Client:

NIF Nemzeti Infrastruktúra Fejlesztő zártkörűen működő Részvénytársaság

M6 motorway section between Bóly- Ivándárda country border

Environmental impact study

In a consolidated structure with supplementation

Designers:

Consortium leader:

Utiber Kft.

Special designers:

UVATERV Zrt.

Budapest
January 2016

PROJECT MANAGER:

Lajos Tómán

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1. INTRODUCTION, BACKGROUND

The public procurement contract notice issued by Nemzeti Infrastruktúra Fejlesztő zártkörűen működő Részvénytársaság (abbreviated as NIF Zrt.) for the feasibility study and transport safety assessment, as well as environmental impact study for the M6 motorway section between Bóly and Ivándárda (country border), based on which the contract was granted to M6 Konzorcium, where the members are UVATERV Zrt. and UTIBER Kft., of which the latter is the consortium leader. On the basis of the winning tender, the Konzorcium and NIF Zrt. entered into a contract for the preparation of this environmental impact study in May 2014.
Within the framework of the design activities, a Feasibility Study was prepared in February 2015 for the ~20.5 km section of the M6 motorway between Bóly and Ivándárda, with an indirect objective of finding the ideal track in the design phase. Under the design contract, the M6 Konzorcium is responsible for obtaining the environmental permit and for preparing for construction of the motorway with 2x2 lanes.
According to the consultations between the Client and the Designer held on 14. 08. 2014, in compliance with the letter issued under reference number KIF/14081/2014-NFM during the preparation of the Feasibility Study, the phased motorway construction must be reviewed according to the following criteria:

Phase 1: construction of a 2x1 lanes expressway with the following cross section structure:

- junction structures: 2x2 lanes
- cross roads, unpaved roads: 2x1 lanes
- above ground wildlife crossing structure: 2x1 lanes
- Complex rest areas: 2x2 lanes
- simple rest areas: 2x1 lanes
- protective fence: 2x1 lanes
- use of land: 2x1 lanes
- utility replacement: 2x1 lanes

Phase 2: phasing of the construction of 2x2 traffic lanes over a 30-year period on the basis of an economic analysis.

The ministerial letter issued under reference number KIF/14081/2014-NFM indicated above states the following:
"*Considering the limited availability of funding available between 2014 and 2020 and the cost-benefit calculations made in preparation for the projects of the programme, part of the motorway road network components will have to be implemented in phases and sections in the new programming cycle.*
In order to reduce the investment costs, for the transit network components with the lowest traffic, the most economic 2x1 expressway lanes should be constructed that ensure safe and continuous unimpeded progress supported by grade separated junctions."

It is a further Client instruction that according to the design contract two track versions will need to be prepared in the study plan:

- Version "A" - the track with the detailed technical design, the construction permits of which have expired.
- Version "B" - the track situated to the west from the former track between Natura 2000 sites.

The expected environmental risks of the project are included in the Feasibility Study. On the basis of the Feasibility Study a design jury was established, which selected Version "A", i.e. the track for which previously a permit was issued. Consequently, in this environmental impact study, we assess the environmental impacts of that track version supplemented with the fact that, according to the site inspections and biota protection criteria, we made a slight correction in the track, which is shown in this study as the corrected version "Am".

The M6 motorway section is a project included in Annex 1 point 1 of Government Decree 345/2012. (6 December) **is a transport infrastructure project of outstanding importance for the national economy.**

The environmental impact study was prepared on the basis of the assessments made in the Feasibility Study and the contents of the technical study plan constituting the basis thereof.

1.1. BACKGROUND TO THE DESIGN OF THE MOTORWAY SECTION CONSTITUTING THE SUBJECT MATTER OF THIS STUDY

At the Third Pan-European Transport Conference held in Helsinki on 23-25 June 1997, the designation of the Ploce - Sarajevo - Osijek - Budapest track marked V/c. among the five international transport corridors crossing Hungary was of crucial importance in terms of the construction of M6 - (M56) motorway.

The preparations for the construction began in 1998 with a network development study, in which the potential track corridors within the country were examined by taking into account the Hungarian requirements. On the basis of the results of the network development study, the review of the detailed study plan for the Budapest - Dunaújváros - Szekszárd - Bóly - country border track corridor began in 1999 in order to identify, assess and compare the potential track options and to define the most suitable track. The most suitable track was selected in 2004 with the issue of the environmental permit. The preparations for the construction and the licensing plans for the selected track on the total length of the M6 motorway, also including the Bóly – country border section lasted until the construction permits were obtained in 2007.

The construction began on the section of Érditető – Dunaújváros in 2004 and was completed with the handover of Dunaújváros – Szekszárd and Szekszárd – Bóly construction sections in 2010 together with the Bóly – Pécs section of the connecting M60 motorway between the M0 motor road and Bóly.

However, the construction of the Bóly - Ivándárda country border section of the motorway did not take place because the complete project was left out from the 2007-2013 government programme.

In 2010, the construction permits obtained for the plans made in 2007 were extended, but even the extended effective term expired on 21 May 2013 and therefore the design and licensing phase had to be started again.

The construction permit for the connecting national and local roads was issued by the National Transport Authority, South Transdanubia Regional Directorate under number KA/1024/1/2007 on 13 July 2007. The authority required a modified design for the 0+000 – 0+600 km section of road No. 5702 (previously and in the permit road number 561) also referred to in the permit. The modified design was prepared by UVATERV Zrt. by 30 July 2007 and was submitted to the authority for approval.

In terms of the relevant section of the M6 motorway, the crossing point of the new road No. 5702, previously known as No. 561. Majs-Villány interconnecting road, where the Lippó grade separated junction is constructed. The Road Management and Coordination Directorate approved Version "C" of the study plan for the interconnecting road (UVATERV Zrt., March

2004) with the track recommended by the designer under No. 2231/4-K-2004 on 24 November 2004.
The relevance of implementation of road No. 5702 is reviewed in the framework of a traffic impact study in Section 7.5.4.3 of this Feasibility Study.
Another important plan that was taken into account is the extension of road No. 57 to 2x2 lanes, the designs of which are already available. This was pointed out by the Baranya County General Assembly, the municipalities and the County Directorate of Magyar Közút Zrt.

1.2. CONNECTION THE CROSS-BORDER EXPRESSWAY SECTION

The plans included in the data supply received from Croatia were taken into account during the preparation of the Feasibility Study and the underlying study plans both in terms of the layout plan and the height and directional connection. In Phase I of the design, we assumed the construction of the right track. Although in general the continuation of the left track is more favourable in order to safely manage the 2x2 lanes and 2x1 lanes transition, in this case, the advantage is not relevant for the 2x2-lane section. In every other aspects the side the track to be continued is not relevant at all. During the construction of the M6 motorway with 2x1 lanes in first phase either the right of the left track may be constructed. If there is a 2x2 lane connection with the Croatian motorway, the construction of the right track is more favourable, while during the first phase of (cost effective) construction of the M6-M60 split junction, the construction of the left track is more favourable. According to former consultations, the study used the construction of the first phase of the right track into account.

1.3. PURPOSE OF THE DESIGNED ACTIVITY, THE APPLICANT'S BASIC DATA

In terms of social-economic aspects the M6 Bóly-Ivándárda motorway axis is situated in less developed areas of Hungary, where competitiveness is low and, as they are unable to resolve the unfavourable local processes with their own resources, the area also faces problems in employment. The strategic and operative goals of the development were defined accordingly.

1.3.1. Strategic objectives

The planned development projects affect the least favourable areas of Transdanubia, Tolna, Somogy and Baranya counties, where the per capita domestic product is the lowest in Transdanubia (35-45% of the EU average) and the unemployment rate is the highest. The planned development will provide jobs and connect the most disadvantaged areas into the circulation of the economy, mobilise the workforce capable of finding jobs, provide easier access to the tourist attractions of the region, and will contribute to improving the standard of life in the region.
On the basis of the problems identified in the status analysis and the outlined future vision the general objectives of the project are as follows:

- Improving the employment situation in the area
- Increasing competitiveness in the area
- Strengthening the social-economic and territorial cohesion

The primary objective of the project is to expand the motorway network of the region and the country and, indirectly:

- better exploitation of the positive economic and social impacts of the Hungarian motorway network with a more effective infrastructure feeding on to the motorway;
- Journey time reduction, increased travel comfort;

- Improved accessibility to the functions of micro-regional centres and county seats (e.g., health and educational institutions);
- Reduction of environmental damages (reduction of harmful substance emission, vibration and noise pollution), in the vicinity of the population of the area;
- Improved transport safety through the deduction of transit traffic in the settlements of the area.

Target groups:

- Participants in long-distance transport and users of this track as a transit track (safer, faster and more comfortable access).
- Investors (the improved traffic infrastructure provides better conditions for investments).
- Disadvantaged groups/unemployed: the new projects implemented in relation to the better transport relations might also create new jobs, and the accessibility of workplaces will improve.
- Tourism: as the infrastructure improves, interest in the region is also likely to increase, and any boost in tourism has a positive impact on the economy of the region.

1.3.2. Operational targets

The operational project level targets define objectives for the road transport. Measurable expectations, i.e. indicators can be attached to specific measures, generally covering a specific segment of the provided service.
In order to achieve the above strategic objectives the operational goal of the development is to construct the Bóly-Ivándárda section of the M6 motorway in order to be able to manage the expected large traffic, to avoid the settlements, with which the accessibility of the settlements of the region and tourist attractions can be improved.
With the extended road infrastructure and construction of new sections, the project will contribute to improving the competitiveness of the area of M6 motorway because the technical parameters of the road will allow it to be used by increasing traffic, and therefore it will help improving the accessibility of settlements and tourist sites.

The planned motorway section is included in Annex 1 of Act CXXVIII of 2003 on Public Interest and Development of the Motorway Network of the Republic of Hungary. Pursuant to Article 1 (1) of the Act: “The state is responsible for designing, developing, regulating the use of the national public road network, as well as for maintaining and operating the national public roads. The development, maintenance and operation of the motorway network is an important activity pursued in the interest and for the purposes of the public.” On the basis of the above, the designed motorway section is in line with public interest.

1.3.3. Basic data of the licence applicant

NIF Nemzeti Infrastruktúra Fejlesztő zártkörűen működő Részvénytársaság
1134 Budapest, Váci u. 45.
Company registration number: 01-10-044180
Tax number: 11906522-2-41
Bank account number: 10300002-20609931-00003285

1.4. POSITION STATEMENTS OF THE AUTHORITIES ISSUED FOR THE PRIOR PLANS, PUBLIC REMARKS

In 1999 Unitef Rt. prepared a preliminary environmental impact study for the Szekszárd and country border section of the M6 motorway. The environmental impact study reviewed 4 options (A, B, C and C1). The preliminary environmental impact study was submitted to the Central Transdanubia Environmental Authority.

In 2002 the authority accepted the environmental impact study and, in its resolution No. 60.012-104/2002 it set a requirement for NA Rt., as licensee (legal predecessor of the current licensee NIF Zrt.) to conduct a detailed environmental impact assessment procedure for version C (supplemented with C2).

The detailed environmental impact study for the Szekszárd and country border section of the M6 motorway (142+800 – 212+064 km) section was prepared by Unitef'83 ZRt. in 2003. The detailed environmental impact study was submitted to OKTVF. At the beginning of 2004 OKTVF requested some supplementation to the impact study. Following the completion and submission of the supplementation in its resolution No. 14/1002-70/2004 of 27 December 2004, OKTVF issued the environmental permit, which was effective until 31 December 2010.

In relation to this project, no preliminary assessment was conducted. During the preparation of the Feasibility Study, we conducted consultations with the municipalities, the memos of which are attached to the annexes (See annexes).

Although during the consultations, no reason occurred that would make the project impossible, the representatives of the settlements affected clearly supported the version, which is examined in this plan and is more favourable in terms of economic benefits.

1.5. THE PROCESS OF PREPARING AN ENVIRONMENTAL IMPACT STUDY

The purpose of an environmental impact study is to assess and examine the environmental impacts of the planned facilities and traffic changes, to make proposals on how to reduce any harmful effect to the minimum and to identify any reason that would prevent the installation for environmental aspects.

In order to achieve the above objectives, in the environmental impact study we reviewed the current environmental status of the investment area, the environmental conditions and processes and the environmental effects occurring as a result of the construction of the planned facility, as well as the degree and consequences thereof.

The current and long-term (after the investment) status of the individual environmental components and the environmental systems, the designation of the reviewed area and the potential methods of protection are discussed separately by specific areas and then the results of the assessment are summarised in a summary evaluation.

The process of the review of the individual special areas includes the same features, whereby following the presentation of the current situation, the environmental conditions without and with the project must be assessed. The conditions without the project should be reviewed only in those special areas where the tendencies are known and the change can be projected. On the

basis of the reviews of the special areas, we make a proposal on how to reduce the environmental impact to an acceptable level in case the project is implemented.

To perform the work indicated above, we use the assessments of the special area, analyses, the available technical literature data, the results of the conducted municipality, administrative and other consultations, data obtained from maps, air photos and site inspections, data of the regulation plans of the settlements and the information obtained from the feasibility study.
In order to describe the current situation, individual measurements and observations are required in each case. They were all completed. The exact process and method of the assessment are presented in the description of each special area.
Similarly, we also used the maps and layout plans of the special technical designs that are in the progress of preparation, the data and technical solutions included in them.

The environmental impact study was prepared in compliance with the currently effective environmental regulations. The environmental impact study was prepared on the basis of the provisions of Act LIII of 1995 on the General Rules of Environmental Protection, amended several times, and Government Decree No. the 314/2005. (25 December) on the environmental impact study and single environmental use procedure.

The applied laws and regulations are presented in each section dedicated to a special area.

The methods used in the impact assessment, their limitations and the conditions of their application, the effective limits of the projections (probability) and the inadequacies and uncertainties of the scientific knowledge and information used for the assessment of the impacts and assessment results are each described separately when applicable.

The design was made on topographic maps of M=1:10,000 scale, supplemented with updated air photos. The track track was also compared to the regulation plans of the settlements concerned.

1.6. DESCRIPTION OF THE OPTIONS PREVIOUSLY TAKEN INTO ACCOUNT

The Feasibility Study reviewed two options.

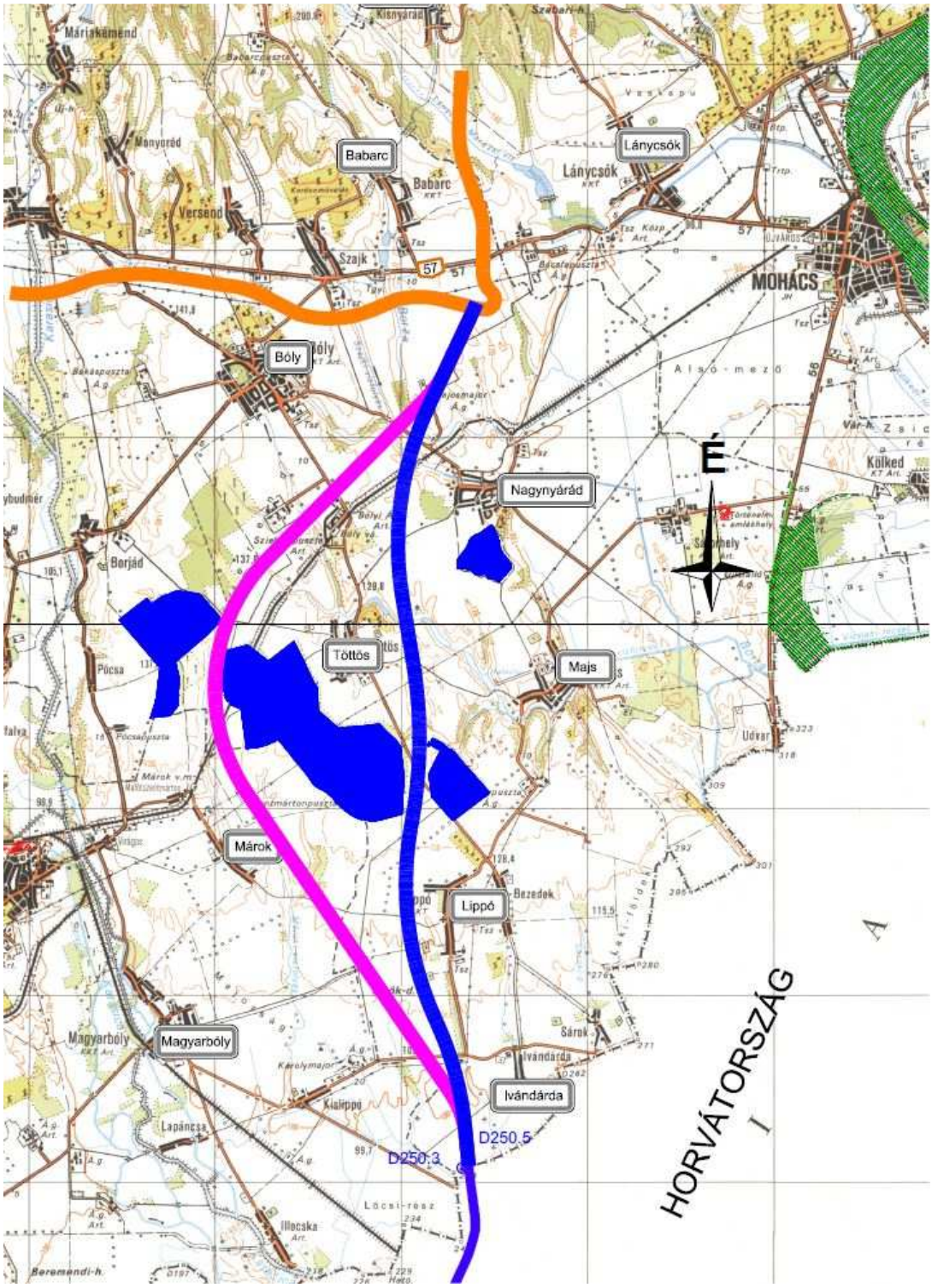


Figure 1 Options reviewed in the Feasibility Study (the selected option is marked with blue)

HORVÁTORSZÁG	CROATIA

The option presented in the environmental impact study was selected from the previously reviewed options according to the requirements of the Municipality, the Client and the

Ministry of National Development by considering technical feasibility and the environmental impacts.

Below we present the previously reviewed option and the reasons of rejection.

The rejected option "B" is designed to the west from the currently reviewed track, it starts at the Bóly split junction of the current M6-M60 motorway with 193+820 km section, the same as in the selected option. (0., marked with pink colour)
At the beginning of the planned section, a flyover will be built above the crossing dirt track and wildlife crossing structure in the 193+905 km section.
Following a right curve, the track approaches "Lajos manor" 90 metres. Based on a municipality proposal, the correction of the paved road to the manor was led to municipality operated road No. 5703 parallel with the motorway and the gas pipeline supplying Lajos manor instead of the former plan of crossing the road with an underpass in 195+220 km section.
Following the correction of the Veresendi water course (196+375 km section) the semi clover type "Bóly east" junction will be constructed at the crossing of the correction of road No. 5703 (196+064 km section) within the administrative territory of Bóly.
Crossing the correction of road No. 5704 (197+978.50 km section) with an underpass, the track continues and affects the Hybrid site of Bóly State Farm. The existing asphalt paved connecting road, which provides access to the Hybrid site, the industrial siding loading facility and Sziebert-puszta and other properties will have to be reconstructed on an adjusted track. The industrial siding of the site must be demolished on 250 m length and the concrete loading facility next to it should also be removed. That option did not meet the interests of the municipality.
Then the track continues almost parallel with the Pécs – Villány railway line and reaches directly the "Boly simple rest area at 199+750 km section.
The track continues a long, R=4,000 m radius and p=1,000m parameter left curve between the two segments of Töttös forest protected under "NATURA 2000" and reaches the Mohács-Villány railway line (203+980 km section), crossing it with an overpass. Then it continues following the unpaved road that crosses the track threw the underpass established at 204+630 km section and reaches the viaduct above the Márok water course.
Then the track continues in a straight line, crosses a water course (208+343 km section) and road No. 5702 (old number: 561) designed and constructed within the framework of a project financed from a different source at 208+110 km section (in the layout plan it is marked with a light dotted line), then continues in a straight line and reaches the underpass of the correction of road No. 5705 (212+580 km section), where the semi-clover type complex rest area combined with a junction will be constructed. Two axle weight measuring stations will be established at the rest area.
After the rest area and the wildlife crossing structure (214+200 km section) and following an R=2 000m radius and p=500m parameter right curve, the design section ends with the 215+022 km section at the intersection point of the Hungarian-Croatian state borders.

Length of the planned section: 21,110 m.

In terms of **cross section** there was no difference between the construction of the selected and rejected B version. The Feasibility Study used the same assumptions for schedule too.
The comparison of the two versions based on the preliminary assessments is illustrated in 0, where we included the criteria based on which a more favourable version can be created, indicating the more favourable aspects with grey filling.

	Version "A"	Version "B"
land use	more favourable	a larger area needs to be expropriated
production land	first 2.5 km good productivity land	first 2 km good productivity land
impact on a water base, cave, mine	none	none
surface water	more favourable: number of crossed water courses 4	number of crossed water courses 6
air	no conflict is expected from construction and operation	no conflict is expected from construction and operation
noise	It is unlikely that the impact will exceed the limit value based on the distance of the residential properties	It is unlikely that the impact will exceed the limit value based on the distance of the residential properties
flora and fauna, natural environment	Natura 2000 site distance from the track: 163 m	Natura 2000 site distance from the track: 37 m
Intersection of an ecological corridor	2 intersection points	No intersection
impact on forests	1 short section in Lippó, 2 forest segments in Töttös, in total 206 m	Márok 430m
Built environment	Number of settlements involved: 7	Number of settlements involved: 8
	number of crossing structures: 20	number of crossing structures: 22
Municipality support	Version preferred by the municipality	

Table 1 Comparison of the two tracks assessed in the Feasibility Study according to environmental criteria

On the basis of the above, and applying weights to the impacts described, the implementation of Version "A" will generate fewer environmental conflicts.

2. BASIC DATA OF THE ASSESSED OPTIONS OF THE PLANNED ACTIVITY

2.1. VOLUME OF THE ACTIVITY

Length of the motorway planned on the new track "A": 18.245 km (construction in both phases)
With the application of the "Am" correction phase: 18.320 km (construction in both phases)

Horizontal tracking

Track "A": The planned track "A" of the M60 motorway leading to Pécs begins at 193+820 km section after the "Bóly split junction". (0 marked with blue colour)

At the beginning of the planned section, a flyover will be built above the crossing dirt track and wildlife crossing structure in the 193+905 km section. Reaching the administrative territory of Szajk, the track lies 120 m from "Lajos manor". Based on a municipality proposal, the correction of the paved road to the manor was led to municipality operated road No. 5703 parallel with the motorway and the gas pipeline supplying Lajos manor instead of the former plan of crossing the road with an underpass in 195+467.60 km section. Following the correction of Borza stream (195+972.50 km section) the track progresses across Korpádi-puszták lane and reaches road No. 5703 (196+235 km section), where the semi-clover type "Bóly east" traffic junction was formed.

The corrected Versend water course is cross with a flyover (196+520 km section), and then the Mohács-Villány railway line is crossed with an underpass (196+709.74 km section). The 196+900 km section cuts across "Anonymous ditch", where a 2.0 m culvert will be built. In the administrative area of Bóly the track moves across "Tüskés" and "Erdős" lanes with a slightly broken R=7,000 m radius left arch.

The corrected dirt road in the administrative border of Bóly and Nagynyárád is crossed with an underpass with 198+297.60 km section, and then the "Nagynyárád" simple structured rest area was designed further at the 199+500 km section.

A viaduct will be constructed above Majs water course and wildlife crossing structure on the administrative territory of Töttös in the 200+182.60 km section. Then the track will move along a right arch, so that the Töttös forest areas, examined in this impact study should be affected to the least possible extent. The dirt track leading through Szilvás lane in Töttös will be crossed with an underpass in the 200+865 km section. A viaduct will be constructed above Szilvás stream and the wildlife crossing structure in the 202+430 km section. A flyover will be built above the wildlife crossing structure in the 202+925 km section. An underpass will be built under the correction of road No. 5704 (203+750 km section).

Reaching the administrative area of Lippó, the track will continue with a slightly broken left arch and reach road No. 5702, planned and constructed in the long term within the framework of a different project, in 205+731.77 km section. Underground structures are designed for the crossing of the dirt track in 207+165 km section, and for wildlife crossing in the 208+180 km section.

The track gets close to a Serbian cemetery around the 207+900 km section. The correction of the "new" road No. 5705 will cross the track with an underpass to be built in the 209+597.9 km section.

Reaching the administrative territory of Ivándárda, the border crossing point agreed with the Croatian partners will be reached with an R=7000 m radius right arch with a slight fraction and then the track will be continued as envisaged on the other side of the border. The track reaches connection road No. 5705 in the 209+597.90 km section. That is where the "Ivándárda junction and complex rest area" will be constructed. In the 211+039 km section an underground will be construction under the wildlife crossing structure. The design phase ends at the 212+065 km section, which is the crossing point of the Hungarian and the Croatian state borders.

"Am" corrected track: The road construction study plan authors were requested to plan the correction on the basis of the flora and fauna protection field surveys.
The purpose of the correction was to avoid the flat areas of Nagynyárád and to protect the valuable undisturbed habitat situated there.
3 different technical versions were prepared for the correction, of which the investor, NIF Zrt., decided that the track presented in this study would be the final track. The correction is more favourable from technical aspects too; although it involves less favourable crossing angle with the Mohács - Villány railway line, based on the landscape conditions and the avoidance of the deep marshy areas covered with water, also known as the Nagynyárád flatland, the track can be laid at a more favourable height and it is also likely that more favourable solution would be adopted for the foundation of the planned earthwork.
The correction phase will be implemented on the territory of Bóly. The corrected track will split from track "A" to the west at the 196+531 section and were returned to the original axis in the 195+110 km section. The axis will be shifted by almost 190 m in the farthest point.

Vertical alignment
Between Bóly and Ivándárda (country border) the reviewed M6 motorway progresses in approximately 20 km, in North-South direction on a consistent, slightly slope area. A few 100-200 m wide and 10-20 m deep valleys cross the area transversely. They include Borza stream, Szajk water course, Majs reservoirs and the anonymous water course valley supplying it. There is a railway crossing on the area too. On the consistent area, the landscape is also occasionally cut by 4-8 m deep minor valleys.
The planned track begins at 193+820 km section following the "Bóly split junction" of the M60 motorway leading to Pécs, with 123.96 mBf axis height, at 118.91 m Bf ground level and p=0.19 % lengthy slope.
At the beginning of the planned section, a flyover will be built above the crossing dirt track and wildlife crossing structure in the 193+905 km section. Reaching the administrative territory of Szajk, the track lies 120 m from "Lajos manor". It will not cross the correction of the paved road leading to the manor. Following the correction of Borza stream (A: 195+972.5 section, Am: 195+946 km section) the track progresses across Korpádi-puszták lane and reaches road No. 5703 (A: 196+235 km section. AM: 196+219 km section), where the semi-clover type "Bóly east" traffic junction was formed. It will reach the deepest point of the profile geometry at 111.74 m between Borza - stream and Versend water course with Rd = 45,000 m concave rounding arch.
The corrected Versend water course is cross with a flyover (A: 196+520 km section, Am: 196+531 km section), and then the Mohács-Villány railway line is crossed with an underpass (A: 196+709.74 km section, 196+883 km section). 2.0 m culvert will be constructed at the crossing of "Anonymous ditch" (A: 196+900 Am:197+439 km section). In the administrative area of Bóly it crosses "Tüskés" and "Erdős" lanes with an R=7,000 m radius left arch with a slight fraction in a bank reducing from 4 m to ground height where the track will continue rising at 1.5 % reflecting the ground conditions. The local high point is again close to the ground level at the 198+200 km section (around the same sections at both versions) and then it begins to subside again at 0.7 % profile geometry to the lowest point around the Majs water reservoir. Special attention was paid to the vertical tracing of this section and the method of protection was consulted with the experts of Forster Centre which prepared the archaeological documentation. It was necessary because the track crosses a 4,500-year-old concentric ditch system to be protected between the 199+880 and 200+065 kms sections. Its place is indicated on the site plan (11LH) and also on the profile. There the track progresses on a bank at 2.00 m above the ground level. This bank had to be established because the archaeological assets to be

protected need to be covered up as required by the experts in order to prevent any harmful impact of road construction and vibration. Given the bank lines and topographic limitations of the Majs reservoirs, the track cannot be shifted horizontally within any reasonable framework. At the same point the 3 gas pipelines cross each other and the track of the planned motorway.
The track crosses the corrected dirt track on the administrative border of Bóly and Nagynyárád with an underpass (A: 198+197.8, Am:198+464 km sections), and then the "Nagynyárád" simple structured rest area was designed at the 199+500 km section on both tracks.
A viaduct will be constructed above Majs water course and wildlife crossing structure on the administrative territory of Töttös (A: 200+182.60: Am:200+250 km sections). Then the track progresses with an R=10,000 m radius right arch to make sure that it affects the forest areas as little as possible. In the 200+250 km it crosses the dirt track across Szilvás lane of Töttös. A viaduct will be constructed above Szilvás stream and the wildlife crossing structure (in A: 202+430 km, AM: 2020+505 km sections). An underpass will be constructed under the correction of road No. 5704 (A: 203+750, Am:203+825 km sections). The track will reach the high point of the watershed between the two Töttös forest parts with Rd=80,000 m arch radius convex rounding arch. There the track continues in a low less than 1 m cut from the existing round. From that point onwards, the track moves along consistently with 0.5 % longitudinal slope until the final section, i.e. the border crossing point, on a low bank.

Cross section construction:

	Construction I.	**(Construction II.)**
traffic lane width	3.50 m	(3.75m)
number	2x1	(2x2)
Width of the separator lane	0	(3.60 m)
width of the emergency lane	2.50 m	(3.00 m)
shoulder	1.00 m	(1.00)
crest width	15.00 m	(26.60 m)
deceleration and acceleration lane width	3.50 m	(3.50 m)

In the case of Phase I construction *(based on consultations with the Croatian party and technical data supply, in the design phase the technical plans project the construction of the right track)*
2*1 lanes, without any physical separation. With 3.50 m wide traffic lanes and 2.5 m wide stabilised shoulders on both sides. Consequently, the average crest width is 15.0 m. The typical cross section is indicated in 0 .
According to our current information, on average approximately 30 m expropriation width should be assumed on the total length.

In the case of Phase II construction:
motor road with 2x2 lanes + emergency lane, 3.75 m wide lanes, 3.60 m separation lane, 3.0 m wide emergency lane, 1.00 m wide shoulders on both sides. Consequently, the average crest width is 26.6 m. The typical cross section is indicated in 0 .
According to our current information, on average approximately 50 m expropriation width should be assumed on the total length.

Design class and environmental category

In compliance with "K.I." design class and "A" environmental requirements, as well as traffic needs, in the first phase the motorway will be built with 2x1 lanes, but the final construction (as a motorway) will involve 2x2 traffic lanes.

Design speed:
If both phases are constructed, then v_t= 130 km/h as a result of the construction into a motorway in Phase II.

Traffic data The long-term traffic load on M6 motorway is as follows:

	Phase I	Phase II
– Split junction – Bóly – east junction	MOF E 338	MOF E 354
– Bóly – east junction – Lippó junction	MOF E 352	MOF E 354
– Lippó junction – country border	MOF E 320	MOF E 315

Structures

Crossing of unpaved roads and railway lines	**Track 'A'**	**"Am" correction track**
Overhead pass crossing above the country road and wildlife crossing structure	193+905	193+905
Underground passage below the correction of road No. 5703	196+235	196+219
Underground passage under Mohács-Villány railway line	196+709.74	196+883
Underground passage below the crossing dirt track	198+297.8	198+464
Underground passage below the crossing dirt track	200+865	200+908
Underground passage below the correction of road No. 5704	203+750	203+825
Underpass under road No. 5702	205+731.77	205+807
Underground passage below the crossing dirt track	207+165	207+261
Underground passage below the wildlife crossing structure	208+180	208+255
Underground passage below the correction of road No. 5702	209+734	209+746
Underground passage below the wildlife crossing structure	211+039	211+114

Water courses, water pipes	**Track 'A'**	**"Am" correction track**
1.2 m culvert	195+006	195+006

Flyover above the correction of Borza stream	195+972.5	195+946
Flyover above the correction of Versendi water course	196+520	196+531
2.0 m pipe culvert below the "Anonymous ditch"	196+900	197+439
Viaduct above Majs water course and wildlife crossing structure	200+182.6	200+250
Viaduct above Szilvás stream and the wildlife crossing structure	202+430	202+505

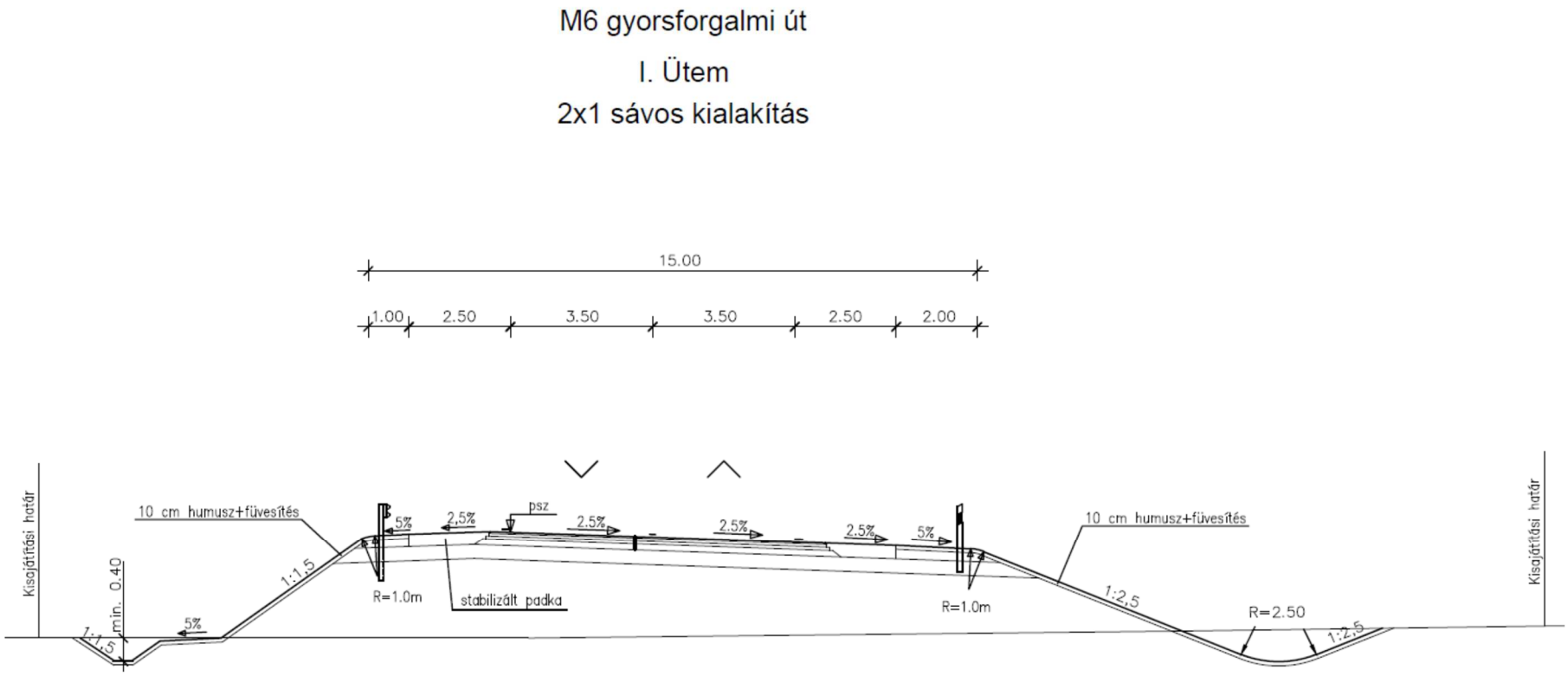


*Figure 2 Sample cross section for Phase I construction with 2*1 traffic lanes*

2. ábra	Figure 2
M6 gyorsforgalmi út	M6 motorway
I. Ütem	Phase I.
2x1 sávos kialakítás	2x1 tracks

Kisajátítási határ	Expropriation border
10 cm humusz+füvesítés	10 cm humus + grass seeds
stabilizált padka	stabilised shoulder

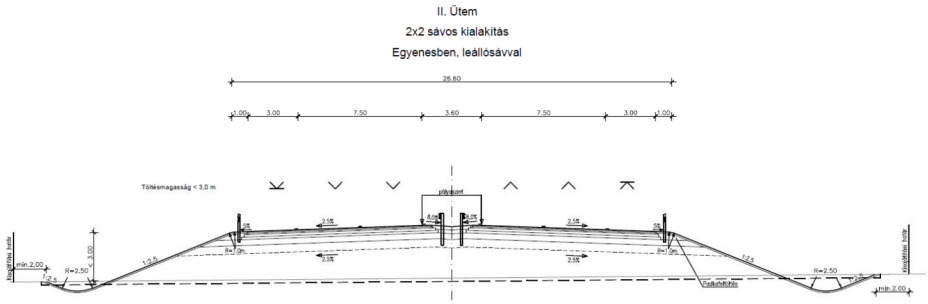


*Figure 3 Sample cross section for Phase II construction with 2*2 traffic lane*

3. ábra	Figure 3
II. Ütem	Phase II.
2x2 sávos kialakítás	2x2 tracks
Egyenesben, leállósávval	In a straight line, with an emergency lane
Kisajátítási határ	Expropriation border
Töltésmagasság < 3,0 m	Bank height < 3.0 m
pályaszint	track level

Padkafeltöltés	Bank filling

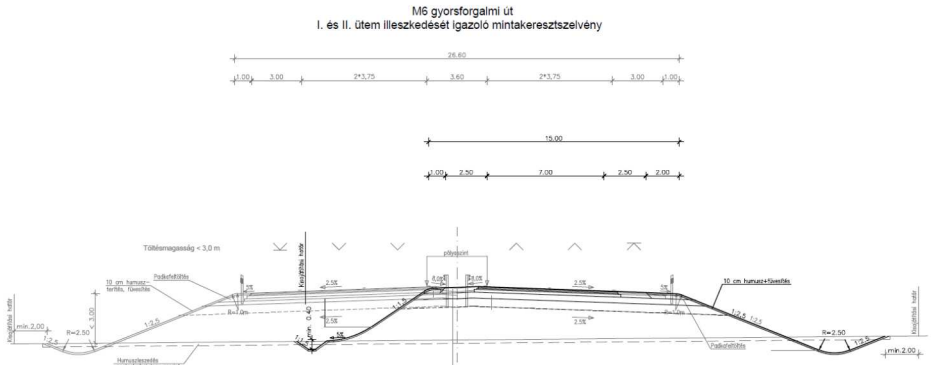


Figure 4 Sample cross section for Phases I and II in construction

4. ábra	Figure 4
M6 gyorsforgalmi út	M6 motorway
I.és II. ütem illeszkedését igazoló mintakeresztszelvény	Sample cross section certifying the alignment of phases I. and II.
Töltésmagasság < 3,0 m	Bank height < 3.0 m
Kisajátítási határ	Expropriation border

10 cm humuszterít és+füvesítés	10 cm humus dissemination + grass seeding
Padkafeltöltés	Bank filling
Töltésmagasság < 3,0 m	Bank height < 3.0 m
pályaszint	track level
Humuszleszedés	Humus removal

2.2. CONSTRUCTION AND ESTIMATED DATE OF THE OPENING OF THE SECTION

The planned M6 Bóly-Ivándárda section is included in Government Resolution No. 1696/2014. (XI. 26.), which contains the indicative list of transport development projects of the 2014-2020 programming period. The Government Resolution lists the project among the projects to be launched after 1 January 2015 with Phase I construction on 2*1 lanes. Consequently, construction will begin during the programming period. The expected date of bringing into operation is 2-3 years from the start of construction.

2.3. THE LOCATION AND LAND REQUIRED FOR THE ACTIVITY, CURRENT WAY OF UTILISATION OF THE AREA TO BE USED AND THE WAY SPECIFIED IN THE LOCAL REGULATION PLAN

The designed motorway section crosses the territory of Baranya county. The direct land use of the motorway is the same as the expropriation area band. The area used by the motorway and related roads can be defined exactly in a subsequent design phase. (The exact land use will be included in the plans for the reclassification of land utilisation included in the licensing plans.) The land used by the road is the actual area covered by it. On average in Phase I construction with 2*1 lanes, it will require a 30 m wide band, while in the case of Phase II construction with 2*2 lanes, it will require a band of approximately 50-metre width. Depending on the topography, on sections involving cuts and banks it can also reach a 60-75-metre wide band.
Further land is required for the junctions, rest areas and the corrected sections of the crossing facilities.
The aggregated land requirement of the planned tracks is included in Section 2.3.1 Land use. The location of the land to be used, the method of its utilisation and the integration of the planned tracks into the local regulation plans are presented in Section 4.6. Built environment.

Abbreviations used in the land use tables.
sz=arable land
l=pasture
r=meadow
e=forest
vízf=water courses

The numbers after each letter refer to the quality category of the land.

2.3.1. Land use

*2.3.1.1. Land use in the case of Phase I construction (2*1 lanes)*

	sz2	sz3	sz4	sz5	sz6	l4	r6	e2	e3	e4	vízf	marsh	road	unpaved road	railway
Babarc	0	2.84	0.28	0	0	0	0	0	0	0	0	0	0	0.12	0
Szajk	0	1.63	0.14	0	0	0	0	0	0	0	0	0	0.06	0.02	0
Nagynyárád	0	1.47	6.09	0.88	0	0	0	0	0	0	0.02	0	0.05	0.07	0
Bóly	0	1.39	2.44	0.83	0	0	0	0	0.63	0	0.03	0.40	0	0.11	0.18
Töttös	1.40	3.01	7.24	4.04	0.98	0.08	0.14	1.10	0	0	0.05	0.43	0.11	0.20	0
Lippó	2.79	17.68	3.27	0	0	0	0	0	0	0.06	0	0	0.08	0.25	0
Ivándárda	13.20	5.99	2.07	0	0	0	0	0	0	0	0	0	0	0.13	0
	17.39	34.00	21.53	5.75	0.98	0.08	0.14	1.10	0.63	0.06	0.10	0.83	0.30	0.89	0.18

Table 2 Lland use based on land registry records; Phase I construction, also including junctions and rest areas

*2.3.1.2. Land use, Phase II construction (2*2 lanes)*

	sz2	sz3	sz4	sz5	sz6	l4	r6	e2	e3	e4	water f.	marsh	road	unpaved road	railway
Babarc	0	4.73	0.47	0	0	0	0	0	0	0	0	0	0	0.20	0
Szajk	0	2.71	0.23	0	0	0	0	0	0	0	0	0	0.10	0.03	0
Nagynyárád	0	2.46	6.60	1.46	0	0	0	0	0	0	0.04	0	0.08	0.12	0
Bóly	0	2.32	3.77	1.39	0	0	0	0	1.05	0	0.05	0.67	0	0.18	0.31
Töttös	2.34	5.02	10.18	6.37	1.63	0.14	0.24	1.83	0	0	0.08	0.72	0.19	0.28	0
Lippó	4.65	23.76	5.45	0	0	0	0	0	0	0.10	0	0	0.14	0.36	0
Ivándárda	13.27	9.42	2.07	0	0	0	0	0	0	0	0	0	0	0.16	0

	20.26	50.41	28.76	9.22	1.63	0.14	0.24	1.83	1.05	0.10	0.17	1.39	0.50	1.32	0.31

Table 3 Land use based on land registry records; Phase II construction, also including junctions and rest areas

*2.3.1.3. Land use on a corrected track, Phase I construction (2*1 lanes)*

	sz2	sz3	sz4	sz5	sz6	l4	r6	e2	e3	e4	water f.	marsh	road	unpaved road	railway
Babarc	0	2.84	0.28	0	0	0	0	0	0	0	0	0	0	0.12	0
Szajk	0	1.63	0.14	0	0	0	0	0	0	0	0	0	0.06	0.02	0
Nagynyárád	0	1.14	6.09	0.88	0	0	0	0	0	0	0.02	0	0.05	0.05	0
Bóly	0	1.97	3.55	0.55	0	0	0	0	0.03	0	0.03	0.15	0	0.03	0.11
Töttös	1.57	3.01	7.24	4.04	0.98	0.08	0.14	1.10	0	0	0.05	0.43	0.11	0.20	0
Lippó	2.79	17.68	3.27	0	0	0	0	0	0	0.06	0	0	0.08	0.25	0
Ivándárda	13.20	5.99	2.07	0	0	0	0	0	0	0	0	0	0	0.13	0
	17.56	34.25	22.63	5.46	0.98	0.08	0.14	1.10	0.03	0.06	0.10	0.58	0.30	0.79	0.11

Table 4 Land use on the corrected track based on land registry records; Phase I construction, also including junctions and rest areas

*2.3.1.4. Land use on corrected track, Phase II construction (2*2 lanes)*

	sz2	sz3	sz4	sz5	sz6	l4	r6	e2	e3	e4	water f.	marsh	road	unpaved road	railway
Babarc	0	4.73	0.47	0	0	0	0	0	0	0	0	0	0	0.20	0
Szajk	0	2.71	0.23	0	0	0	0	0	0	0	0	0	0.10	0.03	0
Nagynyárád	0	1.90	6.60	1.46	0	0	0	0	0	0	0.04	0	0.08	0.08	0
Bóly	0	3.29	5.62	0.92	0	0	0	0	0.05	0	0.05	0.245	0	0.05	0.18
Töttös	2.62	5.02	10.18	6.37	1.63	0.14	0.24	1.83	0	0	0.08	0.72	0.19	0.28	0
Lippó	4.65	23.76	5.45	0	0	0	0	0	0	0.10	0	0	0.14	0.36	0
Ivándárda	13.27	9.42	2.07	0	0	0	0	0	0	0	0	0	0	0.16	0

	20.54	50.82	30.61	8.74	1.63	0.14	0.24	1.83	0.05	0.10	0.17	0.97	0.50	1.15	0.18

Table 5 Land use on the corrected track based on land registry records; Phase II construction, also including junctions and rest areas

2.3.2. Types of operation affected by the track and their breakdown:

*2.3.2.1. Types of land use and their breakdown, Phase I construction (2*1 lanes)*

arable land	**79.64**	**ha**	**94.8%**
pasture	0.08	ha	0.1%
meadow	0.14	ha	0.2%
forest	1.79	ha	2.1%
water courses	0.10	ha	0.1%
marsh	0.83	ha	1.0%
road	0.30	ha	0.4%
unpaved road	0.89	ha	1.1%
railway	0.18	ha	0.2%
	83.95		100%

*2.3.2.2. Types of land use and their breakdown, Phase II construction (2*2 lanes)*

arable land	**110.27**	**ha**	**94.0%**
pasture	0.14	ha	0.1%
meadow	0.24	ha	0.2%
forest	2.98	ha	2.5 %
water courses	0.17	ha	0.2%
marsh	1.39	ha	1.2 %
road	0.50	ha	0.4%
unpaved road	1.32	ha	1.1%
railway	0.31	ha	0.3%
	117.32		100%

*2.3.2.3. Types of land use and their breakdown on the AM corrected track, Phase I construction (2*1 lanes)*

arable land	**80.88**	**ha**	**96.1%**
pasture	0.08	ha	0.1%
meadow	0.14	ha	0.2%
forest	1.19	ha	1.4%

water courses	0.1	ha	0.1%
marsh	0.58	ha	0.7%
road	0.3	ha	0.4%
unpaved road	0.79	ha	0.9%
railway	0.11	ha	0.1%
	84.17		100%

*2.3.2.4. Types of land use and their breakdown on corrected track, Phase II construction (2*2 lanes)*

arable land	**112.34**	**ha**	**95.5%**
pasture	0.14	ha	0.1%
meadow	0.24	ha	0.2%
forest	1,98	ha	1.7 %
water courses	0.17	ha	0.1%
marsh	0.97	ha	0.8 %
road	0.5	ha	0.4%
unpaved road	1.15	ha	1.0%
railway	0.18	ha	0.2%
	117.67		100%

2.3.3. Use of forest areas

In terms of the impact on forests, we contacted NÉBIH Forestry Directorate Registration Department and obtained the boundaries of the forest areas by the track. On the basis of the issued data supply, we requested a declaration from the competent Baranya County Government Office Department of Agricultural and Forestry Management, Forestry Unit concerning the replacement of the forests by new afforestation (see the letter in the attachments)

Forest segment mark	Total area (hectare)	Affected area (hectare)
Bóly 24A	1.63	0.24
Bóly 24C	1.49	0.01
Bóly 24E	0.71	0.15
Töttös 42B	1.14	0.12
Töttös 42E	0,21	0.02
Töttös 43A	0.81	0.12
Töttös 43B	2.21	0.12
Töttös 44A	1,37	0.25
total		1.03

In response to our letter, the Forestry Unit provided the following information:

If in consideration for the planned land use, the applicant arranges for the plantation of new forests replacing the areas falling in the category of cultural forests and included in the table by a forest on the territory of at least 1.03 hectares at the same location, or in the neighbouring settlement, classified in the same natural category or in any higher category, no forest protection contribution shall be payable on the basis of the land use.

In addition, the same unit also stated that the planned motorway section also affected 0.13 ha of the 0.69 ha indicated in the Töttös 42CE forest plan as an area directly used for forest management purposes. As, pursuant to Act XXXVII of 2009 on Forest Protection and Forest Management, no replacement forests can be planted on the area, the forest protection contribution must be paid in relation to that area.

2.4. TRAFFIC PROJECTION

2.4.1.1. Traffic model production and passenger traffic review methodology

A traffic model had to be created to conduct the studies required for the analysis of the versions for the feasibility study, containing the traffic demands and the traffic network in its current and long-term status. This is how the current situation could be analysed and the impacts of future developments could also be examined.

The following data emerged at transport network level as a result of traffic modelling and traffic estimates:

- size of traffic by vehicle type,
- travel time by vehicle type,
- speed,
- mileage by vehicle type,

these data were used as the input data of the Feasibility Study and the financial and economic cost-benefit analysis.

Of the analyses made for the Environmental Impact Study, the projected traffic size figures were used as the initial data of noise, vibration and air quality protection calculations.

In the course of the assignment, the authors relied on the overall transport model developed by STRATÉGIA consortium (leader: FŐMTERV, members: FORRÁS UNIÓ, KÖZLEKEDÉS, KTI Közlekedéstudományi Intézet, TRENECON COWI, UNITEF, UTIBER, UVATERV) within the framework of the preparation of the National Transport Strategy (NTS) document. This overall transport model contains the road and rail network, as well as traffic data and habits.

The computer model was used by using the internationally accredited and widely popular EMME4 program package.

The impact area of the traffic model stretches over a range of 30-40 km to the north. Further north the road section does not have any relevant impact due to M7, towards the east it also stretches into Baja and Kalocsa districts due to the Szekszárd Danube bridge, to the south it stretches to the country border and to the east, it goes as far as Nagykanizsa.

2.4.1.2. Territorial model

The model uses the districts defined in the former National Traffic Survey (NTS) with a more dense district structure around large cities (the city of Pécs has 9 districts in the model).

The model contains 1,178 target traffic districts, of which 68 are across the borders.

2.4.1.3. Network model

The model uses the sufficiently detailed map of the national road network (OKA-50), and the files of the National Road Network, describing the parameters of the network (hereinafter referred to as: OKA) (e.g., length, IDs, track and traffic data). The data file contains the situation at the end of 2012.

Data included in the model:

- road type,

- number of lanes,
- field,
- character,
- speed limit (major),
- pavement width (capacity reducing factor),
- traffic data by vehicle category.

The modelled network elements by their function in the road network are as follows:

- motorways,
- dual carriageways,
- primary roads,
- secondary roads,
- collecting roads, service roads and junction roads with a major role in the network.

The foreign road network was prepared on the basis of the ESRI database available in shops. Compared to the original format, the format of the data file was adjusted to the structure of the domestic network, creating a homogeneous network. The established network contains 126,750 sections and 51,200 junctions.

The sections are described with the following parameters:

- starting point of the section,
- end point of the section,
- actual length of the section,
- type of the section (which includes the number of lanes and assigned capacities, shown in column NAME in the table),
- rank, which defines the hierarchy at the parameterized junctions specifically not defined,
- the direction of the section; most road network components have two directions, but for certain elements (motorway sections and ramps) the direction also needs to be defined,
- free speed of the section in column V0, the speed available on the section when vacant (low traffic density) in default the speed permitted on the specific section of the road.

2.4.1.4. Long-term and long-range network models

The effective national development plans and concepts were taken into account for the definition of the elements of the national road network over the various time horizons:

- For the long-term network (approximately 2050) the currently effective Act XXVI of 2003 on the National Territorial Plan (amended by Parliament in Act L of 2008). Annex 2 of the Act is the structural plan of the country, containing the long-term traffic networks and institutions.
- The long-term indicative list in Government Resolution No. 1696/2014. (XI. 26.), 1199/2015. (III. 31.) of road development projects in the EU 2014-2020 programming period.

In the framework of the NTS, the above factors were taken into account according to the following criteria:

- economic changes of the last few years,

- refining of the territorial model,
- availability of the 2011 traffic count results,
- changes in the network.

2.4.1.5. "Version A" daily load figure for 2030 [vehicle unit/day/direction]

The following figure presents the traffic flow and projected traffic under the traffic model of Version "A", prepared an analytical traffic load in case the version is implemented and the table contains the estimated traffic of M6 motorway.

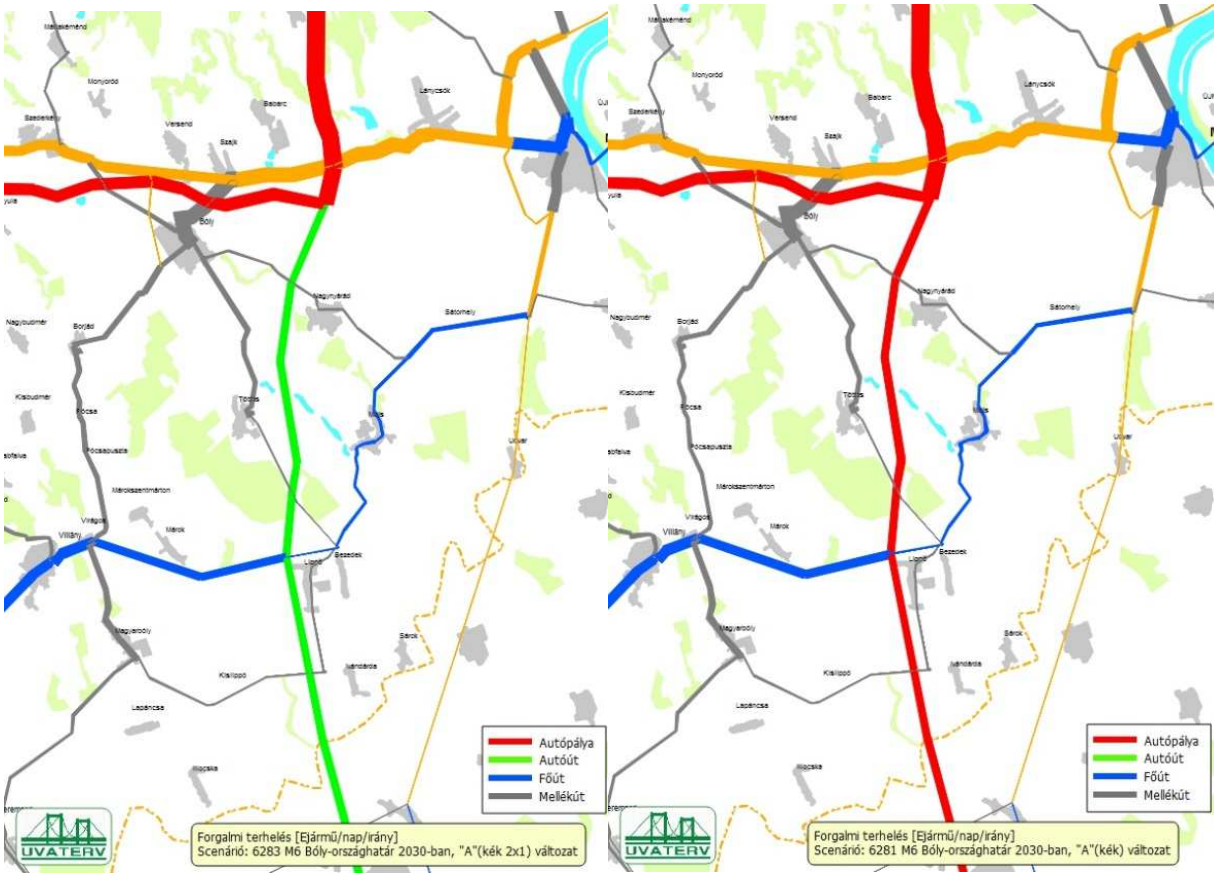


Table 6 2030 projected traffic for 2x1 lanes and 2x2 lanes[1]

6. táblázat	Table 6
Forgalmi terhelés [Ejármű/nap/irány]	Traffic load [Thousand vehicles/day/direction]
Scenárió: 6283 M6 Bóly-országhatár 2030-ban, „A" (kék 2x1) változat	Scnario: 6281 M6 Bóly-country border in 2030 "A" (blue 2x1) version
Autópálya	Motorway
Autóút	Expressway
Főút	Main road
Mellékút	Secondary road

[1] Source: UVATERV Zrt. own editing

Version A		(2x1)		(2x2)	
Section start	End of section	ANF (vehicle unit/day)	MOF (vehicle unit/hour)	ANF (vehicle unit/day)	MOF (vehicle unit/hour)
Year of projection		2030			
Bátaszék	Palotabozsok	12,807	1,243	12,962	1,258
Palotabozsok	M60	8,438	819	8,726	847
M60	Bóly east	3,478	338	3,642	354
Bóly east	Lippó	3,622	352	3,649	354
Lippó	Ivándárda	3,297	320	3,246	315
Ivándárda	country border	3,297	320	3,246	315

*Table 7 Estimated traffic on M6 sections for 2*1 and 2*2 lanes*

What is more striking based on the above table is that due to low capacity utilisation traffic can flow without any disturbance even on 2x1 lanes, and therefore traffic is within the estimation error limit between 2x1 and 2x2 lanes.

The corrected track under “Am option” is equivalent to “Version A” in terms of traffic.

Number and definition of the public road	Junction		Passenger car	Small truck	Bus		Truck					Motorcycle	Slow vehicle
	start	end			individual	articulated	average heavy	heavy	with trailer	semi-trailer	special		
M6 162+000-172+552 Bátaszék-Palotabozsok	17,196	2,284	2,450	521	23	0	53	152	71	360	1	5	0
M6 172+552-193+820 Palotabozsok-M60	2,285	2,273	2,450	521	23	0	53	152	71	360	1	5	0
M60 motorway 0+000-6+430 M6- road No. 5701	2,286	2,289	862	116	8	0	7	68	33	108	0	11	0
M60 motorway 6+430-25+206 Road No. 5701-Road No.	2,289	2,293	862	116	8	0	7	68	33	108	0	11	0
M60 motorway 25+206-29+332 Road No. 5721-Main	2,291	2,265	862	116	8	0	7	68	33	108	0	11	0
Main road No. 56 49+263-52+831 Main road No. 57-Road No.	2,060	2,093	344	88	10	0	32	29	27	57	0	7	4
Main road No. 56 Road No.5702/road No. 5117	2,093	2,041	653	167	20	0	60	54	51	108	0	13	7
Main road No. 57 1+930-3+712 main road No.56. -Lánycsók	2,060	2,059	4,602	657	66	5	66	50	28	64	0	17	10
main road No. 56. 3+712-7+867 Lánycsók-M6	2,059	2,273	5,371	767	78	6	76	59	33	75	0	20	11
Main road No.57 7+867-9+485 M6-Babarc(road No. 56113)	2,273	2,058	5,468	781	79	6	78	60	33	76	0	20	1-2
main road No. 57 9+485-11+488 Babarc- road No. 5714 Szajk	2,058	2,057	5,468	781	79	6	78	60	33	76	0	20	1-2
No. 5702 road 0+000-2+000 main road No. 56-Sátorhely	2,041	2,251	1,086	240	55	0	25	19	18	9	0	34	52
road No. 5702 4+793-6+446 road No. 5703-Majs	2,251	2,248	455	100	23	0	11	8	7	4	0	14	22
road No. 570213+225-15+352 Lippó	2,248	2,247	455	100	23	0	11	8	7	4	0	14	22
road No. 5702 15+352-17+456 Lippó- road No. 57118	2,247	2,244	455	100	23	0	11	8	7	4	0	14	22
road No. 5702 17+456-18+250 road No. 57118-M6	2,244	2,238	455	100	23	0	11	8	7	4	0	14	22
road No. 5702 21+681-23+706 Kislippó-road No. 57119	2,238	2,236	1,295	286	66	0	30	23	21	11	0	40	62
road No. 5703 Bóly-M6	2,242	2,231	553	178	1-2	0	25	23	4	1	0	28	9
road No. 5703 M6- road No. 5702	2,231	2,251	553	178	1-2	0	25	23	4	1	0	28	9
road No. 5704 0+000-4+867 road No. 5702 -Töttös	2,245	2,248	159	61	9	0	15	8	4	8	0	5	4
road No. 5704 6+301-10+790 Töttös-Bóly	2,242	2,245	759	290	44	0	69	40	19	40	0	25	18
road No. 5704 10+790-12+366 Bóly-road No. 5714	2,242	2,241	733	280	43	0	67	39	18	39	0	24	18
road No. 5704 12+366-13+190 road No. 5714-Bóly	2,288	2,241	792	303	46	0	72	42	20	42	1	26	19
road No. 5704 13+861-15+880 road No. 5701-M60	2,288	2,056	804	308	47	0	73	42	20	43	1	27	20
road No. 5714 0+000-2+213 main road No. 57-Bóly	2,057	2,241	3,409	1,236	200	0	101	42	60	189	0	30	43
road No. 5714 2+817-3+916 road No. 5704-Bóly	2,241	2,287	1,608	583	94	0	47	20	28	89	0	14	20

Table 8 Modelled, current traffic (2014) used in planning in [vehicles/day] measuring unit

Number and definition of the public road	Junction		Passenger car	Small truck	Bus		Truck					Motorcycle	Slow vehicle
	start	end			individual	articulated	average heavy	heavy	with trailer	semi-trailer	special		
M6 162+000-172+552 Bátaszék-Palotabozsok	17,196	2,284	6,806	1,448	63	0	146	422	198	999	3	13	0
M6 172+552-193+820 Palotabozsok-M60	2,285	2,273	4,092	870	38	0	88	253	119	601	2	8	0
M60 motorway 0+000-6+430 M6- road No. 5701	2,286	2,289	3,224	432	31	0	24	254	124	403	0	42	0
M60 motorway 6+430-25+206 Road No. 5701-Road No.	2,289	2,293	3,312	444	32	0	25	261	127	414	0	43	0
M60 motorway 25+206-29+332 Road No. 5721-Main	2,291	2,265	3,485	467	34	0	26	274	134	436	0	45	0
Main road No. 56 49+263-52+831 Main road No. 57-Road No.	2,060	2,093	683	175	21	0	63	57	53	112	0	14	7
Main road No. 56 5131 Road-No.5702/road No. 5117	2,093	2,041	1,427	365	43	0	131	119	111	235	1	29	15
Main road No. 57 1+930-3+712 main road No.56. -Lánycsók	2,060	2,059	3,954	565	57	4	56	43	24	55	0	15	8
main road No. 56. 3+712-7+867 Lánycsók-M6	2,059	2,273	5,017	716	72	5	71	55	31	70	0	18	11
Main road No.57 7+867-9+485 M6-Babarc(road No. 56113)	2,273	2,058	6,157	879	89	7	88	68	37	86	0	23	13
main road No. 57 9+485-11+488 Babarc- road No. 5714 Szajk	2,058	2,057	6,157	879	89	7	88	68	37	86	0	23	13
No. 5702 road 0+000-2+000 main road No. 56-Sátorhely	2,041	2,251	2,356	520	119	0	55	42	39	19	1	73	114
road No. 5702 4+793-6+446 road No. 5703-Majs	2,251	2,248	1,128	249	57	0	26	20	18	9	0	35	54
road No. 570213+225-15+352 Lippó	2,248	2,247	370	82	19	0	9	7	6	3	0	11	18
road No. 5702 15+352-17+456 Lippó- road No. 57118	2,247	2,244	370	82	19	0	9	7	6	3	0	11	18
road No. 5702 17+456-18+250 road No. 57118-M6	2,244	2,238	370	82	19	0	9	7	6	3	0	11	18
road No. 5702 21+681-23+706 Kislippó-road No. 57119	2,238	2,236	1,663	367	84	0	39	29	27	14	0	52	80
road No. 5703 Bóly-M6	2,242	2,231	1,106	355	23	0	49	47	9	3	0	55	17
road No. 5703 M6- road No. 5702	2,231	2,251	1,106	355	23	0	49	47	9	3	0	55	17
road No. 5704 0+000-4+867 road No. 5702 -Töttös	2,245	2,248	215	82	13	0	20	11	5	11	0	7	5
road No. 5704 6+301-10+790 Töttös-Bóly	2,242	2,245	1,023	391	60	0	93	54	25	54	1	34	25
road No. 5704 10+790-12+366 Bóly-road No. 5714	2,242	2,241	1,287	493	75	0	117	68	32	68	1	43	31
road No. 5704 12+366-13+190 road No. 5714-Bóly	2,288	2,241	1,318	505	77	0	120	69	33	70	1	44	32
road No. 5704 13+861-15+880 road No. 5701-M60	2,288	2,056	1,303	499	76	0	119	69	32	69	1	43	32
5714 improvement of road 0+000-2+213 57. main road-	2,057	2,241	4,888	1,772	287	0	144	61	86	271	0	44	62
5714 improvement of road 2+817-3+916 5704 improvement	2,241	2,287	2,240	812	132	0	66	28	39	124	0	20	28

Table 9 Modelled, long-term (2030) traffic without the implementation of any development, used in planning, in [vehicles/day] measuring unit

Number and definition of the public road	Junction		Passenger car	Small truck	Bus		Truck					Motorcycle	Slow vehicle
	start	end			individual	articulated	average heavy	heavy	with trailer	semi-trailer	special		
M6 162+000-172+552 Bátaszék-Palotabozsok	17,196	2,284	6,787	1,444	63	0	146	420	198	996	3	13	0
M6 172+552-193+820 Palotabozsok-M60	2,285	2,273	4,472	951	41	0	96	277	130	656	2	9	0
M6 M60-Bóly east	2,286	2,231	1,843	392	17	0	40	114	54	271	1	4	0
M6 Bóly east-Lippó	2,231	2,274	1,920	408	18	0	41	119	56	282	1	4	0
M6 Lippó - Ivándárda	2,274	23,023	1,747	372	16	0	38	108	51	256	1	3	0
M60 motorway 0+000-6+430 M6- road No. 5701	2,286	2,289	2,831	380	27	0	21	223	109	354	0	37	0
M60 motorway 6+430-25+206 Road No. 5701-Road No.	2,289	2,293	2,915	391	28	0	22	229	112	365	0	38	0
M60 motorway 25+206-29+332 Road No. 5721-Main	2,291	2,265	3,479	466	34	0	26	274	133	435	0	45	0
Main road No. 56 49+263-52+831 Main road No. 57-Road No.	2,060	2,093	238	61	7	0	22	20	18	39	0	5	3
Main road No. 56 5131 Road-No.5702/road No. 5117	2,093	2,041	829	212	25	0	76	69	64	136	1	17	9
Main road No. 57 1+930-3+712 main road No.56. -Lánycsók	2,060	2,059	4,144	592	60	4	59	45	25	58	0	15	9
main road No. 56. 3+712-7+867 Lánycsók-M6	2,059	2,273	5,231	747	76	6	74	57	32	73	0	19	11
Main road No.57 7+867-9+485 M6-Babarc(road No. 56113)	2,273	2,058	5,723	817	83	6	81	63	35	80	0	21	1-2
main road No. 57 9+485-11+488 Babarc- road No. 5714 Szajk	2,058	2,057	5,723	817	83	6	81	63	35	80	0	21	12
No. 5702 road 0+000-2+000 main road No. 56-Sátorhely	2,041	2,251	1,221	270	62	0	29	22	20	10	0	38	59
road No. 5702 4+793-6+446 road No. 5703-Majs	2,251	2,248	577	127	29	0	14	10	9	5	0	18	28
road No. 570213+225-15+352 Lippó	2,248	2,247	338	75	17	0	8	6	6	3	0	11	16
road No. 5702 15+352-17+456 Lippó- road No. 57118	2,247	2,244	338	75	17	0	8	6	6	3	0	11	16
road No. 5702 17+456-18+250 road No. 57118-M6	2,244	2,238	338	75	17	0	8	6	6	3	0	11	16
road No. 5702 21+681-23+706 Kislippó-road No. 57119	2,238	2,236	1,716	379	87	0	40	30	28	14	0	53	83
road No. 5703 Bóly-M6	2,242	2,231	574	184	12	0	26	24	5	2	0	29	9
road No. 5703 M6- road No. 5702	2,231	2,251	489	157	10	0	22	21	4	1	0	24	8
road No. 5704 0+000-4+867 road No. 5702 -Töttös	2,245	2,248	215	82	13	0	20	11	5	11	0	7	5
road No. 5704 6+301-10+790 Töttös-Bóly	2,242	2,245	1,023	391	60	0	93	54	25	54	1	34	25
road No. 5704 10+790-12+366 Bóly-road No. 5714	2,242	2,241	830	318	48	0	76	44	21	44	1	28	20
road No. 5704 12+366-13+190 road No. 5714-Bóly	2,288	2,241	815	312	48	0	74	43	20	43	1	27	20
road No. 5704 13+861-15+880 road No. 5701-M60	2,288	2,056	997	382	58	0	91	52	25	53	1	33	24
5714 improvement of road 0+000-2+213 57. main road-	2,057	2,241	4,230	1,534	248	0	125	52	74	235	0	38	54
5714 improvement of road 2+817-3+916 5704 improvement	2,241	2,287	1,522	552	89	0	45	19	27	84	0	14	19

Table 10 Modelled, long-term (2030) traffic with the implementation of the development, used in planning, in [vehicles/day] measuring unit

2.5. LIST OF STRUCTURES REQUIRED FOR THE IMPLEMENTATION OF THE ACTIVITY, AND THE RELATED FACILITIES AND THEIR LOCATIONS

2.5.1. Grade separated junctions

2.5.1.1. Bóly-east traffic junction (A:196+235, Am: 196+219 km s.)

The M6 motorway crosses the modified track of interconnecting road No. 5703.
Prior to the authorisation of the quarter-clover half rhomboid type, "Bóly east traffic junction" designed at the great separated crossing, exemption must be requested from the standard. With adequate construction of the structures designed around the junction, expansion will be possible later at the junction.

2.5.1.2. Lippó traffic junction (A: 205+732, Am: 205+807 km s.)

The M6 motorway crosses the new Majs-Villány interconnecting road No. 5702 (previously named 561).
The full rhomboid type "Lippó traffic junction", designed as a grade separated junction will manage traffic in all directions in the long term for the M6 motorway and the new road No. 5702 (previously No. 561)

2.5.2. Rest areas

The following two rest areas will be constructed on the design phase:

2.5.2.1. Nagynyárádi simple rest area 199+500 km section (both versions)

Construction of a simple rest area with basic services to passengers and the car park for passenger cars and trucks.

2.5.2.2. Ivándárda complex rest area 210+000 km section (both versions)

A rest area, suitable for the temporary restoration of border control, where the NUSZ toll collection offices and axle weight measuring facility must also be placed in addition to complex vehicle and passenger services. As at this junction it should be possible to reverse vehicles and to connect to road No. 5705 at separate grades, with the combination of the two structures not only a complex rest area will be built but also junction functions will be established.
At present according to a decision of the Investor, NIF ZRt., the plans should take into account the establishment of an axle weight measuring facility to such an extent that the territory of the complex rest area should be planned to make sure that it is suitable to host an axle weight measuring facility, but the elaboration of detailed plans of the measuring facility was not part of either the Feasibility Study or the study plans that constituted the basis of the feasibility study.

2.5.3. Engineering plant, manager's questions

On the basis of consultation held with representatives of Manager Magyar Közút NZrt., management will be conducted in two different ways within the framework of the two separate construction options. What is described below applies to the selection of both versions, i.e. the corrected version and the original track

2.5.3.1. Phase I construction

The performance of the Manager's tasks is likely to be controlled from the Mohács site of Magyar Közút NZrt. considering that the previous M6 section is operated as a concession motorway.

2.5.3.2. Phase II construction

The Phase II construction calls for the designation and establishment of an engineering plant. The location of the engineering plant is not known in the current design phase. As soon as a real demand arises, a study must be prepared for the designation of the location, based on which the required technical designs can be ordered by Beruházó NIF ZRt. in a tender with the involvement of the road manager.

2.5.4. Public utilities

The utilities affected by the facility were indicated in the site plan. The replacement solutions and lengths indicated below were defined on the basis of the utility replacements included in the previous implementation plans by taking into account the technical contents that changed in this design process. Please note that the potential modifications of the technical contents and the consultations with the managers may affect or modify the utility replacements in the course of the preparation of the licensing plans. The estimated impacts resulting from the conclusions concerning the replacement of pipes are described in the review of the individual environmental components.

2.5.4.1. Track 'A'

Gas pipeline crossing

196+156 km section Bóly-Nagynyárád gas pipeline of D90 KPE and 6 bar operating pressure, which will be moved 240 m to the south from its existing track on a total length of 1,125 m crossing the envisaged track of the motorway.

198+866,5 km section Bóly-Majs D110 KPE, gas pipeline with 6 bars of operating pressure in a simple protective pipe

199+860 km section Töttös-Majs D90 PE, gas pipeline with 6 bars of operating pressure in a simple protective pipe

206+645 km section Márok-Lippó D160 PE, gas pipeline with 4 bars of operating pressure in a simple protective pipe

209+690 km section Kislippó-Ivándárda-Sárok D90 PE, gas pipeline with 4 bars of operating pressure in a simple protective pipe

Telecommunication network plan

196+173 km section Bóly-Nagynyárád replacement of FveL 3×2 air optical district cables

198+368 km section Nagynyárád-Töttös replacement of FveB 3×2 optical district cables

203+493 km section Töttös-Lippó replacement of FveL 3×2 air optical district cables

Low and medium voltage cable design

201+383 km section 20 kV free cable

Pole No. 110 of the crossing "Siklós-Villány-Mohács" 20 kV backbone cable (jsz: 34) must be replaced. 2 new B12/4 new concrete poles must be constructed on the replacement line

209+725 km section 20 kV free cable

The crossing "Siklós-Beremend" backbone cable (jsz:38) must be raised. The raised cables, required for the reconstruction of road No. 5702, crossing the motorway with a flyover must also be taken into account during the reconstruction. As the cable crosses the existing road No. 5702 at a 20^0 angle and due to the diverted road the crossing angle expands to 26^0, the designers do not recommend the diversion but would like to apply for the consent of the road management company for the crossing. Thus, reconstruction can take place in one line, involving the demolition of 3 B12/4 poles between poles No. 178 and 181, and the installation of one new suspension phase, as well as with the construction of 1 B14/4, 1 B12/4, concrete and 1 V15/4 and 1 V15/18 iron poles. According to the G7 design, the 20 kV cable to the "Ivándárda M6 rest area" will split from pole V15/18.

Water utility crossing plan

203+523 km section replacement of NA 150 KM PVC water pressure pipe

206+651 km section protection of NA 150 KM PVC water pressure pipe

Plan for rail cables

196+709,74 km section MÁV communication cable

Of the utilities listed above, the replacement with an obligatory prior inspection involves the

- 201+383 km section 20 kV free cable
- 209+725 km section 20 kV free cable

2.5.4.2. "Am" corrected track

Gas pipeline crossing

196+148 km section Bóly-Nagynyárád gas pipeline of D90 KPE and 6 bar operating pressure, which will be moved 240 m to the south from its existing track on a total length of 1,125 m crossing the envisaged track of the motorway.

198+866,5 km section Bóly-Majs D110 KPE, gas pipeline with 6 bars of operating pressure in a simple protective pipe

199+934 km section Töttös-Majs D90 PE, gas pipeline with 6 bars of operating pressure in a simple protective pipe

206+717 km section Márok-Lippó D160 PE, gas pipeline with 4 bars of operating pressure in a simple protective pipe

209+767 km section Kislippó-Ivándárda-Sárok D90 PE, gas pipeline with 4 bars of operating pressure in a simple protective pipe

Telecommunication network plan

196+165 km section Bóly-Nagynyárád replacement of FveL 3×2 air optical district cables
198+488 km section Nagynyárád-Töttös replacement of FveB 3×2 optical district cables
203+568 km section Töttös-Lippó replacement of FveL 3×2 air optical district cables

Low and medium voltage cable design

209+455 km section 20 kV free cable
Pole No. 110 of the crossing "Siklós-Villány-Mohács" 20 kV backbone cable (jsz: 34) must be replaced. 2 new B12/4 new concrete poles must be constructed on the replacement line

209+793 km section 20 kV free cable

The crossing "Siklós-Beremend" backbone cable (jsz:38) must be raised. The raised cables, required for the reconstruction of road No. 5702, crossing the motorway with a flyover must also be taken into account during the reconstruction. As the cable crosses the existing road No. 5702 at a 20^0 angle and due to the diverted road the crossing angle expands to 26^0, the designers do not recommend the diversion but would like to apply for the consent of the road management company for the crossing. Thus, reconstruction can take place in one line, involving the demolition of 3 B12/4 poles between poles No. 178 and 181, and the installation of one new suspension phase, as well as with the construction of 1 B14/4, 1 B12/4, concrete and 1 V15/4 and 1 V15/18 iron poles. According to the G7 design, the 20 kV cable to the "Ivándárda M6 rest area" will split from pole V15/18.

Water utility crossing plan

203+598 km section NA 150 KM PVC water pressure pipe

203+727 km section NA 150 KM PVC water pressure pipe

Plan for rail cables

196+709,74 km section MÁV communication cable

2.5.4.3. Environmental aspects of the replacement of public utilities

Of the public utilities listed above, according to Annex 3 of Government Decree 314/2005 (25 December), the following activities require an impact study depending on the decision of the Supervisory Authority, i.e. a preliminary study must be prepared in relation to the following replacements:
Track "A"
201+383 km section 20 kV free cable
209+725 km section 20 kV free cable
Track "Am'
209+455 km section 20 kV free cable
209+793 km section 20 kV free cable

The estimated impacts resulting from the conclusions concerning the replacement of pipes are described in the review of the individual environmental components.

2.6. MAIN MATERIALS USED IN CONSTRUCTION, ESTIMATED QUANTITIES, EXTRACTION SITES AND MINES

2.6.1. Estimated use of materials

The volumes of the materials to be used may be estimated on the basis of the currently available plans. Consequently, the estimated quantities are as follows:

Section	Cutting	Filling	Humus removal
	m3	m3	m3
ap	592456	696245	50268
Bóly junction	1476	15486	12058
Cross roads, unpaved roads	3820	119143	49766
Road No. 5704	2626	25356	8200
Lippó connecting branch	402	58359	674
□	600780	914589	120984

Table 11 Estimated use of materials according to the estimates of the road construction study plan

The materials indicated above will be supplied and integrated in the largest volumes, and therefore according to environmental aspects those material quantities are relevant.

2.6.2. Extraction points that made be considered during the construction

On the design area, primarily limestone and clay can be extracted and there is also a sand pit in Himesháza, which is situated next to the previous M5 section. Volcanic rocks can be obtained from the Northern Mountains and from Bakony. There are andesite mines in the Northern mountains and basalt mines in Bakony.

The following mines are active in the vicinity of the planned project:

Protected name	Mineral resource	Licence holder
Nagyharsány - limestone	limestone	Duna-Dráva Cement Kft.
Beremend limestone - loess clay	limestone, cement industry material	Duna-Dráva Cement Kft.
Siklós I. (Rózsabánya) - limestone	decorative limestone	Magyar Dekor Ásványkutató Kft.
Siklós II. (Zuhányabánya) - limestone	decorative limestone	Magyar Dekor Ásványkutató Kft.
Himesháza I. (sand quarry) - sand	sand	Himes-Homok Termelő, Szolgáltató és Kereskedelmi Kft.

Protected name	Mineral resource	Licence holder
Bátaszék I. - clay	clay	Wienerberger Téglaipari Rt.
Monyoród I. (clay pit) - clay	clay	Valentina Ipari Kereskedelmi és Szolgáltató Kft.

Table 12 Mines in the larger area of the planned project

The earth, sandy gravel and fractioned and granulated materials must be supplied from the existing mines for the construction whenever possible. On the basis of the preliminary reviews, of the extraction points listed above, Himesháza I sand pits can be used for supply of materials on the existing M6 track and next to it. The extraction points of the required materials and the method of supply will be decided by the contractor on the basis of the geotechnical reviews of the subsequent plan phases and the requirements pertaining to the pavement and materials to be integrated.

2.6.3. Establishment of a target extraction site

The concept of a target extraction point is defined in Act CXXVIII of 2003 on Public Interest and Development of the Motorway Network of the Republic of Hungary (hereinafter referred to as Aptv.), referred to above.
At any target extraction point only sand gravel and clay mineral resources, also including their versions and mixtures, can be extracted for the construction of the ground structures (banks) of the motorways specified in the annex to the Aptv. No target extraction points can be established for the extraction of any other mineral resources.
There is no change of ownership in relation to the mineral resources extracted from the target extract point, the materials are still owned by the state and cannot be distributed in trade. In terms of the costs of extraction, the client ordering the construction and the party performing the actual extraction must agree separately.
In relation to the use of the ground properties affected by the target extraction point, the applicable general provisions of Act V of 2013 on the Civil Code must be applied.
In relation to any damage caused by the activity, the stricter rules of mining damage that refer to liability relating to hazardous operation must be applied for immediate conditional and full compensation.
When the target extraction point is terminated, the respective area, the use of which is now limited or is no longer possible, must be restored to a condition suitable for its original purposes again or, if it is not possible, it must be integrated into the landscape in the approved manner. The licensee cannot delegate that responsibility and the liability of any third party is excluded.

2.7. VOLUME OF GOODS AND PERSONAL TRANSPORTATION REQUIRED FOR THE ACTIVITY, ACCOMMODATION REQUIREMENTS

As the planned facility will be used for freight and personal transportation by road, in our case this point refers primarily to the traffic during operation. The traffic data of the planned tracks are described in Section 2.4.
The material supplies during the construction will be defined in the organisation plan prepared on the basis of the implementation plan. The environmental measures relating to the supply of materials must be specified therein.

Line delivery should be given preference during construction. When transportation tracks are designated, the use of sections of the public road network crossing settlements should be avoided as much as possible. Within the area there is a sand pit in Himesháza, and the quality

of the sand extracted there could also be suitable for the banks by the road. The existing track of the M6 motorway can be accessed from the sand pit without affecting the urban area of Himesháza. On the M6 motorway, the bank filling materials can be delivered to the construction site without causing any noise or vibration problems.

2.8. ENVIRONMENTAL FACILITIES AND MEASURES ALREADY INCLUDED IN THE PLAN

The results of the previously prepared impact study and technical plans were taken into account and used but, in view of the time that passed since the issue of the licence, we did not consider the facilities listed in the previous plans applicable in the current plan.
As the project is a facility with a new track, all previous results were reviewed and the impact of the project on the elements of the environment are assessed in this documentation. Depending on the result of the assessment, we make proposals for the application of the environmental facilities in the subsequent chapters.

2.9. RELATED OPERATIONS REQUIRED FOR THE INSTALLATION, IMPLEMENTATION, OPERATION AND ABANDONING OF THE ACTIVITY

The main construction work processes are as follows:

Archaeological excavations, removal of any remaining ammunition: The archaeological excavations must be started in time in order to complete them by the start of the implementation work. All archaeological finds will be rescued and saved on the basis of direct orders from the geographically competent museums. In addition, all remaining ammunition must be removed from the area in order to ensure safe work.

Tree felling and shrub killing: parts of the preparatory works. The plants will be removed from the area to be expropriated.

Humus removal: The humus must be extracted from the area involved in the construction according to a humus management plan. The extracted humus will be deposited to be used later in the landscaping work. And remaining quantity must be removed and used in agricultural areas, in agreement with the owner of the area.

Replacement of utilities and construction of distribution cables: Moving the crossing utilities to adequate tracks and height corrections required in the cables. The utility construction must be completed prior to or during the construction of the road.

Earthwork: consists of the following processes: landscaping, earth transportation, distribution, compacting, ditch formation. The transportation of earth contains the supply of the required quantity of materials and the removal of earth not suitable for bank construction to the deposit site. It is unlikely that temporary transportation tracks will have to be established. During construction, freight transportation is likely to be feasible without any problem on the currently existing favourable road network.

Paving - construction of the road base, asphalt work.

Construction of other technical facilities - bridge construction, culverts, ditch covering, traffic signs and markings, barriers, signs.

Sowing grass and planting of plants - these activities are parts of the finishing work and can be completed after the final landscaping.

Main work processes of construction between Phase I and Phase II

In Phase I the plans related to the construction of the right track according to the technical plans, and therefore during construction in Phase II no demolition is expected to take place on the right hand side of the 2*1 lanes track in relation to the water drainage system and planned fences, as well as structures. On sections where for technical reasons, water drainage is required on the left hand side e.g.: cut sections where ditches are required or where submerged ditches are required to collect groundwater, ditches will have to be dug in the course of the work.

Demolition work may be required in relation to the junctions in the course of the construction of the entry and exit lanes of the junction, depending on the final structure of the junction. Their degree can be examined on the basis of the licensing plans for detailed extension.

The organisation plan, containing in detail the transportation tracks, any required material extraction points and the traffic rules pertaining during construction will be prepared prior to the beginning of the construction work, on the basis of the implementation plan.

Main work processes of operation

In general, during the operation of roads, the following work processes prevail:

De-icing in winter
Mowing and ditch maintenance - the grass outside the crown edge must be mowed at least twice a year and at least four times a year within the edge of the crown of the road. In general, sub-contractors are employed for removing weeds from the shoulder and the areas to be expropriated. Ditch maintenance involves partly the removal of the grown plants and sediments and partly the collection of rubbish and floatage.
Pavement improvement, replacement and improvement of damages in the pavement resulting from accidents and extreme weather conditions.
Pavement painting, maintenance of rails and traffic technical equipment, involving primarily painting and cleaning, but the repair of barriers and signs damages in accidents is also a major activity. Washing down the structures in winter.
Maintenance of the structures - control, repair, corrosion elimination.
Waste collection - collection of communal and other (occasionally hazardous) waste scattered in rest areas and by the road.
Plant cultivation - maintenance of trees and cutting of hedges.

Main hazardous materials used during construction and operation

Asphalt - delivered ready mixed from the mixing plant, to be integrated immediately, therefore there is no need to store or deposit it on site.

Paints and dilutants - Thermoplastik is used for painting the pavement, which does not contain any volatile substance. The other paints are considered hazardous materials due to their volatile substance content. They must be stored in a lockable cabinet.

Fuel and maintenance of the machinery - petrol, diesel - during construction the machinery is filled from mobile fuel filling stations or from established filling stations if the vehicles are involved in transportation. During the construction period, the machines can be repaired and oil and anti-freeze can be replaced only in workshops equipped with the appropriate machinery. If there is any contamination caused by any fault in the machinery, measures must be introduced immediately for the elimination and removal of the contamination, positioning and neutralisation of the pollutant. The spread or scattered pollutants must be covered adsorption materials, then they must be collected and neutralised or destroyed.
transition from 2*1 lanes to 2*2 lanes

2.10. FOREIGN REFERENCE IN THE CASE OF THE INTRODUCTION OF ANY TECHNOLOGY THAT IS NEW IN HUNGARY, BUT ALREADY USED ABROAD

In relation to the construction of the planned structures, no new technology will be introduced.

2.11. UNCERTAINTY OF DATA

The main uncertainty relating to basic data relate to the traffic projections, long-term emission data and environmental protection during construction.

Traffic projection - the traffic projections contain in general ± 20% uncertainty. Differences may also occur in low traffic network components used in the current situation mainly between the available official traffic count data and the load figures modelled on the network. Such a degree of uncertainty is estimated in relation to the long-term traffic projected for 15 years. The uncertainty stem from the initial data that can be estimated for the reviewed period (supply of vehicles, actual implementation of the planned network components, etc.) and other changes in social and economic conditions that cannot be projected exactly.

Long-term emission data - there is also uncertainty in the projection of the emission of pollutants by the vehicles. The projections are made by taking into account the international regulations pertaining to the vehicles and the trend in the replacement of vehicles.

Uncertainty in the data of construction - In this planning phase the contractor and the data of the construction contractor are not yet known. Consequently, we do not have any information about the machinery of the contractor or the schedule with which they intend to construct the road. Furthermore, we do not have any information as to where they intend to establish sites for the construction management, mixing plants and storage of machinery. Similarly, we do not have any information as to which mines the contractor intends to use. We have no information about the deposit sites to be used for depositing humus or any ideas about the depositing of the surplus humus. The designation and licensing of those sites is the responsibility of the contractor. However, in general it may be concluded that no business site, deposit sites or transportation track may be designated on any Natura 2000 site or in the internal and external protected area of the water bases around the planning site even temporarily. Furthermore, it is also recommended to arrange all transportation on the existing road network and on the built ground base of the constructed road.
The specific data of construction will be available during the preparation of the implementation plans, and therefore in any prior plan phase only general requirements may be specified which do not depend on the contractor, the contractor's machine pool or the construction schedule.

The uncertainty factors of the database used as the basis of noise and air pollution calculation stem from the uncertainties of the modelling of social and economic processes that constitute the basis of projections. Apart from the definition of the volume of the processes, these are factors depending on the size (small and large companies), activities and operation of the actors of the economy (enterprises). These latter data are used as the basis of the database of the breakdown of the vehicles types, where uncertainty occurs primarily in the projection of the breakdown of the heavy goods traffic by vehicle type.

2.12. DEMARCATION OF THE INSTALLATION SITE

The planned facilities are presented in the Key Plans. The areas to be used for the motorway sections to be constructed have not yet been expropriated in the case of any option yet, therefore the motorway will be constructed by using third party land. Prior to the start of construction, these areas must be acquired.

2.13. CORRELATION BETWEEN THE CONSIDERED OPTIONS AND FORMER, ESPECIALLY TERRITORIAL OR URBAN DEVELOPMENT OR REGULATION PLANS, INFRASTRUCTURE DEVELOPMENT DECISIONS AND CONCEPTS CONCERNING THE USE AND PROTECTION OF NATURAL RESOURCES THAT INFLUENCED THE SELECTION OF THE INSTALLATION SITE AND IMPLEMENTATION METHOD

The project to be implemented is fully in line with the EU transport policy, the New Széchenyi Plan, the Hungarian Transport Policy and the National Territorial Development Concept, because it promotes the accessibility of underdeveloped areas giving a great impulse to the economy of the region.

2.13.1. Alignment with the Hungarian transport policy

The Hungarian transport policy is in harmony with the EU transport policy. The long-term strategic objectives are laid down in the "National Transport Strategy", setting out the direction of development plans between 2014 and 2050. On that basis the project will contribute to the strengthening of social and economic mobility and will improve the accessibility of the county seats and the whole region, helping reduce regional discrepancies.

2.13.1.1.Alignment with the Unified Transport Development Strategy (UTDS)

"*Parliament Resolution 19/2004. (III. 26.) on the Hungarian Transport Policy for 2003-2015"* defines the main strategic outlines of the Hungarian transport policy for the period between 2003 and 2015 in line with the priorities of the EU transportation policy. The basis of the long-term strategy is transport development in order to improve the efficiency of the economy with more stressed protection of environmental interest and social requirements.
The "Hungarian Transport Policy 2003-2015" was supplemented and extended in 2007 in the form of the "Unified Transport Development Strategy" (UTDS), defining the strategic objectives for the period of 2007-2020 and the development trends and steps leading to it on the basis of the status review of the individual transport segments and the priorities of the EU transport policy. General objectives:

- Environmentally sound organisation of environmentally friendly and cost effective personal and freight transportation is the key component of sustainable economic development
- Transport development provides greater individual and economic mobility for people
- It reduces territorial and regional differences.

The specific objectives of Hungarian transport development were defined in line with the Common Transport Policy. Among the priority objectives the project directly contributes to the development of a main network organisation that improves economic competitiveness by introducing transversal relations. In addition, it helps improving the accessibility and economic sustainability of the region and mitigates the damages caused by heavy goods vehicles in the direct residential environment of the population. In horizontal topics, the project contributes to long-term sustainability through deliberate infrastructure development.

2.13.1.2.Alignment with the Government Resolution 1486/2014. (28 August) that defines the National Transport Strategy (NTS)

The main objective of NTS is to define the transport strategy until 2030, with a long-term outlook until 2050, and the first phase until 2020, with special regard to the first two EU budgetary cycles beginning in 2014. In the NTS development process, the functional regional

analysis received a great emphasis as it was used as the basis of establishing the objectives and the instruments required for their attainment. The figure below shows the economic cooperation relations developing in the country and easing centralisation in Budapest.

Source: NTS

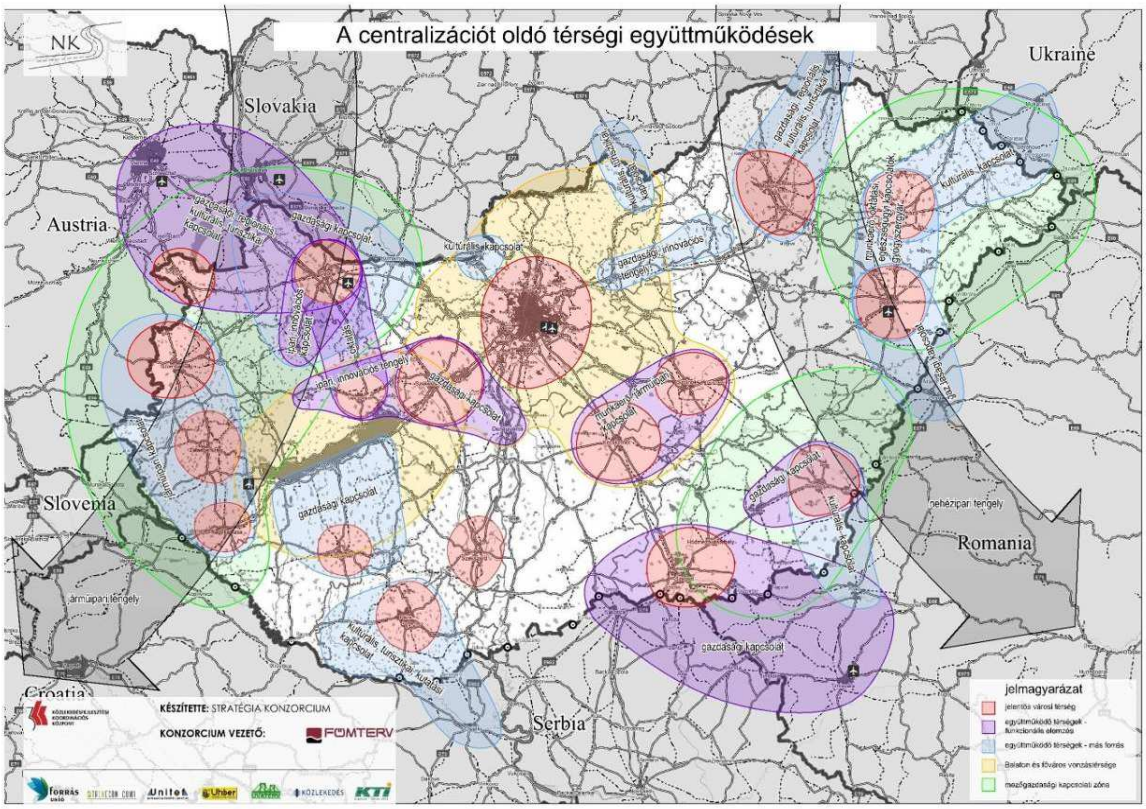


Figure 5 Regional cooperation that eases centralisation

5. ábra	Figure 5
A centralizációt oldó térségi együttműködések	Regional cooperation easing centralisation
Készítette:	Prepared by:
Konzorcium vezető:	Consortium leader:
Jelmagyarázat	Legend
jelentős városi térség	Significant urban area
együttműködő térségek – funkcionális elemzés	Coopearting regions – functional analysis
együttműködő térségek – más forrás	Cooperating regions – functional analysis
Balaton és főváros vonzástérsége	Balaton and Budapest catchment area
mezőgazdasági kapcsolati zóna	Agricultural relations zone

It is obvious that island type junctions developed in the reviewed area but at the moment there is no close economic cooperation between the centres yet. The reviewed road section intends to ease that isolation.

The reviewed project shows a great deal of overlap with the objectives defined in NTS:

Social objectives:

- Reduction of negative impacts on the environment and enforcement of climate protection aspects
- Improvement of health and property safety (major decline in the victims of accidents)

- Promotion of the efficiency growth of the economy
- Improvement of employment
- Improvement of the welfare and mobility conditions of the population
- Reduction of territorial disparities
- Improvement of social justice and equity
- Integration of certain regions of the country into international economic and mobility processes

Transport objectives:

- Development of a transport structure that is more useful at social level
    - Strengthening resource effective transport modes
    - Strengthening a personal and goods transportation structure that is more advantageous at social level
- Improving the standard and efficiency of transport services
    - Improvement of transport services
    - Improvement of the physical components of the transport system

For these objectives, development and management instruments are defined in the NTS, which were reviewed in terms of usefulness for society and the risk of implementation

The most important conclusion of the Strategy is that its objective could be to implement major development projects with great and medium social usefulness. If the social usefulness of a particular project reaches that level, it may become the instrument of the strategy.
The reviewed project serves a number of development instruments. The highest of those is the "Missing road TEN-T complex network elements" instrument of outstanding use, which was added to the category with limited feasibility primarily due to its high cost implications.
Of the instruments of outstanding use, the "Development of the existing motorway and main road network", the "Construction of missing motorway connections to county seats" and the "Development of transversal road components" instruments are served by the construction of this road section, the usefulness of which is also supported by the review of the Strategy. They are classified into the instruments involving a high risk only due to the relatively high expenses.
The figure below presents the project list submitted to the Government on the basis of Government Resolution 1486/2014. (28 August) on the National Transport Infrastructure Development Strategy, which is currently in effect and applies to road developments. Even though its track as been modified, the reviewed project is in line with this resolution.

Source: TDCC

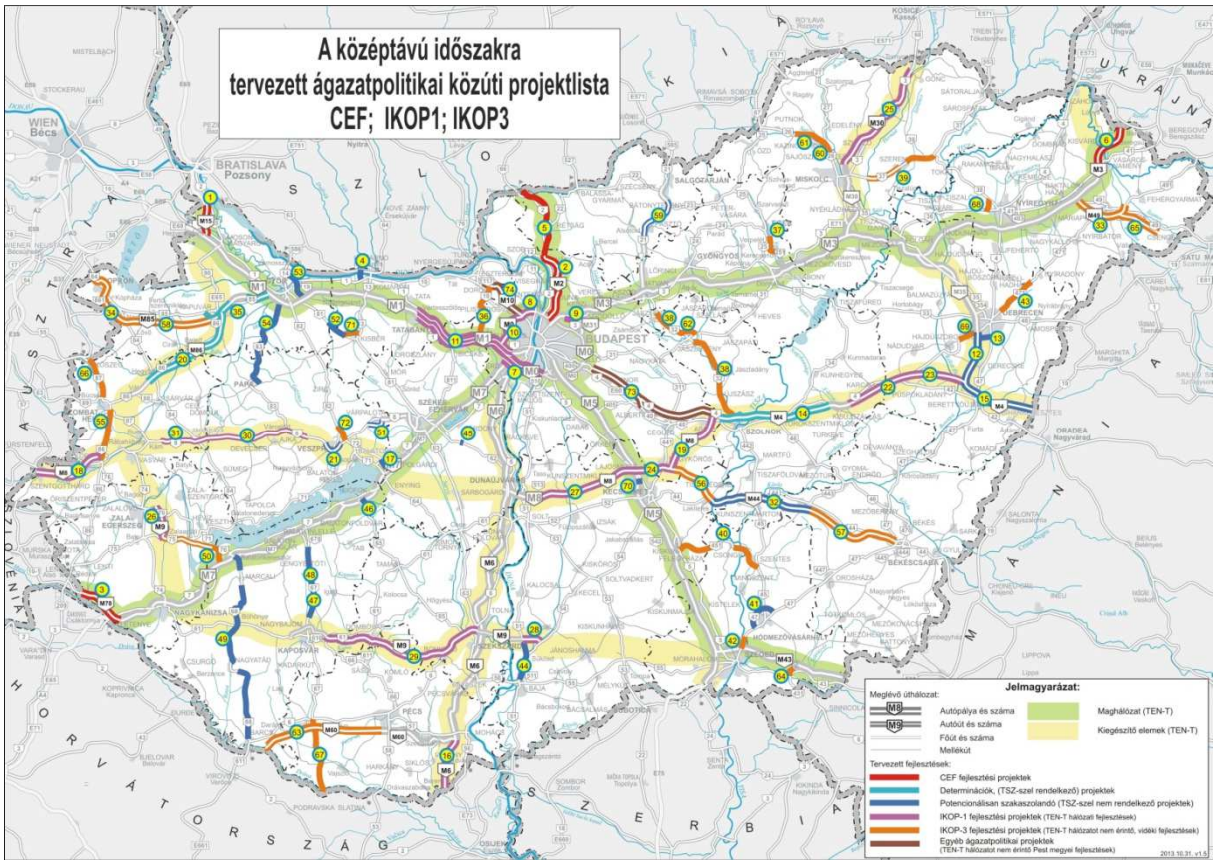


Figure 6 Long-term plan for the impact area pursuant to Government Resolution 1486/2014 (28 August)

6. ábra	Figure 6
A középtávú időszakra tervezett ágazatpolitikai közúti projektlista	Sectoral policy road project list planned for a medium term
CEF; IKOP1; IKOP3	CEF; IKOP1; IKOP3
Jelmagyarázat:	Legend:
Meglévő úthálózat:	
Autópálya és száma	Motorway and its number
Autóút és száma	Expressway and its number
Főút és száma	Main road and its number
Mellékút	Secondary road
Maghálózat (TEN-T)	Core network (TEN-T)
Kiegészítő elemek (TEN-T)	Supplementary elements (TEN-T)
Tervezett fejlesztések:	Planned developments
CEF fejlesztési projektek	CEF development projects
Determinációk, (TSZ-szel rendelkező) projektek	Determinations (projects with SC)
Potenciálisan szakaszolandó (TSZ-szel nem rendelkező projektek)	Potentially phased (projects without SC)
IKOP-1 fejlesztési projektek (TEN-T hálózat fejlesztések)	ITOP development projects (TEN-T network developments)
IKOP-3 fejlesztési projektek (TEN-T hálózatot nem érintő, vidéki fejlesztések)	ITOP3 – development projects (rural developments not affecting TEN-T network)
Egyéb ágazatpolitikai projektek (TEN-T hálózatot nem érintő Pest megyei fejlesztések)	Other sectoral policy projects (Pest county developments not affecting the TEN-T network)

2.13.1.3.Alignment with the New Széchenyi Plan

Objectives of the road development sub-programme

The focus needs to be shifted in road transport. The focus of developments must be put on the construction of bypasses on main roads and on the maintenance works of the existing road network. By 2020 the Hungarian transport infrastructure (both in terms of technical features and network) and, in close correlation with it, all types of vehicles using the infrastructure and the social-economic indicators based on and derived from the previous aspect must reach at least 90% of the then average of the 10 EU Member States, most developed according to the relevant data.

Future Hungarian transport characteristics

- In the road sector, sustainable financing is required at society level with the balanced use of the fee revenues from users and budget resources. As a consequence, the net/gross asset value ratio should be kept around 75%. The "user pays" principle must be applied in the financing of operation and maintenance. The Hungarian transport industry will continue to have a major share in Hungarian employment.
- The sections of the motorway road network carrying international traffic must be connected to the network components of the surrounding countries in order to form the component of the TEN-T corridors.
- The north-western bypass of the M0 motorway and other bypasses removing the traffic from the busiest urban territories of settlements with more than 10,000 residents will also be constructed. The existing road network is of good quality, the wheel rut and pathole indicators are just 10% different from the European average.
- Due to its flexibility, road transport serves the other mainland transport sub-sectors in medium and long-term transportation services, and therefore its role in the local work distribution is reducing and does not exceed 50%. Nonetheless, due to its flexibility, road transportation will relate to the majority of performed deliveries even in the long term.
- It will continue to be the main transport mode in freight and passenger transportation. The dominance of roads is obvious in non-official traffic. Serving tourism aimed at Hungarian health and cultural centres from the neighbouring countries is another responsibility of road transport.
- Road administration is closely integrated into the administrative system of the other sub-sectors, while coordination between the sub-sectors is performed at the next higher level.
- In terms of social impacts, major environmental performance improvement can be set as an objective owing to the rapidly disseminating alternative drives. Alternative energy consumption will reach 30% and less than 250 people will die on the roads (2009 in total 822 people died in road accidents).

Road development components

Most important components of road infrastructure development assisting the attainment of the objectives:

- Complex road operational development concept as part of the long-term transport strategy;
- Implementation of the road operational and development concept;
- Construction and modernisation of international trade corridors;
- Modernisation of tracks within the country, important in terms of economic competitiveness and human relations;
- Easing the star type structure, direct connections between the logistics centres and the Helsinki corridors (the radial structure can also be eased by developing roads to water/rail/logistics/industrial park centres);
- Interconnection of the Helsinki corridors and logistics centres by road;
- Modernisation of main and lower category tracks following motorway development, construction of new roads;
- Construction of roads connecting the motorways and major settlements;
- Construction of bypasses around settlements situated next to parts of the road network also used in international traffic;
- Reconstruction of roads leading to small settlements and cul-de-sac villages with the construction of a new track if necessary, thus connecting those settlements to the circulation of the economy and society;
- Introduction of electronic toll, toll payment based on kilometre and used intensity (number of transversal axes);
- Regular maintenance of roads, motorways and lower category roads.

The M6 Bóly-Ivándárda motorway development programme fits closely to the aspects and objectives described above.

2.13.1.4.Alignment with Government Resolution 1222

Government Resolution No. 1222/2011. (29 June) defined the long-term development programme and long-term plan of the motorway and main road network. The main road of Darány (main road 6) - Sellye - Harkány - Siklós - Villány - Udvar (main road 56) planned in the Government Resolution (see in the map below, marked with cyanide colour) is still valid in the long term.

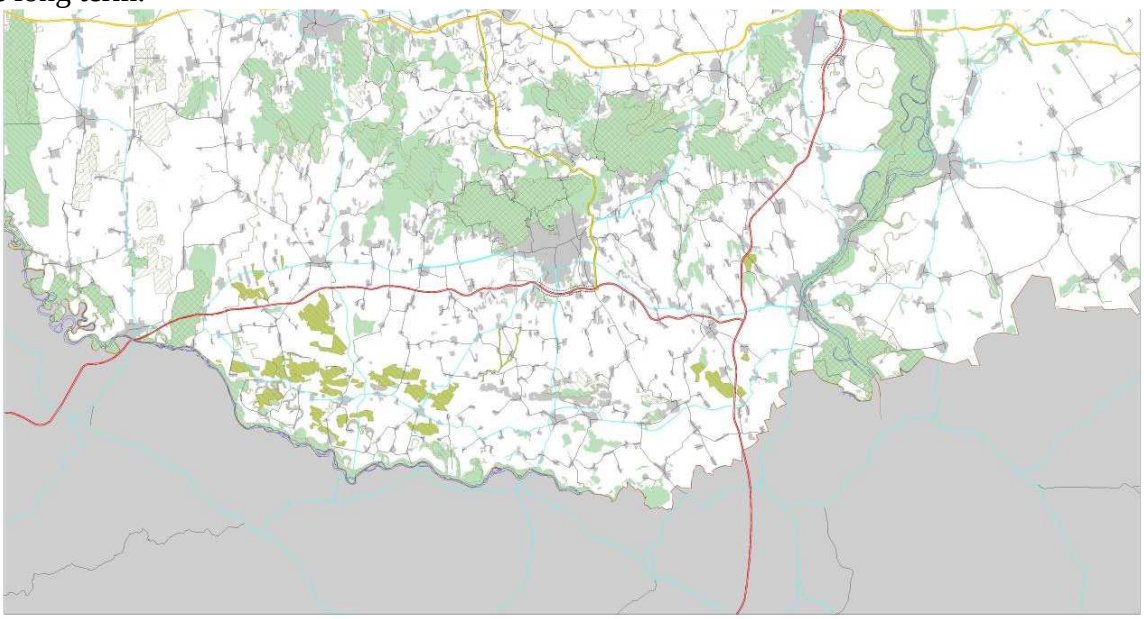


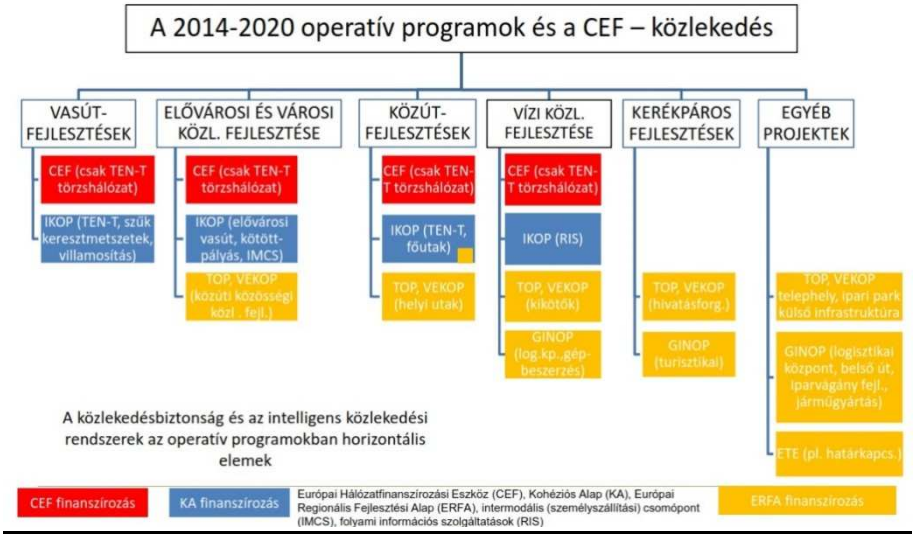
Figure 7 Long-term plan for the area according to Government Resolution 1222[2]

2.13.1.5.Alignment in the system of the Operational Programmes

The sectoral development programme of NHDP is included in the Transport Operational Programme 2007-2013 (TOP) document The M6 Bóly-Ivándárda motorway development programme is in line with the strategic objective of TOP, which is "Improving accessibility in order to enhance competitiveness and strengthen social and territorial cohesion". In line with the content of that objective, the main purpose of the project is to improve the accessibility and competitiveness of the country and significantly increase competitive, environmentally friendly and safe transport capacities satisfying goods transportation demand. Road construction and the bypasses will help significantly improving accessibility and the quality of services provided in goods transportation.

The Integrated Transport Development Operational Programme (ITOP) for the 2014-2020 EU cycle is currently in the social consultation phase.

The resources for the Transport Operational Programme (TOP) in the 2007-2013 EU budget period are now closed. At the moment only the implementation of the projects that were granted support is in progress, where the latest date of the financial closing is 31 December 2015. If the project is not implemented from TOP resources, the available financing options of the 2014-2020 budget period should also be reviewed.



1. Figure: Financing resources of the operational programmes for 2014-2020

1.ábra	Figure 1
A 2014-2020 operatív programok és a CEF - közlekedés	2014-2020 operational programmes and CEF - transport
VASÚTFEJLESZTÉSEK	TRANSPORT DEVELOPMENT
ELŐVÁROSI ÉS VÁROSI KÖZL. FEJLESZTÉSE	SUBURBAN AND URBAN TRANSPORT DEVELOPMENT
KÖZÚTFEJLESZTÉSEK	ROAD DEVELOPMENT
VIZI KÖZL. FEJLESZTÉSE	WATER TRANSPORT DEVELOPMENT
KERÉKPÁROS FEJLESZTÉSEK	CYCLING DEVELOPMENT
EGYÉB PROJEKTEK	OTHER PROJECTS
CEF (csak TEN-T törzshálózat)	CEF (only TEN-T core network)

[2]*Source:* Government Resolution 1222

IKOP (TEN-T, szűk keresztmetszetek, villamosítás)	IKOP (TEN-T, bottlenecks, electrification)
IKOP (elővárosi vasút, kötöttpályás, IMCS)	IKOP (suburban railway, fixed track, IMCS)
IKOP (TEN-T, főutak)	IKOP (TEN-T, main roads)
TOP, VEKOP (közúti közösségi közl. fejl.)	TOP, VEKOP (road public transport development)
TOP, VEKOP (helyi utak)	TOP, VEKOP (local roads)
TOP, VEKOP (kikötők)	TOP, VEKOP (ports)
TOP, VEKOP (hivatásforg)	TOP, VEKOP (business traffic)
TOP, VEKOP telephely, ipari park külső infrastruktúra	TOP, VEKOP business sites, industrial parks external infrastructure
GINOP (logikai kp. gépbeszerzés)	GINOP (log centre, machine procurement)
GINOP (turisztika)	GINOP (tourism)
GINOP (logisztikai központ, belső út, iparvágány fejl, járműgyártás)	GINOP (logistic centre, internal road, industrial siding development, vehicle production)
ETE (pl. határkapcs.)	ETE (e.g., border relations)
Közlekedésbiztonság és az intelligens közlekedési rendszerek az operatív programokban horizontális elemek	Transport safety and intelligent transport systems are horizontal components in the operational programmes
CEF finanszírozás	CEF financing
KA finanszírozás	CF financing
Európai Hálózatfinanszírozási Eszköz (CEF), Kohéziós Alap (KA), Európai Regionális Fejlesztési Alap (ERFA), intermodális (személyszállítási) csomópont (IMCS), folyami információs szolgáltatások (RIS)	European Network Financing Instrument (CEF), Cohesion Fund (CF), European Regional Development Fund (ERDF), intermodal (passenger transportation) junction (IMCS), river information service (RIS)

Integrated Transport Development Operational Programme (ITOP)
(OPERATIONAL PROGRAMME SUBMITTED TO THE EUROPEAN COMMISSION FOR APPROVAL – VERSION PREPARED FOR SOCIAL CONSULTATION, November 2014)
The Integrated Transport Development Operational Programme (ITOP) and the other operational programmes support Hungary's economic growth based on the foundations of sustainable, high added-value production and the expansion of employment as targeted in the Partnership Agreement between Hungary and the European Commission for the period between 2014 and 2020.

The Integrated Transport Development Operational Programme (ITOP) incorporates most of the transport developments to be implemented in 2014 and 2020 from EU grants, which represent only part of the interventions under the currently National Transport Strategy (NTS).
The ITOP takes into account but does not extend to:

- TEN-T core network development eligible for support from the Connecting Europe Facility (CEF),
- planned transport development projects (e.g., urban road network, business type cycling and urban public transport development, tourist cycling track and other road developments for major projects, or transport development planned for intermodal

logistics centres (e.g., port investments)) planned to be financed from the other operational programmes,

- or the measures implemented without any EU grant (e.g., renewable energy, congestion charge).

Improvement of international (TEN-T) road accessibility priority axis (ITOP - 1)

Reasoning for the ITOP 1 priority axis
The ITOP-1 priority axis financed from the Cohesion Fund relates to the construction obligations specified in EU trans-European road transport development directive, which the Commission brought to the attention of Hungary also in its position paper of 30 October 2012. All TEN-T road developments had to be included within one priority axis due to concentration. The ITOP priority-1 also contained the phased projects of TOP belonging to the TEN-T road network.
Measures supported within the framework of ITOP-1 priority axis.
Priority Axis 1 of ITOP will provide non-repayable grants for the following with respect to the Hungarian TEN-T core and comprehensive road network specified in Part 6.4 of Annex I to Regulation (EU) No. 1315/2013:

- **Construction** of **missing sections** necessary for reaching the borders or for connecting county centres as expressways or main roads primarily on the TEN-T comprehensive network, and also on the core network sections which cannot be financed from the CEF. Additionally, we are also planning to support the procurement of equipment necessary for speeding up border crossing at the external borders of the EU (e.g. road X-ray, body scanners) as well as the removal of former border crossing stations at the internal Schengen borders (e.g. buildings, other structures that may impede traffic).
- Increasing the **capacities of the existing TEN-T road network,** based on congestion data and traffic demands, e.g. through the construction of new lanes, overtaking sections and junctions, the extension and modernisation of bridges, and the development of the traffic management system. These actions would primarily cover TEN-T roads (e.g. M0) in the Budapest region.
- **Interventions enhancing the environmental and technical sustainability of the road infrastructure, and current level of service** such as the installation of axle weight weighing stations, the reinforcement of road surfaces, the construction of noise protection walls to improve the population's quality of life, the modernisation of drainage systems to provide protection against sudden heavy rainfalls, grooving of road surfaces, the upgrading of protective fencing to prevent wildlife crossing and roadkill, and the construction of missing wildlife crossings, escape ramps and gates. We are planning to implement the above measures, with the exception of axle weight weighing stations, within the framework of multi-location projects extending to critical locations selected on the basis of a prior study.
- **Interventions for the improvement of transport safety,** e.g. through the construction of missing hard shoulders and collector-distributor lanes, the modernisation of physical barriers (e.g. modernisation of service crossings, construction of deflector walls, replacement of crash barriers), the upgrading of junctions with poor visibility or critical geometric profile, the construction of roundabouts, and the installation of energy-absorbing cushions. In addition, support may also be provided for the installation of public lighting to improve visibility, the extension of truck parking facilities, and the improvement of safety at service places, as well as features to improve driver information (e.g. installation of variable message signs, weather stations and surveillance cameras). We are further planning to support the design, procurement and

installation of further fixed and mobile comprehensive road control points and the improvement of existing ones, while there is also scope for the development of the data communication network related to the above. We are planning to implement the above, similar to TOP, within the framework of (multi-location) transport safety programmes. We are planning to coordinate similar intelligent transport system (ITS) interventions on the basis of the ITS strategy to be completed in the near future.

- **Preparation** of TEN-T road network development **projects** (including those planned to be implemented from the Connecting Europe Facility) (e.g. preparation of planning permission and construction plans, acquisition of land), and **evaluation** of former developments.
- **Traffic Information System and Database (Hungarian abbreviation: KIRA), development of related transport/traffic data collection, renewal of the transport strategy traffic and impact models,** and broadening of conditions of applicability in harmony with the evaluation of projects.
- **Review of tools related to public road regulation by the authorities** (e.g. technical rules).
- TOP **phased projects** within the TEN-T road network which fall on ITOP.
- Institutional developments targeting the tracking of the implementation of the above projects and competence involvement options.

The potential beneficiaries of ITOP Priority Axis 1 include NIF Zrt., the Ministry of Interior, the National Police Headquarters, the Central Office for Administrative and Electronic Public Services, the Governmental IT Development Agency and, in the case of existing sections, Magyar Közút Nzrt., the National Tax and Customs Office, as well as the legal successors of the above mentioned.

2.13.2. Alignment with the National Development and Territorial Development Concept (NDTDC)

Comparing the contents of the M6 Bóly-Ivándárda motorway development programme and the f4 strategic objective of OFK set for 2030 it may be concluded that it indirectly supports each of the strategic objectives, but it mostly focuses on objective “4. Sustainable spatial structure based on regional potentials”. The Budapest concentration of the country must be eased in order to have a multi-centred and effective spatial structure, to distribute economic growth and investments within the territory of the country and to establish and strengthen a special structure and regional connections supporting regional competitiveness and growth. Regional integration and more intensive regional relations require interconnections between settlements and regions, territorial cooperation and stronger integration, renewed relationship between the towns and the countryside, regional autonomy and is strengthening self-sustaining and self-supply capabilities. Territorial cohesion, stronger regional equal opportunities requires a balanced spatial structure, territorial equalisation, alignment of peripheries and underdeveloped regions and adequate regional development courses that reflect the regional specificities.

Of the 13 specific objectives laid down in the concept, the objectives of the project show a great deal of overlap with the following two:

- Consistent and integrating society and economy and equal conditions of living in the whole territory of the country:
    - Alignment of external and internal peripheries and their integration into the economic and social circulation of the country, development of industrial crisis

areas, development of falling behind rural areas, development of areas living in deep poverty, including the improvement of regions and settlements with Roma population and strengthening the economic basis of existence of these countries.

- o

The border areas of Baranya and Somogy counties are included in the most underdeveloped regions of the country with a great deal of unemployment and a large Roma population.

- Accessibility and renewed mobility system
  - Our objective is to provide fast and effective accessibility and sustainable mobility in all territorial levels in order to enable each region to exploit their economic potential and strengthen their competitiveness by maintaining a dynamic regional relationship with their larger environment. At local level effective and sustainable mobility is required within towns and between other towns and their catchment areas. At regional level, the accessibility of employment centres must be ensured. At national level, centralisation must be eased, transversal connections must be strengthened on the basis of the principle of multi-centred development by taking into account the strongly differentiated structure of settlements of Hungary and by using solutions other than the traditional solutions.

The county seats and agglomerations of the region have a huge potential in order to become really dominant poles in the country, but in order to achieve that, the mobility system of the region must be renewed.

2.13.3. Alignment with the National Regulation Plan

The Act XXVI of 2003 on the National Plan of Physical Planning (Parliament Resolution 1/2014, 3 January on the current review of the National Plan of Physical Planning) defines the conditions of use of the area in each region of the country and a coordinated spatial structure for the technical and infrastructure networks. The infrastructure components included in this plan are mentioned among the motorways to be established within the complex TEN-T network. The following main road is included in Annex 1/1 of OtRT:

Darány (main road No. 6.) - Sellye - Harkány - Siklós - Villány - Udvar region (main road No. 56.).

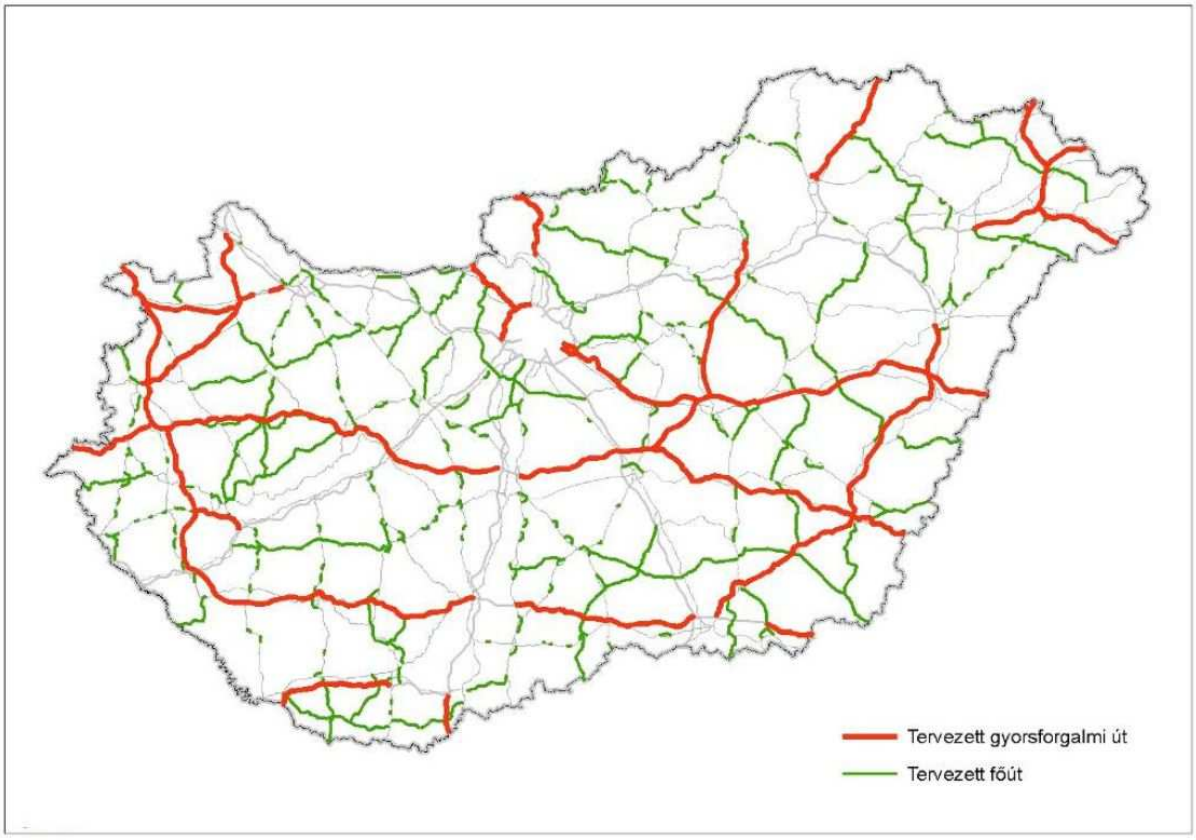
The developments proposed in the National Spatial Development Plan are illustrated in the figure below:

Figure 8 Developments proposed for the region in OTRT (Act XXVI of 2003, modified in Act L of 2008)[3]

8. ábra	Figure 8
Közlekedési hálózatok és építményeik	Transport networks and structures
Gyorsforgalmi út	Motorway
Főút	Main road
Országos kerékpárút törzshálózat	National cycling route core network
Nagysebességű vasútvonal	High speed railway line

[3]Source: National Spatial Development Plan

A transzeurópai vasúti áruszállítási hálózat részeként működő országos törzshálózati vasútvonal	National core network railway line operating as part of the trans-European rail freight traffic system
Egyéb országos törzshálózati vasútvonal	Other national core network railway line



2. Figure: Planned components of the motorway and main road network under OTrT

Tervezett gyorsforgalmi út	Planned motorway
Tervezett főút	Planned main road

2.13.4. Alignment with the county spatial development plan

The spatial development plans of the respective county (Baranya county) Annex 2 of General Assembly Directive 9/2005 (12 May) of the General Assembly of Baranya County Local Government on the Spatial Development Plan of the County contain the reviewed section with option "A".
The spatial development plans of the respective counties (Somogy, Baranya counties) (see the figures below) all contain the reviewed section of the M6 motorway with the Version "A" track and the main road between Darány (main road No. 6.) - Sellye - Harkány - Siklós - Villány - Udvar region (main road No. 56.).

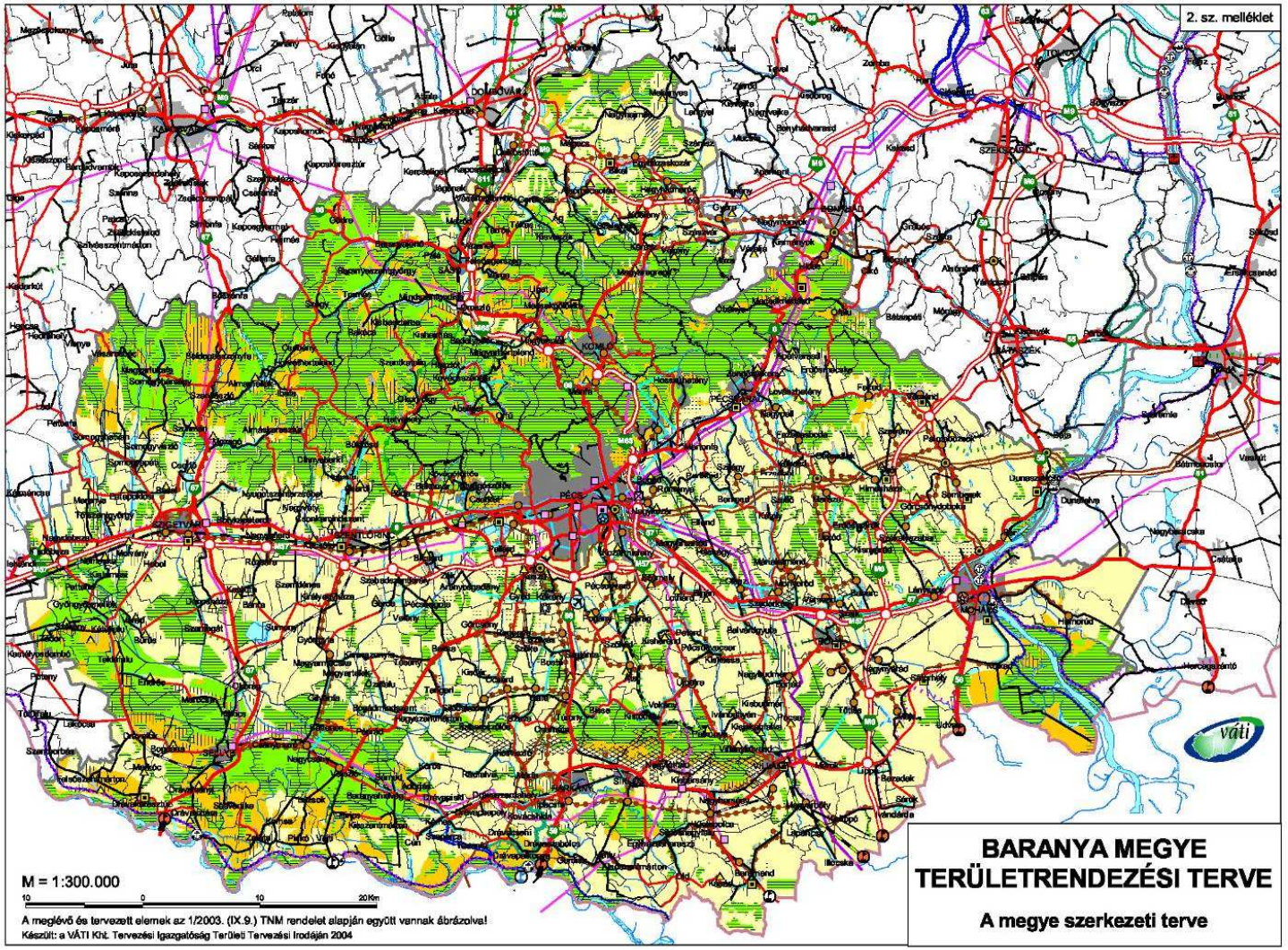


Figure 9 Baranya county spatial development plan[4]

[4]Source: VÁTI Nonprofit Kft.

9. ábra	Figure 9
A meglévő és tervezett elemek az 1/2003. (IX.9.) TNM rendelet alapján együtt vannak ábrázolva!	The existing and planned components are illustrated together pursuant to 1/2003 (9 September) TNM regulation
Készült: a VÁTI Kht. Tervezési Igazgatóság Területi Tervezési Irodáján 2004	Prepared: VÁTI Kht. Planning Directorate Territorial Planning Office, 2004

2.13.5. Compliance with the objectives of the Water Framework Directive (Directive No. 2000/60/EC of the European Parliament and the European Council)

2.13.5.1. Objective of the Water Framework Directive (WFD)

The new water policy of the European Union, the 'Water Framework Directive' (Directive No. 2000/60/EC - WFD) entered into effect on 22 December 2000 in the EU Member States. The objective for the surface and underground water bodies is to reach 'good status' by 2015. According to the framework directive, 'good status' means not only the purity of water but the least disturbed status of habitats connected to water and adequate water quantities as well.
General, major objectives of WFD are the following:

- Protection of habitats related to waters, improvement of their status,
- Promotion of sustainable water use by the long-term protection of water resources available,
- Improvement of water quality by reducing polluting substance emission,
- Gradual reduction of underground water contamination and prevention of their further contamination.

2.13.5.2. Compliance with the Water Framework Directive in practice in Hungary

In the interest of satisfying international and national requirements and effective submission for societal opinion, planning is implemented in Hungary on a number of levels:

- national river basin management plan on national level (hereinafter: OVGT)
- direct Danube and Tisza, Dráva, Balaton (4 sub-basin plans) on sub-basin level,
- on planning sub-unit level (a total of 42 sub-unit plans)
- on water bodies' level

Technical solutions proposed in the River Basin Management Plan which may be interpreted in relation with the motorway:

PT3: Development of filter fields
– *It is intended* to protect water quality of watercourses by the sedimentation of some of the polluting substances, upstream to sensitive water areas, reservoir, when discharged from a reservoir, before introduced into access water recipient, before the introduction of rainwater from settlements, roads, railways.

ME1: Modern drainage system from roads, railways
– *It is intended* to decrease pollution from roads, neighbouring areas of railways by establishing an appropriate rainwater drainage system. It is mandatory to develop it in case of new roads, railways. Filter fields may be needed before it is introduced into the recipient.

2.13.5.3. Compliance with WFD in relation with investment in M6

The current Investment affects downstream Danube, right-hand bank planning sub-unit on the level of sub-unit in the National River Basin Management Plan.

An important objective of WFD is the appropriate collection and treatment of TPH, PAH and heavy metal (Pb, Zn, Cd, Ni, Cr) washed away by rainwater from the surface of transport roads.

Dehydration and water cleaning solutions of motorways will be developed with attention to and in accordance with the objectives of WFD, with consideration to the planning guidance identified below which are also supported by the following general solutions:

- Location and arrangement of facilities and engineering structures for the treatment of rainwaters will be done with attention to the most stringent limit values. (See the estimate of expected concentration of TPH based on traffic data: 0 0)
- On areas with sensitive, high groundwater levels, ditches with water tight cover will be built. (see examination: 0)
- On the 'A' and 'B' hydrogeological protective zone of the water base, ditches with water tight cover will be built (see: 4.2.2.4)

2.13.6. Alignment with the climate protection programme

Transport is one of the most outstanding common technical policy field of the European Union (hereinafter: EU). Since the entry into effect of the Treaty of Rome in 1958, this policy aims at the elimination of borders between Member States, promoting thereby the free movement of persons and goods. Its prime objective is the realisation of the internal market, ensuring sustainable development, extension of transport networks all across Europe, utilisation of space to the maximum, increasing security and enhancing international cooperation. Single market was a real turning point in common transport policy. Since the time of publication of the white book in 2001, this technical policy field is focusing on the concerted and simultaneous development of different transport modes with special attention to commonality, in other words, the application of the most favourable combination of the total transport modes (land, water and air).

Climate policy is also one of the priority technical policy areas in the European Union. Among others, the EU also joined the Kyoto Protocol adopted in 1997 committing itself to decrease greenhouse gases (GHG) in order to mitigate the foreseeable impacts of climate change and global warming up. EU committed itself that Member States jointly decrease their greenhouse gas emissions by 8% by the end of the 2008-2012 period compared to the 1990 base level. The approved objective for the countries participating in EU emission trading is to have 21% lower emission by 2020 compared to the 2005 base year.

This reduction objective also contributes to the fulfilment of the so-called 3x20 climate protection commitment of the EU 2020 strategy, which declares that detrimental substance emission level should decreased by 20% compared to that of 1990, the rate of renewable energy should be increased by 20% and energy consumption should be decreased by 20% by 2020 on EU level.

For the practical implementation of the commitments, the European Union Member States jointly introduced the greenhouses gases trading system (EU ETS, that is EU Emission Trading System). The emission trading periods are the following:

Trading period I	2005-2007
Trading period II	2008-2012
Trading period III	2013-2020

In the European Union, a common environment protection policy regulates the polluting substance emissions, environmental standards and requirements for the Member States. Directive No. 96/62/EC on Ambient Air Quality provides for the following main components of the joint air quality strategy:

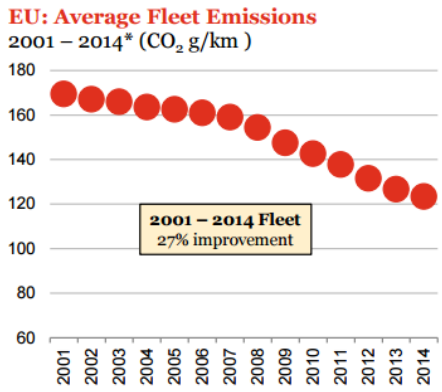
- determines the target values in order to avoid, prevent or reduce detrimental impacts on human health and/or the environment,
- requires the Member States to have a joint strategy by elaborating identical requirements and methods for assessing air quality,
- collect air quality information for the purpose of establishing joint intervention values at a later stage,
- sets the objective to keep, improve the appropriate status of air quality.

Individual Member States have to have however their own independent detailed regulation and measures in order to attain the objectives committed in the European Union and under UNO.
The following 6 gaseous compounds, or chemical groups are responsible primarily for greenhouse effect:

- carbon-dioxide (CO_2),
- methane (CH_4),
- dinitrogen-oxide (N_2O),
- fluorised hydrocarbons (HFC compounds),
- perfluor-carbonates (PFC compounds),
- sulphur-hexafluoride (SF_6).

Each greenhouse gas has a different level of contribution to global warming up in function of its radiation characteristics, molecular weight and atmospheric residence time.

According to European Commission data, CO_2 emission from transport improved by 27% between 2001 and 2014:



Source: ICCT (International Council on Clean Transportation), European Commission, Autofacts Analysis, *2014 = provisional data

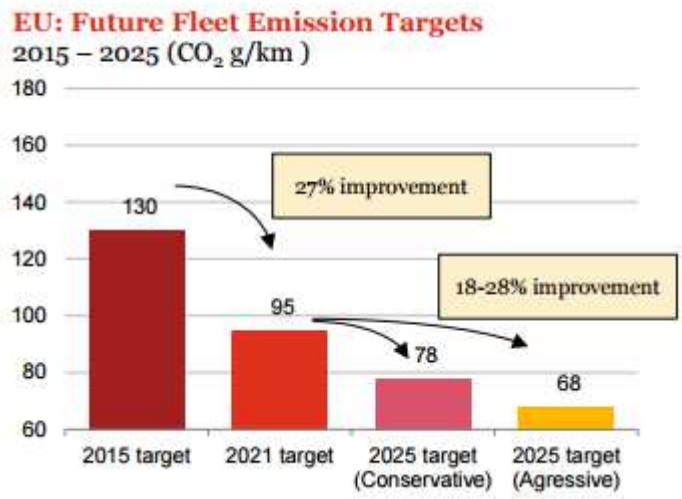
In accordance with Regulation No. 443/2009 of the European Commission, the European Environment Protection Agency operates a database available online which maintains data on each personal vehicle registered in Europe. The database contains information on the CO_2

emission and the mass of each vehicle. Each Member State is obliged to supply data for the purpose of evaluation of changes in personal vehicle fleet, in order to determine the CO_2 emission target value of 2015 (130 g CO_2/km).
Emission target values determined by the European Union:

	2015	2021
Personal vehicle	130 g CO_2/km	95 g CO_2/km

	2017	2020
trucks under 3.5 tonnes permissible maximum mass	175 g CO_2/km	147 g CO_2/km

In accordance with the legislation, the Commission should review the legal framework in 2015 and make proposals for the target values after 2020 including the target value of 2025. A number of scenarios are available, the following diagram of the European Commission[5] foresees a more conservative (Conservativetarget, 78 g CO_2/km) and an ambitious target (Agressivetarget, 68 g CO_2/km):



Source: ICCT (International Council on Clean Transportation), European Commission, Autofacts Analysis, *2014 = provisional data

Impact of the climate change on the project

The climate of our Earth is a highly complex system, and global climate change in the recent times has significantly impacted, among others, road pavements as well. Mainly the following components of the complex phenomena influence the planning, construction, maintenance and/or operation activities related to public road pavements[6]:

- global warming up,

[5] Source: http://www.pwc.com/en_GX/GX/automotive/autofacts/analyst-notes/pdf/pwc-analyst-note-eu_emissions.pdf

[6] István Láng, László Csete, Márton Jolánkai: Felkészülés a globális klímaváltozás várható hatásaira

- extreme cold weather (occasionally),
- flood like rains (excessive quantity of precipitation).

Significant impact of the environmental conditions on the change in the conditions of payment is well-shown by the examples, where certain public road sections, abandoned by traffic when they were still new (when curve correction was completed, vehicles were transferred to a section not far away from that) would get damaged in 5-10 years without having traffic load on them. Degradation was caused by 'natural' climate factors.

High temperature plays a role in rutting of pavements. Due to large quantity of precipitation, engineering structures, earth works, pavements get damaged. Intensive snowing, freezing make winter time transport more difficult and increase the volume of operation interventions (snow removal, elimination of slipperiness, repair of winter time pavement damages, protection against snow drift).

Flood like rains are a phenomenon inherently carrying the hazard of danger but - when combined with some certain defects of the pavement surface - they will decrease traffic safety.

The study issued by the Joint Research Centre (JRC) of the European Commission (Impacts of Climate Change on Transport: A focus on road and rail transport infrastructures[7]) considers the following climate change factors on project level with respect to public road developments in the transport sector:

Impact of climate change	Component of the transport system	Typical lifecycle	Infrastructure element, asset at risk	Adaptation	Impacts avoided
Change in temperature	Infrastructure	7-10 years maintenance cycle	Mapping cracking in edges of the pavement as a future risk factor	Changing asphalt/concrete recipe	Reducing road edge degradation Avoiding accidents
Change in precipitation quantity, flood frequency	Infrastructure (bridges)	> 100 years	Mapping future risk factor in respect of height/brushing against bridges	Arrangement of a covered bridge head, reinforcement of the basement of bridges	Avoiding damages to bridges Avoiding accidents

In summation, it can be stated that the project in essence is vulnerable to climate change.

[7] Source: *http://ftp.jrc.es/EURdoc/JRC72217.pdf*

Impact of the project on climate change

The frequency of warming up, drought, extreme weather conditions accompanying foreseeable climate and weather change in Hungary and the increase of the magnitude of presumable damages may be unexpected for the society, the economy, the natural environment with a multi-faceted impact which is difficult to forecast. According to the National Climate Change Strategy, in Hungary in the last 3 decades, daily maximum temperature has dramatically increased by 2-3 degrees. According to the relevant climate models in Hungary, the change in the quantity of precipitation both in summer and in winter exceeds 30-35%. The number of showers and other 'high precipitation phenomena' is expected to increase, while 'phenomena with little precipitation' will be less frequent. The risk of sudden flood waves will increase due to the showers, while at the same time the rivers in Hungary will decrease to half of the regular water level in some decades time in summer time.

The project will be implemented in accordance with the National Transport Strategy whose targets include the reduction of negative impacts on the environment and the enforcement of climate protection aspects. In line with the Sustainable Development Strategy of the European Union, effort should be made to the couple economic growth from the degradation of the status of the environment.

In an indirect manner, the infrastructure investment project contains the following climate change risk factors:

Risk factor		**Impact decreasing measure**
Area occupation: reduction of forest, agriculture, etc. areas	Area occupied by the road crown	Planting vegetation along the road, replacement afforestation
Greenhouse gas emissions	Emission by traffic	Legal framework of European emission norms

Impacts of the project from climate protection aspect:

- Reaching destination faster, more even travelling are more favourable from a point of view of fuel consumption. Therefore, even though only to a small extent, the investment can be considered positive from the aspect of preserving fossil fuel resources, and mitigating greenhouse gas emissions.
- The planned provision of game passage?????? to decrease habitats fragmentation impact considers as much as possible and contribute to maintaining habitats and the diversity of the landscape in the framework of the project.
- Landscape adequate plantation accompanying the road is indirectly protecting the soil and improving climate.
- Along the new road sections to be constructed in the project, greenhouse gas emissions is of local nature; on parallel road sections of the existing road network however smaller emission can be expected due to the transferred traffic load. The significance of the latter is further increased by the fact that decreased emission affects road sections

cutting across densely populated settlements, therefore, from the aspect of life quality healthier environment will be created on the residential areas.

Overall we may say that - due to its volume - the project has a negligible impact from the aspect of climate protection. The impact of factors causing climate change and that of he measures serving their reduction are in practice of equal value.

2.13.6.1.Alignment to other projects

NIF Zrt. is already involved in the preparation of the development of the entire length of road section between Szeged and Baja of Main Road No. 55. In the framework of the project, the carriage way will be widened, pavement will be re-enforced for 11.5 tonne axle load, and parallel bicycle road will also be constructed. Until M9 motorway from Szekszárd to the east is constructed, it is Main Road No. 55 which carries the east-west traffic of the region therefore it is an integral part of the targets of the project.

Overall reconstruction of Road 61 was completed in the recent years between Dombóvár and Nagykanizsa, which investment is directly linked to the road section of the subject project, allowing the east-west traffic from Szeged to Nagykanizsa to be performed on a carriageway of favourable service standard.

2.14. CONTINUATION POTENTIAL

The planned M6 section is linked to the Bátaszék-Bóly construction section of the already constructed M6 motorway at the separating junction of M6 and M60 at Bóly. The planned carriageway section is the missing Hungarian 20 km section of the V/c TEN corridor (Budapest – Eszék – Szarajevó – Ploče), which is planned to be constructed up to the harbour at Ploče, which is planned to be constructed from Eszék along the Hungarian border section towards Bóly (motorway A5, constructed from Eszék to the border as semi-motorway.

3. GENERAL DESCRIPTION OF IMPACT FACTORS, IMPACTS, IMPACT PROCESSES, AFFECTED MEDIA, IMPACT AREAS

Below we give an overview of the impact processes, impacts, changes in the status of impacted parties, as well as the general principles of delineation of impact areas, while in the technical chapters, we give a detailed description of their size, significance, specific borders of impact areas, if they can be identified on the basis of our current knowledge.

When examining the sections of the activities, the impacts of the investment can be broken down as follows:

Construction – activity for a determined period of time, whose impacts may occur within the work area (compulsory land purchase) in its immediate environment, and along the road network and the adjacent settlements of the area.

Impact of the facility – occurs primarily in area occupation and in the separating impact. When the facility is established, the impacts will prevail irrespective of the traffic.

Impact of putting the facility into operation – impacts generated by traffic which are linked primarily to the noise and air polluting substance emission of vehicles.

Impact of the operation of the facility – impacts generated by the keeping up and maintenance processes

Abandonment – not characteristic to the activity linked to motorways, highways. Therefore, we no longer deal with the issue.

The impact factors are the above activities and the facility itself in the course of which changes may be launched in the status of the environmental elements. The impacts will be borne by the environmental elements or systems, where changes in the status can be felt or detected.

The studied environmental elements and systems are the following:
- Geological media, soil
- Water - surface water and underground water
- Air
- Biosphere: man, plant, animal
- Built environment
- Landscape (the whole environment as such)

- Threatening factors:
- Noise, vibration
- Waste

According to Annex No. 7 of Government Decree No. 314/2005 (XII. 25.):

I. Impact area types

1. *Direct impact areas:* areas that may be attributed to the different impact factors, which may include

a) the spreading of certain substance or energy emissions into land, water, air in the environmental element affected, furthermore

b) areas directly occupied from the land, water, biosphere, built environment.

2. *Areas of direct impact:* spread area of further spreading impact processes due to changes in the environmental status in the areas under direct impact according to those environmental components and systems that are affected by some impact processes.

3. *Full impact area:* assembly of direct and indirect impact areas.

Further, we describe the impacts, impact processes eventually occurring in the different phases and the general aspects applicable to the delineation of the impact area are described separately for each environmental component, system for linear infrastructures.

3.1. GEOLOGICAL MEDIA AND SOIL

3.1.1. Impact of the infrastructure

Area occupation by the road may result in reduction of the productive land. Its magnitude depends on the size of the land mandatory to purchase, including the road and other related facilities. Areas affected and establishments of crops are shown in the table.
In case of high dikes changes in the structure, compactness of the soil may also occur as an impact.

3.1.2. Impact of the construction of the infrastructure

On the one hand, it may occur as additional area use, which means the temporary use of productive lands beyond the lands mandatory to purchase. When this happens, when use is completed, the area must be remediated. Another impact of construction may be soil pollution generated on the sites where work machines are stored, or contamination arising from the storage of hazardous substances. Therefore, these areas are to be appointed with increased care.

3.1.3. Impact of motorway use

Deposition of air polluting substances from traffic may result in the contamination of soil, but this effect is mainly predominant in the lanes along the road and based on results of investigations along roads with high traffic it is negligible as polluting substances get deposited in a diffuse manner on the area where it cannot be delineated. Due to the improved composition, technical conditions and specific emission of vehicles in the last 15 years and the introduction of the unleaded patrol, contamination of the soil by the exhaust gas has significantly decreased and concentration has become insignificant in the lanes along the roads as well. It is to be noted that in relation with the current investment, in contrast with the expected traffic for motorways lower traffic load can be forecast, this is why it is justified to have construction in two phases.

Emergency contaminations can be expected in case of accidents. Polluting substances can be determined in advance. Their impact in time is transitional. In case of an emergency, oil contamination can be expected most frequently, and polluting substances may get into the soil depending on the substance transported. Contamination will affect the shoulders and the direct environment of the carriageway. It will not spread to the soil beyond the impact area.

3.1.4. The impact of operation of the infrastructure

Winter time de-icing can also bring about quality changes in the soil. Immediate impact is dominant on the shoulders and in the vicinity of ditches, this impact cannot be detected however on the cultivated lands along the motorway.

Herbicides are used for the weed control of the bands of the motorway. Weed control affects only a small lane. Typically a couple of meters area along the carriageway, therefore, the impact is well within the borders of the land mandatory to purchase.

3.1.5. Impact area

The area occupied by the route can be considered as a ***direct impact area,*** which is identical with the size of the area mandatory to purchase. This area is expected to be:

- 25-30 m width lane in case of 2*1 lane construction in the phase I, while
- in phase II, final 2*2 lanes structure 40-50 m width lane can be forecast. The exceptions are the sections connected by viaducts where impacts on the soil are typically limited to the construction phase.

Larger area than that is expected to be required for road connections - at junctions - and at lays-by. Dehydration of precipitation water and its entry into temporary watercourse qualifies as direct entry into a geological media according to Government Decree No. 219/2004 (VII. 21.). Due to the deposition of air polluting substances, the ***direct impact area*** of soil contamination is identical with the full impact area of air in principle, as soil becomes contaminated from air in the course of deposition.
The direct impact area of construction also includes the construction site. The exact site can only be determined prior to launching construction after the appointment of the constructor and the completion of the organisation plan. The use of the construction site (staging ground) is limited to the direction of the construction upon completion of which it needs to be remediated.

3.1.6. Affected media

The affected media area the productive land, the shoulders, the ditches and the surfaces of slopes along the carriageway.

3.2. GROUND WATER

3.2.1. Impact of the infrastructure

Arrangement of cuts, embankment may bring about change in ground water level.
In case of high ground water level, the road may influence flow of conditions of the terrain, if the route hinders flow towards low lying areas excess water areas may be generated.
Due to landscaping and the generation of covered surface, the hydrological conditions, run-off, infiltration will change.

3.2.2. Impact of the construction of the infrastructure

In respect of a motorway, in general, we may expect the following impacts during construction:

Arrangement of cuts, embankment may bring about change in ground water level.

High ground water level significantly influences the implementation of construction technology. Based on preliminary studies, there are no such sections in respect of the route and its correction.

Construction intervention in the environment of meliorated areas may hinder water drainage. No meliorated area can be found on the planning area of the current project.

Facilities for the storage and treatment of hazardous materials used or generated and polluting substances shall be established in a manner that excludes the contamination of ground water (fuel tanks, conditions of work machine maintenance, tools of protection, method of storage and transportation of waste and hazardous waste).

3.2.3. Impact of motorway use

In the course of operation, the following general impacts can be expected in relation with motorways.

Dust deposited from air and other polluting substances may get to the soil and from there by the intermediation of infiltration rain may get as far as the ground water reservoir.

When oil and other contaminations of water running off from the motorway get into the soil of the slopes, they may go as far as ground waters.

3.2.4. The impact of operation of the infrastructure

In the course of operation of the road, the direct impact of the agents used in winter de-icing and weed control is predominant in the environment of the shoulder and the ditches, but it may also get as far as ground water by way of infiltration (e.g., in case of high ground water level).

3.2.5. Impact area

For underground water, direct impact area is difficult to localise. On sites of paved carriageway, drain ditches, dehydrators and earth excavation sites, water supply conditions (infiltration) depending on geological conditions will change which brig about modification in ground water

replenishment as a direct impact. This impact in case of the linear infrastructure, however, is at a minimum cannot be or can hardly be perceived.
Underground waters should primarily be studied on areas sensitive to contamination.

3.2.6. Affected media

The affected media of the area are the groundwater, in the given case, also the deep ground water, and the studied water reserves built on this and operated, irrigated areas and irrigation wells.

If accidents (emergency) occur during construction and operation, contamination infiltrating through the soil may reach ground water and in certain cases even the deep ground water by ground water movement.

3.3. SURFACE WATER

3.3.1. Impact of the infrastructure

The investment will change the water balance of the area. Change in run-off conditions will be brought about in the one hand by the change in the proportion of paved and non-paved surfaces. On the other hand, run-off conditions are also impacted when precipitation water running off from the carriageway - which earlier was spreading over the surface and infiltrating into the soil - is collected by a ditch system and at a certain point is discharged into recipient. Due to this there will be a little deficit on certain sections of the watercourse, while on the section subsequent to the in-charge, there will be excess water. This, at the same time, will also cause a change in the balance of the surface waters, as waters that used to be evenly infiltrating until that time will appear as run-off waters on the surface.
When roads are constructed change in watercourse bed conditions must be taken into account, which may be due to watercourse bed corrections, watercourse bed covering at crossing points of watercourses and favourable or unfavourable changes in the fall conditions of the watercourse.

3.3.2. Impact of motorway use

The operation of the road will primarily affect the water quality of the watercourses. Watercourses will primarily be affected by the reposition of air polluting substances, component wear, dripping fuel and contamination coming from emergencies in case of accidents. Concentrated deposition of air polluting substances and their access into surface waters thereby has significantly decreased since the termination of lead containing patrol trade. Its impact is insignificant in case of surface watercourses crossing. Another potential polluting impact is the detrimental substances getting washed into the surface water by the precipitation water, whose quantity changes in function of traffic. In case of motorways, the expected concentration of TPH which is most characteristics and can be classified as hazardous can be estimated on the basis of traffic. Treatment of waters running off from the carriageway and expected to contain significant TPH concentration must be taken care of before entry into the recipient.

3.3.3. The impact of operation of the infrastructure

Among the impact of operating the infrastructure, the winter time de-icing can be mentioned but former studies have shown that its impact is negligible. We can mention however the operating issues of the sediment trap and other cleaning, sedimenting structures, as well as those of the intersecting objects, culverts and trench foot talpárkok performing drainage functions. Mainly due to extreme weather conditions, e.g., as a result of high intensity significant precipitation events more frequent maintenance activity may become necessary on engineering structures

3.3.4. Impact of the construction of the infrastructure

To store the different equipment and to perform smaller administrative work, usually containers are set up o the work area for each section. Water is supplied either by using the existing water network or by transporting water container on-site depending on the local conditions. Toilette is provided by installed mobile toilette.
Machines are stored on the sites along the line but repair is done at the central repair shops and in special repair facilities. Exchange of oil in heavy machines and earth machines is done in specialised workshops.
Fuel is supplied from fuel tankers owned or leased.
Tankers are equipped with a nozzle regular at patrol stations therefore the hazard of oil contamination during fuelling is at a minimum.

The following ill occur as environmental impact:

- disposal of municipal waste water and precipitation water on the construction sites during construction
- disposal, storage of hazardous substances, municipal waste
- arrangement of construction roads, culverts at watercourse intersections
- erosion protection during construction
- protection against emergencies

3.3.5. Impact area

Based on the above, delineation of the impact area in case of surface waters is the following:
The direct impact area at intersections of watercourses and at sites of inlet of precipitation waters on the upstream side is about 25-50 m while on the down stream side, depending on the characteristics of the watercourse is 50-100 m, but it can also be significantly more than that especially if we consider the impacts of contamination coming from an emergency. In case of watercourse bed correction, the entire corrected section belongs to the direct impact area. The river basin is part of the direct impact area, and the same is true for the area affected by changes caused in surface run-off conditions.

3.3.6. Affected media

The affected media of the area are the intersecting and parallel running watercourses.

3.4. AIR

3.4.1. Impact of the construction and operation of the infrastructure

Impacts on air as an environmental component may occur during operation and during the time of construction. The latter one is temporal, may be predominant on larger areas in relation with the transportation routes, earth excavation and target exploration sites but when construction is completed, it comes to an end.
During operation, polluting substance emission of the vehicles put a load on the area. Its degree depends on the conditions of the route, the size of traffic, emission by vehicles which is in correlation with the time perspective studied and the meteorological conditions.

3.4.2. Impact area

Government Decree No. 306/2010. (XII. 23.) does not regulate the concept of impact area in respect of linear sources, according to the applicable Government Decree, no residential building, resort building, teaching, education, health care, social and administrative building can be placed within a distance of 50 and 25 m.
By direct impact area, we understand the direct environment on the road in the current situation it is a distance of 50 m from motorway and a distance 25 m from main roads.
Due to the re-arrangements of traffic, indirect impact area means the areas along roads with changed traffic outside the direct impact area.

3.4.3. Affected media

The affected party is the population living in the direct and indirect impact area.

3.5. BIOSPHERE: HUMANS, FLORA, FAUNA

3.5.1. Humans

3.5.1.1. Health impacts

Change in the health status of the population may occur after the putting in service of the road, primarily due to changes in the impacts of the traffic. Impacts may occur with a time lag, on a permanent manner omits the population loaded.
From health aspect, he may distinguish between positive and negative impacts. Along roads currently heavily loaded by noise and air pollution positive impacts can be mentioned in case traffic decrease can be expected, while along road sections leading up to junctions of the motorway negative impacts may occur in the first place if it is of significant degree and affects residential area.
As the planned investment will run at a distance from residential areas and perspective traffics are not significant either in relation with the current investment, we may say both in respect of noise and air load that the project will not result in a conflict, therefore, no significant impact on the population should be considered from health aspect.

3.5.1.2. Social-economic impacts

When infrastructure development is carried out, impacts on social-economic life are usually of positive direction, but in the given case, may even be neutral for development. Positive impact primarily occurs in economy. A negative impact occurs when the investment induces

unfavourable processes which are alien to the development tendencies of the region to the traditions, endowments and the environment trigger further non-aligning investments or the degree of these investments are not aligned to the environmental conditions.

3.5.2. Biosphere: Natural environment

3.5.2.1. Impact of the infrastructure and its operation

Construction of expressways may first of all cause living space and habitats termination. Due to the construction of the road, the surrounding living space will also change. A road built in a cut slope or on an embankment will change the terrain conditions, the micro climatic conditions and in certain cases the water balance conditions. These factors combined may bring about change in the vegetation in the environment of the roads which may indirectly affect the fauna. In case of linear infrastructures, the most significant, hazard posing impact of construction and operation is habitats fragmentation. Isolation of habitats will bring about the isolation of the genetic stock of some population, therefore, it will indirectly lead to genetic drifting. Resistance of the remaining smaller populations will decrease in a number of aspects. Habitats fragmentation may bring about changes in the live space of the flora which indirectly may have a retrospective impact of animal species. Habitats fragmentation that is the impact of traffic is shown more spectacularly in running over animals by vehicles. The road may or will narrow the daily space for movement and may interrupt migration routes.
The vegetation along the road but the carriageway itself also has a special attracting influence. The vegetation of the shoulder and slope is usually different from the vegetation of the surrounding areas, e.g., that of the road leading in between arable plots is much more diverse and attracts animals from a long distance. Similarly, the road pavement with a temperature different than that of the environment is also attractive just as well as the line of lamps along the entry lanes to the road.
By the destruction of the surface and by the disturbance of its natural vegetation, the construction of linear infrastructures, including roads give way to alien species into the innermost areas with natural biosphere until then, giving free way to weeds, therefore, it also operates as a ‘negative ecological corridor’.

3.5.2.2. Impact of the construction of the infrastructure

Construction can cause further temporary habitats loss. The construction routes, the reception sites of construction materials occupy large areas, destroying, contaminating thereby the natural habitats. This hazard is significant in particular when construction is pursuit in the neighbourhood of an area with valuable biosphere to be protected. In that case, superfluous habitats use should be limited to the smallest possible degree.
Due to increased traffic caused by transportation during construction, environment pollution, temporarily, affects larger area than later (air quality degradation, noise load, vibration, soil contamination). A special form of environment pollution is the disturbance caused by human presence. In certain periods, this disturbance can significantly change the ordinary behaviour of animals.

3.5.2.3. Impact area

On the area affected, the planned investment exercises impact on natural environment for two reasons: impacts of construction and/or those of the later operation, respectively. The **direct impact area** of construction is the planned route and its direct environment (lane mandatory to

purchase). In that lane, the hazard of termination of habitats, disappearance of certain plant associations, death of items of plants and animal species is a realistic danger. Considering the crown width of the road, the game fence and the service roads built at certain places the width of the lane can be maximum 50 m. Beyond this, habitats were assessed in a lane of 300-300 m measured from the axle of the road, which can be called the **indirect impact area**. Mechanical damages, contamination and low degree disturbance can be expected there but not direct area occupation. With regard to certain animal species (mainly predatory birds, wild game), disturbance can occur beyond the 300-300 m lanes measured from the axle (that is, here the indirect impact area is wider). In respect of these species, the potential of occurrence was studied in a varied, 500-500 m width (that is, in their case, the indirect impact area is a total width of 1 km).
In summation: the 50 m wide lane along the axle was considered a direct impact area, and 600 m (300+300 m) lane along the axle was considered the indirect impact area (detailed habitats map was prepared for the lane of 300+300 m width), in case of certain animal species however we studied their occurrence in a lane of a width of 1,000 m (500+500 m).

3.5.2.4. Affected media

Natural or semi-natural habitats and their plant species in the area, animals living there, searching for food there or migrating animals.

3.6. BUILT ENVIRONMENT

3.6.1. Impact of the infrastructure

The impact of the infrastructure is demonstrated in separating outer or inner areas by the road, in area reduction due to land use, and in the change of the value of the areas (appreciation or depreciation). The latter occurs as an indirect impact, with a time lag, following the putting in service of the road. Occurrence of related infrastructure and other facilities can also be expected in relation with the construction of the road.
The separating impact and area decrease occur as an indirect impact, when construction is started or when it is put in service. Separating impact can be mitigated by the construction of crossing structures, junctions.

3.6.2. Impact of motorway use

The impact arising from operating the road is related to the rearrangement of traffic; this means change in the noise, vibration and air pollution load on certain parts of the settlements.

The impacts of construction and operation may be of positive or negative direction.

3.6.3. Impact of the construction of the infrastructure

The driving factor is the construction related traffic occurring during construction and passing across the settlements and the related loads.

3.6.4. Impact area

Settlements where environmental components can be found that are directly impacted by the road are considered part of the *direct impact area*. The planning area concerns the periphery and the urban area of the settlement; from the aspect of the built environment the urban area can be considered relevant.
All area, settlement, where any impact of the investment can be perceived (spatial development, rearrangement of traffic, separating impact, area occupation) should be considered the *indirect impact area.*

3.6.5. Affected media

The population and the buildings of the settlements affected.

3.7. LANDSCAPE

3.7.1. Impact of the infrastructure

The impact of the infrastructure can be expressed in the following:

- space occupation,
- changes occurring in landscape,
- changes occurring in landscape use methods,
- impact exercised on individual landscape values.

The primary impact of the infrastructure is space occupation. Within the area mandatory to purchase, the former land uses, establishments of crops, natural or semi-natural areas, individual landscape values come to an end and in their place a transport lane is established. On the area purchased, it is possible and necessary to establish biologically active surfaces (e.g., slopes) but these surfaces cannot substitute the natural areas occupied by the carriageway of the road. The route options use arable lands roughly in 94-96% and forest areas in 1-2%.

The establishment of the route changes the former connections of the area. Primarily the existing road network is transformed but changes also affect ecological relations and the water network. On areas cut into two profitability of farming pursued on certain areas can decrease. Landscape structure is determined by the agricultural plots and a system of trees and shrubs lining watercourses and roads. Larger coherent forest areas are certain spots of the Töttös forest, which are not directly affected, only the woodlands in the neighbourhood of the Szilvás brook registered as an ecological corridor between the two spots. Continuity of ecological connections is ensured by the planned ecological passages. The planned expressway will improve the accessibility of the region, where presently there is a significant deficit of connections as there are a lot of dead-end settlements.
Changes occurring in the landscape are related to the horizontal and the vertical lines of the road. Terrain conditions will significantly influence how the road can be adjusted into the landscape, its visibility and degree of coverage. 45% of the route passes along an embankment of 2 m height whereby it can be favourably adjusted into the landscape. In the first part of the section, there are longer cut in sections but there is not cut in higher than 7 m. Embankment higher than that is necessary mainly at junctions, at road, railway and watercourse crossings.
65% of the carriageway runs along the arc of a circle as a result of which driving along the road can be evaluated as exiting physiologically, and straight line sections are also in the less boring category for the most part. Due to the large number of slopes and concave sections most of the carriageway can be well overseen.

On the broader planning area a number of individual landscape values can be found but the route options do not affect these.

3.7.2. Impact of motorway use

Motorway use will have an impact on the landscape as a complex unit through the changes in the different environmental compartments. Impacts of motorway use are discussed in detail in the different technical chapters (soil, ground and surface water, noise, air).
Along the new route, one of the most significant impact is expected to be the invigoration of investments. It will boost the appreciation of the area by the good transport connections, insulation of production and services activities. This impact will be perceivable in particular in the neighbourhood of junctions.

3.7.3. Impact of the construction of the infrastructure

From landscape protection aspect, the impact of construction usually brings about temporary changes, but it can also be final. It is primarily related to the establishment of earth excavation and target exploration sites, and reception sites.
Construction of the road is accompanied by the change of the terrain surface, making slope cuts and building embankments, and temporary destruction of the surface limited to the duration of construction. Disturbance generated by the change in the terrain surface, setting up construction sites for the construction works and disposal of waste generated, may extent beyond the regulated route for the carriageway.
Construction requires a huge quantity of material for embankment and the start of excavation of material suitable for embankment.
Appearance of unfavourable landscape components (work machines, transport vehicles) during construction may be temporarily disturbing; similarly to area use, it may extend beyond the route of the road and the areas mandatory to purchase. When construction is finished, destroyed surfaces will need remediation.

3.7.4. Impact area

The *direct impact area* is the relevant part of the landscape unit where the route is passing across, which is having a direct impact on the landscape, the individual landscape values and land use method.
All areas, where any impact of the investment can be perceived (spatial development, change in area use, landscape protection, landscape remediation) should be considered as a direct impact area.

3.7.5. Affected media

Affected parties are the habitats systems affected by the route, people living at the settlements affected, and all those who will use later the built express way.

3.8. THREATENING FACTORS

3.8.1. Noise

Noise is not an environmental compartment, but as an airborne impact, it is considered as threatening factor, therefore it is to be examined. Impacts exercised through the air, as an intermediary compartment, may occur during motorway use and the duration of construction.

3.8.1.1. Impact of the construction of the infrastructure

It is a temporary impact which is terminated when construction is completed. It may prevail on larger areas due to the transportation routes. Routes are determined by the earth quantity to be delivered and the location of the earth excavation and target exploration sites to be found on the neighbourhood of the area concerned.

3.8.1.2. Impact of motorway use

To analyse loads generated during motorway use, we need the estimate values of perspective traffic size and composition, as well as the location of the planned route and junctions, and sites suitable for permanent human stay.

3.8.1.3. Impact area

Government Decree no. 284/2007 (X. 29.) on 'certain rules of protection against environmental noise and vibration' gives a general interpretation of the concept of impact area, its limit is determined on the basis of the criteria system in the Decree, in accordance with the degree of the background load.

In respect of the degree of background load, the existing transport noise sources have been considered at a value of noise load limit value -10 dB. With this delineation of the impact area, we shifted towards safety, towards the delineation of the largest area. Therefore impact area is the area lane within which a load exceeding limit value -10 dB is expected for the relevant (night time) time interval without protective measures of the infrastructure. With this we have determined the widest possible impact area delineation in theory. In our case, it means 55-10 = 45 dB(A) at relevant night time limit value.

When the construction of the express way is completed, traffic is expected to be rearranged on the surrounding road network. On certain road sections, traffic will opt for the express way, therefore, decrease of noise load from traffic and transport can be expected, while on other sections, in the neighbourhood of motorway junctions - feeding in further transport to the junction - an increased noise load from traffic and transport can be expected. Direct impact areas include road sections affected by this rearrangement.

3.8.1.4. Affected media

The affected party is the population living in the direct and indirect impact area.

3.8.2. Vibration

Vibration is not an environmental compartment either, but it is the flexible change of form of 'bodies consisting of solid particles' recurring in time around there rest position with increasing or decreasing (reduced) intensity owing to some external impact (excitation). Naturally this change of form is mostly of very small degree, not detectable for the eyes (because it that case, it is called displacement), but vibration - depending on its degree - may give rise to discomfort, may cause damages in buildings, therefore it may be a reason for a complaint.
Vibration impact related to the relevant investment should be considered primarily during the period of construction: during earthworks and structure construction (piles basement, etc.), when the different construction machines carry out the excavation of the surface and the deeper layers and compacting. When construction is completed, the impact terminates.

The *affected party* is the population living on the impact area.

3.8.3. Waste

Impacts
Also belongs to among factors threatening the environment. It may have a detrimental impact on the soil, groundwater and surface water, as well as the biosphere.
Collection and storage at the collection sites of waste generated during construction and use of the motorway shall be taken care of in accordance with the valid rules of law. With this, detrimental impacts on the environmental compartments can be avoided.

Impact area
From the aspect of waste, the direct impact area is the area within the border of the land mandatory to purchase, where waste is generated and collected. If the route of the motorway affects a landfill, then its area is also part of the direct impact area.
The temporary construction sites used during the time of construction, where waste can also be generated and may have to be collected are also part of the direct impact area.

Direct impact area can be designated in relation with the transportation and disposal of waste. Waste generated along the carriageway is usually transported to the reception site (collecting site), therefore, it is also part of the direct impact area.

4. EXAMINATION OF THE ENVIRONMENTAL COMPARTMENTS AND THREATENING FACTORS

4.1. GEOLOGICAL MEDIA, SOIL

4.1.1. Examination of current status

4.1.1.1. Examination method

In the elaboration of this chapter, we used the agro-topographical maps prepared by the Cartography Company in 1981 and the publication titled 'Inventory of the micro-regions of Hungary' (Magyarország kistájainak katasztere) published by the Geographic Research Institute of the Hungarian Academy of Sciences in 2010. To characterise the current status of the soil, we identify the soil type, the physical type of soil affected by the route on the basis of the agro-topographical map, the water management feature of the soil, its pH and soil value number, and we also present the results of the soil mechanical drillings made for the preliminary plan.

In respect of public administration, the planning area can be found in Baranya County. The examined route affects the following micro regions:

Large region	*Middle region*	*Micro region*
The Great Plain	Plain along the Dráva River	Nyárád-Harkány Plain

The micro region is located in Baranya County. It is an area of 359 km^2 (27.7% of the middle region, and 0.7% of the large region).

4.1.1.2. Topographical, geological features of the planning area

The Nyárád-Harkány Plain is an alluvial fan terraced plain of a height between 89 and 162 m, which in the direction of NW is converted into a hill foot surface. The surface has a gentle slope towards S-SE, vertically slightly fragmented, the average relative relief changing between 2 and 30 m/km^2. Most of the micro region is low lying flood free plain, while the area west of Karasica can be classified as orographic topographical type undulating plain. The ground surface is strongly fragmented by valleys of N-S and NW orientation especially in the middle part of the micro region. They are connected in the formal part to the loess surfaces, and partly to the erosion activities of the watercourses. Valleys of SE orientation further formed by erosion and deration.
In addition to the structural lines, the mosaic like broken bacon shows varied geo-lithological structure: the Triassic fragmentary formations are decisive. Following the sink of the Dráva trench and the Dráva estuary in the Würm age, areas of the micro region W and E of Karasica had different development tendency. The E part has become free from floods and in calm environment, especially in an Aeolian way, loess of 15-20 m was formed. Loess is fragmented by fossil soils, on the E edge in spots, it is converted into infusion loess. W of Karasica the surface is covered by Holocene alluvial soils irrespective of some smaller kovárványos, quick sand islands. The lime rock of lower cretaceous age at Beremend and Kistaloca is elevated from the alluvium as a mountain.

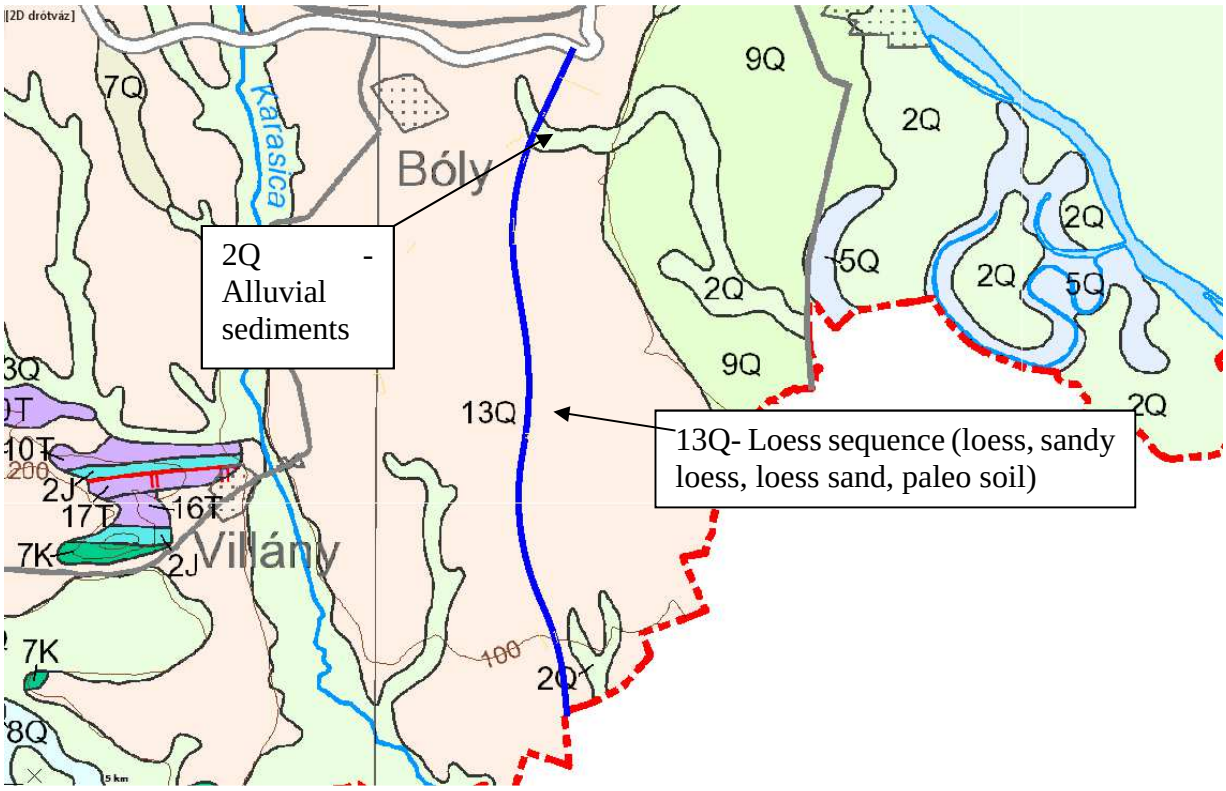


Figure 10 Surface geological map of the planning area

Mineral reserves

Mining areas in the environment of the route are described in Chapter 2.6.

Soil types of the planning area

Soil types of the land occupied by the route options are characterised on the basis of the agro-topographical map with consideration to 30 m wide lane in Stage I construction and on an average 50 m wide lane in respect of Stage II construction in calculating area occupation.
Since deviation is of very small degree in the corrected route length (75 m) and horizontal tracking of 'Am', it does not substantially influence the calculation in hectare, therefore, from the aspect of impact of soil types, no separate tables have been prepared for the two options.
Soil types concerned are characterised below. (The soil value mark expresses the natural fertility of different soils in percentage of the facility of the most fertile soil.)

Construction stage I

Serial No.	Length on the route (m)	Km No..	Soil value mark	%	Area (ha)	Soil type
	5530	**193+820 -199+350**	80 - 70	30%	16.59	lime pleque chernozem soils
	10623	**199+350 -209+973**	60 - 50	58%	31.87	chernozem brown forest soils
	2093	**209+973 - 212+065(212+140)**	50 - 40	12%	6.28	alluvial meadow soils
total:	**18245**			**100%**	**54.74**	

Table 13 Soils affected by M6 in case of construction stage I

Construction stage II

Serial No.	Length on the route (m)	Km No.	Soil value mark	%	Area (ha)	Soil type
	5530	**193+820 - 199+350**	80 - 70	30%	27.65	lime pleque chernozem soils
	10623	**199+350 - 209+973**	60 - 50	58%	53.115	chernozem brown forest soils
	2093	**209+973 - 212+065 (212+140)**	50 - 40	12%	10.46	alluvial meadow soils
total:	**18245**			**100%**	**91.225**	

Table 14 Soils affected by M6 in case of construction stage II

Description of soil types concerned (*source: Soil Protection Foundation: Soils of Hungary*):

In the case of the **alluvial meadow soil**, the meadow process can also be discovered in addition to the alluvial nature, that is the humus generation process can be observed. The structure, however, is less emerged, iron movement and calcium dynamics is of small degree. The soil type is usually generated on higher lying parts of the flood plain, where released from constant water cover, humus generation may get started. Nutrient supply is favourable, but due to low organic metal content and slow springtime warming up, they have a weak nitrogen supply capacity.

The **lime pleque chernozem soils** are a typical soil formation not only of Hungary but of the entire Danube valley. The name comes from the lime plaque in the sections usually between 30-70 cm, which covers the structural components, that is the soil drops by a thin mould like film. The plaque layer, especially when it is dry, is of light colour, of greyish shade and easily falls apart into its structural components. Lime plaque is the consequence of the specific dynamics of this soil types, where the period of leaching out, that is, the migration of carbonated lime and plaque generation and the period of deposition of carbonated lime from the soil solutions are automating. Leaching out coincides with moisturising lasting from autumn to spring, while plaque formation is the consequence of summertime dehydration and concentration of soil solutions. It has good water management as each of its level has excellent water permeability and water storage capacity. Exceptions are only the dusty ploughed layers of degraded structure and the concentrated furrow bottom. To eliminate these is highly important. These soils have good nutrient management as well due to favourable nitrogen supply, phosphate digestion and potassium supply capacity.

In the section of **chernozem brown forest soils**, two processes dominate. One is leaching which connects the soil type to the brown forest soils, the consequence of which is iron containing clay formation, he other is the intensive humus generation which is a characteristic of the main type of chernozem soils. These soils are usually to be found on the border of brown forest soils and chernozem soils. The structure of this section is characterised by intensive deep humus level which often stretches into the accumulation level of brown forest soil, covering its colour and original attributes. There is no difference in clay content between the leaching and accumulation levels. Humus distribution in the section is in line with that of the chernozem soils.

Meliorated areas:

On the section affected by planning, we have no knowledge of affecting meliorated and irrigated areas.

4.1.2. Changes in status on construction of the motorway

4.1.2.1. Decrees, laws referred to

- Act LIII of 1995 on the general rules applicable to the protection of the environment
- Act LIII of 1996 on the protection of the environment
- Act CXXIX of 2007 on the protection of arable land
- Joint Degree No. 6/2009. (IV. 14.) KvVM - EüM-FVM Ministry of Environment and Water-Ministry of Health- Ministry of Agriculture and Rural Development on limit values required for the protection of the geological media and groundwater against water contamination and on the measurement of contamination

4.1.2.2. Impact of the infrastructure

The impact of area occupation on soils ensuring agricultural production

An unfavourable impact of area occupation occurs especially where the area occupation by the motorway results in the loss of good quality, high soil value mark for agricultural production.

Soil types of the planning area and their characteristics are discussed in Chapter 4.1.1.2. We can state that in respect of the planned route and correction, good fertility soils can be found on the first 5.5 km length. Fertility of the soils is medium in the middle 10.6 km sub-section of the section on most of the Töttös and Lippó area, from here to the national border it is not better than medium, low fertility. From the aspect of the soils concerned, any of the route options can be implemented.

Pursuant to par. 1 (1) d) of FVM Decree No. 90/2008. (VII. 18.) on the detailed rules of preparing soil protection plan, the preparation of a soil protection plan, and based on this a humus rescue plan is a requirement. For lands occupied for the motorway, a plan for removal from agricultural production must be made.
Land use must be limited to the smallest area of land in accordance with justified needs. Effort should be made to possibly use the poorest quality lands, on the smallest possible area and for the shortest possible duration. It must also be borne in mind that future actual use of the land should be in harmony with the needs. Using arable land for other purpose and starting construction can only be done in possession of the permission of the authorities.

Impact on the structure of the soil on the basis of former experiences:

Impact can be exercised on the structure of the soil primarily by the construction of high embankments. As a result of load (pressure), which affects the sub-soil, the soil structure can be changed. The compressive force of the embankment however impacts only the soil body underneath, therefore, it cannot be perceived on the neighbouring areas. Frozen soils, dispersive soils and soils of strong volumetric change cannot be incorporated into earthwork. Suitability for incorporation of materials not mentioned before (slags, fly ashes, etc.) can only be permitted on the basis of laboratory and/or suitability site test results. Opinion on suitability for incorporation of soils on the planning area can only be given in essence following the excavation of soils and in knowledge of the soil physical parameters of those soils.

4.1.2.3. Impact of the construction phase

The impact of the construction on the soil is in correlation with the movement of machines, fuelling, construction material excavation, transportation and storage of hazardous substances and disposal of waste.

Related to this, the direct impact area is identical with the area to be mandatory purchased where the direct construction activity is pursued.

The area used for machine storage disposal of hazardous substances and waste is also a direct impact area, which, in the given case, may also be placed outside the construction site.

The transportation routes are also part of the direct impact area. The indirect impact area includes the environment of the transportation routes, where the soil and groundwater may get contaminated, as well as the environment of the construction area.

It has not been possible to deal with the impact of the construction phase in detail, because, in lack of the organisational plan, only general points of view can be proposed. Yet, it is important to prescribe as a prime requirement that the designation of the site and arrangement of the temporary temporary storage sites of waste and hazardous waste generated during construction, as well as fuel storage for earth machines should be done in an environments with a cover layer and groundwater not sensitive to contamination with attention not only to the cover layer conditions, but also to the general flow directions of groundwater.

Temporary hazardous waste storage facilities should be free from leakage, especially on area sensitive to contamination.

Attention should be paid to soil protection instructions, paying special attention to use lands for transportation routes that are less used for agricultural cultivation.

In case of new routes, removal of areas from cultivation should be done in phase manner in accordance with the stages of construction.

The degree of soil compactness can be minimised by decreasing the extent of work area, where heavier trampling than necessary should be avoided and by work organisation, the use of machines producing a load should be limited to the shortest possible time.

The degree of soil compaction depends on the weight of the machines and the moisture content of the soil as well. A vehicle of 8-12 tonnes generates significant compaction to 30-40 cm layer of the soil, the same value for 10-20 tonnes is 40-50 cm. Compaction can decrease soil fertility for years, damage to soil structure can deteriorate water management capacity, therefore, on completion of the construction, the soil needs remediation. This can be achieved by medium

deep decompaction. The quality of the soil remains unchanged presuming that it is not affected by pollution during the works. Eventual soil quality degradation caused by dusting may be restored by organic manure, green manure mixed into the soil during decompaction.

The works shall be carried out so that the extent of soil pollution should be possibly the least. After the completion of the works, the area shall be cleaned up from the possible pollution.

4.1.2.4. Impact of motorway use

Impacts arising from M6 motorway use may be the following:
- waste 'production' (municipal waste primarily of those taking part in transport),
- gases and deposition, infiltration of other particles coming from the operation of vehicles,
- atmospheric dry deposition,
- polluting substances leaching in rainwater

Expected negative impacts may occur primarily due to road transport emission, polluting substances bound on dust deposited from the air, and dust grains polluted by oil along the road. Such are wear materials, lubricants, petrol and diesel drops, liquid from winter salting of the road, deposited dust. In ordinary operation, these substances are washed from the carriageway by rain and collected on the shoulder along the road and in the ditch.

Expected pollutants are CH derivatives and heavy materials whose quantity the vegetation of the ditches able to bind, CH derivatives may in a small amount get infiltrated into the soil, but technical literature and research results show that polluting substances are bound in the upper 30 cm layer of the soil, or pollutants washed into the ditch by precipitation are bound to soil grains and get sedimented in the form of thin sludge layer. Infiltrating polluting substances are degraded by the biofilm living in the route zone of the vegetation. The removal of CH derivatives from uncovered earth bedded ditches on 500 m is of 70-80 % efficiency in case of low quantity of precipitation. This means that their quantity is negligible when they reach the recipient.
The water in the ditches, where possible, is conducted into the watercourses crossing the road. Where it is not possible, it is recommended that the structure of the uncovered earth bedded ditch should be grassy rut followed by sedge, bulrush, reeds (indigenous aquatic plants).
In terms of filtering and binding polluting substances, and in case of low polluting substance quantities, ditch established appropriately (planting vegetation, widening at certain points) operates as a kind of biological treatment system (efficiency of degradation 70-100%).
With attention to that, the contamination of the upper soil layer of 0.3-0.5 m cannot be excluded, but the polluting substances going further than the route zone of the vegetation having shallow routes can be excluded due to the natural degradation processes.
In order to former opinion on the impact of expected soil contamination, the job performed by Roden Mérnöki Iroda Kft. in 1998 must be mentioned. Fejér County NTA Soil Protection Department ordered a study and requested an expert opinion on the soil of the median strip of M7 motorway.
The many years old toxic substance and heavy metal load of the median strip may primarily come from air pollution.
Primarily lead, cadmium and oil pollution were studied at 14 sampling sites.
In spite of several decades' operation no significant load was found, limit values for soil were not exceeded by the measured data. Soil was contaminated by toxic elements only to a small degree. Contamination by oil occurred only to a small degree and in the upper 10 cm.

As of 1999, no significant lead emission has to be taken into account, as of 1 April 1999 distribution of leaded fuel came to an end in Hungary. But today's fuels are not totally lead-free either, therefore, due to the deposition of polluting substances getting into the air, lead derivative depositions pose a health risk. Former studies have also come to the conclusion valid here as well that on the basis of excavations and former studies of model value conducted on motorways, motor roads, that according to our current knowledge, lead contamination from emission cannot be considered as a factor directly threatening neighbouring land use or underground water reserves.

4.1.2.5. The impact of operating the infrastructure

For the weed control of the edges of national roads, herbicides are used. Weed control affects a very little lane. As long the route currently agricultural production is pursued by using herbicides, therefore, it is not extra burden for the soil.

Usually NaCl mixed with anti-clotting substance, and under -7 ^{o}C $CaCl_2$ solution are used on national roads for de-icing.

(We note that according to Government Decree No. 346/2008, since September 2010, for the protection of woody plants, it is prohibited to use NaCl for de-icing, the exception is public road surface. If it is used, financial penalty can be imposed.)

Substance marked $CaCl_2$ is fully environmentally friendly as it is used as artificial fertiliser in agriculture. In contrast with salt, it has the advantage that about a quarter of the quantity is needed, salt gets frozen below -7 ^{o}C, while the freezing point of $CaCl_2$ is -35 ^{o}C, furthermore, $CaCl_2$ does not enter into chemical reaction with the asphalt and has a freezing point below domestic winter conditions, therefore, the solution generated with snow/ice will not get re-frozen and does not damage therefore the road surface. Under domestic weather conditions, the recommended quantity of 20-28 gram/nm depending on the external conditions.

ÁAK Zrt. conducted a study in relation with the expressways in August 2008 focusing on the soil quality of the hard shoulder and on to what extend this quality is influenced by the substances applied to the carriageway surface for the purpose of winter de-icing.

The study found that accumulation of chlorides is not typical even in samples along expressways.

4.1.3. Impacts of scheduled development

Considering that at the time of preparation of the current plan, according to the information received from the Investor, NIF Zrt., and in accordance with the calculations of the study, the areas necessary for final development will not be purchased in stage I, impacts that can be evaluated from the aspect of the geological media can only be interpreted in light of the size of the used productive lands. This difference between the 2 stages is shown in 0 and 0

4.1.4. Evaluation, proposed protective measures

<u>The impact of area occupation on soils ensuring agricultural production</u>

We can state that in respect of the planned route and correction, good fertility soils can be found on the first 5.5 km length. Fertility of the soils is medium in the middle 10.6 km sub-section of the section on most of the Töttös and Lippó area, from here to the national border it is not better than medium, low fertility. From the aspect of the soils concerned, both the route and its corrected section can be implemented.

The planned route and its correction does not affect meliorated area:

Proposed protective measures

The excavated humus containing fertile layer should be deposited on a deposit site and used in re-cultivation. The original structure of the deposited soil is degrading and its fertility changes, due to excavation its soil structure changes. During storage, soil life number of soil micro-organisms decreases, therefore, the humus containing fertile layer should be used as possible following excavation. In the interest of protecting fertile layer, the excavated humus layer should be placed in prisms in order to preserve its biological values. Until re-use, it should be properly taken care of and should be protected from dehydration. It should be free from weeds which must be maintained by regular mowing.
The humus management plan should be prepared as part of the implementation plan based on the soil protection plan.

4.1.5. Impacts expected in case of the construction of the related facilities

With regard to soil, it can examined in relation with area occupation and loss of fertile lands related to the development of public utilities or in relation with other temporary utilisation during construction. Based on the available preliminary replacement plans, construction of the motorway does not justify replacement on a new route, therefore, it can be stated that replacement will be carried out within the area mandatory purchase for the carriageway, therefore, use of additional lands on the cultivation is not justified. The construction time of replacement works and the necessary work demand is of negligible rate compared to the construction of the carriageway, therefore, it does not generate additional impacts that can be evaluated. In terms of time, it is carried out together with the planned investment.

Based on the above, it can be stated, that the replacement of public utilities concerned with the development of M6 motorway (known in the present planning phase) and the development of the new related facilities have no detectable impact on the geological media, the soil. Impacts of related facilities on soil are identical with the impacts described in Chapter 4.1.2. Their construction does not result in significant additional detrimental impact.

4.1.6. Tasks to be performed before construction

Before launching construction work, the organisation plan must be prepared. The environment protection plan which prescribes the requirements to comply with in knowledge of the machine fleet and potentials of the Constructor company, is part of the organisation plan.
During the preparation of the licensing plan, soil excavation of sufficient detail and depth must be prepared for the detailed geotechnical expert opinion.
According to legislative requirements, a soil protection plan must be elaborated before the construction permitting procedure.
In attachment to the implementation plan, humus management plan needs to be prepared based on the landscape protection plan.
Along the planned routes, fertile land loss according to soils' fertility can only be specified in knowledge of the geometry of slope cuts and embankments.

4.1.7. Requirements applicable to the term of construction

Humus fertile layer cut off during construction and suitable for use should be separately stored, taking care of complying with legal requirements.

The environmental impacts of temporary disposal of the excavated humus layer can be mitigated by the selection of the right site. In the interest of protecting fertile layer, the excavated humus layer should be placed in prisms in order to preserve its biological values. Until re-use, it should be properly taken care of and should be protected from dehydration. It should be free from weeds which must be maintained by regular mowing.
The disposed humus must be re-used on the established new slope surfaces, and can also be used in planting vegetation. Slopes must be protected against dusting and erosion by grassing.

When appointing the transport routes, a major aspect is to use the least possible lands on the agricultural cultivation, and possibly avoid residential areas.
Implementation and vegetation planting work should be coordinated by leaving the slope areas without biological protection for the shortest possible time.

4.1.8. Requirements applicable to putting in service, operation

The operator, in the present case, the Magyar Közút Zrt., has elaborated instructions for emergency events. The applicable instruction, requirement identifies the authorities to be notified in case of an accident, their contact and also who is responsible for taking measures. Continuous, temporary maintenance of water construction facilities planned must be taken care of.

4.1.9. Proposals for monitoring

Our position is that on completion of the construction of the motorway and in case of compliance with the prescribed measures and provisions in rules of law referred to, no special monitoring will be needed.

4.2. UNDERGROUND WATER

4.2.1. Analysis method, decrees, laws referred to

Based on data and findings of hydrogeological conditions of the area, we analyse the changed to occur in perspective conditions, their degree and the necessary protective solutions.

- Government Decree No. 219/2004 (VII.21.) on the protection of underground waters
- Government Decree No. 220/2004 (VII.24.) on the rules applicable to the protection of surface water quality
- Joint Degree No. 6/2009. (IV. 14.) KvVM - EüM-FVM Ministry of Environment and Water-Ministry of Health- Ministry of Agriculture and Rural Development on limit values required for the protection of the geological media and groundwater against water contamination and on the measurement of contamination
- Government Decree No. 123/1997 (VII.18) on the protection of water resources, perspective water resources, hydraulic establishments
- Ministry of Environment and Water Decree No. 28/2004. (XII. 25.) KvVM on the threshold limits of the emission of water pollutants and on certain rules of their application
- Ministry of Environment and Water Decree No. 27/2004 (XII.25.) KvVM on the classification of settlements in territories, sensitive in terms of the condition of underground waters

4.2.2. Examination of current status

According to the national water management plan, the planning area is on the planning sub-unit of the right-hand side bank of the Lower Danube River.

4.2.2.1. Climate of the area

It is an area of moderately warm- moderately dry climate. The annual duration of sunshine is 2,070-2,080 hours. The hours of sunshine of the summer quarter of the year is above 820, while that of the winter quarter of the year, is a little less than 210.
The mean annual temperature is between 10.6-10.8°C, the average temperature of the vegetation period is between 17.2 and 17.4°C. After 1 April, the daily mean temperature exceeds 10°C; the period lasts for 200-202 days and finishes on 19-21 October. The ice-free period is about 200-203 days starting on 5-8 April and finishing on 25-27 October. The average of the annual absolute temperature maximums and minimums is around 33.5-34.0°C and -16.0°C. Annual precipitation quantity is 630-670 mm (more in the S), the average in the vegetation period is 340-380 mm, but in SW it is around 400 mm. The 24-hour precipitation maximum which was 108 mm, was perceived in Berend. We can expect about 30 days with snow cover during winter; the average maximum snow height is 22 cm. Aridity index is between 1.05 and 1.10.
Wind blows most frequently from NW, N, in autumn, frequency of wind from SE is increasing. The average wind speed is between 2.5-3 m/s.
The climate is favourable for the production of crops requiring more heat and of long vegetation period as well.

4.2.2.2. Close to surface waters

The average groundwater depth is 2-4 m in the vicinity of watercourses, in other sections of the area, it is between 5-10 m, its quantity is not significant. Chemically it is of calcium-magnesium - hydrogen-carbonate type. Hardness is high, between 25-35 nk°. Sulphate content in general is 60 mg/l, in some places nitrification occurs.

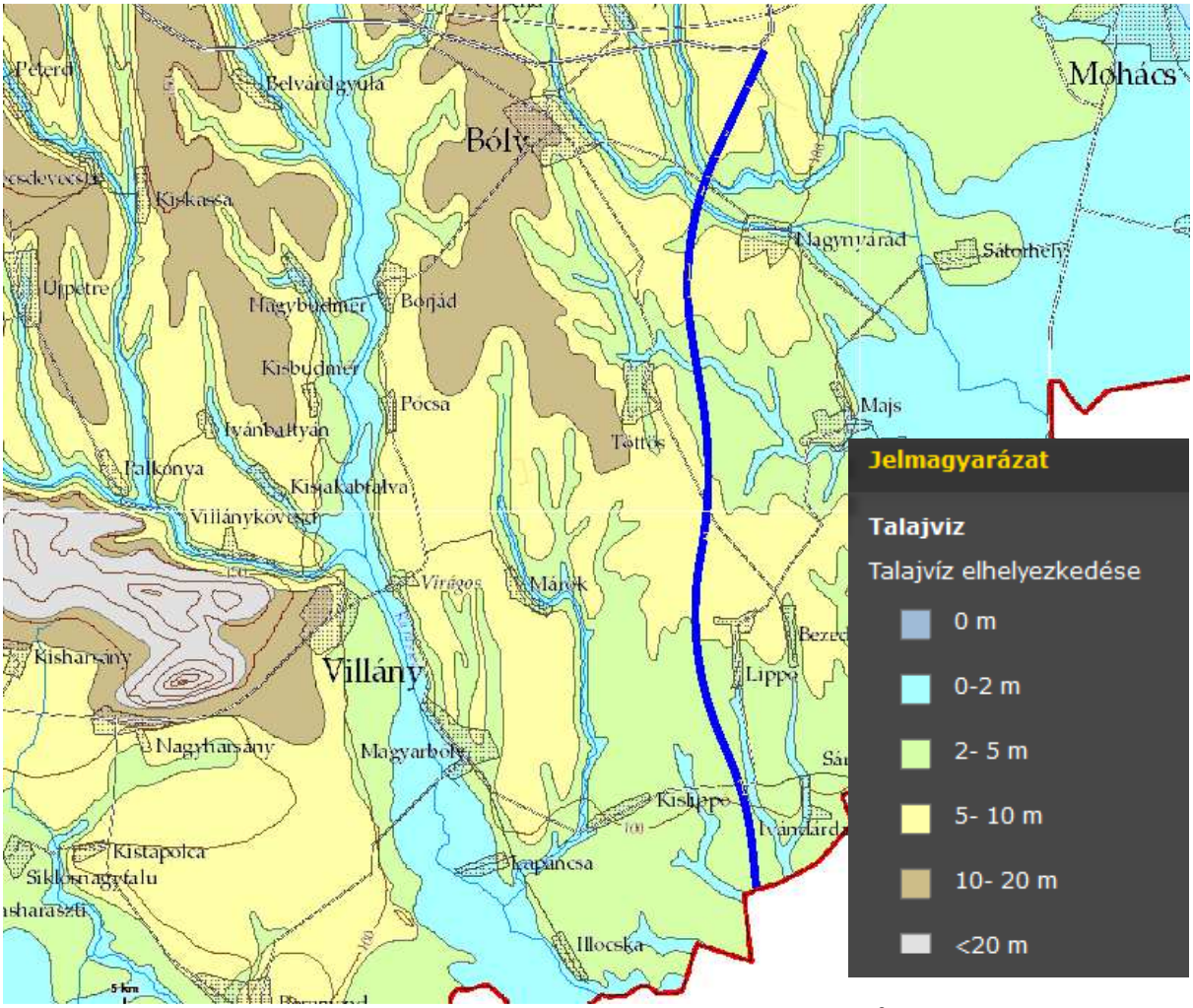


Figure 11 Groundwater map of the planning area[8]

Jelmagyarázat= Legend,
Talajvíz = Groundwater,
Talajvíz elhelyezkedése = Location of groundwater

4.2.2.3. Groundwaters

In the environment of the carriageway, the ground waters between Majs and Töttös are collected by the watercourse of the NW-SE valleys (Lánycsók-Marázai-watercourse, Borza-brook, Szajki-watercourse, Versendi-watercourse, Majsi-watercourse) and conducted into the Danube. On this area, due to the valleys of the watercourses, longitudinal narrow hilly ridges occurred, and in accordance with the groundwater type of the mountains, groundwater level is at a great

[8]source: http://map.mfgi.hu/tvz_1248/

depth in mountainess areas. The groundwaters located in larger depth in closed aquifers are in fact not just groundwater but they are a transition between ground and deep groundwaters. The different definitions of groundwaters also include the criteria that meteorological conditions have a role in the formation of groundwaters on the surface. In case of waters at a depth deeper than 8 m, the impact of evaporation is not prevailing anymore. Tapping flowing to the sites is small in line with the closed layers, therefore, in these areas fluctuation of groundwater further away from the watercourses is of small degree. The sucking effect of the tapping watercourses cannot be estimated higher than of a magnitude of 100 m.
From this region to the country border, groundwater flow towards south in accordance with the terrain. The Lippói trench and the Mároki watercourse heading towards south also set the same direction. The sucking effect of these watercourses extends only for a small distance, and on this section, from about section 204+000 up to the national border, the groundwater streamlines are running almost parallel with the planned route, although south of the Bóly- Nagynyárád area, groundwater contour lines are difficult to determine, as the route here is seemingly running on the top of the groundwater ridge formed between the Danube and the Karasica valley. We wish to highlight here that west of the line of the planned route no groundwater flow is possible towards the valley of Karasica.

4.2.2.4. Water reserves

Based on the map of the National Water Management Plan (OVGT), drinking water abstractions in Hungary (map No. 3.1), the planned routes affect neither operating nor perspective protected water reserves.

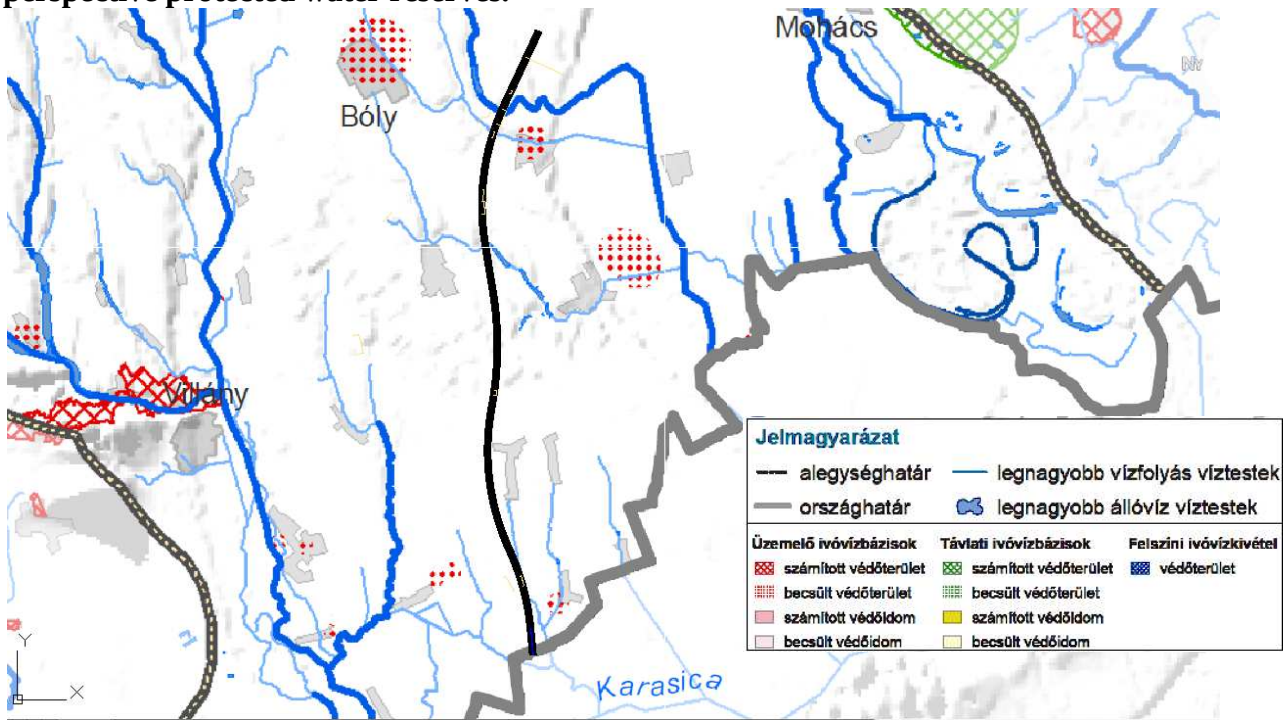


Figure 12 cut of the map titled National Water Management Plan (OVGT), drinking water abstractions in Hungary (map No. 3.1) with the planned M6 route

Jelmagyarázat = Legend,
Alegység határ = Sub-unit border,
Országhatár = National border,
Legnagyobb vízfolyás, víztestek = Largest watercourse water bodies,
Legnagyobb Állóvíz víztestek = Largest lake waterbodies,
Üzemelő ivóvízbázisok = Operating drinking water reserves,

Számított védőterület = Calculated protective area,
Becsült védőterület = Estimated protective area,
Számított védőidom = Calculated protective structure,
Becsült védőidom = Estimated protective structure,
Távlati ivóvíz bázisok = Perspective drinking water reserves,
Felszín ivóvíz kivétel = Surface drinking water abstractoin,
Védőterület = Protective area

4.2.3. Changes in status on construction of the motorway

4.2.3.1. Impact of the infrastructure

Investigation of areas sensitive for pollution

Pursuant to Ministry of Environment and Water Decree No. 27/2004 (XII.25.) KvVM as amended by Ministry of Environment and Water Decree No. 7/2005 (III.1.) KvVM on the classification of settlements located on areas sensitive from the aspect of underground water conditions, the settlements affected can be classified into the following categories.

Settlement	Very sensitive	Sensitive	Less sensitive	Highly sensitive ... area
Babarc		X		
Szajk		X		
Bóly		X		
Nagynyárád		X		
Töttös		X		
Lippó		X		
Ivándárda		X		

Based on Annex No. 2 of Government Decree No. 219/2004 (VII.21.) on the classification of area sensitive from the aspect of underground water conditions, the area affected by the planned route can be classified into the ***sensitive area*** (2.a) category.

The basis of that is determined by the referenced legislative provision as follows:

2. From the aspect of underground water condition, sensitive areas
a) are those areas where the multi-year average value of replenishment originating from precipitation exceeds 20 mm/year.

Disposal of risky materials (which may cause contamination in deeper layers by the intermediation of infiltrating precipitation water, groundwater) furthermore, their direct introduction into underground water is prohibited irrespective of the sensitivity of the area for the sake of protection of underground waters quality. On a sensitive area, indirect entry is not prohibited, but it is subject to permission.

During the implementation and operation of expressways, the following risky substances causing contamination may occur:

-Volatile and non-volatile aliphatic and aromatic hydro-carbons: in case of transport infrastructure, these area petrol, diesel and machine oils. Most of the hydro-carbons are biologically easily degradable and less toxic.
- Metals: Cd, Cr, Cu, Zn, contamination by them is not significant during transport operation.

<u>Impacts on water reserves:</u>
With respect to motorways, highways, Government Decree No. 123/1997 provides for the protection of water reserves, perspective water reserves and water facilities providing drinking water supply. In the interest of protection of underground water reserves, the decree prescribes the division and appointment of the protective structure and protective area into internal, external and hydrogeological protective zone and its arrangement and maintenance.
Annex No. 5 of the Decree contains the limitations applicable to the protective zones and protective structures zones.

On activities to be pursued on the protective zone of designated drinking water reserves, Government Decree No. 123/1997. (VII. 18.) lays down provisions on ‘The protection of water facilities serving water reserves, perspective water reserves and water facilities providing drinking water supply’. The Government Decree prescribes limitations and opportunities.

No impact exercised on water reserves by the current investment should be considered with attention to the fact that the planned route and its correction affects neither

designated water reserve nor water reserve not yet having vulnerable operation designation.

Impacts on groundwater balance:
Decisive factors of groundwater balance of natural status: actual infiltration *Btv* (reaching groundwater), evaporation from groundwater *Etv*, flow in from the sides *Rh*, flow off on the sides *Re*, vertical flow up *F*, vertical flow down *L* and ΔVnegative or positive storage. The groundwater balance formula which can be described as such for the defined area, more precisely, for aquifer volume and determined time:

$$Btv + Rh = Etv + Re + L \pm \Delta V$$

This formula can create connection between members that are generated not at the same time or in the same period, as actually filtration takes place with a weight during winter, while the same is true for evaporation during summer.
Establishment of the carriageway only seemingly decreases the infiltration value, as when summer precipitation collected and infiltrated, a part of it can increase groundwater quantity (as it is publicly known that the precipitation infiltrated during summer usually does not reach groundwater except in case of large quantity or concentrated infiltration, therefore, its replenishment is provided only from the proportion infiltrating from the winter precipitation). Summer time evaporation however terminates on paved areas, therefore, in our opinion, the summer time additional infiltration can only resulted of a smaller degree increase, in the magnitude of a cm under the motorway and in its narrower environment. Development of larger differences is prevented by the balance of the groundwater in distant areas and areas under the motorway. **In other words, the carriageway cannot give rise to changes that could be perceived in groundwater levels.**

4.2.3.2. Impact of the construction phase

The impact of the construction on the soil and ground water is, first of all, connected with the movement of construction machines and vehicles, with fuel filling-up, with haulage, and with the storage of dangerous substances, and placing of debris.

Related to this, the direct impact area is identical with the area to be mandatory purchased where the direct construction activity is pursued. The area used for machine storage disposal of hazardous substances and waste is also a direct impact area, which, in the given case, may also be placed outside the construction site.
The indirect impact area includes the environment of the transportation routes, where the soil and groundwater may get contaminated, as well as the environment of the construction area.
Containers are to be installed on the work area for each section for the storage of the tools/devices and for the performance of smaller administrative works. Water supply will be provided in accordance with the local conditions from a drilled well or in a water tanks transported on-site. Toilette is provided by installed mobile toilette.
In every case, employees live at rented accommodations where they have an opportunity for taking shower and getting a wash. Meals are individually arranged. On the work area, they can only eat non-cooked food.
Machines are stored on the sites along the line but repair is done at the central repair shops and in special repair facilities. Exchange of oil in heavy machines and earth machines is done in specialised workshops.

Fuel is supplied from fuel tankers owned or leased.
Tankers are equipped with a nozzle regular at patrol stations therefore the hazard of oil contamination during fuelling is at a minimum.

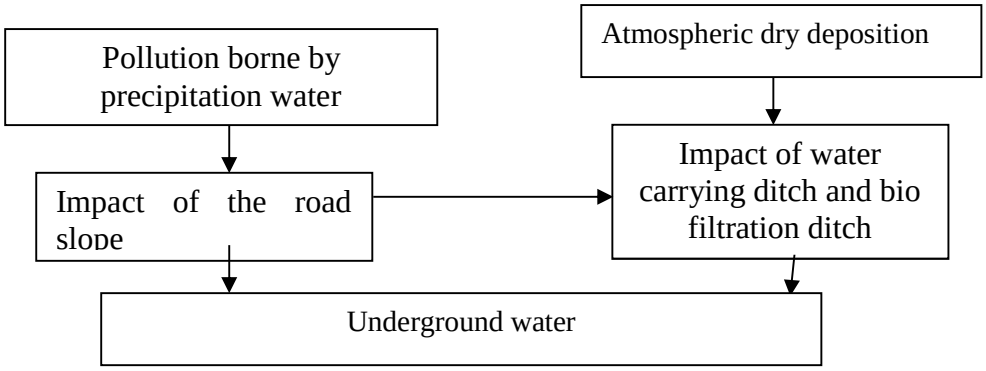
The following ill occur as environmental impact:
- disposal of municipal waste water and precipitation water on the construction sites during construction
- disposal, storage of hazardous substances, municipal waste
- arrangement of construction roads, culverts at watercourse intersections
- erosion protection during construction
- protection against emergencies

Under proper work discipline, contamination of underground water can be avoided on the areas affected by intervention (worksite, construction site, transportation routes).
If solid and liquid municipal waste and hazardous waste contaminated by hydrocarbons and generated in smaller quantities are treated with proper care, underground water contamination can be safely avoided.
Underground water contamination during works is not probable, the exception is emergency events. It is considered an emergency contamination when machines are overturned or lubricants, fuels get into the environment. Probability of occurrence of such contamination can be decreased to a minimum by the proper employment of machines and their regular maintenance. Preparation for emergency events (oil or fuel leakage, turnover of machine, etc.) can be solved by keeping the general set of tools of damage elimination at hand (leakage free container, shovel, absorbent materials in case of paved surfaces). In the case of the occurrence of contamination, the danger of groundwater contamination can be safely averted by the rapid delineation of contaminated area and excoriation of the contaminated soil.

4.2.3.3. Impact of infrastructure use

Direct entry of polluting substance into underground waters

The impact of motorway use is illustrated by the schematic block below. As it can be seen, in addition to the precipitation water running off from the road, polluting substances in the air above the road can also directly get to the areas along the road and into the underground waters by direct atmospheric leaching by precipitation and also by dry deposition.



Impact of motorway use

Rainwater has access into underground water by way of infiltration. But by the time contaminated rainwater gets into underground waters, the slope of the road will have a significant impact on the reduction of its quantity. In the interest of avoiding contamination, watertight (e.g., covered ditch, or ditch with earth bed with foil cover) water drain ditches can be built on highly sensitive areas.

The fundamental objective of legislation is (in compliance with the EU Water Framework Directive) that the good status of underground water bodies must be achieved, that is, they must comply with the requirements of good status in terms of quantity and quality.

According to Government Decree No. 219/2004. (VII. 21.) (which provides for the protection of underground water), the Chapter on quality protection states in respect of prevention and limitation of entry of polluting substances into underground waters that in the interest of securing the good quality of underground waters it cannot result in a less favourable condition than the limit value for underground water, geological media (B). Az annál magasabb (Ab) bizonyított háttér-koncentráció, továbbá az (E) egyedi szennyezettségi határérték, illetve kármentesítés esetében a (D) kármentesítési célállapot határérték jellemez.???
Entry into underground water cannot result in the degradation of the good chemical status of the water body, and the significant and permanent increase of polluting substance concentration.

The following substances are prohibited from direct entry into underground water (nominating but not limited to substances contained in rainwater running off from the carriageway):

6. Cadmium and its compounds
7. Mineral oils and other hydrocarbons, persistent hydrocarbons in particular

The following semi-metals and metals, and their compounds:

11. Zinc
12. Copper
14. Chromium

35. Ammonia *and nitrites*
36. *Substances promoting eutrophication (nitrates and phospates in particular)*
38. *Substances unfavourably influencing oxygen balance (which can be measured by parameters such as BOD and COD).*

This requirement should be applied to entries into temporary watercourses on areas or flowing across areas, where underground water level is permanently lower than the bottom level of the watercourse.

An exception is that the entry into water, geological media of the absolutely necessary smallest quantity polluting substance - notwithstanding any other tougher requirements laid down in other rules of law - can be permitted on areas sensitive or less sensitive from the aspect of underground water status. It can be permitted in such a low concentration or small quantity that the quality degradation of the underground water occurs neither in the close nor in the distant future, or it is the consequence of an accident or extraordinary natural circumstance which rationally is not foreseeable, not avoidable and cannot be mitigated, or technical cannot be prevented, and cannot be limited without measures highly threatening human health or quality of the environment as a whole.

When hazardous substances are disposed, environment protection preventive measures (technical protection in particular) should be applied that prevents the entry of these polluting substances into underground water.

Analysis of runoff rainwater contamination and determination of measures necessary are contained in Chapter 4.3.2.4

Impact of water reserves in the environment of the routes studied
With respect to motorways, highways, Government Decree No. 123/1997 provides for the protection of water reserves, perspective water reserves and water facilities providing drinking water supply. In the interest of protection of underground water reserves, the decree prescribes the division and appointment of the protective structure and protective area into internal, external and hydrogeological protective zone and its arrangement and maintenance.
Annex No. 5 of the Government Decree contains the limitations applicable to the protective zones and protective structures zones.

With attention to the fact that the planned expressway section does not cross, what is more, does not even come close to neither designated water reserve nor water reserve of vulnerable operation, we may declare that the planned expressway has no impact on water reserves.

4.2.3.4. The impact of motorway use

As the impact of motorway use, we must examine the impact of salt solutions on the carriageway and in its environment and washed in during de-icing, which is discussed in Chapter 4.1.2.5

4.2.4. Evaluation of route options, proposed protective measures

Investigation of areas sensitive for pollution

Pursuant to Ministry of Environment and Water Decree No. 27/2004 (XII.25.) KvVM as amended by Ministry of Environment and Water Decree No. 7/2005 (III.1.) KvVM on the classification of settlements located on areas sensitive from the aspect of underground water conditions, the settlements affected can be classified into the sensitive category.

Based on Annex No. 2 of Government Decree No. 219/2004 (VII.21.) on the classification of area sensitive from the aspect of underground water conditions, the area affected by the planned route can be classified into the ***sensitive area*** (2.a) category.

Disposal of risky materials, furthermore, their direct introduction into underground water is prohibited irrespective of the sensitivity of the area for the sake of protection of underground waters quality. On a sensitive area, indirect entry is not prohibited, but it is subject to permission.

The route and its correction does not affect, does not cross and does not come close to a water reserve.

No protective measure is proposed in relation with the infrastructure.

4.2.5. Impacts expected in case of the construction of the related facilities

Replacement of public utilities concerned (known in the current planning phase) along the subject section of M6 and the construction of the related new facilities do not have a detectable impact on the underground waters. Impacts of related facilities on underground waters are identical with the impacts described in Chapter 4.2.3. Their construction does not result in significant additional detrimental impact.

4.2.6. Requirements applicable to the term of construction

Facilities intended for the storage and treatment of hazardous and polluting substances used or generated in the course of road construction and construction of related facilities should be established in a manner that excludes the contamination of underground water and geological media (maintenance conditions of fuel storage facilities, machine maintenance, tools of protection, storage and transportation of waste and hazardous waste).

4.2.7. Requirements applicable to putting in service, operation

For the sake of the protection of the soil and underground water resources, the operator, in the present case, the Magyar Közút Nzrt., has elaborated instructions on emergency events. The applicable instruction, requirement identifies the authorities to be notified in case of an accident, their contact and also who is responsible for taking measures. Continuous, temporary maintenance of water construction facilities planned must be taken care of.

4.2.8. Proposals for monitoring

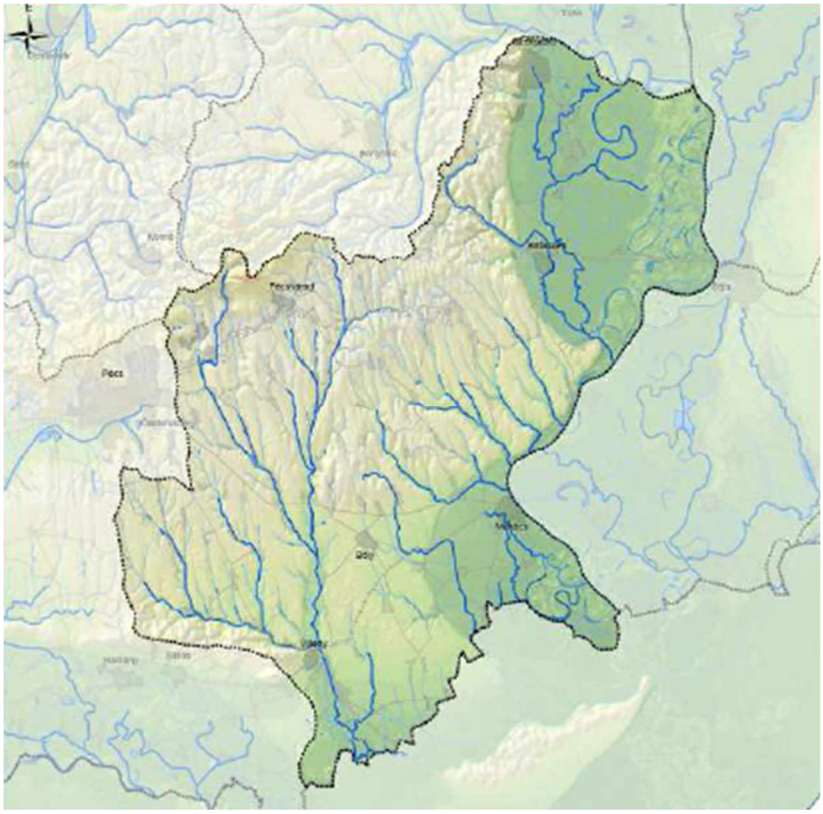
On completion of the construction of the motorway, the legislative provisions and authority requirements on rainwater drainage and water quality protection are considered relevant, our position is that for the protection of underground waters, there will be no need for monitoring activity.

4.3. SURFACE WATERS

4.3.1. Examination of current status

4.3.1.1. Characteristics of the water system

According to the national water management plan, the planning area is on the planning sub-unit of the right-hand side bank of the Lower Danube River.



The largest river basin of the sub-unit is the Karasica water system, which has its spring in the east side of the Mecsek Mountains and then collecting the waters of a number of branches it conducts water through Croatia into the Danube. Its river basin above the border section is 812 km^2. Most of the river basin is mountiness, only the vicinity of the Dráva River can be considered a plain. Sometimes in summer, the watercourse becomes dry because of leakage (Szederkény, neighbourhood of Villány). Its multi-annual medium water flow at Villány is 1,345 m^3/s. A number of ponds for fishing and angling were established on the mountiness areas. A number of significantly smaller sub-basins belong to the water body (below 100 km^2) which flow directly into the Danube. The multi-annual medium water flow of these is around 100 l/s. The Lánycsók-marázai water and Csele stream has also become temporary due to the excessive surface water use, namely fishponds.
Downstream of the Danube band at Mohács, on the right-bank down to the country border, and up to the Mohács-Udvar connecting road, the deep lying area of the Mohács-béda excess water polder can be found, which is protected against the Danube floods by a flood protection dike and safety barricades. Outside the primary protective line, in the polder and along the country border, localisation dikes can also be found. Through the flood protection dikes, surface waters can only be conducted into the recipient through the built-up locks or by lifting over via the pumping stations.

North of Mohács, small watercourses collecting the surface waters of the mountains along the Danube flow directly into the Danube River.
The Szekszárd-Bátai-main channel which was established by using the old bad watercourse beds is running along the slope direction of the area. The Little Danube channel at Lankóc is carrying out the transportation of water from the other half of the polder and transport water to the pumping station at Lankóc. The two main channels were connected by the Dárfok channel. The pumping stations are operated by the Central Transdanubian KÖVIZIG.
Two significant mountiness watercourses are the Szekszárdi-Séd and the Lajvér streams.
On the planning sub-unit and number of irrigation water reservoirs and rain reservoirs can be found of which the most significant is the Szálkai reservoir. The Szálkai rain reservoir is to be found on the Lajvér- Stream, which is managed by the Szekszárd-Paks Water Company. The purpose of the reservoir is to decrease flood water flow on the lower section of the Lajvér Stream, to partially release the load on the pumping station at Báta, to decrease sediment and to facilitate recreation rest ad sporting activities.

4.3.1.2. Water courses crossed

The following is a list of the major water courses crossed, together with a description according to the catchment management sub-unit plan.

Water courses crossed by M6 track:

The planned tracks cross the following water courses:
- Borza Creek: length: 24 km, catchment area: 247 km2
- Versendi Creek:
- Majsi Creek: length: 11 km
- Szilvás Creek

km section 'A'	km section 'Am'	object
195+972.5	195+946	Overpass over the correction for Borza Creek
196+520	196+531	Overpass over the correction of the Versendi water course
200+182.6	200+250	Viaduct over the Majsi water course (water course at Falu-dűlő) and wildlife crossing
202+430	202+505	Viaduct over Szilvás Creek and wildlife crossing

4.3.1.3. Inland water systems

Inland water protection section no. 05.02 named Kölked-bédai, divided into two low inland water bays protected from floods on the Danube by a dam, is located downstream from the Danube bend at Mohács to the country border on the right bank and to the road connecting Mohács and Udvar in the area of the catchment sub-unit. Surface waters may be channelled into the reservoir through the dam only through the sluices installed or by lifting them by pumping stations. There are several pumping stations to increase gradient in the area.

4.3.1.4. Significant water uses in the area

For the purposes of utilisation of surface waters, the area is dominated by pond farming, in the form of ponds or pond systems with dams or longitudinal levees, and often take the shape of a 'chain' of ponds along the given water courses. Most of the ponds are venues for intensive fishery, the operation of which entails continuous water replacement and bilge draining from time to time. The total area of the fish ponds is 949 hectares.

4.3.1.5. Ponds and reservoirs

The following artificial ponds and reservoirs can be found in the region of the planning area:
Borza Pond: An artificially impounded stillwater barely 300 metres to the west of the planned track

Töttösi Ponds: artificially created on the Majsi water course (Falu-dűlői water course) by filling over (with dam or cross-levee)

4.3.2. Changes in condition if the road is built

4.3.2.1. Investigation method, legislation cited

The requirements and restrictions of the National Catchment Management Plan for the sub-unit, investigations of earlier plans following a review of their outcome, and the technical case study prepared for the Feasibility Study were used for this investigation

Legislation
- Act LVII of 1995 on water management
- Decree of the Ministry of Environmental Protection and Water no. 28/2004. (XII. 25.) KvVM on the limits applicable to water pollutants and certain rules of their application
- Government Decree no. 220/2004. (X. 26.) on the "rules for protecting the quality of surface waters" amended by Government Decree no. 312/2005. (XII. 25.)

The purpose of the decree is to conserve, maintain and improve the quality of surface waters, to ensure the conditions required for sustaining land habitats and living organisms directly dependent on surface waters, and to prevent and ***reduce*** pollution in order to ensure the safety of water uses and to conserve human health and the natural condition.

4.3.2.2. Impact of the facility

The planned facility crosses the water courses listed in chapter 4.3.1.2, which are mostly constant water courses. These water courses also receive a large portion of rainwater. The quantity of water, arriving from the paved surfaces in concentration, in the absence of leaking away in the soil, will cause a slight surplus load on water courses along the sections after introduction.

Changes in the condition of beds

Changes in the condition of water course beds are related primarily to corrections, the installation of culverts and the channelling in of rainwater. Changes in the condition of water course beds are related primarily to corrections. Bed corrections will be needed for crossing larger water courses and smaller creeks. The length of these corrections should be reduced to the necessary minimum in order to have the shortest section possible where the bed's natural condition is damaged, otherwise there may be washouts and sludge build-ups pursuant to the

change in gradient conditions. The cross-section of the new section should preferably be aligned to the existing one to keep unfavourable impacts to the minimum.

Bed corrections
Versendi water course: according to the study plan's concept, the planned length of the correction is 185 m.
Side branch of Versendi water course: according to the study plan's concept, the planned length of the correction is 497 m.
Szilvás Creek: according to the study plan's concept, the planned length of the correction is 357 m.

Planned solutions for channelling water
The covering to be installed for crossing water courses should preferably be provided using natural materials. The openings of objects to be installed for each water course crossed by the track variations were specified based on the data of site layout drawings and longitudinal sections as well as the inspection of the site.
The section dimensions usually contain the minimum necessary dimensions, to be defined more accurately in the course of preparing the plans in further phases

The planned motorway section may be divided into the following five dehydration sections:

km section of road section	Name of recipient water course	Connections	Bridging object
193+820 - 196+060	Borza Creek	4 connections	ø 5.00 m Bridge
196+060 (070) - 198+117	Versendi water course	4 connections	ø 5.00 m Bridge
198+117 – 202+130	Majsi water course	4 connections	120 m viaduct
202+130 – 203+800	Szilvás Creek	4 connections	200 m viaduct
203+800 – 212+065	Topolyás Dyke	2 connections	ø2000 m across

Table 15 Water channelling sections

Expected impacts of the height of the track
We need to address the expected changes that come out of conducting the motorway in road cuttings or on embankments. Due to the intensive variation in terrain, the track will consist of alternating typically short road cuttings and embankments primarily between Majs and Töttös.

Water channelling solutions arising out of track height:
Dehydration of embankment sections: waters flowing off the road paving in blankets gravitate towards the road shoulder, and the rainwater courseing off the shoulder and the escarp will be caught by the floor ditch. In case of embankments, a water channelling curg needs to be built along the edge of the paving, interspersed by openings. The water running down along the curb will be conducted into the floor ditch through the hoppers, and the water collected will be channelled into the receptacle.
Dehydration of low-cut sections: the water courseing off the paving will be channelled from the cutting through trenches to be put in after short - 300 m - sections. The underdrain below the trench will channel the structural waters from the road. Covered floor ditches should be installed in longer sections in cuttings, taking into account traffic safety considerations.

In *deep cuttings*, the road section should be canalised. Stability of the slopes of the cutting should be ensured. In order to channel groundwaters and springing waters, draining ribs should be carved into the slope along such sections, and the water should be channelled into the canal. Intercepting drips should be added beyond the cut made in the terrain at the top of the slope.

Floor ditches to be built in *areas with groundwater* should be paved.

No areas without draining may be created by routing the road. *In order to ensure free flow, canalisation of the low points crossed should be ensured, possibly by building intercepting drips so that no harmful erosion takes place on the side of the road towards the valley.*

We think it is reasonable to *design sediment catching and cleaning objects* for connecting water courses to the intercepting drips where the planned track crosses the water course over a fish pond or a pond for water utilisation.
These are as follows:

- **Connection leading to Borza Creek 4 sediment catching objects**
- **Connection leading to Majsi water course 4 sediment catching objects**

Flood protection
The planned motorway involves no flood protection facilities or areas threatened by flood. Therefore, no flood protection intervention is needed in connection with the facility.

4.3.2.3. The impact of the construction stage

Construction may affect primarily the water quality of water courses. When building bridges, trenches and the road structure, it should be ensured that no pollution reaches water courses.

Construction may entail a slight change in the rainwater drainage system and flow conditions, but this will have a temporary and insignificant effect. No technological wastewater will be generated in the course of construction, and communal wastewater may be collected at the construction site, which will be removed by the contractor, so that surface waters will not be polluted. Surface waters may be polluted in other ways only accidentally (e.g. droplets of fuel, hydraulic oil, etc.), but this may be avoided and localised with proper discipline and attention by the contractor.
No water course beds may be washed out pursuant to construction in, over and under the sections where water courses through, and connections to the existing beds should be made at the planned level of the bed, without any breaks.
In the course of construction, it should be ensured that water movement is not restricted and flow-through is ensured in water courses and canals. If work is to be done in the bed during construction, the bed should be reconstructed once construction is completed.
Special attention should be paid to this in a distance of 20 metres to each side of the water courses affected by the correction, both in the existing and the planned bed:

- Versendi water course
- Side branch of Versendi water course
- Szilvás Creek

As regards surface waters running off into the soil, water quality may change only in rainy periods when unpaved and uncovered soil surfaces are likely to be eroded by surface erosion. As a result of the soil washing off, the floating particles load will increase on receptacles, which may cause a slight increase in mud. Once construction is completed, any alluvion must be eliminated and the original runoff conditions shall be restored.
The sites to be used to store construction equipment shall be designated further away from water course.
Therefore, no storage sites may be established in the following locations:

- Within a distance of 20 m on each side of Borza Creek
- Within a distance of 20 m on each side of Versendi water course
- Within a distance of 20 m on each side of Majsi water course
- Within a distance of 20 m on each side of Szilvás Creek
- Within a distance of 20 m on each side of Topolyás árok

Work equipment will be stored at line sites, but repairs will take place in the central repair shop or specialist repair shop. Oil in the heavy equipment and earthwork equipment will be replaced in specialist repair shops.

4.3.2.4. Impact of the facility's operation

The motorway's operation will affect primarily the water quality in water courses.

Rainwater quality

The following is a presentation of the composition of rainwater running off the road based on measurements in Hungary and published in trade literature.

Description of pollutants mg/l	Quality of water running off the road with a likelihood of 90% (figures from trade literature)	Pollutant concentrations measured beside road no. 2/A (average values)
Chemical oxygen consumption (KOId)	85 - 227	222
Total nitrogen (ÖN)	2.19 - 3.17	4
Total phosphorus (ÖP)	0.48 - 1.06	1.71
Total floating particles	135 - 295	229
TPH	0.100-0.800*	0.293
Total zinc	0.185 - 0.564	0.458
Total cadmium	0,002 - 0,400*	0.002
Total chromium	0,018 - 0,270*	0.020
Total copper	0.050 - 0.119	0.077

Table 16 Composition of rainwater running off the road based on measurements beside road no. 2/A and published in trade literature:

The above figures show that there is no substantial and essential difference between figures published in trade literature and those measured in Hungary.
The slightly high phosphorus and nitrogen concentrations and the proximity of floating particle and organic substance concentrations to international figures are justified by the high traffic rate of 28,000 vehicles/day along motorway no. 2/A. The values are likely to be lower along motorways currently in operation and those planned.

Limits for inlets into surface waters are regulated by *Annex no. 2* to Decree of the Ministry for Environmental Protection and Water no. 28/2004. (XII. 25.) KvVM, based on which the surface water courses that are possible receptacles in the area in question belong to category 3,

periodical water course, and category 4, general, according to the territorial categories applied by the decree.

Accordingly, they are as follows:

Description	3. periodical water course receptacles	4. Receptacles in general protection category
Pollutants	Limit mg/l	Limit mg/l
Dicromate oxygen consumption (KOIk)	75	150
Total inorganic nitrogen, ÖNásv	20(3)	50
Total nitrogen, ÖN	25(3)	55
Total floating particles	50	200
Total phosphorus, ÖP	5(4)	10
Organic solvent extract (oils, greases)(2)	5	10
Total zinc	*	5
Total cadmium	*	0.05
Total chromium	*	1
Total lead	*	0.2
Total tin	*	0.5
Total copper	*	2
Total aliphatic hydrocarbons - TPH	-	-

Table 17 Major water quality limits based on Decree no. 28/2004. (XII. 25.) KvVM

Annex no. 5 to Decree no. 28/2004. (XII. 25.) KvVM contains the lowest and highest individual limits by pollutants that may be determined by the authority for direct inlet into the receptacle. The annex specifies 3 mg/l as the low and 20 mg/l as the high limit for total aliphatic hydrocarbon TPH C_5-C_{40}, The latter is a value that may be specified for inlets into public sewers and may not be specified for natural receptacles. From this point on, we considered a concentration of 10 mg/l as the maximum for natural receptacles.

Article 1, addressing the scope of the decree, specifies rainwater drainage utilities and factory canals as well. Pollutant emissions by motorways are not included among technological limits. TPH is not included as an emission limit specified by territorial category for water quality protection. This way, the only annex that is applicable is the above annex, but it does not fix the method of determining the significant concentration of non-permanent emissions.

Estimate of expected TPH pollution based on traffic data

Tests for the pollution in rainwater running off the road, commissioned by NIF (formerly Nemzeti Autópálya Zrt. - National Motorway Plc) were concluded in 2007; testing measurements were aimed primarily at TPH (hydrocarbon) pollution as the most critical pollution. Measurements were taken between km sections 33+201 and 33+500 of road no. 2/A, along motorways M0 and M7. The testing indicated that the values remained below the TPH limits for inlets into live waters. Other pollutions tested were also below the limit. According to the outcomes of the experiments, runoff from slopes also represents considerable cleaning. The pollutant contents of runoff water are influenced by the material of the ditch, as biological degradation and absorption processes that would result in significant cleaning do not occur in paved ditches. Based on the measurements, BME (Budapest University of Technology) prepared a study entitled “Determination of the volume of reservoirs for water quality protection purposes in rainwater draining systems for motorways”. In addition to studying the

test results, the paper elaborated a calculation method for the extent of expected oil contamination subject to traffic on the public road.

Based on the study, the correlation applied to average concentration for paved ditches:
CE =(4.33 * J – 0.0507 * H), (mgTPH/l),
where

J - the number of vehicle units moving along half the motorway during rain expressed in a thousand vehicle units (1,000 vehicle units/hour), and

H – height of the rainwater fallen, (mm).

According to the study, the value received should be reduced by 60% in case of grassy ditches. The significant rainwater height was taken as 10 mm based on the study's recommendation. The concentration value produced as the result had to be compared against the permitted limit and the intervention method had to be identified.

Traffic on motorway M6 and the average concentration of the oil contamination expected as calculated on the basis of traffic figures are set out in the following tables:

Motorway section	Two-way traffic Unit vehicle/hour	Average concentration for over-elevated road on an arc (mg/l TPH)	One-way traffic Unit vehicle/hour
Separation interchange - Bóly east int.	338	0.956	169
Bóly east int. - Lippó int.	352	1.017	176
Lippó int. - border	320	0.8786	160

Table 18 TPH contamination concentration running off with rainwater estimated based on long-term traffic forecast for 2x1 lane structure

Motorway section	Two-way traffic Unit vehicle/hour	Average concentration for over-elevated road on an arc (mg/l TPH)	One-way traffic Unit vehicle/hour	Average concentration for horizontal top road section (mg/l TPH)
Separation interchange - Bóly east int.	354	1.03	177	0.26
Bóly east int. - Lippó int.	354	1.03	177	0.26
Lippó int. - border	315	0.86	158	0.18

Table 19 TPH contamination concentration running off with rainwater estimated based on long-term traffic forecast for 2x2 lane structure

The above figures apply to paved ditches, and the value should be reduced by 60% in case of earth ditches according to the study. Based on this, the concentration figures will be even lower.

According to the calculated values, the estimated oil contamination will not exceed the limit, and will remain considerably below it even if rainwater is collected in paved ditches for over-elevations. **Therefore, it may be stated that as the estimates indicate, the oil contamination that will reach receptacles is highly likely to remain below the limit, so no treatment object is necessary.**

Investigation of cases of accidents

In case of industrial accidents, water courses may be polluted directly, which can be localised and eliminated primarily by damage control. However, the likelihood of industrial accidents to occur and of their occurrence right in the vicinity of water courses is very low. Furthermore, the structural design of bridges crossing water courses will not allow vehicles to fall in the water courses in industrial accidents.

Objects to be installed before rainwater inlets to water courses have to be designed in a way so that they can be closed off in the course of an accident, thereby avoiding the entry of pollutants into the water course. A damage control plan must be prepared prior to putting the road into operation, which shall contain the procedure for handling accidents. Contaminated areas and objects need to be cleaned in all cases in the course of damage control.

4.3.2.5. Impact of the facility's operation

The impact of the facility's operation may be investigated in conjunction with de-icing, and the applicable findings are detailed in chapter 4.1.2.5.

When an accident occurs, the operator's instructions shall be followed in respect of the authorities and supervisory agencies to be notified. Contaminated areas and objects need to be cleaned in all cases in the course of damage control.

Maintenance of water construction objects must be ensured in the course of operation. The sludge to be removed from objects shall be classified based on testing. If it qualifies as hazardous waste, its removal and disposal shall be arranged for in accordance with Government Decree no. 225/2015. (VIII. 7.).

In the course of weed control, the quantity of chemicals should be reduced to the minimum required.

4.3.3. Impacts of phased construction

As regards single-direction water drainage, when preparing the detailed water construction plans, it should be investigated how the water drainage systems along the 2x1 and 2x2 lane half-roads may be resolved in a way so that the drainage system may be used with the least degree of alteration in the course of building phase 2.

The differences between the two phases of construction are extremely small, nearly within the error tolerance of the forecast, nevertheless we provide the calculations based on the data of both traffic scenarios. We note that in the course of constructing the first phase of 2x1 lanes, as indicated in 0, the half-road will be built with a single-side tilt, so it will not have a horizontal top-level in phase 1 construction.

The expected values are significantly below the limits in the case of both designs.

4.3.4. Compliance with VKI objectives:

design principles	**investigation and outcome**	**proposed solutions**
Placement and design of facilities and objects for treating rainwater will be done by taking into account the strictest limits	Estimation of expected TPH concentration based on traffic rates (0) Outcome: considerably below limit	no reason to design treatment object

design principles	investigation and outcome	proposed solutions
investigation of vulnerable areas, areas with high groundwater and internal water	investigation of the underground depth of groundwater by presenting study plan figures and groundwater map (0) between 2 and 5 m below terrain at highest points	no area with high groundwater, review based on geotechnical drilling and laboratory tests at the time of drafting designs for licensing purposes
Investigation of the involvement of water bases	track involves no hydrogeological protective zone 'A' or 'B' or internal and external protective zones of water bases	paving of ditches, which is not necessary in the absence of involvement

4.3.5. Summary

Bed corrections will be made at the following locations:

- Versendi water course: according to the study plan's concept, the planned length of the correction is 185 m.
- Side branch of Versendi water course: according to the study plan's concept, the planned length of the correction is 497 m.
- Szilvás Creek: according to the study plan's concept, the planned length of the correction is 357 m.

Along these water courses, a free flow of water shall be ensured during construction.

No construction and storage locations may be designated in the zones along the water courses concerned:

- Within a distance of 20 m on each side of Borza Creek
- Within a distance of 20 m on each side of Versendi water course
- Within a distance of 20 m on each side of Majsi water course
- Within a distance of 20 m on each side of Szilvás Creek
- Within a distance of 20 m on each side of Topolyás árok

We see reason to *design sediment catching and treatment objects* for the connections of floor ditches into water courses where the planned track crosses the water course over a fish pond or pond for water utilisation.
These are as follows:

- **Connection leading to Borza Creek 4 sediment catching objects**
- **Connection leading to Majsi water course 4 sediment catching objects**

The expected average concentration of TPH pollution from runoff water was estimated based on long-term traffic projections in order to investigate the impacts of operation. According to the calculated values, the estimated oil contamination will not exceed the limit, and will remain considerably below it even if rainwater is collected in paved ditches for over-elevations. **Therefore, it may be stated that as the estimates indicate, the oil contamination that will reach receptacles is highly likely to remain below the limit, so no treatment object is necessary.**

4.3.6. Tasks to be completed prior to construction

In drafting the design for licensing purposes, the detailed water drainage plan needs to be prepared. A water permit needs to be obtained for building the elements of the planned water drainage system and for completing other related water construction tasks, as well as in the case of letting in rainwater into water courses.

The detailed figures that will serve as the basis of planning the crossing for water courses in the future may come out of a geodesic survey, after which the managers of the water courses need to be consulted on the planned design.

The design for licensing purposes needs to investigate whether there are any sections where rainwater needs to be desiccated or stored - even though it is not necessary based on the current concept - and if yes, what possible technical solutions there might be.
The locations of bed corrections need to be defined more accurately, together with the consequences of these on the condition of the beds of water courses. The actual solution to be used for treating rainwater also needs to be elaborated in the design for licensing purposes.

4.3.7. Requirements for the construction period

In the course of working by the water courses crossed, it should be ensured that water movement is not or only slightly restricted and flow-through is ensured.
No equipment maintenance or oil replacement may take place in the vicinity of water courses and within a distance of 20 m on each of their banks. No sites for equipment storage and maintenance may be designated within a distance of 20 m on each side of water courses.
When building bridges, trenches and the road structure, it should be ensured that no pollution reaches water courses.

4.3.8. Requirements concerning commissioning and operation

In order to protect surface waters, the operator, in this case Magyar Közút Nzrt., has developed instructions for any industrial accidents. The applicable instruction or requirement includes the authorities to be notified in the case of accidents together with their contact details and the person responsible for taking action. Following damage control, objects need to be cleaned in all cases.
In the course of operation, maintenance of sediment catching and treatment objects must be ensured. The sludge to be removed from objects shall be classified based on testing. If it qualifies as hazardous waste, its removal and disposal shall be arranged for in accordance with Government Decree no. 225/2015. (VIII. 7.).
In the course of weed control, the quantity of chemicals should be reduced to the minimum required.

4.3.9. Monitoring proposals

Once the motorway is built, the contents of legislation and statutory requirements related to rainwater drainage and water quality protection may be deemed to govern, and in our opinion, there will be no need to monitor surface waters separately.

4.4. AIR

4.4.1. Legal requirements

In the course of elaborating this chapter, the following decrees and standards were taken into account:

Government Decree no. 306/2010. (XII. 23.) on the protection of air,

Decree of the Ministry for Rural Development no. 4/2011. (I. 14.) VM on the limits for air load levels and emission limits of fixed point sources of air pollution,

Decree of the Ministry for Rural Development no. 6/2011. (I. 14.) VM on the rules related to the investigation, control and evaluation of air load levels and the emission of fixed point sources of air pollution,

Decree of the Ministry for Environmental Protection and Water no. 4/2002. (X. 7.) KvVM on the designation of air pollution agglomerations and zones,

Joint Decree of the Ministry for Transport, Telecommunication and Energy, the Ministry of Justice and Enforcement and the Ministry for Environmental Protection and Water no. 77/2009. (XII. 15.) KHEM-IRM-KvVM on the rules for the environmental protection review of road vehicles,

Decree of the Ministry for Transport, Telecommunication and Building no. 6/1990. (IV. 12.) KöHÉM on the technical requirements for releasing road vehicles into traffic and their operation,

Decree of the Ministry for Transport, Telecommunication and Building no. 5/1990. (IV. 12.) KöHÉM on the technical inspection of road vehicles,

Joint Decree of the Ministry for Economy and Trade and the Ministry for Environmental Protection and Water no. 75/2005. (IX. 29.) GKM-KvVM on restricting the emission of gaseous and particle pollutants of internal combustion engines to be incorporated in mobile equipment not for road traffic use,

Hungarian Standard MSZ 21457 Meteorological characteristics of the dissemination of air pollutants,

Hungarian Standard MSZ 21459 Determining the transmission of air pollutants,

Hungarian Standard MSZ 21460 Definitions of terms for clean air protection,

Government Decree no. 306/2010. (XII. 23.) sets the following requirements for mobile air pollution sources and line sources:

"Article 28 (1) The commissioning and operation of mobile air pollution sources shall be governed by legislation on air, railway, water and road transport.

(2) In case of transport, the operator of a road vehicle or of rolling stock shall arrange for preventing an air load caused by the material transported."

"Article 29 (1) In the case of building a line source of motorway or highway, no residential buildings, resort buildings, buildings for training, education, health care, welfare and administration purposes may be and may be built within 50 metres from the axis of a transport facility, or within 25 metres from the axis of single-digit and two-digit national public roads and railroad line sources, save for structures associated with the operation of the motorway or highway.

(2) If proposed by the environmental protection authority, the transport authority may order measures to restrict traffic or other technical measures in order to prevent and reduce air load in case of air pollution regularly and permanently caused by that line source."

4.4.2. Design input data

This plan looks at the impacts stemming from road transport. In order to do so, the expected emissions and loads in the significant condition of individual sources need to be determined. In the design area, air pollution by transport is caused by road transport.

4.4.3. Requirements to protect clean air, investigation method

Government Decree no. 306/2010. (XII. 23.) sets out the general rules for protecting air quality, Decree no. 4/2011. (I. 14.) VM sets out the air quality requirements (0).

Pollutant	**Hazard grade**	**Limit [µg/m^3]**		
		Annual	24-hour	Hourly
Carbon monoxide	II.	3,000	5,000	10,000
Nitrogen oxides (in nitrogen dioxide)	II.	40	85	100
Sulphur dioxide	III.	50	125	250
PM_{10}	III.	40	50	-

Table 20 Air quality requirements

In the course of the investigation, we evaluated the area's condition based on air pollution concentration values, and carried out emission and immission calculations based on current and predicted traffic data. Traffic data for 2030 distinguish between two scenarios, the "Without" scenario, assuming that the planned project will not be built (reference status) and the "With" scenario.

Emissions of road transport were calculated using the data base produced by KTI in 2000, subject to the traffic and composition of the given road sections, the speeds that can be reached, and weather conditions. As the data base offers no breakdown for the lorry category, we also treated it as a single category. The data base contains no specific values for the years investigated, which is why the values expected for 2010 and 2020 were used for the calculations. As time goes on, specific emissions show a decreasing trend, so we deviated to be on the safe side for the years investigated, taking into account the data bases forecast for 2010 and 2020.

For calculation purposes, speeds of 90-90-70 km/h were taken into account for public roads and of 130-130-80 km/h for motorway M6.

Based on the above, we calculated with the specific emission factors set out in 0 and 0.

Specific emission factor (g/km/j)	2014 main roads, side roads in outskirts				2030 main roads, side roads in outskirts			
	CO	CH	NO_x	Dust	CO	CH	NO_x	Dust
MOF1	1.76	0.418	0.668	0.0286	1.584	0.3762	0.6012	0.02288
MOF2	16.1	1.15	0.32	-	12.88	0.92	0.32	-
MOF3	3.18	0.125	3.13	0.191	2.385	0.10625	1.57	0.0764

Table 21 Specific emission factors for main roads and side roads

Specific emission factor (g/km/j)	2030 motorway			
	CO	CH	NO_x	Dust
MOF1	3.618	0.414	0.8082	0.03224
MOF2	22.88	1.08	0.55	-
MOF3	2.085	0.1054	1.78	0.0804

Table 22 Specific emission factors for motorways

Transmission calculations were prepared based on the correlations described in Hungarian Standard series MSZ 21457 and MSZ 21460. Based on the traffic predictions, we defined each concentration value at 10 m from the road axis (reference distance).

According to item 17 Article 29 of Government Decree no. 306/2010. (XII. 23.) on air protection, no residential buildings, resort buildings, buildings for training, education, health care, welfare and administration purposes may be and may be built within 50 m from the axis.

The reviewed and calculated NO_x (nitrogen oxides) figures were compared to the NO_2 limit values stated in the law i.e., we made an approximation for safety. The air quality calculations were made for the most difficult components i.e., carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM_{10}) according to the indicative hourly traffic.

The transmission calculations took into account the following parameters:

- Emissions per road section calculated for MOF periods (g/h/m)
- Pasquill's stability indicator: 0.44
- Emission height: 0.3 m
- Surface covered by flat foliage (z_0=0,1)
- Average wind speed: 2.5 m/sec)
- Wind direction's angle with the road (α): 30°

We disregarded the impacts of existing forests and built-in areas, thereby remaining on the safe side again.

Based on traffic figures, we defined the public road network components involved for which the increase or decrease between the 'WITHOUT' and the 'WITH' scenario may be expected to be greater than 25% in the long run.

4.4.4. Description of the current situation

4.4.4.1. Area classification by zoning group

Based on Government Decree no. 306/2010. (XII. 23.) on air protection, the territory and settlements of Hungary should be classified into zones based on the degree of air pollution, taking into account the proposal of the environmental protection and public health authorities. The zones were specified in Decree of the Ministry for Environmental Protection and Water no. 4/2002. (X. 7.) KvVM on the designation of air pollution agglomerations and zones. The decree evaluates 11 pollutants in each zone, based on which zones are classified in groups A, B, C, D, E and F, and groups O-I and O-II for ozone near the ground.

According to Decree no. 4/2002. (X. 7.) KvVM, the design area belongs to the zone "Other areas in Hungary" (see 0).

Air pollutant	SO_2	NO_2	CO	PM_{10}	benzene	Ground-level O_3	Bound on PM_{10} surface				
							As	Cd	Ni	Pb	BaP
Air quality zone	F	F	F	E	F	O-I	F	F	F	F	D

Table 23 Pollutant evaluation by zone

According to the classification, looking at the five priority pollutant, the concentrations of sulphur dioxide, nitrogen dioxide, carbon monoxide and benzene are below the low test limit; the concentration of floating particles is between the top and bottom test limit. As regards floating dust particles, the concentration of all air pollutants is below the low test limit save for benzo(a)pyrene, the concentration of which is between the top test limit and the air pollution limit.

4.4.4.2. Based on data from the measurement network

The measurement station closest to the design area - within the National Measurement Network for Air Pollution (OLM) - is located in the residential area of the city of Pécs, which measures background pollution in suburbs. The station is some 30 km to the northwest of the planned track as the bird flies.

The data necessary for investigating the current status were obtained from the OLM's data bank, and were used after evaluation.

In the indirect impact area, air pollution stems primarily from transport and from the community, there is no industrial facility causing significant air pollution in the area, so the background pollution is minimum in the vicinity of the planned motorway.

The measurement data of the measurement station operating on a continuous basis in Pécs, at Boszorkány Street, taken from samples from between 1 January and 31 December 2014, were used to assess the current status of the area. The average concentration values over 24 hours were analysed for sulphur dioxide, nitrogen dioxide, nitrogen oxides and PM10 (floating dust particles).

The base data on air pollution for the measurement location can be found in 0.

Pécs, Boszorkány utca légszennyezettségi adatai az OLM adatbázisa alapján

2014. év	Kén-dioxid (ug/m^3)	Nitrogén-dioxid (ug/m^3)	Nitrogén-oxidok (ug/m^3)	Szálló por (ug/m^3)
24 órás átlag határértéke	**125**	**85**	**150**	**50**
Minimum	0,2	0,5	0,8	4
Maximum	37,4	167,4	188	81
Átlag	7	18	23	24
Gyakorlati db	300	330	330	344
Elméleti db	365	365	365	365
Adatrendelkezés %	82%	90%	90%	94%
Határérték átlépés	0	10	0	16
Határérték átlépés	0,0%	3,0%	0,0%	4,7%
Minősítés	kiváló	kiváló	kiváló	jó

Table 24 Air pollution figures for Pécs, Boszorkány Street based on OLM's data base

2014. év	2014
Kén-dioxid	Suplhur dioxide
Nitrogén-dioxid	Nitrogen dioxide
Nitrogén-oxidok	Nitrogen oxides
Szálló por	Flying dust
24 órás átag határérték	Average limit value for 24 hours
Minimum	Minimum
Maximum	Maximum
Gyakorlati db	Practical number
Elméleti db	Theoretical number
Adatrendelkezés %	Data instruction %
Határérték átlépés	Limit value excess
Minősítés	Rating
kiváló	excellent
jó	good

Assessment

Based on these values, the average concentrations of sulphur dioxide, nitrogen dioxide, nitrogen oxides and floating dust particles were below the limit, implying good and excellent air quality, during the period and in the area investigated. Limits were exceeded in the following instances:

- nitrogen dioxide (10 times),
- floating dust particles (16 times).

The current air condition is even more favourable in the design area, as it is not a city environment.

4.4.4.3. Based on current traffic

Out of the existing elements of the public road network, those where a considerable difference between the 'WITHOUT' and the 'WITH' scenario may be expected in the long run based on the forecast were included in the investigation.

The grouping of traffic figures used by category and the results of the calculations carried out are set out in 0.

2014	Szakasz	MOF_1	MOF_2	MOF_3	Sebesség	CO	NO_X	Por	Távolság
útszám		(j/h)			km/h	$\mu g/m^3$			(m)
56	57. sz. főút - 5121. j. út	43	1	16	90	3,3	1,9	0,1	10
56	5121. j. út - 5702/5117. j. utak	82	1	30	90	6,3	3,6	0,2	10
5702	56. sz. főút - 5703. j. út	133	3	18	90	8,2	3,5	0,2	10
5702	5703. j. út - 5704. j. út	56	1	8	90	3,4	1,5	0,1	10
5703	Bóly - M6 csp.	73	3	7	90	4,8	1,7	0,1	10
5703	M6 - 5702. j. út	73	3	7	90	4,8	1,7	0,1	10
5704	Töttös - 5714. j. út (Bóly)	101	2	22	90	6,8	3,3	0,2	10
5704	5714. j. út (Bóly) - 57. sz. főút	110	3	24	90	7,7	3,6	0,2	10
5714	Bóly	219	1	30	50	20,1	4,2	0,3	10

Table 25 Traffic figures for 2014, immissions of air pollutants and limits to compliance with limits on the road network concerned, in connection with the planned section of motorway M6

2014	Section	MOF_1	MOF_2	MOF_3	Speed	CO	NO_x	Particles	Distance
Road no.			(j/h)		(km/h)		$\mu g/m^3$		(m)
56	main road no. 57 – road no. 5121	43	1	16	90	3.3	1.9	0.1	10
56	road no. 5121 – roads 5702/5117	82	1	30	90	6.3	3.6	0.2	10
5702	main road no. 65 – road no. 5703	133	3	18	90	8.2	3.5	0.2	10
5702	road no. 5703 – road no. 5704	56	1	8	90	3.4	1.5	0.1	10
5703	Bóly – M6 interchange	73	3	7	90	4.8	1.7	0.1	10
5703	M6 – road no. 5702	73	3	7	90	4.8	1.7	0.1	10
5704	Töttös road no. 5714 (Bóly)	101	2	22	90	6.8	3.3	0.2	10
5704	road no. 5714 (Bóly) – main road no. 57	110	3	24	90	7.7	3.6	0.2	10
5714	Bóly	219	1	30	50	20.1	4.2	0.3	10

4.4.4.4. Assessment

According to calculations carried out on the basis of current traffic, the limits required for individual pollutants are comfortably complied with within 10 m from the axis of the public roads covered by the investigation. There are buildings to be protected within this distance, but individual immission values are well below the limit. Based on the above, it can be stated that the current traffic does not cause considerable loads for the people living in the vicinity of existing roads.

4.4.5. Projected condition

4.4.5.1. Direct impact of the planned motorway

The traffic figures and calculation results for motorway M6 are presented in 0.

2030	Szakasz	MOF_1	MOF_2	MOF_3	CO	NO_X	Por	Távolság
útszám		(j/h)			$\mu g/m^3$			(m)
M6	M60 - Bóly-Kelet	224	0	50	22	7	0	10
M6	Bóly-Kelet - Lippó	233	0	52	23	7	0	10
M6	Lippó - Ivándárda (Oh.)	212	0	47	21	6	0	10

Table 26 Traffic figures for M6, immissions of air pollutants and limits to compliance with limits

2030	Section	MOF_1	MOF_2	MOF_3	CO	NO_x	Particles	Distance
Road no.			(j/h)			$\mu g/m^3$		(m)
M6	M60 – Bóly east	224	0	50	22	7	0	10
M6	Bóly east - Lippó	233	0	52	23	7	0	10
M6	Lippó – Ivándárda (border)	212	0	47	21	6	0	10

The calculation results indicate that pollutant concentration will decrease to below the applicable limit already within 10 m from the axis, so the 50 m protective zone set out in legislation is appropriate.

According to item 17 Article 29 of Government Decree no. 306/2010. (XII. 23.) on air protection, no residential buildings, resort buildings, buildings for training, education, health care, welfare and administration purposes may be and may be built within 50 m from the axis (air protection zone). According to data from the land register, there are no buildings to be protected within this distance, and this is supported by the on-site inspection.

4.4.5.2. Indirect impact of the planned motorway on the road network

The planned motorway basically removes some of the traffic from the surrounding road network, so it will have a favourable effect on the population concerned. No increase in traffic equal to or exceeding 25% may be expected on the road network.

The grouping of traffic figures used by category and the results of the calculations carried out are set out in 0.

2030. évi forgalmi adatok, a légszennyező anyagok immissziói és határértékek teljesülésének határai az érintett úthálózaton az M6 gyorsforgalmi út tervezett Bóly - Országhatár szakasza kapcsán - NÉLKÜLE

2030	Szakasz	MOF_1	MOF_2	MOF_3	Sebesség	CO	NO_X	Por	Távolság
útszám		(j/h)			km/h	$\mu g/m^3$			(m)
56	57. sz. főút - 5121. j. út	86	1	31	90	5,4	2,4	0,1	10
56	5121. j. út - 5702/5117. j. utak	179	3	66	90	11,6	5,1	0,2	10
5702	56. sz. főút - 5703. j. út	288	7	39	90	15,5	5,7	0,2	10
5702	5703. j. út - 5704. j. út	138	4	18	90	7,6	2,7	0,1	10
5703	Bóly - M6 csp.	146	6	15	90	8,3	2,7	0,1	10
5703	M6 - 5702. j. út	146	6	15	90	8,3	2,7	0,1	10
5704	Töttös - 5714. j. út (Bóly)	178	4	39	90	10,3	4,1	0,2	10
5704	5714. j. út (Bóly) - 57. sz. főút	182	4	40	90	10,5	4,2	0,2	10
5714	Bóly	305	2	42	50	24,5	4,2	0,2	10

Table 27 Traffic figures for 2030, immissions of air pollutants and limits to compliance with limits on the road network concerned, in connection with the planned section of motorway M6, WITHOUT implementation

2030	Section	MOF_1	MOF_2	MOF_3	Speed	CO	NO_x	Particles	Distance
Road no.			(j/h)		(km/h)		$\mu g/m^3$		(m)
56	main road no. 57 – road no. 5121	86	1	31	90	5.4	2.4	0.1	10
56	road no. 5121 – roads 5702/5117	179	3	66	90	11.6	5.1	0.2	10
5702	main road no. 65 – road no. 5703	288	7	39	90	15.5	5.7	0.2	10
5702	road no. 5703 – road no. 5704	138	4	18	90	7.6	2.7	0.1	10
5703	Bóly – M6 interchange	146	6	15	90	8.3	2.7	0.1	10
5703	M6 – road no. 5702	146	6	15	90	8.3	2.7	0.1	10
5704	Töttös road no. 5714 (Bóly)	178	4	39	90	10.3	4.1	0.2	10
5704	road no. 5714 (Bóly) – main road no. 57	182	4	40	90	10.5	4.2	0.2	10
5714	Bóly	305	2	42	50	24.5	4.2	0.2	10

4.4.5.3. Assessment

Based on the concentration values, it may be stated that the planned project will have a favourable impact on air quality in the areas along the roads in the vicinity. Similarly to the WITHOUT scenario, limits are complied with within 10 m of each section investigated, but the concentration values for the WITH scenario are lower within the same distance. The appearance of the motorway will reduce traffic by 32 to 65 % on each section compared to the reference situation.

4.4.6. Impacts of phased construction

According to the investigation completed on the basis of traffic data estimated for 2030, used for the investigation (see 0), the limits will be complied with within 10 m of the axis of the new road, regardless of road design. The implementation of phase I will already have a favourable impact on air quality in the areas alongside the roads in the vicinity.

4.4.7. Assessment, recommended protection measures

Concentrations of air pollutants stemming from the long-term traffic on motorway M6 will decrease to well below the applicable limit within 50 m (already within 10 m) from the axis. There is no building to be protected within 50 m, so no protection measures are necessary. For the same reason, no control measurements are necessary.

4.4.8. The impact of the construction stage

The expected effects of construction on air pollution may be estimated only once material extraction locations, mixing plant locations and the equipment to be used for construction are known. The organisation plan to be prepared directly before construction (or, to be more precise, as aligned to the possibilities of the winning contractor) is necessary for this investigation. The plan has to be agreed with the competent environmental protection authority.

The air pollution sources expected in the course of construction are construction equipment and transport vehicles, and the air emission load from their operation - primarily nitrogen oxides, fly ash and floating dust particles - will occur locally, and may cause problems in the immediate vicinity of the track.

Dust pollution should be expected out of soil extraction, transport and loading/unloading, the construction technology and landscaping.

The sites of the equipment performing construction should be designated as close to the track as possible but far from residential and nature conservation areas in order to avoid unnecessary transport on the road network in the vicinity.

The construction operation entailing the highest rate of equipment movement is the construction of the earthwork and the inbound transport of the materials required for it. Air emission load from this source - primarily nitrogen oxides, fly ash and floating dust particles - varies in space and time but will not cause considerable air pollution outside the construction area. The Contractor shall strive to make sure the transport track for construction materials is as short as possible and avoids populated areas. In order for this, the Contractor shall designate the places for extracting raw materials and manufacturing plants as close to the road being built as possible, while complying with other legal and statutory requirements. Transport along the track is recommended to be done wherever possible.

In order to reduce floating dust pollution, lorries transporting materials should be covered up, the tracks used for transportation and the soil deposited should be watered at regular intervals - to prevent dusting - until they are used again. No air pollution in excess of health care limits will stem from lorry traffic if the necessary protection measures are complied with.

In the course of construction, a temporary increase in the load caused by floating dust particles on the environment should be expected. The dust that will be generated consists of large particles and will settle in a distance of 50 to 70 m of the construction site. This may increase further in case of strong wind, which is why the area needs to be watered regularly. In order to reduce dust emission, the slopes of the sections completed should be planted with grass and planting should take place as soon as possible.

Pavement layers will be produced primarily in mixing plants, which have their own air polluting effect. These sites may obtain their licences for establishment in a separate licensing procedure. Efforts should be made to apply the best available technology (BAT).

For air protection purposes, other operations associated with road construction such as building bed corrections and utility replacement, have a less considerable effect that is temporary and local.

The construction areas that put a pollution load on air are expected to be the construction and work sites and their immediate vicinity. Based on experience, it is possible to prevent loads in excess of the limit on residential areas by appropriate scheduling and work discipline. The effect will be temporary and will cease to exist after the road is put into operation.

4.4.9. Tasks to be completed prior to construction

For the purposes of protecting clean air, no measures are required for the period before construction.

4.4.10. Requirements for the construction period

Air pollution during construction is temporary, experience indicates it is not significant, and will cease after the road is put into operation. In the vicinity of residential areas, technological discipline and the consideration of weather conditions are absolutely necessary to minimise floating particles pollution.

Public road transport before sunrise and after sunset should be avoided in the vicinity of residential or nature conservation areas. In order to avoid dust emission in the course of transporting construction materials, lorries should be covered by tarpaulin.

The sites for equipment and machinery completing construction should be as close to the track (recommended to be far from residential areas) as possible, avoiding unnecessary movement on the surrounding road network.

The harms associated with earthwork construction may be reduced by selecting material extraction locations close to the track and designating transport tracks that avoid residential areas. Transport along the track is recommended to be done wherever possible.

In order to protect against floating dust pollution, the tracks used for transportation and the soil deposited should be watered at regular intervals.

In order to reduce dust emission, the slopes should be planted with grass as soon as possible.

It is prohibited to incinerate waste!

Based on experience, it is possible to prevent loads in excess of the limit on residential areas by appropriate scheduling and work discipline. The effect will be temporary and will cease to exist after the road is put into operation.

4.5. BIOSPHERE: HUMAN

4.5.1. Health care effect

4.5.1.1. Current situation

The health situation of residents depends on a high number of factors. The population living in the area affected by the plans may be affected primarily by noise and air pollution to an extent that may be harmful to health, out of the emissions arising out of traffic. Any favourable or unfavourable trends may be deduced subject to these two types of environmental load.

The current planning exercise affects the administrative areas and population of the following settlements:

The chapter on noise and clean air protection made the following findings on the current situation:

A more significant increase in traffic and/or noise may be expected along the section preceding motorway M6, but there is no facility requiring protection within 105 m.
On the other hand, traffic will decrease by 25 to 65 per cent on other sections, significantly improving the noise situation of the region.

According to calculations carried out on the basis of current traffic, the limits required for individual pollutants are comfortably complied with within 10 m from the axis of the public roads covered by the investigation. There are buildings to be protected within this distance, but individual immission values are well below the limit. Based on the above, it can be stated that the current traffic does not cause considerable loads for the people living in the vicinity of existing roads.

4.5.1.2. Changes that may be expected without building the motorway

Changes that may be expected without building the motorway should be divided into two parts. On the one hand, the development trends that have a strong impact on the area's noise and air pollution load should be considered; on the other hand, the variation in the load on the area concerned without the development project needs to be assessed.
Development trends indicate that the volume of vehicles is expected to increase, whereas the number of obsolete vehicles without catalysers is decreasing, and the replacement rate of vehicles is also expected to accelerate. Based on the above and the stricter emission requirements on new vehicles imposed by the EU, the specific emission of vehicles is expected to decrease considerably.
These trends were taken into account in the calculations carried out for the chapter on air pollution and noise protection.
In the long-term 'without' scenario, no NO_2 immission exceeding the limit will arise out of the traffic on the road investigated. This favourable development will arise due to more favourable emissions thanks to the evolution of the vehicle fleet.
Based on the results, it may be stated in general that under the long-term 'without' scenario up to 2029, noise load will increase slightly due to an increase in traffic but will cause no excesses of limits.

4.5.1.3. Expected changes if the project is implemented

As the environmental impacts expected during construction are temporary, they will presumably cause no significant changes in the health status of the resident population.
The development trends concerning the vehicle fleet and emissions are the same as those set out above due to the identical time horizon.

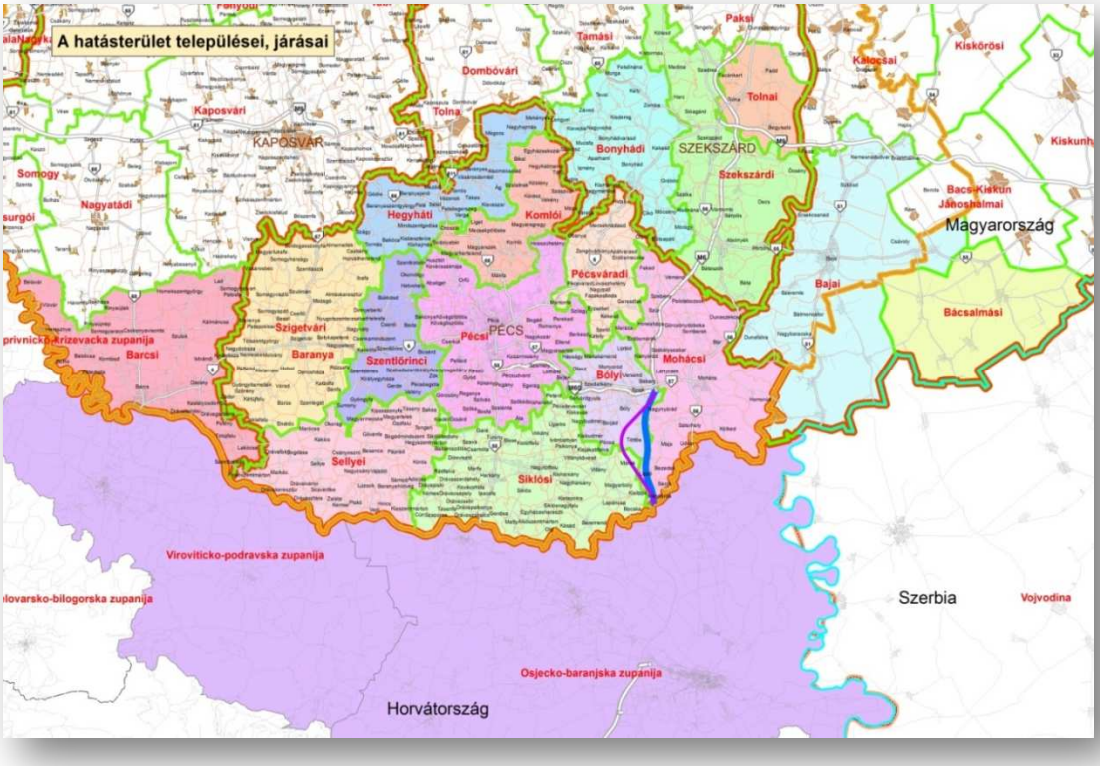
With the traffic estimated for the long term, the variations of M6 will fulfill health care limits for air pollution within 10 metres for all variations of the track.

Based on the concentration values, it may be stated that the planned project will have a favourable impact on air quality in the areas along the roads in the vicinity. Similarly to the WITHOUT scenario, limits are complied with within 10 m of each section investigated, but the concentration values for the WITH scenario are lower within the same distance. The appearance of the motorway will reduce traffic by 32 to 65 % on each section compared to the reference situation.

4.5.2. Social and economic impacts

4.5.2.1. Current situation

The socio-economic impacts of the planned project are detailed in the Feasibility Study on the M6 section between Bóly-Ivándárda and the country border.
The impact area involves three counties in Southern Transdanubia and Bács-Kiskun County, with the greatest impact in Baranya County. The region's boundary to the south is Croatia, to the north, the Central Transdanubian region, to the northwest, the Western Transdanubian region, and is separated from the Southern Great Plains by the Danube on the east. The centre of the region is Pécs, a large city with nearly 160,000 inhabitants, where the region's economic and cultural life is focused. 15% of Hungary's territory and barely one-tenth of its population belong to the region. It has the third largest area out of the seven regions, and is the least densely populated area in Hungary with a density of 67.8 persons/km², and the lowest figure of 55 persons/km^2 in Somogy County.
The impact area involves Bács-Kiskun County to a small extent, with two districts included - the Bácsalmás and Baja districts - because that is where the border connection to be developed has an impact on mostly transit traffic.



A határterület települései, járásai	Settlements and districts of the border zone

The gross domestic product (GDP) realised by the three counties made up 6.3% of the national total according to the most recent figures for 2011. In a time span of 10 years, the region's performance has clearly declined compared to other areas in Hungary; in 2002, 7.1% of output came from this region compared to other regions in the country.

In 2010, the resident population of **Baranya** County made up 3.93%, of **Somogy** County, 3.20%, of **Tolna** County, 2.33%, and the three counties together, 9.46% of Hungary's population. By 2011, this rate decreased slightly (9.42%), and continued to decline in 2012 (9.38%), meaning that the three counties' population decreased by more than the national average.

According to 2011 figures, the ratio compared to the national average of **per capita GDP**: 63.86% in **Baranya,** 63.32% in **Somogy,** 75.12% in **Tolna,** while the average of the **three counties** is 66.44%. The figures compared to the average of the countryside calculated without Budapest are 88.27%, 87.52%, 103.84% and 91.85% respectively. This means that in the ranking of counties, **Baranya ranks 15th, Somogy ranks 16th and Tolna is no. 8.** Therefore, the three counties remain below the national average.

As regards the **unemployment rate,** Baranya County was considerably over the national average with its 14.7% rate in 2012, while Somogy and Tolna Counties had more favourable figures than the national average with 10.3% and 9.6% respectively; Tolna County is nearly at the same rank as Budapest. At the same time, this 9.6% may also be said to be rather high compared to the years before the economic crisis.

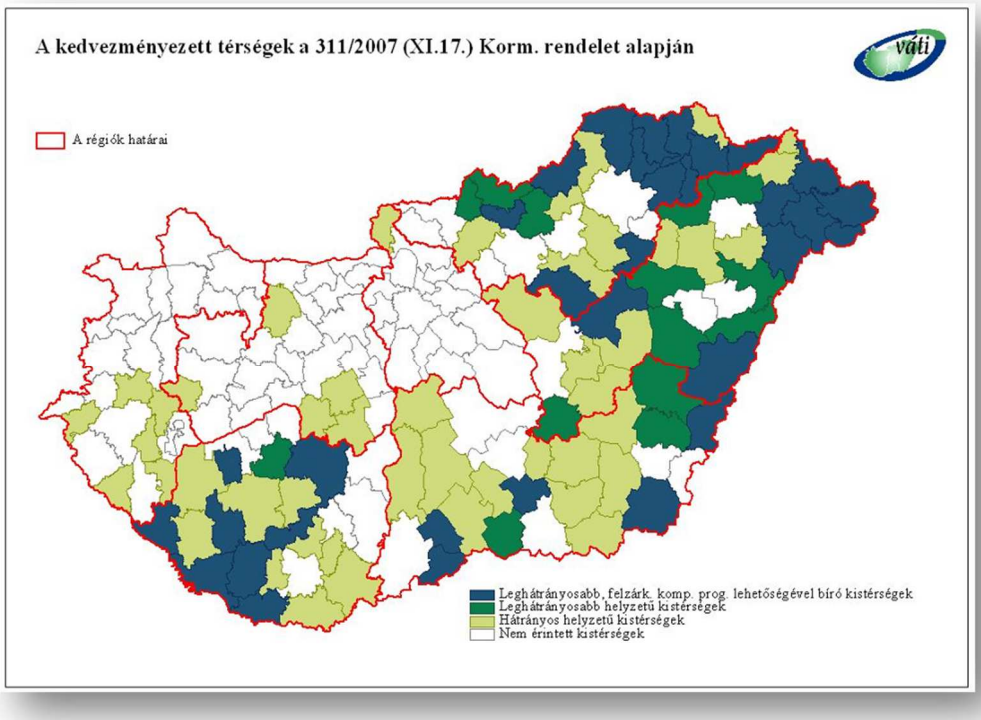


Figure 13 The beneficiary micro-regions[9]

A kedvezményezett térségek a 311/2007 (XI.17.) Korm. rendelet alapján	Beneficiary regions based on Government Decree 311/2007 (17 November)
A régiók határai	Region borders
Leghátrányosabb, felzárk., komp. prog. lehetőségével bíró kistérségek	Most disadvantaged, converging small regions with a potential complex programme
Leghátrányosabb helyzetű kistérségek	Most disadvantaged small regions
Hátrányos helyzetű kistérségek	Disadvantaged small regions
Nem érintett kistérségek	Unaffected small regions

Overall, the few typical figures provided allow for concluding that the three counties may be considered to be medium and declining areas in socio-economic terms, particularly taking into account the deteriorating trends of recent years. The backwardness and level of development of individual micro-regions and settlements in the counties paints a differentiated picture, illustrated by tables and figures in the chapter. Naturally, the county seats and the micro-regions around Mecsek Mountains are well over the county average in this respect.
All this is well reflected by the 0, which presents the regions falling behind and therefore made beneficiaries on various grounds in a national perspective.

Urban structure, population

The urban structure of Southern Transdanubia, characterised by the lack of medium-sized cities and the excessive weight of small and micro-settlements, determines the situation of the people living here. The structure of having tiny villages is the most widespread in the Ormánság area.

[9]Source: Government Decree no. 311/2007. (XI. 17.)

The region includes a significant part of Hungary's dead-end villages, because the evolution of urban structure was determined by the terrain. Dead-end villages are typically located at greater distances from cities or roads with higher traffic rates, their community transport supply is poor, and the only road leading to the village is usually a side road of a very poor quality.

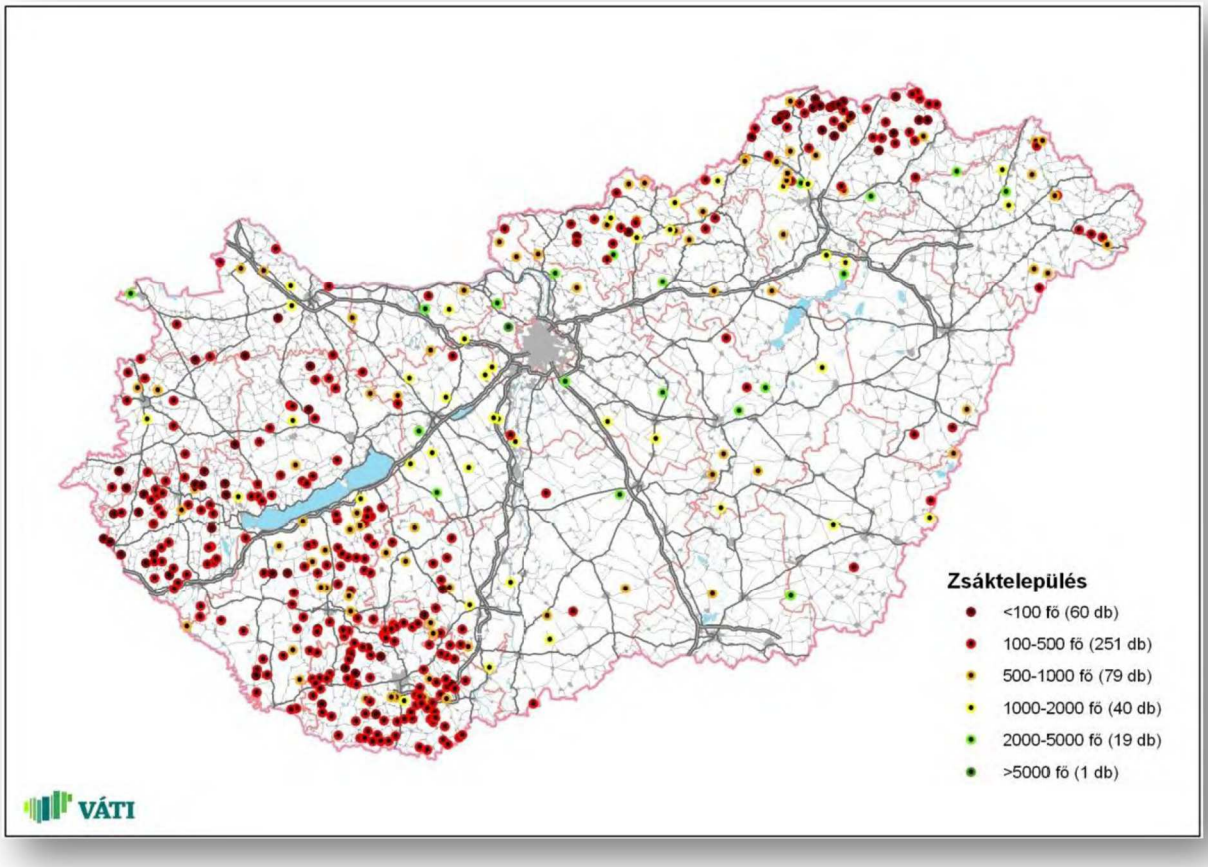


Figure 14 Location of dead-end villages in Hungary[10]

Zsáktelepülés	Cule de sac settlement
<100 fő (60 db)	<100 persons (60)
100-500 fő (251 db)	100-500 persons (251)
500-1000 fő (79 db)	500-1,000 persons (79)
1000-2000 fő (40 db)	1,000-2,000 persons (40)
2000-5000 fő (19 db)	2,000-5,000 persons (19)
>5000 fő (1 db)	>5,000 persons (1)

Cities are dominated by county seats. The one city outstanding in terms of population and economic and cultural significance is Pécs. Kaposvár has undergone highly dynamic development in many respects over the past decade. Though having no national significance in terms of population and economic weight (being the smallest county seat of the country), Szekszárd's vineyard culture, tourism and logistics potentials offer an opportunity for it to become important.

[10]Source: National Regional Landscaping Plan - background work parts

The region's spatial structure based on regional functions is shown in 0.

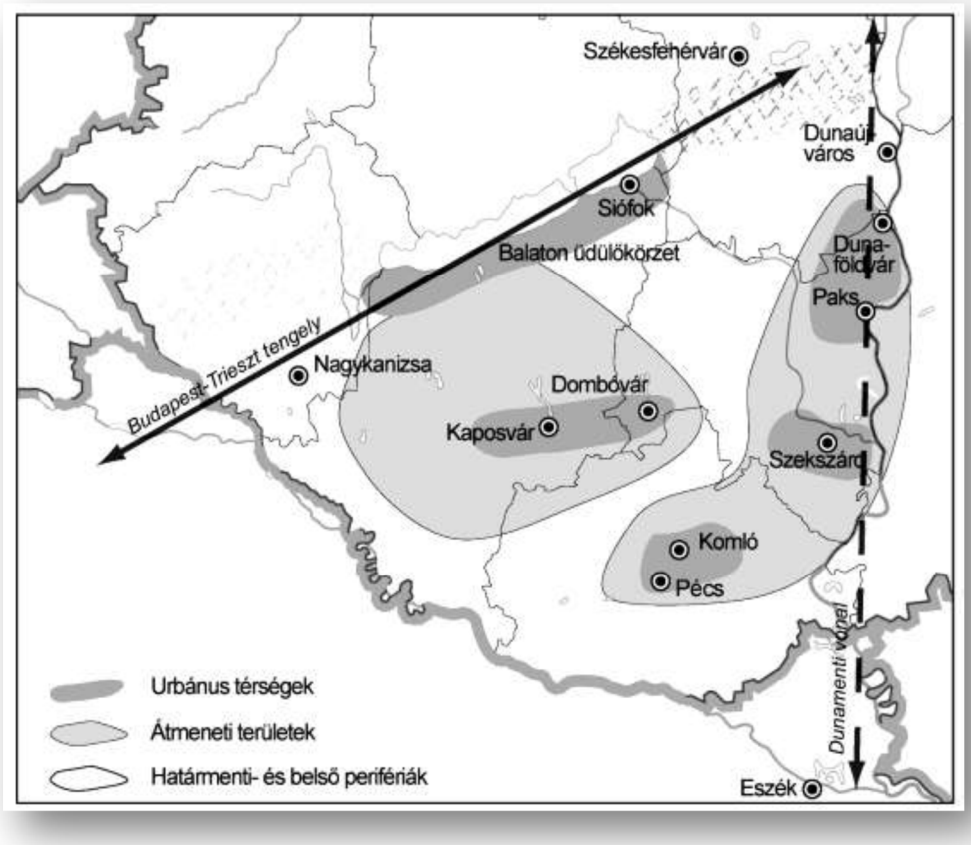


Figure 15 Structure of Southern Transdanubia[11]

Urbánus térségek	Urban areas
Átmeneti rerületek	Temporary areas
Határmenti- és belső perifériák	Cross border and internal peripheries
Budapest-Trieszt tengely	Budapest Trieste axis
Dunamenti vonal	Danuble line

In Southern Transdanubia, the system of public service institutions of towns with a population of less than 10,000 - and even more so for less than 5,000 - has severe deficiencies, and people living there are forced to use the services used less frequently than on a daily basis at other locations. The level of the urban infrastructure of these towns also remains below the standard of larger cities. In addition, some areas in the region totally lack cities, such as the middle part of Tolna County, the Zselicség region or the region of the Somogy Hills. The region's network of settlements is characterised by tiny villages. In smaller settlements, it is possible to find employment and make a living almost exclusively out of agriculture and forestry.
The three most typical national and ethnic minorities are German, Croatian and Gypsy. 30% of Germans, over one-third of Croatians and 13% of Gypsies living in Hungary reside in this region. Germans are present in the following settlements: Mecseknádasd, Pécs, Bonyhád, Szekszárd, Mohács, Sásd. There are also Croatians and Serbians living in Mohács.

[11]Source: Regional Development Concept for Baranya County

Similarly to all of Hungary's regional units, the population of the impact area is characterised by natural reduction. The number of live births is regularly below the number of deaths, in parallel with which the population ages constantly.

Internal migration in the area is significant, but this does not compensate for natural reduction. Starting from the middle of the decade, the region has typically had losses as a result of migration, but more people moved into the micro-regions surrounding county seats than the number of those who left these areas. The number of the migration surplus compared to the population varies year after year but shows a declining trend.

Economic characteristics

The excellent natural characteristics of South Transdanubia, such as the climate, the topography and good quality arable land, provide favourable conditions for agriculture. Even despite the sector has lost a great deal of importance under the current economic circumstances the role of agriculture in this area is still greater than the national average. The share of agriculture is continuously declining, which tendency is in line with the Hungarian and European processes. The main arable plants are wheat, corn, sunflower seeds and sugar beet. There are long traditions of viniculture and viticulture, which have a long history. The representatives of that tradition are the 5 qualified wine-growing regions of the area: Balatonboglár, Mecsekalja, Szekszárd, Tolna and Villány. In addition, the conditions are also ideal for forest and game management. Agriculture has 8% share in the GDP.

Since the systemic change, the ratio of employees working in industries fell by 30%, in which tendency, the closure of mines was an important factor. The hills are the richest in minerals and energy carriers. The most typical mineral resources of Mecsek include black coal and uranium ore. There is a large amount of clay in the hilly areas, processed by a large number of brick and tile factories that all have small capacities. The region is poor in hydrocarbons but thermal waters of various mineral composition were discovered at numerous places as a side product of their research.

Among the service branches, trade, real estate transactions, business services and public administration are the most important. Education, health and social services and accommodation services, which are relatively low despite the fact that Balaton also has an impact on the area, as well as the catering services somewhat exceed the general national and county averages.

There are four higher education institutions in the South Transdanubia region: In Pécs, Kaposvár, Szekszárd and Paks.

The gross average wages vary a great deal by economic branches. With the exception of agriculture and electricity, gas, steal and water supply, they are lower than the national average in every other branch of the national economy. The agricultural crisis and the sudden decline in the industrial output also triggered a major staff decrease recently. A large number of former employees of production branches lost their jobs and became unemployed. According to consolidated branches of the national economy, the largest decline could be observed in agriculture. In most sectors of the economy Baranya county plays the leading role with the exception of the electricity sector which dominates in Tolna county with the operation of the Paks Power Plant, as well as accommodation services which are led by Somogy county due to its situation on the shore of Lake Balaton. In national comparison, there is rather high unemployment in the South Transdanubia region.

The tourism of the region relates to Lake Balaton a great deal, although guests visit this region for other reasons too. There are a number of castles and related museums and exhibition sites in the county. Szigetvár, Siklós, Pécsvárad castles, as well as the Máré castle in Magyaregregy

have high tourist turnover and a number of visitors. However, there are hardly any tourist products built on castles as tourist attractions. Apart from the static castle museums, there are hardly any tourist attractions, such as castle games, or concerts, or festivals recalling the best times of the castles and aligned to them in atmosphere and in times.
Just as in the whole Hungary, health tourism plays an important role in the tourism in the region too. There are 21 medicinal and thermal baths in the region, including those at Csokonyavisonta, Dombóvár-Gunaras, Igal, Nagyatád and Harkány. It is unfortunate though that between two traditional and historic thermal baths of the country Hévíz has preserved its international attraction, Harkány was increasingly left behind in the competition and even the developments of the last few years could not make a major breakthrough in the situation. Nevertheless, with its extensive balneo therapy and other medical functions, a hospital attached to the baths and a resort with numerous other pools, Harkány is still the only complex health tourist settlement in Baranya county.
7 thermal baths have qualified medicinal water in the region (Dunaföldvár, Hőgyész, Kaposvár, Marcali, Nagyberény, Szigetvár, Tamási).
Due to the lack of concentration of developments, no internationally recognised tourist attraction could evolve in any of the above locations. However, the local population and the residents of the surrounding area have an easily accessible health tourism attraction with recreation facilities. In 2005 70% of the guests of the region and Baranya county were from Hungary and only Harkány had a considerable number of Croatian and German guests.
In terms of the attractions of rural tourism Baranya county has extremely favourable attractions. The outstanding areas of rural tourism are eastern and western Mecsek. Rural tourism generates additional revenues for the rural population and also contributes to the preservation of cultural and ethnographic values and the continuation and strengthening of the identity of the villages. The rural environment and getting to know the local life provides recreation for urban tourists. The region is in the neighbourhood of Croatia, which has an outstanding role in Hungarian tourism because in 2013 in total 360,000 Hungarians spent their holidays in Croatia. The development of Croatian tourism still continues. The tourism revenues of the country reached another record in 2013 and a further increase is projected. The reduction of VAT on tourism and catering to 10% in 2014 can be an important incentive for that. The South Transdanubia region can also profit from that increase in tourism due to transit traffic as some guests may add a few days to their beach holiday for a different type of recreation in the region.
The most important architectural attractions of the region are in Pécs, where the Old Christian cemetery excavated in Pécs Downtown was granted the title of “Part of World Heritage”. In addition, the Cathedral whose foundation goes back to the Roman Age and the Turkish and Baroque historic monuments of the town are also important attractions. Here are a few examples: the Pécs Cathedral, the Mosque of Pasha Qasim, the Jakowali Hassan Pasha Mosque and the Castle of Pécs. The traditional Zsolnay family of Pécs established a world famous porcelain factory there, which is still active.
In 2010 Pécs wore the title of the Cultural Capital of Europe, owing to which numerous developments took place and the use of a lot of sites changed. The Zsolnay factory contracted to just a small part of its former site. The rest of the block-sized “Zsolnay quarter” was taken up by cultural institutions and the Faculty of Arts of the University, and new functions are also being established at the site. There are two large cultural facilities in the vicinity of Zsolnay: the “Kodály Centre”, which is a conference and concert hall and the “Knowledge Centre” building, which is home to the libraries of the city with advanced library services and another major change in the utilisation of the area. In this context it may also be added that most of these changes were made with the reconstruction of the already built-in areas and an increase in the intensity of building. In relation to the Cultural Capital title, the international relations of

the city have also improved and the city has become a listed party of the European cultural market and selection of programmes.
The capacities of the commercial accommodation facilities operated for the guests are illustrated in Figure 19. It is obvious that Pécs, Harkány, Szigetvár, Kaposvár and Dombóvár have the largest capacities.
The economic crisis in 2008 also impeded tourism, which tendency can be observed in the number of guest nights. Since 2000 the number of foreign visitors has been falling significantly, but it was offset by the domestic trade, which has grown over the last ten years. The data clearly reflect the impact of the Cultural Capital title, worn by Pécs in 2010, as there was a major increase in the foreign and domestic traffic in the county. Unfortunately, a considerable portion of that growth could not be retained for the next year when another major decline could be observed.

Business environment

Looking at the regional concentration of the enterprises, it is obvious that there are great differences between the various small settlements.
Looking at the number of enterprises it may be concluded that the number of businesses fluctuated a great deal over the last few years. Despite the crisis, the data in 2010 were very similar to those in 2006, which could be explained by the fact that although a lot of businesses were terminated as a result of the crisis, people tried to avoid the negative impacts by establishing new businesses.
In the main towns the number of enterprises stagnated for a long while until 2007 in certain places, but then an increasing tendency can be observed.
In the South Transdanubia region, the fluctuation of the number of job-seekers is similar to the national trend. The impacts of the global economic crisis that started in 2008 are obvious, although what stands out is that the number of job-seekers has been rising significantly in Hungary already from 2003.

There are major differences between the settlements of the region in terms of unemployment. While around county seats relatively few people seeks jobs compared to the number of residents, unemployment is outstandingly high in the southern parts of Baranya and Somogy county, where the number of job-seekers may be higher than 300 within a thousand people.

4.5.3. Impacts of the investment

4.5.3.1. Social-economic impacts

The direct target groups of road developments are the users of the implemented projects and the areas that are relieved from their burdens as a result of the developments. The direct target group includes the residents of the settlements that are not affected by traffic and the residents, industrial and other businesses and tourist attracts of Vas, Zala és Somogy counties, the access time to whom and which will be shorter.

1. **direct objective**: Construction of a connection between the M6 motorway and the Croatian road network. The project will contribute to bypassing the urban area in transit traffic with which environmental damages will be mitigated and transport safety and travel comfort will improve. With the bypasses around the settlements the environmental impacts on residence will decrease (air pollution, noise).
2. **direct objective**: *Territorial convergence.* The transport development will improve accessibility and enhance competitiveness in order to strengthen social and territorial cohesion. Good accessibility and sufficient intermodal connection attract working capital

and affect the choice of business sites by the enterprises, bring closer procurement and sales markets, give more space to work flow mobility and allow for the realisation of additional income. With the implementation of the project, the **economic competitiveness of the region and its role in the competition for goods transportation will improve which, in turn, will also improve the living standards of the population**.

Indirect target groups:

- Users of the motorway,
- local communities (residents of the settlements affected),
- participants in long-distance transport (safer, faster and more comfortable access),
- users of the track for transit purposes,
- agricultural farmers - improved conditions of the marketing of the goods,
- investors - the improved traffic infrastructure provides better conditions for investments,
- disadvantaged groups/unemployed: the accessibility on workplaces will be improved due to the better access/accessibility/network relations, the new projects implemented in relation to the better transport relations might also create new jobs,
- tourism: as the infrastructure improves, interest in the region is also likely to increase, and any boost in tourism has a positive impact on the economy of the region.

4.5.3.2. Economic advantages

With the new road compliance with the projected traffic needs can be achieved and settlements and tourist attractions can be accessed more effectively.

With the planned project, the investment attraction ability will improve significantly because the district supplied with a good quality transport infrastructure increasingly attracts investor interests and provides opportunities primarily for large and medium-sized enterprises to exploit the economic and transport geographic potential of the area. As a result of the project, the investor's views on the region will also improve. The major public investment itself can attract working capital investors. There is a likely increase in the number of production and logistics enterprises settling down in the area.

As a secondary impact of the settled new enterprises, the local supplier businesses serving the new enterprises will also gain strength. The local enterprises can acquire markets primarily as suppliers of the newly established foreign medium-sized and large companies and therefore they will also gain development options in services and production cooperation. The increasing interest of foreign investors is likely to raise the value of, and wages in, the area.

This will improve the economic competitiveness of the region because the significantly improved accessibility and the transport quality will represent clear advantages. Through improved competitiveness, further investments may appear in the region. The economic impacts of growing employment and income are also likely to be considerable. All in all, regionally, the settling in enterprises will make a major contribution to a GDP increase, thus providing indirect new development resources for the settlements concerned and the state.

4.5.3.3. Social advantages

The social advantages of the planned project will occur mainly indirectly. The direct increase in employment stems primarily from the available larger capacities, as additional workforce will be required for the investment and operational phases.

The impacts of the project on the increase of employment will be mostly indirect. The more favourable transport and logistics conditions encourage potential investors in selecting their

sites with a favourable impact on the region in terms of employment. The project and the large investments resulting from it will also increase demand for employees with secondary and high qualifications and allow the preservation of more qualified workforce, whereby territorial segregation will reduce. As an overall result, the purchasing power of the local population will improve, which will strengthen primarily the local enterprises on the market of secondary services.

4.5.3.4. Traffic impacts

If this investment project is implemented, the major towns of the region would have access to motorways which, according to experience, can also have a major impact on cooperation between towns. The workforce can be mobilised more easily, and therefore the economic centres present in the area will also become accessible. As a consequence, traffic generated over and above the existing traffic will also appear on the motorways.

4.6. BIOSPHERE: PLANTS, ANIMALS

4.6.1. Applicable laws and regulations

- Act LIII of 1996 on the General Rules of the Protection of the Environment
- Act LV of 1996 on the Protection of Game, Game Management and Hunting
- Government Decree No. 67/1998 (3 April) on the restrictions and prohibitions concerning protected and strictly protected associations
- Decree of the Minister of Environmental Protection No. 13/2001. (9 May) on the protected and increasingly protected plant and animal species, on increasingly protected caves and on the disclosure of plant and animal species, important in the European Community in terms of nature conservation (extended and modified by the Decree of the Minister of Environmental Protection and Water Management No. 23/2005. (31 August) KvVM and the Decree of the Minister of Environmental Protection and Water Management No. 22/2008. (12 September) KvVM
- Act XXVI of 2003 on National Land Use Plan, and Act L of 2008 on the modification of Act XXVI of 2003 on National Use Plan
- Government Decree No. 275/2004. (8 October) on the nature conservation areas with European Community importance
- Government Decree No. 314/2005. (25 December) on the environmental impact study and environmental permit proceedings
- Act XXXVII of 2009 on Forests, Protection of Forests and Forest Management
- Decree of the Minister of Agriculture and Rural Development No. 153/2009. (13 November) implementing Act XXXVII of 2009 on Forests, and on the Protection and Management of Forests
- Government Decree 297/2009 (21 December) on expert activities in environmental protection, nature conservation, water management and landscape protection
- Decree of the Minister of Environmental Protection, Water Management No. 14/2010. (11 May) on portions of land affected by the nature conservation areas with European Community importance

4.6.2. Study methods

4.6.2.1. Botanical methods

Following the tour of the area, the study documentation was compiled primarily on the basis of known unpublished data, issued scientific publications (see literature used) and nature conservation technical materials on the area. Site studies embrace a **full vegetation period**, as they were conducted between August 2014 and August 2015. As a result of the survey, we have accurate information for the full vegetation period which is sufficient basis for making an opinion and making conclusions on nature conservation. During the survey, digital photos were made and their exact sites were also recorded.

Survey of the different living organism groups, and habitats was fundamentally done **on the basis of the NBMR methodology**, specifically for living organism groups. Occurrence of protected plant and animal species was recorded with a preciseness of 2 m if it was justified by using GPS.

The survey also covered the examination of the naturalness of certain habitats spots. In their characterisation however, the generally accepted and applied Seregélyes and S. Csomós (1995) type of naturalness categories are further broken down (modified Seregélyes and S. Csomós scale = mT_S), further sophisticating it by interim categories (e.g., 2-3) while maintaining the main categories. Further breaking down enables us to give better fine-tuned, more sophisticated characterisation of the naturalness of habitats spots than the base scale. According to Seregélyes and S. Csomós (1995), the naturalness categories are as follows:

1: The natural status is fully degraded, original vegetation cannot be recognised, in practice only weeds and uncharacteristic species occur (arable land, intensive forest and fruit cultures, mine yards, mining waste dump, waters with concrete covered shores/banks, etc.).

2: Natural status is heavily degraded, original association occurs only in traces, dominant individuals occurs sporadically not in characteristic proportion, weed like plants in masses (intensive lawn cultures, degraded pastures covered with gamba grass, Bahama brass, forests planted to former arable land or grassland, waters in artificial, regulated bed, etc.).

3: Degradation of natural status is at medium level, components of original vegetation are present in appropriate proportion, but colouring elements hardly occur, proportion of weeds and uncharacteristic species is significant (overused grassland, areas affected by intensive tourism, etc.).

4: The status is semi-natural, human intervention is not significant, species number is close to the maximum number characteristic of the association, proportion of colouring elements is significant, proportion of weeds and uncharacteristic species is not significant (old forests under forestry management, waters having natural bank/shore lanes, mountain foot orchards abandoned in the old times, etc.).

5: Natural status, or can be considered as such, proportion of colouring elements (the bulk of them are protected species) is outstanding, among them relictum type of rarities can be identified. Few species classified as weeds are characteristic. (Virgin forests, virgin peat lands, unused rock lawns, ??? with rich nourish, marshy flora, mountain grasslands rich in species, etc.)

In this system, category 1 stands for the non-natural; categories 2 and 3 are of low naturalness (2. degraded, 3. medium degraded), while categories 4 and 5 indicate the natural habitats. Categories attributed to the different habitats spots are to be found in Chapter titled '**Serial numbers and data of spots delineated on the habitats map'** in columns 'T_S'.

4.6.2.2. Zoological methods

Arthropods (Arthropoda)
With respect to **arthropods,** targeted faunistic research in relation with the investment has not been carried out. In our studies, as preliminary information, we collected the data available in technical literature for the planning area and for its narrower environment. We have stated that rather little data are available from the planning area. Flying specimens were determined by visual detection and by catching them by using butterfly nets (for mostly butterflies and dragonflies).

Fish (Pisces)
With respect to **fish species,** in the absence of a water body that could be qualified as a stable aquatic habitats, no targeted fish faunistic research in relation with the investment was carried out.

Amphibians (Amphibia) and Reptiles (Reptilia)
During our tour of the area, mapping and survey of status, each expert paid attention to the **herpetofauna** occurring on the area under study. Tour of the area was carried out with attention to the activity period - both annual and daily - of the taxons surveyed. We were endeavouring to search on the basis of visual and audio signs during our random like tours. Most reliable results were achieved by the systematic survey of the reproduction (egg-laying) sites, where on the basis of visual and audio signs we were able to identify the species or groups of species.

Birds (Aves)
Ornithological observations were performed during the entire vegetation period, on a total of 8 sampling days. In our field work, we were assisted by Minox 10×42 manual telescope, in addition to visual observation, we were able to identify a number of bird species on the basis of theri sound. The route of the ornithological tours was selected in order to cover all relevant habitats. Archived winter data known from the area were processed in addition to the spring and summer observations. Observations were performed primarily close to the route, in a lane of 2x300 m, data were also collected of some large body bird species of priority importance outside that lane.

Mammals (Mammalia)
Data collection related to **mammals** can be divided into two parts. Small mammals (terrestrial mammals not able to fly having a weight smaller than 200 g) were assessed by live trapping. The 2 sites appointed for trapping were the Nagynyárád plain and the Töttös forest (the area called Nagynyárád plain is located east of Nagynyárád, in a triangle closed by the Versend watercourse and the railway track ‘Nagynyárádi-lapos’ (a name of their own in spite of the fact that in public administration terms it belongs to Bóly). We applied a traditional, 18x7x7 cm box trap with a glass door, placed on the ground. For the bait, we used bacon and corn exaggerated by anise extract. Traps were placed out for 4 nights, their doors were continuously open. Inspection was done early in the morning and in the evening. 100 traps were placed in different habitats spots along a transect. The distance between two adjacent traps was 10 m. At a number of points, we also placed a trap for dormouse. We also took into considering the animals observed during the field tours, and also the small mammals data from the barn owl (*Tyto alba*) droppings collected at Majs.
Animal species available for hunting were separately surveyed in autumn 2014 and spring 2015.

4.6.3. Areas of nature conservation significance on the area studied

Protected natural areas of national importance

The planned route does not affect nationally important protected natural areas. The closest to the planned route in area line is the Historic Monument Natural Area at Mohács at a distance of 6.9 km to the east. Further nationally significant protected natural areas close to the planned route are at a safe distance, larger than 8 km. Source: Biotic database of the Danube-Dráva National Park Directorate.

'Ex lege' protected natural areas, natural monuments, natural values

'Ex lege' bog and saline lake, kurgan mounds, earth fortress, spring, sink, cave

The planned route does not affect 'ex lege' bog and saline lake, kurgan mounds, earth fortress, spring, sink, cave. Source: Biotic database of the Danube-Dráva National Park Directorate.

Locally important protected natural areas

Within the public administration borders of settlements affected by the planned route, locally important natural monument under protection is known only in case of Bóly. A summary is given in the following table. The planned investment does not affect locally important protected natural areas or natural monuments. Source: **Protected natural areas register (http://www.termeszetvedelem.hu/-helyi-jelentosegu-vedett-termeszeti-teruletek)**

Bóly	natural monument	Sycamore trees in Bóly	1/72/TE/85
Bóly	natural monument	Castle park	1/42/TT/75

1.táblázat Locally important protected natural areas in the environment of the planned route

Areas under protection according to European Community directives

Sites of Community Importance (SCI)

The planned route does not directly affect the special nature conservation site of the Töttös forest (HUDD20065). It is passing across without touching the area units of the Natura 2000 site consisting of mosaics. Route No. 1 is bordering (not directly) the given nature conservation site between sections 202+650 and 204+310 km. Its closest border is at a distance of 85 m from the planned investment (overpass between Töttös and Bezedek) to the east (see environmental layout plan E.03.01)

Habitats included in the data sheet (SDF) of the special nature conservation Natura 2000 site called Töttösi-erdő (forest) (HUDD20065)

Hungarian name	Code	COVER	REPRESENT	REL_SURF	CONSERVE
Pannon cseres-tölgyesek	91M0	654.3	C	C	C
Illír gyertyános-tölgyesek (Erythronion-Carpinion)	91L0	59.46.5	C	C	C

Table 29 Habitats included in the Natura 2000 datasheet (SDF) of the Töttösi forest (HUDD20065) special nature conservation area. (source: http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HUDD20065)

Legend:

Cover
Extension of the habitats in hectare

Rel_Surf:
A: 100% >= p > 15%
B: 15% >= p > 2%
C: 2% >= p > 0%

Represent:
A: excellent
B: good
C: significant representivity
D: non-significant representivity

Conserve:
A: excellent protection
B: proper protection
C: average or weak protection

Plant and animal species included in the datasheet (SDF) of the special nature conservation Natura 2000 site called Töttösi-erdő (HUDD20065)

SPECNAME	Hungarian name	POPULATION	CONSERVE	ISOLATION
Bombinabombina	vöröshasú unka	D		
Lucanuscervus	nagy szarvasbogár	C	C	C

Table 30 Animal species on the Natura 2000 datasheet (SDF) of the special nature conservation site called Töttösi-erdő (HUDD20065). (source: http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site= HUDD20065)

Legend:

Population
A: 100% >= p > 15%
B: 15% >= p > 2%
C: 2% >= p > 0%
D: non-significant population

Conservation:
A: excellent protection
B: proper protection
C: average or weak protection

Isolation:
A: the population is (almost) isolated
B: population not isolated but at the edge of the invasive area
C: population not isolated and within the invasive area

Special protection areas (SPA) (for birds)

The planned route does not affect special protection areas (SPA)

Other areas designated for nature conservation

National Ecological Network (OÖH)

The planned route affects areas of the National Ecological Network of different classification directly at number of points. (see E.03.01. environment protection layout plan) These are summarised in the following table:

settlement	km sz.	type of settlement
Töttös	200+138 – 200+231	ecological corridor
Töttös	202+154 – 202+514	ecological corridor
Töttös	202+759 – 202+860	ecological corridor

4.6.4. Priority habitats and priority species of Natura 2000 sites affected by the planned route

Impact on the priority habitats and species of Natura 2000 sites approached by the planned route is discussed in detail a separate Natura 2000 impact assessment documentation.

4.6.5. Biosphere of the studied area

4.6.5.1. Landscape environment of the studied area

The planned route is running in the south-east of Baranya County, leaving M6 motorway to the south via Bóly to Ivándárda, the national border. In public administration terms, the route is on the external area of settlements Babarc, Szajk, Nagynyárád, Bóly, Töttös, Márok, Lippó and Ivándárda.

According to the landscape distribution currently adopted for the territory of Hungary – according to the register of Hungary's micro-regions (DÖVÉNYI 2010) – it is to be found on the territory of the Nyárád-Harkány plain micro-reigon.

In plant geographical terms, the planning area is to be found on the south Alföld (Titelicum) floristic district, in the Alföld floristic region (Eupannonicum) of the Pannonicum floristic province (MOLNÁR in FARKAS 1999).

It is accessible from a number of directions on paved roads. The area surveyed can be visited by car and, partly, only by foot.

The planned route development is fundamentally passing across a landscape fragmented by agricultural lands, narrow watercourses ad forest blocks of varied extension and naturalness and under significant anthropogenic impact.

4.6.5.2. Habitats conditions of the area studied

Below, we describe the main habitats types on the planning area and in its environment. Habitats are identified on the basis of the habitats list of the General National Habitats Classification System (ÁNÉR 2011).

B1a – Eu- and mesotrophic reed and Typha beds

The wetland habitats type poor in species along the watercourses, channels on the studied area is represented by stocks abandoned in weeds. The reason is that on the impact area, watercourses are usually surrounded on both sides by large extension agricultural areas. As a result, significant quantity of artificial fertiliser is washed from the steep slopes of the mountains because of the vicinity of the arable land. The impact of this nutrient surpass can be well observed in the vegetation surrounding the lakes and watercourses. Vegetation of channels is fundamentally determined by reeds (Phragmitetum communis) and narrow and broad leaved tipha beds (Typhetum angustifoliae, Typhetum latifoliae). They are alternating and get mixed only rarely.

B4 – Tussock sedge communities

Carex paniculata bogs which are scattered in the high tipha bags and occur in habitats complex are affected by the planned investment at one point. The area called Nagynyárád plain is to be found east of Nagynyárád, in a triangle closed by the Versend watercourse and the railway line. The deep lying area next to the Versendi watercourse is also fed form the south by a marked spring. The water of the spring is covering the surface as a film and having no definite watercourse bed is flowing/ waterflowing towards the slope, the Nyárád plain. The current shallow and narrow bed of the watercourse is different, it was generated as a result of wallowing similarly to places of roughly the same conditions (Töttösi forest) and became wide in spots gradually. Bogs of Carex paniculata stand out from the high Solidago gigantea, which reaffirms the fact that earlier the water of the spring was flowing in a broad lane without having a definite bed. Flow down conditions have changed with the development of the watercourse bed. Due to the occasional drying up of the brinks ???, high Solidago gigantea got routed in the zone where earlier due to the flowing water is was not possible. In the watercourse, narrow leaved Berula

erecta can be found sporedically. The watercourse is accompanied by Sparganietum erecti in the high sedges and in smaller spots. The high sedges consist of Carex riparia. It is close vegetation, which is interrupted only at wallowing places.

B5 – Non-tussock tall-sedge beds
Evenly spread, carpet like stocks mostly consisting of grassing sedge species. In the environment of the planning area, they generally occur in the riparian zone, on the brink of the sedges. Monodominant stocks of large extension also occur separated from the reeds. These spots usually populate surfaces among the mountains saturated?????? by leakage water from the water springs. Of the characteristic species, Carex acutiformis and C. riparia occur. These dominant species are often accompanied by species usually characteristics to high sedges, e.g., Lythrum salicaria and Iris pseudacorus.

J5 – Riverine ash-alder woodlands
It is a spot of Fraxinus angustifolia subsp. pannonica of small extension in the Nagynyárád Plain, which is to be found at the edge of the area studied (indirect impact area). Under the alder trees, there is water, while under the ash trees on the higher surface level it is completely dry. On herb level, number of species refer to naturalness, like Valeriana dioica occurring in masses. Further observed plant species are: Deschampsia cespitosa, Carex acutiformis, Circaea lutetiana, Rumex confertus. In the small patch of ash trees, trees of trunk diameter 50-70 cm can also be found. The upper level consists of Hungarian ash trees, but on the second level, Cerasus avium also occurs. Shrub level is sparse, consisting of mainly ash seedlings but Euonymus europaeus and Ligustrum vulgare can also be foiud there. More exiting species under the ash trees are Galium odoratum, Lapsana communis, Agrostis canina. Further plan species observed: Parietaria officinalis, Lysimachia nummularia. By preserving the water balance conditions of the Nagynyárád Plain area, the planned investment will not have an impact on the habitats.

K2 – Sessile oak-hornbeam woodlands
It can be observed on the territory of the Majsi-Nagy forest, along the route of a gully and the watercourse coming to the surface at a later stage, which is to be found at the edge of the studied area (indirect impact area). Upper canopy level is determined by Quercus petraea, Quercus robur, but sporedically Fraxinus angustifolia subsp. pannonica and Ulmus laevis are also present. Characteristic species of the herb level include Galium odoratum, Circaea lutetiana, Cardamine bulbifera, Dryopteris filix-mas, Athyrium filix-femina, Parietaria officinalis, Urtica dioica, Polygonatum latifolium. In addition to Helleborus odorus as a protected species, Primula vulgaris is also found. The planned investment does not affect the habitats.

L2a – Pannonian-Balcanic Quercus cerris-Quercus petraea woodlands
A habitats retained in the form of semi-natural in part and derivative forests in other part of large extension in the Töttös forest and the Majsi-Nagy forest. In its former stocks, in the upper canopy level, Quercus cerris is decisive and Quercus petraea occurring sporadically. On second level characteristic species include Acer campestre, Carpinus betulus occurs individually. On second level especially along the brim parts, Robinia pseudoacacia can be found. Shrub level is sparse. Among shrub species, we can find Acer tataricum, Sambucus nigra, Crataegus monogyna, Ligustrum vulgare, Celtis occidentalis young shrub size specimen. In spite of the dominant tree species, the forest has a rather fresh nature. Hedera helix is running up into the canopy along the trunk of the quercus trees. Grassland is poor, with no characteristic features. Observed plant species: Brachypodium sylvaticum, Dactylis polygama, Viola reichenbachiana, Torilis arvensis, Urtica dioica, Alliaria petiolata, Stellaria holostea, Rumex sanguineus,

Stellaria media, Galium odoratum, Scutellaria altissima. Under the oak trees Helleborus odorus is quite frequent.

(I1) – Natural pioneer vegetation of wet substrates in annual intensive arable fields
We could examine natural pioneer vegetation of wet substrates in arable fields. On arable land in the region, mainly close to watercourses, access water flat areas could get generated in a number of places. In rainy years they take over the place of cultivated crop and after a certain degree of dehydration they fully cover the soil surface. Following the survey the habitats was observed at a number of points but because of its small extension it was not separately marked. Next to the Versendi Watercourse cross by the planned investment there was a larger patch at the crossing point. In the year of the survey the area began totally dry by the middle of the summer, which was broken up again by the farmer up to the bank of the watercourse following harvest. Species observed: Plantago major, Juncus bufonius, Euphorbia platyphyllos, Lythrum hyssopifolia, Sonchus asper, Ambrosia artemisifolia, Persicaria lapathifolia, Juncus inflexus, Juncus articulatus, Epilobium parviflorum, Schoenoplectus lacustris, Rumex palustris, Xanthium strumarium, Xanthium italicum, Lythrum hyssopifolia, Peplis portula, Scleranthus annuus, Plygonum aviculare, Polygonum aviculare, Echinochloa crus-galli, Matricaria recutita, Tripleurospermum inodorum. The access water patch in the arable land may serve as a temporary habitat for amphibians. The Triops cancriformis was observed at a number of places in these access water flat services.

OB – Uncharacteristic mesic grasslands
We classified here the grasslands of channels, roads (dirt roads), narrow grass lanes along arable land and re-grassed arable land poor in species and showing degradation by applying different kinds of hybrid categories. Species stuck is of mixed composition consisting of species of wet, semi-arid and arid grasslands. In addition, segetal and ruderal which species of the surrounding agricultural areas can also be found here. Furthermore, from among the herbaceous hazardous invasive species a number of species can be observed here such as Solidago gigantea, Solidago canadensis, Phytolacca americana. The parts close to the road are regularly mowed they are less weedy. Decisive grass species here are Arrhenatherum elatius, Lolium perenne, Dactylis glomerata, Festuca pratensis. Non-mowed parts are characterised by the dominance of Calamagrostis epigeios, Solidago gigantea and Urtica dioica. Further plant species observed are: Sorghum halepense, Galium mollugo, Setaria pumila, Rumex crispus, Phytolacca americana, Rumex crispus, Melandrium album, Cirsium arvense, Salvia nemorosa, Erigeron annuus, Agrimonia eupatoria, Centaurea jacea, Setaria verticillata, Carduus acanthoides, Asclepias syriaca, Arctium lappa, Sambucus ebulus, Plantago lanceolata, Picris hieracioides, Glechoma hederacea, Linaria vulgaris, Cichorium intybus, Plantago major, Verbena officinalis, Falcaria vulgaris, Lotus corniculatus, Hypericum perforatum, Stachys germanica, Eryngium campestre, Ranunculus acris, Aster sp., Dipsacus fullonum, Trifolium campestre, Mentha longifolia.

OD – Stands of invasive forbs
Invasive forbs on the studied area can be found on areas dominated by Solidago gigantea. In the absence of former cultivation, e.g., mowing it spontaneously got routed and gradually pressed out the components of the former vegetation. The forest cleared areas, planted, not indigenous forest stocks, abounded arable land and disturbed areas, e.g., the embankment of the channels provided easy access for getting establish there. These clusters open the way to the species to supress the natural vegetation. At the surveyed habitats a number of hazardous invasive forbs were observed as such Solidago gigantea, Sorghum halepense and Phytolacca americana.

P2a – Wet and mesic pioneer scrub
Wet and mesic areas areas are collective group of almost exclusively secondary scrubs. These are woody patches, bands consisting of fast spreading tree and scrub species whose herbaceous species stock also consist of rather mobile species. They often occur in relation with linear infrastructures (e.g., roads, storm ditches, channels). On the planning areas and in its vicinity its outstanding habitats along the Borza stream and the reedy section following the Töttösi lake. In its species stock spontaneously Cornus sanguinea, Prunus spinosa, Rosa canina, Salix cinerea may occur.

P2b – Dry and semi-dry pioneer scrub
Wooded habitats accompanying linear infrastructure (roads, railways, channels watercourses) forest edges and cuts. They consist of thorny species, characteristic species in the region are Prunus spinosa, Crataegus monogyna, Cornus sanguinea, Sambucus nigra, Euonymus europaeus and Rosa canina. Sometimes they generate a thick, impenetrable lane along the narrow edges of arable land, channel and dirt road. The indigenous and non-indigenous tree species sometimes grow out of the scrub.

P6 – Parks, botanical gardens, old churchyards
The Lippó cemeteries have been put into this category. It suits especially the Serbian cemetery where burying is still pursued in spite of the fact that it looks rather abandoned. The unwooded parts are mowed two times a year. From the outside the cemetery is surrounded by a woody-scrub lane. Trees get elevated above the Syringa vulgaris scrub. Among planted trees the following can be found: Quercus robur, Cerasus avium, Fraxinus angustifolia subsp. pannonica, Tilia tomentosa, Robinia pseudoacacia, Celtis occidentalis, Ulmus minor, Ailanthus altissima. In scrub level among other species we find Sambucus nigra, Euonymus europaeus, Ligustrum vulgare, Clematis vitalba. On the territory of the cemetery inside, among the tombs trees can be found irregularly. The scrub around some of the trees shows that with the exception of mowing no other human impact affects the area, succession is taking place spontaneously. On unwooded parts, herb level has a mix composition of species, uncharacteristic, mesic and semi-arid species. Under the trees, weedy, herbaceous species referring to nutrient surplus can be found: Urtica dioica, Bromus sterilis, Solidago gigantea, Sambucus ebulus, Ballota nigra, Stellaria media, Melandrium album.

RA – Scattered native trees or narrow tree lines
This category has been applied to indigenous trees, lines of trees of one or two lines, not planted along roads, channel banks. The groups of lines of trees consist of indigenous ligneous species such as Fraxinus angustifolia subsp. pannonica, Populus nigra, Salix alba, Quercus cerris and Ulmus minor. From among scrubs the most characteristics are Sambucus nigra, Prunus spinosa, Rubus caesius, Rosa canina.

RB – Uncharacteristic or pioneer softwood forests
It is a collective term for forest dominated by softwood indigenous species and poor in forest herbaceous plants, which are usually of spontaneous nature, and due to their poor species diversity cannot be classified as a natural forest association. In terms of production site it is a highly heterogeneous group, which can get generated from dry to wet production site anywhere. On the planning area it has been identified in relation with wet habitats. Its characteristic species include Salix fragilis, Salix alba, Populus alba, Populus nigra, Fraxinus angustifolia subsp. pannonica and Acer negundo. The woody line is further increased by other trees species which in part are planted and in part spontaneously got there, such as the Quercus robur, Populus

×euramericana, Juglans regia, Cerasus avium. In the deepest, wettest parts directly on the line of the stream, the scrub level is given by Salix cinerea, Cornus sanguinea. Due to strong shadowing and intensive pressure by wild game under scrub level herb level is missing or is very sparse. The observed plant species include: Brachypodium sylvaticum, Geum urbanum, Angelica sylvestris, Rubus caesius, Galium mollugo, Galeopsis speciosa, Festuca gigantea, Circaea lutetiana, Dactylis polygama, Lamium maculatum, Equisetum arvense, Arctium lappa, Lapsana communis, Prunella vulgaris. Clematis vitalba and Humulus lupulus is climbing up to the trees and scrubs. Very different, smaller-larger stocks occur at the number of points e.g., in the Nagynyárád plain, along the watercourse following the Töttös lake and in front of the Töttös forest.

RC – Uncharacteristic hardwood forests and plantations
Uncharacteristic forest with hardwood species of plantation origin. A stock of more or less the same age planted in lines by forestry method. Characteristic species are Quercus robur and Fraxinus angustifolia subsp. pannonica. It is a closed stock poor in species. Due to shadowing herb level is very sparse or missing. Observed plant species: Urtica dioica, Alliaria petiolata, Brachypodium sylvaticum, Bromus sterilis, Geum urbanum, Stellaria holostea, Moehringia trinervia, Rumex sanguineus, Galium aparine, Carex sylvatica, Elymus caninus, Lolium perenne, Fallopia dumetorum, Lactuca serriola, Torilis arvensis, Dactylis glomerata, Melica altissima, Lapsana communis, Rubus caesius, Heracleum sphondylium.

RDb – Non-native deciduous forests and plantations mixed with native tree species
Partly artificial, partly spontaneous stocks of varied extension, mixed species composition, poor in species, uncharacteristic, where native species mixed with the non-native ones. On higher ground level Juglans regia and Robinia pseudoacacia are characteristic. Next to Tilia tomentosa and Pinus sylvestris occurring sporadically some individual items of Ulmus laevis and Betula pendula also occur. On scrub level Sambucus nigra is decisive. In line with the habitats the herb level is uncharacteristic, strongly fragmented and weedy. Its decisive species include Bromus sterilis, Stellaria media and Urtica dioica. Further lant species observed: Viola hirta, Torilis arvensis, Solidago gigantea, Heracleum sphondylium, Brachypodium sylvaticum, Equisetum arvense, Urtica dioica, Geum urbanum, Phytolacca americana. Humulus lupulus at Vitis vulpina climb up to the trees and scrubs.

S1 - Robinia pseudoacacia plantations
The decisive tree species of the habitats is the acacia giving the name (Robinia pseudoacacia). Its scrub level is determined by Sambucus nigra as a close scrub to a varied extent. Its herb level is characterised by nitophil species like Bromus sterilis, Anthriscus cerefolium, Stellaria media, Chelidonium majus, Urtica dioica, Galium aparine. On the edges of the forest or in parts richer in light ruderal weed species also occur like Lactuca serriola, Onopordum acanthium, Ballota nigra, Carduus acanthoides.

S2 – Populus × euramericana plantations
Older and younger Populus × euramericana plantations can be observed at a number of points in small extensions. In the second canopy level young acacia can be found, below this a closed scrub level. As other colouring elements Juglans regia, Cerasus avium, Acer campestre are also present. Scrub is determined by Cornus sanguinea and Sambucus nigra, but on the edges Prunus spinosa, Rhamnus cathartica, Crataegus monogyna can also be observed. Clematis vitalba and Parthenocissus inserta climb up to the trees, scrubs. Herb level is missing for a most part due to the strong shadowing or it is uncharacteristic, weedy. In parts along the edges and in parts rich in light species stock referring to nutrient surplus that may be tie to the acacia can be found:

Bromus sterilis, Anthriscus cerefolium, Ballota nigra, Urtica dioica, Elymus repens, Galium aparine. Ad observed plant species: Sonchus arvensis, Potentilla reptans, Viola hirta, Brachypodium sylvaticum. In a patch a stock of about a hundred Cephalanthera damasonium was found as a protected species.

S3 – Plantations of other non-native deciduous tree species
Juglans nigra plantation. Under the old trees, on the second level there is Celtis occidentalis. It can be found planted in the marked patch but reproduced from seed it can also be found in other points of the area (e.g., on the edge of the reeds). The large number of specimen of different ages along the edge of the forest shows that it is able to get renewed spontaneously from seed. Its scrub level is determine in addition to Sambucus nigra by Cornus sanguinea, Clematis vitalba and Ligustrum vulgare. Its herb level is identical with that of the acacia, it is weedy and uncharacteristic. Observed plant species: Bromus sterilis, Anthriscus cerefolium, Chaerophyllum temulum, Dactylis glomerata, Lapsana communis, Brachypodium sylvaticum, Sisymbrium strictissimum, Torilis arvensis, Galium aparine. In the narrow grass lane along its edges Elymus repens, Melandrium album, Sambucus ebulus can be found.

S6 – Spontaneous stands of non-indigenous tree species
The channels, dirt roads by accompanied by lonely trees, small groups or lines of trees which consist of spontaneously established specimen of non-native tree species. Characteristic species ainclude Robinia pseudoacacia, and rarely Acer negundo.

S7 – Scattered trees or narrow tree lines of non-natives tree species
Habitats type mostly consisting of non-native tree or scrub species lining the roads, channels. Channels, dirt roads are accompanied by smaller groups of trees, lines of trees, consisting of mainly of planted or spontaneously established acacia specimen (Robinia pseudoacacia). In the vicinity of linear infrastructure (road, railway) and settlements fruit tree specimen often occurs spontaneously and by way of plantation. The most characteristic species is Juglans regia and Populus ×euramericana.

T1 – Annual intensive arable fields
Habitats type covering a largest part of the region, fundamentally determining the landscape. The weed species stock of the annual agricultural arable lands show high similarity in the entire region. Due to intensive weed control arable land weed primarily occur along the edges of the field. Characteristic species: Veronica polita, Setaria pumila, Heliotropium europaeum, Hibiscus trionum, Abutilon theophrasti, Datura stramonium, Convolvulus arvensis, Stellaria media, Cirsium arvense, Ambrosia artemisifolia, Tripleurospermum inodorum, Capsella bursa-pastoris, Chenopodium album, Matricaria recutita, Viola arvensis, Stachys annua, Reseda lutea, Euphorbia falcata, Setaria pumila, Setaria verticillata, Setaria viridis.

T6 – Extensive arable fields
Arable fields close to smallest settlements have been classified here, usually with uncharacteristic vegetation. Their set of species is identical with the set of species described in category T1.

U3 – Villages
Villages affected by planning (Lippó) have been marked with this category.

U4 – Yards, wastelands, dumping grounds

Yards, dumping grounds to be found in the environment of settlements, roads, transport junctions have been put into this category. This category has been applied within the border of the site irrespective of the vegetation.

U8 – Water streams
Category applied to water streams crossed by the planning area (Borza stream, Versendi watercourse, Majsi watercourse (Falu-dűlő watercourse), etc.), but has been left out of marking due to the multiple code combinations.

U9 – Standing waters
Category used on one occasion in relation with the artificial lake established on the Borza stream.

U11 – Roads and railroads
From among linear infrastructures on the impact area highways, dirt roads and railroads have been classified into this category but distinguished from each other.
In addition to trampled vegetation of the dirt roads arable land weeds are also to be mentioned. Characteristic species: Lolium perenne, Polygonum aviculare, Plantago major, Cichorium intybus, Tripleurospermum inodorum, Potentilla anserina, Setaria pumila.

4.6.6. General characterisation of the habitats along the route

Habitats affected by the route are described from the starting point to the end point, in line with the sections proceeding from the north to the east.
The list of habitats patches observed in the environment of the planning area is shown in 0. The table contains the ID numbers of the patches, the Á-NÉR codes and the description of the patch. In addition to the table nature conservation evaluation of the patches is also given. *See map E.03.02 in the Annex.*
The following table contains the ID numbers of the habitats patches, the Á-NÉR codes and the description of the patch. In addition to the table nature conservation evaluation of the patches is also given.

Bracket is used next to the Á-NÉR code, e.g., OBx(S6xP2b), if the other habitats observed next to the main habitats (main category) do not reach the percentage coverage value recommended in Á-NÉR (2011) description, but their indication carries important information.

ID	Á-NÉR	Short description	T_S
1	T1	Arable land	1
2	U11	Roads, railroads	1
3	T1	Arable land	1
4	T1	Arable land	1
5	T1	Arable land	1
6	S1	Acacia	1-2
7	T1	Arable land	1
8	OBx(S6xP2b)	Uncharacteristic, weedy, mesic grassland along the edge of the road of which native tree species (mainly acacia) and scrubs are standing out.	2
9	B5xODx(P2a)	Tall sedge showing the route of the watercourse, with Solidage gigantea on the side of the arable land. Sporedic salix cinerea bushes.	3

10	OB	Uncharacteristic weedy, mesic grassland.	2
11	S1	Acacia	1-2
12	RC	Uncharacteristic hardwood forest plantations	2-3
13	RBxP2a	Uncharacteristic soft wood woodlands with mesic scrubs (with Salix cinerea in patches).	3
14	S1	Acacia	1-2
15	RBxP2a	Uncharacteristic soft wood woodlands with mesic scrubs (with Salix cinerea in patches).	3
16	B1a	Reeds.	3
17	OB	Uncharacteristic weedy, mesic grassland.	2
18	B1axB5	Mixed patch of reeds and tall sedges.	3
19	RBxP2a	Uncharacteristic soft wood woodlands with mesic scrubs (with Salix cinerea in patches).	3
20	S1	Acacia	1-2
21	P2bx(RAxOB)	Dry and semi-dry scrub (Ctrataegus, Sloe) of which trees stand out. Smaller, uncharacteristic weedy, mesic patches of grassland can be found in the scrub.	3
22	RDb	Non-native deciduous forests and plantations mixed with native tree species	2
23	RA	Lonely native tree, an old Quercus cerris	3
24	T1	Arable land	1
25	U4xOB	Hidroglobe and its environment. Surrounded by uncharacteristic weedy mesic grassland with species identical with that of the lane along the road.	1
26	OBx(S6xP2b)	Uncharacteristic, weedy, mesic part along the edge of the road of which non-native tree species (mainly acacia) and scrubs are standing out.	2
27	L2a	Pannonian-Balcanic Quercus cerris-Quercus petraea woodlands. See detailed description in the text.	3
28	T1	Arable land	1
29	OB		2
30	U11	Roads, railroads	1
31	L2a	Pannonian-Balcanic Quercus cerris-Quercus petraea woodlands. See detailed description in the text.	3
32	S1	Acacia	1-2
33	P2bxOB	Sry and semi-dry scrub (Crataegus, Sloe) uncharacteristic, weedy, mixed with mesic patches of grassland.	3
34	T1	Arable land	1
35	P2bxOB	Sry and semi-dry scrub (Crataegus, Sloe) uncharacteristic, weedy, mixed with mesic patches of grassland.	3
36	T1	Arable land	1
37	T1	Arable land	1
38	T1	Arable land	1
39	S1	Acacia	1-2
40	S7xP2b	Mixed stock of non-native tree groups, tree lines (acacia) and dry and semi-dry scrub (Ctrataegus, Sloe).	2
41	T1	Arable land	1
42	U11	Roads, railroads	1
43	S3	Juglans nigra plantation.	1-2
44	B1ax(B4)	Reeds. Bogs of Carex paniculata sporedically on the edge.	3-4
45	RAxP2a	Small group of lonely native trees. Salix cinerea bushes around.	3
46	RA	Small group of lonely native trees.	3
47	U11	Roads, railroads	1
48	T1	Arable land	1

49	T1	Arable land	1
50	OBxU8	Watercourse accompanied by uncharacteristic, weedy, mesic grassland.	2
51	T1	Arable land	1
52	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
53	P2bxS6	Dry - semi-dry scrub (Crataegus, Sloe) mixed with spontaneous stocks of non-indigenous tree species.	3
54	T1	Arable land	1
55	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
56	S7	Scattered trees or narrow tree lines of non-natives tree species	1-2
57	U11	Roads, railroads	1
58	T1	Arable land	1
59	T1	Arable land	1
60	S2	Populus × euramericana plantations	1-2
61	B1ax(P2a)	Reeds, with scattered smaller patches of Salix cinerea.	3
62	T1	Arable land	1
63	T1	Arable land	1
64	RAxS6x(OB)	Group of native and non-native trees. Smaller, uncharacteristic, weedy, mesic patches of grassland including into the patch.	2-3
65	OBx(RAxS6)	Uncharacteristic, weedy mesic native and non-native tree species with some spontaneous patches.	2
66	OBxS7xP2b	Uncharacteristic, weedy, mesic grassland with acacia line and with Crataegus and Sloe in the scrub.	2
67	OBxS7xP2b	Uncharacteristic, weedy, mesic grassland with acacia line and with Crataegus and Sloe in the scrub.	2
68	U11	Roads, railroads	1
69	T1	Arable land	1
70	RBxP2a	Uncharacteristic soft wood woodlands with mesic scrubs (with Salix cinerea in patches).	3
71	RA	Small group of lonely native trees.	3
72	T6	Extensive arable fields	1
73	RA	Small group of lonely native trees.	3
74	B1a	Reeds.	3
75	S7	Scattered trees or narrow tree lines of non-natives tree species	1-2
76	U11	Roads, railroads	1
77	T1	Arable land	1
78	T1	Arable land	1
79	U11	Roads, railroads	1
80	S3	A patch of red oak.	1-2
81	T1	Arable land	1
82	RA	Small group of lonely native trees.	3
83	RB	Character soft wood gallery forest.	3
84	T1	Arable land	1
85	OD	High Solidago gigantea stock.	1-2
86	P2bxS6	Dry - semi-dry scrub (Crataegus, Sloe) mixed with spontaneous stocks of non-indigenous tree species.	3
87	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2

88	U11	Roads, railroads	1
89	S7	Groups of trees, lines of trees of non-natives tree species	1-2
90	U3	Part of the urban area of Lippó.	1
91	T1	Arable land	1
92	U11	Roads, railroads	1
93	T1	Arable land	1
94	U11	Roads, railroads	1
95	T1	Arable land	1
96	T1	Arable land	1
97	T1	Arable land	1
98	P6	Cemetery.	2
99	T1	Arable land	1
100	U11	Roads, railroads	1
101	P6	Cemetery.	2
102	T1	Arable land	1
103	S7	Groups of trees, lines of trees of non-natives tree species	1-2
104	T1	Arable land	1
105	U11	Roads, railroads	1
106	T1	Arable land	1
107	T1	Arable land	1
108	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
109	OBx(P2b)	Uncharacteristic, weedy, mesic grassland with sporadically dry and semi-dry scrub (Crataegus, Sloe).	2
110	OBx(RAxP2b)	Uncharacteristic, weedy, mesic grassland with sporadic native tree species specimen, groups and with dry and semi-dry scrub under (Crataegus, Sloe).	2
111	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
112	OBx(P2b)	Uncharacteristic, weedy, mesic grassland with sporadically dry and semi-dry scrub (Crataegus, Sloe).	2
113	OB		2
114	OBxU8	Watercourse accompanied by uncharacteristic, weedy, mesic grassland.	2
115	RAxP2a	Small group of lonely native trees. Broom willow bushes around.	3
116	S1	Acacia	1-2
117	K2	Sessile oak-hornbeam woodlands. See detailed description in the text.	3
118	S3	A patch of red oak.	1-2
119	U11	Roads, railroads	1
120	T1	Arable land	1
121	T1	Arable land	1
122	OB		2
123	T1	Arable land	1
124	T1	Arable land	1
125	T1	Arable land	1
126	B1ax(P2a)	Reeds, with scattered smaller patches of Salix cinerea.	3
127	RAxP2a	Small group of lonely native trees. Broom willow bushes around.	3
128	T1	Arable land	1
129	U11	Roads, railroads	1

130	RAxS7x(OB)	Group of native and non-native trees. Smaller, uncharacteristic, weedy, mesic patches of grassland including into the patch.	2-3
131	S2xP2a	Populus euramericana plantations with abandoned, mesic scrub (with Cornus sanguinea).	1-2
132	OBx(RAxS6)	Uncharacteristic, weedy, mesic with smallest spontaneous patches of sporadic native and non-native tree species.	2
133	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
134	S6xRAx(B1a)	Spontaneous stocks of groups and lines of trees of native and non-native species mixed with smaller reeds in patches.	2-3
135	B1ax(OD)	Reeds. Narrow lane of sporadic Solidago gigantea on the edge.	2-3
136	B1axP2a	Mixed stock of reeds and Salix cinerea.	3
137	J5	Esh-alder woodlands See detailed description in the text.	4
138	OBxP2b	Uncharacteristic, weedy, mesic grassland with dry and semi-dry scrub (Crataegus, Sloe).	2
139	P2a	Closed stock of Salix cinerea.	3
140	OB		2
141	P2a	Closed stock of Salix cinerea.	3
142	S6xP2bxOB	Spontaneous stock of non-native species tree groups mixed with dry and semi-dry scrub and uncharacteristic, weedy, mesic grassland.	2
143	RDb	Non-native deciduous forests and plantations mixed with native tree species	2
144	OBx(P2b)	Uncharacteristic, weedy, mesic grassland with sporadically dry and semi-dry scrub (Crataegus, Sloe).	2
145	RDb	Non-native deciduous forests and plantations mixed with native tree species	2
146	ODxB5x(B4)	High Solidago gigantea stock mixed with high sedges in the deeper layers. Bogs of sedges also contained sporadically.	3
147	B1a	Reeds.	
148	ODx(B5)	High Solidago gigantea stock mixed with high sedges in the deeper layers.	2-3
149	T1	Arable land	1
150	U4	Site.	1
151	T1	Arable land	1
152	T1	Arable land	1
153	T1	Arable land	1
154	U9	Part of the Borza lake.	2

Table 31 ID numbers, Á-NÉR codes and characterisation of patches of habitats patches observed in the environment of the planning area.

4.6.6.1. Route option 'A'

193+440 km section: the starting point of habitats mapping performed as part of biosphere conservation survey.

193+440 – 195+947 km section: The route is passing through arable land (T1; T: 1) by crossing smaller roads (dirt road, highway leaving to a site, see description below). See description and list of species in the general description of habitats.

195+947 – 195+962 km section: Crossing point of the Borza stream (OBxU8; T: 2). Channel bed is filled up by broad leaved Typhetum latifoliae. Edge of the stream bed is accompanied by Carex riparia in narrow lanes. Further aquatic and riparian plants: Berula erecta, Scrophularia umbrosa, Calystegia sepium, Solanum dulcamara, Angelica sylvestris, Lythrum salicaria, Sium latifolium, Symphytum officinale. In the channel and on its two banks intensive scrubbing can be observed the Salix cinerea and Cornus sanguinea. On

higher, drier parts of the embankment crown Rosa canina, Ligustrum vulgare, Rhamnus cathartica, Sambucus nigra, Amorpha fruticosa, Crataegus monogyna can be found. Sporadically individual trees are standing out from the closed scrub, like Morus alba. The unwooded parts on the bank of the channel are characterised by weedy, uncharacteristic, mesic grasslands. The arable land comes close to the edge of the channel, therefore because of its direct proximity nutrient leaching from the steep slope is quite significant. This is well shown by the vegetation of the channel. Decisive grass species include Elymus repens, Dactylis glomerata, Arrhenatherum elatius, Cynodon dactylon. Further plant species observed: Rubus caesius, Linaria vulgaris, Pastinaca sativa, Melandrium album, Sorghum halepense, Amaranthus retroflexus, Amaranthus powellii, Chenopodium album, Carduus acanthoides, Portulaca oleracea, Galium mollugo, Cirsium arvense, Picris hieracioides, Erigeron annuus, Carex hirta, Lactuca serriola, Polygonum aviculare, Reseda lutea, Xanthium italicum, Salvia nemorosa, Sonchus asper, Cichorium intybus, Tripleurospermum inodorum, Persicaria lapathifolia, Ambrosia artemisifolia. In addition to invasive Solidago gigantea, weedy patches consist of the closed stocks of Urtica dioica or Conium maculatum in addition to the nitrophil species.

Figure 16 The route is fundamentally passing across large parcels agricultural lands, but crosses watercourses at a number of points. The picture shows the Borza stream in among agricultural areas. (195+962 km section.)

The Borza lake is west of the planned route hardly at a distance of 300 meters (U9). It was artificially established by a dam on the Borza stream. The water surface is weed-free. Aquatic -riparian herbaceous vegetation can only be found on a narrow lane (1-2 m wide) along the banks. Smaller patches of broad leaved Typhetum latifoliae, narrow leaved Typhetum angustifoliae and Sparganietum erecti are alternating. Further plant species observed: Iris pseudacorus, Epilobium hirsutum, Lythrum salicaria, Calystegia sepium, Lycopus europaeus. Considering ligneous vegetation woody, scrubby lane consisting of

natural softwood species can only be observed in the shore zone of the lake. Some of them are of plantation origin like Salix alba 'Tristis', Morus alba, or Populus ×euramericana. Other ligneous species observed: Salix alba, Salix cinerea, Amorpha fruticosa. On the steep slopes on both side young acacia would can be seen. Under the acacia trees the nitrophil scrub level indicating the usual nutrient surplus and herbaceous species stock can be found.

196+162 – 196+180 km section: Crossing point of highway No. 5703 leading from Bóly to Nagynyárád (U11 and OBx(P2b); T: 1 and 2). The road is accompanied on the road side by uncharacteristic, mesic grasslands loaded by arable land weeds. Beyond the regularly mowed lane sporadic scrubs and woodland is growing in the ditch along the road. Scrub consist of Cornus sanguinea, Crataegus monogyna, Sambucus nigra, Euonymus europaeus, and Rosa canina, which forms a narrow lane along the road, closed in some places, hardly possible. From among rare species in the lane along the road defined Lycium barbarum. Characteristic species among individual trees standing far from each other is Juglans regia, Morus alba. The decisive grass species is Elymus repens, Arrhenatherum elatius, and in some places Calamagrostis epigeios. Further plant species observed: Setaria pumila, Lathyrus tuberosus, Linaria vulgaris, Glechoma hederacea, Anagallis arvensis, Knautia arvensis, Papaver rhoeas, Malva neglecta, Galium mollugo, Stachys annua, Erigeron annuus, Picris hieracioides, Dactylis glomerata, Taraxacum officinale, Salvia nemorosa, Clinopodium vulgare, Plantago major, Trifolium repens, Verbascum blattaria, Artemisia vulgaris, Verbena officinalis, Melandrium album, Galium aparine, Sambucus ebulus, Chenopodium album, Carduus acanthoides, Salvia verticillata, Rubus caesius, Onopordum acanthium) Silene vulgaris, Verbascum nigrum, Ballota nigra. In addition to invasive Solidago gigantea, weedy patches consist of the closed stocks of Urtica dioica or Conium maculatum in addition to the nitrophil species. In the lane along the road the invasive Phytolacca americana occurs at a number of points.

In the direction of Nagynyárád, along the highway east of the route, at a distance of 360 m the Nagynyárád railway station can be found belonging to the Pécs-Villány-Mohács railway line.

196+180 – 196+480 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

196+480 – 196+500 km section: Crossing point of Versendi watercourse (B1ax(P2a); T: 3). In contrast with the topographic map, the narrow grassland lane earlier accompanying the watercourse was ploughed up. At the crossing point indicated the Versendi watercourse is running among agricultural fields that can be characterised by steep mountain slope of large extension. In the narrow ditch of the watercourse Phragmitetum communis can be found. Calystegia sepium and Humulus lupulus is climbing up on the reed. The reed has opening at certain places and on the more open parts smaller patches of Sparganietum erecti, Glycerietum maximae – or Galio palustris-Caricetum ripariae can be observed. Due to strong flow only small patches of Lemnetum minoris can be observed. Other plant species to be found in the shore or close to the shore zone: Lythrum salicaria, Persicaria amphibia, Scrophularia umbrosa. The route of the watercourse on this section is fundamentally without any trees, with the exception of some fragile Salix fragilis and Salix cinerea along its line. Coming close to the railway embankment, the lanes along the watercourse get wider and closed thorny scrubs of Prunus spinosa can be observed together with specimen of Sambucus nigra. Right next to the railway bank on the bank of the watercourse an old Salix fragilis tree can be seen. The watercourse bed is accompanied by weedy, mesic grassland in a narrow lane. Further plant species observed: Althaea officinalis, Urtica dioica, Arctium lappa, Conium maculatum, Echium vulgare. On the side with the arable land, with a varied width,

invasive Solidago gigantea is also accompanying in the watercourse for quite a distance. On the right side of the watercourse access water covered plain of large extension is generated temporarily. In the year of the survey this area was totally dried up, which the farmer ploughed again after the harvest up to the bank of the watercourse. Further plant species observed: Juncus inflexus, Juncus articulatus, Epilobium parviflorum, Schoenoplectus lacustris, Rumex palustris, Xanthium strumarium, Xanthium italicum.

Figure 17 Place of crossing the Versendi watercourse. In the narrow ditch of the watercourse reeds can be seen (Phragmitetum communis). The access water covered flat area in its fore ground was ploughed by the farmer when it dried up up to the edge of the watercourse bank (196+500 km section).

196+500 – 196+678 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

196+678 – 196+835 km section: Crossing the Pécs-Vilány-Mohács railroad and the non-native deciduous forests and plantations mixed with native tree species on the two sides of the railway track (U11 and RDb; T: 1 and 2). The railway embankment is directly accompanied by a closed woods-scrub lane. The woody lane is climbing up as high as the crown of the embankment. The lane is fundamentally determined by Robinia pseudoacacia and Juglans regia. The woody lane is further increased by spontaneous specimen of other native and non-native species, like Tilia tomentosa, Pinus sylvestris, Populus nigra, Populus alba, Salix alba, Ulmus laevis, Betula pendula, Acer pseudoplatanus, Ulmus minor, Acer campestre, Celtis occidentalis. Scattered plantation of Populus ×euramericana can also be found. Scrub consist of Cornus sanguinea, Prunus spinosa, Crataegus monogyna, Sambucus nigra, Ligustrum vulgare, Rhamnus cathartica, Euonymus europaeus, Rubus fruticosus agg and Rosa canina constitting a closed not accessible lane on the slope of the embankment and at the foot of the

embankment up to the edge of the arable land. A closed stock of Sambucus nigra can be found under the acacia.. Humulus lupulus, Vitis vulpina, Clematis vitalba appear in patches separated from each other as load plants on trees and scrubs. Due to strong shadowing herb level is very sparse or missing. Urtica dioica is decisive in herb level. Further plant species observed: Brachypodium sylvaticum, Geum urbanum, Bromus sterilis, Anthriscus cerefolium, Viola hirta, Glechoma hederacea, Arctium lappa. Galium odoratum and Carex sylvatica belong to among the more interesting species.

Small parts with no woods are covered by grasslands of high resistance species well adapted to the dry, semi-dry production site conditions of the embankement. Similarly to the highway here again large weedy patches can be observed with Urtica dioica, Conium maculatum. Decisive grass species include Elymus repens, Calamagrostis epigeios, Dactylis glomerata, Bromus sterilis, Arrhenatherum elatius, Cynodon dactylon. Further plant species observed: Setaria pumila, Digitaria sanguinalis, Sambucus ebulus, Galium mollugo, Silene vulgaris, Carduus acanthoides, Chondrilla juncea, Torilis arvensis, Daucus carota, Tragopogon orientalis, Fallopia dumetorum, Chelidonium majus, Melica altissima, Rubus caesius, Physalis alkekengi, Anthriscus cerefolium. In the lane along the railroad the invasive Phytolacca americana occurs at a number of points.

196+835 – 197+000 km section: In the Nagynyárádi plain area the former woody patch of mixed composition is followed by an uncharacteristic softwood forest and plantation lane and reeds (RB and B1ax(B4); T: 3 and 3-4). In front of the reeds, at a varied width, old Salix alba and Populus alba and Fraxinus angustifolia subsp. pannonica speciment can be found. They used to be the former natural vegetation among which later walnut tree became established. Thi si followed at a deeper point by the mixed stock of reeds and Salix cinerea. Several hundreds of Carex paniculata can be found along the edges of the reeds.

Figure 18 The area called „Nagynyárádi-lapos" close to the crossing by route A. At the deepest part of the plain area it affects uncharacteristic softwood forest lane and reeds. The plain area is fed by a watercourse

having no name fed by a spring among the mountain (197+095 km section). The photo was made at the corner of the black walnut forest.

A narrow watercourse having no name and fed by a spring is running from the south in the deep among the mountains in between the railway embankment and the Versendi watercourse through the area called Nagynyárádi-lapos. The patches of reeds, Salix cinerea and alder stocks of the above mentioned deep lying plain are fed by this watercourse. In the beginning its water was flowing without a definite watercourse bed towards the slope in a film-like manner. Due to wild wallowing at certain sections a watercourse bed was deepened which was further deepened by the flowing water. The water of the spring is collected by the Versendi watercourse. The watercourse and the related lane of varied width (20-50 m) covered by vegetation has a direct contract with agricultural areas on both sides on its section in between the mountains. It is strongly felt on its vegetation left in the narrow lane (a significant part of its southern section was ploughed in in the recent years). On the edges closed Solidago gigantea lane can be found (OBxB5x(B4); T: 3). In this lane the natural vegetation was moorish meadow only traces of which have been left like Poa trivialis. In the middle part where there is continuous water leakage mixed stock of high sedge and tussock sedge can be found. High sedge is represented by Carex riparia, while tussock sledge by scattered specimen of Carex paniculata.

Figure 19 Route of the watercourse feeding the Nagynyárád-lapos is indicated by specimen of Carex paniculata. The while willow in background is in the planned route (197+085 km section).

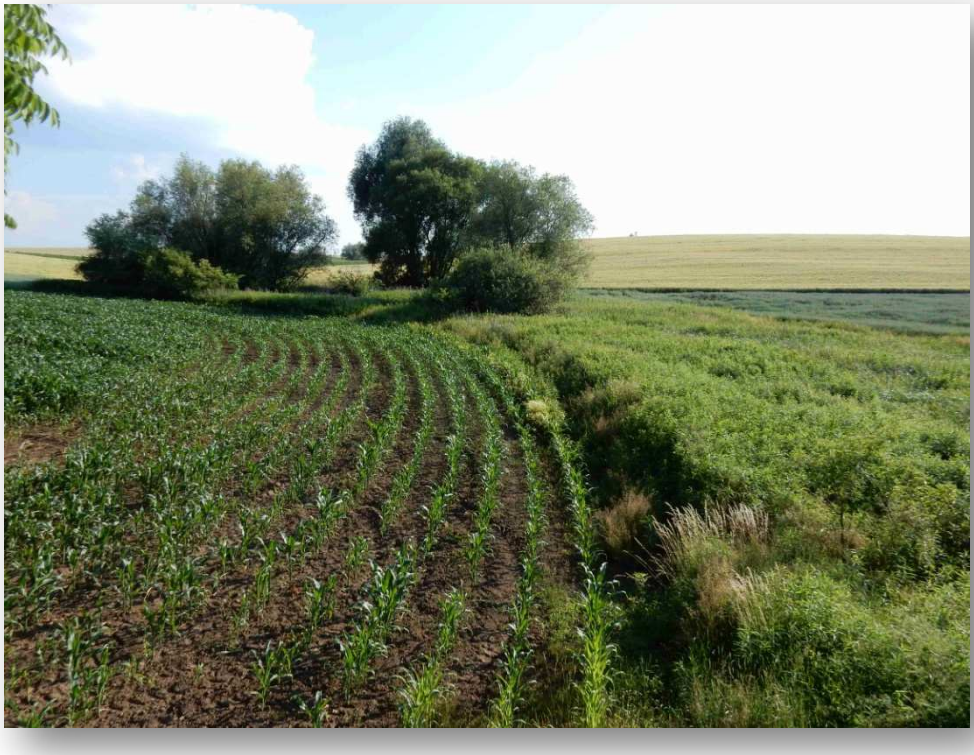


Figure 20 Out of the watercourse feeding the Nagynyárád-lapos is passing among agricultural areas along the deepest point among the mountains. The first plants of Carex paniculata appear before the group of trees and getting close to the plain their number is increasing. (197+095 km section).

197+000 – 197+095 km section: Juglans nigra plantation. (S3; T: 1-2). Under the old trees, on the second level there is Celtis occidentalis. It can be found planted in the marked patch but reproduced from seed it can also be found in other points of the area (e.g., on the edge of the reeds). The large number of specimen of different ages along the edge of the forest shows that it is able to get renewed spontaneously from seed. Its scrub level is determine in addition to Sambucus nigra by Cornus sanguinea, Clematis vitalba and Ligustrum vulgare. Its herb level is identical with that of the acacia, it is weedy and uncharacteristic. Observed plant species: Bromus sterilis, Anthriscus cerefolium, Chaerophyllum temulum, Dactylis glomerata, Lapsana communis, Brachypodium sylvaticum, Sisymbrium strictissimum, Torilis arvensis, Galium aparine. In the narrow grassland lane on its edge Elymus repens, Melandrium album, Sambucus ebulus can be found.

Figure 21 The spring of the watercourse feeding the Nagynyárád-lapos is in the reeds. In the picture the degraded high sedge can be seen at the crossing point [???] (197+500 km section).

197+095 – 200+140 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

200+140 – 200+225 km section: Crossing point of Majsi watercourse (Village lane watercourse) (B1a and RBxP2a; T: 3 and 3). The planned route crosses a relatively narrow reeds lane to be found in the neighbourhood of Töttös following the arable land, in between two lake units. The lakes (e.g., the 'Three wishes lake' of Töttös) was artificially established by a dam on the Majsi watercourse (Village lane watercourse) (dammed lake or cross filled up lake). The watercourse is surrounded by agricultural areas of large extension on own site on the studied area. Due to the direct vicinity of the arable land, significant quantity of artificial fertiliser is washed from the steep slopes of the mountains int the watercourse. The impact of this nutrient surpass can be well observed in the vegetation surrounding the lakes and watercourses. The narrow watercourse bed is filled up by reeds for the most part, but due to the intensive movement of wild game there are small sections where vegetation different from that can be observed. In addition to reeds, Glycerietum maximae and Galio palustris-Caricetum ripariae can also be observed. Other aquatic-riparion plant species observed: Iris pseudacorus, Calystegia sepium. Along the watercourse woods and scrubs growing can be observed with a varied rate along the sections. With attention to native species, ligneous vegetation species show great similarity with the species composition of saftwood woodlands but even inspite ofthat it cannot be considered semi-natural. Decisive species include include Salix alba, Salix fragilis and in addition, Juglans regia. On higher levels even Robinia pseudoacacia appears. Under the trees and in their environment the scrub

level is represented by Sambucus nigra, Rosa canina, Cornus sanguinea, Crataegus monogyna. In the watercourse bed in the deeper parts lonely or small groups of Salix cinerea can be found. On the trees and scrubs Humulus lupulus, Clematis vitalba and Parthenocissus inserta appear as burden plants.

Figure 22 The crossing point of Majsi watercourse (Village lane watercourse) is of Töttös. The planned route will cross a relatively narrow degraded reeds lane next to a watercourse (in the line of 200+140 – 200+225 km section).

At the crossing point the route is crossing weedy reed bed Phragmitetum communis poor in species and established on the two sides of the watercourse. In the dryer part of the reeds, Urtica dioica appears in masses indicating nutrient surplus, and scrubs of Sambucus nigra appear in the reeds. Further plants species observed in the weedy part: Stellaria media, Bromus sterilis, Echinochloa crus-galli, Glechoma hederacea, Rubus caesius, Arctium lappa, Lactuca serriola, Rumex crispus, Cirsium arvense, Phytolacca americana, Sambucus ebulus, Galium aparine, Conium maculatum. Certain parts of the one-time meadow vegetation can be recognised in the narrow lane between the reeds and the dirt road.

200+225 – 202+126 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

202+126 – 202+191 km section: Young Acacia stand (S1; 1-2). Young acacia stand which in terms of its structure and stock of species is identical with those of the young acacia stand indicated later. Signs of wild game movement are well visible everywhere under the forest. Further plant species observed: Brachypodium sylvaticum, Dactylis glomerata, Geranium robertianum, Geum urbanum, Hedera helix, Lapsana communis, Arctium lappa, Parietaria officinalis, Rubus caesius.

202+191 – 202+290 km section: Right after the young acacia stand in a narrow lane sporadic forest lane of mixed composition follows including Quercus robur, Quercus cerris, Juglans

regia and young planted Quercus rubra (RDb; T: 2) Its closed scrub level consists of Cornus sanguinea and Ligustrum vulgare. In smaller patches Hedera helix can also be observed. On herb level Bromus sterilis, Anthriscus cerefolium, Circaea lutetiana, Lamium maculatum, Carex sylvatica, Rumex sanguineus can be found.

Figure 23 Section of watercourse having no name, with no trees, accompanied by arable land south-east of Töttös. The planned route crosses the forest area on the left hand side of the picture, of to the arable land at the corner of the acacia stand. (in the line of 202+000 km section).

West of the planned route, from the gullet among the mountains a watercourse having no name has its spring. It reaches the planned route just after flowing the couple of hundreds of meters. Quantity of atmospheric precipitation largely influences its water discharge. It is flowing scattered on a lane of varied widths without having a definite watercourse bed at the feet of the hills. It is shallow (hardly 15 cm at the deepest point) and may even dry up temporarily. Small islands are integrated into its line, where closed stocks of Solidago gigantea can be found. Among the agricultural lands the watercourse is characterised by closed, unwooded vegetation (which sporadic Salix cinerea). Due to the vicinity of the arable land a significant amount of artificial fertiliser is washed into the watercourse. The high sedge vegetation of the watercourse is intensively weeded by Solidago gigantea and Urtica dioica on both sides. The middle part which is always wet is free from Solidago gigantea. In the middle line of the watercourse Catabrosa aquatica, Carex riparia and Carex acutiformis constitute the high sedge vegetation. Further plant species observed: Juncus inflexus, Alopecurus pratensis, Equisetum arvense, Epilobium hirsutum, Lythrum salicaria, Veronica anagallis-aquatica, Tussilago farfara, Symphytum officinale, Juncus effusus. Every 5-10 meters game trails cross the high sedges accompanying the watercourse in the line of the arable land.

Figure 24 At the intersection point of the watercourse patches of reeds and high sedges alternate with Salix cinerea scrubs and softwood woodlands tree species along the bank of the stream. At the fore ground Solidago gigantea while the background planted forest lane of Populus euramericana can be seen. (202+315 km section).

202+290 – 202+430 km section: At the crossing of the above mentioned watercourse the line of the watercourse bed is accompanied by close to natural vegetation burdened with weed species in a narrow strip. Patches of reeds and high sedges alternate with Salix cinerea scrub and softwood woodland tree species along the stream (RBxP2a and B1a; T: 3 and 3). Starting from the line of the forest Salix cinerea scrubs appear and then old Salix alba, Salix fragilis specimen and high sedges pass into the reed beds. A number of other tree species are added to the woods strip, some of them are the results of plantation others for established spontaneously, like Quercus robur, Populus ×euramericana, Juglans regia, Acer negundo and Cerasus avium. In the deepest, wettest parts directly on the line of the stream, the scrub level is given by Salix cinerea, Cornus sanguinea. On higher parts Crataegus monogyna and Prunus spinosa are decisive. Sporadically Euonymus europaeus also occurs. Due to strong shadowing and intensive pressure by wild game under scrub level herb level is missing or is very sparse. The observed plant species include: Brachypodium sylvaticum, Geum urbanum, Angelica sylvestris, Rubus caesius, Galium mollugo, Galeopsis speciosa, Festuca gigantea, Circaea lutetiana, Dactylis polygama, Lamium maculatum, Equisetum arvense, Arctium lappa, Lapsana communis, Prunella vulgaris. Clematis vitalba and Humulus lupulus is climbing up to the trees and scrubs.

Among the trees weedy Phragmitetum communis poor in species and high sedges (Carex riparia), (Carex acutiformis) can be found. Weeding by Solidago gigantea and Urtica dioica

is the consequence of more permanent drying up and continuous artificial fertiliser infiltration. Smaller open water parts of the stream can be found at points strongly shadowed by trees and scrubs. Plant species observed on the open water part: Alisma plantago-aquatica, Equisetum arvense, Veronica anagallis-aquatica, Berula erecta, Galium palustre, Ranunculus sceleratus, Catabrosa aquatica, Hypericum tetrapterum, Glyceria notata, Scrophularia umbrosa. As floating weed in the water Lemna minor is present. Due to intensive game movement in some places open sludgy patches hardly covered with vegetation can be observed. In addition to tramping these are also used as wallowing places.

202+430 – 202+443 km section: Among the planted woodland patches at the level of the stream and at higher levels the grassland remaining in a narrow strip can be qualified as uncharacteristic, mesic grassland (OB; T: 2). Characteristic weed species include Alopecurus pratensis, Poa pratensis and Festuca pratensis. Urtica dioica and invasive Solidago gigantea however, form large patches in it due to the infiltrating neutriant. Further plant species observed: Galium mollugo, Rubus caesius, Equisetum arvense.

202+443 – 202+513 km section: Young Acacia (S1; T: 1-2). The acacia (Robinia pseudoacacia) forms a monodominant weedy stock poor in species. Sporadically young Juglans regia, Morus alba and Acer pseudoplatanus also occur. In shrub level Sambucus nigra is decisive, but on the edges Crataegus monogyna, Prunus spinosa and Prunus cerasifera can also be found all along. Clematis vitalba is climbing up to the trees and shrubs. At herb level species like Bromus sterilis, Anthriscus cerefolium, Urtica dioica, and Chelidonium majus are decisive as species referring to nutrient surplus in accordance with the productive site.. Further plant species observed: Phytolacca americana (mainly in the edge parts), Ballota nigra,Elymus repens, Leonurus marrubiastrum.

The route comes close to the special nature conservation area called Töttösi-erdő (HUDD20065) between **202+500 and 204+500 km section**. The mosaic Natura 2000 site is not directly affected by the planned investment. See description of woody habitats determining its vegetation and the list of species in the general description of habitats.

200+225 – 202+126 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

202+760 – 202+890 km section: Older acacia stand (S1; T: 1-2), where sporadically native tree species specimen can be found. These include Carpinus betulus, Acer pseudoplatanus. In one patch Acer pseudolatanus occurs in plantation and this is the explanation for the occurrence of spread spöecimen. Non-native species include Juglans regia, Morus alba, Populus ×euramericana. Shrub level primarily occurs under the acacia trees whose decisive species is Sambucus nigra, but sporadically Crataegus monogyna, Ligustrum vulgare, Rosa canina and Rubus caesius also occur. In some patches invasive Parthenocissus inserta climbs up to the trees. Herb level is fragmented, which is determined by the species stock referring to nutrient surplus: Bromus sterilis, Anthriscus cerefolium, Stellaria media, Chelidonium majus, Urtica dioica, Galium aparine. Further plant species observed: Geum urbanum, Parietaria officinalis, Brachypodium sylvaticum, Torilis arvensis, Viola hirta.

202+890 – 203+491 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

203+491 – 203+522 km section: Crossing of highway 5704 from Töttös to Lippó and Bezedek. On the two sides of the highway the unwooded vegetation of the water drain ditch is uncharacteristic weedy (U11 and OBx(S6xP2b; T: 1 and 2). The grassland creating species are characteristic of mesic and semi-arid production sites, which are supplemented with arable land and ruderal weed species because of the proximity of the arable land.

Furthermore, a number of species can be observed of the dangerous invasive herbaceous species such as Solidago gigantea, Solidago canadensis, Phytolacca americana. The parts close to the road are regularly mowed they are less weedy. Decisive grass species here are Arrhenatherum elatius, Lolium perenne, Dactylis glomerata, Festuca pratensis. Non-mowed parts are characterised by the dominance of Calamagrostis epigeios, Solidago gigantea and Urtica dioica. Further plant species observed are: Sorghum halepense, Galium mollugo, Setaria pumila, Rumex crispus, Phytolacca americana, Rumex crispus, Melandrium album, Cirsium arvense, Salvia nemorosa, Erigeron annuus, Agrimonia eupatoria, Centaurea jacea, Setaria verticillata, Carduus acanthoides, Asclepias syriaca, Arctium lappa, Sambucus ebulus, Plantago lanceolata, Picris hieracioides, Glechoma hederacea, Linaria vulgaris, Cichorium intybus, Plantago major, Verbena officinalis, Falcaria vulgaris, Lotus corniculatus, Hypericum perforatum, Stachys germanica, Eryngium campestre, Ranunculus acris, Aster sp., Dipsacus fullonum, Trifolium campestre, Mentha longifolia. Species constituting the road side shrub patches include Sambucus nigra, Cornus sanguinea, Rubus fruticosus agg. and Prunus spinosa. Clematis vitalba climbs up to the trees and shrubs. Often trees stand out from the scrub. Mostly it is Robinia pseudoacacia but Morus alba and Acer pseudoplatanus can also be observed. The highway is crossed by significant wild game movement.

203+522 – 205+165 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

205+165 – 205+200 km section: Crossing narrow young acacia tree line and dirt road (U11 and S7; T: 1 and 1-2). Characteristics of the habitats are identical with those described in case of the acacia stands.

205+200– 209+663 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

At 207+165 km section the planned route comes to a distance of 150 m to the Serbian cemetery (S6) to be found in the vicinity of Lippó. See description of the cemetery and the list of species in the general description of habitats.

Figure 25 Crossing highway 5702 between Lippó and Kislippó. On the left side of the picture, along the Lippói trench, a number of lines of old Populus ×euramericana can be found. The planned orute is passing across arable land up to the national border (209+670 km section).

209+663– 209+670 km section: Crossing highway 5702 between Lippó and Kislippó. Along the highway, in a narrow strip, water drain ditch can be found and then up to the intersection point of the border, arable lands can be found. In the road side strip trees can be seen each at a distance from each other sporadically. The observed species include Juglans regia, Fraxinus angustifolia subsp. pannonica, Populus nigra. The unwooded vegetation of the ditch is the usual weedy uncharacteristic, mesic grassland. Due to regular mowing it is poor in species. At certain point large nitrophil weed patches can be observed with Urtica dioica and Conium maculatum. In the ditch individual specimen of reeds Phragmites australis can be observed. Plant species observed: Arrhenatherum elatius, Festuca pratensis, Elymus repens, Galium aparine, Polygonum aviculare, Bromus sterilis, Linaria vulgaris, Rubus caesius, Melandrium album, Carex hirta, Cirsium arvense, Sambucus ebulus, Torilis arvensis, Stellaria media, Phytolacca americana, Arctium lappa.

209+670– 212+105 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

Although in the east side, in the line of crossing highway 5702 between Lippó and Kislippó, the planned route is passing across arable land, but it comes close, within 200 m, to the woody scrub vegetation accompanying the Lippo trench. It is important because of the resting place/service station planned to be established before the state border. Both sides of the trench are surrounded by agricultural land of large extension as far as the state border. The Lippó trench carries water only temporarily. During permanent drought it fully dries up.

Its non-shadowed sections of small extension are covered by a carpet of Lemnetum minoris and narrow leaved Berula erecta. Further plant species observed: Symphytum officinale, Iris pseudacorus, Phragmites australis, Carex acutiformis, Carex riparia. Up to the Kislippó highway it is accompanied by spontaneous woodlands - scrub in a relative broad strip. Spontaneously established tree species include Salix alba, Salix fragilis, Salix purpurea, while from among non-native secies, Juglans regia occurs in messes. Under the trees closed scrub can be found. Scrub is constituted by species including Cornus sanguinea, Rosa canina, Prunus spinosa, Rhamnus cathartica, Sambucus nigra. Among the woody patches closed grassland contaminated by hardly possible reeds and Solidago gigantea. Further plant species observed: Calystegia sepium.

Beyond the highway, along the Lippói trench, a number of lines of old Populus ×euramericana can be found. In the middle of the area there is an artificial drinker for the game. The edge of the popular woodland is interrupted by Fraxinus angustifolia subsp. pannonica on a short section. On the Populus euramericana Juglans regia got also spontaneously established. Cornus sanguinea forms a closed shrub level under the lines of trees there is hardly possible, but sporadically Rosa canina and Amorpha fruticosa can also be found. Humulus lupulus and the invasive Parthenocissus inserta) climb to the shrubs. Herb level is uncharacteristic, weedy, loaded by arable land weeds in part. Plant species observed: Urtica dioica, Rubus caesius, Cucubalus baccifer, Symphytum officinale, Phytolacca americana, Calamagrostis epigeios, Elymus repens, Cirsium arvense, Cirsium vulgare, Torilis arvensis.

The Lippói trench is running parallel with the planned route up to **210+400 km section**. In the meantime the Populus ×euramericana is replaced by a woods shrub lane determined by native species of which sporadically old Populus euramericana specimen stand out. Patches of old Salix fragilis can be seen and in addition specimen of Juglans regia and Acer negundo can also be seen. In addition to Salix cinerea shrub level mainly consists of Cornus sanguinea. Among further observed shrub species defined Sambucus nigra. Herb level is weedy, uncharacteristic. It consists of mainly Solidago gigantea, Urtica dioica and Calamagrostis epigeios. Further plant species observed: Arctium lappa, Torilis arvensis.

212+105 km section: end point.

‘Am’ corrected route option

Planning of the 1a. sub-option (betétváltozat?) was necessary as during the biosphere protection surveys conducted in the vegetation period in 2015 have explored a number of values to be protected (habitats, species). The change was justified by the highly protected Ciconia nigranesting in the Nagynyárád flat area in addition to the significant effectiveness of Carex paniculata.

According to the current status of planning 1a. sub-option gradually get further away from route 1 at **195+450 km section**.

195+450– 196+154 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

195+948 – 195+963 km section: Crossing point of the Borza stream. See detailed analysis at route 1, **195+947 – 195+962 km section**.

195+163– 196+154 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

196+154 – 196+176 km section: Crossing point of highway No. 5703 leading from Bóly to Nagynyárád (U11 and OBx(P2b); T: 1 and 2). See detailed description of route 1 at **195+162 – 195+180 km section**.

196+176– 196+472 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

196+472 – 196+494 km section: Crossing point of Versendi watercourse (B1ax(P2a); T: 3). See detailed description of route 1 at **196+480 – 196+500 km section**.

196+494– 196+880 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

196+880 – 196+940 km section: Crossing the Pécs-Vilány-Mohács railroad and the non-native deciduous forests and plantations mixed with native tree species on the two sides of the railway track (U11 and Rdb; T: 1 and 2). See detailed description of route 1 at **196+678 – 196+835 km section**.

196+940– 197+458 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats.

197+458– 197+500 km section: Degraded marsh meadow and high sedges (OBx(B5); T: 2-3). Remnant of high sedges in the deep area in between the hills. Its upper part has recently been ploughed up. On the two sides it is accompanied by the invasive Solidago gigantea. In its medium line there is a degraded high sedges area with wallowing site. Plant species observed: Lythrum salicaria, Scrophularia umbrosa, Equisetum arvense, Epilobium hirsutum, Mentha aquatica, Cirsium canum, Epilobium parviflorum, Lycopus europaeus, Bolboschoenus maritimus, Sonchus arvensis, Mentha longifolia.

From the crossing point of 1a. sub-option vegetation changes as follows up to route 1: The reed bed which also includes the spring feeding the Nagynyárád flat area starts at the patch described above. The reed bed is highly poor in species, it is uncharacteristic mono-dominant stock. Solidago gigantea and Urtica dioica climbing under the reeds as well. Plant species observed at the edge of the reeds: Equisetum arvense, Urtica dioica. Trees, groups of trees stand out from the reeds constituting Salix alba, Salix fragilis and Salix cinerea. It is not possible to walk across the reeds because of the flowing water and the accumulated peat, only the path cleared by hunters can be used.

The reed bed comes to an end and is converted into a weedy vegetation of mixed composition. On its edges the invasive Solidago gigantea is decisive. The deep lying medium part is determined by marsh species. The high sedge consist of Carex riparia. Further plant species observed: Lythrum salicaria, Scrophularia umbrosa, Equisetum arvense, Epilobium hirsutum, Mentha aquatica, Cirsium canum, Epilobium parviflorum, Lycopus europaeus, Bolboschoenus maritimus, Sonchus arvensis, Mentha longifolia, Typha angustifolia, narrow leaved Berula erecta, broad leaved Sium latifolium. Disturbance is caused by intensive pressure from the game (large patches of wallowing). Bogs of protected Carex paniculata can also be found in this patch.

197+500– 199+900 km section: Arable land (T1; T: 1). See description and list of species in the general description of habitats. The sub-option is reconnected to route 1.

4.6.7. Protected plant species of community interest occurring on the impact area.

A number of nationally protected plant species had been found on the impact area. In respect of protected plant species, localities that have become known are shown in E.03.01 environmental layout plan.

No plant species of community interest occurs on the impact area.

4.6.7.1. Protected plant species found:

- ***Helleborus odorus*** – protected, nature conservation value: HUF 10,000

Member of early spring aspect of mesic, deciduous forest (in mixed beech and hornbeam forests of rock karst). Typical occurrence in continental and moderate climate areas, in deciduous forest. Its home is South-East Europe In Hungary it is native only in the Mecsek mountains and in South-Transdanubia. In the stocks of native species of good condition (hornbeam-oak, sessile oak) it is not rare in forest blocks under Natura 2000 protection (Töttösi-erdő (HUDD20065). In acacia stands planted in the place of oaks it is surviving as individual items. The route does not affect its stock in the region.

- ***Primula vulgaris*** – protected, nature conservation value: HUF 5,000

Member of the early spring aspect of mixed, mesic, sessile oak and beech forests, in canyon and woodlands. Its coherent areas are to be found in South and West Europe, as well as in Central Europe up to the line of the Alps and the Carpathians, and then it appears again on the shore of the North Sea. In Hungary it is frequent in west and South-Transdanubia, and also occurs sporadically in the Mátra, Bakony mountains, in the Balaton uplands and in the Keszthelyi mountains. From among the forest stocks of the Natura 2000 protection (Töttösi-erdő (HUDD20065) on the territory of the Majsi-Large-forest a stock of some ten pieces have been found in the sessile oak-beech forest part. The route does not affect its stock in the region.

- ***Carex paniculata*** – protected, nature conservation value: HUF 5,000

Standing in water it constitutes bogs of 20-100 cm in high sedges associations, in transitional, willow and birch and alder marches. On the area called Nagynyárád flat area (lapos), along the watercourse supplying water to the flat area, and in the edge of the reeds filling up the deepest point of the flat area several hundreds of stems have been found. Its stock in the region is affected by route 1.

As a result of the mapping of the protected plant species it can be stated that due to the planned investment, on construction of route 1 destruction of hundreds of *Carex paniculata stems can be expected*. 1a sub-option avoids the individual specimen of the stock.

4.6.8. Protected animal species of community interest occurring on the impact area.

Relatively little former information was available on the fauna of the impact area. The large body birds of the region are relatively well documented but only occasional ornithological occurrence data are available. In respect of the animal groups it can be stated in general that due to the use of the area fundamentally taxons having high degree resistance and well-tolerating disturbance are characteristic of the area. In the absence of special habitats and lack of disturbance where, valuable species only occur in small numbers.

4.6.8.1. Description of the fauna by taxon groups

Arthropods (Arthropoda)

From the entire territory of the route discussed a number of protected arthropod species have been found of which one is of community interest. These species are generally spread over the entire territory of Hungary, are species of high disturbance tolerance, which are not specialised for certain habitats or only to a small extend, therefore they have no indication (priority) nature. The planned investment is a hazard for the insect species mainly because of the destruction of habitats along the route and by promoting the degradation of the neighbouring habitats patches.

Species found:

- ***Iphiclides podalirius*** – protected, nature conservation value: HUF 10,000

Generally psread species in Hungary, which also occurs on the territory of orchards and sloe and scrubs. We have founded in the Töttösi forest but presumably in the semi-dry grasslands of the planning area (in edges of channels, roads, forest) it is generally spread. The planned road construction will certainly not endanger its local stock.

- ***Vanessa cardui*** – not protected

Broadly spread, poliphagous species which occurs in agricultural areas and in ruderal, vegetation covered areas as well. Data were recorded about it in the semi-dry grasslands of the planning area (occurring in thistle in rich channel banks and road sides). The planned road construction will presumably not endanger its local stock.

- ***Inachis io*** – protected, nature conservation value: HUF 2,000

Occurring in many places all over the country, a species having a stable stock. On the planning area it can be regularly observed as flying in. As its feed plant (nettle) lives sporadically on the planning area, the plant investment does not endanger its local stock.

- ***Aglais urticae*** – protected, nature conservation value: HUF 10,000

Occurring in many places all over the country, a species having a stable stock. The Aglais urticae is still very frequent today, and occurs everywhere in open habitats. It mainly lives in bushy forest edges, in open forest areas but it also occurs on arable lands, in gardens and parks - even in cities. It sucks out the nectar from thistle and elderberry. We managed to observed it at a number of points, namely along roads and channels. The planned road construction which certainly not endanger its local stock.

- ***Calopteryx splendens***– not protected

Can be found everywhere in flowing waters, in channels and ditches as well. It favours rich weed vegetation and shore vegetation. It has been observed in large messes along the route of the Versendi watercourse. Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built at the watercourses.

- ***Coenagrion pulchellum interruptum*** – not protected

It is more frequent in Hungary in the hilly and flat area. It is a dweller of marshy, moorish standing water rich in vegetation. It has been observed at a number of points. Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built at the watercourses.

- ***Orthetrum coerulescens*** – not protected

It habitats need can be well-designated, it is a dweller primarily of the peaty small waters, tranches, channels, smaller moorish waters, but it develops well in flowing and standing water alike. It is characteristic species of small watercourses, channels. It has been observed both in the Versendi watercourse and in the watercourse at the Töttösi forest. Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built at the watercourses.

- ***Lucanus cervus*** – of community interest, protected, nature conservation value: HUF 10,000

Species strongly tied to oak forests, where it can mainly be found on the trunk of the trees, in the crown of the trees or on branches fallen. A species occurring potentially both in the Pannonian-Balcanic Quercus cerris-Quercus petraea woodlands and Illyrian oak-hornbeam forests. It was observed during the survey. The planned route options do not affect the habitats, they are located at a larger distance from the axis of the route, therefore the impact of the planned development on the local stock of the species cannot be detected.

Amphibians (Amphibia)

Based on field surveys 6 protected amphibian species/species groups occurrence is for certain on the planning area along the route. It needs to be emphasised that amphibians sensitively respond to the changes in annual precipitation quantity, in optimal years a number of reproduction site are formed in the wet its (or even in arable fields), while in dry years they occur at most in the deep lying stable water bodies. On the planning area the occurrence of one more amphibians species of community interest is considered probable.

Species found:

- ***Common spadefoot*** *(Pelobates fuscus)* – protected, nature conservation value: HUF 10,000

It can be found in varied habitats, it gives preference mostly to areas with open, loose (sandy, loess) soil areas. For reproduction it searches for standing waters, smaller or larger lakes, or areas flooded by water, and it also favours water spaces rich in aquatic vegetation. In the access water covered flat areas of arable land affected by the planning area they could be found in a number of points until the middle of the summer when those parts dried up. In the vicinity of the route it doe not have a significant stock, therefore the planned investment impact on its local stock cannot be felt.

- **Bull frog group of species** (*Rana esculenta agg.,* in the region *R. esculenta, R. ridibunda*) – protected, nature conservation value: HUF 10,000

Taxons spread over the country, can be found the whole year in smaller number of specimen in marches of permanent water cover and channels, in the area a stock of a minimum of thousands can be presumed. Due to its mobility and broad resistance, none of the rout options would affect its stock negatively in particular. This amphibian group can be considered the most frequent as it can be found in every watercourse. Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built at the watercourses.

- ***Rana dalmatina*** – protected, nature conservation value: HUF 10,000

It is quite general in Hungary both on the plain as well as a mountainous areas. Comes out from winter rest only in the second half of March and then not much later eggs are lain. We find it in water only during this period. Grown up animals stay under the vegetation or the leaf-litter during the day, but cloudy weather of high humidity they are mostly active during the day as well. It was observed in the planning area in the Töttösi forest and on the territory of the Majsi-Large forest, it is rare. The route avoids its habitats therefore the planned investment will not affect its local stock.

- **European tree frog** (*Hyla arborea*) – protected, nature conservation value: HUF 10,000

Very frequent frog species all of the country, lives mainly in reeds and in wet meadows but in practice it may occur in any grassland or scrub habitats. Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built at the watercourses.

- **European green toad** *(Bufo viridis*) – protected, nature conservation value: HUF 10,000

Frequent frog species all over the country. It is most frequent in the flat area habitats of mostly sand soil; it feels at home in anthropogenic environment (e.g., in settlements) as well. It tolerates well dry habitats conditions, it may get away fro large distances from water spaces. During that time it often uses the channel to get spread. The route does not essentially affect its stock in the region.

- **Common toad - European toad** (*Bufo bufo*)– protected, nature conservation value: HUF 10,000

In Hungary, there is almost no habitats where it not present, but it occurs primarily in the plain and hilly areas. In spite of its occurrence in masses in some places it may be highly threatened as it has a number of natural enemies. On the planning area because of the above mentioned weather conditions and in spite of its frequency only a few specimen could be observed. In the absence of the effecting wetlands habitats (as reproduction sites) the implementation of the route we have a negligible negative impact.

- **European fire-bellied toud** *(Bombina bombina*), – protected, nature conservation value: HUF 10,000, Annex II. species

In rainy years, the access water patches of arable land are suitable for the European Fire-bellied toud (Bombina bombina) to get established there. During the survey on the impact area in the access water covered flat areas of small number only Pelobates fuscus larvae and some specimen could be seen. Access water covered flat areas for the most part are further away from the axis of the route, therefore the impact of the planned development on the local stock of the species cannot be detected.

In respect of species significant for nature conservation, the impact of the road is neutral or of negative nature of small extent. From among the most important threatening factors the termination of habitats can be excluded, but the moving of the appropriate habitats patches to a further distance, their degradation and degradation in water supply can also have an impact. The direct danger on the amphibian specimen during the construction can be avoided by selecting the appropriate time for the implementation (avoiding the reproduction period).

Reptiles (Reptilia)

During filed survey, along the planned route, occurrence of two frequent protected reptiles species became known. These species are generally spread over the entire territory of the country, they are frequent in some places and have relatively high disturbance tolerating ability. Reptiles species of community interest was not found.

Species found:

- **Grass snake** (*Natrix natrix*) – protected, nature conservation value: HUF 25,000

Frequent species all over the country, in contrast with its name it lives not only in wet land habitats but also in forests and in scrubs. On the area we found develop specimen at a number of points, usually in the ecotones of aquatic habitats and scrubs. On the entire planning area occurrence several hundreds of the specimen can be considered probable, the investment may have a negative impact of a small degree on its stock.

- **Sand lizard** (*Lacerta agilis*) – protected, nature conservation value: HUF 10,000

Frequent all over the country, occurs in different grass associations. It is sporadically widespread on the area studied in the narrow grass strips of roads, watercourses.

Nature conservation problems concerning reptiles are identical with those related to amphibians.

Birds (Aves)

In spite of the significant anthropogenic impact (extensive agricultural areas, linear infrastructures, etc.) the planning area has colourful, valuable bird fauna in line with the locally rich habitats and richness of habitats of neighbouring areas. Over 90% of the area is agricultural landscape, the mosaics in between (watercourses, forest strips, woody patches, forest areas) provide nesting and feeding site for a number of species.
On the line from Bóly to the state border a total of 62 nesting and 51 feeding species were found with regular occurrence.

Planned development may have an impact on the species enlisted in **bold**.

Bird species nesting on area affected by development

Bird species protected and of community interest

- **Black Stork (*Ciconia nigra*)** – highly protected

The most important nature conservation value of the studied area. Its nest can be found at a distance of 50 metres from the axis of route 1 in an undisturbed, old group of trees. Its protection is justified as of this is the only known nesting site in the region. In the environment of its nest a rather good quality wetland habitats can be found compared to the conditions of the region, which is the feeding area of the species. It is recommended to designate a protective zone of 300 metres and to modify the line axis of the line.

- **Red-backed shrike (*Lanius collurio)*** – protected

On intensive agriculture lands - what the impact area is like - it is extremely important to have a mosaic feature. Scrub lanes connecting different tree groups forest that are lining the linear infrastructure and other wood-scrub habitats are exclusive nesting places of this species. Their interruption decreases the number of plant of the population in the region directly (e.g., by the termination of the nesting site) and indirectly (e.g., by interference in the migration route). In the course of the investment attention should be paid to establish these scrub lanes and woody scrubs operating as ecological corridors, mitigating thereby the negative impact on species tied to similar life conditions.

- *Ficedula albicollis* – protected

Species of older closed forest. Such habitats types can only be found on the edges of the impact area. As these Natura 2000 forests will not be directly intervened thus, there is no impact on the number of specimen of the species.

- *Anthus campestris* – protected

Appeared primarily during the migration period on the surveyed area. During our study in the nesting period we manage to localise its nest on the basis of its sound on the sparse patches of dried up access waters. As it appears on the area only temporarily for nesting, investment will probably not have an impact on the species.

Protected bird species

- **Common linnet (*Carduelis cannabina*)** – protected

It builds up its nest in the scrub lanes, woody scrub lining the linear infrastructures and agricultural areas. Their interruption decreases the number of plant of the population in the region directly (e.g., by the termination of the nesting site) and indirectly (e.g., by interference in the migration route). In the course of the investment attention should be paid to establish these scrub lanes and woody scrubs operating as ecological corridors, mitigating thereby the negative impact on species tied to similar life conditions. Number of breeding pairs: 5-10.

- **Common white throat (*Sylvia communis*)** – protected

It is hatching in the scrub lanes, woody scrubs and forest edges lining the linear infrastructures and agricultural areas. Their interruption decreases the number of plant of the population in the region directly (e.g., by the termination of the nesting site) and indirectly (e.g., by interference in the migration route). In the course of the investment attention should be paid to establish these scrub lanes and woody scrubs operating as ecological corridors, mitigating thereby the negative impact on species tied to similar life conditions. Number of breeding pairs: 5-10.

- **European stone chat (*Saxicola torquata*)** – protected

It is hatching in the scrub lanes and woody scrub habitats and forest edges lining the linear infrastructures and agricultural areas. Their interruption decreases the number of plant of the population in the region directly (e.g., by the termination of the nesting site) and indirectly (e.g., by interference in the migration route). In the course of the investment attention should be paid to establish these scrub lanes and woody scrubs operating as ecological corridors, mitigating thereby the negative impact on species tied to similar life conditions. Number of breeding pairs: 5-10.

- **Long-eared Owl (*As otus)*** – protected

It may settle in any woody habitats where it finds abandoned nest suitable for it. Potential hazard infector is road accident. Number of breeding pairs: 2-4.

- **Eurasian scops Owl (*Otus scops)*** highly protected

It is hatching in hollow of old tree lines, forest edges lining open areas. As a result of motorway development the number of death caused by accident is increasing. Number of breeding pairs: 1-2.

- *Accipiter nisus* – protected

Nesting species of forests, tree groups. Its feeding area in practice affect all bird habitats. Number of breeding pairs: 2-5.

- *Buteo buteo – protected*

It may settle in any woody habitats, during the wintering period it is presently larger number on the area. Number of breeding pairs: 3-8.

- *Falco tinnunculus* – protected

It may settle in any woody habitats where it finds a suitable abandoned nest. Number of breeding pairs: 1-2.

- *Falco subbuteo* – protected

It may settle in any woody habitats where it finds abandoned nest suitable for it. Number of breeding pairs: 2-3.

- *Rallus aquaticus* – protected

It is nesting in the thick vegetation primarily in reeds of wetland habitats. Number of breeding pairs: 2-5.

- *Gallinula chloropus* – protected

Nesting bird of smaller-larger reeds accompanying open waters. Number of breeding pairs: 1-3.

- *Vanellus vanellus* – protected

It is breeding in the vicinity of temporary waters coming about on arable land, on the ground. Number of breeding pairs: 2-4.

- *Streptopelia turtur* – protected

It is nesting in the edge of forest, in tree lines accompanying roads. Number of breeding pairs: 5-10.

- *Upupa epops* – protected

It s breeding in the hollow trees, garden and ranch buildings of woody areas. It is feeding on the open area. Number of breeding pairs: 1-2.

- *Jynx torquilla* - protected

It is breeding in woodland, wood-scrub habitats forming mosaics on the grasslands. It settles in the hollows of the walnut trees lining the road. Number of breeding pairs: 1-2.

- *Picus viridis* – protected

Breeding in old trees of woodlands, tree groups along parks, wetland habiats, and important hollow making bird species. Number of breeding pairs: 1-2.

- *Dendrocopos major* – protected

It may settle in any woodlands habitats, where it finds all the trees in which it can prepare its hollow. Number of breeding pairs: 5-10

- *Galerida cristata* – protected

It is breeding in the edges of agricultural areas and roads, dirt roads. It is tied to bare or short grass areas. Number of breeding pairs: 20-40.

- *Alauda arvensis* – protected

Bird species occurring in open, woodless habitats, breeding on the ground. On the area surveyed it was breeding mainly on the agricultural area. Number of breeding pairs: 60-120.

- *Hirundo rustica* – protected

Bird species tied to animal husbandry, breeding on buildings. Number of breeding pairs: 2-5.

- *Motacilla flava* – protected

It is breeding exclusively in access water period, in the vicinity of waters retained ion the arable land, it is breeding on the soil Number of breeding pairs: 1-3.

- *Motacilla alba – protected*

It is nesting close the grasslands, open surfaces and wetlands habitats, and in buildings. Number of breeding pairs: 2-5.

- *Troglodytes troglodytes* – protected

It is nesting in the rich scrub level of closed forest. Number of breeding pairs: 1-5

- *Erithacus rubecula* – protected

Nesting bird of forests, woodlands scrub habitats of larger extension and of gardens. Number of breeding pairs: 10-15.

- *Luscinia megarhynchos* – protected

It is breeding in mesic scrub, in the scrub level of the forest. It prefers to breed in the thick scrub along the side of the railway embankment. Number of breeding pairs: 15-20.

- *Phoenicurus phoenicurus* – protected

Bird species tied to buildings. Number of breeding pairs: 1-5.

- *Turdus merula* – protected

Nesting bird of forests, woodlands scrub habitats of larger extension and of gardens. Number of breeding pairs: 10-15.

- *Turdus philomelos* – protected

It is nesting in the forest but it may settle in other closed woodlands habitats as well. Number of breeding pairs: 5-10.

- *Locustella luscinioides* – protected

Breeding bird of extensive closed reeds. Number of breeding pairs: 1-3.

- *Acrocephalus scirpaceus* – protected

Nesting bird of smaller-larger reeds of permanent water. Number of breeding pairs: 1-3.

- *Acrocephalus arundinaceus* – protected

Nesting bird of smaller-larger reeds accompanying open waters. Number of breeding pairs: 4-8.

- *Sylvia curruca* – protected

It is breeding in coherent, mesic scrub habitats and gardens. Number of breeding pairs: 2-5.

- *Sylvia atricapilla* – protected

It is breeding in coherent scrubs, in the scrub level of the mesic forest. Number of breeding pairs: 15-20.

- *Phylloscopus collybita* – protected

It is breeding in closed forest and mesic scrubs. Number of breeding pairs: 5-15.

- *Muscicapa striata* – protected

It is nesting in large groups of trees in mesic forest, wetland habitats. It builds its nest primarily on old trees or buildings. Number of breeding pairs: 5-10.

- *Aegithalos caudatus* – protected

Nesting in the forest but may get settled in other woody habitats as well. Number of breeding pairs: 5-10.

- *Poecile palustris* – protected

It is nesting in the older trees of oak stands, mixed oak forests. Number of breeding pairs: 2-5.

- *Cyanistes caeruleus* – protected

Nesting in the forest but may settle on other woodland habitats as well, if it finds appropriate hollows. Number of breeding pairs: 5-10.

- *Parus major* – protected

It is nesting in forests, groups of trees. It also occurs at settlements. Number of breeding pairs: 10-15

- *Sitta europaea* – protected

It is nesting in the forest but may settle in other more closed woodlands habitats as well. Number of breeding pairs: 5-10

- *Oriolus oriolus)*– protected

Nesting in the forest but may get settled in other woody habitats as well. Number of breeding pairs: 10-20.

- *Corvus corax – protected*

It is nesting in the forest but may settle in other more closed woodlands habitats as well. Number of breeding pairs: 1-3.

- *Passer montanus* – protected

Typical breeding species of bush strips lining agriculture areas and other non-woodland habitats. Number of breeding pairs: 30-50.

- *Fringilla coelebs* – protected

It is nesting in forests, groups of trees. Number of breeding pairs: 10-15.

- *Serinus serinus* – protected

It may settle in any woodlands scrub habitats, except close forest. Number of breeding pairs: 5-10.

- *Carduelis chloris* – protected

It occurs in all kinds of woodlands habitats, it builds up its nest mostly on evergreens. Number of breeding pairs: 5-10.

- *Carduelis carduelis* – protected

It is nesting in the woodlands areas. Number of breeding pairs: 15-20.

- *Emberiza citrinella – protected*

It is nesting in edges of forests and woodlands scrubs areas. Breeding pairs: 10-15.

- *Emberiza schoeniclus* – protected

It is nesting a smaller-larger reeds. Number of breeding pairs: 2-5.

Non-protected bird species

- **Pheasant (*Phasianus colchicus)*** – can be hunted

Its number is decreasing in intensive agricultural fields if due to the large extension of parcels hardly any grassland or scrub-grass lane is left along the boundaries. Habitat of this type is

further fragmented by the investment, decreasing thereby the nesting opportunities of species. Number of breeding pairs: 10-25.

- *Anas platyrhynchos*

It is nesting in the reeds of watercourses, artificial lakes. It is tied to water during the rearing of the young birds. Number of breeding pairs: 2-5.

- *Columba palumbus*

It may settle in any woodlands habitats, it is present on the area during migration period. Number of breeding pairs: 5-10.

- *Streptopelia decaocto*

Occurs in any woodlands habitats except in closed forests. It loves to nest in settlements as well. Number of breeding pairs: 10-15.

- *Garrulus glandarius*

It is nesting in woodland areas of large extension. Number of breeding pairs: 8-15.

- *Pica pica*

It may settle in any woodlands scrub habitats, except closed forest. Number of breeding pairs: 5-10.

- *Corvus corone*

It may settle in any woodlands habitats with the exception of closed forest. Number of breeding pairs: 10-15

- *Sturnus vulgaris*

It is species occurring in forests and in other woodlands habitats. Number of breeding pairs: 15-20.

- *Passer domesticus*

Bird species tied to buildings nesting in settlements. Number of breeding pairs: 5-10.

Bird species feeding on areas affected by the development

Bird species protected and of community interest

- *Milvus migrans* – highly protected

It is nesting outside the surveyed area at a distance of 450 m from the axis of the route in the closed forest, on Natura 2000 site. Theconstruction is not endangering its nesting site. In the area another 1 or 2 pairs are breeding whose territory also coincides with the areas affected by development. It is feeding on open areas, during migration period their number is increasing primarily in the plain areas.

- *Circus aeruginosus* – protected

It is breeding in closed reeds or perhaps in cereals. It has no nest known on areas affected by the development. Areas suitable for breeding can be found in the area but due to the excessively high number of wold boars and intensive farming cultures no successful hatching can be expected. The open habitats are significant feeding areas for pairs breeding in the region. Following harvest specimen nesting at a distance of 20 km appear. From the aspect of the species in the investment has no negative impact.

- **European night jar (*Caprimulgus europaeus*)**– protected

It is not breeding in the impact area, it appears on the territory during the migration period. Due to its lifestyle at night it is intensively endangered by run over.

- *Egretta alba* – highly protected

The small number of feeding individuals appear on arable land, wetland habitats. Their number is increasing in access water period and during winter. The investment causes no hazard for it.

- *Ciconia ciconia* – highly protected

On the settlements affected by the development 6 pairs are breeding which visit the impact area for the purpose of feeding. During migration period their number is increasing mainly in vole gradation years. From the aspect of the species in the investment has no negative impact.

- *Haliaeetus albicilla* – highly protected

A significant proportion of the domestic stock is breeding in South-Transdanubia. Outside the impact area the closest pair is breeding in the forest strip accompanying the rail road. Although its hunting rate is overlapping with the area affected by investment, but it does not negatively affected, it affects the extensive wetlands habitats being its main feeding area exclusively on a small part. In winter time, due to hunting for big game, the larger feed source keeps 1-5 individuals on the area.

- *Circus cyaneus* – protected

Wintering and migrating individuals appear on the open areas, mostly in the vole gradation years. Foreseeably the investment will have an impact on the wintering individuals.

- *Buteo rufinus* – highly protected

It may occur in any part of the year on the area in periods rich in food (harvest, vole gradation). During the survey, in the middle of June, we manage to observe one individual on the flat area. From the aspect of the species in the investment has no negative impact.

- ***Merlin (Falco columbarius)***– protected

A small number of wintering individuals appear on the open areas, in the scrub and tree lines. Its main sources of food on the area are the finch and sparrow species. The investment we have an indirect negative impact on the species. On the borders of intensive arable parcels, boundaries of roads, bush lanes important from the aspect of the bird fauna of agriculture areas have remained only in traces. The development will further fragment the coherent lanes, decreasing thereby the area for life of prey animals.

- *Falco cherrug* – highly protected

Wondering and migrating individuals appear on the area. During the time of increase number of dove and pigeon species beings its food at late summer and autumn period. The development will have no impact on the local occurrences of the species.

- *Dryocopus martius* – protected

Species of older closed forest. Such habitats types can only be found on the edges of the impact area. As these Natura 2000 forests will not be directly intervened thus, there is no impact on the number of specimen of the species.

- **Syrian wood packer (*Dendrocopos syriacus*)**– protected

It is a hollow making bird species of old tree lines, groups of trees and gardens. On the area surveyed we did not manage to find nest, only feeding individuals. Cleaning of tree lines will interrupt the coherent habitats of the species, decreasing the number of individuals. In case of development establishing hardwood tree lines is recommended.

- *Dendrocopos medius* – protected

Species of older closed oak forests. Such habitats types can only be found on the edges of the impact area. As these Natura 2000 forests will not be directly intervened thus, there is no impact on the number of specimen of the species.

Protected bird species

- **European bee-eater (*Merops apiaster*)**– highly protected

It regularly appears for feeding purposes on the impact area, in the vicinity of wetland habitats and forests. A smaller colony (8-10 pairs) is to be found at the distance of 300 metres from the surveyed area. The development will not negatively influence the stock. Potential positive impact may be the bank side to be established during earthwork, which will provide nesting places. Protection of these should be taken care of.

- **Quail (*Coturnix coturnix*)**– protected

It appears on the area only during migration period. Although its typical nesting site are on agricultural lands, during the present survey we did not manage to find one in the breeding period. On intensive agricultural fields it appears if due to the large extension of parcels hardly any grassland or scrub-grass lane is left along the boundaries. Habitat of this type is further fragmented by the investment, decreasing thereby the migration opportunities of species.

- **Barn owl (*Tyto alba*)**– highly protected

In the church towers of settlements n the neighbourhood of the impact area 4 pairs are nesting which are feeding on the site of the investment. Due to their lifestyle at night the greatest danger for them is run over.

- **Little owl (*Athene noctua*)**– highly protected

The open habitats of the impact area surveyed are the hunting area of pairs breeding in the agricultural buildings of the surrounding areas. Due to their lifestyle at night the greatest danger for them is run over.

- **Tawny owl (*Strix aluco*)**– protected

It is the night time predatory bird of forest and larger groups of trees in the environment of the impact area. Motorway development causes the danger of being run over due to its lifestyle at night.

Other bird species feeding on areas affected by the development and less important from the aspect of development

Protected bird species

- *Ardea cinerea* – protected
- *Milvus milvus* – highle protected
- *Accipiter gentilis* – protected
- *Buteo lagopus* – protected
- *Falco peregrinus* – highly protected
- *Larus ridibundus* – protected
- *Larus canus* – protected
- *Columba oenas* – protected
- *Cuculus canorus* – protected
- *Riparia riparia* – protected
- *Delichon urbica* – protected
- *Anthus trivialis* – protected
- *Prunella modularis* – protected
- *Saxicola rubetra* – protected
- *Oenanthe oenanthe* – protected
- *Turdus pilaris* – protected
- *Turdus viscivorus* – protected
- *Locustella fluviatilis* – protected
- *Acrocephalus schoenobaenus* – protected
- *Sylvia borin* – protected
- *Phylloscopus sibilatrix* – protected
- *Regulus regulus* – protected
- *Ficedula hypoleuca* – protected
- *Periparus ater* – protected
- *Certhia familiaris* – protected
- *Lanius excubitor* – protected

- *Corvus frugilegus* – protected
- *Fringilla montifringilla* – protected
- *Pyrrhula pyrrhula* – protected
- *Coccothraustes coccothraustes* – protected

Non-protected bird species
- *Cygnus olor*
- *Scolopax rusticola*
- *Larus cachinnans*

In case of most species significant for nature conservation reasons, the impact of the road is of negative nature only to a small extent. The most important threatening factors are termination of habitats as nesting sites, removal further away, degradation of appropriate habitats patches, increase of disturbance during construction. The direct danger on the bird species individuals can be prevented by construction of appropriate time (avoiding the reproduction period).

Mammals (Mammalia)

Protected species:
The **edible dormouse** (*Glis glis*) was observed a number of times in the brick cracks of the railway bridge south of the Nagynyárád railway stations, and signs of it have also be found in a trap placed (nibbled corn, apple and fallen hair). The Nagynyárád plain area is an excellent site for the species to stand their winter time hibernation there. It feeds on walnut and berry fruits in the vicinity. It is protected, its nature conservation value is HUF 50,000.
The **red squirrel** (*Sciurus vulgaris*) was observed a number of times during our field ours on the Töttösi forest and Nyárádi flat area. It is a species frequently occurring in the natural and human environment as well. Tree species to be found in the area are suitable for it both for rearing up the offspring and for finding food. It is protected, its nature conservation value is HUF 25,000.
We were able to show the **bicolored shrew** (*Crocidura leucodon*) from owl droppings. It is dwelling in open grasslands. Its main feed are insets but it also loves to feed on molluscs (snails) as well. It is a food animal for the fox, marten, ermine and owl. It is protected, its nature conservation value is HUF 25,000.
The **lesser white-toothed shrew** (*Crocidura suaveolens*) was also found in owl droppings. It avoids coherent forest blocks and dry areas poor in water, it occurs rather in mosaic vegetation area. It is searching for prey almost all day, mainly feeding on insects and their larvae. It is the food animal of fox, weasel, ermine and barn owl. It is protected, its nature conservation value is HUF 25,000.
The **harvest mouse** (*Micromys minutus*) was also found in owl droppings. Its area for life is thick bushes lining forest edges and buggy shores grown over by reeds and sedges of slow flowing waters, lakes, and weeds associations, cereals fields. Reeds covered with sedges on the area are a good nesting place for it. Its district for movement is small, it is sensitive to fragmentation. It is food for owls, shrikes, stokes and small body predators. It is protected, its nature conservation value is HUF 25,000.
Dead body of **northern white-breasted hedgehog** (*Erinaceus roumanicus*) was found at a number of points of the area.. It is a frequent species occurring both on urban areas as well as in natural habitats. Fallen trees, pile also also wood in the surrounding forest are suitable hiding places for it. It is feeding on insect, molluscs and smaller vertebrates. Its thorns provide

protection for it but wild boars easily trample it apart and eat it. It is protected, its nature conservation value is HUF 25,000.
The proof to the presence of the **European mole** (*Talpa europaea*) is the signs of digging.. It is a regular species occurring almost everywhere where the structure of the soil allows to do so. It is feeding on worms, smaller vertebrates and invertebrates. It spends most of the time under the grounds, if it comes to the surface it may become a prey to the fox, smaller predators, barn owl. It is protected, its nature conservation value is HUF 25,000.

In addition memos, spread in general over the entire territory of the country, frequent in places and relatively disturbance tolerant.

Non-protected species:
The **bank vole** (*Myodes glareolus*) was found in a trap in the Töttösi forest. It is generally well-spread, frequent species in forests, edges of forests. It is feeding on acorn (oak fruit, Quercus spp.), and cereals of agricultural fields. It is a food animal for the fox, badger, weasel, but the hedgehog and wild boar can also feed on it.
The **wood mouse** (*Apodemus sylvaticus*) is another characteristic species of the Töttösi forest which was also found in owl droppings analysis. It is also a frequent species, it lives in closed forest. It is feeding on berries, plant parts, acorn, walnut and fruit. It is one of the main food for the barn owl but the fox, the ermine, marten and barge may also feed on it.
From the traps place along the watercourses of the Töttösi forest we managed to find one species, the **striped field mouse** (*Apodemus agrarius*), which was also analysed from owl droppings. It was also found in the Nagynyárád flat area from similar habitats. This species is quite regular in South-Transdanubia, it especially likes open areas with dense vegetation but it frequently occurs also in forests, forest strips. It is the main food for owl, predatory birds, but it is also eaten by the weasel and the ermine.
The **yellow-necked mouse** (*Apodemus flavicollis*) was found in a trap on the territory of the Nagynyárád flat area. It was also shown from owl droppings. This forest mouse species is primarily herbivorous. It feeds on berries and oak fruit to be found in the area, but sometimes it also eats insects. It is a food animal of the marten, the ermine, the fox and the owl.
The **common vole** (*Microtus arvalis*) was also found in owl droppings. It is feeding on the mess species of agricultural areas, alfalfa, corn and cereals, it is easily reproduced and as such it can also be a pest. It is the food for the fox, the badger, the smaller body predators, the buzzard and the stoke.
The **house mouse** (*Mus musculus*) was found in owl droppings. It is strongly tight to human environment. It is feeding on cereals, corn (can also be a pest) and human foodstuff. It is food for owls and smaller predators. It may occur in granaries to be found in the area.
The **brown rat (***Rattus norvegicus*) was also found in owl droppings. It is a frequent species, it is tight to the human environment. It is omnivorous therefore it is able to live almost everywhere. It is food for owls, badger, marten and predator birds.

Potentially occurring protected and non-protected species on the area (on the basis of the literature):
The **hazel dormouse** (*Muscardinus avellanarius*) is probably nesting in hollows placed earlier on the territory of the Tötösi forest. As its name shows it main food is hazel which occurs on the territory of the significant number. It is food for mainly small body predators and owls. It is protected, its nature conservation value is HUF 50,000.
The **Eurasian water shrew** (*Neomys fodiens*) lives in wetland habitats but may wonder to the surrounding areas to find food. It is feeding on insects, larvae and molluscs as well as small fish

from the local streams or watercourses. Its main predator is the barn owl, but it may also become a prey to the otter (*Lutra lutra*). It is protected, its nature conservation value is HUF 50,000.
The **common shrew** (*Sorex araneus*) favors primarily the wet waterlogged areas but it also settles on drier habitats. It is feeding on molluscs, insects and worms. Due to its unpleasant smell it primarily food for the barn owl but smaller predators also feed on it. It is protected, its nature conservation value is HUF 25,000.
From among voles, **field vole** (*Microtus agrestis*) can occur.. It favours more mesic, wet habitats. It is feeding on green plant parts and grass seeds. It is food for barn owl, smaller predators and fox. It is protected, its nature conservation value is HUF 25,000.
The **European pine vole** (*Microtus subterraneus*) prefers habitats of diverse vegetation, it is feeding on plant parts, cereals seeds. It is feeding on green plant parts and grass seeds. It may be the prey of barn owl, the fox and smaller predators.
The occurrence of **otter** (*Lutra lutra*) can be taken for sure occasionally along the larger semi-natural watercourses (Borza stream, etc.), the species presumably has a stable stock in the region at the larger fishpond (Borza lake, Töttösi lake, Majsi fishponds). Unfavourable impacts of the road to be built on the species can be significantly mitigated by the proper implementation of engineering structures to be built along the watercourses. Based on the well-known mobility and tolerance to disturbance of the species, the route will not have major negative impact on the size of stock and nature conservation status of the species. It is highly protected, its nature conservation value is HUF 250,000.
The **European water vole** (*Arvicola amphibius*) may occur in the shore zone of lakes, marshes. It is feeding on the root zones. It may become a prey to barn owl, the weasel and the fox. It is not under protection.

In summation it can be stated that fallen or rotten trees, wood piles and railway level crossing which provides suitable hiding place for the small mammals can be found in the vegetation of both sample areas (the Töttösi forest, the Nagynyárád flat area). Nesting material is also available in abundance. Rodents caught in traps or determined from owl droppings or potentially occurring (squirrels, dormouse, mice, voles) feed on acorn (red oak, sessile oak, etc.) black and common walnut, hazel and green plant parts. The food of insectivores (shrews, hedgehogs, voles), feed on worms, insects, spiders, centipedes, snails of which a number of species can be found in the area. They can well adapt themselves to the changes in the forest in the course of the investment, and due to their fast reproduction ability they will occupy areas suitable at a distance. Therefore, they can serve as food for predator mammals and birds living in the areas just as before.

The absence of shrews (*Neomys* ssp., *Sorex* spp., *Crocidura* spp.) expected in trapping can be explained by the intensive insecticide use washed into the soil from the agricultural areas to be found next to the sample area. Due to their fast metabolism, shrews need continuous nutrient uptake, with the exception of a couple of hours of rest, they search for food almost a whole day. Therefore, if their food disappears from the surrounding area or it was not sufficient, the number of individuals of the species is decreasing.

Obviously there are also other small mammals and rodents (fox, weasel, badger), but we can safely state that they have a stock, and protection status that will not be substantially influenced by the planned development.
Due to their frequency and/or in the absence of being affected the described protected and non-protected species will not be permanently negatively influenced by the planned investment and due to their higher adaptability they are expected to be able to tolerate the change in their space for life.

4.6.9. Characterisation, dynamics, protection options for the game stock of the area

The planned route is passing across the South Transdanubia big game game management landscape, in the big game management district of the Dráva River (South Baranya County) district. It is the area situated on the territory of the Baranyai mountains and the Dráva River vicinity, which is bordered in the east by the Danube River. It is definitely distinguished from the northern part of Baranya mainly its deer stock density is smaller. But at the same time the stag stock of the district in the country is of the most valuable, and the flood plains along the Dráva and the Danube rivers also belong here. Fallow deer also occurs at a number of places in the district. The good quality roe stock of the area is also worth mentioning. The preservation of the genetically valuable deer stock in the game management district will be a decisive purpose of game management.

The big game stock survey conducted in autumn 2014 and spring 2015 has concluded that along the planned route, but also in its wider impact area a significant big game stock is present. From among species hunted, red deer, roe and wild bore are characteristic, but at the same time small game species, fazant and the European hare are also significant. In addition fur-bearing predators such as the fox and the badger can also be observed.

4.6.10. Movement of wild game stock, wildlife crossing structures

Due to the big game nature of the entire planning area, the wild life protective fence planned for the express way must be sized for big game (deer). It is justified to construct at least 2.40 m high protective fence in the interest of exclusion of the largest body big game, the red deer. Special attention must be paid to the maintenance of the protective fence. At multi-level junctions, it is advisable to build the protective fence up to the corrected section of the crossing roads in order to prevent access of the game into the carriageway.
Based on experiences of existing motorways, expressways with a protective fence, the hazardous sites in terms of access of game to the motorway are the junctions.
Along the route, considering the entire section, the reeds-scrub lanes along wetland habitats, watercourses are the places which orientate and attract big game as drinking and feeding sites, the regularly used changers are placed accordingly.
Wildlife crossing structure should be placed in accordance with the area conditions. Among these local conditions, they are ideal in lanes next to watercourses, therefore, we recommend to place the wildlife crossing structures connected to bridges over watercourses. Dimensions of these crossing structure should be coordinated with the applicable ÚT 2-1.304 requirement, with special attention to this outdoor index, whose expected smallest value is 1.5. Considering the width of the carriageway characteristically as 30-35 m, attention should be paid to the fact that sufficient space should be left on the two sides of the watercourse, with sufficient height. The dike of the bridged watercourse should not be included in the depth, only the flat terrain next to it. As characteristic to deers, engineering structures are planned to have minimum 4 m height (this is in line with the expert opinion of the hunting authority as well). Care should be taken to have trees and shrubs lines along the path visually leading up to the wild life crossing structure. When they became sparse or disappeared during operation, their substitution must be provided for with no delay.

Proposed site for wildlife crossing structures (in accordance with the wildlife density of the area and migration directions):

Km section		Name and engineering structure	planned hole width
"A"	„Am"		
193+905	193+905	Over path above dirt road and wildlife crossing structure	35 m
200+182.60	200+260	Viaduct above Majs watercourse and wildlife crossing structure above 2 dirt roads	120 m
202+430	202+505	Viaduct above Szilvás stream and wildlife crossing structure above 2 dirt roads	200 m
208+180	208+255	Under path under wildlife crossing structure	Upper transfer
210+039	210+114	Under path under wildlife crossing structure	Upper transfer

4.6.11. Expected impacts of the planned investment on the biosphere of the studied area

Expected impacts should be looked at from two aspects: impact caused by construction and impact caused by later regular operation. It must also be borne in mind that the current leave of anthropogenic origin disturbance on the area comes only from agricultural activity, with the exception of a few sections. Animals can easily get adapted to this extent, which means that in an area with a low level of disturbance a radical change will take place. Due to the newly built section, load from disturbance will increase.

4.6.11.1.Impact of the construction phase

On the site of the earthworks and along the route of the embankment, the habitats and the biosphere there will be irreversibly and significantly damaged.
Traffic increased due to transportation will temporarily produce higher environmental pollution during construction (air quality degradation, noise load, soil contamination). A special form of environment pollution is the disturbance caused by human presence. This disturbance may change the regular behaviour of animals in certain period (e.g., in reproduction periods, in winter time food shortage period when a number of animal species come together in large groups).

Disturbance of individuals of species under protection or of community interest

The direct disturbing effect of construction will be limited to the carriageway and the lane on its sides, outside the 50 m wide direct impact area (in practice: on the construction area) it can be felt in a couple of hundreds meters width. Its main source will be noise, in smaller degree, it will be vibration. The degree of disturbance during construction will largely depend on the selection of the time for the performance of the activity, shrub removal performed at inappropriate time is detrimental e.g., for nesting birds. During construction, it may be a realistic danger that the storage on machines, materials may cause damages outside the narrowly understood construction area in the vegetation and in the stocks of protected species, whose option should be excluded. Disturbance during construction is temporary, it is connected to the phases of work.

Pollution

If technological discipline is complied with sedimentation and pollution may not be transferred into the waters running parallel and crossed at a number of sites during construction, therefore, damage to aquatic living organisms cannot be considered probable.
During operation and duty emergencies, contamination may get to the wet road surface. Contamination may cause damage in the metabolism of animals (mainly of amphibians). However, the probability of significant damage on the area is small, as contamination cannot get as far as the recipient even in case of an emergency event. Rainwater running off from the surface cannot be directly transferred into open living waters.

Desposal and target exploration sites
Establishing disposal and target exploration sites (see chapter 2.6.3.) in the wrong place may cause desctruction and degradation of valuable habitats patches and disturbance of certain flora and flora groups. By careful selection of disposal and target exploration sites, degradation of the status of semi-natural habitats can be avoided, disturbance of fauna and flora of community interest and under protection can be prevented.

4.6.11.2.Impact of the infrastructure

The most significant threatening impact of the infrastructure is habitats fragmentation and as a result, isolation. The wider carriageway is an impossible physical barrier for groups of animals living on the ground surface and unable to fly, but as a 'psychological' barrier, it may prevent the spread, migration of other animals, which may result in the fragmentation, impoverishment and even destruction of the populations. In case of certain mammal and bird species maintaining large territories, hunting areas, possibility for passing over the area concerned is terminated or decreased.

Destruction, transformation, degradation of semi-natural habitats or habitats of community interest
The planned investment does not affect habitats of community interest, its destruction, transformation or degradation cannot be expected.
From among semi-natural habitats, route 'A', affects a woodland patch of mixed composition, a softwood uncharacteristic forest lane of native tree species and reeds. Several hundreds of Carex paniculata stems can be found at the edges of the reeds. The expressway to be built on an embankment will change the current water balance conditions of the flat area, which may affect a still remaining alder and bush willow stocks of good condition at a distance from the route.
Sub-option 'Am' avoids the Nagynyárád flat area by not affecting the protected species and not influencing unfavourably the current water balance conditions of the flat area.

Destruction of individual animals of species under protection or of community interest
On habitats on the impact area direct threat to individuals of species under protection, or of community interest which are not able for movement or hardly able to move must be expected. These are plants and some members of the insect fauna tied to the special habitats. More mobile individuals of vertebrate species are less threatened by direct destruction (exceptions are e.g., affectedness of reproduction sites during construction, or increase of run over by vehicle during operation), in their case, the negative impact of the transformation of the habitats or disturbance is much more significant.
We managed to detect the occurrence of a number of protected insect species on the impact area, the planned investment cannot cause significant direct destruction in any of the species.

In case of most of the amphibian, reptile species under protection, there is no threat of direct destruction.

In the event of implementation of investment, destruction of plan species stocks of community interest (Natura 2000) cannot be expected.
As a result of mapping the protected plan species, it can be stated that due to the planned investment, if route 'A' is built, destruction of hundreds of *Carex paniculata* stems can be expected. Sub-option 'Am' avoids the individuals of the stock.

Fragmentation of habitats, isolation of population

From among the impacts of the roads on biosphere, habitats fragmentation can be called the most significant. Habitats fragmentation is a process in the course of which the size of a large coherent habitats decreases and gets divided up into a number of pieces. When habitats is destroyed, small scattered pieces may remain, which are isolated from each other while unsuitable habitats (roads, agricultural areas). If populations living on the habitats patches remain isolated permanently, they may get ultimately eroded and their genetic diversity may decrease.
The planned investment will have significant fragmentation impact mainly in case of the wild game stock. With respect to plant species, fragmentation as a threat is less important than the threat of direct destruction and habitats degradation.

4.6.11.3.Impact of motorway use/operation

During use - and even during construction – the area may get directly damaged due to contamination (crewed oil derivatives, etc.). This cannot happen if expectations described in technical specifications are complied with, we can expect damages caused by contamination during emergencies at most. In an emergency case, a number of contamination (e.g., salt, detrimental organic substance, mineral nutrients, etc.) may get to the road surface and due to rainwater drainage, it may directly get into the deep areas along the road. Contamination from an emergency may cause problems for a number of groups of animals (especially insects, amphibians and reptiles are at a risk). Contamination may damage the metabolism of the animals, which may lead to bad general health condition and often direct death.
Disturbing effects include light pollution, and noise and vibration load. Light pollution includes light issued by vehicle traffic in the course of motorway use and lighting of facilities necessary for operation (resting places, lighting of junctions). Artificial lights encourage animal groups pursuing nigh time lifestyle towards light sources. Lights of vehicles in the dark not only attracts the animals, but also destroy them by running over or crashing them causing a decrease of detectable number of individuals, and depending on the population size of a given species, it may threaten its survival. Affected animals groups include insects pursuing night lifestyle and flying to the light, insects pursuing night lifestyle i the vicinity of the motorway unable to fly but moving to the light and pursuing predatory lifestyle, birds (owls) and mammals (bats) pursuing night lifestyle and flying to the light.
Another type of pollution is noise and vibration load as a result of which a number of vertebrate species sensitive to disturbance can ultimately leave the direct vicinity of the road. All animal groups are affected whose communication by sound is unfavourably impacted by noise and vibration. Their place is taken over by generalist species.

Destruction of individual animals of species under protection or of community interest

With respect to vertebrates, one of the most discussed subject is run over by vehicle on public road and technical solutions on how to decrease it. From among vertebrates, amphibians are the

group which both in its number of individuals and also in the number of species is at threat in particular, as at least in one season of the year, they are characterised by high migration (egg laying) to traditional habitats that they have used often for centuries.
Domestic experiences show that traffic is less dangerous to reptiles. One reason is that in case of reptiles, there is no concentrated migration like in case of amphibians, populations in general have a smaller number of individuals, on the other hand, most reptiles, lizard species in the first place, have a more efficient flight strategy.
From among small mammals and medium size mammals, both are exposed to the risk of being run over, in whose nutrition materials of animal or plan origin to be found on the roads play an important role in their nutrition, and where the route of the given road crosses their migration route. Hedge hogs, certain shrew species, hamster, certain vaul??? and mouse species feed on the remnants of run over animals.
In respect of birds, direct threat due to construction is expected to be negligible. When the expressway is constructed, occasion run over can be expected, as a the carriageway running on the embankment crosses the usual flying route of the birds which may be moderated by different measures. Run over can be expected mainly in case of accipitry birds, owls and certain songbirds.

Disturbance of individuals of species under protection or of community interest
With respect to arthropods, amphibians, reptiles, the negative role of the expected disturbance is meagre. This should be considered as a source of threat mainly with regard to birds and wild game stock.

The highly protected black stoke (Ciconia nigra) nesting in the Nagynyárád flat area is to be highlighted as its nest is located at a distance of 50 m from the axis of route 'A' in an undisturbed group of old trees.

Later, during regular operation, even load can be expected where vehicles leaving the direct carriageway (accidentally or intentionally) cannot be expected.

4.6.11.4.Proposals for bio-monitoring

The planned route passes across arable land in over 90%. Habitats affected outside the arable land (watercourses and their environment, lines of trees, smaller forest patches, forest blocks) show varied naturalness status. Based on the surveys, with the exception of black stoke (Ciconia nigra), no serious nature conservation value occurs on the impact area.

On the basis of field experiences available, it can be stated that the implementation of the planned route does not cause complex nature conservation problem which would require afterwards bio-monitoring tests.

4.6.12. Protective measures, requirements

- During implementation, effort should be made that in the environment of protected (belonging to the ecological network) or Natura 2000 sites and other semi-natural status habitats (Nagynyárád flat area) works should be performed only on the direct lane of the road sign exclusively within the borders of mandatory purchased land, in the interest of avoiding disturbance and damage to neighbouring habitats.

- On protected areas (belonging to the ecological network) or on Natura 2000 sites and other semi-natural status areas situated in the vicinity of the planned route no reception or disposal site can be established for the storage of debris, construction materials and machinery not even temporarily, and no target exploration site can be established.
- When opening target exploration sites, patches of good naturalness status should be avoided. The construction material sites and sites used for disposal of humus layer should be designated at easily accessible sites (on arable land, ruderal area, etc.) avoiding patches of good naturalness status. Prior to designating disposal sites and earth excavation sites, preliminary opinion of the nature conservation authority must be requested (according to the above criteria), also covering access roads.
- Passages at watercourse crossings should be built in a way that allows to have open space between the bank lane accompanying the watercourse and the lower part of the over path at a minimum that enables large body animal species birds occurring in the area to use it as a passage.
- In the interest of the protection of protected species and species of community interest tied to the wetland habitats attention should be paid to the preservation of water quality of crossing watercourses in the course of implementation, in the interest to avoid the contamination of watercourses emergency no storage site or disposal site can be established in the vicinity of the watercourse.
- Crossed watercourse bed can only be covered as technically justified and up to the necessary degree by using environment and nature friendly materials.
- On the impact area of the planned route, in the interest of the protection of amphibians, reptiles in wetland habitats and excess waters, it is necessary to apply limitation on work during the reproduction period. For this purpose, it is not allowed to perform earthwork between 1 March and 15 June on this area (if fundamental spatial planning has already been done and there are no wetland habitats, the work started can be pursued in that period as well). If due to dry weather conditions, no ponds temporary inundations occur, following preliminary consultation with the nature conservation manager work can be pursued on the potential habitats, and the temporary limitation can be resolved.
- Steep wall pits (e.g., trenches) generated during construction activity should not be left uncovered for several days as it may cause the mortality of the individuals of small mammals, amphibians. Before filling up the puts, doing the earthwork it should be made sure that no animals have fallen into it and work can only be pursued after rescuing them.
- Technical parameters of culverts, engineering structures designed for crossed watercourses (diameter, cross sectional size) are in compliance with the ÚT 2-1.304 road requirements applicable to the arrangement of frog crossing structures. At design, attention should be paid that crossing structures should not be covered by water during springtime movement, not even in excess water years.
- For the purpose of protecting small mammals and medium-size mammals and to prevent access of wild bore to the carriageway, the protective fence should be built 30 m deep into the soil.
- Movement of small mammals and medium-sited mammals is ensured by larger size watercourses crossed by the route and dirt road passages built with multi-level junction in part but not sufficiently. Further crossing structure for small mammals and medium-sized mammals is not recommended.
- Attention should be paid to adjusting the linear infrastructure into the landscape. Along the route, the embankment can be adjusted into the landscape by the alternating woodlands and shrub plantations on the two sides. Concerning the plantation of trees and shrubs, and also with respect to protective forest plantation, the list of planned tree and shrub species and the plantation plan must be submitted to the first instance authority and the Danube-Dráva National

Park Directorate requesting their opinion. In the compilation of the list of species, native species appropriate for production site conditions and well-tolerating extensive maintenance and trees wit long lifecycle, rich in canopy keeping it for a long time primarily hard canopy species should be applied. Species recommended for plantation: trees: Quercus robur, Quercus petraea, Quercus cerris, Tilia tomentosa, Fraxinus angustifolia subsp. pannonica, Acer campestre, Ulmus minor, Populus alba, Populus nigra; shrubs: Prunus spinosa, Crataegus monogyna, Rosa canina, Euonymus europaeus, Ligustrum vulgare, Rhamnus catharticus.

- Tree and shrub plantation on the embankment and protective tree plantation should be performed in late autumn or early spring depending on the condition of the soil. In order to prevent undesired weeding and spread of invasive species, the area affected by construction should be mowed for 3 years, minimum two times each year. Protective tree plantation should be pursued until gaps occur in the lines. Substitution should be done by species which prove to be best during afforestation from among plants planned for the area. Following planting, young trees should be taken care of in the interest of their healthy development. Areas in between lines of trees should be cultivated in the first five years manually or by using a weed control equipment.
- Electric wires are a threat for birds because of electric shock and hit. In areas with no trees, birds often use electric wires and poles for sitting there. The high wire poles that are to be standardised or replaced should be equipped with bird protection devices in the line of the Natura 2000 site. Due to the arrangement of the cross structures of the tensioning posts it cannot be equipped with bird protection device, therefore, 780 mm insulation must be applied for bird protection. In case of certain service providers, 'V' bird friendly cross structure and covered power bonds as well as longer tensioning insulator (700 mm) should be applied. The directives and technological proposals (pole head structure) of the National Association of Ornithology and the power suppliers in Hungary elaborated for medium voltage (22 and 35 kV) free transmission lines as a solution for bird protection should be considered in design.
- Under local conditions, wild game movement is ideal in the lanes along the watercourses, therefore, it is recommended to establish wildlife crossing structures related to bridged watercourses. Dimensions of these crossing structure should be coordinated with the applicable ÚT 2-1.304 requirement, with special attention to this outdoor index, whose expected smallest value is 1.5.
- At multi-level junctions, build the protective fence up to the corrected section of the crossing roads in order to prevent access of the game into the carriageway.
- The height of the protective fence is 240 cm (sized for a deer). The protective fence will be formed of a fence placed on poles.
- During regular maintenance of the protective fences, the status and connection of the protective net shall be performed at least twice a year (in March, September) . Entry to the crossing structure should be made free from obstacles for the animals by removing the vegetation and litter. In the vicinity of the crossing structure, when doing vegetation cultivation, the original (planned or planted) vegetation should be renewed, depending on the habitats type, or on the basis of a nature conservation expert(s) opinion generation of a spontaneous vegetation cover should be promoted.
- Within a distance of 200-500 m from the junctions considered as places of risk for access of wild game it is recommended to plan a wild game jumping ramp.
- During construction, regular mowing of the area temporarily used must be taken care of in order to prevent weeding and spread of invasive species, at least 2 times a year in the first years following plantation.
- On the entire planning area, in planting trees and vegetation related to the expressway, effort should be made to apply native plant species/varieties characteristic of the landscape. Deviation from this is possible only in special cases for the purpose of nature conservation interests. In

the plantation plan, special attention should be made to the fact that no species/varieties are planted among other plants that are considered invasive in Hungary (their list is contained in Table No. 9 Invasive neo-phytons, study volumes of the Nature Conservation Office of the Ministry of Environment and Water. The plantation plan must be coordinated with the first instance authority and the Danube-Dráva National Park Directorate.

- When grassing slopes, embankments, species alien to the landscape such as Festuca rubra, Lolium multiflorum, etc. should be avoided, instead (depending on the production site)? application of Festuca pratensis, Festuca arundinacea, Lolium perenne, Poa pratensis, Festuca rupicola and Alopecurus pratensis is recommended.
- Regular mowing of the grassed areas is necessary (parts between the earthwork and the border of land to be purchased, areas affected by plantation) in the interest of preventing weeding and spread of invasive species, at least 2 times a year in the first three years following plantation.
- In implementation, the experts of the Danube-Dráva National Park Directorate and the Nature Conservation Patrol Service must be consulted. Prior to launching certain works in the vicinity of the Natura 2000 site, it is to be coordinated on-site with the employees of the Directorate in order to minimise damages to nature.

Bibliography

- BIHARI Z. – CSORBA G. – HELTAI M. (eds.): Magyarország emlőseinek atlasza. – Kossuth Könyvkiadó, Budapest, 360 pp.
- BORHIDI A. – SÁNTA A. (eds.) (1999): Vörös Könyv Magyarország növénytársulásairól I-II. – A KöM Természetvédelmi Hivatalának Tanulmánykötetei 6., 362 + 404 pp.
- BORHIDI A. (1996): An annotated checklist of the Hungariain plant communities I. The non-forest vegetation. In: BORHIDI A. (ed.): Critical revision of the Hungarian plant communities. – Janus Pannonius University, Pécs, pp.: 43–94.
- BÖLÖNI J. et al. (szerk.): Magyarország Élőhelyei. Vegetációtípusok leírása és határozója, ÁNÉR 2011. MTA Ökológiai és Botanikai Kutatóintézete, Vácrátót.
- Dövényi Z. (szerk.). (2010): Magyarország kistájainak katasztere - második, átdolgozott és bővített kiadás. – Budapest, Magyar Tudományos Akadémia, 876 pp.
- FARKAS S. (ed.) (1999): Magyarország védett növényei. – Mezőgazda Kiadó, Budapest, 416 pp.
- FEKETE G. – MOLNÁR ZS. – HORVÁTH F. (eds.) (1997): Nemzeti Biodiverzitás-monitorozó Rendszer II. A magyarországi élőhelyek leírása, határozója és a Nemzeti Élőhely-osztályozási rendszer. – Magyar Természettudományi Múzeum, Budapest, 374 pp.
- HARASZTHY L. (1998): Magyarország madarai. – Mezőgazda Kiadó, Budapest.
- KIRÁLY G. – MOLNÁR ZS. – BÖLÖNI J. – CSIKY J. – VOJTKÓ A. (szerk.) (2008): Magyarország földrajzi kistájainak növényzete. – MTA ÖBKI, Vácrátót, 248 pp.
- KIRÁLY G. (szerk.) 2009. Új magyar füvészkönyv. Magyarország hajtásos növényei: Határozókulcsok, Aggteleki Nemzeti Park Igazgatóság, Jósvafő.
- KIRÁLY G., VIRÓK V., MOLNÁR V. A. (szerk.) 2011. Új magyar füvészkönyv. Magyarország hajtásos növényei: Ábrák, Aggteleki Nemzeti Park Igazgatóság, Jósvafő.
- KUN A. – MOLNÁR ZS. (1999): A Nemzeti Biodiverzitás Monitorozó Rendszer XI. – Élőhelytérképezés, Scientia Kiadó, Budapest.
- MIHÁLY B. – BOTTA-DUKÁT Z. (2004): Özönnövények. – TermészetBúvár Alapítvány Kiadó, Budapest.
- PUKY M. – SCHÁD P. – SZÖVÉNYI G. (2005): Magyarország herpetológiai atlasza. – Varangy Akciócsoport Egyesület, Budapest.
- SEREGÉLYES T. – S. CSOMÓS Á. (1995): Hogyan készítsünk vegetációtérképeket? (How to prepare vegetation maps?) – Tilia **1**: 158–169.
- STANDOVÁR, T. & PRIMACK, R. (2001): A természetvédelmi biológia alapjai. Nemzeti Tankönyvkiadó, Budapest.
- TAKÁCS G. – MOLNÁR ZS. – BIRÓ M. – BÖLÖNI J. – HORVÁTH F. – KUN A. (2009): Élőhely-térképezés. Második átdolgozott kiadás. Nemzeti Biodiverzitás-monitorozó Rendszer Kézikönyvei IX. MTA ÖBKI - KvVM, Vácrátót – Budapest, 77 pp.

Websites

- http://natura2000.eea.europa.eu/Natura2000/ SDF.aspx?site= HUDD20065

4.7. BUILT ENVIRONMENT

4.7.1. Study of the current status

4.7.1.1. Micro-regions and affected settlements

The planned routes affect the public administration area of the following settlements:
Babarc, Szajk, Nagynyárád, Bóly, Töttös, Lippó, Ivándárda.

Routes affect the public administration area of settlements belonging to the Mohács micro-region, the Bóly and mohács district.

Micro-region base data		Bóly micro-region	Mohács micro-region
Area (km^2)		220.03	600.98
Population (persons)		12 055	35 796
Number of settlements		16	26
Legal status	city	1	1
	község	15	25
Population density (person/km^2)		55	60

Table 32 Regions affected by M6 and their data

Almost half of the settlements of the micro-region belong to tiny and small settlement category, which are primarily located on the less favourable conditions hillsides and many of them are bags settlements. According to a study performed by the RKK Great Plain Scientific Institute of the Hungarian Academy of Sciences, the micro-region belongs into the so-called "rural micro-region category', that is less than 50% of the population of the region live on settlements with a population density of 120 persons/km^2. In further classification of the study, it is considered as a rural and small town micro-region as less than 50% of the population lives in towns.
Mohács, the primary centre of the micro-region had a very fast development as early as in the Middle Ages due to its excellent geographical energy (Danube waterway, and the proximity of the Pannonia-Moesia military road). The designation of the Tryannon national borders meant for Mohács that part of its former agglomeration was separated from it. Former agglomeration studies have stated the Mohács used to be a significant settlement not because of the large extension of its public administration area, number of population, but mainly because of the size of its agglomeration and radiating power of its central role.
The coop centre of the micro-region, Bóly, was given more significant supply and development role in line with its rank as a town on 1 July 1997.

The value of agricultural enterprises per one thousand person is higher than the national average in the Mohács micro-region, that is, this micro-region has a large number of enterprises in agricultural sector. Based on the number of enterprises - share in each sector exceeding 10% - trade, repair, real estate, economic services, industry and agriculture are to be highlighted, as these sectors give over 67% of the operating enterprises in the region.

The industry of the region is primarily concentrating on Mohács, and looking at its structure it can be stated that agricultural processing industry has outstanding importance which grew out of traditional small plant processing industry. Its characteristic branches are: milling industry, mixed feed preparation, canning plant. Light industry has a significant share from the industry

of the region in which the following are decisive: furniture industry, silk production, textile and cloth industry, leather and shoemaking. Heavy industry established here when heavy industry development was done can also be found here with the most characteristic examples in machine and instruments and fibre board production.
Very little foreign capital came here, and the enterprises established here are mostly concentrating on Mohács and Bóly. There may be a number of reasons for this of which the infrastructure problems are slowly solved.

The industry of the micro-region has been stagnating since the change of the political system as privatisation was not companied by fresh capital investment, technology change, more significant innovation. A moderate role of industry was maintained, and it cannot be expected to have a decisively increased role in the economic structure of the micro-region. But at the same time, development options have improved due to change in its transport, logistic position and expected boost of world economy, which will promote in part growth of existing companies and generation of new investments on the other hand.

Data of settlements concerned	Population (inhabitants)	Area (ha)
Bóly district		
Babarc	723	1 885
Bóly	3 915	2 538
Szajk	829	1 136
Töttös	591	2 299
total	6 058	7 858
Compared to the micro-region	50%	36%
Mohács micro-region		
Nagynyárád	735	2 434
Lippó	483	1 453
Ivándárda	228	767
total	1 446	4 654
Compared to the micro-region	4%	8%

Table 33 Settlements affected by the route:

4.7.1.2. Description of settlements

Babarc:
Both the M6 Szekszárd – National border as well as the route of the connection to Pécs passes across its territory and the planned separation junction is also located on the public administration territory of Babarc.
The settlement is located at a distance of 206 km from Budapest and it is built along road 56113. Its terrain makes the landscape interesting, there are extensive arable lands, forests on the steep slopes and vineyards. The lands around have good fertility, but due to fragmentation, they are sensitive to erosion. Its vineyards belong to the feet of Mecsek Mountains wine growing region and the Versend district. North of main road 57, a fispond was established by building a dam on the Borza stream. German nationality people live on the settlement.
The Roman Catholic and the Reformed churches are historic monuments, in classicist style. In the vicinity of the village, Roman times archaeological findings are hidden. The village is fully

supplied with public utilities. Its population is decreasing, the difference of natural growth and migration is negative.

Szajk:

Town settled most north of main road 57, built on the bank of the Szajki watercourse, having a flowing direction from NW to SE. East of the residential area, extensive vineyards can be found with good location and soil, therefore, yield safety is high. South of the main road, there is a cemetery and an animal keeping facility, and some new enterprises. The brick factory in the vicinity of Babarc is no longer in operation, it is fully covered by weeds, it is an abandoned set of buildings going into ruins. The population of the settlement is around 800, population of German and Croatian nationality is significant. Its church, chapel and Calvary are historic monuments. It is fully supplied with public utilities. Bóly is a town of decisive importance of the region, it is just a few km away from Szajk and the two settlements are connected by a bicycle road. The municipality wants to offer house plots for building houses to fight against the ageing. Different kind of enterprises are active at the settlement providing jobs for the population. They are active partly in agriculture, partly in industry and also in services.

Bóly:

It is accessible from the direction of main roads 6, 56 and 57 as well as from roads 5701, 5703, 5704 and 5714.

Farming is pursued on high fertility lands, arable lands and vineyards. The successor organisations of the one-time State Farm in Bóly still produce high quality agricultural products. The Agricultural Production and Trade Rt. of Bóly employs a staff of 1,600 and performs the farming of approximately 18,000 ha productive land. Seed production and processing, as well as feed and fodder production and manufacturing are of high importance. In animal husbandry, dairy cattle, breeding sow, poultry and in a smaller scale, cold blood and sport horse breeding are performed. In addition to plant production and animal husbandry, the corporation is also active in wild life management on a territory of 34,000 ha where deer, roe, wild bore and small games can be found.

The settlement was given an opportunity in 1998 to establish an industrial park and an area more than 30 ha was designated for this. The enterprises settled there now employed several hundreds of people. Difficulty of road transport and the distance from Budapest makes development more difficult.

Tourism and relative visiting tourism of the German nationality have outstanding importance. From among its built environmental heritage, we have to mention the Batthyány estate remaining buildings, its Calvary and church and remnants of the Castrum of Roman times. The Batthyány Castle park and the line of sycamores are protected areas of local importance.

Nagynyárád:

It is at a distance of 15 km south-west of the neighbouring Mohács. It is accessible from Bóly or from Sátorhely by road 5703.

The village is situated in a nice surrounding, its territory is being fragmented by hills and valleys. The number of inhabitants is around 735, 60 % of which are of German mother tongue and they still speak the language in a special local dialect. The history of the settlement dates back to the end of the 11th century. Like in case of settlements of the region, agriculture is of decisive importance, industry fundamentally serves the needs of agriculture. The highly fertile lands of 40-45 gold crown are cultivated in large parcels by lease contract even following the transformation of ownership relations. They produce cereals and corn in the first place, which has a high yield here.

The village has a good infrastructure.

From the point of view of transport, it is quite closed as a settlement. By rail road it can be approached on the Mohács-Pécs line, its bus service needs improvement.
Fundamental services are available at the settlement but to keep the young people there is rather difficult as there are no jobs.
Its line of horse chestnut trees is a protected area of local importance, but part of the Béda-Karapancsi Landscape Protection District can also be found on its territory. Its baroque style Roman Catholic church is a historic monument, and one cellar building of the cellar lane is a historic monument type building.

Töttös:
It can be accessed by road 5704 riding towards south from Bóly, it is situated at a distance of 6 km. The village was built on the bank of one of the side branches of the Töttösi watercourse. Similarly to many other settlements in the vicinity, the structure of the village was determined by the topographical features. In the neighbourhood of the village on the south-west mountain slopes, grape production is pursued. In the former closed gardens, 105 cellars can be found, the wines produced here have reached very good ranking at wine competitions in the neighbourhood.
By putting a dam on the watercourse, a fishpond was established north of the village. And south-west of the settlement, there is quite a big forest block.
The first written records on the settlement date back to 1349, and all signs indicate that Töttös used to be an inhabited place even before. During Turkish occupation, the village became abandoned, and remain so for a long time. Major change came in the 18th century: Serbian, German and Croatian people arrived in a number of waves. When German nationality people were ousted following the Second World War, Hungarian people from the Uplands and from Transylvania came to settle here.
Until the change of the political system, public utilities were fully missing in practice. Roads, public buildings were in a rather bad condition. Public utility service was started in 1991 by the introduction of piped drinking water which was followed by telephone, gas supply and waste water collection.
The settlement has good employment indicators. Most people work in the former cooperatives and in the agricultural plant of Bóly or at a local floriculture facility where cut flower is produced in foil camps by mechanised irrigation.

Lippó:
It is accessible by roads 5702 or 5704 from the north. It is at a distance of 19 km from Mohács and 11 km from Boly.
Lippó is a characteristics little village in Baranya County with 203 houses and 483 inhabitants. It is a settlement of north-south orientation, a prolonged, typically one street settlement.
The village is mentioned in official documents as early as in the 13th century. During its stormy history, its population of 3 nationalities (Hungarian, German, Serbian-Croatian) suffered a lot of hardship. On the good quality lands neighbouring the village, agriculture always had the main role.
Some of the inhabitants work for the local agricultural enterprises (mainly in crop production), others work at Mohács or at the Agricultural Company in Bóly. The village has a nursery school, a school and a medical practitioner.

Ivándárda:
A settlement situated in the most southern corner of the county, which is accessible by road 5702 from Lippó or from Kislippó. It has a more even surface than the settlement described above, its territory directly extends to the national border.

The first written records of the settlement date back to the 13th century. Following the battle at Mohács, Germans and Serbians came to live here and by 1840, the German were already in majority. Nowadays Hungarians are again in majority in the village. The name of the village used to be Iván-Dárda even in the 19th century, its current name has been used since the turn of the century. At the census of 1900, there were 1,375 inhabitants of Ivándárda, in 1930, only 605. Nowadays it is only 290 inhabitants.
Local employment is extremely modest. Most of the employees find work at the agricultural enterprise in Lippó. Very few people work at Mohács.
Agricultural cultivation is pursued on 670 ha of the settlement. Földje csaknem egészében szántóterület. The little fishpond in the boundary of the village was dammed up.
The settlement is a village with one street. Most of its buildings are farmers houses with characteristic foundation and facade, with the related large economic additional buildings. The friendly picture of the village showing calmness is further reinforced by its tiny little church building and the surrounding cultivated park.

The infrastructure of Ivándárda has made a significant progress in the recent years. Piped drinking water supply and waste water collection have been solved. Natural gas has become available. The nursery school, education, health care, medical practitioner and nurse services are jointly organised with other partner villages.

4.7.2. Description of cultural heritage

4.7.2.1. Historic monuments

The planned options do not affect buildings under historic monument protection.

4.7.2.2. Archaeological sites

In respect of the planned route, the risk assessment part of the Preliminary Archaeological Documentation was prepared by the Forster Gyula National Heritage Protection and Asset Management Centre for the Feasibility Study (February 2015). The full work document can be found in the annexes, below we only describe the findings.

Based on the asset review, it has been ascertained that the planned investment will affect and threaten a total of 7 registered archaeological sites, and another 4 registered archaeological sites can be found in its 250 m environment.

Name of site	*ID*	Status	Situation
Babarc-Korpádi puszták lane	37604	can be excavated	affected
Nagynyárád-M60/85. lh.	52481	can be excavated	affected
Nagynyárád-M6 route, site 68	33255	can be excavated	affected
Nagynyárád-M60/86. lh.	52484	can be excavated	affected
Bóly-Sajti lane II.	33256	can be excavated	avoided
Bóly-under the railway	33257	can be excavated	avoided
Bóly-M60/88. lh, Erdős lane	52490	can be excavated	affected
Töttös-M60/87. lh., Alsómegye lane	52489	to be avoided in part (circular ditch system)	affected
Töttös-M6 route, site 71	33258	can be excavated	avoided
Töttös-M6 route, site 72	33259	can be excavated	avoided

Ivándárda-M60/89. lh.	52491	can be excavated	affected

Table 34 Archaeological sites based on the risk assessment work by the Forster Centre

According to the information received from the Forster Centre, 11 sites to be found at 200+000 km is a circular ditch system, whose protection is of priority importance. For the precise measurement of the extension of the site, the Centre performed geophysical analysis, magnetic measurement on the basis of which the extension of the site could be precisely detected.
Due to other restrictions, the planned route could not be changed in order to avoid the site, therefore, after coordination with the specialist design colleagues, by amending the longitudinal section on the current plan level, we recommended transfer on a 2 m high embankment. The Preliminary Archaeological Documentation prepared by the Forster Centre is part of the current plan documentation

4.7.3. Public utilities

The routes of the planned road section is crossed by public utilities. During planning, coordination was performed with the authorities performing supervision of the public utilities concerned and with the public utility owners and operators. But we want to note that during the preparation of the road construction licensing plans, the competent persons were contacted again for data supply purposes.

The crossing points of public utilities crossed by the planned routes is contained in Chapter 2.5.

The 20 kV air wires to be replaced along the new route and the establishment of gas lines are subject to EVD. The impact of replacement on certain environmental compartment have been studied in the present plan. See the list in Chapter 2.5.4

Bird protection

On the overhead line poles to be standardised or replaced bird protection shoes must be introduced. Due to the arrangement of the cross structures of the tensioning posts it cannot be equipped with bird protection device, therefore, 780 mm insulation must be applied for bird protection. In case of certain service providers, 'V' bird friendly cross structure and covered power bonds as well as longer tensioning insulator (700 mm) are applied.

4.7.4. Changes in status on construction of the motorway

4.7.4.1. Study method, rules of law referred to

The settlements spatial plan data, information available on the website of the villages, and meetings with the local municipalities have been the basis of the environmental description of the settlement.
The planned routes were coordinated with the municipalities and we also considered their perspective development needs and opportunities
We studied the relation of the routes and the regional development plans and then we analysed the changes to take place on the impact area.

Rules of law:

Act LXXVIII. of 1997 on the Formation and Protection of the Built Environment

253/1997. (XII. 20.) Government Decree on national settlement spatial planning and construction requirements
Act XXVI of 2003 on the National Spatial Plan

4.7.4.2. Impact of the infrastructure

The impact of the infrastructure is demonstrated in separating outer or inner areas by the road, in area reduction due to land use, and in the change of the value of the areas (appreciation or depreciation). The latter occurs as an indirect impact, with a time lag, following the putting in service of the road. Occurrence of related infrastructure and other facilities can also be expected in relation with the construction of the road.

The separating impact and the land area decreasing impact will occur directly with the start of the construction.
The planned road will cut apart areas that could be passed with no obstacle earlier, as well as the existing road network. The separating impact can be mitigated by the construction of crossing structures, junctions. Accessibility of agricultural areas must be ensured. Crossing of roads should always be done by a crossing structure of a different level.
In terms of land use, with regard to the new route, attention should also be paid to the significant area demand of the resting places and junctions to be built.

Value of residential areas in the vicinity of the infrastructure may decrease following putting in service due to increased traffic, while that of certain areas may increase due to better accessibility.

4.7.4.3. Impact of the construction phase

In the construction phase, the harmful environmental impacts causing the degradation of the built environment and factors triggering both may be the following:

Triggering factor	Form of occurrence
Air pollution	Corrosion damages
Soil and groundwater contamination	Corrosion damages
Change in soil mechanical characteristics and groundwater level	Sinks, slides, stability, statical problems
Vibration load	Structural damage
Non-appropriate handling of construction waste	Contamination by waste, surface contamination

Table 35 Harmful impacts on the built environment and triggering factors12

Harmful environmental impact on the built environment

Construction will exercise significant impact on the residential area if construction is performed directly next to the residential area or the transportation routes cut across residential areas. In the present plan phase, we have no information about large volume transportation routes, therefore, e can establish the grade of he actual impact only at a later stage, when the constructor

[12]Source: Település és épített környezet állapota-Kristóf Andrea

is known and in possession of the organisation plan. In the elaboration of the organisation plan applicable to the time of construction, outstanding attention should be paid to residential and other buildings requiring protection in the vicinity, and the daily maximum operation time and interval of performing activities generating significant noise, vibration or air pollution should be determined on the basis of that.

In the interest of the protection of the archaeological heritage, special care should be applied in relation with change of construction and establishment of crop, as by any implementation work going underneath the ground archaeological heritage may get destroyed. All activities involving earthwork deeper than 30 cm are subject to a licence.

In case of all archaeological monuments and findings found not by an archaeological excavation effort should be made to preserve the archaeological heritage on-site. If in the pursuit of any activity archaeological monument or finding is found unexpectedly, the entity (constructor, investor) is obliged to stop the activity with no delay pursuant to the heritage protection law and report the monument of finding to the notary of the municipality or the museum having territorial competence and take care of the guarding of the site and the finding.
Cultural heritage components should be searched, inventorised, valuated by scientific methods and preserved for the offsprings and make them available to them.

4.7.4.4. Impact of motorway use

Impact of motorway use may be positive or negative. The planned investment may bring about the re-arrangement of traffic and thereby impact on certain parts of the settlement may change: it may increase in certain places at other places it may decrease. Changes in noise and air pollution loads is described in the relevant specific chapters.
Re-arrangement of transit traffic from the current main roads may affect the commercial and service sector of the affected areas.

4.7.4.5. Alignment with the town plans and spatial planning

<u>On national level</u>

National Spatial Plan

Act XXVI of 2003 on the National Spatial Plan still valid (as amended in 2008) provides for the spatial arrangement of transport infrastructure networks of national importance.

Annex 1/a of the Act includes

M6 expressway
Budapest (M0) - Dunaújváros - Szekszárd - Bóly–Ivándárda area - (Croatia)

as planned infrastructural component.

The route indicated in the structural plan of the National Spatial Plan is identical with the option studied in the current plan.

<u>On county level</u>

Baranya County Spatial Plan

The spatial plan of the county concerned (Baranya County) Annex No. 2 of Assembly Decree No. 9/2005 (V.12.) on the Baranya County Spatial Plan by the Baranya County Municipality Assembly) contains the studied route.

On settlement level

The purpose of the regulation plans for the urban areas is that all spatial problems caused by the new infrastructure on the territory affected by the new main transport route should be managed in accordance with the legislation.

Purpose of regulating plans for the external areas:

The construciton area of the motorway and its exits are classified into transport zone.

- It determines the construciton and use limitations determiend by the transport authorities, environmental authorities, soil mechanic experts, etc. within the 2x250 m protective zone.
- Designates the necessary protective forest lanes.
- Examines the environmental extra load generated by the new infrastructure and keeps it within the framework set in legislation by the tools available.
- Established the other necessary regulaitons.

By the amendment of the Settlement Spatial Plans, the areas concerned are re-classified into the transport zone in the structural plan and external area regulation plan. If necessary, the traffic work parts are amended and special requirements of the expressway are incorporated into the Local Building Code

Settlements affected by the routes have the following spatial plan tools:

settlement	length affected (m)	nature of the area (urban, external)	structural plan	regulation plan Local building code
Babarc	1085	external area	Resolution No. 104/2003 (X.15.)	Decree No. 11/2003 (X.15.)
Szajk	615	external area	Decree No. 1/2005 (II.01.)	6/2007. (V.25.) Decree No. 5/2010. (II.15.) ör. Decree No. 2/2011. (III. 18.)
Nagynyárád	905	external area	no data	Decree No. 4/2007 (III.28)
Bóly	1913	external area	adopted by Resolution No. 63/2007 (VIII.07.), as amended several times	Bóly, local building code amended a number of times (consolidated version) – Decree No. 201310/2007.(VIII.10.)
Töttös	5800	external area	no data	Decree No. 2/1999. (X.25.)

Lippó	5548	external area	Decree No. 9/2001 (XII.01.)
Ivándárda	2380	external area	Decree No. 11/2001 (XII.29.)

Figure 26 Spatial plans of settlement affected

Babarc:
The spatial plan of Babarc is from 2003, during the time since the, M6-M60 separation junction and the Babarc section of the M60 expressway were built (M57 expressway on the design sheet) with different route. The route of the studied section in the present plan is slightly deviates from what is contained in the regulation plan (~100 m).

The route does not affect the development ideas of the settlement, it is passing across arable land far from urban areas.

Szajk:
The motorway uses the area of Szajk on a length of about 600 m. The settlement has no objections concerning the route, it is running all along arable land, far away from urban area. The route included in the regulation plan is identical with the one examined in the current plan. A waste water sludge composting facility, whose accessibility must be ensured is to be found at a distance of 145 m on the right side of the motorway.

Figure 27 Photo of Lajos Farm

Nagynyárád:
The route affects the area of the settlement on 2 short sections, one is along road 5703 where a junction will be constructed. The settlement structure plan contains a slightly differnet route and junction. According to the land registry office map, the route passes across arable land, the structural plan registers the surrounding areas as public road area, and in the vicinity of the junction, commercial and servicing areas are indicated.

Bóly:

The route included in the regulation plan is identical with option 1 studied in the current plan. The route is passing across agricultural areas, it is crossing railroad and then on a short section it affects forest area and a marsh.
The dirt road leading to the Seed Plant, running parallel with the railway is an agricultural exploratory route of high importance, often used good status, whose suitability for use needs to be secured in the future as well.

Töttös:
The route affects its territory on the eastern side close to its public administration border. The first half of the route appears in the structure plan slightly shifted to the east, the second half of the section is identical.
On the section, a simple resting place (199+500 km section) will be built, it will cross the Majsi watercourse by a viaduct, and also the Szilvás water stream, road 5704 and the dirt road towards Nagynyárád will also be conducted over.
The route typically travels across agricultural areas, affects Majsi area at the Majsi watercourse and Szilvás Brook and affects forest area at the latter.

Lippó:
The route is passing across west of the urban area, across the public administration territory of the settlement. Junction 5702 and a wildlife crossing structure will be built along the section, and the firt road leading to Kislippó will also be conducted over. The route is passing across all along arable land. The route in the spatial plan is slightly shifted to the east.
On the right side of the planned route, two cemeteries can be found (topographical lot numbers 044, 032). In the interest of coverage of the motorway section next to the Serbian cemetery topographical lot number 032 it is recommended to plan plantation of vegetation of several levels providing full coverage.

Figure 28 Photo of the Serbian cemetery in Lippó

Ivándárda:
The route is passing across west of the urban area, across the public administration territory of the settlement. The junction 5705 and the complex resting place as well as a wildlife crossing structure will be built on the section. The route is passing across all along arable land. The route in the spatial plan is slightly shifted to the east.
The border crossing point will be built on the territory of the settlement. The plan does not contain the construction of the border crossing point, later on it will have to be planned and licensed.

4.7.5. Impacts of scheduled development

From the aspect of the built environment, there is no difference between the 2x1 or 2x2 lanes versions but when the spatial plan is amended it is recommended to regulate the transport area for the final 2*2 lanes II phases construction, so that the spatial plan would not need any more re-amendment during the construction of phase III.

4.7.6. Summary, proposed protective measures

From among the spatial plans of the settlement, that of Szajk and Bóly has a route identical with the one with option 1 in the current plan, in case of the other settlements amendment is needed.
Based on the calculations of the noise protection chapter, there is no need for the construction of noise mitigating wall for the planned options.
Based on the results of air quality protection calculations, limit values are complied with at the border of the 50 m air quality protection zone.

4.7.7. Tasks to be carried out in the later design phases

Determination of the exact number area use and properties to be mandatory purchased will become possible when technical solutions are accurately elaborated.
Continuous dialogue must be maintained with the settlements even after the present plan phase, also in the interest of follow-up in changes in build-up.
The effective settlement structural plans and the effective external and urban regulation plans of the settlement need to be amended on those sections, areas where the planned investment is not in harmony with the local plans. Therefore, when the licensing plan is prepared, harmony with the territory or settlement spatial plans must be examined, necessary amendments must be entered into the plans.
The protective measures for noise protection on the territory of the settlement are contained in the sectoral chapters. Their specification and elaboration will be a task for later plan phases.

ERD to be prepared later based on the tour of the area will contain the measures related to the affected archaeological sites.

4.7.8. Tasks to be performed before construction

Prior to construction, the areas/lands must be purchased.

4.7.9. Requirements applicable to the term of construction

During the construction process, the contents of the plan titled ‘Environmental protection during construction’ planned by the constructor must be complied with. Impacts of the construction in the immediate vicinity of residential area and mitigation options should be discussed in it.
During the time of construction, the built environment can primarily be affected unfavourably by the designation of transportation routes. Transportation should be established so that residential areas are spared. If significant volume transportation is carried out by affecting residential area, it is advisable to prepare status survey of the road section concerned and the buildings in its environment.
On areas with archaeological interest, earthworks can only be performed under archaeological observation.

4.7.10. Proposals for monitoring

Monitoring examinations necessary for noise and air quality protection reasons are contained in the sectoral chapters, none of the chapters prescribed monitoring activity.

4.8. LANDSCAPE PROTECTION

4.8.1. Landscape examination

4.8.1.1. Physical geographic conditions

The planning area is located in Baranya County, in the Great Plain, within the plain along the Dráva River on the Nyárád –Harkány plain area. This area is a terraced alluvial cone area with 89 and 125 m above the see level height, which in north-west is elevated to the surface of the South Baranya Mountains. The part of the micro-landscape affected is a plain, its surface has a slight slope towards S-SE. Mainly in the middle part of the small landscape affected by the route, the surface is heavily fragmented by valleys of N-S and NW direction in the planning region. The surface shows the characteristics of the loess surface and the river water erosion activities.
Soil types concerned: lime covered chernoziem, chernoziem brown forest soil, alluvial meadow soil.
On the section affected by planning, we have no knowledge of affecting meliorated and irrigated areas. The average groundwater depth is between 2-4 m, its quantity is not significant. Based on the map of the National Water Management Plan (OVGT), drinking water abstractions in Hungary, the planned route affect neither operating nor perspective protected water reserves.

4.8.1.2. Main characteristics of the water network

According to the National Water Management Plan, the planning area is on the planning sub-unit of the right-hand side bank of the Lower Danube River.
The area studied can be divided into two parts from the aspect of surface waters:
in the first area, the waters of the Geresdi hills are collected in deep cut watercourse valleys, and lead them into the Danube according to the structural lines in north-east-south-west direction. These watercourses include the Borza Brook, Nagynyárádi watercourse and Majsi watercourse. In essence, these watercourses are performing drainage whereby they release the groundwater body under the hills.
The Mároki watercourse, the Lippói trench and the Karasica valley belong to the second area, where they flow on the area into N-S direction, and perform the drainage of the groundwater to a small extent.
It is a moderately dry area with moderate run off.

The planned route will cross the following watercourses:
Borza stream: length 24 km, river basin: 247 km2
Versendi Brook:
Majsi watercourse: length: 11 km
Szilvás Brook

The route is also crossing marshy areas at 197+000 km section, 200+170 km section, 202+350 km section.

The quality of the surface waters of the area is influenced by the infrastructure of the settlements including public water supply and sewerage, as well as industry working there. As in the economic life of the region, agriculture is of primary importance, diffuse contamination washed from areas under cultivation have a significant impact on the quality of the waters.

4.8.1.3. Landscape history

Pleistocene crust quakes, the glacial age loess formation and the degradation of the established loess surface had the most important role in the formation of the fundamental surface terrain features of the landscape. All this started when the Pannonian plate toppled as a result of which the northern part rows the southern sank. Parallel with this, it became fragmented along faults of NW - SE orientation more or less perpendicular. After this, in the Ice Age, primarily wind had surface forming significance. And the wind brought from the east a loess blanket covering the area (from plain areas east of the Danube). Loess blanket could stay only on places where it was not washed off by precipitation or by water in the river flood plains and in marshes. Watercourses following fault plains established erosion terraced valleys. Due to further erosion on the loess, deep valley systems emerged, whose direction for the reasons mentioned above is usually north-west - south-east or perpendicular.

The flood plain of the Dráva River has significantly changed since the river has become regulated. Its natural vegetation became fragmented, remnants consist of oak-ash-elm woodlands and sessile oak-hornbeam woodlands. These forest patches are typical primarily in the cultivated areas but we often find plantations as well (poplar, willow, acacia). Willow woodlands or white poplar woodlands can still be found in a natural state in the flood plain and in the vicinity of oxbows, but e.g., black poplar woodlands have almost fully disappeared by now. The same can be experienced with the two largest watercourses of the area, in the environment of Fekete water and Pécsi water. Areas that used to be covered by sick vegetation are primarily used for agricultural purposes. Former pastures can still be found on these flood plains but the marshy associations are on the way of disappearance.
By the filling up of the dead branches, vegetation characteristic to marshes like the marsh willows and the marsh forests have appeared one after the other and highly varied weeds and reeds associations have come about. The mood of the former flood plain is recognised most here: pioneer sludge vegetation which is revived in the dead branches can be found here in a number of places.
As mowing and grazing have come to an end, marsh and moor meadows can only be found at some places, steppe meadows are close to disappearance on higher areas
On the Nyárád –Harkányi flat area affected, the characteristic landscape is lands transformed for arable land. Originally associations consisted of sessile oak woodlands which, proceeding towards the east, became more and more loess like oak forests. Plantations are frequent here as well, and sub-Mediterranean type loess grassland also occur on the dryer parts.

4.8.1.4. Landscape use

Along a significant part of the planned route, agriculture is a sector having huge traditions in terms of land use modes. Geographic conditions of the area allow good quality crop production. Where topographical conditions make it possible, large parcel farming is pursued.

The planning area is strongly transformed agricultural landscape covered by arable land. On the large extension arable land, intensive arable crop production is pursued (wheat, corn, silo corn, English clover). Large parcels are fragmented by dirt roads, watercourses. There are no field protecting forest strips, only some tree or shrub lines along certain dirt roads.

<u>Hydrological, hydrogeological limiting factors:</u>
On the planning area, there is no vulnerable water reserve, water abstraction engineering structure. The chapter on the Soil underground water is discussing in detail the water reserves.

Mineral asset protection limiting factors.
A number of mining sites can be found in the region. Most of them area gravel mines, but there are clay and sand mines as well on the planning area. The list of mines can be found in Chapter 2.6.2.

Nature conservation limiting factors:
The Töttösi erdő HUDD 20065 Natura 2000 status approved special nature conservation site can be found on the planning area. The route will be conducted among the forest blocks not affecting directly the area. The Chapter on Biosphere gives a detailed discussion of biosphere protection.

4.8.1.5. Landscape use of the planning area:

The M6 expressway studied is passing along an about 20 km long section of unified appearance with gentle slope in north-south direction between Bóly-Ivándárda-national border. The valley of about 100-200 m width and 10-20 m deep is crossing the area in transversely as the Borza Brook, Szajki watercourse, Majsi reservoir and the valley of the anonymous watercourse feeding it. A railway crossing can also be found on the area.
The planned route starts at section 193+820 km after the 'Bóly separation junction' of M6 expressway leading to Pécs.
In the early part of the planning section, in the 193+905 km section, a flyover will be built over the crossing dirt road and wildlife crossing structure. Entering the public administration area of Szajk, the route comes close to 'Lajos farm' to 145 m (waste water sludge composting facility). On the public administration area of Babarc and Szajk, the route is passing along arable land.
Following the Borza Brook correction (195+972.50 km section), the route passing along the Korpádi-puszták slope reaches road 5703 (196+235 km section), where the half-clover type 'Bóly east' traffic junction will be constructed. The route is passing across arable land also on the territory of Nagynyárád.
It is crossing the Versendi watercourse correction (196+520 km section) by flyover and then the Mohács-Villány railroad (196+709.74 km section) by an underpass. It is crossing the 'Anonymous trench' by its km section 196+900 km where a culvert of 2.0 m opening is going to be built. Between the crossing of the railroad and the trench, the route is passing across forest area, although otherwise arable lands are affected on the public administration area of Bóly.

The 1.m option deviates from option 1 on this short section: it is crossing the Mohács-Villány railroad (196+890 km section) further rest by ~150 m, avoiding thereby the forest patch next to the railway, and affecting the marshland to be found there on a shorter section.

It is crossing the dirt road correction at the Bóly and Nagynyárád public administration border by an underpass in the 198+297.60 km section, and then the so-called 'Nagynyárád' simple resting place on the territory of Töttös is planned to be built up in 199+500 km section.
On the public administration area of Töttös, in 200+182.60 km section, a viaduct will be built above the Majsi watercourse and the wildlife crossing structure. Areas registered as pastures and marshland in the environment of the Majsi watercourse are also affected. From this point, the road is going on so that it affects forest areas in the least possible extent. In section 200+865 km, it is crossing the dirt road leading over to the Töttös Szilvás lane by an underpass. In section 202+430 km, a viaduct will be built over the Szilvás Brook and the wildlife crossing structure, at this point it affects to a small extend forest, meadow and marsh areas. Under the correction of road 5704 (203+750 km section) an underpass will be built.

Route is passing along arable land all along the public administration territory of Lippó, it is crossing road 5702 implemented in the frame of another investment at section 205+731.77 km (on the layout plan it is indicated by weigh, dashed line). Dirt road is conducted over in 207+165 km section, wildlife passage is ensured by an under path planned at 208+180 km section.
Where reaching the public administration area of Ivándárda a right arc of slight curve of R=7,000 m leads to the intersection point of the border as agreed with the Croatian partners, and appropriate further lead of the line on the other side of the national border. The road passes all along arable lands. The route reaches connecting road 5705 in 209+597.90 km section, whose correction is conducted over at 209+734 km section. The 'Ivándárda junction and complex resting place' (210+000 km section) was established here. Axel weight measuring station to be built at the resting place on both sides. In 211+039 km section an under path will be built under the wold life crossing structure. The end of the planning section 212+065 km, which is the intersection point of the Hungarian-Croatian national border.
The length of the planned section is 18,245 m.

The establishment of crops as affected by the route and their distribution attributed to the different settlements concerned, have been presented on the basis of the land registry office documentation (2.3.1Land use).
Route option 'A' is arable land in 94.8/94.0 %, it affect forest cultivation area in 2.1/2.5 %.
Route option 'Am' is arable land in 96.1/95.5 %, it affect forest cultivation area in 1.4/1.7 %.

Most of the arable land affected is of quality class 3 and 4.

4.8.1.6. Landscape structure

The characteristic landscape component in the environment of the routes is agricultural cultivation.
Landscape structure is determined by the agricultural plots and a system of trees and shrubs lining watercourses and roads. Larger coherent forest areas are certain spots of the Töttös forest, which are not directly affected, only the woodlands in the neighbourhood of the Szilvás brook registered as an ecological corridor between the two spots.

The structure of the landscape is also determined by M60 express way and the Pécs-Mohács railway line of South-West - North-East direction.
From the economically backlogged borderline areas it is more difficult to get to the express way network. Transversal express way connections between the eastern and the western, the northern and the southern parts of Baranya county, and the network elements enabling the accessibility of the Croatian express road network are missing. Towards Croatia the opportunity for passage over the Dráva river, the absence of main road public road connections of south-west direction and border crossing points are also a problem. Crossing over the Danube river and main road connections of east direction (Danube bridge at Mohács) are not sufficient. Significant sections of existing main roads passing over settlements on that quality roads have not be replaced yet by roads avoiding the settlements. Connection between certain towns are difficult (e.g., Sellye – Siklós – Mohács), part of the towns are accessible only by side roads (connection road) (e.g., Sellye, Mágocs), main road connections replacing connection roads are missing (e.g., 5801, 5804 and 5701). Connections of towns and settlements belonging to their agglomeration are missing or detours have to be taken. Many times neighbouring settlements can only approached by major detours, there are significant connection absences. Deficiencies contribute to the establishment of small towns having no functions.

The character of the landscape opening up from the carriage way is determined by monotonous, flat, sometimes hilly area, the site of settlements situated relatively close to the route, arable land, woody vegetation accompanying the watercourse crossing the rout and forest.

4.8.1.7. Settlement data

The settlement system of Baranya county is characteristically small villages, with a number of bags settlements among them. The transport related and social consequences are the main region for the fact that among the micro regions of the county there are a number of micro-regions that are suffering from accumulated disadvantages.

The current town network of the county, the micro-region centres cover the territory of the county proportionally perform the most important different missing supply needs in their environment.

The planned routes affect the public administration area of the following settlements:
Babarc, Szajk, Nagynyárád, Bóly, Töttös, Lippó, Ivándárda.

Routes affect the public administration area of settlements belonging to the Mohács micro-region, the Bóly and mohács district.

Micro-region base data		Bóly micro-region	Mohács micro-region
Area (km2)		220.03	600.98
Population (persons)		12 055	35 796
Number of settlements		16	26
Legal status	city	1	1
	village	15	25
Density (person/km2)		55	60

Almost half of the settlements of the micro-region belong to tiny and small settlement category, which are primarily located on the less favourable conditions hillsides and many of them are bags settlements. Mohács, the primary centre of the micro-region had a very fast development as early as in the Middle Ages due to its excellent geographical energy (Danube waterway, and the proximity of the Pannonia-Moesia military road).
The coop centre of the micro-region, Bóly, was given more significant supply and development role in line with its rank as a town on 1 July 1997.

4.8.1.8. Green surface system

The nature geographical landscape classification registers the plain south and east of the Villányi mountains as the Nyárád-Harkányi loess area. Its western part (Harkányi flat area) is classified to the Dráva flat area, while its eastern part (Nagynyárádi flat area) is classified to the foot of the Mecsek mountains. According to earlier plant geographical classifications the former is part of the South-Great Plain (Titelicum), while the latter is part of the Mecsek floral district (Sopianicum). Botanic research of the recent decades have shown that the Baranyai and the Somogy Dráva flat area is significantly different from the floral district of South-Great Plain (Titelicum), therefore it should be evaluated as an independent floral district under the name Dravense. In contrast with that the Nagynyárád flat area and the Drávaköz south of it should continued to be classified to the South-Great Plain (Titelicum) floral district.

On a larger part of the impact area the current area use is primarily agricultural. On large extension arable land intensive arable crop production is pursued (wheat, corn, sile corn, English clover). Large parcels are segmented by dirt roads, watercourses. There are no field protecting forest lanes, only tree and shrub lines along certain dirt roads.

The planned motorway will be implemented on external lands, characteristically mixed agricultural lands, exception are the environment of the watercourses and route sections running amidst forest blocks of the Töttösi forest.
The forest is affected only to a small degree: On a length of sum 200 m at Bóly (after the railway crossing), which in case of the 'Am' option affects only the western tip of the forest, on a length of 300 m at 2 points at Töttös (in the vicinity of the Szilvás brook), and a 20 m wide forest strip is also affected at Lippó.

Some of the meadows and forest accompanying the Borza stream are part of the national ecological network, on a short section however, the stream is directly passing by arable lands. Along the Versendi watercourse and the anonymous trench leading into it meadows and marshy areas have emerged. By damming of the water on the Majsi watercourse a water reservoir and a fishpond were established, in which reeds, next to them swampy wetland habitats have been created.
Along the Szilvás stream remnants of flood plan woodlands can be discovered. In the south of the studied area a flood plain woodlands is accompanying the Topolyás trench on a width of 50-100 metre, flood plain woodlands can be found also on the shore of the Lippói trench. Valleys of watercourses are accompanied by shrub forest strips, and coherent forest blocks of large extension of the Töttösi forest.

Figure 29 Versendi watercourse and its environment

Figure 30 Majsi watercourse and its environment

Figure 31 Majsi fishpond

The original vegetation of the broader region is sessile oaks, which shows increasing loess oak nature as we proceed from west to the east towards the planning area. Sub-mediterranean nature of the low situated forest can still be recognised. Forest vegetation has remained only in isolated patches, such as parts of the Töttösi forest, degraded forest and acacia, Populus americana and pine plantations however are frequent. In the dryer parts tiny loess grass fragments occur

reflecting sub-mediterranean impact. Along regulated watercourses mostly aquatic, riparian vegetation poor in species, high sedges and marsh meadows can be found with medium-rate weeds flora.

4.8.1.9. Areas of nature conservation significance on the area studied

Protected natural areas of national interest
The route does not affect nationally important protected natural areas.

Protected natural areas of local interest
From among the settlements concerned, on the territory of Bóly areas of local protection can be found on the urban part of the settlement, that will not be affected by the route.

'Ex lege' protected areas
Neither the route, nor its correction will affect ex lege protected areas.

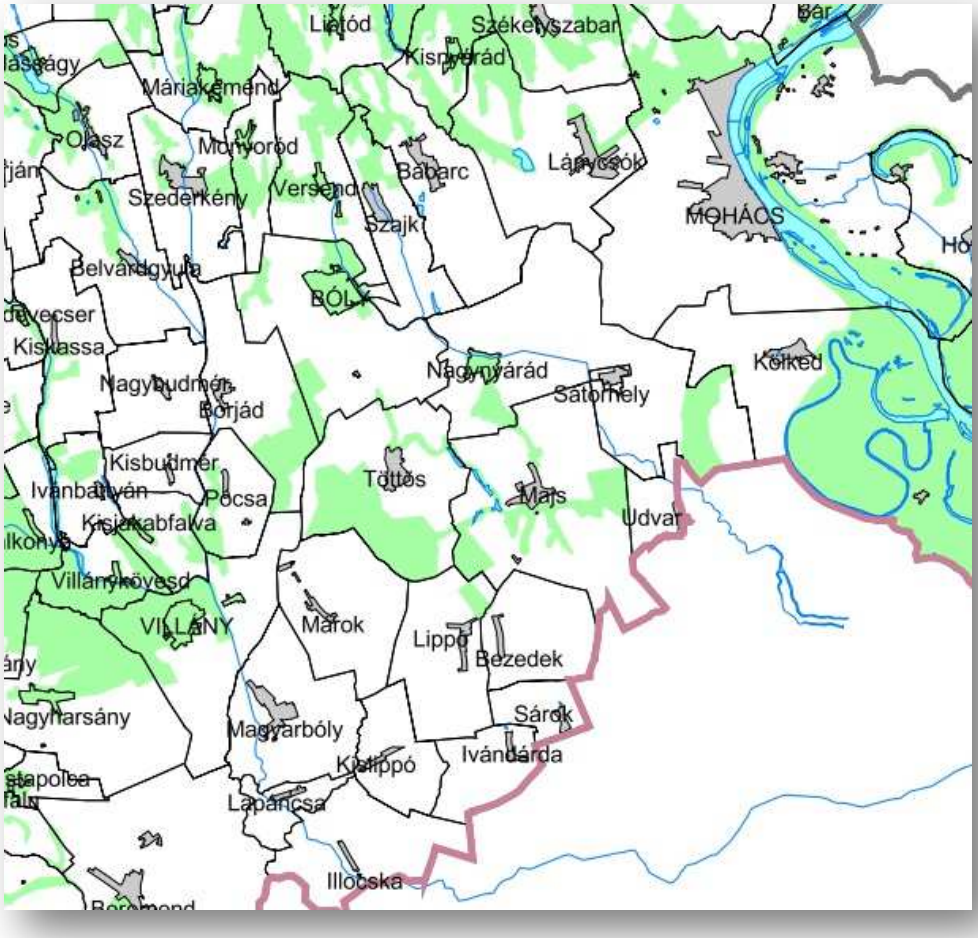
Natura 2000 nature conservation site (SCI:)
The Töttösi forest HUDD 20065 special nature conservation areas of approved Natura 2000 status can be found on the planning area. The area is managed by the Danube-Dráva National Park Directorate. The Töttösi forest consists of 4 separate areas with a total area of 1,189.15 ha, which areas are to be found on the public administration areas of Borjád Majs, Nagynyárád, Márok, Pócsa and Töttös. The route is running among forest blocks not affecting directly the area. At the closest point the route axis is approximately at a distance of 163 m from the area situated the closest to the route.

Natura 2000 bird protection areas (SPA)
The route and its impact area do not affect bird protection area.

National Ecological Network
The lands embracing the Majsi stream valley belong to the ecological corridor of the National Ecological Network. At the Majsi and Szilvás stream construction of viaduct has been planned at both site, combined with a wide life crossing structure therefore the ecological corridor function can be further ensured.

4.8.1.10.Landscape protection area

The route studied affects landscape protection area on the territory of Töttös.



Landscape protection area zone (County Spatial Development Plan - MtrT)
Area of High Natural Value
Areas that require special utilisation for nature conservation, soil protection and/or water protection aspects. These regions are part of a network, this is how the network of the so-called High Natural Value Areas was established.

The route studied does not affect such areas.

4.8.1.11. Unique landscape values

Natural assets characteristic to the given landscape, formations and landscape constituting components established by human activity which have significance for the society from the aspect of nature history, cultural history, science and aesthetics are considered unique landscape values. In the interest of their preservation their assessment, in other words the inventorisation of unique landscape value is necessary by all means.
On the planning area we can find a number of unique landscape value (www.tajertektar.hu) of which the route does not affect any (cannot be found within 300 m).

4.8.1.12.Landscape wounds

Damaged, degraded areas

On the settlements affected no mining site can be found. The list of mines in the broader region are contained in the chapter titled Soil, ground water.

Negative scenery elements

Landfill

No landfill can be found in the direct vicinity of the route. The closest landfill at Lippó (no longer functioning) can be found at a distance of 290 m from the route (207+500 km section left side) was re-cultivated by earth cover and trees have been planted on it (acacia and ash plantation).

Figure 32 Remediated landfill at Lippó

Functioning landfills on the broader planning area are discussed in Chapter Waste management

Waste water sludge composting plant

Entering the public administration area of Szajk, the route approaches ‘Lajos farmstead’ (waste water sludge composting facility) at a distance of 145 m.

Figure 33 Composting facility next to Lajos farmstead

Electricity lines
The list of power and gas lines crossing the route, which have also been indicated in the maps, are contained in Chapter titled Built environment.

4.8.2. Landscape evaluation

The evaluation of the planning area from the aspect of landscape protection was carried out on the basis of the Hungarian standards MSZ 20370 Nature conservation. General landscape protection. Definition of terms, as well as MSZ 20372 Nature protection. Aesthetic evaluation of landscapes, along with a book on landscape planning and landscaping, by Attila Csemez, whose original title Tájtervezés – tájrendezés) (published by Mezőgazda Kiadó, Budapest 2006.).
Landscape evaluation comprises the interpretation and understanding of the landscape's natural, modified and artificial elements and combinations of elements, together with the establishment of their ecological and aesthetic significance.

4.8.2.1. The establishment of the landscape potential

Landscape potential is the potential capacity or performance of a given landscape, expressing the possible extent of land use, or in other words, the extent to which a given landscape is suitable for satisfying society's varied requirements.
The landscape potential was established on the basis of the landscape's characteristics, taking into account the following criteria:
- Topography: evaluation of relief energy and topographic diversity
- Coverage: calculation of biological activity values
- Edges: evaluation of the length and diversity of edges

Definitions of relief energy and topographic diversity
Relief energy is the local or average value of the largest topographic level difference applying to the given surface unit.
The evaluation of the relief number (the numerically expressed difference between the highest and lowest point in a given surface unit, the evaluation of which is specified in the Hungarian Standard (MSZ 20372), as follows

Minősítés	Reliefszám	Pont
igen alacsony	<40	1
alacsony	40,1–80	2
	80,1–120	3
közepes	120,1–160	4
	160,1–200	5
	200,1–240	6
magas	240,1–280	7
	280,1–320	8
	320,1–360	9
igen magas	360<	10

Figure 34 Evaluation of the relief number according to the Hungarian standard MSZ 20372

The relief energy was evaluated on the basis of the longitudinal section.
The terrain surface is undulating in the first half of the section; the differences between surface heights in different areas fall in an approx. 5-21 metre range, primarily where watercourses cross each other. In the second half of the section the terrain surface gradually declines towards the border (136.89 m aBS – 95.07 m aBS level). The relief number per km^2 is below 40 everywhere, therefore this section has a very low overall relief energy level.

The altitude of the route of the motorway varies within a 25 metre interval in the first half of the section; the lowest point is at 111.74 m aBS (196+400 km section), the highest is at 136.03 m aBS (203+800 km section), and thereafter it gradually declines to the end of the section, where it is at 95.56 m aBS level.

Topographic diversity is a measure of the frequency of the occurrence of the highest and lowest points. As a quantified measure it shows that the higher the topographic diversity, the more beautiful the view of the landscape is.

The Hungarian Standard (MSZ 20372) services out the following grades of topographic diversity:

Rating	Number of peaks	Number of low points	Score
very monotonous	0	0	0
monotonous	1 0	0 1	1-2
of little diversity	0 1	2 1	3-4
varied	2 1	3 2	5-6
highly varied	2 3	1 0	7-8
diverse	1 1	4 3	9
highly diverse	2 5	2 4	10

Minősítés	Csúcsok száma	Mélypontok száma	Pont
igen egyhangú	0	0	0
egyhangú	1 0	0 1	1–2
kevésbé mozgalmas	0 1	2 1	3–4
változatos	2 1	3 2	5–6
igen változatos	2 3	1 0	7–8
mozgalmas	1 1	4 3	9
igen mozgalmas	2 5	2 4	10

Figure 35 Evaluation of topographic diversity according to the Hungarian Standard MSZ 20372

Topographic diversity was evaluated in a spatial grid of 0.5 km^2 grid cells.
The first few kilometre part of the section is rated as very monotonous, in the absence of any peaks or low points. Following the Borza streamlet crossing there are several 0.5 km^2 sections that are rated as „of little diversity" (in the 196-197 km section, and in the 200-201 km section) or monotonous (in the 202-204 km section). It should be noted that, the surface height differences do not exceed a few metres, with the only more notable surface level differences observed at the valleys of watercourses, while there is no level difference exceeding 21 metres in any 0.5 km^2 unit at all.

Calculation of the biological activity value of the various areas
The form of the appearance of vegetation can be characterised most markedly in terms of coverage, reflecting its ecological quality rating and the presence of various grades of biological activity as well.
According to decree 9/2007. (IV. 3.) issued by the Minister of Local Government and Regional development the biological activity value of a given area (undifferentiated calculation) or surface quality (differentiated calculation) is calculated as the result of the multiplication of the size of the given area in hectares by the relevant value indicator see Annexes 1 and 2 to the Decree.

The area to be occupied was calculated on the basis of an average width of 30 metres (2x1 lanes) and for an average width of 50 metres (2x2 lanes), taking into account the extra areas occupied by resting places and junctions as well. The actual area to be occupied can be calculated in later Phases of the planning and design process.

Construction in One Phase along the original route "A":

Occupied area	Size of the area (ha)	Value indicator	Biological activity value
arable land	79.64	3.2	254.85
grazing land	0.08	6	0.48
meadow	0.14	6	0.84
woodland	1.79	9	16.11
watercourse	0.10	6	0.60
swamp	0.83	8	6.64
road	0.30	0.6	0.18
unpaved road	0.89	1	0.89
railway	0.18	0.6	0.11
	83.95		280.70

Table 36 Biological activity value in the case of construction in One Phase (2x1 lane)

Construction in Two Phases along the original route "A":

Occupied area	Size of the area (ha)	Value indicator	Biological activity value
arable land	110.27	3.2	352.86
grazing land	0.14	6	0.84
meadow	0.24	6	1.44
woodland	2.98	9	26.82
watercourse	0.17	6	1.02
swamp	1.39	8	11.12
road	0.5	0.6	0.30
unpaved road	1.32	1	1.32
railway	0.31	0.6	0.19
	117.32		395.91

*Table 37 Biological activity value in the case of construction in Two Phases (2*2 lanes)*

Construction in One Phase along the adjusted route "Am":

Occupied area	Size of the area (ha)	Value indicator	Biological activity value
arable land	80.88	3.2	258.82
grazing land	0.08	6	0.48
meadow	0.14	6	0.84
woodland	1.19	9	10.71

watercourse	0.1	6	0.60
swamp	0.58	8	4.64
road	0.3	0.6	0.18
unpaved road	0.79	1	0.79
railway	0.11	0.6	0.07
	84.17		277.12

*Table 38 Biological activity value in the case of construction in One Phase along adjusted route (2*1 lane)*

Construction in Two Phases along the adjusted route "Am"::

Occupied area	**Size of the area (ha)**	**Value indicator**	**Biological activity value**
arable land	112,34	3,2	359,49
grazing land	0,14	6	0,84
meadow	0,24	6	1,44
woodland	1,98	9	17,82
watercourse	0,17	6	1,02
swamp	0,97	8	7,76
road	0,5	0,6	0,30
unpaved road	1,15	1	1,15
railway	0,18	0,6	0,11
	117,67		389,93

*Table 39 Biological activity value in the case of construction in Two Phases along adjusted route (2*2 lanes)*

The degree of decrease in the biological activity value

The planned 2x1-lane road structure entails a planned 17.60 m wide road crown. The traffic lanes would be 3.50 m wide. The width of the wearing layer of the main road track is 4.25 m on one side. The width of the paved surfaces is, in this way, a total of 8.5 m (added to which may be the width of the paved ditch, if its paving is necessitated by the gradient of the slope). The total width of the road, the area of which needs to be expropriated, is approx. 30 metres, or somewhat more.

The planned 2x2-lane road structure entails a planned 26.60 m road crown width. The width of each traffic lane would be 3.75 metres, the width of the emergency lane is 3.00 m, while the nearside safety lane's width is 0.5 m. The main track wearing layer is 11 metres wide on each side. The width of the paved surfaces is, in this way, a total of 22 m (added to which may be the width of the paved ditch, if its paving is necessitated by the gradient of the slope). The total width of the road, the area of which needs to be expropriated, is approx. 50 metres, or somewhat more.
It can be calculated from the above that the green strip alongside the road is wider than one-third of the paved surfaces in both cases.
Upon the construction of the prospective expressway (or controlled access highway) the area of the various types of area use (occupied areas) is occupied in the case of "Motorways, controlled access highways and main roads" by the category identified as follows: "The green strip alongside the road is wider than 1/3 of the paved surfaces", with a value indicator of 1.2.
The construction of the expressway results in less favourable activity values.

Option	Occupied area (ha)	Value indicator	Biological activity value	Degree of decrease in biological activity value
"A" One Phase 2x1 lane	83.95	1.2	100.74	179.96
"A" Two Phases II 2x2 lanes	117.32	1.2	140.78	255. 13
"Am" One Phase 2x1 lane	84.17	1.2	101.00	176.12
"Am" Two Phases II 2x2 lanes	117.67	1.2	141.20	248.72

Table 40 Decrease in the biological activity value in the case of the original and the adjusted route and in the case of construction in One Phase and in Two Phases

The activity values of the various pieces of land can be clarified with the help of the indicators specified in Annex 2 to the Decree in relation to the different surface qualities in the case of the various specific forms of area use.
There are no material differences between the different options.

The biological activity value can be restored alongside the road by the planting of a protective strip of woods or the forming of some other type of green surface.

Evaluation of the length and diversity of the edges

The aggregate of the effects appearing on the borderlines of different pieces of land, areas under different types of use or of habitats is referred to as edge effect. The edge effect is a biological phenomenon on the one hand, and on the other hand it is one of landscape aesthetics. The diversity of an area (as landscape) is manifested through – besides its surface features and components – the diversity of landscape utilisation and the different forms of agricultural land use, as well as the length and quality of the borderlines (edges) between such different pieces of land. The edges are also an expression of the landscape's character, including the coexistence of different ways of area use as well.
The length of the edges is an indicator of the diversity or monotony of the landscape. Ideally, edges should be neither too long, nor too short. This is said because too short edges upset the landscape and they are not even perceptible from a certain distance. By contrast, too long edges add to the monotony of the land.
The edge effect is evaluated by the Hungarian Standard (MSZ 20372) as follows:

Quality	Length per 0.5 km^2 pieces of land	Score
homogeneous	<0.5	1
	0.51-1.1	2
structured	1.11-1.7	3

	1.71-2.3 2.31-3.0	4 5
diverse	3.01-4.7 4.71-6.3 6.31-8.0	6 7 8
highly diverse	8.01-9.0 9.01<	9 10

Minősítés	Hosszúság 0,5 km^2-enként km	Pont
homogén	<0,5 0,51–1,1	1 2
tagolt	1,11–1,7 1,71–2,3 2,31–3,0	3 4 5
változatos	3,01–4,7 4,71–6,3 6,31–8,0	6 7 8
igen változatos	8,01–9,0 9,01<	9 10

Table 41 Edge effect according to the Hungarian Standard

The edge effect was evaluated as detailed below:
Different forms of land use and major visual landscape elements were assessed and examined on the basis of maps, municipal development plans and aerial photos available at the land registry office. Focus was placed on the immediate 100 metre strip alongside each side of the route, looking for edges between man-made and man-made, man-made and near-natural as well as near-natural and near-natural areas.
Man-made land use forms are regarded as including arable lands, public roads, railways; these come into being as a result, in essence, of human factors. Near-natural forms of land use include particularly meadows, grazing lands, forests or watercourses; these are not so profoundly dominated by factors of human influence.
The evaluation used 1:10 000 maps, maps of the land registry office orthophotos taken of the planning area along with municipal development plans.
The following table shows the proportions of different edges in the 100 metre planning zone alongside both sides of the route options.

Edge type	Edge length (m)	Length of the given edge as a percentage of the total length of edges
Man-made-man-made	4235	68 %
Arable land-Road	4015	
Arable land-Railway	220	
Man-made-near natural	1610	26 %
Arable land-Watercourse	350	
Arable land-Woodland	860	
Arable land-Swamp	180	
Railway-Woodland	220	

Near-natural-near-natural	415	6 %
swamp-woodland	415	
∑	6260	%

Table 42 Edges found within the 100 metre strip along both sides of route "A"

Edge type	Edge length (m)	Length of the given edge as a percentage of the total length of edges
Man-made-Man-made	4235	70 %
Arable land-Road	4015	
Arable land-Railway	220	
Man-made-Near-natural	1550	26 %
Arable land-Watercourse	350	
Arable land-Woodland	740	
Arable land-Swamp	350	
Railway-Woodland	110	
Near-natural-near-natural	215	4 %
Swamp-Woodland	215	
∑	6000	%

Table 43 Edges found within the 100 metre strip along both sides of the adjusted route "Am"

It is clear from the percentage rates presented in the third column that the highest proportion is that of edges between man-made areas alongside the planned routes of the prospective road. Within this category the highest percentage rate is that of edges between arable lands and roads (mainly unpaved roads).

The density of edges is more-or less the same in each one-km section; accordingly, the average length of edges is 0.34 km in each 0.25 km^2 area unit (a 250 m strip). The edge density increases somewhat in the area after the railway crossing, at the crossing of the Majsi watercourse and the Szilvás streamlet but even there their density falls short of that of the "structured" category. The edge effect in the section under review according to the Hungarian Standard (MSZ 20372) falls in the "homogeneous" category. There are no differences between the plan options.

On the whole, it is concluded that the planning area does not show a high degree of diversity from the aspect of landscape protection and that there are no material differences between the planning options.

4.8.2.2. Alignment of the planned route from the aspect of landscape protection to the existing landscape conditions

Alignment to the existing conditions can be assessed with the help of the longitudinal section and the site drawing from the following three aspects:
Comparison of the planned terrain with the original terrain conditions
Evaluation of the landscape impacts of the planned route
Appearance of unfavourable visual elements in the landscape

Comparison of the planned terrain to the original terrain conditions

Comparison was carried out on the basis of the altitude data found in the longitudinal section. The proportions of the occurrence of the various different planned route-original terrain altitudes were examined. Since our planning area is to be found in a plain region, the following categories were worked out:

Category	Altitude difference (m)
I	-7 - 0
II	0 – 2
III	2,1 – 6
IV	6,1 - 14

Table 44 Altitude difference categories

Option "A" (”Am” option)

Altitude difference (m)	Length	%
-7 - 0	7477	41
0 – 2	8256	45
2,1 – 6	1904	10
6,1 - 14	696	4
Total	18333	100

Table 45 Ratios of the occurrences of altitude difference categories

The „Am” option is not specifically quantified because there is no material difference between the two options.
It is clear that 45 % of the total length of the routes will run on top of an only 2 metre high embankment, as a consequence of which it favourably fits in with the landscape. There are long sections cut into the terrain in the first half of the section but there are no cuttings exceeding 7 metres in depth. Increased embankment heights are to be found primarily at junctions, and crossings between the road, railways and watercourses.

Evaluation of the landscape impacts of the planned route

The evaluation of the route was based on the following table:

Route	Curves	Psychological effect on those driving on the road	Visual perception while passing along the road
Straight	Straight	Boring	Clear view
Straight	Uphill	Boring	Blocked view
Straight	Downhill	Less boring	Clear view
Straight	Concave	Less boring	Clear view

Route	Curves	Psychological effect on those driving on the road	Visual perception while passing along the road
Straight	Convex	Less boring	Blocked view
Arc	Straight	Exciting	Clear view
Arc	Uphill	Exciting	Blocked view
Arc	Downhill	Exciting	Clear view
Arc	Convex	Exciting	Blocked view
Arc	Concave	More exciting	Clear view

Table 46 Table facilitating the evaluation of effect on landscape13

It is clear from the table that an arc with a concave rounding is the most favourable route. A concave end provides for a clear view of the route, while an arc ensures a more exciting visual effect.

In the course of our investigations we assessed the proportions of the various route traces and curves to be found in the prospective section. Sections with an incline up to 0.49% were categorised as level, while those were categorised as downward or upward slopes, from the direction of Babarc toward Ivándárda.

Option "A" („Am" option)

straight					**arc**				
straight	upward slope	downward slope	convex	concave	straight	upward slope	downward slope	convex	concave
1639 m	-	1618m	2096 m	1323 m	-	1344 m	7443 m	2232 m	1497 m
9%	-	8%	11%	7%	-	7%	39%	12%	8%

Table 47 Ratios of straight and curve sections for the adjusted and the original options

The adjusted "Am" option is not quantified separately because the difference between the two options is negligible.

Some 65 percent of the route runs in arc shaped sections, as a result of which the psychological effect of driving down the road is "exciting" , while the majority of the straight sections also fall into the "less boring" categories. Thanks to the numerous downward slopes and concave sections there is a clear view of much of the route. Since the route trace sections of different forms follow one another in a relatively quick succession, the entire road section cannot be regarded as monotonous at all.

Appearance of unfavourable visual elements in the landscape

The landscape effect of the planned route of the road can also be evaluated in terms of the number of the junctions and non-level crossing points as well, since they will appear as new visual elements in the landscape.

The locations and identifications of the engineering structures to be constructed along the planned route of the prospective road are summed up in the following table. The height differences relative to the terrain are also indicated in the table, along with the specification of the respective categories.

[13]Forrás: Csima Péter Tájrehabilitáció c. könyve

Km section "A".	"Am"	Identification and engineering structure	Height difference
193+905	193+905	Overpass over an unpaved road and game crossing point	III.
195+972	195+972	Overpass over the adjustment to the Borza streamlet	III.
196+235	196+235	Underpass under the adjustment to the No. 5703 municipal governmental road (junction)	IV.
196+520	196+531	Overpass over the adjustment to the Versendi watercourse	III.
196+709,74	196+883	Underpass under the Mohács-Villány railway line	IV.
198+297,80	198+464	Underpass under a crossing unpaved road	IV.
200+182,60	200+250	Viaduct over the, Majsi watercourse and game crossing point and 2 unpaved roads	IV.
200+865	200+908	Underpass under a crossing unpaved road	IV.
202+430	202+505	Viaduct over the Szilvás streamlet and game crossing point 2 unpaved roads	IV.
203+750	203+825	Underpass under the adjustment to the No. 5704 local governmental road	IV.
205+731,77	205+807	Underpass under the prospective No. 5702 local governmental road (junction)	IV.
207+165	207+261	Underpass under the crossing unpaved road	IV.
208+180	208+255	Underpass under a game crossing point	IV.
209+734	209+746	Underpass under the existing No. 5702 and prospective No. 5705 local governmental road (junction)	IV.
210+039	210+114	Underpass under a game crossing point	IV.

Table 48 Height differences – including their respective categories – relating to the planned engineering structures

In the case of both options a total of 15 bridge structures are going to be constructed in the entire planning area.
The construction of underpasses is the most favourable solution from the aspect of the landscape. It is clear from the tables that most of the necessary structures are underpasses; overpasses only need to be constructed over larger watercourses. The greatest changes to the landscape are caused by the high embankments to be built up wherever larger watercourses, railway lines or roads are to be crossed, along with the junctions to be constructed. Owing to the topographic conditions in the plain region these are visible from great distances, therefore it is important that they are designed and constructed in a way that they fit in well with the landscape.

From the aspect of alignment to the landscape there are no material differences between the route options.

4.8.3. Proposals

The straight lines, of man-made structures in a plain area, appearing to run into infinity are always important landscape elements. The integration of linear structures into the landscape at the design phase involve the determination of route tracing while during the construction and execution phase it involves terrain adjustment and after the completion of the construction phase the arrangement and shaping of the environment with horticultural and/or forest management methods, including the planting of vegetation.
One very effective method for integration in the landscape is the planting of vegetation. Plants, trees and groups of trees in the area along public roads are important means for integration in the landscape and for orientation. In addition, they help maintaining drivers' attention and improve environmental and climatic conditions (e.g. by shading). Planting vegetation may help

adjust defects in the coordination of route tracing and may even draw attention to dangerous spots, junctions and stopping places.
It may be suggested in general, that park type vegetation should be planted on both sides of roads to be constructed in plain terrains or on an uphill slopes. In the case of a straight rounding curve the space perception may be improved by the planting of shrubs or groups of trees that do not grow very tall. In the case of arcs in plain areas or on uphill slopes or in the case of convex arcs the planting of park vegetation on the outside of the arc helps staking out the trace of the road and make orientation easier for motorists.
From a visual aspect an expressway can be interpreted through two different approaches. The question is what the view of the road is like and what can be seen from the road. The view of a road is different in a plain area and in a hilly region, or on top of an embankment or in a cutting. Nothing can be seen from the road when it runs in a cutting or in a spatial corridor (between protective walls, protective embankments or protective forest strips) while from the top of an embankment "everything" can be seen. The route of the planned road section highly varied, running on top of embankments and in cuttings, and it comprises two viaducts as well.
A road constructed on top of an embankment is visible in both plain areas and in hilly regions. The degree to which it can be hidden by vegetation varies by the height of the earthwork. The views of engineering structures also vary. Underpasses are hardly visible while overpasses, bridges and embankments exceeding heights of 9-10 metres are marked structures, having a profound impact on the landscape. Space forming, covering, opening up and the creation of space connections and space systems are operations enabled by planting woody vegetation comprising tree species of different behaviour, appearance and growth as well. Facilities and earthworks are always easier to "hide" in plain areas. A strip of shrubs 2-3 metres tall can completely cover the engineering structures. Differences in elevation up to 3 metres are hardly or only just visible; the height of a building floor can be nearly completely "made to disappear" by terrain forming and the planting of park vegetation.
Creeper plants and other plant species that do not need much in the way of cultivation and that can do well under unfavourable habitat conditions are suggested to be planted for the protection of slopes against erosion. When planting grass on slopes, preference must be given to indigenous grass species, those that are characteristic of the given area to help the slope gradually fit in with the landscape and possibly to impede the appearance of invasive species.
Strips of shrubs are suggested to be planted on slope sides; they provide for a reassuring space perception and reduce the effects of serious accidents.
Groups of trees should be planted at junctions, in places where lower level roads join higher level roads and at resting places. To draw drivers' attention species of unusual appearance or that look different form the general vegetation of the region should be chosen from in such cases.
In the case of land usage conflicts, in order to alleviate or eliminate conflicts a variety of environmental facilities may need to be put in place. Fitting these in with the landscape (in terms of, for example, forms and material use) is also an important component of the adjustment of the whole of the road into the landscape and they are indispensable for the purposes of the protection of wildlife as well, which is of outstanding importance in terms of the very character of the land. At both ends of overpasses that are also used as game crossing points the vegetation must be such that it attracts and leads animals onto the crossing structure and at the same time reduce the disturbance caused by the motorway.
In the case of bridge structures a choice of colour(s) and painting blending in with the landscape is an additional option for fitting the structure into the landscape. In painting bridges the use of any violent colours, ones that are not compatible with the environment, should be avoided.

The following vegetation planting options are suggested in order to have the route blend in with the landscape:

Option 1
The engineering structures planned to be put in place at different levels of junctions stand out from their environment 8-11 metres high. Park vegetation, including trees should be planted in the areas enclosed by the branches making up the junctions while on the slopes of embankments shrubs should be planted to fit these areas in with the landscape, paying attention to traffic safety considerations. Where junctions standing out of the landscape, at 8-11 metre heights, are gradually connected to the general ground level the structures can be covered by the planting of cover trees, in awareness of the fact that it will take several years for the trees so planted to fulfil their intended functions.

Option 2
Where unpaved roads or lower level roads are crossed over, and where existing wooded areas or forests are affected, only shrubs, including ground covering shrubs should be planted on embankment slopes and inside the expropriated areas, giving preference to the use of species that can well adapt to the existing habitat types.

Option 3
The prospective resting places should be constructed on the basis of garden architecture designs. When planting vegetations in resting places part must be paid to isolating such areas from the traffic, protection against wind and creating shaded resting sites. For the purpose of decoration various exogenous species might be permitted to be planted.

Option 4
Where the road runs on top of an embankment the linear facility can be made to fit in with the landscape with the help of solutions depending on the size of the area to be expropriate. The embankment can be integrated in the landscape by planting park vegetation, trees and shrubs in alternation, on both sides of the route. This is the proposed solution to be applied at overpasses crossing watercourses as well.
Trees and shrubs may be planted on the slopes of cuttings as well.

Option 5
Overpasses for wild animals should be supplemented with lines and strips of trees and shrubs to visually lead animals to the crossing point. The entire surface of the path formed for use by animals must be covered with grass. Only shrubs may be planted – besides grass – on top of bridge structures. In planting vegetation it must always be made sure that they do not reach into the crossing path even when the plants are fully grown. To reduce the disturbing light and sound effects of road traffic and to prevent animals from jumping off, closed panels at least 2 metres high must be installed on both sides of such bridges. Another acceptable solution is the installation of protective fences combined with rows of logs of at least 1.4 metres height (over the level of the crossing path).

Option 6
To cove the route section along the Serbian cemetery of Tln. 032 Lippó vegetation of multiple levels, providing complete coverage, should be planted. The route runs on top of a 2 m tall embankment along the graveyard therefore a 2-3 metre tall strip of brushes may guarantee complete coverage. The vegetation to be planted should include quickly growing tree species and dense shrubs.

Engineering structures and junctions at the following km sections must be properly integrated in the landscape in the various parts of the route:

Km section		Name and structure	Option
"A"	"Am"		
193+905	193+905	Overpass over unpaved road and game crossing point	4.
195+972	195+972	Overpass over the adjustment of the Borza streamlet	4.
196+235	196+235	Underpass under the adjustment of the No. 5703 local governmental road (junction)	1.
196+520	196+531	Overpass over the adjustment of the Versendi watercourse	4.
196+709,74	196+883	Underpass under the Mohács-Villány railway line	1.
196+740-196+866	196+880-196+930	Woodland	2.
197+000-197+082	left side		
198+297,80	198+464	Underpass crossing under unpaved road	2.
199+500	199+575	Simple resting place at Nagynyárád	3.
200+182,60	200+250	Viaduct over the, Majsi watercourse and game crossing point and 2 unpaved roads	4.
200+865	200+908	Underpass under a crossing unpaved road	2.
202+130-202+317	202+205-202+392	woodland	2.
202+430	202+505	Viaduct over the Szilvás streamlet and game crossing point 2 unpaved roads	4.
202+752-202+880	202+827-202+955	woodland	2.
203+750	203+825	Underpass under the adjustment to the No. 5704 local governmental road	2.
205+175	205+250	woodland	2.
205+731,77	205+807	Underpass under the prospective No. 5702 local governmental road (junction)	1.
207+165	207+240	Underpass under the crossing unpaved road	2.
207+740-208+070	207+815-208+145	Covering of the Serbian cemetery of Lippó	6.
left side			
208+180	208+255	Underpass under a game crossing point	5.
209+734	209+746	Underpass under the existing No. 5702 and prospective No. 5705 local governmental road (junction)	1.
210+000	210+075	Ivándárda complex resting place and axle weight measuring place	3.
210+039	210+114	Underpass under a game crossing point	5.

Table 49 Facilities suggested to be integrated in the landscape and the options assigned to each

Option 4 is proposed to be applied all along the remaining sections (uninterrupted-flow segments).
The planting only of indigenous tree and shrub species is suggested in the green strips along the roads. The planting of invasive species (e.g. acacia, American ash tree) is not supported in any place in the area, while any other ornamental plants (e.g. ornamental shrubs that do not spread to the environment) may only be planted in places at least 1 km away from Natura 2000 sites where there is no natural accompanying vegetation.
The following (locally indigenous) plant species are to be proposed to be planted in the planning area:
The Hungarian ash is a relatively quickly growing tree species, yet it is capable of develop into a lasting wooded area along roads and there are traditions of its use in the wider neighbourhood as well.
In lower lying areas the proposed species include alder, birch, domestic willow species and other indigenous shrubs, grey poplar groves also need little maintenance and may provide a solution for a longer period of time.
Edges can be closed – in areas frequented by game animals – with prickly and thorny shrubs.

In later planning phases, in the designing of the vegetations to be planted along the expressway, the list of the tree and shrub species intended to be used will have to be submitted to the authority of the first instance and the competent National Park Directorate as well, for commenting.
The technical content of the prospective facility will be clarified and fixed in the course of the preparation of the plans and designs to be submitted in order to obtain construction and other required permits, therefore the proposals concerning the planting of vegetation will also need to be reviewed and revised if necessary.
Recultivation of any single-purpose extraction sites and depots appearing in the landscape in the way of negative visual elements will have to be carried out following the completion of the construction phase.
Ensuring unobstructed traffic and an environment preserving, high quality and high standard maintenance, will constitute operation imposing minimum load on the environment. This is also important from the aspect of landscape protection because an orderly, well-tended road is also visually more pleasing and it has smaller impacts (e.g. an unkempt, weedy and littered road section and roadside imposes a massive load on the environment). Advertisement activities must be minimised in the road's impact area as well.

4.8.4. The effects of phased construction

There is a very small difference between the construction of 2x1 or 2x2 lanes only in terms of the biological activity values taken up by the route: 280 in the case of 2x1 and 395 in the case of 2x2 lanes.

4.9. NOISE PROTECTION

4.9.1. Decrees and regulations referred to

- Government Decree 314/2005. (XII. 25.) environmental impact assessment and integrated pollution prevention and control permit procedures

- Government Decree 284/2007. (X. 29.) on certain rules on protection against environmental noise and vibration
- Joint Decree 27/2008. (XII.3.) KvVM-EüM issued by the Minister of Environment Protection and Water Management and the Minister of Health on the establishment of noise and vibration load limits
- Decree 25/2004. (XII. 20.) KvVM issued by the Minister of Environment Protection and Water Management on the retailed rules on the preparation of strategic noise maps and the relevant action plans
- Decree 93/2007. (XII. 18.) KvVM issued by the Minister of Environment Protection and Water Management on the way of the establishment of noise emission limit values and the checking of noise and vibration emission
- Joint Decree 29/2001. (XII. 23.) KM-GM issued by the Minister of Transport and the Minister of Economic Affairs on the limitation of the noise emission of certain outdoor facilities and the method of the measurement of noise emission
- The standard series MSZ ISO 1996, Acoustics
- Hungarian Standard MSZ 15036, Noise spreading outdoors

4.9.2. Basic input data to planning and design

In Baranya county the options of the prospective expressway pass through the municipal administrative areas of the municipalities of Babarc, Bóly, Nagynyárád, Töttös, Lippó, Majs and Ivándárda. They pass through typically outer, primarily agricultural areas.

4.9.3. Method of examination, limit values, piece of legislation referred to

According to Joint Decree 27/2008. (XII.3.) issued by the Minister of Environment Protection and Water Management and the Minister of Health on the establishment of noise and vibration load limits in the case of the installation of a new transport noise source the equivalent A sound pressure level of the noise originating from transport is to be measured 2 metres in front of the front wall of the building to be protected, if it is an existing residential building.

Ser. No.	Area to be protected from noise	limit value (L_{TH}) for the L_{AM} assessment level * (dB)	
		daytime 06-22 o'clock	**nighttime** 22-06 o'clock
1.	Resort area; of the special areas: healthcare area	60	50
2.	**Residential area (small town, suburban, village, settlement type construction), of the special areas: the areas of education institutions, cemeteries and green areas**	**65**	**55**
3.	Residential area (metropolitan construction), mixed area	65	55
4.	**Commercial area**	**65**	**55**

Table 50 Noise pollution limit values

Those elements of the relevant road network (indirect impact area), in the case of which the construction of the new expressway will entail profound changes in the local traffic, were also examined in the calculations carried out on the basis of traffic data and forward looking estimates. The following cases were distinguished in the forward looking traffic estimates:

- "WITHOUT" case, the reference state
- "WITH" option.

In the indirect impact area the four-digit connection roads belonging to the national auxiliary public road network qualify as side roads, where the noise limit at 2 metres before a facility that needs to be protected is 65 dB(A) and 55 dB(A) during daytime and nighttime, respectively.
To describe the noise pollution we worked out the limits where the limit values are met, on the basis of current (2015) traffic and speed data and traffic and speed data estimated for 2030, using the calculation method laid down in Annex 2 to decree 25/2004. (XII. 20.) KvVM, for both the daytime and the nighttime periods. The nighttime limit values are met at a greater distance therefore those data are regarded as the ones to be taken into account. In the case of the cemetery the daytime limit value is to be taken into account.

In the course of our calculations 130-90-90 km/h speeds were taken into account in the case of the expressway, along with 90-70-70 km/h speeds for public roads outside the municipal administrative areas and 50/50/50 km/h inside the municipal administrative areas.

Unblocked outdoor noise spreading was taken into account in the calculations. The noise map sound spreading assessment was carried out with the Soundplan 7.3 noise mapping software in which the built-in 3D model takes into the terrain conditions with due precision.

4.9.4. Examination of the existing situation

In analysing the current situation we determined the width of the noise protection zones stemming from traffic on the exiting road network outside the boundaries of which the noise pollution level is already below the nighttime limit value (Table 51). Based on the findings of the onsite inspection and the existing traffic data we do not see a need for base-case noise measurement in the current planning phase. In the environment of the prospective M6 expressway only natural sounds are to be observed at present, while the relatively low levels of traffic in the neighbouring road networks are causing only low levels of noise.

					90 km/h			50 km/h		
Road No.	Road, section	I	II	III	Laeq daytime	Laeq nighttime	protective zone	Laeq daytime	Laeq nighttime	protective zone
M6	M6 preceding section	2971	81	584	70,9	67,2	48			
56	No. 56 main road 49+263-52+831 No. 57 main road - No. 5121 road	432	49	117	61,2	52,5	11	57,5	48,9	7,5
56	No. 56 main road No. No. 5121 road - No. 5702/5117 roads	820	93	220	64,0	53,3	16,5	60,2	51,6	9,6
5702	No. 5702 road 0+000-2+000 No. 56 main road -Sátorhely	1326	114	98	64,4	55,5	17,5	60,1	51,3	9,1
5702	No. 5702 road 4+793-6+446 No. 5703 road-Majs	555	48	41	56,4	47,6	7,5	60,6	51,7	9,8
5703	No. 5703 road Bóly-M6	731	65	37	61,6	52,7	11,2	57,2	48,4	7,5
5703	No. 5703 road M6- No. 5702 road	731	65	37	61,6	52,7	11,2	57,2	48,4	7,5
5704	No. 5704 road 10+790-12+366 Bóly-No. 5714 road	1013	134	114	63,8	55	16	59,7	51	8,5
5704	No. 5704 road 12+366-13+190 No 5714 road-Bóly	1095	144	124	64,1	55,3	17	60,1	51,3	9,2
5714	No. 5714 road 2+817-3+916 No. 5704 road-Bóly	2191	155	157	66,5	57,6	24	62,2	53,4	12,5

Table 51 Distances where the nighttime noise limit values are met at present

In the case of the sections under assessment the nighttime noise limit value is met at distances of 7.5-12.5 m from the axis in residential areas. Residential buildings within the above distances are to be found in one section of the No. 5714 road inside the municipal administrative area of the town of Bóly, while in the rest of the road sections the buildings are typically at greater distances from the road axis.

4.9.5. Examination of the expected future situation

The calculations were carried out for year 2030 in regard to the scenario involving the construction of the M6 expressway section between the town of Bóly and the state border (WITH) and the scenario in which that particular section of the M6 expressway is not put in place, that is the reference state (WITHOUT). The noise pollutions resulting from changes in the traffic on the local road network were also examined as part of the assessment.

4.9.5.1. Direct impact of traffic on the M6 expressway

The traffic data and calculation results taken into account in order to identify the borderline where the nighttime limit values are met, are presented in Table 52.

M6 traffic sections	Nighttime noise limit values	
	dB(A)	distance where met (m)
M6 M60 - Bóly east	55	47
M6 Bóly east - Lippó	55	58
M6 Lippó - Ivándárda	55	57
M6 traffic sections	**Daytime noise limit values**	
	dB(A)	**distance where met (m)**
M6 Lippó – Ivándárda Serbian cemetery	65	18

Table 52 Distances where limit values will be met in the future

- According to the cadastral data and the onsite inspection there are no facilities to be protected within the distances resulting from the calculations.
- There is a Serbian cemetery near the protective zone in the municipal administrative area of the village of Lippó.

The noise pollution calculation was carried out for 4 relevant sites in regard to the prospective future state:

Vp1 Lajosmajor, 368 metres from the expressway route
Vp2 The residential building in the village of Lippó, which is the one closest to the road, at 306 metres from the road axis
Vp3 Lippó, Serbian cemetery, at 78 metres from the road axis
Vp4 Töttös allotments, the agricultural facility (a line of cellars) closest to the road, at 415 metres

The following noise pollution levels are calculated by noise-map based modelling:

Point	Distance	Laeq daytime	Laeq nighttime	Limit value

Vp1	368 m	46.1	43.1	65/55
Vp2	306 m	47	43.4	65/55
Vp3	78 m	54.2	50.5	65/55
Vp4	415 m	44	40.2	65/55

Table 53 Noise levels resulting from noise map modelling

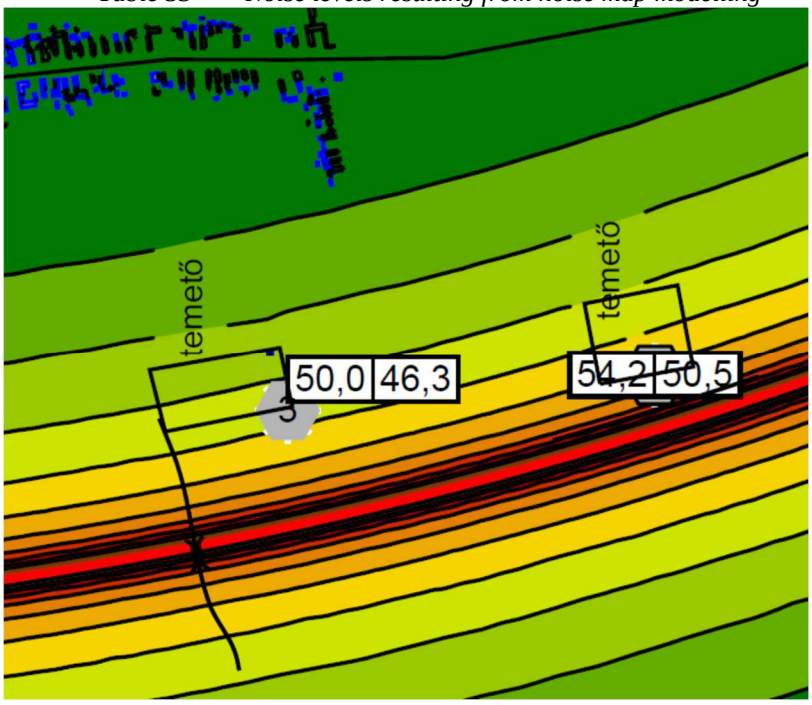


Figure 36 Expected future noise pollution at the Serbian cemetery of Lippó

Temető Cemetery

The limit value regulations pertaining to the daytime period will be met at the site boundaries of the two cemeteries in the impact area , that is, the Catholic cemetery (Tln. 044) Lippó, and the Serbian cemetery (Tln. 032) Lippó. The noise level at the Catholic cemetery will be 50 dB(A), while that of the Serbian cemetery will be 54-55 dB(A) at the site boundary. The area registered under Tln. 032 is divided into two parts (a and b), the cemetery is located in part “b”, while part “b” is a piece of arable land. The two parts are separated by a row of trees.

Accordingly, there is no need for any protective measure – a proposal has been made for the planting of multi-level vegetation to ensure protection of the Serbian cemetery to provide for its isolation. (see Table 49, Facilities suggested to be integrated in the landscape and the options assigned to each)

4.9.5.2. The effects of phased construction

In the course of the planning process we examined the effects of construction in two phases (Phase One: 2x1 lane, Phase Two 2x2 lanes) as well. From the aspect of traffic there are no differences between the two cross section options, therefore in regard to noise and vibration pollution there is practically no difference, i.e. the same effects are expected.

4.9.5.3. Indirect effects of the construction of the M6 expressway

In the course of the assessments we analysed changes in the noise pollution resulting from changes in traffic on the connecting road network. The data pertaining to traffic on the road

network elements affected by the prospective road and the results of the calculations are set out in Table 54, together with the distances at which the nighttime noise limit values are met.

WITHOUT

					90 km/h			50 km/h		
Road No.	Road, section	I	II	III	Laeq daytime	Laeq nighttime	protective distance	Laeq daytime	Laeq nighttime	protective distance
M6	M6 connecting section	4962	134	975	70.3	66.8	46			
56	***No. 56 main road 49+263-52+831 No. 57 main road -No. 5121 road***	***858***	***98***	***229***	***64.1***	***55.5***	***8***	***60.4***	***51.8***	***7.5***
56	No. 56 main road No. 5121 road - No. 5702/5117 roads	1792	203	481	67.4	58.7	15	63.6	55.0	7.5
5702	No. 5702 road 0+000-2+000 No. 56 main road-Sátorhely	2876	247	215	71.3	62.4	50	66.7	57.8	24.9
5702	No. 5702 road 4+793-6+446 No. 5703 road-Majs	1377	118	101	64.5	55.7	21	60.3	51.5	9.8
5703	***No. 5703 road Bóly-M6***	***1461***	***127***	***76***	***64.6***	***55.7***	***21***	***60.3***	***51.4***	***9.5***
5703	***No. 5703 road M6-No. 5702 road***	***1461***	***127***	***76***	***64.6***	***55.7***	***21***	***60.3***	***51.4***	***9.5***
5704	No. 5704 road 10+790-12+366 Bóly-No. 5714 road	1780	235	200	66.2	57.4	30	60.2	53.4	14.1
5704	No. 5704 road 12+366-13+190 No. 5714 road-Bóly	1823	241	205	66.3	57.5	30	62.3	53.5	14.4
5714	No. 5714 road 2+817-3+916 No. 5704 road-Bóly	3052	218	219	67.9	59.0	40	63.6	54.8	18.2

Table 54 Borderline where the nighttime noise limit values are met in case the project is not implemented

WITH

					90 km/h			50 km/h		
Road No.	Road, section	I	II	III	Laeq daytime	Laeq nighttime	protective distance	Laeq daytime	Laeq nighttime	protective distance
M6	M6 connecting section	5423	146	1065	73.6	69.3	105			
56	***No. 56 main road 49+263-52+831 No. 57 main road-No. 5121 road***	***2235***	***61***	***440***	***67.5***	***58.7***	***15***	***63.5***	***54.9***	***7.5***
56	No. 56 main road No. 5121 road-No. 5702/5117 roads	2328	63	458	67.6	58.9	15.5	63.7	55.1	7.5
5702	No. 5702 road 0+000-2+000 No. 56 main road-Sátorhely	2119	57	416	67.2	58.5	36	63.3	54.6	17.6
5702	No. 5702 road 4+793-6+446 No. 5703 road-Majs	299	34	80	59.6	50.9	9	55.8	47.2	7.5
5703	***No. 5703 road Bóly-M6***	***1041***	***118***	***279***	***65.0***	***56.3***	***24.0***	***61.3***	***52.7***	***12.1***
5703	***No. 5703 road M6-No. 5702 road***	***1491***	***129***	***111***	***64.9***	***56.0***	***23***	***60.7***	***51.9***	***10.5***
5704	No. 5704 road 10+790-12+366 Bóly-No. 5714 road	704	61	52	61.6	52.8	12.5	57.4	48.6	7.5
5704	No. 5704 road 12+366-13+190 No. 5714 road-Bóly	758	67	40	61.7	52.9	13	57.4	48.6	7.5
5714	No. 5714 road 2+817-3+916 No. 5704 road-Bóly	646	56	34	61.0	52.2	11	56.7	47.9	7.5

Table 55 55 Borderline where the nighttime noise limit values are met in case the project is implemented

Of the examined relevant road network elements the sections where traffic and consequently the noise level increases in comparison to the "WITHOUT" scenario are ***highlighted*** below.

Road No. and section		Nighttime noise limit value		
		difference dB(A)	distance where met (m)	
			WITH	WITHOUT
M6	*M6 connecting section*	*2.5*	*105*	*46*
56	No. 56 main road 49+263-52+831 No. 57 main road-No. 5121 road	3.1	7.5	7.5
56	No. 56 main road No. 5121 road-No. 5702/5117 roads	0.1	7.5	7.5
5703	No. 5703 road Bóly-M6	1.3	14.1	12.1
5703	No. 5703 road M6-No. 5702 road	0.5	10.5	9.5

Table 56

Significant increase in traffic and the noise levels may be expected in the preceding section of the M6 motorway but there are no facilities in need of protection within the 105 metre noise limit value distance. A minor increase in the noise level may be expected on the No. 56 main road and on the No. 5703 road in comparison to the reference level, as a consequence of which the limit values will be measured 1-3 metres further away from the road axis in the road sections in municipal administrative areas. In the rest of the road sections under review traffic will decrease by 25-65 %, resulting in a considerable improvement in the region's noise status.
We suggest that monitoring points be put in place on the No. 5703 road and on the No. 56 main road in order to make it possible to measure any increase in the prevailing noise pollution levels in the future. According to the results of the calculations that have been carried out a modest increase in the noise levels may be expected along the No. 5703 road, within the limit of error owing to the degree of precision of the forecast concerning the expected increase in traffic in the future. Depending on the results of the monitoring measurements there may be a need for noise protection measures. Monitoring points should be put in place at the two ends of the road crossing the village of Nagynyárád.

the effects of construction in 2 phases in terms of cross section (Phase One: 2x1 lane, Phase Two: 2x2 lanes) as well. From the aspect of traffic there are no differences between the two cross section options, therefore in regard to noise and vibration pollution there is practically no difference, i.e. the same effects are expected.

4.9.6. Impact area

The impact area has also been identified in regard to the prospective expressway. The route runs across agricultural areas for the most part. The impact areas however, reach the edges of residential areas as well, in some places.

Buildings within the noise impact area of the prospective route of the expressway are to be found in the area of the municipality of Lippó:

- Petőfi Sándor utca 28. (Lippó Tln. 172/2)
- Petőfi Sándor utca 30. (Lippó Tln. 173/2)
- Petőfi Sándor utca 39. (Lippó Tln. 176)
- Petőfi Sándor utca 41. (Lippó Tln. 175)
- Petőfi Sándor utca 43. (Lippó Tln. 174)

In the village of Töttös the impact area comprises allotments in agricultural area and an area where sports fishing is possible. There are two cemeteries in the village of Lippó within the impact area:

- Lippó, Catholic cemetery (Lippó Tln. 044.)
- Lippó, Serbian cemetery (Lippó Tln. 032.)

Both cemeteries are actively used for burials, however, the municipality has a new cemetery as well, which is used together with the municipality of Bezedek, therefore not more than 1-2 burial ceremonies take place in any given year in these two cemeteries.

Since the planning area and its immediate vicinity involves quiet municipalities with low levels of traffic induced noise emission (with a low background noise level), therefore in the course of the calculations we identified that distance from the road axis where the noise pollution level is

- 10 dB below the limit value, i.e. in this case, in residential areas it equals **45 dB**;
- in environments that need not be protected from noise – with the exception of economic buildings – the same as the limit value applying to resort areas, that is, in this case **50 dB**.

The results are presented in Table 57.

M6 traffic sections	Applicable noise level (dB)	Impact area (m)
	Area in no need of noise protection / residential area	Area in no need of noise protection / residential area
M6 M60 - Bóly east	50/45	45/120
M6 Bóly east - Lippó	50/45	165/365
M6 Lippó - Ivándárda	50/45	135/340

Table 57 Impact area, noise

4.9.7. The effects of construction

The impact area of the construction phase is expected to be the same as the areas involved in construction and mobilisation as well as their immediate surroundings. Noise emission will stem from the movement of the construction and loading machines. The noise generated by the

construction machines may only cause problems at buildings near the road but even such problems will only be of a transient nature.

The construction time is expected to be around 12-18 months. Each of the scheduled periods of the various construction phases taken into account from the aspect of noise protection is expected to be shorter than three months. The main noise generating phases of construction include earth works, embankment construction, road structure construction and in the case of the construction of engineering structures the construction of diaphragm walls and the piling works.

The route of the prospective expressway crosses areas under agricultural cultivation, for the most part. The minimum distance between the route and any residential area is over 180 metres.

The permitted equivalent A-sound pressure levels of the noise originating from the construction works are listed in Annex 2 to Joint Decree 27/2008. (XII.3.) issued by the Minister of Environment Protection and Water Management and the Minister of Health on the establishment of noise and vibration load limits, accordingly, the limit values pertaining to the duration of the construction period in the above construction phases are as follows:

		Limit value (L_{TH}) for the L_{AM}assessment level * (dB)					
		if the duration of construction is					
Ser. No.	**Area to be protected from noise**	Not more than 1 month		More than one month, up to one year		More than one year	
		daytime 6-22 o'clock	nighttime 22-6 o'clock	daytime 6-22 o'clock	nighttime 22-6 o'clock	daytime 6-22 o'clock	nighttime 22-6 o'clock
1.	Resort area; of the special areas: healthcare area	60	45	55	40	50	35
2.	**Residential area (small town, suburban, village, settlement type construction), of the special areas: the areas of education institutions, cemeteries and green areas**	65	50	**60**	**45**	55	40
3.	Residential area (metropolitan construction), mixed area	70	55	65	50	60	45
4.	**Commercial area**	**70**	**55**	**70**	**55**	**65**	**50**

* To be interpreted in accordance with the Hungarian Standard MSZ 18150-1 and the Hungarian Standard MSZ 15037.

Any construction work entailing significant noise emission may be performed in the environment of buildings in need of protection only during 06.00 and 22.00 o'clock, during daytime, accordingly, only the satisfaction of the daytime limit value requirements were examined.

The following conclusions can be drawn from our current knowledge of the organisation of the project:

Work in the course of the linear construction activities will be carried out in phases, in sections several hundreds of metres long and 25-30 metres wide. The total period involving mechanised work in any given phase does not exceed half a year.

The noise emission of the machines and equipment used in the course of the construction phase and the environmental noise pollution levels were estimated on the basis of data taken from literature and the noise measurements carried out.

Table 58 contains noise level data pertaining to certain machines typically used in construction.

Types of machines	Noise emission level L_{AM}, dB	Distance of relevance (m)	Noise capacity level L_{WA}, dB
Pile drivers			
bore pile driver	84,5	10	-
explosive	108	10	-
Vibrators (depending on capacity and operation)	68-83	7	-
Cranes of different types (depending on capacity)	86-92	7	
Transport machines			
articulated lorry tractor (depending on capacity)	82-96	7	-
truck (diesel)	82-90	7	-
dumper truck (depending on capacity)	56-83	7	-
Earth moving machines			
Universal earth moving machine	79,5	10	100
Dredger	72,5	10	-
Trencher	75-92	7	-
Bulldozer	85	7	-
Compacting machine, road roller	85-100	7	-
Foundation building machines			
Submersible pump	75-80	7	-
Compressors			
DK 661	102,2	10	118
Atlas Copco (PRA 425 DD)	87,7	10	105
Concrete and cement injecting equipment	88	7	-

Types of machines	Noise emission level L_{AM}, dB	Distance of relevance (m)	Noise capacity level L_{WA}, dB
Soil drills	80-89	7	-
Rock drills	101	7	-
Cable laying machines	87	7	-
Drill-demolition hammers	97-105	7	-

Table 58 Noise level data of certain construction machines

Accordingly, the noise emission from each construction phase is estimated to be approx. L_{WA}=114 dB. The location of noise emission varies continuously in the course of the construction phase.

The daily operating time of the noise emission sources scheduled to the extent possible and taken into account in the calculations is 8 hours per day. Noise emissions different from, probably lower than, the levels taken into account in the calculations may be expected in the various main construction phases however, in order to err on the safe side, the same, maximum, noise emission levels were taken into account for each typical construction phase.

Accordingly the daytime limit value is met at 80 metres from the axis according to the above data taken from literature within which distance there are no facilities in need of protection.

Truck movements in the areas of construction should also be taken into account as construction noise emission sources.

Accordingly, the following general conclusions are drawn and the following proposals are formed:

- The effects of construction may be observed in a larger area but they will only be transient and come to an end upon the completion of the facility.
- The base sites of the machines and equipment involved in construction must be placed as close as possible to the route of the prospective road, to avoid unnecessary movements in the surrounding road network.
- The construction of the earthwork is one of the construction operations entailing the most intensive and heaviest vehicle movements. Its negative impacts may be mitigated by finding material extraction sites close to the route of the prospective road.
- Construction work may only be carried out during the daytime hours between 06.00 and 22.00 o'clock, therefore only the daytime limit values need to be observed.
- The use of low noise equipment and machines fitted with noise protection casing or cover is suggested.

The noise effects of the construction phase may be determined following the clarification at a later stage of the – currently indicative – data, along with any necessary noise protection actions, but it is clear from the currently available data that there will be no need for any specific noise reducing actions.
The noise and vibration protection documentation will have to be worked out prior to the commencement of the construction phase – in view of the precise organisation plan, the construction schedule and the machinery to be used by the contractor – setting out also the

monitoring points to be observed during the construction phase where documented noise measurements will have to be taken during the construction phase in accordance with the applicable regulations.

In the course of the planning phase we also assessed the effects of operation in 2 Phases in terms of cross section (Phase One: 2x1 lane, Phase Two: 2x2 lanes). From the aspect of traffic there are no differences between the two different cross section designs, therefore there are no material differences in terms of the noise and vibration load either; the same effects are to be expected over a 15-year horizon even if the motorway is constructed in two phases.

4.9.8. The construction effects of implementation in phases

The effects on noise of the construction of the **extension** will, in essence, be the same as the effects caused by the construction of the original 2x1-lane structure in the first place, with the difference that the noise emission from the operation of the 2x1 lanes of Phase One will also be present during the construction of Phase Two. Construction alongside the already operating road, the movement of materials and the deliveries will cause a temporary additional load on the sections of the road being extended in successive phases, along with the relevant parts of the access road network.

Construction works will be carried out on sections several hundred metres in length and 20-25 metres in width, in Phase Two as well. The duration of mechanised construction work will not, in all, exceed half a year in any such section.

The means used in the construction activities will be the same as those to be used in Phase One, accordingly, the noise emission in each phase of the construction process is estimated to equal approx. L_{WA}=114 dB. The location of noise emission varies continuously in the course of the construction phase.

The daily operating time of the noise emission sources scheduled to the extent possible and taken into account in the calculations is 8 hours per day. Noise emissions different from, probably lower than, the levels taken into account in the calculations may be expected in the various main construction phases however, in order to err on the safe side, the same, maximum, noise emission levels were taken into account for each typical construction phase.

Accordingly the daytime limit value is met at 80 metres from the axis according to the above data taken from literature within which distance there are no residential buildings in need of protection.

Prior to the execution of the extension the necessary protective actions will have to be accurately specified in the organisation plan to be worked out, in view of the background load of the then prevailing traffic intensity.

4.9.9. Construction of the associated facilities

The category of related engineering structures include public utility facilities for which preliminary assessment documentations must be prepared. Two 20 KV power line replacements may take place in the road section covered by the planning phase: one at the 201+383 km section and one in the 209+725 km section. The 20 KV power lines generate no noise or vibration during the operation period, the only time when such environment pollution is observed is during the demolition-construction period in relation to the construction of the prospective road.
Experience shows that the noise emission of the public utility related works to be carried out before the actual road construction phase is far below the expected noise emission of road construction itself.

The noise protection effects of the construction of the other related facilities, such as junctions and road connection adjustments, cannot be detached from the noise emission of the main road structure, from the noise emission of whose construction it is not possible to identify the construction noise emission of the relevant facilities under scrutiny in this document.

4.9.10. Evaluation of the different route options, proposed protection measures

The prescribing of no protective measures is considered to be justified in this planning phase concerning the indirect impact area, in consideration of the relatively low prospective traffic levels and the uncertainties relating to any future changes. The fact that the limit values will not be exceeded must be proven on the basis of the noise level measurements taken at the designated monitoring points before the commencement of the investment project and its delivery.
The proposed monitoring points:
Mp1 The first residential building, which is closest to the road in the municipality of Lippó, at a distance of 306 metres from the road axis.
Mp2 Lippó, Serbian cemetery, at a distance of 78 metres from the road axis
Mp3 Nagynyárád Zalka Máté utca 1 (Nagynyárád Tln.79)
MP4: Nagynyárád Táncsics Mihály utca 4. (Nagynyárád Tln.314)

4.9.11. Tasks to be carried out in subsequent planning phases

In this planning phase we see no reason for carrying out noise measurements, however, in later planning phases, but not later than before the commencement of construction, base-case noise pollution measurements will have to be carried out at the prescribed monitoring points in the indirect impact area.

4.10. VIBRATION

The effects caused by vibration stemming from transport fall into two categories: damage to building structures, and an unpleasant sensation of vibration. The latter falls in the scope of regulation of vibrations affecting people inside buildings.
One way of the generation of vibration in relation to public road transport originates from the connection between the vehicle and the road. The transmission is difficult to describe or model; there is a complex connection between the two. In general: the more uneven the road surface, the more substantial the impact of speed on the magnitude of vibration.
The soil's mechanical attributes are affected by moisture content and temperature (winter frost, thawing in the spring) as well.
The vibration effect at the observation point decreases with the increase in the distance from the road, resulting from geometric attenuation and the soil's internal attenuation.
Another way of vibration resulting from public road transport is related primarily to the movement of heavy motor vehicles, where the low frequency noises (airborne sounds) can cause vibration of the glazing of buildings or of small loosely fixed objects, inside buildings.
In the following sections we will be scrutinising the impacts on humans, of the vibrations expected to be caused by the construction and the operation of the road, describing the applicable regulations.

4.10.1. Regulations and laws referred to herein

Vibrations affecting people:
Vibration caused by traffic has no direct negative impact on human health inside building; indeed, it causes an unpleasant perception of vibration falling in the following main categories:

- unpleasant physical sensation affecting the human body,
- sleeping disorders,
- vibration of window glazing and minor unfixed objects,
- concern about damage being done to the dwelling.

The standard No. ISO 2631-2:1989 sets out perception threshold curves. The establishment of vibration load limit values is based on the perception threshold curves identified in this standard.
The currently effective Joint Decree 27/2008. (XII.3.) issued by the Minister of Environment Protection and Water Management and the Minister of Health on the establishment of noise and vibration load limits specifies requirements pertaining to environmental vibration load levels in its Section 7 and Annex 5.
Annex 5 to Joint Decree 27/2008. (XII. 3.) KvVM-EüM
Limit values of vibration affecting people, inside buildings

Ser. No.	Building, room*		Vibration assessment limit value * (mm/s^2)	Vibration load limit value * (mm/s^2)	
			A_0	A_M	A_{max}
1.	Room particularly sensitive to vibration (e.g. operating theatre)		3.6	3	100
2.	Residential building, resort building, social-welfare hostel, commercial accommodation	daytime 6-22 o'clock	12	10	200

	building, sanatorium residential and resting rooms	nighttime 22-6 o'clock	6	5	100
3.	Rooms of cultural and religious facilities requiring increased attention (e.g. concert room, church building), activity rooms of kindergartens and pre-schools; doctors' office		12	10	200
4.	Rooms of educational, administrative and office facilities requiring increased attention (e.g. school room, computer room, library reading room, design office, dispatch centre); theatre, cinema audience spaces; shared spaces in higher category hotels		24	20	300
5.	Shop floors and catering spaces of commercial and catering buildings, audience spaces of sports facilities; corridors and foyers of public buildings		36	30	600

* For interpretation see Hungarian Standard MSZ 18163-2:1998 .

As regards vibration load the impact area is the strip of area in which the relevant (nighttime) limit value is expected to be exceeded without protective measures as a result of the prospective facility. In the case of newly constructed, high load bearing capacity expressways it is highly safe to say that no vibration loads exceeding the applicable limit values should be expected outside a 50 metre zone measured from the road axis on each side.

4.10.2. The existing situation

There is practically no road section of considerable traffic in the vicinity of the prospective routes. There are only lower level roads in the region of the planned routes without significant heavy vehicle traffic.

Vibration caused by traffic is related to the passing of heavy motor vehicles which may, in the current state, be of a disturbing degree only in closed structure buildings of parts of municipalities with narrow roads. Particular attention will have to be paid in the course of construction to the designation of the transport routes from this perspective as well. Traffic on the adjoining M6 motorway is not causing problems associated with vibration loads either.

4.10.3. The prospective situation

New earth work and road structure will be built up in the course of the continued section of the M6 motorway. The road structure with the planned asphalt wearing layer is dimensioned to support the planned heavy motor vehicle traffic.

In the case of the new bridge structures to be constructed attention will need to be paid to the construction of dilatation structures.

There must be no building that is in need of protection from the perspective of clean air protection within a 50 metre distance on either side of the motorway, therefore no residential building exposed to the effects of vibration needs to be expected within the 50-metre zone in the planned state of the prospective motorway.

The statutory vibration load limit values set out in the relevant statutory regulations are expected to be met at a 50 metre distance from the axis alongside the earthwork, road structure and engineering structures (adequate dilatation structures) to be constructed in the framework of the project.

4.10.4. The effects of construction

In the planning section, just like in all cases of road construction, the requirements relating to transport, construction and extraction of the input materials of the earth work are the predominant requirements, together with local point-source effects of the construction of bridge foundations. At present we have no information concerning the quantities of materials moved during such work phases, the scheduling of the construction work, the sizes and compositions of the machine chains performing the works, the material transport routes or the mining sites to be used. Preference must be given in the course of construction to road transports on the line and other short transport routes which should be designated, to the extent possible, without relying on sections of the public road network crossing municipalities. Based on this principle, in this phase of the planning process deliveries along the route of the road itself are proposed to be made. Should transport routes run though residential areas as well, the conditions of buildings that may be potentially affected, must be assessed before the commencement of the construction phase, with the primary aim of documenting the grounds for the settlement of any damage that may be caused by any increase in vibration.
Like the noise level limit values, the limit values applying to vibration loads are also tighter during the nighttime hours. For this reason, the construction activities and deliveries must be organised with a view to making sure that operations entailing vibration emissions are only carried out during the daytime hours, without exceeding the applicable limit values (this applies particularly to transport activities).

4.11. WASTE MANAGEMENT

Reasonable waste management, in line with the relevant and applicable statutory regulations, is a mandatory requirement to be met in the course of both the implementation of the project and the operation and use of the facility.
All activities must be planned and performed in a way that their impacts on the environment are minimised or that the load on and the use of the environment is reduced; the activities should not cause environmental pollution and must not impose environmental hazards.
In the course of the implementation of the project and the operation of the new road waste must be managed in accordance with the following basic principles (pursuant to Act CLXXXV of 2012 on waste):

<u>The principle reuse and preparation for reuse:</u>
To prevent waste output the use, repair, refill and/or preparation for reuse, of products as well as the development of reuse and repair networks must be facilitated by economic and technical means, as well as the introduction of criteria and quantified targets for the procurement of materials and objects;

<u>The principle of proximity:</u>
Actions must be taken to ensure that the network specified in Act CLXXXV of 2012 on waste enables the use or disposal of waste in the nearest waste management facility that is suitable for the purpose, with the most suitable methods and technologies, taking into account the environmental conditions and the environmental and economic effectiveness and efficiency, the best available techniques and any specific management requirements of the waste output; the principle of proximity does not mean that Hungary needs to have the complete range of the possible waste recovery facilities;

<u>The polluter pays principle:</u>

Responsibility for the management of waste and for the payment of the costs of waste management lies with the producer of the waste, the owner of the waste or the manufacturer of the product that has turned into waste;

The principle of the recovery of biodegradable waste:
Separated collection and recovery of biodegradable waste must be facilitated to make sure that after waste recovery the material that is returned into the natural organic matter cycle is a pure as possible and that the biodegradable waste content of municipal waste disposed of in landfills is minimised;
The waste output must be collected, transported and delivered to waste recovery or disposal organisation without endangering the environment.

Possibilities for waste disposal in the region according to the **www.okir.hu** database:

No. 15 and No. 17 main waste groups	
Mohácsi Városgazdálkodási és Révhajózási Nonprofit Kft.	7700 Mohács Szabadság road 17. Festetics fasor 0249/7
Dél-Kom Dél-Dunántúli Kommunális Szolgáltató Nonprofit Nonprofit Kft.	7632 Pécs Siklósi road 52.
BIOKOM Pécsi Városüzemeltetési és Környezetgazdálkodási Nonprofit Kft.	7632 Pécs Siklósi road 52.
Beremendi Szolgáltató Nonprofit Közhasznú Kft.	7827 Beremend Szabadság tér 6.

Collection of the No. 8 main waste group	
Mohácsi Városgazdálkodási és Révhajózási Nonprofit Kft.	7700 Mohács Szabadság road 17. Festetics fasor 0249/7
BIOKOM Pécsi Városüzemeltetési és Környezetgazdálkodási Nonprofit Kft.	7632 Pécs Siklósi road 52.
Győri Szolgáltató és Vendéglátó Betéti Társaság	7630 Pécs Zsolnay Vilmos u. 59/1.
Biolé Környezetvédelmi Korlátolt Felelősségű Társaság	7633 Pécs Szigeti road 138.
No. 200201-biodegradable waste and No. 200301 Egyéb municipal waste, including mixed municipal waste	
Dél-Kom Dél-Dunántúli Kommunális Szolgáltató Nonprofit Nonprofit Kft.	7632 Pécs Siklósi road 52.
BIOKOM Pécsi Városüzemeltetési és Környezetgazdálkodási Nonprofit Kft.	7632 Pécs Siklósi road 52.
Beremendi Szolgáltató Nonprofit Közhasznú Kft.	7827 Beremend Szabadság tér 6.
No. 16 main waste group	
BIOKOM Pécsi Városüzemeltetési és Környezetgazdálkodási Nonprofit Kft.	7632 Pécs Siklósi road 52.

Note: the validity of the licences of the above organisations must be verified by the contractor at the time of the commencement of the work.

Applicable decrees and acts

- Act CLXXXV of 2012 on waste,
- Decree 72/2013. (VIII. 27.) VM issued by the Minister of Rural Development on the list of waste,

- Government Decree 98/2001. (VI. 15.) on the conditions pertaining to the performance of activities involving hazardous waste,
- Government Decree 309/2014. (XII.11.) on the registry and data reporting obligations concerning waste,
- Government Decree 385/2014. (XII. 31.) on the conditions pertaining to the performance of public waste management service,
- Decree 20/2006. (IV. 5.) KvVM issued by the Minister of Environmental Protection and Water Management on certain rules and conditions pertaining to waste deposition and waste depots
- Government Decree 191/2009. (IX. 15.) on construction industry activities,
- Joint Decree 45/2004. (VII.26.) BM-KvVM issued by the Minister of the Interior and the Minister of Environmental Protection and Water Management on the detailed rules on the management of construction and demolition waste

4.11.1. Waste output of construction

The following is a description of the statutory regulations applying to the management and registration of waste produced in the course of the construction activities:

1. According to Act LXXVIII of 1997 on the development and protection of the built environment:

Section 43. (2) The developer and the contractor are jointly responsible for making sure that the construction waste generated in the course of the construction-execution operations is removed, in the way prescribed in specific other legislation, from the engineering structure's environment within the time frame prescribed by the construction authority and that the environment and the terrain surface are delivered in their original state or in the authorised condition and any damage caused to the environment are eliminated.

2. Joint Decree 45/2004. (VII.26.) BM-KvVM issued by the Minister of the Interior and the Minister of Environmental Protection and Water Management on the detailed rules on the management of construction and demolition waste provides as follows:

Section 10 (1). Following the construction or demolition activities the developer must prepare the waste registry sheet specified in the Government Decree on the waste actually produced in the course of the construction activity and on construction execution activity as well as the demolition waste registry sheet specified in the Government Decree on waste actually produced in the course of the construction activity and on construction execution activity.

(3) The demolition waste registry sheet referred to in paragraph (1) and the certificate of the organisation managing the waste shall be submitted by the developer to the competent environmental authority, otherwise the environmental authority may start an infringement proceeding and shall not grant its specialised authority consent to any new building permit for the area concerned, as prescribed in specific other legislation.

The tasks of the environmental authority in the course of the planning of and rendering accounts for the quantity of construction and demolition waste

Section 12. The environmental authority shall verify compliance with the regulations prescribed in Sections 3-8 hereof and in other applicable environmental legislation by checking the design sheets and the registry sheets, moreover, it shall form its standpoint as specialised authority in the procedure of the issuance of the construction permit.

Registration of the quantity of the construction and demolition waste

Section 13 In addition to as specified in this Decree the registration and data supply obligations relating to construction and demolition waste must be fulfilled pursuant to specific other legislation . on registry and data supply obligations relating to waste.

3. Section 65 of Act CLXXXV of 2012 on waste management prescribes registration and data supply obligations for all entities producing, possessing and/or managing waste, covered by the Act, the way, content and timeframe of which are regulated in detail by Government Decree 309/2014. (XII.11.) on the registry and data reporting obligations concerning waste since 1 January 2015.

Annex 1 to the Decree specifies the data the entity producing waste must keep in its registry.

Annexes 2-3 to the Decree set out the forms to be filled out for data supply.

The reports containing the data must be submitted to the Environmental Authority having competence in the area in which the site supplying data is located.

Management of municipal liquid waste

Act LVII of 1995 on water management provides for the management of liquid waste, including that of household wastewater not collected by public utility systems.

Section 44/B The owner, asset manager or user of the real estate under some other title, shall collect household wastewater – produced on his/its real estate that is not discharged into the public utility wastewater network or, after on-site treatment in some authorised way, into the recipient – in the way specified in the Government Decree on the general rules on the activities and facilities serving the purposes of the protection and utilisation of water and the prevention of damage by water, and hand over such wastewater to the public utility service provider authorised to collect it.

Section 44/C (1) In the way of a public service to be provided on a mandatory basis the municipal government or the association of municipal governments shall organise and maintain a public service for the collection of household wastewater not discharged into the public utility wastewater network or, after the individual wastewater treatment authorised in the way specified in the Government Decree on the exercising of the powers of water management authorities, into the recipient. The wastewater treatment plant that is obliged to take over household wastewater not collected by public utility systems, the element of the wastewater collection system designated for this purpose, the pond or other wastewater treatment plant (hereinafter collectively: hand-over site) shall be designated by the water authority after consulting the clerk of the municipal government having competence in the territory in which the hand-over takes place.

The types of waste to be generated in the course of the construction phase and the expected quantities

A variety of different types of waste are to be expected to be produced in the course of the construction of facilities.

The following table shows the type of hazardous waste and non-hazardous waste to be expected to be generated in the course of the execution of the project, identified by the codes specified in Decree 72/2013. (VIII. 27.) VM, issued by the Minister of Rural Development.

The provisions set out in Joint Decree **45/2004. (VII. 26.) BM–KvVM issued by the Minister of the Interior and the Minister of Environment Protection and Water Management** concerning construction and demolition works shall be applied. **According to the quantitative calculations available in this phase of planning we work out a preliminary estimate of the waste outputs of the various construction activities, identified in the fifth column of the table, by type of waste.**

Non-hazardous wastes:

Name	ID code	Place of output

	Main group number	Sub-group number		Expected quantity (tonnes)	Threshold quantity (tonnes)	Way of treatment
Inert waste:						
Concrete	17	17 01 01 17 09 04	Concrete: from the demolition of the structure of engineering structures, from the demolition of the road foundation	no data available in this phase of planning	20	recyclable (handed over to waste treatment operator, or to be used in the given construction project)
Metals (including their alloys)	17	17 04 01-07 17 04 11	Reinforced concrete structures from removing bridge railings, metal waste from the demolition of crossing railway lines	no data available in this phase of planning	2	recyclable (handed over to waste treatment operator)
Wood waste	17	17 02 01	from the removal of support structures bolstering concrete structures, from the demolition of temporary terrain covers	no data available in this phase of planning*	5	recyclable (handed over to waste treatment operator, or to be used in the given construction project)
Soil extracted	17	17 05 04	Soil resulting from the removal of unsuitable cover layer, that cannot be used for humus	no data available in this phase of planning	20	The whole of the extracted humus and other soil is spread back or built in in the course of the execution of the project.
Asphalt debris waste	17	17 03 02	From the demolition of the road surface	no data available in this phase of planning	5	recyclable (handed over to waste treatment operator, or to be used in the given construction project)
Mixed construction and demolition waste	17	17 09 04	Mixed waste from demolition that cannot be treated by fraction	no data available in this phase of planning	10	disposal by deposition
Construction materials and auxiliary materials:						

Waste from the use of other coatings (including ceramic)	08	08 02 01-03	Materials originating from the removal of bridge structure insulations and the application of coatings of railings of engineering structure, other protective paints and insulating coatings	Without knowledge of the contractor their quantity cannot be estimated	5	disposal by deposition
waste resulting from the use of glues and sealants (including waterproofing products)	08	08 04 10 08 04 12 08 04 14 08 04 16			5	disposal by deposition
waste originating from the manufacture, packaging, distribution, application and removal of paints and varnishes	08	08 01 12 08 01 14 08 01 16 08 01 18 08 01 20			5	disposal by deposition
Communal waste:						
Communal solid waste	20	20 03 01	Waste output of workers, collected temporarily in containers at the work site	Without knowledge of the contractor their quantity cannot be estimated	2	disposal by deposition
Waste to be collected selectively						
metal waste (iron, steel)	15	15 01 04	Metal fastenings and reinforcements resulting from packaging	Without knowledge of the contractor their quantity cannot be estimated	5	recyclable (handed over to waste treatment operator)
wood waste	15	15 01 03	waste from damaged pallets and the box pallet packaging of other construction materials	Without knowledge of the contractor their quantity cannot be estimated*	5	recyclable (handed over to waste treatment operator)
paper waste	15	15 01 01	Waste from the packaging of construction materials	Without knowledge of the contractor their quantity cannot be estimated	5	recyclable (handed over to waste treatment operator)
plastic waste,	15	15 01 02	Waste from packaging materials, parts of PVC pipes of	Without knowledge of the contractor	5	recyclable (handed over to waste

			public utility lines that cannot be used	their quantity cannot be estimated		treatment operator)
Biodegradable waste	20	20 02 01	Green waste from shrub removal and terrain forming	no data available in this phase of planning	2	recyclable (handed over to waste treatment operator - composting)

* Any waste wood that cannot be used for any further purposes shall either pass into the client's ownership and the client pays its price to the contractor or it passes into the contractor's ownership and its value is subtracted from the value of its performance.

Hazardous waste

Among waste listed below, waste indirectly generated at the contractor's central site in connection with the operation of the machinery and performance of work on site is indicated in italics.

(Only hazardous waste types are listed here. Where the subgroup number only consists of 4 digits, all types of waste included in the subgroup are expected to be generated.)

Name	**Identification code**		**Location of generation**	**Expected quantity (tons)**	**Threshold (tons)**
	Main Group no.	**Subgroup no.**			
Motor and engine lubricating oil waste ***- oil and oily waste*** ***- fuel waste*** ***- absorbents, oily rags***	*13* *15*	*13 01** *13 02 ** *13 05 ** *13 07** *15 01 ** *15 02 02**	*Typically from maintenance at central site*	*On-site generation irregular; quantity cannot be estimated*	*0.1*
Waste battery	*20*	*20 01 33**	*Typically probable at central site*	*On-site generation unlikely*	*0.1*
Oily sand	16	16 07 08*	From sand used to absorb and neutralise oil in decontamination work in case of accident or vehicle breakdown at construction site	From disaster; quantity in case of local work cannot be estimated; not generated in course of normal construction work	0.1
Waste from vehicle maintenance	*16*	*16 01 04** *16 01 07-11** *16 01 13-14** *16 01 21**	*Typically probable at central site*	*On-site generation unlikely*	*0.1*
Paint and lacquer waste containing volatile organic compounds or other hazardous substances **Paint packaging waste**	08 15	08 01 11* 08 01 13* 08 01 15* 15 01 10*	Materials left behind from removing insulation and applying coating and protective paint on bridges, engineering stuctures, rails	Quantity cannot be estimated unless contractor is known	0.1

Collection and management of waste from construction works

Construction waste produced during implementation must be managed in a segregated manner in accordance with the provisions of Joint Ministerial Decree 45/2004 (VII. 26) BM-KvVM.
The contractor has a disclosure obligation if in the year of implementation the amount of waste disposed of and decontaminated exceeds the amount specified in Government Decree 440/2012 (XII.29).

Inert waste generated is composed of "rejects" from necessary demolition works and produced during the construction phase.
Due to the nature of the facility, the amount of inert waste will be kept to a minimum in connection with its use during foundation works.
Before its use for building-in, waste must be classified on the basis of structural engineering and environmental expert opinions in respect of its suitability for use as construction materials and also in terms of its impact on the environment.

Communal waste will be generated subject to the design of facilities and to implementation technologies to be applied throughout the entire investment period, in accordance with work scheduling. Its amount cannot be estimated in the current planning phase. Liquid communal waste will be collected in standardised hygienic premises used for this purpose, as required in compliance with the provisions of the Public Health Service.
Standardised containers must be placed at the work sites for the appropriate collection of solid communal waste.
Waste generated from construction can be handed over to a licensed waste management company or a licensed decontamination company and such waste must always be accompanied by appropriate certification. A significant portion of the waste generated is not hazardous waste. Its collection and removal – to a waste management contractor, for the purpose of landfill or to a communal waste disposal site (dump) – must be performed in a manner avoiding pollution of the environment (e.g. dusting). Among non-hazardous waste that which can be sold or reused should be collected separately and then sold and reused..

Options to make use of waste generated during the construction phase

In the case of waste generated during construction an important practice is recycling and reuse. Much demolition waste can be used for foundation works after appropriate preparation. The following types of waste can be handed over for the purpose of reuse:

Name	**Identification code**		**Management method**
	Main Group no.	**Subgroup no.**	
Concrete	17	17 01 01 17 09 04	recyclable (can be transferred to waste management company and used in given construction)
Metals (including alloys)	17	17 04 01-07 17 04 11	recyclable (transferred to waste management company)
Wood waste	17	17 02 01	recyclable (can be transferred to waste management company and used in given construction)
Concrete debris	17	17 03 02	recyclable (can be transferred to waste management company and used in given construction)
Metal waste (iron, steel)	15	15 01 04	recyclable (transferred to waste management company)
Wood waste	15	15 01 03	recyclable (transferred to waste management company)
Paper waste	15	15 01 01	recyclable (transferred to waste management company)
Plastic waste	15	15 01 02	recyclable (transferred to waste management company)

Bio-degradable waste	20	20 02 01	recyclable (transferred to waste management company - composting)

Activities related to hazardous waste must be performed in accordance with the provisions of **Government Decree 225/2015 (VIII.7),** i.e. they must not jeopardise and pollute the environment during collection and transport. This also applies to staging, material extraction and construction sites.
Hazardous waste may only be transferred to persons and organisations licensed to take over such waste. Their collection must be ensured in accordance with relevant provisions.
Depending on the amounts of hazardous waste generated, it is necessary to set up hazardous waste storage sites with parameters complying with relevant regulatory provisions.
Transportation by road can only be performed with the use of vehicles specified in the aforesaid regulation. In the accompanying documents the hazard category and composition etc. of waste must be indicated.
Handover of waste must be documented in detail, which data and information may be requested by the competent authority in relation to the occupancy licensing procedure.

Waste generated during operation

In the area of the road section – following full completion and occupancy – generation of small amounts of hazardous and non-hazardous waste must be reckoned with. Their types are currently only partly known or can only be partly predicted; there is no information available in the current planning phase as to their exact quantity and type.

In the present planning phase there is no precise information available yet concerning repair and maintenance activities and the equipment and materials required for such activities.

During the operation of the road section, waste will be generated from the following activities:

- Cleaning
    - Maintenance of rest stops
    - Removal of roadkill
- Cultivation of green areas
- Maintenance and repair
    - Maintenance, coating and washing of the roadway and road fixtures (rails and columns)
    - Repair of the road surface (removed asphalt)
- Response to any disasters

During the operation of the proposed road section, the list of major types of waste to be generated under Ministerial Decree 72/2013 (VIII.27) VM is as follows:

Name	Identification code		Location of generation	Expected quantity (tons)	Threshold (tons)	Management method
	Main Group no.	Subgroup no.				
Garden waste, bio-degradable waste	20	20 02 01	Scything within expropriation area; shrub removal, if needed	No quantity specified by manager. Quantity generated predictably remains below threshold.	2	recyclable (transferred to waste management company - composting)

Other municipal waste including mixed waste	20	20 03 01	Roadside rubbish thrown from vehicles	No quantity specified by manager. Quantity generated predictably remains below threshold.	2	Disposal at landfill
Road cleaning waste	20	20 03 03	Waste from washing/sweeping off dirt from roadway	No quantity specified by manager	2	Disposal at landfill

The generation of the following categories of waste can be reckoned with at the central site of the road manager, Magyar Közút Zrt., given that some of this waste will be generated from administrative activities and the data on anticipated amounts are of an indicative nature and calculated on the basis of quantities generated in earlier years in respect of the entire waste management district.

ID code		Name	Expected annual quantity (ton)
Main group No	**Subgroup No**		
20	20 01 33*	batteries and rechargeable batteries	0.03-0.05
16	16 06 01*	lead rechargeable batteries	0.02-0.03
15	15 01 10*	packaging waste containing hazardous substances as remains	0.05-0.06
13	13 02 05*	used oil	0.05-0.06
16	16 07 08*	waste containing oil	9-10
13	13 05 02*	oily sludge	0.01-0.02
16	16 01 07*	oil filters	0.01-0.02
13	13 07 01*	heating oil and diesel oil	0.25-0.3
15	15 02 02*	absorbents (e.g. oily sand), filters, wiping cloth, protective clothes contaminated by hazardous subtances	3-5
17	17 05 03*	earth and stones containing hazardous subtances	1.5-3
18	18 02 02*	wastes requiring special collection and desinfection	0.15-0.20
16	16 01 14*	used antifreeze liquids	25-30 liter
20	20 01 21*	fluorescent tube	0.003-0.005
08	08 03 17*	toner that has become waste	0.001-0.005

4.11.2. Collection and management of waste generated from operation

Collection and decontamination of communal waste
The competent road management authority will be responsible for removing communal waste generated during road operation.
It will organise periodical collection of roadside rubbish thrown away by road users.

Collection and removal of hazardous waste:
Generation of large volumes of hazardous waste is not anticipated.
Activities related to hazardous waste must be organised in accordance with Government Decree 225/2015 (VIII.7) on hazardous waste.
Waste collected from the location of operations will be transferred directly to a waste collection company. Management of waste generated from road maintenance and cleaning will be dealt with by the road engineering authority.

Transport by road can only be performed with the use of vehicles prescribed in the aforementioned decree; their documentation must indicate the type, hazard category and composition of waste. Waste handed over to a licensed decontamination site must be certified.

Selective collection of waste during operation

Waste generated during operation at rest stops and filling stations will be collected selectively. Motorway engineering authorities will also collect waste selectively. Waste removal will be the responsibility of the competent road management company.

As from 01 January 2006, selective waste collection islands have been created in all motorway roadside rest stops managed by ÁAK Zrt. (now Magyar Közút Zrt.) and thus selective waste collection will also be carried out at the rest stops on the proposed M6 motorway.

Containers to be found at selective waste collection islands are made of metal and have a capacity of 2500 and 1500 litres. Selective waste extends to separating paper, PET bottles, glass bottles and metal beverage cans into designated containers that carry pictograms informing travellers about the each type of waste.

Roadkill management

Roadkill must be reported to the motorway dispatch service in the territory of the competent county.

The road management company is not permitted to remove roadkill as it does not have either the equipment or the licenses required for compliance with public health provisions. Roadkill removal must be performed with the involvement of a specialised licensed sub-contractor.

The road management authority notifies the competent contractor about the task to be completed, which the latter will be obliged to fulfil within 24 hours. Roadkill must be transported to licensed designated processing plants.

Provisions applicable to waste management:

The different types of communal waste must be collected and disposed of by the road manager. In respect of the takeover of communal waste, the operator must have a valid contract by the time of occupancy.

Records must be kept of waste generated during operation in accordance with the provisions of a separate regulation based on which compulsory quarterly and annual disclosure of data must be provided.

Storage containers for hazardous waste at hazardous waste collection sites:

- Used oil: metal drums/containers with sealable cover
- Oily sludge: metal drums/containers with sealable cover
- Packaging materials, adsorbents and textiles contaminated with oil and paint: metal or plastic drums with sealable cover
- Oil filters: metal or plastic drums with sealable cover
- Used anti-freeze liquids: plastic drums
- Electrical office waste and light tubes: plastic drums with removable cover
- Lead and other batteries: acid-proof plastic drums with cover

Storage of non-hazardous waste at collection sites

- Solid communal waste: in collection containers at designated open-air storage sites
- Tyres and plastic waste: in open-air concrete storage sites

- Metal waste and aluminum: in open-air concrete storage sites

5. TRANSBOUNDARY ENVIRONMENTAL IMPACTS

Transboundary environmental impacts of the proposed route versions can be assessed in respect of traffic levels, for which separate documentation has been prepared (E.01.04).
Based on the assessment of transboundary environmental impacts, it can be stated that there will be no significant impact in respect of any environmental component.

6. SUMMARY, RECOMMENDED PROTECTIVE MEASURES AND MONITORING PROPOSALS

6.1. GEOLOGICAL MEDIUM AND SOIL

6.1.1. Evaluation and recommended protective measures

The impact of land occupation on soils ensuring agricultural production

It can be stated that high-fertility soils are situated in the first 5.5 km stretch of the proposed motorway route and its correction. Soil fertility is of medium quality in the middle 10.6 km stretch of the section between Töttös and Lippó and then it does not exceed medium quality or is of lower quality up to the border. Both the route and its corrected section can be implemented from the aspect of soils affected.

The proposed route and its adjustment do not affect ameliorated areas.

Recommended protective measures

The removed fertile humus layer must be deposited and used in recultivation. The original structure of the deposited soil deteriorates and its fertility changes; with its removal, the soil structure changes. During storage, soil biology and the amount of soil microorganisms will decrease and so the fertile humus layer must be reused as soon as possible after removal. In order to protect fertile soil and preserve its biological values, the removed humus must be placed in a prism. Before it is re-laid, it must be taken care of in a professional manner and protected from desiccation. Its weedless state must be preserved by means of regular scything.
A humus management plan as part of the implementation plan must worked out on the basis of a soil protection plan.

6.1.2. Tasks to be completed before construction

Before commencing construction works, an organisational plan must be drawn up. The organisational plan includes an environmental plan prescribing requirements to be fulfilled based on the contractor’s equipment and possibilities.
In drawing up the permit plan, a soil analysis of sufficient detail and depth must be performed and attached to a detailed geotechnical expert opinion.
Based on regulatory provisions, a soil protection plan must be drawn up before the commencement of the building permit proceeding.
A humus management plan needed to be prepared and attached to the implementation plan.
Along the proposed motorway routes, the exact definition of arable land loss by soil fertility level will only be possible when incisions and embankment geometry are known.

6.1.3. Provisions applicable to the period of construction

During construction, the removed and reusable fertile humus layer must be stored separately, in compliance with regulatory provisions.
The environmental impacts of removed and temporarily stored humus can be mitigated by selecting an appropriate location. In order to ensure the protection of the fertile soil, the removed humus must be placed in a prism to ensure the preservation of its biological values. It must be taken care of until it is re-laid, during which period it must be protected from desiccation. It must be kept free from weeds by regular scything.

The deposited humus must be re-laid on the newly formed slope surfaces and can be reused when vegetation is planted. The slopes must be protected against dusting and erosion by means of planting grass.
In designating transport routes, it is important to minimise the use of cultivated land areas and, if possible, to bypass inhabited areas.
Construction works and vegetation plantation must be coordinated in a manner ensuring that slope surfaces are left without biological protection for the shortest possible time.

6.1.4. Provisions applicable to commissioning and operation

The operator must have a detailed plan for the eventuality of disaster. The plan must include provisions to prevent or minimise the run-off of pollutants from the road surface and their leakage into the soil.

6.2. SUBSURFACE WATERS

6.2.1. Evaluation of route versions and recommended protective measures

The route and its correction do not affect or pass by any catchments.

Protective measures connected with the facility are not justified.

6.2.2. Provisions applicable to the period of construction

Facilities (including fuel storage; machinery maintenance conditions; protective equipment; methods of storing and transporting waste materials and hazardous waste) serving to store and manage hazardous or polluting materials generated during construction of both the road and related facilities must be established in a manner to avoid the pollution of subsurface waters and the geological medium.

6.2.3. Provisions applicable to commissioning and operation

In order to protect surface and subsurface water resources, the operator – in this case Magyar Közút Zrt – has detailed instructions for the eventuality of any disaster. The relevant instruction and policy list authorities to be notified in the event of accidents, together with their availabilities and describe actions and action owners. The proposed hydraulic structures must be maintained at regular intervals as required.

6.3. SURFACE WATERS

6.3.1. Summary

Bed corrections will be carried out at the following locations:

- Versend Watercourse: the proposed length of correction in the study concept is 185 m.
- Versend Watercourse anabranch: the proposed length of correction in the study concept is 497 m.
- Szilvás Stream: the proposed length of correction in the study concept is 357 m.

Ezeknél a vízfolásoknál az építés alatt a szabad vízmozgást biztosítani kell.

Az építési és a depóniahelyeket az érintett vízfolyások menti sávban kijelölni tilos az alábbiak szerint:

- 20 m wide band on each side of the Borza Stream
- 20 m wide band on each side of the Versend Watercourse
- 20 m wide band on each side of the Majsi Watercourse
- 20 m wide band on each side of the Szilvás Stream
- 20 m wide band on each side of the Topolyás Ditch

It is justified to *design sediment trapping and cleaning structures* at connections of roadside bottom ditches into watercourses where the proposed motorway route crosses watercourses over fishponds or reservoirs.
These locations are as follows:

- Borza Stream point of entry: 4 sediment trapping structures
- Majsi Watercourse point of entry: 4 sediment trapping structures

In order to assess the impacts of operation, we have estimated on the basis of long-term traffic loads the average concentration of TPH pollution from run-off. The calculated values suggest that the estimated oil pollution will not exceed the permissible limit; in fact, it will remain significantly below that value when in the case of cant the covered drain collects rainwater. **Therefore it can be stated that according to estimates oil pollution getting into rainwater drains will remain below the permitted limit and therefore there is no need to install separate cleaning structures.**

Conformity to VKI objectives:

Design guidelines	Assessment and results	Recommended solutions
Location and installation of rainwater cleaning facilities and structures to take place in compliance with strictest standards	Estimation of anticipated TPH concentration level based on traffic levels (Table 18) Result: significantly below limit	Planning for cleaning structure not justified
Examination of sensitive areas with high groundwater and drainage water levels	Examination of groundwater depth below surface level by means of presentation of study data and groundwater map	There is no area with high groundwater levels; review based on geotechnical drillings and

Design guidelines	Assessment and results	Recommended solutions
	(Figure 11); highest level below surface is between 2-5 m	laboratory results when preparing permit plans
Examination of impacts on catchments	Motorway route does not affect protected hydrogeological Zones A and B of catchment and protected internal areas	Covering ditches is not necessary as these areas are unaffected

In accordance with the foregoing, the proposed investment fulfils and is consistent with VKI objectives.

6.3.2. Tasks to be completed before construction

In drawing up the permit plan, a detailed drainage plan must be prepared. In the event of channelling rainwater into watercourses, water rights licensing proceedings must be conducted for constructing the components of the proposed drainage system and completing related hydrological construction tasks.

Detailed data for subsequent planning at points of crossing watercourses can be provided by geodetic surveys, after which consultations on the proposed layout must be conducted with managers of watercourses.

Even though it is not compulsory based on the current concept, the permission plan should include a chapter evaluating whether there are sections where rainwater has to be dried or collected and, if so, what technical solutions are available.
The location of bed corrections must be clarified together with its consequences regarding the condition of watercourse beds. Furthermore, the permit plan should cover the specific solution to be applied to purify rainwater.

6.3.3. Provisions applicable to the period of construction

During the performance of work at crossed watercourses, it must be ensured that the flow of water is not limited or is only limited to a very minor extent or that the free flow of water is maintained. Near watercourses and in a 20 m wide band along each side of watercourse machine maintenance and oil exchange must not be performed.
Sites serving the storage and maintenance of machinery must not be designated in a 20 m wide band on each side of surface watercourses.
In constructing bridges, culverts and roadway structures, attention should be paid to avoiding any water pollution.

6.3.4. Provisions applicable to commissioning and operation

In order to protect surface waters, the operator – in this case Magyar Közút Zrt – has detailed instructions for the eventuality of any disaster. The relevant instruction and policy list authorities to be notified in the event of accidents, together with their availabilities and describe actions and action owners. Following emergency response, hydrological structures must be cleaned in all cases.
During operation, maintenance of sediment trapping and cleaning structures must be ensured. Sludge removed from such structures must be classified after examination. If it is to be

classified as hazardous waste, its removal and disposal must be taken care of in accordance with Government Decree 225/2015 (VIII.7).
In performing herbicide operations, the amount of chemicals must be reduced to the necessary minimum.

6.3.5. Monitoring proposals

Following construction of the motorway, regulatory provisions on rainwater drainage and water quality protection and official requirements will be deemed applicable and, in our opinion, no separate monitoring will be required in respect of surface waters.

6.4. AIR QUALITY PROTECTION

6.4.1. Assessment and proposed protective measures – main roadway

Within a 50 meter distance (even within a 10 meter distance) from the centreline, concentration of pollutants generated from long-term traffic on the M6 high-speed road will drop significantly below permitted limits. There is no building to be protected within a 50 meter distance and therefore no protective measures are necessary. For the same reason, control measurements will not be required either.

Pursuant to Article 29 (17) of Government Decree 306/2010 (XII.23) on air quality protection, no residential, recreational, educational, health care, social or administrative building can be located within a 50 meter distance measured from the centreline (air quality protection zone). Based on cadastre data, there are no buildings requiring protection within this distance, a fact that has also been confirmed by an on-site visit.

6.4.2. Evaluation of the connecting road network

From prevailing concentration values it can be concluded that the proposed investment will have a beneficial impact on air quality in settlements located along surrounding roads. Similarly to the WITHOUT scenario, the limit is met within a 10-meter distance in each section under review; however, concentration values within the same distance are lower in the WITH scenario. The presence of the high-speed road will reduce the level of traffic by 32 to 65 per cent, compared to the reference state.

6.4.3. Impacts of construction

During construction, anticipated air pollution impacts can only be estimated on the basis of information about material extraction sites, mixing plants and the equipment of contractors performing construction. Such analysis will require an organisational plan which will be drawn up immediately before construction (adapted exactly to the possibilities of the winning contractor). The plan must be agreed with the competent environmental authority.

During construction, anticipated sources of air pollution will include construction machinery and transport vehicles; local emissions – primarily nitrogen oxides, soot and particulate matter – caused by their operation and impacting air quality will appear locally and may cause problems in the immediate environment of the route.

Dust pollution can be anticipated from earth extraction; transport and loading; construction technologies; and site development works.

The storage sites of construction machinery must be located as close as possible to the route but at a distance from inhabited and protected natural areas in order to avoid unnecessary traffic on the surrounding road networks.

The operation involving the highest volume of vehicular traffic will be the construction of the earth embankment involving transportation of necessary materials. The resulting emissions – primarily in the form of nitrogen oxides, soot and particulate matter – burdening air quality will change in space and time but will not cause significant air pollution beyond the construction area. The contractor must make every effort to ensure that the transportation route of construction materials is shortened to the greatest possible extent and bypass inhabited areas. To this end, locations for extracting raw materials and manufacturing sites must be located as close as possible to the road under construction, in addition to compliance with other regulatory provisions and official requirements. Wherever it is possible, transportation should be carried out on the route itself.

In order to reduce pollution from dust, trucks transporting raw materials must be covered and the routes used for transportation as well as the deposited soil must be watered until re-use in order to ensure protection against dusting. By way of fulfilling protective measures, truck traffic will not cause air pollution in excess of health standards.

During earthworks, dust pollution affecting the environment is expected to increase temporarily. Dust particles thus generated will be of large diameter and will settle within a 50 to 70 metre radius around the construction site. In the case of high winds, this distance can further increase and therefore it will be necessary to water the sites on a regular basis. In the case of completed section, slopes must be planted with grass and vegetation as soon as possible in order to minimise dusting.

The manufacturing of surface layers will primarily take place in mixing plants, which will cause air pollution in and of itself. Such sites can receive operating licences under a separate licensing procedure. Every effort must be made to apply the best available technology (BAT).

Other related operations connected with the construction of the motorway route, such as bed corrections and relocation of utility services etc. will have a lesser environmental impact from an air quality aspect compared to the road construction itself, and their impact will be temporary and local.

Selection of mines and determination of transportation routes as well as work scheduling etc. will be the contractor’s responsibility, as will be compliance with environmental regulations.

The areas affected by air pollution from construction will predictably be identical with the construction and staging areas as well as their immediate environment. Based on experience, appropriate work scheduling and work discipline will allow avoiding environmental burdens in excess of permitted limits in inhabited areas. The impact will be of a temporary nature and will cease to exist after commissioning.

6.4.4. Tasks to be completed prior to construction

No air quality protection measures will be necessary in respect of the period of time preceding construction.

6.4.5. Provisions applicable to the duration of construction

Air pollution during construction will be of a temporary nature and, based on experience, insignificant and will cease to exist after commissioning. Technological discipline and consideration of meteorological conditions will be essential in order to minimise dust pollution in the environment of residential areas.

Road transport after sunset and before sunrise must be avoided in residential and protected natural areas. During transportation of construction materials, vehicles must be covered with canopies in order to avoid dusting.

Construction machinery and equipment storage sites should be located as close as possible to the route (but at a distance from residential areas) in order to avoid unnecessary movements on the surrounding road network.

The harmful impact of the foundation construction can be minimised by selecting raw material extraction sites near the route and by designating transport routes bypassing residential areas. Wherever it is possible, transportation on the route itself is recommended.
Routes used for transportation and the deposited soil must be watered until re-use on a regular basis in order to protect against dusting.

In order to minimise dusting, slopes should be planted with grass as soon as possible.
Burning waste is strictly prohibited.

Based on experience, by way of appropriate work scheduling and discipline burdening residential areas in excess of permitted limits can be avoided. Such impact is of a temporary nature and will cease to exist after commissioning.

6.5. WILDLIFE PROTECTION: FLORA AND FAUNA

6.5.1. Circumstances of assessments

From a wildlife aspect, the immediate impact area will be a 50 m wide band along the centreline, while the indirect impact area will be a 600 m (300+300 m) wide band along the centreline. A detailed habitat map has been prepared for a 300+300 m band; however, we have examined the prevalence of certain animal species in a 1000 m (500+500 m) wide band.

The proposed route will be at a distance from protected natural areas – except those assigned to the National Ecological Network – between the exit from the M6 high-speed road and the national border and therefore will be situated at a safe distance. The Töttös Forest composed of mosaics (HUDD 20065) is a special protected natural area and the route will bypass it.

Wildlife in the planning area
The proposed route will primarily pass along cultivated land in agricultural regions, a landscape under significant anthropogenic impact. The monotony of large-table mosaics are divided by a small network of water courses and roads near the settlement of Töttös and by the blocks of the Töttös Forest and the Majsi-Nagy Forest in a varied natural state. In terms of their stock of species and role in nature protection, these habitats show relatively great similarity on the entire

road section, to which the only significant exception are the forest blocks. The wildlife of these latter will be unaffected and thus will not be impacted to a significant degree by the proposed investment.

In the small watercourses and their environment affected there are a few protected species of insects, amphibians and reptiles. On certain watercourse sections by shrub bands there are larger, widespread, more or less natural aquatic habitats as well as forest spots with wooded shrubland. Among them, in the triangle enclosed by the Versendi Watercourse and a railway route, there is area known as "Nagynyárádi-lapos". In addition to the existence of protected plant species, this is an important site also because certain protected animal species (amphibians and birds) prefer this area thanks to its aquatic habitat-like features.

As a result of the proposed investment, along Route A a few hundreds of greater tussock sedges are expected to be destroyed. Sub-Version 1A would bypass individual plants in this stock. In the impact area, no plant species of community interest are to be found.

Relatively limited additional preliminary information was available about the fauna of the impact area. Large-bodied birds of the region are relatively well documented, but data only suggest their occasional ornithological occurrence. In the case of wildlife groups it can be generally said that as a result of the use of the area it is basically taxons with increased tolerance to disturbance that are typically present. In the absence of special habitats and due to the lack of tranquillity, only a small number of rare valuable species occur here.

Several protected species of arthropods have been found in the entire area of the route, but none of them is of community interest. These species are widespread in the entire territory of Hungary, highly tolerant to disturbances, are not specialised in respect of any particular habitats and therefore are not indicator species.

There are 6 species or groups of species of amphibians along the route for certain and there is 1 further amphibian species of community interest is likely to be present. Protected amphibians and reptiles can be prevented from large-scale direct destruction by way of appropriate protective measures. There is an additional 2 frequent protected reptile species, these species being generally widespread all over Hungary and frequently occurring in certain locations. No reptile species of community interest have been identified.

Despite a significant anthropogenic impact (widespread farming areas, facilities with designated routes etc.), the planning area has a diverse and valuable bird population thanks to the richness of the local and neighbouring areas in habitats. Over 90% of the area is cultivated land interspersed with mosaics (watercourses, forest strips, woody spots, forested areas) providing nesting or feeding grounds for a number of species. There are altogether 62 nesting and 51 feeding species occurring on a regular basis along the route section between the settlement of Bóly and the national border. Among nesting bird species, the most prominent one is the highly protected black stork (*Ciconia nigra*), whose nest is at 50 metres from the centreline of Route A in an undisturbed old group of trees. There is one known nesting place in the region which was identified in 2015.

7 protected and over 10 unprotected species have been identified among mammals along the proposed route. In respect of the size of their population and nature protection status, the overwhelming part of species will not be particularly adversely affected by the route.

The construction work can only affect a few animal species adversely. The proposed investment can cause some indirect adverse impacts perspective (e.g. disturbance and pollution) from a nature protection aspect, but these will remain within the acceptable limits if environmental protection provisions are complied with.

The implementation of the investment is not expected to cause significant changes or any reduction in the population of known species since the habitat is large enough and, more importantly, contiguous, which will enable species exposed to any disturbance to relocate to more appropriate habitats.

6.5.2. Protective measures and applicable provisions

- During implementation, every effort has to be made to ensure that works near protected or Natura 2000 sites or other protected natural habitats (Nagynyárádi-lapos) are exclusively contained within the expropriation boundary in order to avoid disturbance of and any damage to neighbouring habitats.
- In the area around the proposed motorway route, no storage site or deposit can be established for debris, construction materials or equipment, nor can any raw material extraction site be opened, even on a temporary basis in protected areas (belonging to the ecological network), Natura 2000 sites or other protected natural areas.
- When opening raw material extraction sites, areas in a good natural state must be avoided. Construction material deposits or locations to place humus layers must be established within easy reach (on ploughlands or ruderal areas etc.) and by avoiding areas in a good natural condition. The location of both deposits and raw material extraction sites must be prior-agreed (based on the foregoing criteria) with the nature protection authority in special consideration of accessible roads as well.
- At watercourse junctions, the motorway route must be constructed in a manner allowing sufficient height between the watercourse bank and the bottom part of the overpass to enable large animals and birds living in the area to use it as a passage.
- In order to protect protected species and species of community interest attached to aquatic habitats, attention must be paid to preserving the water quality of watercourses crossing the motorway route under construction; furthermore, in order to avoid disastrous pollution of watercourses, no storage site or deposit of any kind can be established near watercourses.
- The coating of the beds of crossed watercourses must be performed with the use of technologically justified environment- and nature-friendly materials and only to the absolutely necessary degree.
- In order to protect amphibians and reptiles in aquatic habitats and water-logged areas within the impact area of the proposed motorway route, construction works must be limited during the reproductive period. To this end, no earthworks can be performed in these areas between 01 March and 15 June (if the basic site development has been completed and there are no aquatic habitats, the works commenced can be continued during this period of time). If due to dry weather no puddles or seasonal floods have occurred then during this period works can continue at potential habitats in prior consultation with the manager of the nature protection area and temporal restrictions can be lifted.
- Steep-walled cavities created during construction works (e.g. work trenches) cannot be left open for several days as small mammals and amphibians can be exposed to destruction. During backfilling these holes and earthworks, assurances must be obtained as to whether there are any animals that may have fallen in such holes and only when they have been rescued can work continue.
- The technical parameters (diameter and cross sectional dimensions) of culverts and structures designed for crossed watercourses correspond to Instruction no. UT2-1.304 on road design applicable to frog passages. However, in the planning phase attention must be paid to

making sure that passages should not be under water for an extended period of time typically during spring migrations even in years with periods of persisting stagnant water.

- In order to protect small and medium-size mammals and also to prevent wild boars from getting on the roadway, the protective wire mesh must be buried underground at a depth of 30 cm.
- The movement of small and medium-size mammals will be ensured partially but not sufficiently by larger watercourses crossed by the motorway route and dirt road passages built as grade-separated junctions. No further crossings for small and medium-size mammals are recommended.
- The linear facility must fit in with the landscape. The embankment can be integrated into the landscape along the motorway route by planting grove-like woody areas alternating with shrub plantations along each side of the route. In the case of planting trees and shrubs as well as protective forests a list of recommended tree and shrub species and a vegetation plan must be submitted for comments to the authority of first instance and the Duna-Dráva National Park Directorate. In assembling the list, indigenous species tolerating extensive maintenance in line with conditions of their growth locations and, in the case of trees, long-life, wind-resistant, primarily hard broad-leaved species retaining their foliage for a long time must be applied. The following species are recommended for plantation: trees – pedunculated oak (Quercus robur), sessile oak (Quercus petraea), Turkey oak (Quercus cerris), silver lime (Tilia tomentosa), Hungarian ash (Fraxinus angustifolia subsp. pannonica), field maple (Acer campestre), field elm (Ulmus minor), white poplar (Populus alba), black poplar (Populus nigra); shrubs – blackthorn (Prunus spinosa), common hawthorn (Crataegus monogyna), dog rose (Rosa canina), spindle-tree (Euonymus europaeus), common privet (Ligustrum vulgare), buckthorn (Ramnus catharticus).
- Tree and shrub planting on the embankment and protective tree planting must be performed subject to soil conditions in late autumn and early spring. In order to prevent undesirable weed growth and the proliferation of invasive species, scything of the areas affected by construction must be provided at least twice annually for 3 years. Protective tree planting must be continued as long as there are gaps in the tree rows. Those species should be used to fill gaps which have proven to be the most suitable during the tree planting operation among vegetation planned for the area. The planted seedlings must be taken care of following plantation in order to ensure their healthy development. In the first 5 years, manual hoeing and mechanised disking will serve to take care of inter-row spacings.
- Overhead power lines pose a danger to birds in the form of electric shock and collision. In the basically treeless areas birds often use overhead power lines and pylons to sit on. Bird protectors must be designed on power line pylons to be standardised or to be relocated along the line of the Natura 2000 site. The cross-arms of tension towers do not allow installing bird protectors and therefore 780 mm insulators can be installed to ensure bird protection at these locations. Certain electricity suppliers must use bird-friendly V-shaped cross-arms and covered power connections as well as longer (700 mm) tensor insulators. In planning, guidelines worked out by the Hungarian Ornithological and Nature Conservation Society and Hungarian electricity suppliers to solve bird protection problems on medium voltage (22 and 35 kV) free power lines and their technological recommendations (pillar-head-structure) must be taken into consideration.
- In local conditions animals ideally move along land strips by watercourses and therefore it is recommended that wildlife crossings are located were they are connected to bridged

watercourses. The dimensions of such crossings must be harmonised with Instruction no. ÚT 2-1.304, in particular its free space index, whose lowest required value is 1.5.

- At grade-separated junctions, protective fences must be built up to that section of crossing roads which is affected by construction corrections, in order to prevent wild animals from getting on the roadway.
- The protective fence is 240 cm high (dimensioned for deer). Protective fences will be made of wire mesh fixed on pillars.
- During regular maintenance of protective fences, the condition and connection of protective netting must be checked at least twice annually (in March and September). Crossing entrances must be kept clean by removing plants and rubbish in order to allow free access for animals. During care of vegetation in the areas around crossings, possibly original (planned or planted) vegetation must be renewed depending on the habitat type or the formation of a spontaneous vegetation cover must be facilitated based on nature protection experts' opinion.
- At a distance of 200 to 500 metres from junctions deemed risky because of the possibility of wildlife getting on the roadway, wildlife jump-outs should be designed.
- Regular scything must be provided in areas used temporarily during construction in order to prevent weeding and proliferation of invasive species at least on 2 occasions annually in the first 3 years after plantation.
- In the entire planning area during tree and vegetation planting related to the high-speed road, efforts must be made to use indigenous plant/tree species typical of the landscape. Departure from this principle is only allowed in special cases for purposes serving nature protection interests. In the vegetation plan special attention must be paid to avoiding the inclusion of species in the vegetation that are considered invasive in Hungary (the list of such species is included in Table 9 "Invasive neophytons" of the Study Volumes of KvVM's Nature Protection Authority). The vegetation plan must be submitted to the first instance authority and the Hortobágy National Park Directorate for comments.
- When planting grass on slopes and embankments, alien species must be avoided. Such species include: red fescue (Festuca rubra) and ryegrass (Lolium multiflorum). Instead (depending on their growth area), medow fescue (Festuca protensis), tall fescue (Festuca arundinacea), perennial ryegrass (Lolium perenne), Kentucky bluegrass (Poa pratensis), furrowed fescue (Festuca rupicola) and medow foxtail (Alopecurus pratensis) should be used.
- In areas to be planted with grass, part of the area lying between the embankment and the expropriation boundary and areas affected by vegetation) must be scythed on a regular basis, at least on 2 occasions annually in the first 3 years after plantation in order to avoid weed growth and the proliferation of invasive species.
- In the course of construction, consultations must be conducted with the experts of the Duna-Dráva National Park's Directorate and the Nature Protection Guard Service. Before certain parts of the work start near the Natura 2000 site, on-site consultations must be conducted with the Directorate's employees in order to minimise damage to nature.

6.5.3. Movement of wildlife and wildlife crossings

Due to the presence of wildlife in the entire planning area wildlife fencing must be dimensioned for large game (deer) near the high-speed road. The protective fence must be at least 2.4 m in height on the entire section in order to exclude the possibility of large game, especially deer,

getting on the roadway. Maintenance of protective fencing must be taken special care of. It is recommended that at grade-separated junctions protective fences are built up to that section of crossing roads which is affected by construction corrections, in order to prevent wild animals from getting on the roadway.
Based on experience from the use of the high-speed road, locations exposed to the risk of wildlife getting on the roadway are the existing and the fenced motorway sections, especially junctions.
In the surroundings of the route in consideration of the entire section, it is aquatic habitats and reedy and shrubby bands by watercourses that orient and attract large animals as drinking and feeding grounds and thus regularly used váltók are located accordingly.
Wildlife crossings must be located in accordance with the conditions of the area. Under local circumstances, game crossings are ideally situated in the land strips by watercourses and therefore it is recommended that wildlife crossings are located where they are connected to bridged watercourses. The dimensions of such crossings must be harmonised with the provisions of Instruction no. ÚT 2-1.304, especially its free space index, whose lowest required value is 1.5. In consideration of the width of the roadway, which is typically 30 to 35 m, special care must be taken to ensure that sufficient space is left on each side of the watercourse with the right height. The depth must not include the embankment of the bridged watercourse, only the flat terrain next to it should be calculated. In areas typically used by deer, structures are planned to have 4 m in height as a minimum (which is consistent with the Hunting Authority's expert opinion). Attention should be paid to the importance of planting tree and shrub rows in a visible manner for them to lead to wildlife crossings. If these species are thinned or disappear during operation, they must be replaced without delay.

Proposed locations of wildlife crossings (consistently with wildlife density and migration routes in the area):

Km chainage		**Designation and engineering structure**	**Planned size of opening**
"A"	"Am"		
193+905	193+905	Overpass over dirt road and wildlife crossing	35 m
200+182.60	200+260	Viaduct over Majsi Watercourse, wildlife crossing and 2 dirt roads	120 m
202+430	202+505	Viaduct over Szilvás Stream, wildlife crossing and 2 dirt roads	200 m
208+180	208+255	Underpass under wildlife crossing	Overhead crossing
210+039	210+114	Underpass under wildlife crossing	Overhead crossing

6.5.4. Bio-monitoring recommendations

Over 90% of the proposed motorway route runs on ploughland. In addition to ploughland, habitats (including watercourses and their surroundings, tree rows, small woody spots, forest blocks) affected show varied levels of naturalness. Based on assessments, with the exception of black stork (Ciconia nigra), no other major nature protection value can be found in the impact area.

From available on-site experience it can be concluded that implementation of the proposed motorway route will not cause a complex nature protection problem that would warrant subsequent bio-monitoring examinations.

6.6. LANDSCAPE PROTECTION

Summary of our assessment findings:

The planning area is located on the Plain area in Baranya County, a flatland near the Dráva River, namely in the Nyárád-Harkányi Plain.
A terraced sediment mound rising towards the Southern Baranya hills on the North-Western side, the height above sea level of the area varies between 89 and 125 metres. The sub-region's impacted area is a floodless plain, its surface sloping in the South-South Eastern direction.
Soil types affected include lime-covered chernozem, brown forest chernozem and alluvial meadow soil.
In the planning area, we have no knowledge of ameliorated and irrigated areas that could be affected. The motorway routes do not have an effect on the aquatic environment.
The proposed motorway route will cross the following watercourses:

- Borza Stream: length
- Versendi Stream
- Majsi Watercourse
- Szilvás Stream

The motorway route will also cross marshlands around the 197+000 km chainage, the 200+170 km chainage and the 202+350 km chainage.
Pleistocene crustal movements, glacial loess formation and subsequent loess surface degradation played a key role in the formation of the landscape's basic relief features. Land areas converted into ploughland are the dominant feature of the affected Nyárád-Harkányi plain. Originally, assemblages were formed from hornbeam-oak forests gradually converting to oak forests on loess towards the East.
The planning area is a strongly converted agricultural landscape covered by ploughland. On the extensive ploughland intensive arable crop (wheat, corn, silo wheat, red clover) production is carried out. Large ploughland tables are divided by dirt roads and watercourses. Field-protecting forest strips do not exist except for tree and shrub rows along certain dirt roads.
Influence on forests is limited: there is a 200 m section at Bóly (after the railway crossing), which – in the 1.m version – only affects the western tip of the forest and there are 3 locations in Töttös on a 350 m section in total (around the Szilvás Stream), in addition to a 20 m wide forest strip in Lippó.
The landscape structure is determined by the M60 high-speed road and the SW - NE Pécs-Mohács railway line.
Access to the high-speed road network is difficult from economically more depressed cross-border areas. Transversal connections to the high-speed road – and thus also to the Croatian high-speed road network – between the Eastern and Western and the Northern and Southern parts of Baranya County are absent.
Almost half the settlements in the micro-region belong to the category of small disadvantaged rural settlements located primarily in the hilly areas, many of them being dead-end villages.
The motorway route versions do not affect natural areas or values of national or local interest.
Töttös Forest, a Natura 2000 special nature conservation site with approved HUDD20065 status is located in the planning area. The motorway route will pass among forest blocks and does not affect the area directly. Areas surrounding the Majsi Stream valley belong to the ecological corridor of the National Ecological Network. The route under review **affects** a landscape protection site in the area of Töttös.
The route under review **does not affect** areas of high natural value.
In the broader planning area, we find several individual landscape values which are left unaffected by the different route versions.

Wounds in the landscape

- Damaged or degraded areas

There are several mining sites in the area, most of them quarries but there are also clay, sand and peat mines in the planning area.

- Negative visual elements

Waste disposal site
There is no waste disposal site in the direct surroundings of the motorway route. The nearest waste disposal site (no longer in use) is located in Lippó 290 m away from the route (207+500 km chainage left side).
Waste disposal sites in the wider planning area are covered by the chapter "Waste Management".
Sewage sludge composting plant
As the motorway route enters the administrative area of the settlement of Szajk, it passes Lajos Major (Lajos Manor) (a sewage sludge composting plant) at a 145 m distance.
We determined the **landscape potential** based on landscape conditions and in doing so we took into account the following considerations:
- Relief: evaluation of relief energy and surface dynamics
- Cover: calculation of biological activity
- Edges: evaluation of the length and the diversity of edges

The relief level is undulating in the first part of the section, the elevation varying between 5 m and 21 m at other locations, mostly watercourse crossings. In the second part of the section, the terrain level gradually slopes towards the national border (136.89 metres above Baltic sea level – 95.07 metres above Baltic sea level). The relief number remains below 40 per surface unit (m²) everywhere; therefore, overall the section shows a low value from a relief energy aspect.
The first few kilometres of the section can be considered rather monotonous from a relief dynamics aspect; there are no peaks or valleys. From the Borza Stream crossing, several less dynamic (between 196-197 km chainage and 200-201 km chainage) or monotonous (between 202-204 km chainage) sections of 0.5 km² follow. It is to be noted that elevation differences constitute only a few metres and greater level differences are to be found in the valleys of watercourses. The largest elevation difference is 21 metres; within a 0.5 km² unit, elevation differences exceeding 21 metres do not occur at all.
Calculation of area use has been made for a width of 30 metres (2x1 lane) and 50 metres (2x2 lanes) on average and we also took into account the additional area around resting places and junctions. The actual area use can be determined in subsequent planning phases.

Version A

2x1 lane

Area use	Exposure (ha)	Value indicator	Biological activity value
Ploughland	79.64	3.2	254.85
Pasture	0.08	6	0.48
Grassland	0.14	6	0.84
Forest	1.79	9	16.11
Watercourse	0.10	6	0.60
Marshland	0.83	8	6.64
Road	0.30	0.6	0.18

Dirt road	0.89	1	0.89
Railway	0.18	0.6	0.11
	83.95		280.70

2x2 lanes

Area use	Exposure (ha)	Value indicator	Biological activity value
Ploughland	110.27	3.2	352.86
Pasture	0.14	6	0.84
Grassland	0.24	6	1.44
Forest	2.98	9	26,82
Watercourse	0.17	6	1.02
Marshland	1.39	8	11.12
Road	0.5	0.6	0.30
Dirt road	1.32	1	1.32
Railway	0.31	0.6	0.19
	117.32		395.91

“Am” változat

2x1 lane

Area use	Exposure (ha)	Value indicator	Biological activity value
Ploughland	80.88	3.2	258.82
Pasture	0.08	6	0.48
Grassland	0.14	6	0.84
Forest	1.19	9	10.71
Watercourse	0.1	6	0.60
Marshland	0.58	8	4,64
Road	0.3	0.6	0.18
Dirt road	0.79	1	0.79
Railway	0.11	0.6	0.07
	84,17		277.12

2x2 lanes

Area use	Exposure (ha)	Value indicator	Biological activity value
Ploughland	112.34	3.2	359.49
Pasture	0.14	6	0.84
Grassland	0.24	6	1.44
Forest	1.98	9	17.82
Watercourse	0.17	6	1.02
Marshland	0.97	8	7.76
Road	0.5	0.6	0.30
Dirt road	1.15	1	1.15
Railway	0.18	0.6	0.11
	117.67		389.93

Along the proposed motorway routes the meeting of artificial-artificial edge types is more frequent including, in particular, the meeting of edges of a ploughland – road (mostly dirt road) type.
The edges more or less alternate at the same density per kilometre and thus the edge length is 0.34 km in an area unit of 0.25 km² (250 m section). Edges in the area after the railway crossing become more frequent at the crossing of the Majsi Watercourse and the Szilvás Stream, but even there they do not qualify as segmented. According to the standard (MS20372), the edge impact of the section under review is: homogenous. There is no difference between the versions.
Overall it can be stated that **from a landscape protection perspective the planning area does not show great variety and there is no significant difference between different options.**

With the help of a longitudinal section and a local site plan, three considerations can be used to examine fit to the existing conditions:

1. Planned terrain – comparison of regional terrain conditions

2. Evaluation of the impact of the proposed motorway route on the landscape

3. Representation of unfavourable visual elements in the landscape

45% of the motorway routes run on a 2-metre high embankment only, which provides a favourable fit in the landscape. There are long incised sections, too, in the first part of the section, but there are no incisions higher than 7 metres. Higher embankments are more typical especially around junctions and road, railway and watercourses crossings.
The motorway route runs on a curve for 65% of its length and, as a result, the psychological impact of the road can be considered exciting, with even straight sections predominantly falling in the less boring category. Thanks to many slopes and concave sections, a large part of the motorway route is clearly visible. In consideration of the fact that the different types of route conduct alternate relatively frequently, the road section cannot be deemed monotonous at all.
In both versions, there are altogether 15 bridges to be built in the entire planning area. Predominantly underpasses will be created and overpasses will only be necessary at larger watercourse crossing.
From the aspect of landscape fit, there are no major differences between the different route versions.

For fitting the route in the landscape, the following vegetation types are proposed:

Vegetation Type 1

Engineering structures planned at grade-separated junctions will stand out of their surroundings with a height of 8 to 11 metres. In areas enclosed by junction arms, landscape fitting should be ensured by planting groves and, on the embankment slopes, shrubs, taking into account traffic safety considerations. Crossings raised at 8 to 11 metres in height above the landscape can be covered by tree planting, taking into consideration the fact that planted tree stands take several years to fulfil their appropriate functions.

Vegetation Type 2

In the case of overpasses over dirt roads and low-level roads and in the event that existing tree-covered or forested areas are affected, when planting vegetation only shrubs – especially soil-covering shrubs – should be planted on the slope sides and within the expropriation area, with the use of species best suited to the existing habitat type.

Vegetation Type 3

Planned rest stops should be created on the basis of a horticultural plan. In planting vegetation at rest stops, an important consideration is isolation from traffic, wind protection and formation of a shady resting area. For the purpose of decoration, use of different non-indigenous species can be used.

Vegetation Type 4

Where the motorway route runs on an embankment and depending on the size of the future expropriation area belonging to the route, the linear facility can be fitted in the landscape. The embankment can be fitted in the landscape by planting groves and shrubs along the motorway route. The same solution is recommended near watercourse crossings where overpasses are built.
In the case of incisions, plants and trees can also be planted on the slope side.

Vegetation Type 5

Wildlife overpasses should be equipped with tree and bush rows providing visual guidance. The entire surface of the traffic lane must be planted with grass. In addition to grass, only shrubs can be planted on the bridge structure. When planting vegetation, consideration must be given to the fact that even fully developed individual plants should not overhang the traffic lane. In order to keep out disturbing light and noise impact from road traffic and prevent jumping off, closed panels at least 2 m in height should be installed on both sides of the bridge. Another acceptable solution is the building of protective fences in combination with log rows at least 1.4 m in height high (measured from the level of the traffic lane).

Vegetation Type 6

In order to keep the route section covered along the Lippó Serbian cemetery (located under topographical lot no. 032), it is recommended that vegetation ensuring full cover should be planted. The motorway route passes the cemetery on a 2-metre high embankment and so a 2-3 metre high shrub strip can provide full cover. The proposed vegetation should include fast growing tree species and shrub species forming thick branches.

On each section, engineering structures and crossings must be fitted in the landscape in the following kilometre chainages:

Km chainage		Designation and engineering structure	Vegetation type
A	Am		
193+905	193+905	Overpass over dirt road and wildlife crossing	**4.**
195+972	195+972	Overpass over Borza Stream correction	**4.**
196+235	196+235	Underpass due to correction of 5703.j. connecting road (junction)	**1.**
196+520	196+520	Overpass over Versendi Watercourse correction	**4.**
196+709.74	196+900	Underpass under Mohács-Villány railway line	**1.**
196+740-196+866 **197+000-197+082**	196+880-196+930 bal oldal	Forest	**2.**
198+297.80	198+370	Underpass under crossing dirt road	**2.**
199+500	199+575	Simple rest stop at Nagynyárád	**3.**
200+182.60	200+260	Viaduct over Majsi Watercourse, wildlife crossing and 2 dirt roads	**4.**
200+865	200+930	Underpass under crossing dirt road	**2.**
202+130-202+317	202+205-202+392	Forest	**2.**
202+430	202+505	Viaduct over Szilvás Stream, wildlife crossing and 2 dirt roads	**4.**
202+752-202+880	202+827-202+955	Forest	**2.**
203+750	203+825	Underpass due to correction of 5704.j. connecting road (junction)	**2.**
205+175	205+250	Forest	**2.**
205+731.77	205+805	Underpass under planned 5702 j. connecting road (junction)	**1.**
207+165	207+240	Underpass under crossing dirt road	**2.**
207+740-208+070 **bal oldal**	207+815-208+145	Cover of Lippó Serbian cemetery	**6.**
208+180	208+255	Underpass under wildlife crossing	**5.**
209+734	209+809	Underpass under existing 5702 and planned 5705 j. connecting roads (junction)	**1.**
210+000	210+075	Complex rest stop and axle-weighing point at Ivándárda	**3.**
210+039	210+114	Underpass under wildlife crossing	**5.**

On other sections (normal running lanes) Vegetation Type 4 is recommended all along.

It is recommended exclusively to use indigenous tree and shrub species in green roadside strips. Plantation of invasive species (e.g. acacia or American ash) cannot be supported anywhere in the area; other ornamental plants (e.g. non-creeping ornamental shrubs) can only be used at

least at a 1-kilometre distance from Natura 2000 sites on sections not having natural accompanying vegetation.
In the planning area, the recommended plant species (domestic species indigenous in the area) are as follows:

- Hungarian ash, a relatively fast growing but longer lasting tree, can be planted on roadsides and in the wider surroundings where it is also traditionally used.
- In lower lying areas, alder, poplar, domestic willow and other indigenous shrubs and grey poplar groups will also need lower maintenance costs and can provide a long-term solution.
- For closing edges – in areas with the presence of wildlife – all thorny shrubs are suitable.

When designing vegetation along the high-speed road in further planning phases, the list of proposed tree and shrub species must be submitted to the first instance authority and the competent National Park's Directorate for comments.
In drawing up permit plans, the technical content of the proposed facility will be clarified and, accordingly, a review of proposed vegetation will also be required.
Following completion of construction, raw material extraction sites and deposits appearing as negative visual elements must be recultivated.
In order to ensure the smooth flow of traffic, environment-friendly high-quality maintenance will ensure operation with the least burden on the environment. All this is important from a nature conservation aspect as well, since the sight of an orderly motorway is more favourable and its impact is also limited (e.g. a disorderly, weedy, dirty road section or road edge imposes higher environmental burdens). In addition, advertising activities in the impact area of the road must be reduced to a minimum.

6.7. BUILT-UP ENVIRONMENT AND HERITAGE PROTECTION

6.7.1. Summary and proposed protective measures

Among the development plans of settlements, in the case of Szajk and Bóly the motorway route is identical with Version 1 examined in the current plan; in the case of the other settlements, modifications will be needed.
Based on calculations contained in the chapter on noise protection, it will not be necessary to build noise protection walls along the proposed versions.
Based on the results of air quality protection calculations, environmental limits are met on the boundary of the 50-metre air quality protection zone.
Access to plots will be ensured by building grade-separated junctions at crossing roads and dirt roads and by constructing parallel service roads.
For the replacement of 20 kV overhead power lines on the new motorway route and the construction of gas pipelines, preliminary survey documentation must be prepared *(EVD /*. The impact of relocations on individual environmental elements have been examined in the current plan.

Heritage protection
According to information from the Forster Centre, 11 archaeological sites located at the 200+000 km chainage form a circular trench system, protection of which is of paramount importance. The Centre has assessed the exact extent of the archaeological site by way of geophysical examinations and magnetic measurements, based on which the exact size of the archaeological site has been clearly determined.

It was not possible to modify the proposed motorway route to bypass the archaeological site due to other restrictions and therefore, in consultation with discipline engineers, a modification of the longitudinal section is recommended by means of elevating it to a 2-metre high embankment. The current design documentation includes Preliminary Archaeological Documentation prepared by the Forster Centre.

Vegetation

The motorway route runs outside built-up areas throughout, at an appropriate distance from inhabited areas. There are two cemeteries (located under topographical lot numbers 044 and 032 at Lippó) on the right hand side of the proposed route. In order to cover the road section passing by the Serbian cemetery located under topographical lot number 032, multi-level full coverage is proposed by means of vegetation.

Bird protection

Bird protectors must be designed on power line pylons to be standardised or to be relocated. The cross-arms of tension towers do not allow installing bird protectors and therefore 780 mm insulators can be installed to ensure bird protection at these locations. Certain electricity suppliers use bird-friendly V-shaped cross-arms and covered power connections as well as longer (700 mm) tensor insulators.

6.7.2. Tasks to be completed in subsequent planning phases

When working out technical solutions it will be possible to determine the exact extent of area use and the number of real estate properties to be expropriated.

A continued dialogue must be conducted with settlements even after completion of the current planning phase in order to monitor changes in area and built-up percentages.

The currently effective zoning plans and regulation plans of settlements both for inside and outside areas will have to be modified in sections and areas where the proposed investment is not consistent with settlement zoning plans. Therefore, in preparing the permit plan consistency with area and settlement zoning plans must be examined and necessary modifications, if any, must be included in plans.

Within settlements, protective measures to ensure noise protection are covered by discipline chapters. The clarification and develeopment of such measures will be subject to subsequent planning phases.

With regard to the proposed motorway routes, the Forster Gyula National Heritage Protection and Asset Management Centre has prepared the risk analysis chapter of the Preliminary Archaeological Documentation for the feasibility study (February 2015).

The ERD to be prepared together with the current plan on the basis of an on-site visit will contain measures concerning the archaeological excavation sites affected.

6.7.3. Tasks to be completed before construction

The areas concerned must be acquired before construction.

6.7.4. Provisions applicable to the duration of construction

During construction, adverse impacts, if any, primarily in relation to designating transport routes may affect the built-up environment. Transport routes are advisable to be determined in a manner to ensure protection of inhabited areas. If large-scale transportation should take place through inhabited areas then it is advisable to assess the condition of the road section and buildings in surrounding areas affected.
In areas of archaeological importance, the performance of earthworks must take place under archaeological supervision.

6.7.5. Proposed monitoring measures

Any necessary monitoring assessment for noise and air quality protection is dealt with in the relevant discipline chapters, which do not prescribe any monitoring action.

6.8. NOISE AND VIBRATION PROTECTION

6.8.1. Evaluation of route versions and proposed protective measures

In the current planning phase, we do not deem it necessary to determine protective measures in the indirect impact area, given relatively low anticipated traffic levels and the uncertainty of long-term changes. Prior to the commencement and following the handover of the investment, the designated monitoring locations will provide noise measurements and, based on those results, the fulfilment of noise limits must be certified.
Proposed monitoring points:
MP1: The dwelling house in the settlement of Lippó lying closest to the road; distance from the road centreline is 306 m.
MP2: Serbian cemetery in Lippó; distance from the road centreline is 78 m.
MP3: Nagynyárád, 1 Zalkamáté Street (Nagynyárád, topographical lot number 79)
MP4: Nagynyárád, 4 Táncsics Mihály Street (Nagynyárád, topographical lot number 314)

6.8.2. Construction of related facilities

The related structures include utility relocations requiring EVD. On the planning section, 220 kV overhead power lines can be relocated at the 201+383 km chainage and the 209+725 km chainage. The 220 kV overhead power lines will not generate any noise or vibration pollution during the operational period. Such environmental burdens will appear exclusively in relation to construction and during the period of demolition works. Based on experience, it can be stated that any noise pollution generated by utility works before the commencement of road construction will be significantly lower than noise pollution expected to be caused by road construction itself.

The noise protection impacts of other related facilities, i.e. junctions and connecting road corrections cannot be separated from the construction of the main roadway; among the noise burden generated, the construction of related facilities will not produce any measurable noise burden.

6.8.3. Tasks to be completed before construction

At the plot boundary of the Serbian cemetery, a noise level between 54-55 dB(A) can be predicted. The plot registered under topographical lot no. 032 is subdivided into two subplots

(subplots A and B). The cemetery is located on subplot A while subplot B is ploughland. There is a row of trees at the boundary of the two subplots. The boundary of the plot under topographical lot no. 032 is located at 78 metres from the centreline of the motorway, while the boundary of the cemetery subplot is located 9 metres further away at 87 metres.
Based on each work phase and available machinery (and its noise characteristics), the contractor will organise construction works in consideration of anticipated noise pollution levels.
Besides, the municipality (Lippó) operating the cemetery should be informed about the scheduling of construction, its duration and the anticipated noise levels during construction. If noise pollution limits cannot be met, then pursuant to Government Decree 284/2007 (X.29) the contractor may apply for exemption from fulfilling the limits prescribed in Joint Ministerial Decree 27/2008 (XII.3) KvVM-EÜM to the environmental protection authority for individual construction phases if, according to the noise emission exemption request, noise pollution cannot be reduced to the prescribed limit with the use of technical or work organisation solutions. In the application, the reason for exceeding the limits must be justified together with the indication of the start and end dates of the period affected by such exemption, as well as measures proposed to be taken in order to minimise noise levels and their expected results. In his/her resolution on providing exemption from noise pollution limits, the notary can also prescribe restrictions in respect of the daily or weekly construction work schedule and work performance.

6.8.4. Proposals applicable to the duration of construction

For the duration of construction, we make the following general statements and proposals:

- The location of storage sites of construction machinery and equipment must be designated as close to the motorway route as possible in order to avoid unnecessary movements on the surrounding road network.
- One of construction operations involving the largest vehicular movement is earthworks. The harmful effects of these works can be minimised by selecting raw material extraction sites near the motorway route.
- During transportation activities, built-up areas should be bypassed as far as possible.
- Construction works can only be performed during daytime, between 06:00 and 22:00 pm hours and thus only daytime limits must be met.
- During construction, it is recommended that machinery covered with noise protection housing and emitting limited noise is used.

After clarification of data – which are of an indicative nature for the time being – referring to construction works, the noise impact of construction works and necessary noise protection measures, if any, can be determined; however, based on current data it can be seen that no separate noise protection measures will be necessary.
Prior to commencing the construction, a precise organisational plan, construction schedule and precise information about the contractor’s machinery will be the basis of noise and vibration protection documentation referring to the duration of construction, in which documentation monitoring points considered reliable must be indicated for the duration of construction at which points documented noise level measurements can be performed in compliance with regulatory provisions.

Construction works and transportation must be organised in a manner to ensure that activities causing vibration pollution are limited to the daytime period and remain within permitted limits (especially in respect of transportation activities).

The municipality (Lippó) operating the Lippó Serbian cemetery must be informed in good time in advance of commencing construction works about the scheduling of works, the duration of construction and the noise pollution expected to be caused by construction. If emission limits cannot be met, then pursuant to Government Decree 284/2007 (X.29) the contractor may apply for exemption from fulfilling the limits prescribed in Joint Ministerial Decree 27/2008 (XII.3) KvVM-EÜM to the environmental protection authority for individual construction phases, if according to the noise emission exemption request noise pollution cannot be reduced to the prescribed limit with the use of technical or work organisation solutions. In the request, the reason for exceeding limits must be justified together with the indication of the start and end dates of the period affected by such exemption, as well as the measures proposed to be taken in order to minimise noise levels and their expected results. In his/her resolution on providing exemption from noise pollution limits the notary can also prescribe restrictions in respect of the daily or weekly construction work schedule and work performance.

6.9. WASTE MANAGEMENT

6.9.1. Collection and management of waste generated from operation

Collection and decontamination of communal waste
The competent road management authority will be responsible for removing communal waste generated during road operation.
It will organise periodical collection of roadside rubbish thrown away by road users.

Collection and removal of hazardous waste:
Generation of large volumes of hazardous waste is not anticipated.
Activities related to hazardous waste must be organised in accordance with Government Decree 225/2015 (VIII.7) on hazardous waste.
Waste collected from the location of operations will be transferred directly to a waste collection company. Management of waste generated from road maintenance and cleaning will be dealt with by the road engineering authority.
Transport by road can only be performed with the use of vehicles prescribed in the aforementioned decree; their documentation must indicate the type, hazard category and composition of waste. Waste handed over to a licensed decontamination site must be certified.

Selective waste collection during operation
Waste generated during operation at rest stops and filling stations will be collected selectively. Motorway engineering authorities will also collect waste selectively. Waste removal will be the responsibility of the competent road management company.
As from 01 January 2006, selective waste collection islands have been created in all motorway roadside rest stops managed by ÁAK Zrt. (now Magyar Közút Zrt.) and thus selective waste collection will also be carried out at the rest stops on the proposed M6 motorway.
Containers to be found at selective waste collection islands are made of metal and have a capacity of 2500 and 1500 litres. Selective waste extends to separating paper, PET bottles, glass bottles and metal beverage cans into designated containers that carry pictograms informing travellers about the each type of waste.

Roadkill management

Roadkill must be reported to the motorway dispatch service in the territory of the competent county.

The road management company is not permitted to remove roadkill as it does not have either the equipment or the licenses required for compliance with public health provisions. Roadkill removal must be performed with the involvement of a specialised licensed sub-contractor.
The road management authority notifies the competent contractor about the task to be completed, which the latter will be obliged to fulfil within 24 hours. Roadkill must be transported to licensed designated processing plants.

Provisions applicable to waste management:

The different types of communal waste must be collected and disposed of by the road manager. In respect of the takeover of communal waste, the operator must have a valid contract by the time of occupancy.
Records must be kept of waste generated during operation in accordance with the provisions of a separate regulation based on which compulsory quarterly and annual disclosure of data must be provided

Storage containers for hazardous waste at hazardous waste collection sites:

- Used oil: metal drums/containers with sealable cover
- Oily sludge: metal drums/containers with sealable cover
- Packaging materials, adsorbents and textiles contaminated with oil and paint: metal or plastic drums with sealable cover
- Oil filters: metal or plastic drums with sealable cover
- Used anti-freeze liquids: plastic drums
- Electrical office waste and light tubes: plastic drums with removable cover
- Lead and other batteries: acid-proof plastic drums with cover

Storage of non-hazardous waste at collection sites

- Solid communal waste: in collection containers at designated open-air storage sites
- Tyres and plastic waste: in open-air concrete storage sites
- Metal waste and aluminum: in open-air concrete storage sites

7. ANNEXES

1. Memorandum of a municipal consultation meeting held in Bóly on 21 October 2014

2. Statement issued by the Forestry Section of the Baranya County Government Office's Agricultural and Forestry Department on Reforestation

3. Noise maps

4. Position Statement of the Baranya County Government Office on Heritage Protection