demolition interventions occurring in the city, aimed at improving the city operation. In this time the housing fund is renewed by the construction of the first apartment houses of the residential areas. The existing industrial sites are renovated and new ones are built. University campuses arise, etc. In 1968, other municipalities were annexed to Bratislava, namely Podunajské Biskupice, Vrakuňa, Záhorská Bystrica, Jarovce, Rusovce, Čunovo. The realization of new housing areas and the radical solutions of traffic problems required major demolition interventions to the detriment of the original historical housing fund, mainly in the city centre, in the 1970s.

Bratislava is currently one of the two main settlements of international importance, having significant relations with the regions of Vienna, Brno, Budapest.

The prerequisite for making the most of the strategic potential of Bratislava and its hinterland is to improve the quality of the environment, which, despite positive tendencies, is one of the most damaged and most heavily impacted in Slovakia.

**Table C.II.13:** *Services available in the capital city of Bratislava, as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	Yes
Pension *** to *	Yes
Tourist accommodation **, *	Yes
Cottage settlement *** to *	Yes
Camping **** to *	Yes
Other mass accommodation facilities	Yes
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Záhorská Bystrica** was first mentioned as a municipality in a deed of donation by the Hungarian King Karol I. Robert in 1314. In past, it was named Pistrich, Byzhrycza, in Hungarian Besztercze, in German Bissternitz or Wisternitz. The village was subject to the Stupava estate. In 1377 it was donated to the order of Pauline Fathers from Marianka by Louis the Hungarian. In the early 16<sup>th</sup> century a part of the municipality belonged to the Stupava estate and a part to the Marianka Pauline Fathers. When the Stupava estate passed into Gašpar Szerédy's property, thanks to the Hungarian King Ferdinand I, Záhorská Bystrica became permanent part of the estate. As one of the first municipalities, it was inhabited by the colonists from Croatia, later by farmers from Moravia, Austria and neighbouring estates. A tax documentation from that period mentions Záhorská Bystrica as Bystricz, the Slovak and Croat village. It gained the name of the richest village of that part of Bratislava in the 18<sup>th</sup> century. Not only it was rich in population (1 503 residents), but it also had an important agricultural production. The soil was very fertile and suitable for growing vegetables, mainly cabbage. The Bystrica residents were known for their farming qualities and selling their goods in Bratislava and Vienna. Even after being annexed to Bratislava in 1972, Záhorská Bystrica has maintained its countryside character.

**Table C.II.14:** *Services available in Záhorská Bystrica, as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	no
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no

Camping **** to *	no
Other mass accomodation facilities	no
Commercial insurance company	no
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**The municipal district of Rača** is first mentioned in the royal deed of donation document from 1245, by which the lands around the settlement of Recha (Rača) up to Čierna voda were given to Lelek and Peter and their sons. The Rača residents are very proud of their past. A town chronicle quote: "Since Rača has been Rača, the Rača people grow vine". Grape-vine has been cultivated in the area since the Roman times. Villa Racha was mentioned in 1237. Later on, by a decree from 1767, Maria Theresa acknowledged the red wine, nowadays know by name of Račianska frankovka, and saw it fit for the imperial table. The first settlement in the region was documented by findings dating back to the end of the 8<sup>th</sup> century. The Slavs were the original population. After the Turk invasion, the German colonists arrive in the 13<sup>th</sup> century, and then the Croats in the 16<sup>th</sup> century. Since 1647 Rača has possessed the privileges of a lord owned town. In the Middle Ages, the vineyard area covered the space between the castle hill and Karlova Ves and even to Rača. The old, new and planned vineyards are mentioned already in the King Andrew III privilege exempting the winemakers of Bratislava from taxes in the 13<sup>th</sup> century. The municipal district of Rača was an independent municipality, named Račišdorf until 1946. Today, Rača is one of the Bratislava's municipal districts, covering an area of 23,6 km<sup>2</sup> and being home to almost 21 thousand residents. It consists of three local areas - the Rača itself, Krasňany and Východné (Rendez). The construction of the housing area of Krasňany started more than 50 years ago. It belongs to one of the oldest neighbourhoods in Bratislava. The housing area of Východné originated as a railway transshipment station. At present, there is a small railway museum.

**Table C.II.15:** *Services available in Rača, as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	Yes
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

According to archeological findings, the first settlement in the Vajnory municipality dates back to the Late Iron Age (la Tene), that is approximately 2300 years ago. During a highway construction, there was also found a Slavonic-Avar cemetery, including ten skeleton tombs and six Slavonic urns of ancient shape. In times of the Great Moravian Empire, there were the settlements of Prača and Dvorník belonging to the castle area on the Bratislava castle hill. The Dvorník inhabitants served the feudal lords from the surroundings and castle, obliged to

supply them with wine. In Prača, there lived warriors who shot a slingshot or made arms. The oldest written mention dates back only to 1237, when the place had become a developed village (villa). It bore the original Slav name of Prača, or Pračany. From 1307, when the municipality was owned by an Austrian monastery in Heiligenkreuz, the German name of Weinern had come into usage, referring to the prevailing activity of the residents - viticulture and wine-making. The name has been used to this day in the adapted Slovak form of Vajnory. From 1525 to 1848, the present municipality of Vajnory belonged to the city of Prešporok. (Bratislava) The abolition of serfdom represented a change, allowing the municipality to become independent in 1851. It became a part of Bratislava from 1946, gaining the position of a Bratislava municipality in 1990.

**Table C.II.16:** *Services available in Vajnory, as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	no
Pension *** to *	Yes
Tourist accommodation **, *	Yes
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

Marianka is the oldest pilgrimage site in Bratislava. Its history dates back to 1377 when the King of Hungary Louis I the Great, Anjou laid the cornerstone of the church and gave it to administration of the Pauline fathers, which lasted until 1786. The monastery was later bought by the Earl Schwarzenberg from Orlik nad Vltavou who rebuilt it into a hunter's manor. The monastery became a mansion that was owned by a number of families of earls. Since the 1927, the pilgrimage site has been administered by the Congregatio fratrum consolatorum de Gethsemani. In 1950 the order was abolished together with other religious orders. In 1990 they resumed the Marianka religious administration.

Marianka was known for the slate mining from as early as the beginning of 17<sup>th</sup> century. The material was processed for various purposes and exported from Marianka until the end of World War I.

Due to its ideal location near the capital city (at the distance of 11 km from Bratislava), Marianka has recently been experiencing a construction boom, granting the town a more modern shape.

**Table C.II.17:** *Services available in Marianka as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	no
Fuel station	no
Car repair shop	no
Motor vehicles spare parts and equipment shop	no

Hotel (motel, botel)	no
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping ***** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

**Borinka**, called Pelystan at the time, was mentioned in a document from 25 July, 1314. The town has developed in the area under the Pajštún castle. In 1828, the municipality counted 98 houses and 698 residents. They thrived on agriculture, lime-burning, wood utensils and brooms production and sale in Bratislava and surroundings. In the 18th century, there were an explosives factory, paper mill, brick factory, glass factory and a sawmill. In the location of Medené Hámre, copper kitchen utensils were produced. There is also a stone-pit in the municipality. In 1950, a Collective farm was founded. Today, the residents travel for work mostly to Bratislava.

*Table C.II.18: Services available in Borinka as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	no
Fuel station	no
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	no
Hotel (motel, botel)	no
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping ***** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

**Stupava** was inhabited already in the Bronze Age. The Celts were the first ethnically recognised settlers. Later, the territory became a barbarian neighbour to the Roman Empire (Pannonia province). Out of the area of today's Slovakia, only the transdanubian portion of Bratislava was a part of it. A number of military camps and civic objects were also built on the other bank of the river. The attention focused mostly on securing the border territory called Limes Romanus. The Roman activity considerably increased during the so called Marcomannic wars (AD 160-180). In that time was probably founded the big fortress of Iža near Komárno and a smaller station in Stupava. It was built on a slightly elevated area. There had previously been a Germanic settlement. The location was selected because of its strategic position on the Amber route, an important trade road at that time. It was possible to supervise most part of the Záhorie and Bratislava gate territory from the fortress. In case of need, it was possible to get in visual contact (e.g. using fire signals) with Carnuntum, distant 30 km. The permanent Slavic settlement followed, which is documented by the findings from a Slavic burial place including ceramic object from centuries 6<sup>th</sup> to 9<sup>th</sup>. The burial place is located in

the local district of Mást. Béla IV, King of Hungary, first mentions Stupava, called Ztumpa, in a deed of donation in 1269. In the late 13th century, the Stupava stone castle was built in the town. It has later acquired the name of Pajštún, being the seat of the lords of Pajštún and Stupava. The castle owners later moved to a more comfortable mansion in Stupava, owned by the Palffy family. The Károlyi family, the last owners, left the castle in 1945. Thanks to its exceptional position, the town soon became an important centre and crossroads of trade routes. The local market place and traditional markets were famous, which gave origin to a "thirtieth station" where a fee on transported goods in the amount of 3 percent of the price of goods was collected. The residents mostly lived off agriculture, animal growing, fishing, forest work, lime-burning and other crafts and trade. The most important crops were flax and hemp, which were used to produce oil. The pressing mills, called "stupa", were built on the Stupavský brook, used for extracting the oil from flax and hemp. The agriculture production of the 16<sup>th</sup> century gave rise to a brewery, later to a paper mill and a washboard facility. A starch factory was built in the 19th century. In the early 20<sup>th</sup> century, a cement factory, cannery and distillery were established.

**Table C.II.19:** *Services available in Stupava as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, botel)	Yes
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	Yes
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Lozorno** is mentioned in historical documents first in 1438 where it is called Ezelarn as an urbarium of the Stupava castle owners. The name Lozorno was gradually derived from the name Ezelarn. At the time, Lozorno was a medium sized community, with a part of population originating from Croatia. Most of the population worked in agriculture and vine growing, usually on land belonging to the landlord to whom relevant taxes and tenths were paid.

In the 18th century, the community saw growth not seen before. It had around 2000 inhabitants, own parish, school, and three mills. Later, in 1850, Lozorno became a separate municipality with own municipal notary. It gradually freed itself from the administration by the landlord and the urbarian land was divided among the inhabitants. Thereby, Lozorno became one of the largest municipalities in the Záhorie region with own sources of food and all necessary crafts.

Despite the unfavourable impacts of the first and second world war, Lozorno did not stop developing in the first half of the twentieth century. While the population oscillated between 1500 and 2000, a railway station, steam saw mill and several larger companies were built. Also, a police station that also administered the municipalities of Jablonové and Pernek was operating there. Already prior to World War I, a voluntary firefighter unit with an own

firehouse was active in Lozorno. Education was not lagging behind - a new municipal school was opened, replacing an insufficient building of a church school. After graduating from the municipal people's school, pupils could continue on a burgher school created in the building of a mansion that the municipality purchased from the previous owner.

Between 1970 and 1973, the Bratislava - Malacky highway was built alongside the municipality, increasing the exclusivity of the municipality. The increasing living standard was reflected in the construction of new, modern family homes. Newly established recreation areas of Košariská and Kamenný mlyn contributed to a more pleasant life in the municipality. The development of agriculture was assisted by dams on the Suchý creek in three locations, creating water reservoirs.

**Table C.II.20:** *Services available in Lozorno as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	no
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	no
Hotel (motel, hotel)	Yes
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping ***** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Svätý Jur** has been settled since the Neolithic period (the turn of 4th - 3rd millennium B.C.). Thanks to its favourable natural conditions, especially in terms of defence options, the territory of Svätý Jur has been inhabited sporadically. It is only from the 9th century AD that a continuous population (Slavic) of the present territory of Svätý Jur can be presumed. The oldest written mention of the municipality dates back to 1209. In that year, Svätý Jur was donated to the title of the family of earls from Svätý Jur and Pezinok. Together with Pezinok that was owned by a related branch of the family, Svätý Jur became a seat of earls and economic centre of their properties. Already at the end of the 13th century, solid castles made of stone were built in the burgs (the so-called Biely Kameň in Jur). In 1543, when the last male member of the family of earls from Svätý Jur and Pezinok, Svätý Jur had extensive rights and economic benefits, entitling the inhabitants of the burg to expect favourable future. After the vanishing of the earl family, Svätý Jur and Pezinok (the destinies of both burgs were identical until 1647) belonged to the king, together with the domain with the same name. In 1602, Svätý Jur became a royal town. The town also became the owner of a large domain that included 7 whole villages and parts of 12 villages. The fight for full rights ended in 1647 when Ferdinand III promoted Svätý Jur to the status of a free royal town.

Besides vine growing and wine production, crafts also developed in Svätý Jur; however, crafts never became the major occupation of the inhabitants of Jur.

Already in 1871, Svätý Jur lost its previous benefits and status, changed into a town with a appointed consistor and was subordinated to a county office. The system survived until the end of the Austro-Hungarian Empire. During vine frotter times (appearing in Jur for the first time in 1890) that destroyed a majority of the old vineyards in the domain of Svätý Jur, most

impoverished vine growers asked for jobs in manufactories around Pezinok and Bratislava. The situation only improved after planting of vine grafted to American rootstocks that were resistant to the infection. Lack of subsistence opportunities led a number of Jur inhabitants to emigration to America.

At the end of 1922, Svätý Jur changes, in line with law, to a large village although it was still referred to as a town, and from 1 January 1923 it was subordinated to the Bratislava-surroundings District Office. Svätý Jur lost its urban status in 1943. In the 1944 Neštich was annexed.

**Table C.II.21:** *Services available in Svätý Jur as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	no
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	no
Hotel (motel, botel)	Yes
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	Yes
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Ivanka pri Dunaji** and the adjacent area were inhabited as early as in 4 000 BC, as several archeological findings testify. From the period between the 8<sup>th</sup> and 13<sup>th</sup> century, there are no material remnants of the town and/or the surroundings.

The first written mention of the existence of the municipality is from 1209. It is a deed of donation by which King Andrew II was giving Svätý Jur, Čeklis, Iwand, Eberhart and the town of Kastelan to Tomáš from Hont – Svätójurský for his service in fighting against the Bulgarians at the Morava river in 1205. At the beginning of the 15<sup>th</sup> century, in the period of a considerable German influence, Iwand becomes a German settlement named Aichen. In the 16<sup>th</sup> century, it passes to Hungarians who call it Aicha.

In 1526, after the defeat of the Hungarians at Mohács, when the Turks appropriated a major part of Hungary, King Ferdinand I issued an order to list and describe all courtyards - ports in 1553. The purpose: tax collection. The document identifies the municipality as Iwáni. In the 18<sup>th</sup> century, the Ivanka estate was bought by Anton I. Grassalkovich, a land administrator and an actual secret counsellor of the sovereign Maria Theresa. At the site of a mansion built by Leonard Amade in 1640, he built a hunter summer castle in the Rococo style. At that time, the northern parts of the area were covered by large oak woods, serving as hunting ground. There was a castle with a beautiful Baroque park used for various important social events. Anton I. Grassalkovich, as the new owner of the manor, built also other important edifices on his property, besides the castle. One of the most important was the Baroque church. He established and built a large yard - farmstead and a church school near the church (next to the parish building), which served the residents until 1928 when the municipal school was built. In 1948, after the following two owners (the family Hunyady de Kéthely, and the Jesuits who decided to buy it from Earl Hunyady and moved to the mansion on January 1,



1943), the property was nationalised, passed to the Commissionery of Agriculture that occasionally used the property for various purposes, e.g. educational, etc.

The World War II significantly influenced the life in the village, given its geographical location near Bratislava. After the 2<sup>nd</sup> of April 1945, the liberation of the town, the local life took a new direction. In 1950, a Collective Farm was founded. The collective joined the State property in 1962, creating the National Poultry Enterprise, which, along with the Research Institute of Poultry Keeping and Breeding, determined the direction of the municipality development and offered jobs to a major part of the population. In 1961, the Secondary Agricultural Technical School with a focus on poultry-keeping with a nationwide scope was established. Several scientific institutes of different fields and levels, including the academic, were founded. Their importance crossed not only the village, but also the country boundaries.

**Table C.II.22:** *Services available in Ivanka pri Dunaji as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, botel)	no
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Pezinok** and the territory where the town is located today is mentioned for the first time in a document from 1208 as "terra Bozin". In the following centuries, the town gradually changed from a mining settlement (gold was mined in Pezinok until the 19th century) to a vineyard burg after the second wave of German colonists arrived at the beginning of the 16th century. The effort of the burgers and inhabitants of Pezinok to reach the rights of a free royal town peaked on 14 June 1647 when king Ferdinand III conferred these privileges upon Pezinok. In the 17th and 18th century, Pezinok saw its greatest flourishing and belonged to the richest towns of the Hungarian Empire. Its fame and richness were based on the production of quality wines.

In the 19th century, the town gradually became industrialized. The first factory producing sulphur acid in Hungary was established here, a needle factory, and large brickworks. The temporary growth in the 19th centry was caused mostly by the renewal of gold mining in the domain of Pezinok and building of a railway; Pezinok became the most important town of the Lesser Carpathian Vineyard Area. The first half of the 20th century saw a fall of the town. At that time, Pezinok had no larger industrial companies, and together with a decrease of vineyard production, this caused massive emigration to America. A gradual improvement started only after the end of World War II. Today, Pezinok is a modern district city with mature industry (mostly woodworking, brickworks, and construction production), quality vineyard and wine production, developed trade, and interesting historical monuments. The city is characteristic by its historical centre with typical burger houses, streets in a regular network structure, and residue of former city walls.

**Table C.II.23:** Services available in Pezinok as of the 31 December, 2008

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	Yes
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping ***** to *	no
Other mass accommodation facilities	Yes
Commercial insurance company	Yes
Commercial bank	Yes
Cash machine	Yes

The number of stars (\*) in the table expresses the quality of provided services.

**Viničné** is mentioned for the first time in a donation deed of Andrew II of Hungary to Thomas, the count of Nitra, from 1208. The deed mentions a neighbouring village on the eastern side of Pezinok called Villa Suslan, located in the territory of today's Viničné. Another mention dates to 1256 when a neighbouring village to the south from Šenkvice called Susulan is mentioned in a description of the borders of Pezinok. Jobagiones (highest echelons) - administrators of the Bratislava Castle lived in there. The name Suslan or Susulan is used in documents with Latin text. In the beginning of the 13th century, all villages and settlements around Pezinok, including the present Viničné, were economically developed and independent villages. This and the favourable natural conditions may have been why the territory was settled by German population. In this period, the village is mentioned in historical records as Schweisbach or Swanspoch. When Emperor Charles V sent his armies to fight against the Turks in the 16th century, Spanish soldiers settled, for some time, also in the territory between Bratislava, Senec, and Trnava. During their stay, a number of villages were destroyed and burned down. This village was one of them. The records of the Bratislava county from 1553 say about the Swanczpoch village that the Spanish burned down "15 port (combustos) per Hispanos". In the second half of the 16th century, new population started to settle here; according to a historical record from 1773, Slovak was the prevailing language of the population. The maps and documents from the 19th century from the period of the Austro-Hungarian Empire mention the village under the Hungarian name Hattyú patak (Labutí potok, swan creek). In the period before World War I, the name Labudová was also used. The current name of the municipality, Viničné, was created in 1948.

**Table C.II.24:** Services available in Viničné as of the 31 December, 2008

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	no
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	no
Hotel (motel, hotel)	Yes
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no

Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

**Slovenský Grob** is mentioned for the first time in a donation deed to Šebuš when the land of Dvorník was donated in 1214 under the name Monar. The existence of Monar village is also confirmed in a record from 1296 when a dispute for the village existed. The second Monar, mentioned in 1214, should probably be identified with the present Slovenský Grob. In 1324, the Monar village is mentioned for the last time and thus, it had to be depopulated sometimes in the 14th century; however, it was repopulated, by Germans, without doubt, and it got its new name Garab - ditch.

In 1548 the Spanish army completely burned down the village and a re-settlement by Croats came; these also settled in the Slovenský Grob. In a 1634 visitation (inspection) by the Bratislava County, these villages are referred to as Horvat Eisgrub and Totaizgrub (Slovenský Grob).

During the entire middle ages, Slovenský Grob was a tributary village and its owners changed several times. The population worked in agriculture and wood-cutting, later also by crafts typical for medieval villages. The buildings of the village made it the line, or street type.

Already long ago, the inhabitants of the settlement worked in agriculture, vine growing, home crafts flourished - weaving of hemp cloth, but especially needlework and bobbin lace work that survived until this day.

The beginning of the 20th century is characteristic by an increase of population that could not be supported by the small fields; this is why inhabitants from our village also left for the world to look for work, especially for America. Also after the war, jobs were rare and unemployment support was insufficient to support families. The joyless situation forced women from Grob to do needlework and bobbin lace work for the market; it became their main work. The period of the Slovak Republic brought jobs; most small farmers, crofters and workers found jobs in factories in Bratislava. After both world wars, the only larger employer in the municipality was the agricultural cooperative.

**Table C.II.25:** *Services available in Slovenský Grob as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	no
Fuel station	no
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	Yes
Hotel (motel, hotel)	no
Pension *** to *	Yes
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

**Chorvátsky Grob** and the settlement in the location was documented by archaeological findings already from the late stone age. The oldest written mention of the municipality, under the name of Monar, dates back to 1214. At that time, jewellery was made in the municipality. In the 16th century, Turkish armies systematically and carelessly devastated the region of the Balkan Peninsula. In fear from the Ottoman Empire, Croats came to Slovakia. When Turks won over Hungary in the 1526 Battle of Mohács, the exodus of Croats became even stronger. Around 200 thousand Croats moved to the territory of the Central Danube. They populated devastated areas and in 1552, they also came to the territory of Chorvátsky Grob. According to a note in the records from 1553, Croatian colonists were invited and settled by earl Illésházy. Croats worked in agriculture and vine growing. Home production developed, and so did folk art - woodcarving, lacing, needlework, and painting. In years 1634 - 1780, the population of the municipality was purely Croatian.

A significant decline of Croats occurred in the beginning of the 20th century, yet its presence survived in the village until this day.

**Table C.II.26:** Services available in Chorvátsky Grob as of the 31 December, 2008

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	no
Fuel station	no
Car repair shop	no
Motor vehicles spare parts and equipment shop	no
Hotel (motel, hotel)	Yes
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	Yes
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

**Bernolákovo** and the surrounding territories have been settled, according to the historical materials, since the Neolithic period. Later settlement is documented in the early bronze age. Many more proofs of settlement come from the 8th century. The oldest written mention of the municipality dates back to 1209. In this year, Andrew II of Hungary donated to Šebeš (Sebastian - the son of Thomas, the count of Nitra), administrator of cellars, the village and title of Svätý Jur (Jengurg) together with villages: Ceki (Bernolákovo), Joan (Ivanka pri Dunaji), Casteilan (Farná), and Ybrehart (Malinovo). Šebeš thus became the founder of an earl family of earls of Pezinok and Svätý Jur. Bernolákovo has always belonged to the Svätý Jur domain. In 1216, the name of the municipality was Cheki. Other historical materials teach that before the 13th century, two settlements existed in the territory of present-day Bernolákovo - Čeki and Lužnica. Later, both settlements merged and the name of the united municipality was Slovakized to Čeklís. The hill called Várdomb holds the ruins of the Čeklís Castle that protected the territory from the south. The Čeklís Castle was probably built after the invasion of Tatars (1241) around year 1290. The chronicles of the village say that at the beginning of the 14th century, it belonged to Charles I Robert of Hungary. In 1324, he donated it to palatine Abrahám Vereš. Since then, it was known under the name Castrum Chekles.

From 1390, the new owners are the Apponyi family. In 1458, the castle and the village belonged to Barbora Denelengi - wife of Šebastián from Rozhanovce. In the beginning of the 16th century, the village had its office and seal. In 1523, the municipality received its first deed of privileges; it became a burg only in the 17th century. In 1553, the Čeklís Castle belonged to Ondrej Báthory and the lords from Pajštún. In the beginning of the 18th century, during the uprising of Francis II Rákóczi, the insurgents completely destroyed the castle and the village of Čeklís. Nearby the old castle location, the Esterházy family had built a new mansion in years 1714-1722.

In 1766 Emperor Maria Theresa founded the first manufactory producing cloth and various types of cotton fabric - print-works in Čeklís. The print-works produced around 3000 circuits of cotton-print and 5000 circuits of zizus. The manufactory in Čeklís was the most important in Slovakia after the Šaštín manufactory. Only these two were permitted to export their goods also to Austria.

In the period of search of small nations for identity, Anton Bernolák, a young catholic priest, comes to Čeklís after completing his studies of theology. This offer made him very joyous as the village was close to Bratislava and was not far from Trnava either. These were the two significant centres that he needed for his language work. He already brought the prints of the first work, the Critical and Philological Discourse on Slavic Letters. Year 1787 entered the history as the year of codifying - enactment of the Slovak language. From the 18th century, the village had a station of a stagecoach post between Bratislava and Blatné. In 1828, the municipality of Čeklís counted 268 houses and 1803 residents. The owners has a large property here used for sheep rearing. In 1910, the municipality had 2103 residents.

In years 1922 - 23, Esterházy lands and construction plots were divided in the municipality - the municipality extended at a very fast pace. In that year, Čeklís has approximately 5000 inhabitants. In 1948, the name of Čeklís was changed to Bernolákovo.

**Table C.II.27:** *Services available in Bernolákovo as of the 31 December, 2008*

Selected services	Value
Food store	Yes
Restaurant facility	Yes
General store	Yes
Fuel station	Yes
Car repair shop	Yes
Motor vehicles spare parts and equipment shop	no
Hotel (motel, botel)	no
Pension *** to *	no
Tourist accommodation **, *	no
Cottage settlement *** to *	no
Camping **** to *	no
Other mass accommodation facilities	no
Commercial insurance company	no
Commercial bank	no
Cash machine	no

The number of stars (\*) in the table expresses the quality of provided services.

## **Activities of the Residents**

The production of the Bratislava region, consisting of industry, construction, services and agriculture, represents a significant part of the national economy based on the GNP creation. The industry, agriculture, as well as services have undergone considerable transformation and structural changes. Many businesses closed, many were established resulting in changes in the number of workers in the individual sectors.

Over the last 20 years these changes resulted in the highest work productivity and almost a 27 % share of the Bratislava region in the GNP creation in Slovakia. Similarly, the GNP creation per inhabitant reaches 160% of the EU regional average in the Bratislava region (The Statistical Office of the Slovak Republic, in 2007).

It needs to be said that the distribution of the activities, mainly industrial ones, is not homogeneous in the region. They are concentrated in Bratislava, while being less present in the surrounding districts and municipalities. Consequently, most of the municipalities involved performs the functions of housing, recreation and relaxation with a very few production activities.

### **Industry**

The industrial production consists mainly of vehicle production companies, refineries, chemical substance and artificial fiber producers, as well as food, drink and tobacco producers.

Over the last years, the industrial production of the Bratislava region has exceeded the national average, not dropping below 32,9 % of the national production in the last decade.

The most significant employers in the region are Volkswagen Slovakia a.s., Slovnaft a.s., SPP a.s., Slovenské elektrárne a.s.. Besides Bratislava, there are no other important industrial companies in the municipalities involved.

### **Agriculture**

The agriculture land covers 45,6 % (as of 31 December, 2008) of the whole area. The soil is very fertile, yet suffering from lack of water in the growing season. The territory boasts a long vine-growing tradition. Despite of that, there are many long unmanaged and vanishing vineyards and fruit gardens. The structure of the agricultural land use has been undergoing changes in relation to current demand. The greatest change is a considerable decrease in the vegetable planting, in contrast with the growth of cereal and oilseed production. The production aims at supplying the city of Bratislava. The agricultural production of the Bratislava region represents only 5,6 % of the national production, based on the profit value. Nevertheless, the region is the second largest, after the Nitra region, in grape-vine growing.

### **Forest management**

The forestation of the Bratislava region represents 75 195 ha, that is 36,6 % of its overall area (data from the end of 2008). Compared to the national forestation rate, reaching 41 % (2 007 142 ha) in 2008, the forestation of the Bratislava region is slightly below the average.

The less forested districts are the Bratislava I, II, V and Senec with the forestation under 15 %. The Malacky district counts a 30 % forestation. The most forested districts are those of Bratislava III, IV and Pezinok, with forests covering a 45 % of their respective areas.

In terms of forest classification, there are protected and special purpose forests in the territory of Bratislava, and also production forests in the area of the districts of Malacky, Pezinok, and Senec.

The forests are managed by Lesy SR, š.p. Banská Bystrica, Mestské lesy v Bratislave and other smaller management organisations in accordance with the valid forest management policy (LHP).

### **Services and Tourism**

In the Bratislava region, and mostly in Bratislava, a vast network of internal trade facilities, hotels and restaurants has been created, where a 33 % of the total number of enterprises aimed at gaining profit and more than a third of the number of sole proprietors in the region performed business activities as of 31 December 2008. In addition to trade, the transformation process of the economy expanded the tertiary sector by a number of entities offering different kinds of market services.

There is the largest number of higher education institutions in the Slovak Republic. In the school year 2008/2009, there were 11 universities' with rector's offices and faculties situated

in Bratislava. The most of the students in the region were enrolled at the Comenius University, Slovak University of Technology and University of Economics. In the field of culture there is a two-hundred-year long tradition of stagecraft bound to the Capital City of the Slovak Republic Bratislava. The Slovak National Theatre has an international reputation, including drama, opera and ballet scenes. Musical life is represented by the Slovak Philharmonic with Bratislava Music Festival and the genre diversity is complemented by other music festivals. There is a number of museums and galleries. The most exhibits and exhibitions are presented by the Slovak National Museum and Slovak National Gallery.

In the region the healthcare services are provided by the network of facilities, most of which is in Bratislava. Highly specialized hospitals, specialized medical centres, and specialized rehabilitation facilities provide medical care with nationwide coverage.

## **Infrastructure**

### Road traffic

The road network in the Bratislava territory and its surroundings is currently characterized by high growth of car traffic congestion. The fundamental roads of the assessed territory are currently the highway D1, highway D2, roads of class I: I/2, I/61, I/63 and roads of class II: II/502, and II/572. The density of the road network in the districts of the Bratislava region, in the Bratislava region itself and in the territory of the Slovak Republic is shown in the following table. The description of the specific traffic situation of the entire assessed territory is elaborated in the independent text annex No.1.

*Table C.II.28: The extent of the road network in the given territory comparing the districts with the region and the entire Slovak Republic.*

Data from the Road Database of the Slovak Road Management	Bratislava City	District: Malacky	District: Senec	District: Pezinok	Bratislava Region	the Slovak Republic
Roads of class I - km	52.7	35.018	42.720	-	131.680	<b>3316.500</b>
Roads of class II - km	31.0	90.955	29.217	59.136	210.415	<b>3643.673</b>
Roads of class III - km	19.8	116.485	140.404	76.316	353.019	<b>10406.412</b>
Highways - km	49.9	34.575	22.424	-	107.588	<b>390.980</b>
Highway feeders - km	-	0.173	-	-	2.465	<b>8.874</b>
Motor roads - km	-	-	-	-	-	<b>179.653</b>
Network of highways and expressways together - km	153.4	277.206	234.765	135.452	806.167	<b>17,946.092</b>
Density of the road network – km/km <sup>2</sup>	0.367	0.282	0.652	0.361	0.382	<b>0.366</b>
Density of the road network – km/1000 inhabitants	2.332	4.030	3.747	2.320	1.300	<b>3.313</b>

### Railway transport

The railway transport network is not as dense as the road one: There are seven railways in the region:

- 100 Devínska Nová Ves – Marchegg
- 101 Bratislava – Petržalka – Kittsee – Wien
- 110 Bratislava – Malacky – Kúty
- 112 Zohor – Plavecký Mikuláš
- 113 Zohor – Záhorská Ves
- 120 Bratislava – Žilina
- 130 Štúrovo – Bratislava
- Devínske Jazero – Stupava

The length of the railway network is currently approx. 169 km. Out of that, the Bratislava railway node covers 79 km. The railway traffic provides approx. 25% of the total number of

people transported from the suburban towns and catchment territory of the Bratislava region to Bratislava.

The capacity of the current railways network and the existing railway facilities shows sufficient reserve potential in view of the present as well as expected use of the railway system. The on-going modernisation is an important step in the railway system development.

#### Air transport

Airport Bratislava - the M.R.Štefánik Airport is situated in the proximity of the crossing of the highways D1 and D4, between the municipal districts of Podunajské Biskupice, Vrakuňa, Ružinov and MD Vajnory. Its current capacity is 3.5 million passengers per year. After the construction of a new terminal, it will increase to 5 million.

The runway system consists of two perpendicular runways and taxi ways. Such a system enables the landing of all commonly used transport airplanes - ranging from the small ones with a single engine to Boeing 747. The runway 04-22 is 2.9 km long and 60 m wide. The runway 13-31 is 3.190 m long and 45 m wide. There are 27 airplane stands in the service area (approx. 125 thousand m<sup>2</sup>).

The airport is comparable to the European airport standard, thanks to its sufficient capacity and technological equipment.

#### Product lines and telecommunications

The route of the highway D4 in all the assessed variants touches several gas lines facilities (DN 150, pressure 2.5 MPa) crucial for the supply of the areas surrounding the city.

All the variants of the D4 highway we assessed (except the variant SPL) shall touch the irrigation pipeline network north of the municipal district of Vajnory equally.

All the proposed variants of the highway D4 collide with the existing HV lines, as well as the planned ones in the section Ivanka North – Záhorská Bystrica, which will have to be coordinated with the potential D4 construction in the future.

In terms of the LV lines, the individual variants shall collide with remote optic cables, remote metallic cables, optic cables and local telephone lines in the section Ivanka North – Záhorská Bystrica.

#### **Waste and Waste Management**

1,414,037.64 t of waste were produced in the territory of the Bratislava region in 2008. Out of that amount, 408 463,48 t underwent material recovery, 134 718,97 t energy recovery, 7 063,72 t were burnt without energy recovery, 579 673,11 t of waste was transported to landfills, and 284 090,45 t was disposed of in a different manner.

There are 4 waste incineration facilities in the territory of Bratislava and the Bratislava region, i.e. the town incineration plant at Vlčie hrdlo, the incineration facility focusing on healthcare waste of the hospital NsP sv. Cyrila a Metóda in Petržalka, Slovnaft a.s. has a plant registered for its own use, and finally the cement factory Holcim a.s. in Rohožník owns one.

In the very area of the city are located three landfills, i.e. in Devínska Nová Ves, at Slovnaft a.s. in the cadastral area of Podunajské Biskupice, a landfill in the area of ÚCOV in Vrakuňa for the sewerage company use. Other landfills in operation in the Bratislava region territory are in Zohor, Stupava, Senec, Pezinok, Budmerice, and Dubová.

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## **C.II.12. CULTURAL AND HISTORICAL MONUMENTS AND SIGHTS**

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Overview of the national cultural monuments (according to the Central List of the Monument Fund) in the municipalities involved in the assessed territory:

#### ***Lozorno***

- Church of St. Catherine, virgin and martyr of Alexandria, from 1629
- Sculpture of St. John Nepomuk and St. Florian



### ***Pezinok***

- Krušičovská manor-house at the corner of Holubyho st. and Radničné square
- Mariánsky column on the Radničné square
- Town hall on the Radničné square
- Renaissance house at 2, M.R.Štefánika st.
- Kaviakov house at 4, M.R.Štefánika st.
- Gothic house at 3, M.R.Štefánika st.
- Palugyayovská manor-house, also Petersovská, at 9, M.R.Štefánika street
- Relief of the Coronation of the Virgin Mary at 19, M.R.Štefánika street
- Memorial of the victims of the World War I at the Roman-Catholic Parish Church
- Roman-Catholic Parish Church in Farská street.
- Memorial of the liberators in Mladoboleslavská street
- Memorial of the heroes of the Slovak National Uprising in front of the entrance to Zámocký park (castle park)
- Castle in Mladoboleslavská street
- Castle Park near the Castle in Mladoboleslavská street.
- Fire station in Mladoboleslavská street near the town fortifications
- Walls (town fortifications)
- Order of Capuchin Friars Minor Church and Monastery in Holubyho street n.91
- Evanjelical Church in Potočná street.
- Lower Church at the corner of Radničné square and Holubyho street.
- Turkish house at 1 Radničné square
- Bujanovská manor-house at 1 Kollárova street
- Art Nouveau houses at 7 Holubyho street, school building at 14 and 19 Holubyho street
- Railway station at 1 Holubyho street
- Baroque house at 5 Holubyho street
- Cajlanský Church in Cajlanská street
- Schaubmarov mill at 255 Cajlanská street
- Palffy paper mill - behind the Pinelova hospital at Fabiánov mill
- Hodossyovská manor-house in Limbašská street
- Catholic Church in Myslenická street
- Evanjelical Church in Myslenická street
- Rozálka Chapel in Suvorova street (next to military barracks)
- The Calvary of Pezinok - blue tourist mark in direction Baba, and along the route of Banský naučný chodník (Mine educational pathway)
- Mine works in the forests around Cajla, and along the route of Banský naučný chodník (Mine educational pathway)
- Winemakers stoneworks - blue tourist mark, and along the route of Banský naučný chodník (Mine educational pathway)

### ***Viničné***

- Roman-Catholic Church of St. Philip and Jacob

### ***Slovenský Grob***

- Roman-Catholic Church of St. John the Baptist from 1635
- Chapel of Mary of the Seven Sorrows from 1790
- Baroque chapel of St. Anne from 1756

#### ***Chorvátsky Grob***

- Roman-Catholic Church of Christ the King

#### ***Bernolákovo***

- Roman-Catholic Church of St. Stephen the King from the 14<sup>th</sup> century
- Baroque manor-house from the early 18<sup>th</sup> century
- Chapel of St. Anne from 1724
- Memorial of Anton Bernolák, who was a parish here
- Mariánsky column in the historical area around the castle
- Historical waterworks from the times of the first republic

#### ***Stupava***

- Roman-Catholic Church of St. Stephen the King from the 14<sup>th</sup> century
- Manor-house, seat of the Pajštún lords
- Townsmen houses in Baroque and Classicist styles in the main street
- Jewish Synagogue

#### ***Bratislava - Záhorská Bystrica***

- Roman-Catholic Church of St. Peter and Paul
- Baroque Roman-Catholic parish building from 1737

#### ***Marianka***

- Monument zone of the town, established in 1993
- Roman-Catholic Church of the Nativity of the Virgin Mary
- Monastery of the Pauline Fathers
- The chapels devoted to the Blessed Mary are located at the pilgrimage site

#### ***Borinka***

- Roman-Catholic Church of the Sacred Heart of Jesus
- Ruin of the former explosives factory from the beginning of the 18<sup>th</sup> century

#### ***Bratislava - Rača***

- Roman-Catholic Church of St. Philip and Jacob
- Palffy manor-house
- Mansion of the Order of the Hospitallers of Saint John of God
- Sculpture of St. Florián
- Sculpture of Samuel Jurkovič on the square in Rača

#### ***Bratislava - Vajnory***

- Roman-Catholic Church of Mary of the Seven Sorrows
- Sculpture of St. Florián
- Vajnory folk house (118, Roľnícka st.)

#### ***Svätý Jur***

- Armbruster Renaissance mansion
- Evanjelical Church, rebuilt from a townsman house

- Gothic Church of St. George
- Roman-Catholic Church of St. Trinity
- Plague Column with St. Trinity statue
- Pallfy Renaissance mansion
- Piarists' monastery
- Zichy family Renaissance aristocratic mansion
- Ruin of the Biely Kameň castle

### ***Ivanka pri Dunaji***

- Roman-Catholic Church of St. John the Baptist
- Chapel of St. Rosalie
- Bell-tower from the 18th century
- Memorial of the General M. R. Štefánik
- Sculpture of St. John of Nepomuk
- Sculptures of St. Valerianus and St. Florian at the Roman-Catholic Church

### **Other historical objects**

- chapel with St. Mary motives north of the Marianka municipality
- stone cross at the edge of the cadastral territory of Marianka and Mást I.
- stone cross at the road I/2 in proximity of the FOI Záhorská Bystrica
- "runes" stone walls originated by removing stones from vineyards and by border making  
They are present at the eastern slopes of the Little Carpathians, between the vineyards and the forest, often covered with greenery.

## **C.II.13. ARCHAEOLOGICAL SITES**

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A separate archaeological survey has been elaborated to enable better evaluation of archaeological and historical values within the area concerned (Duris, 2010).

The high frequency of primeval and historical settlements of the area concerned gives a clear indication of convenient environment with fertile soil and sufficient water resources, sufficient amounts of lumber as well as the plenty of raw materials found within the Little Carpathians area and exploited in the vicinity and surrounding areas (small deposits of copper ores, graphite and lime).

Another important factors with significant impact on intense settlement is the geographically strategic location of the souther part of Little Carpathians making the surrounding of Bratislava an important junction between the Alps, the Carpathian and the Danubian areas. The Bratislava portal and its broader surroundings comprised a vital intersection especially in primeval times, a significant junction for procurement of items and contacts from culturally more advanced centres in the South and South-East Europe. One may even legitimately say that this place was kind of a Central-European transport junction joining two long-range routes, resulting in numerous fortifier villages and unfortified settlements on the elevated ground around Bratislava and Devín, as well as at convenient geographical locations on the southward and westward slopes of the Little Carpathians. The Pan-European North-South route begins in the Mediterranean region, passing through the Bratislava portal through Danube, winding around the foot of Little Carpathians and the Lamac Break to continue

through the Slovakian Morava region (Zahorska Lowland) further up to the Baltic Sea. This so called Amber Trade-Route ran up to the vicinity of Bratislava to meet with the intercontinental Danube-Rhine Route connecting the East with the West (the so called 'Limit Route' during the Roman era) to establish a link between West-European areas with South-Eastern countries.

These main routes obviously branched out within the location of Bratislava portal and the close vicinity to form routes of great importance (e.g. northward along the south-western slopes of the Little Carpathians or even along the Vah River bed).

The existing findings and surveys within the area of Bratislava portal and its broad vicinity have generated valuable facts of great importance with respect to the Primeval, Roman, Slavonic and Medieval settlement structures. That is evidenced by the fact that the area includes sites that are valuable, not only within Slovakia yet also with respect to other Central European locations. Settlements within the Bratislava portal area and the southern part of Little Carpathians can be traced back to the very oldest period of human development - the Paleolith. Paleolithic relics found in the north-west part, around locations in the Lamac Break, prove the first settlement from the said period in the Bratislava portal and its broader vicinity. The Mesolite Period is documented by findings recovered in the Sur pri Jure nature conservation area with typical microlithic stone industria from the said period . Neolite brings fairly dense settlements on the low terraced slopes or even gravel sand dunes both on the western and the eastern sides of individual slopes of the Little Carpathians mainly with settlements of the linear ceramics people or even population from the earlier development levels of the Lengyel cultural complex. The Eneolithic Period, while the people discovered the technology to process their first metal - copper, brings a shift for the local population, who move to higher locations of better strategic characteristics, e.g. from the Bratislava Castle plain and the Devin Castle high up to individual slope and elevated areas situated in the souther part of the Little Carpathians (both the west and east side), forming natural protection barriers in times of danger. The largest group came from the later development levels of the Lengyel cultural complex, the Boleraz group people, the Baden group people, the Baitch-Retz people and population from the Mako-Chaka group. Numerous copper tools found there prove not only the significance of Bratislava portal and its vicinity for procurement of products from other regions yet also the utilisation of the raw material bases available (Pernek, Cajka a i.). This area played a very important part during the earlier Bronze Age and the medium Bronze Age – represented by the Mid-Danube barrow culture and the later Bronze Age – represented by the Velatic and Velatic-Podol horizon. All of its development stages are evidenced by numerous bronze products as clear proof of the existence of manufacturing centres as well as dynamic trade contacts, further emphasized by findings recovered in the slopes of Devinska Kobyla documenting the trade route towards the Lamac Break and further due North. The intersection of trade route was probably the prerequisite for establishment of the settlement during the later Iron Age situated on the Bratislava Castle high, as well as the more significant colonisation of the surroundings in the souther part of Little Carpathians. The area around Bratislava and the South-West Slovakia was actually the destination of numerous manufacturers and merchants from developed centres of South Europe. Even Celts from the later Iron Age also built their 'town' – oppidum - as the centre of political and economic power with their acropolis - on the castle high. The area in immediate vicinity to this town hosted intense manufacturing operations even directly linked to the broad economic, craft and supply infrastructure. The supply of food to their oppidum also came from small farming villages, e.g. Dubravka, Devinska nova Ves, Trnavka and Vajnory. The economic importance and political power of the area around Bratislava portal are also proven by the fact that this area used to be protected by tow oppida, as well as the fact that the local group of Celts was in charge of the profitable trade route, yet its position was further consolidated by its own coin mint producing the so called 'biatek coins'. The Bratislava area

retained its importance even during the Roman era, during the time of immediate military, trade and cultural interference of the Roman Empire with the South-West Slovakia. The Bratislava area underwent a specific development, being on the verge of the empire and the savage world. However, the land behind Danube in the Bratislava actually belonged to the Panonia province. The chain of fortresses along the Roman border in the Mid-Danube region also included Gerulata, later replaced by the existing village of Rusovce. It was first established as a military sentry for defence of the Bratislava portal and its surroundings and protection of the above-mentioned Amber Trade-Route, as well as for military presence in the most important section of the Panonian-German border. The whole of Panonian-Danubian border has no such concentration of military sentries from the 2nd century B.C., except for the Bratislava portal and its immediate and broader vicinity. The right bank of Danube hosted a legion camp with the civil town in Carnunta and the auxiliary camp with the civil village in Gerulata. The left bank of Danube offered discoveries proving presence of Roman units in Devin, Bratislava and Podunajske Biskupice. There were some more in Stupava and Stillfried. The Slavonic tribes entered the Bratislava portal area during 5th and 6 centuries to establish permanent settlements in the area of Bratislava and its broad surroundings. The Avar tribes also made significant efforts to occupy the Danubian region during the 6th century and they managed to annex the strategic area of Bratislava portal. There is a very important site with findings of Slavonic-Avar burial grounds in Devinska Nova Ves, Zahorska Bystrica, Vajnory, Cunov etc. The important role of Bratislava portal continued through the Great Moravian Empire with fortresses built on the Bratislava and Devin highs, whereas the vital importance is further emphasized by other fortresses, e.g. on the north-west peninsula of Devinska Kobyla and other smaller features in the close vicinity. Besides fortresses in the Bratislava portal and its broader vicinity, there have been discoveries of Slavonic burial grounds and lowland settlements. The fortress of Bratislava itself, situated on the castle high, belongs to the important Great-Moravian centres in our country, whereas its importance would highly exceed actual significance of a border fort. There is no doubt that the discoveries made would label the Bratislava fortress a larger administration centre of material and religious organisation with its centre of operations during the second half of the 9th and the beginning of the 10th century, whereas the said political centre was also superior to the above-mentioned are of concern to host the construction of highway D4 body. Since the Great-Moravian era, one may have called the Bratislava portal and its surroundings a continually populated area (*Polla / Vallaaek 1991, 8-10*).

Variants of the highway D4, as far as the above-mentioned development of settlements in the said area over time, are passing through the land with very dense settlements, from primeval, later historical periods as well as the medieval and modern age. The particular situation concerns mainly the area comprising the above-mentioned foothills and lowlands. There are also some smaller settlements in the area of adjacent Little Carpathian Mountains. These settlements are evidenced by means of outcome from archaeological surveys. Additional knowledge will be gathered through the so called surface research associated with collection of archaeological items from ruptured surfaces and studies focusing on written materials addressing the medieval age.

For more details see descriptions of individual 23 locations located in the immediate vicinity to the body from particular variants. Whereas the individual locations are identified by location names, position names, location types and potential finding circumstances, date of the location and information resources.

For geographic localisation of 23 locations see the graphic appendix No. 3, whereas the individual circular marks indicate the border of particular locations and the potential area of damage. The specific numbering of individual locations in the map matches the numerical codes in the list of archaeological sites.

There are also indications showing sites relatively close to the D4 highway body with potential establishment of mining sites, access roads, resp. construction yards posing a potential risk to the archaeological site.

### **List of Archaeological Sites in the Route of "D4 Highway (Variant 2a, 2b, 7a, 7b, 7C)"**

1. Bratislava – Vajnory, Dvor Triblavina location
  - settlement findings, surface survey of the site - polycultural location
  - late stone age (neolit - Lengyel culture); bronze age; early iron age (La Tene); Roman age; Slavic age (9th - half of 10th century)
  - Polla / Vallašek 1991, 159-160; Janšák 1933-1934, 64; Eisner 1935, 80; Kraskovská 1948, 15-17; Pichlerová 1963, 263-264
2. Bratislava – Vajnory, within the municipality (groove of an irrigation facility)
  - settlement findings, surface survey of the site - polycultural location
  - late bronze age (Velatice culture); early iron age (Hallstatt - Kalenderber culture); late iron age (late La Tene); Roman age; Migration period
  - Polla / Vallašek 1991, 159-160; Studeníková / Zachar 1980a; 254-255; Studeníková / Zachar 1980b; 198-199
3. Bratislava – Vajnory, Tomanová Street location
  - burial site, survey
  - Slavic age (6th - 8th century)
  - Polla / Vallašek 1991, 159-160; Mináč 1976, 147-148; Mináč / Slivka 1976, 426-429
4. Chorvátsky Grob, part Čierna Voda, Triblavina location
  - settlement findings, rescue research, surface collection
  - early iron age (Hallstatt)
  - NS no. 6673/73
5. Chorvátsky Grob, part Čierna Voda, Feketevíz puszta location
  - settlement findings, rescue research, surface collection
  - Slavic age (7th century)
  - NS no. 4287/81
6. Chorvátsky Grob, part Čierna Voda, Červený háj location
  - settlement findings, rescue research, surface collection - polycultural location
  - middle bronze age (Central Danube mound culture); late stone age (eneolit); late iron age (La Tene)
  - NS no. 16747/09; NS no. 15254/04
7. Chorvátsky Grob, part Čierna Voda, Čierna voda location
  - mound burial site, rescue research, surface collection
  - early iron age (Hallstatt - Kalenderber culture)
  - NS no. 1238/62; NS no. 3221/66
8. Bratislava – Rača, Detvianska Street location (house no. 23) + two other unknown locations
  - settlement findings, singular findings, burial site, surface survey of the site - polycultural location
  - late stone age (eneolit); early iron age (La Tene); Roman age
  - Polla / Vallašek 1991, 130; Pochlerová 1967, 14, 26; Eisner 1922, 30; Ondrouch 1964, 84, 132
9. Záhorská Bystrica, Krče location

- settlement findings, polycultural location
  - late stone age (neolit); late bronze age; early iron age (Hallstatt); Slavic age
  - Polla / Vallašek 1991, 165-169; nepublikované: uložené v SNM AÚ B.; Studeníková 1980, 196-197
- 10. Záhorská Bystrica, Lokvy pri Morave location**
- burial site, surface survey of the site
  - Slavic age (6th - 8th century)
  - Polla / Vallašek 1991, 165-169; Kraskovská 1972
- 11. Záhorská Bystrica, Poľný mlyn location + other unknown locations**
- burial site, singular findings, surface collection
  - Roman age; early iron age (La Tene)
  - Polla / Vallašek 1991, 165-169; Kraskovská 1965, 355-357, 382; stored in SNM AÚ B.
- 12. Stupava, Ivance location**
- settlement findings, rescue research, surface collection - polycultural location
  - late stone age (eneolit); middle ages (12th - 13th century)
  - NS no. 11025/85
- 13. Marianka, south-western edge of municipality**
- settlement findings, rescue research, surface collection
  - early iron age (La Tene)
  - NS no. 13302/94
- 14. Marianka, to the west from the municipality**
- settlement findings, rescue research, surface collection - polycultural location
  - Slavic age; early middle ages to middle ages (10th - 13th century)
  - NS no. 10836/84
- 15. Marianka, Nad Bednárovým II location**
- settlement findings, rescue research, surface collection
  - Slavic age (8th - 9th century)
  - NS no. 15400/04
- 16. Marianka, in non-urbanized area**
- settlement findings, rescue research, surface collection, hill-fort
  - late bronze age (Velatice - Podolí horizon)
  - NS no. 11758/86; NS no. 14125/99
- 17. Borinka, Medené Hámre (Dračí Hrádok) location**
- settlement findings, rescue research, surface collection, hill-fort - polycultural location
  - Roman age; early middle ages; middle ages (13th - 15th century)
  - NS no. 13326/94; NS no. 13506/95; NS no. 13654/96

**List of Archaeological Sites in the Route of "D4 Highway (Variant Senec - Pezinok - Lozorno)**

- 18. Lozorno, Nové diely / Široké diely location**
- settlement findings, rescue research, surface collection - polycultural location
  - late stone age (neolit - linear pottery culture); late stone age (eneolit - Makó-Čaka culture); middle / late bronze age (Central Danubian mound culture, Velatice culture); late iron age (La Tene); Roman age; middle ages
  - NS no. 15570/05

#### 19. Svätý Jur, Hradisko location

- settlement findings, rescue research, surface collection - polycultural location
- late stone age (eneolit); early iron age (Hallstatt); late iron age (La Tene); Slavic age
- NS no. 167/58

#### 20. Svätý Jur, Kačačnice location

- settlement findings, rescue research, surface collection - polycultural location
- Roman age; early middle ages; middle ages; late middle ages; modern period
- NS no. 16133/07

#### 21. Pezinok, Lazárna location

- settlement findings, rescue research, surface collection - polycultural location
- late stone age (late eneolit - Boleráz group, Bajč-Retz group)
- NS no. 14907/03

#### 22. Slovenský Grob, Štepnice / Za Baťovým location

- settlement findings, rescue research, surface collection - polycultural location
- late stone age (eneolit - Lengyel culture, Boleráz group); late iron age (La Tene); early middle ages; modern period
- NS no. 16830/09

#### 23. Bernolákovo, Spodné Lesné / Irtáše location

- settlement findings, rescue research, surface collection
- late stone age (eneolit - Lengyel culture - Ludanice group)
- NS no. 11412/86

### C.II.14. PALEONTOLOGICAL SITES AND IMPORTANT GEOLOGICAL LOCALITIES

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*E.g. rock formations, karst areas, and others.*

A number of such localities are situated within the territory subject to the assessment:

Paleontological site **Pezinská tehelňa** (*brickworks*) (a tooth of an elephant dating back to the Tertiary has been discovered there). It is situated close to the SPL alternative (the premises of the old Pezinok municipal waste dump that used to serve as an extraction pit for the local brickworks).

Paleontological site **PR Štokeravská vápenka** (*lime works*). It is situated close to the Bratislava Lamač city district.

**Mineralogical sites and sites where mineral extraction** was carried out in the past next to the town of Pezinok. They are situated within the Little Carpathians massif, north-westwards from Pezinok.

Natural monument **Limbach Spring** (situated northwards from the 16.100 km of the SPL alternative, approximately 1.430 kilometers away). It has been declared a protected important karst phenomenon documenting the hydrographic evolution of the Borinský Karst Area. This area is of great importance as concerns both speleological research and educational purposes.

### C.II.15. CHARACTERIZATION OF THE EXISTING SOURCES OF ENVIRONMENTAL POLLUTION AND THEIR IMPACTS ON THE ENVIRONMENT.

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*Noise, vibration, radiation.*

The Little Carpathians massif, as the central part of the assessed territory, has been a protected country area since 1976, due to which human activities have been minimized there. Therefore all the environmental pollution sources are concentrated within neighboring lowland areas.



## **Soil**

Agriculture and inadequate use of chemicals for nutrition and protection of plants, especially in the past, represent the main sources of soil pollution. The erosion caused by water and wind on the slopes of Little Carpathians represents an important cause of soil degradation. It is a consequence of vine growing on steep slopes without building agricultural terraces. Other causes of erosion include a wrong choice of crops and forestry activities (clear-cuts) within exposed parts of the territory of the Little Carpathians.

## **Atmosphere**

The whole agglomeration of Bratislava, the capital, including the assessed area, ranks among quite affected areas in terms of air pollution. The prevailing northwest wind and situation of the largest air pollution sources on the southeast side of the city minimize their impact on the assessed territory. The chemical industry, energy industry, and traffic hold the main share in air pollution. Secondary dust creation represents an important secondary air pollution source both in the city and around it. Companies Slovnaft, a.s. and OLO a.s. Bratislava (municipal incinerator) are the biggest air polluters.

## **Noise**

As concerns the noise burden, the assessed area ranks among the most burdened ones in Slovakia. The noise is caused primarily by automobile traffic, air transport, and railway transport.

Within the assessed territory, the automobile traffic noise is caused mainly by the corridors of the D1 highway, roads II/502, I/2, and a network of roads of lower categories.

The source of aircraft noise is the M. R. Štefánik airport; the city district of Vajnory and Rača are affected by the noise caused by air traffic the most.

Busy railway lines no. 120, Bratislava - Žilina, and no.130, Štúrovo - Bratislava are the source of the excessive noise produced by railway transport in the assessed area.

## **Groundwater and surface water**

The quality of groundwater is greatly influenced by the rock environment as well as by the quality of surface water that significantly contributes to the replenishment of groundwater reserves. Within the assessed area, the water pollution is caused by the sites at which waste water from industrial plants (petrochemical and chemical industries) is discharged plus the sewage and rainwater sewerage systems of villages and towns as well as agriculture - a diffuse source of pollution. The traffic is also a source of pollution due to the fact that the polluted water from roads is flushed into surface water bodies or penetrates groundwater bodies. Uncontrolled waste dumps and old ecological burdens represent another pollution source. Last but not least, polluted rainwater is the source of water pollution too.

Surface water quality is monitored by the Slovak Hydro-Meteorological Institute (SHMI) within the Partial Monitoring System (PMS) - water under Government Regulation no. 296/2005 Coll., as amended (hereinafter referred to as "GR").

The assessed area belongs to the Danube river basin and the Danube and Morava sub-basins. The Morava basin is classified as significantly polluted where 9 indicators at one sampling point, 5 indicators are two sampling points, and 4 indicators at another sampling point did not meet relevant requirements. The indicators exceeding the GR limit include N-NO<sub>2</sub>, N-NO<sub>3</sub>, total phosphorus, total nitrogen, COD<sub>Cr</sub>, Mn, N-NH<sub>4</sub>, BSK<sub>5</sub> (ATM), NEL<sub>UV</sub>, chlorophyll "a", saprobic index of bioseston, bacterial contamination, producers, and phytoplankton abundance.

When assessing the results from the Danube sub-basin under GR, the number of indicators exceeding limits in respect of individual sampling points ranged from to 1 to 6. Those

included N-NO<sub>2</sub>, bacterial pollution, chlorophyll "a", producers, AOX, and chloroform. The highest number of exceeded limits related to the sampling point Danube - Karlova Ves (6x).

The assessed area is partially situated also in the Váh sub-basin and the Little Danube basin. On the main flow of the Little Danube and its tributaries excessive values have been recorded in respect of two up to six indicators: COD<sub>Cr</sub>, BSK<sub>5</sub> (ATM), total phosphorus, N-NO<sub>2</sub> N-NO<sub>3</sub>, N-NH<sub>4</sub>, free chlorine, and chloroform.

Groundwater quality is monitored based on PMI - water under Government Regulation č.354 / 2006 Coll., as amended. In the Bratislava area, pollution of groundwater by heavy metals (As, Ni, Cd, Pb), iron, and manganese, nitrate, sulfate, and chloride NEL<sub>UV</sub> has been recorded.

### **Waste and waste dumps**

Significant sources of pollution are wild waste dumps that may have negative impacts on soil, water, and air around them. Within the assessed area there are several dozens of uncontrolled waste dumps (up to 50) registered with yet unproven environmental impacts. Several of them have been previously repaired or reclaimed and are subject to monitoring currently.

### **Biodiversity**

In lowland areas and at the foothills of Little Carpathians a strong anthropogenic pressure on all elements of the environment has been registered which has many times resulted in pushing the original fauna and flora species from their original sites and this especially due to sudden changes in the use of the area or changes in the management of agricultural areas. Thus individual species have moved to sites suitable for them or even worse, they extinguished within this area.

### **Landscape**

"Negative" features within the landscape indicate disorders within its functioning or presence of extraneous elements. Symptomatic features represent external manifestations of an inner cause, and inform about functioning or non-functioning of a given relationship within the landscape.

Elements as, for instance, erosion, waste dumps, extraneous items, neglected areas, calamities, contamination, bear the *symptomatic character*. Also the secondary accompanying features of the social-economic phenomena, which disturb the ecological balance and cause irreversible changes in the landscape due to their long-term effects, are symptomatic. Negative elements - symptoms disturb the balance and ecological stability within the landscape through their action and their effects irreversibly change the landscape and the overall character of the territory.

Within the assessed area, especially close to settlements, pollution symptoms can be identified based on the character of waste dumps, developed areas, and arable land and associated contamination in many cases. Symptoms associated with effects of extraneous structures (production halls, warehouses, urbanization of the landscape) manifest themselves through soil contamination, adjustments of water flows, removal of scattered vegetation, and in appropriate manners of land management, which cause disorders such as erosions, calamities, and others.

Other than the above named sources of pollution have not been registered in the assessed area.

## **C.II.16. FULL-SCALE ASSESSMENT OF THE CURRENT ENVIRONMENTAL PROBLEMS**

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Undoubtedly, transport is one of the greatest environmental problems with all its negative features and thus it participates in environmental pollution to a significant extent. Transport contributes significantly to air pollution throughout the entire Bratislava region along with other major sources of air pollutants such as company Slovnaft a.s. Bratislava and many other industrial facilities.

Territory urbanization represents an important problem especially in the eastern lowland area; it is accompanied by other problems that have not required any solution or have occurred to a smaller extent until now. It mainly involves the problems associated with the water drainage from this area and insufficient infrastructure necessary for further development and to ensure the balance within the given territory. We cannot omit associated extensive land occupation and extinction of many more or less precious habitats. Peripheral parts of developed areas are subject to occupation by ruderal species and change both their character and species composition.

The problem of uncontrolled development of “wild” waste dumps with all kinds of waste seems to be unexpected; such dumps are spread through all the monitored area and their number has been increasing. They represent a potential source of pollution of water, soil, and air.

The water pollution is still occurring due to discharge of sewage and waste water into surface water without any prior treatment in WWTPs. Therefore many brooks and canals become polluted already at their initial parts.

Due to a failure to cultivate a lot of agricultural areas, vineyards, and orchards, many invasive and alien plant species spread, push out the original species, and thus they reduce the biodiversity in the affected areas and reduce their attractiveness for many fauna representatives.

A full-scale assessment of the current environmental situation within the assessed area can be reviewed also based on the environmental regionalization of Slovakia. The regionalization is based on the assessment of the sanitary suitability of the territory, assessment of its landscape and urban suitability, categorization of the conditions for recreation, declared conservation areas and folk architecture settlements, definition of the mining areas for strip mining, land slide areas, inundation areas, and the areas affected by erosion and ruderal vegetation. Based on those criteria, the regions of a certain quality or featuring trends towards environmental changes are excluded. This has resulted in division of the territory of Slovakia according to 5 grades of quality, ranging from the high quality environment, through satisfactory environment, slightly disturbed, disturbed, and severely disturbed environment. According to the 2008 environmental regionalization of Slovakia, a greater part of the assessed area is classified as severely disturbed, a smaller northern part of the assessed area is classified as deteriorated environment. Within this assessment, Bratislava is set aside as an unsafe (endangered) area in terms of health along with another 8 areas throughout the entire Slovak Republic.

## **C.II.17. THE OVERALL QUALITY OF THE ENVIRONMENT**

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### *Synthesis of positive and negative factors.*

The assessed alternatives of the D4 highway project - the part Ivanka north - Záhorská Bystrica - cross an area that has been populated and managed in a long run except for the central section of the Little Carpathians massif where all assessed versions lead through a

tunnel. The southern part of the assessed area touches the densely developed parts of the city of Bratislava, the density of both buildings and population decreases northwards.

The area is crossed by important transport lines, i.e. the D1 highway, the D2 highway, and important railways no. 120 Bratislava - Žilina and no. 130 Štúrovo - Bratislava. In close proximity of the assessed area there is the Airport of M.R. Štefánik, which is the largest one in the Slovak Republic. These facts confirm that the area is subject to a great traffic burden through all transport modes.

Settlements close to assessed alternatives are of rural character mainly, Bratislava, Pezinok, and Stupava are settlements of the urban character.

The area has the character of lowlands, it is divided by the Little Carpathians massif in the central part in the north -south direction. The massif represents the most precious and the best preserved part of the environment within the entire assessed area. Several protected areas have been declared there, i.e. the Little Carpathians protected area, the Little Carpathians special protected area for birds, areas of European importance Homolské Carpathians and Šúr, the Šúr national nature reserve, four nature reserves, and one protected site.

Other valuable sites are located in the outskirts of the Danube Lowland, near the Šúr national nature reserve, local watercourses and the remnants of bottomland forests and ecotone communities on the border of forests and nearby meadows and vineyards.

Based on the above we can state that the area concerned is, in term of environment, very diverse and rich in valuable environmental elements that require a specifically sensitive approach when planning any intervention affecting their functioning and integrity.

## **C.II.18. ASSESSMENT OF EXPECTED DEVELOPMENT OF THE AREA IF THE PROPOSED ACTIVITY IS NOT REALISED**

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Many activities are connected to the construction of D4 Highway already now, at the preparatory stage, in particular in versions 2a, 2b, 7a, 7b, 7c. If D4 Highway construction is not realised, it is hard to imagine the development of the given region which is already now lacking infrastructure of a good quality. Many of the planned urbanistic activities could not be realised because the existing network of roads is overloaded and a great part of the assessed area would remain in its existing form.

A great part of the traffic would remain in the existing network of roads (even in the urban areas of municipalities) together with the existing problems which could be described as follows:

### *The development of the traffic situation without the realisation of D4 Highway*

All planned road investments, which will be realised within the given time framework, were included within the affected network for its zero condition, independent of the assessed investment, in the given example stage II of D4 Highway. The construction of stage II of D4 Highway as an independent construction would not meet the requirements of road connection, which have been expected of D4 Highway, in full, and it was expected that the connection of this part to other road network would be made possible also by means of other parts of D4.

Stage II of D4 Highway starts already on D1 Highway at the crossroads Ivanka – North. In order to use this section sufficiently as well as connect it in a logical way, the realisation of stages I and III of the section of D4 Highway should precede, which will make it possible to connect Highways D1 and D2 in the circuit of Bratislava.

The need for construction of stage I of D4 Highway is given not only by analysis of the existing road situation as one of the priorities of solving the road situation in Bratislava (the need for a new traffic connection over Danube river and the dispersion of traffic on the entrance to the city) but also by the possibility of connecting R7 speed road (the necessity to

solve the entrance to Bratislava from the directions I/63 and II/572). The construction of stage section III – Stupava crossroads South is already being realised.

The expected presentation of the assessed section II of D4 Highway was during 2020 and this year was considered as the first whole year of the operation of the section.

For this reason, the construction of other sections of D4 Highway was considered within the traffic plan with regard to the zero condition:

- D4 Jarovce – Ivanka North 2015 (section I)
- D4/D2 Stupava crossroads, South – 2011 (section III)

Other road investments expected to be realised by 2020 and considered at the zero condition:

- D1 Bratislava – Trnava, highway extension to six lines – 2010
- R7 Bratislava – Dunajská Lužná – 2015
- Road I/61, upgrading for a 4-line – 2015
- R7 Dunajská Lužná – Holice – Dunajská Streda – 2017
- D4 Stupava South – the border Slovakia/Austria (section IV) – 2018
- Speed road Marchfeld S8 with the connection to the regional bypass of Vienna (S1, S2) – 2015 – 2018

Prospective intensity of traffic was stated on conditions which corresponded with the existing knowledge of the presupposed development of the area and road investments and which take into consideration the presupposed development scenarios and plans associated with the planned investment activities which will generate transport in this area.

Based on the outcomes of the capacity assessment (according to the Study of Feasibility and Purposefulness for the route D4 Bratislava Jarovce – Ivanka North - Stupava South - state border SR/AUT, it was shown that the existing road network does not meet the demands of the traffic today to a large extent. The outcomes of section assessment show the time frameworks for meeting the capacity of the individual sections:

#### D2 Highway

- section Lafranconi bridge will not have a sufficient capacity with regard to the traffic load already in 2015
- section Lamač – Polianky will have a sufficient capacity by 2025,
- section of the Sitiny tunnel will have a sufficient capacity by 2035.

#### D1 Highway

- section Incheba – Ovsíšte will have a sufficient capacity with regard to the traffic load by 2025
- sections from Osviště to Vajnory are not sufficient even today, with the limiting section being Prístavný bridge with the load over 110,000 vehicles/24 hours.

#### Class I roads I2 and I/61

- section of the road I/2 will have a sufficient capacity with regard to the traffic load by 2035 and section of the road I/61 will have a sufficient capacity with regard to the traffic load by 2017,
- sections of the road I/61 Zlaté Piesky – Vajnory will have a sufficient capacity in all assessed periods.

After building section I of D4 Highway which is expected to be around 2015 and after other planned road investments (R7, relocation of I/61...), the redistribution of the traffic will have a positive impact on D1 Highway Ovsíšte – Vajnory in particular, and with regard to the above mentioned road investments also on roads I/63 and I/61.

Even despite of this fact, the influence is not as significant as to solve the bad traffic situation in full. D1 Highway sections Prístavný bridge and Prievoz – Ružinov will come to the

condition in which they are today – meaning they will not have a sufficient capacity with regard to the traffic load. The existing situation which means traffic load approx. 110,000 vehicles/24 hours will be reached in 2020. Section Ružinov – Trnávka will reach the limit of capacity as well.

## **C.II.19. COMPLIANCE OF THE PROPOSED ACTIVITY WITH THE EFFECTIVE DOCUMENTATION OF TERRITORIAL PLANNING**

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### Lozorno

- Documentation of Territorial Planning (DTP): ***Territorial plan of Lozorno municipality*** – author: Ateliér Olympia, Ing. Arch. I. Petro a Ing. Arch. E. Žolnayová, approved on 28/5/2002
- ***Changes and modifications no. 1/2007***– author: Ateliér Olympia, Ing. Arch. I. Petro a Ing. Arch. E. Žolnayová,
- ***Changes and modifications no. 2***– author: Ateliér Olympia, Ing. Arch. I. Petro a Ing. Arch. E. Žolnayová, July 2008
- D4 Highway in SPL version is not plotted in the Territorial plan of the municipality

### Pezinok

- Documentation of Territorial Planning (DTP): ***Territorial plan of Pezinok municipality*** – author: SB Partners, Ing. Arch. Karol Balaš,
- Author of the Territorial plan – 1996 San Huma, s.r.o, Ing. Arch. Jarabica
- Author of the update of the TP – 2002 – Ing. Arch. I. Pleidel,
- ***Changes and modifications 2/2005*** - Ing. Arch. I. Pleidel
- the municipality is currently preparing a new territorial plan, the proposed D4 Highway is, however, not considered

### Viničné

- Documentation of Territorial Planning (DTP): ***Territorial plan of Viničné municipality*** – author: SIKARD s.r.o., approved 20/2/2003
- ***Changes and modifications no. 1/2007***– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, April 2007
- D4 Highway in SPL version is not plotted in the Territorial plan of the municipality

### Slovenský Grob

- Documentation of Territorial Planning (DTP): ***Territorial plan of Slovenský Grob municipality*** – author: AUREX spol. s r.o., Ing. Arch. Ľubomír Klaučo
- ***Changes and modifications 1/2005***
- ***Changes and modifications 2/2007***– author: AUREX spol. s r.o., Ing. Arch. Ľubomír Klaučo
- D4 Highway in SPL version is not plotted in the Territorial plan of the municipality

### Chorvátsky Grob

- Documentation of Territorial Planning (DTP): ***Territorial Plan of residential formation Chorvátsky Grob*** – 2001,
- ***Changes and modifications 2006 and 2007***
- ***Territorial Plan of zones Chorvátsky Grob, Čierna voda "Triblavina"*** – author: ÚPn spol. s r.o. Bratislava, Ing. arch. Monika Dudášová, approved in 2009
- the proposed route of D4 Highway only touches the municipality Chorvátsky Grob marginally, i. e. by extending the D1 Highway to a 6-line highway, which is in compliance with the territorial plan of this municipality
- version SPL which passes through the municipality area marginally is not in compliance with the territorial plan of the municipality

### Bernolákovo

- Documentation of Territorial Planning (DTP): **Territorial Plan of residential formation Bernolákovo** – author: STAVOPROJEKT a.s. Bratislava, Ing. Arch. Košťál, Ing. Arch. Košťálová, approved on 13/12/1995
- **Changes and modifications 1/2002** – author: PRO\_ARCH, Bratislava, June 2002
- **Changes and modifications 1/2004** – author: SB Partnerst, May 2004
- **Changes and modifications 2/2004**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, January 2005
- **Changes and modifications 1/2006** – author: AUP Media s.r.o., October 2006
- **Changes and modifications 1/2007**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, February 2007
- **Changes and modifications 2/2007**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, 2007
- **Change no. 1/2008**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, October 2008
- **Changes and modifications 1/2009**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, December 2009
- **Changes and modifications 2/2009**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, March 2010
- **Changes and modifications 3/2009**– author: ÚPn s.r.o. Ing. Arch. Monika Dudášová, June 2010
- Highway D4 in SPL version is not plotted in the territorial plan of the municipality, which is not in compliance with the territorial plan of the municipality

### Stupava

- Documentation of Territorial Planning (DTP): **Territorial plan of Stupava municipality** – proposal – author: SB Partners, Ing. Arch. Karol Balaš, October 2005
- D4 Highway is plotted in the territorial plan of the crossroads Záhorská Bystrica, D4 Highway section in the areas of Bystrická Hora and Mást II is plotted in the most northern area of all of the assessed versions 2a, 2b, 7a, 7b, 7c but it is possible to observe that the assessed versions 2a, 2b, 7a, 7b, 7c are in compliance with the territorial plan

### Marianka

- Documentation of Territorial Planning (DTP): **Territorial plan of the residential formation Marianka** – author: Ing. arch. Monika Dudášová, Ing. arch. Alžbeta Sopirová CSc. and coll., approved on 9/12/1998
- **Changes and modifications 01/2006**– author: ÚPn s.r.o. Bratislava, Ing. arch. Monika Dudášová, approved on 25/10/ 2006,
- **Proposal - Changes and modifications 02/2008** – author: Architecture UNA s.r.o., Ing. Arch. J. Kačala
- in versions 2a, 2b, 7a, 7b and 7c, the proposed route is in compliance with the territorial plan of the municipality with the delimited corridor with the width of 200 m

### Borinka

- Documentation of Territorial Planning (DTP): **Changes and modifications** – author: aa ateliér, Ing. Arch. Ivan Boháč, March 2006
- Highway D4 is not plotted in the territorial plan of the municipality, which is not in compliance with the territorial plan of the municipality

### Svätý Jur

- Documentation of Territorial Planning (DTP): **Territorial plan of municipality Svätý Jur** – author: Architektonický ateliér BP, Ing. Arch. Bohuslav Pernecký, approved on 7/9/2004

- **Changes and modifications no. 1** – author: Architektonický ateliér BP, Ing. Arch. Bohuslav Pernecký, February 2007
- **Changes and modifications no. 2** – author: Architektonický ateliér Ing. Arch. Miriam Šebianová, Ing. Arch. Marek Poliačik, June 2009
- In the section between crossroads Ivanka North and Záhorská Bystrica, D4 Highway route in the territorial plan of Bratislava city reflects the assessed versions 2a, or rather 2b, versions 7a, 7b, 7c are situated more to the north in the area of MÚK Rača to the eastern portal of the Karpaty tunnel

#### Ivanka pri Dunaji

- the settlement is located in the southeast of the proposed route, nearby MÚK Ivanka North
- Documentation of Territorial Planning (DTP): **Territorial plan of the residential formation Ivanka pri Dunaji** – author: Ing. Arch. Hana Hlubočká and coll., 1998
- **Changes and modifications 01/2006** - author: AŽ Projekt Bratislava, Ing. Mária Krumpolcová, approved on 5/2/2007
- D4 Highway route in versions 2a, 2b, 7a, 7b, 7c is in compliance with the territorial plan of the municipality
- It is proposed to reserve the corridor for the route of the zero traffic circuit around Bratislava in the area between the airport and Šúr channel

#### Bratislava

- city parts Záhorská Bystrica, Rača, Vajnory
- the capital city is located in the south of the proposed versions which will interfere with some of the city parts, in particular by their connections to interchanges
- Documentation of Territorial Planning (DTP): **Territorial plan of the Slovak capital city Bratislava** – approved on 31/5/2007
- author: Ing. Arch. Oľga Vránková (text), Ing. Arch. Tatjana Čechová (graphics)
- **Changes and modifications 01** – effective since 15/1/2009
- in the area of the higher infrastructure it is ordered to reserve a zero traffic circuit around Bratislava, starting from D2 x D4 crossroad in Bratislava – city part Jarovce and further in the direction of the new bridge over Danube river, Rovinka, Most pri Bratislave, Ivanka pri Dunaji, Bratislava – city part Vajnory, tunnel under Carpathian Mountains, connection to D2 south of Stupava with the prospective continuation in the north of Bratislava – city part Devínska Nová Ves along with the train bridge over Morava river to the state border with Austria
- In the section between crossroads Ivanka North and Záhorská Bystrica, D4 Highway route in the territorial plan of Bratislava city reflects the assessed versions 2a, or rather 2b, in the corridor which was considered within the realisation of the zero traffic circuit



## **Disclaimer**

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The name of this document in Slovak is *Správa o hodnotení*. The file name has not been changed.

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