NON-TECHNICAL SUMMARY

OF

AN ENVIRONMENTAL IMPACT ASSESSMENT REPORT OF AN INVESTMENT PROPOSAL FOR "IMPROVEMENT OF 'STRUMA' MOTORWAY LOT 3.2 ROUTE"

Sofia
June, 2017

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Contents:

Introduction

This document is a Non-Technical Summary of the Environmental Impact Assessment Report (EIAR) of an investment proposal for "Improvement of 'Struma' Motorway Lot 3.2 Route". The objective of the Non-Technical Summary is to present and summarize, in a publicly accessible form, the basic information and the conclusions, contained in the Environmental Impact Assessment (EIA) Report so that all interested parties can understand the nature of the investment proposal in terms of the expected environmental impacts and impacts on people's health and the appropriate mitigation measures where they are needed, as well as all interested parties to form an informed opinion with regard to the positive and negative consequences of the project implementation.

The Environmental Impact Assessment (EIA) report of the investment proposal for "Improvement of 'Struma' Motorway Lot 3.2 Route", with the "Road Infrastructure" Agency as a Purchaser, has been developed on the basis of a letter with Outgoing Reference No. EIA-85/13.05.2015 of the Ministry of Environment and Water (MOEW) (Annex No. 1).

The EIA report has been prepared in accordance with Art. 96, para. 1 of the Environmental Protection Act (EPA; promulgated, State Gazette (SG) No. 91/2002 …, last amended and supplemented, SG No. 12/2017) and Art. 12, para. 1 of the *Ordinance on the Conditions and the Order for Implementing EIA* (*EIA Ordinance*; promulgated, SG No. 25/2003, last amended and supplemented, SG No. 12/2016).

According to the requirements of Art. 95 para. 2 and para. 3 of the EPA and Art. 9 of the EIA Ordinance, information has been prepared and consultations have been carried out on the investment proposal and the EIA scope and contents, the information having been provided to specialized authorities, representatived of the affected public, including as well Non-Governmental Organizations (NGOs), in accordance with Art. 9, para. 1 of the EIA Ordinance.

After carrying out the consultations with the specialized authorities, representatives of the affected public and NGOs, a supplemented EIA Scope and Contents Assignment has been prepared, comprising the information, obtained during the consultations under Art. 9, para. 1 and para. 4 of the *Ordinance on the Conditions and Order for Implementing Environmental Impact Assessment* and on the grounds of Art. 10, para. 2 of the *Ordinance on the Conditions and the Order for Implementing EIA*, the Purchaser consulted the competent environmental body (the Ministry of Environment and Water) and the Ministry of Health on the supplemented Assignment.

By means of a letter with Outgoing Reference No. EIA-85/13.01.01.2017, the competent body – MOEW has expressed an opinion on the EIA Scope and Contents Assignment (Annex No. 2). The Ministry of Health has also expressed an opinion on the EIA Scope and Contents Assignment by means of a letter with Outgoing Reference No. 12-00-2/13.01.2017 (Annex No. 3).

The comments and recommendations have been reflected and taken into consideration in the EIA report and the final version of the EIA Scope and Contents Assignment, namely the comments made and the recommendations, resulting from the consultations carried out, including those, made by the competent bodies as well, on the scope and contents of the EIA.

Upon woking on the EIA report, the conditions and measures have been taken into consideration that are relevant to the investment proposal from EC Opinion No. 1-1/2010, thus coordinating a General Transport Master Plan and from EC Opinion No. 10-6/2014, thus coordinating an Operational Program "Transport and Transport Infrastructure" 2014-2020.

Upon woking on the EIA report, opinions and reports have been taken into consideration, provided by the Purchaser from the Bulgarian Academy of Science, Bulgarian and international experts. A great part of the information from the opinions na reports has been included in Engineering Geological and Geotechnical reports (with regard to the seismicity and the features of underground waters). Information from the Ministry of Energy has been used with regard to the availability of deposits of underground resources (including radioactive underground resources).

By means of a letter with Outgoing Reference No. EIA-85/13.05.2015, the MOEW ordered also preparation of a Report for Assessment of the Impact Degree (RAID) of the investment proposal on the subject and the objectives of the affected protected areas that fall within the scope of the route:

- BG0000366 "Kresna – Ilindentsi", for the conservation of natural habitats and of wild fauna and flora, included in the list of protected areas, adopted by the Council of Ministers by means of the Decision No. 122/02.03.2007 (promulgated, SG No. 21/2007), amended and supplemented by means of the Decision of the Council of Ministers (DCM) No. 811/2010 (State Gazette No. 96/2010).
- BG0002003 "Kresna", for the conservation of wild ducks, announced by means of the Order No. РД -748, dated 24 October 2008 (promulgated, SG No. 97/2008), of the Minister of Environment and Water.

As a separate annex to the EIA report, a RAID has also been attached of the investment proposal on the subject and the objectives of the affected protected areas, in accordance with Art. 12, para. 2, item 5 of the *Ordinance on the Conditions and Order for Implementing Environmental Impact Assessment.*

The report for Assessment of the Impact Degree (AID) has been developed by a team of experts, meeting the requirements of Art. 31, para. 21 of the Biological Diversity Act (BDA) and Art. 9, para. 1 of the Ordinance on the Compatibility Assessment (CA), with competence, complied both with the subject of protection within the protected areas and the specificity of the investment proposal.

By means of letter ref. No. OVOS-85/05.07.2017 the competent authority MEW evaluated the quality of the Environmental Impact Assessemtn report, including the Report for Assessment of the Impact Degree for the investment proposal for "Improvement of 'Struma' Motorway Lot 3.2 Route". The EIA Report has been prepared in compliance with the requirements of art. 96, para. 1 of the Environmental Protection Act /EPA/ and art. 12 of the *Ordinance on the* EIA. Pursuant to art. 14, para. 3, item 2 of the *Ordinance on the EIA,* the evaluation of the quality of the report on the EIA was positive with certain omissions, which were of no major significance and shul be reflected in the final version of the EIA Report. Pursuant to art. 24, para. 4 of the Ordinance on the CA, the evlauiation of the quality of the RAID was negative with respect the investment proposal for "Improvement of 'Struma' Motorway Lot 3.2 Route" and pursuant to art. 24, para. 6 of the Ordinance on the CA and art. 14, para. 10

of the Ordinance on the EIA, the RAID is returned for re-working and supplementation, with guidelines, requesting the elimination of any and all omissions.

The final version of the EIA Report reflects the omissions and remarks, in accordance with the evaluiation of the qualotu of the EIA Report, made by the MEW. A separate, individual annex to the final EIA Report is the re-worked and supplemented Report on the Assessment of the Impact Degree of the investment proposal за "Improvement of 'Struma' Motorway Lot 3.2 Route".

The procedure for the preparation of the RAID of the investment proposal "Improvement of 'Struma' Motorway Lot 3.2 Route" was **combined** with the procedure for the Environmental Impact Assessment according to art. 38 of the Ordinance on the Conditions and Order for Performing Assessment of the Conformity of Plans, Programmes, Projects and Investment Proposals to the subject matter and objectives of the conservation of protected areas, according to Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC on the conservation of wild birds.

The EIA report has been developed by "DANGO PROJECT CONSULT" EOOD, Sofia. The authors of the report are independent experts in the field of EIA, meeting the requirements of Art. 83, para. 1 and para. 2 of the EPA (last amended and supplemented, SG No. 12/2017), the relevant declarations having been attached.

General Information

1. Information about the Purchaser

Data on the Purchaser:
"Road Infrastructure" Agency
Unified Identification Code: 000695089
Full postal address:
3, Makedoniya Boulevard, 1606 Sofia
Telephone number, fax number and e-mail address:
Telephone number: 02 952 19 93

Fax number: 02 952 14 84

Chairman of the Managing Board (MB) of "Road Infrastructure" Agency:
Doncho Atanasov, Master of Science in Engineering

Contact person:
Victor Lebanov, Master of Science in Engineering
Telephone number: 02 952 19 93
E-mail address: lebanov@dir.bg

2. Need for and Objective of the Investment Proposal

Five Trans-European corridors – IV, VII, VIII, IX and X of the Trans-European Transport Network run through the territory of the Republic of Bulgaria, the objective of this Trans-European Transport Network being to improve the economic and social cohesion of the countries in Europe.

"Struma" Motorway is a part of the North-South Trans-European Motorway (TEN) and a part of the Fourth Trans-European Transport Corridor.

As an arterial road, it is of great importance to the integration of the National Transport Infrastructure into the European Transport System. It offers the shortest route for connecting the Danube River waterway and the Aegean Sea and it plays an important role, connecting Romania, Bulgaria and Greece, and within the wider scope - connecting the Baltic Sea, the Black Sea and the Aegean Sea.

This route is the busiest one, running through Bulgaria in the North-South direction.

The implementation of the project for "Improvement of 'Struma' Motorway Lot 3.2 Route" will result in completing the overall construction of "Struma" Motorway which will be the next important step in the integration of Bulgaria into the European Transport System.

The main prerequisite for the construction of "Struma" Motorway has also resulted from the need to update and bring the road infrastructure in conformity with the European regulations with regard to the respective classes of roads. As a result of the new route construction, the number of road traffic accidents is expected to decrease. Last but not least, a long-standing problem will be solved, related to the risky passage through Kresna gorge – a road section with a very high degree of emergency.

Numerous studies have been carried out with regard to the designing "Struma" motorway.

The project options, proposed by the Purchaser, have been evaluated equivalently in the EIA report, as follows: Option G20 – blue; Option G20 – red; Eastern Option G10.50; Long Tunnel Option and Eastern Option G20.

3. Location of the Investment Proposal

"Struma" motorway connects six of the largest towns and cities in the western part of the coutry – Sofia, Pernik, Blagoevgrad, Vratsa, Montana and Vidin.

From a physical and geographic point of view, the area of the project routes and the existing road runs through Kresna Gorge which is formed along the valley of the Struma River, between Maleshevska Mountain and Pirin. To the north, the gorge starts south of the village of Krupnik and to the south – the gorge ends north of the town of Kresna - at Yavorov railway station, on the northern periphery of the `hollow of Sandanski and Petrich. The length of the gorge is about 16 km. The average altitude of the gorge area is 475 m (from ridge elevation to the river-bed elevation). In places, the displacement is over 500 m - the river Struma is at elevation 250 - 270 m, while the fencing frame exceeds 750 m. In this area, the Struma River forms numerous meanders and steep and highly segmented slopes rise above them. The steep and step-like slopes are segmented by deeply cut-in river valleys where there are conditions for a strong slope degradation to take place.

The subject of this EIA is the "Improvement of 'Struma' Motorway Lot 3.2 Route", from the town of Simitli to the town of Kresna, according to the project option solutions, provided by the Purchaser, evaluated equivalently in the EIA report and the RAID. Lot 3.2 of "Struma" Motorway, from the town of Simitli to the town of Kresna, runs through broken terrain, a part of the option project solutions running through Kresna Gorge.

The project options being considered, related to the "Improvement of 'Struma' Motorway Lot 3.2 Route", run through the territory of Simitli municipality and the territory of Kresna municipality.

The Purchaser's project options being considered, related to the "Improvement of 'Struma' Motorway Lot 3.2 Route", are at the following closest distances from the populated places, situated near the route:

Option G20 – Blue – km 376+000 to km 399+789 (convergence with Lot 3.3 at km 397+000), project 2014

Populate Place	**Distances from the Axis of the Lane Which is Nearer, m**		
	"Struma" Motorway Lot 3.2		
	km	Option G20 Blue – Project 2014 Distance, m	Type of the Area
Distances from the Axis of the Route			
The town of Simitli*	km 373+670	10/20 m east	Single buildings
The town of Simitli*	km 373+700	45 m west	A group of buildings
The town of Simitli*	km 373+800	30 m east	Hotel complex
The town of Simitli, "Dalgata Mahala" District*	km 374+100	25/30 m east	Residential area
The town of Simitli, "Dalgata Mahala" District*	km 374+100	30 m west	Residential buildings
The town of Simitli, "Dalgata Mahala" District*	km 374+300	10/30 m east	Single buildings
The town of Simitli, "Dalgata Mahala" District south*	km 375+000	130 m east	A row of buildings
The village of Cherniche	km 376+000	30 m west	Industrial buildings
The village of Cherniche	km 377+000	130/150 m west	A group of buildings
The western part of the village of Poleto	km 378+200	260/280 m east	Residential area
"Poleto – Cherniche" road junction	km 378+250	18 m west	A single building
Distances from the Axis of the Route			
Gas station complex on a road	km 379+100	40 m, next to a bridge	An industrial building
A half-destroyed building and a residential building	km 379+700	25 m from the west	Agricultural buildings and residential buildings
Railway lodge	km 381+500	70 m east	A railway lodge
"Stara Kresna" railway station	km 385+000	100/110 m east, across a river	Inhabitable buildings
Kresnensko Hanche	km 387+900	6 m east	Inhabitable buildings
Railway lodge, bat house	km 388+500	75 m from the east	A single uninhabitable building
"Peyo Yavorov" railway station	km 391+600	Adjacent to the road	An abandoned building
Pig-breeding complex	km 392+000	30 m south	Agricultural buildings
Distances from the Axis of Encircling of the Town of Kresna – Blue Option			
Apiary	km 394+200	35 m west	Inhabitable buildings
Northern and western part of the town of Kresna	km 395+300	Through them	Agricultural goat-breeding buildings
Northern and western part of the	km 395+300	80-100 m south	Residential buildings

town of Kresna			
The village of Novo Selo	km 395+500	290/300 m north	Abandoned houses
The town of Kresna	km 395+600	15/30 m southwest	Residential buildings
Northern and eastern part of the town of Kresna	от km 395+800 до 396+300	10/15/25 m southwest	Residential area
Industrial zone of the town of Kresna	km 396+650	200 m southwest	Residential area
The town of Kresna	km 398+120	150 m west	Residential buildings

*Remark: The option G20 – blue / red (joint routes) have been moved in front of the town of Simitli and have a common start at km 373+300, so that all options are evaluated equivalently (after Lot 3.1, the traffic follows the existing road E79 – from km 373+300 to km 376+000).

Option G20 – Red – km 376+000 to km 399+832 (convergence with Lot 3.3 at km 397+000), Project 2015

Populate Place	**Distances from the Axis of the Lane Which is Nearer, m**		
	"Struma" Motorway Lot 3.2		
	km	Option G20 Red – Project 2015 Distance, m	Type of the Area
Distances from the Axis of the Route			
The town of Simitli*	km 373+670	10/20 m east	Single buildings
The town of Simitli*	km 373+700	45 m west	A group of buildings
The town of Simitli*	km 373+800	30 m east	A hotel complex
The town of Simitli, "Dalgata Mahala" District*	km 374+100	25/30 m east	Residential area
The town of Simitli, "Dalgata Mahala" District*	km 374+100	30 m west	Residential buildings
The town of Simitli, "Dalgata Mahala" District*	km 374+300	10/30 m east	Single buildings
The town of Simitli, "Dalgata Mahala" District south*	km 375+000	130 m east	A row of buildings
The village of Cherniche	km 377+000	130/150 m west	A group of buildings
Western part of the village of Poleto	km 378+200	260/280 m east	Residential area
"Poleto – Cherniche" road junction	km 378+250	18 m west	A single building
Distances from the Axis of the Route			
Gas station complex on a road	km 379+100	40 м, next to a bridge	An industrial building
A half-destroyed building and a residential building	km 379+700	10 m from the west	Agricultural buildings and residential buildings
Railway lodge	km 381+500	65 m east	A railway lodge
"Stara Kresna" railway station	km 385+000	115/120 m east, across a river	Inhabitable buildings
Kresnensko Hanche	km 387+900	10 m east	Inhabitable buildings
Railway lodge, bat house	km 388+500	75 m from the east	A single uninhabitable building

"Peyo Yavorov" railway station	km 391+600	8 m northeast	An abandoned building
Pig-breeding complex	km 392+000	30 m south	Agricultural buildings
Distances from the Axis of Encircling of the Town of Kresna – Red Option			
Apiary	km 394+200	20 m west	Inhabitable buildings
Northern and western part of the town of Kresna	km 395+100	150 m south	Agricultural goat-breeding buildings
The village of Novo Selo	km 395+500	140/150 m north	Abandoned houses
The town of Kresna	km 395+650	180 m south	Residential buildings
The town of Kresna (between two tunnels)	km 396+100	220 m southwest	Residential area
The town of Kresna	km 396+430	225 m southwest	Residential area
The town of Kresna	km 398+120	230 m west	Residential buildings

* Remark: The option G20 – blue / red (joint routes) have been moved in front of the town of Simitli and have a common start at km 373+300, so that all options are evaluated equivalently (after Lot 3.1, the traffic follows the existing road E79 – from km 373+300 to km 376+000).

Eastern Option G10.50 – Left Lane – km 373+300 to km 397+000, project 2016

Populate Place	**Distances from the Axis, m**		
	"Struma" Motorway Lot 3.2		
	km	Eastern Option G10.50 – Left Lane, m	Type of the Area
The town of Simitli	373+300	270 east	A row of buildings
The town of Simitli	373+300	220 west	Industrial building
The town of Simitli	373+400	220 east	Buildings
The town of Simitli	km 373+650	15 west	Two single buildings
The town of Simitli	km 373+730	30 west	A hotel
The town of Simitli, "Dalgata Mahala" District	km 373+900	40 west	A row of buildings
The town of Simitli, "Oranovo" District	km 374+000	40 east	Single buildings / houses
The town of Simitli, "Dalgata Mahala" District	km 374+000 до km 374+350	40/120 m west	A row of residential buildings
The town of Simitli, "Oranovo" District	km 374+250 до km 375+500	110/120/200 m east	Residential buildings
The town of Simitli, "Oranovo" District	km 374+500	80/120/130 m east	A row of buildings
The town of Simitli, "Oranovo" District	km 374+550	80 east	Residential buildings
The town of Simitli, "Dalgata Mahala" District	km 374+700 до km 375+400	120/100/90/180 m to the southwest	Residential buildings
The town of Simitli, "Dalgata Mahala" District	km 375+650	60 m southwest	A group of buildings
The village of Poleto	km 378+960	180 m southwest	A group of buildings

The village of Mechkul, a single building	km 384+400	56 m east	A single building, half-destroyed
The village of Stara Kresna (after a tunnel)	km 387+700	550 m west	A group of buildings
The village of Oshtava, the Cool Bath (before a tunnel)	km 389+100	90/100 m east	Recreation area with a hotel
The village of Oshtava	km 390+200	450 m east	Single buildings / houses
A building	km 390+600	60 m west	Unusable single building
Microhydroelectric power plant, the Vlahinska River	km 394+700	120 m east	Industrial building
Farm buildings	km 397+500	100 m west	Farm buildings
Sheepfolds above the town of Kresna	km 398+000	50 m southeast	Farm buildings
A farm building	km 398+150	Adjacent	Farm building
"Kresna" substation	km 398+800	160 m south	Industrial building
Industrial area of the town of Kresna	km 399+200	60 m northwest	Industrial buildings
The town of Kresna	km 399+500	230 m west	A group of residential buildings

Eastern Option G10.50 – Right Lane – km 373+300 to km 397+000, project 2016

Populate Place	**Distances from the Axis, m**		
	"Struma" Motorway Lot 3.2		
	km	Eastern Option G10.50 – Right Lane, m	Type of the Area
Distances from the Axis of an Existing Road E79			
The town of Simitli	km 373+670	10/20 m east	Single buildings
The town of Simitli	km 373+700	35 m west	A group of buildings
The town of Simitli	km 373+800	25 m east	A hotl complex
The town of Simitli, "Dalgata Mahala" District	km 374+100	25/30 m east	Residential area
The town of Simitli, "Dalgata Mahala" District	km 374+100	25 m west	Residential buildings
The town of Simitli, "Dalgata Mahala" District	km 374+300	15 m east	Single buildings
The town of Simitli, "Dalgata Mahala" District south	km 375+000	110/120 m east	A row of buildings
The village of Cherniche	km 377+000	150/170 m west	A group of buildings
Western part of the village of Poleto	km 378+200	280/300 m east	Residential area
"Poleto – Cherniche" road junction	km 378+250	40 m west	A single building
Gas station complex on a road	km 379+100	30 m, next to a bridge	Industrial building
A half-destroyed building and a residential building	km 379+700	25 m from the west	Agricultural buildings and a residential building
Railway lodge	km 381+500	70 m east	A railway lodge
"Stara Kresna" railway station	km 385+000	110/130 m across a river	Inhabitable buildings
Kresnensko Hanche	km 387+900	6 m east	Inhabitable buildings

Railway lodge, bat house	km 388+500	75 m from the east	A single uninhabitable building
"Peyo Yavorov" railway station	km 391+600	8 m northeast	An abandoned building
Pig-breeding complex	km 392+000	30 m south	Agricultural buildings
Distances from the Axis of Eastern Encircling of the Town of Kresna			
Apiary	km 394+200	20 m west	Inhabitable buildings
Northern and western part of the town of Kresna	km 395+100	150 m south	Agricultural goat-breeding buildings
The village of Novo Selo	km 395+500	140/150 m north	Abandoned houses
The town of Kresna	km 395+650	180 m south	Residential buildings
The town of Kresna (between two tunnels)	km 396+100	220 m southwest	Residential area
The town of Kresna	km 396+430	225 m southwest	Residential area
The town of Kresna	km 398+120	230 m west	Residential buildings

Eastern option G20 – km 373+300 to km 397+000, project 2016

The trail of the eastern option G20 covers the trail of the eastern option G10.50 - left lane and for this reason, the distances, specified in the table, for the eastern option G10.50 – left lane, are applicable as well to the eastern option G20.

Long tunnel option – from km 376+000 to км 397+000 (convergence with Lot 3.3 at km 397+000), project 2015

Populate Place	**Distances from the Lane Axis, m**		
	"Struma" Motorway Lot 3.2		
	km	Long Tunnel Option – Project 2015 Distance, m	Type of the Area
Distances before a northern gate of the tunnel at the village of Krupnik - 379+267/379+255			
The town of Simitli*	km 373+670	10/20 m east	Single buildings
The town of Simitli*	km 373+700	45 m west	A group of buildings
The town of Simitli*	km 373+800	30 m east	A hotel complex
The town of Simitli, "Dalgata Mahala" District*	km 374+100	25/30 m east	Residential area
The town of Simitli, "Dalgata Mahala" District*	km 374+100	30 m west	Residential buildings
The town of Simitli, "Dalgata Mahala" District	km 374+300	10/30 m east	Single buildings
The town of Simitli, "Dalgata Mahala" District south*	km 375+000	130 m east	A row of buildings
The village of Cherniche	km 376+000	30 m west	Industrial buildings
The village of Cherniche	km 377+000	130/150 m west	A group of buildings
Western part of the village of Poleto	km 378+200	260/280 m east	Residential area
"Poleto – Cherniche" road junction	km 378+250	18 m west	A single building
Gas station complex on a road	km 379+100	110 м, under a bridge	An industrial building
Distances after a southern gate of the tunnel at the town of Kresna – 394+605/394/600			
Southeastern part of the town of	km 394+600	210/230 m north	Single residential

Kresna, after the southern gate of the tunnel			buildings
Southeastern part of the town of Kresna, after the southern gate of the tunnel	km 394+600	330 m north	Residential area
Industrial area	km 395+000	120 m south	Greenhouses
Industrial area	km 396+000	500 m northeast	Industrial buildings

* Remark: The long tunnel option has been moved in front of the town of Simitli and has a start at km 373+300, so that all options are evaluated equivalently (after Lot 3.1, the traffic follows the existing road E79 – from km 373+300 to km 376+000).

Protected Areas

The protected areas under the Protected Areas Act that are closest to the project options for the route of Lot 3.2 of "Struma" Motorway are:

- "Kresna Gorge" Protected Area (PA), declared to be a buffer zone of "Tisata" Reserve, by means of Order No. 130/22.02.1985 of the Chairman of the Committee for the Preservation of the Environment (CFPE) (promulgated, SG No. 24/1985), amended by means of Order No. 844/31.10.1991 (promulgated, SG No. 24/1985) of the Minister of Environment and Water and re-categorized into a protected area by means of Order No. РД - 56/ 30.01.2008 (promulgated, SG No. 29/2008) of the Minister of Environment.
- "Tisata"Reserve, declated to be one, by means of decree No. 6663/05.12.1949 of the Ministry of Forestry, Order No. 440, dated 09 December 1977 (promulgated, SG No. 6/20.01.1978) of the CFPE and Order No. 844, dated 31 October 1991 (promulgated, SG No. 93/12.11.1991) of the Minister of Environment, with regard to area changing.
- "Moravska" PA, declared to be a natural landmark, by means of Order No. 133, dated 22 February 1985 of the CFPE (promulgated, SG No. 26 of 1985), re-categorized into a protected area by means of Order No. 727, dated 28 September 1991 of the Minister of Environment (promulgated, SG No. 87 of 1991).
- "Momina skala" natural landmark, declared to be one, by means of Order No. 468/30.12.1977 of the Chairman of the CFPE at the Council of Ministers (CM) (promulgated, SG No. 6 of 1987).
- "Natural Deposit of Plane Tree – Buyna" PA, declared to be a natural landmark, by means of Order No. 1427/13.05.1974 of the Ministry of Forestry and Environment (MOFE) (promulgated, SG No. 44 of 1974) and re-categorized into a protected area by means of Order No. РД - 647/25.05.2003 of the Minister of Environment and Water (promulgated, SG No. 60 of 2003).

"Natural Deposit of Plane Tree – Buyna" PA, "Moravska" PA, "Momina skala" natural landmark and "Tisata" Reserve are not concerned by the proposed project options.

The route, related to the Options G20 – red and blue, affects peripherally a part of "Kresna Gorge" PA. The right lane (the existing road), according to the Eastern

Option G10.50, runs through the periphery of a part of "Kresna Gorge" PA. By virtue of Item b of the authorization mode, introduced by means of Order No. 130/22.02.1985 of the Chairman of the CFPE (promulgated, SG No. 24/1985), within the borders of the buffer zone, "the maintenance and reconstruction of 'Sofia – Kulata' international road" is permitted. Related to this, the Options G20 – red and blue and the Eastern Option G10.50 are admissible in relation to the modes of "Kresna Gorge" PA.

The Long Tunnel Option and the Eastern Option G20 do not concern "Kresna Gorge" PA.

For the project developments of Lot 3.2 route of 2014 and 2015 – the options through Kresna Gorge with a dimension G20 (blue and red option), we enclose map material of November 2016 and 2017, with a situation of a blue and red option, in the sections along "Tisata" Reserve and "Kresna Gorge" PA, the project routes being thoroughly within the scope of the existing road E79, according to geodetic recording of 2016 and elimination of an obvious factual error (Annex No. 4).

Lot 3.2 route runs through NATURA 200 protected areas, as follows:

- "Kresna – Ilindentsi" Protected Area (identification code BG0000366) – located in Lots 3.2 and 3.3. A protected area under Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora;
- "Kresna" Protected Area (identification code BG0002003) – located in Lots 3.2 and 3.3. A protected area under Directive 2009/147/EC (the birds directive).

We apply a topographic map, at a scale of 1:25 000, with positions / situations of the project options of the investment proposal for "Improvement of 'Struma' Motorway Lot 3.2 Route" – option G20 – blue (Annex No. 5), option G20 – red (Annex No. 6), eastern option G10.50 (Annex No. 7), eastern option G20 (Annex No. 8) and an orthophoto map, at a scale of 1:5000, of a long tunnel option (Annex No. 9).

4. Structure, Situational Positioning and Basic Technological Features

General Information

"Struma" Motorway is a route with a length of about 150 km, located in the southwestern part of the country, between "Daskalovo" road junction (near the town of Pernik) and the border between Bulgaria and Greece, near the village of Kulata. The motorway runs parallel with the Struma River, including through natural landmarks, as well, such as Kresna Gorge.

"Struma" Motorway is divided into four lots:

- Lot 1 – from the village of Dolna Dikanya to the town of Dupnitsa;
- Lot 2 – from the town of Dupnitsa to the town of Blagoevgrad;
- Lot 3 – from the town of Blagoevgrad to the town of Sandanski;
- Lot 4 – from the town of Sandanski to the Greek border crossing at the village of Kulata.

Lot 1, Lot 2 and Lot 4 have already been completed and commissioned. Lot 3.1 and Lot 3.3 are currently under construction.

The unconstructed part of "Struma" Motorway – Lot 3 "Blagoevgrad – Sandanski" starts from km 359+000 (the end of Lot 2 – south of the village of Barakovo and east of the Struma River) to km 420+624 (the start of Lot 4 – about 500 m away from the village of Novo Delchevo), with a total length of about 61,624 km.

Lot 3 is further divided into the following sections, as they are shown on the map (Figure No. 4-1):

- Lot 3.1 – from the town of Blagoevgrad to the village of Krupnik – from km 359+000 (coinciding with km 359+482 of the "Struma" Motorway Lot 2) to km 376+000;
- Lot 3.2 – from the village of Krupnik to the town of Kresna – subject to this EIA (from km 373+300 to km 397+000). This section runs through broken terrain, a part of the project solutions being located within Kresna Gorge.

With a view to seeking the most appropriate and expedient solution for Lot 3.2, both from an environmental and technical point of view, options have been developed: eastern option G10.50 and eastern option G20, resulting in the impact of a stretch of approximately three kilometers at the end of "Struma" Lot 3.1 (from km 373 + 300 to km 376 + 000).

засягане на участък приблизително три километра в края на АМ Струма Лот 3.1 (от км 373+300 до км 376+000).

- Lot 3.3 – from the town of Kresna to the town of Sandanski – from km 397+000 to км 420+624 (coinciding with km 423+800 of the "Struma" Motorway Lot 4).

The project for the construction of "Struma" Motorway is a part of the Operational Program "Transport" 2007-2013, used for funding the implementation of Lot 1, 2 and 4, as well as the preparation of Lot 3. The implementation of Lot 3 is stipulated for the programming period 2014-2020 and includes option N + 3.

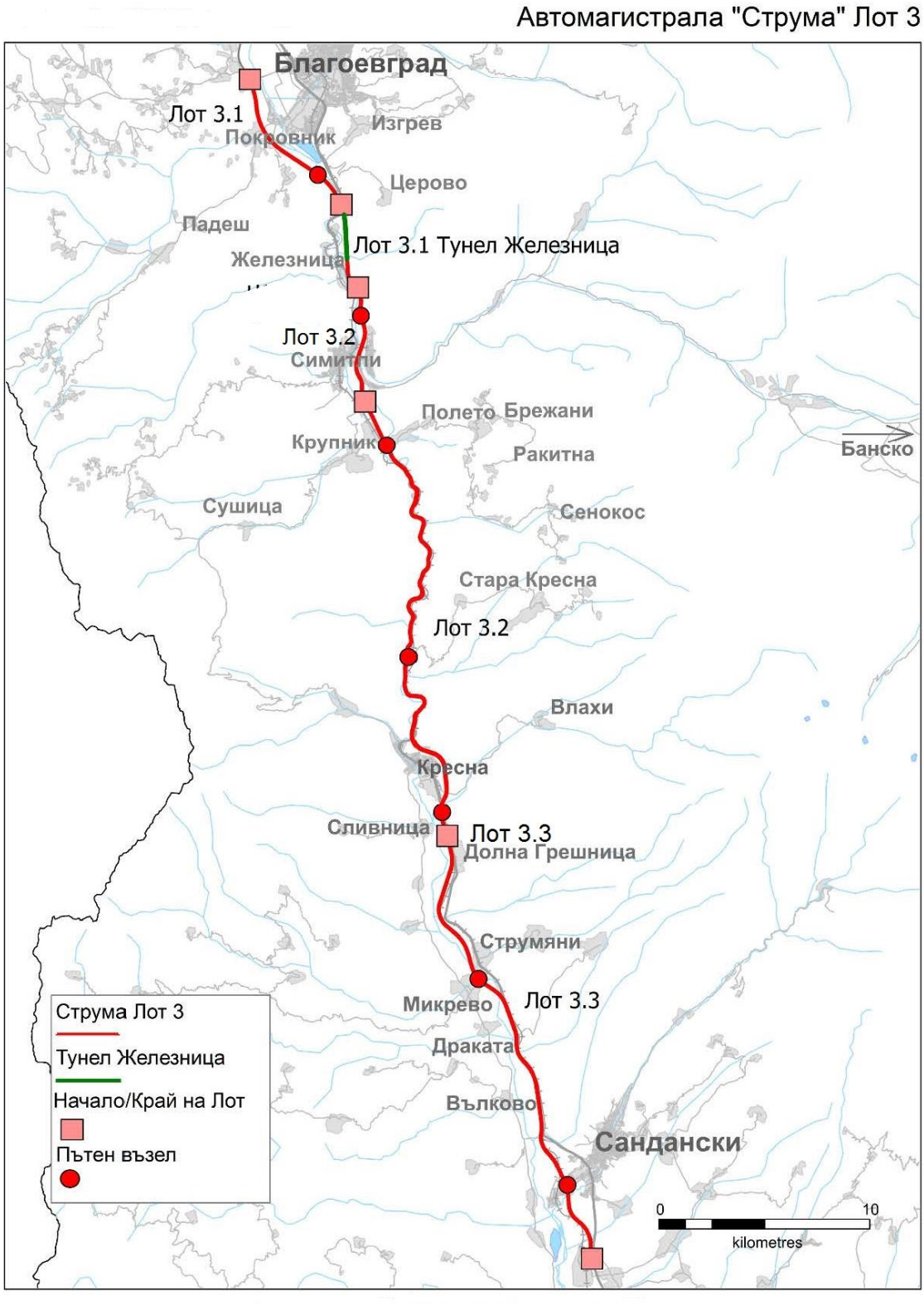

Автомагистрала "Струма" Лот 3
Благоевград
Лот 3.1
Покровник
Изгрев
Церово
Падеш
Лот 3.1 Тунел Железница
Железница
Лот 3.2
Симитли
Полето
Брежани
Крупник
Ракитна
Банско
Сушица
Сенокос
Стара Кресна
Лот 3.2
Влахи
Кресна
Сливница
Лот 3.3
Долна Грешница
Струмяни
Микрево
Лот 3.3
Драката
Вълково
Сандански
Струма Лот 3
Тунел Железница
Начало/Край на Лот
Пътен възел
0
10
kilometres

Figure No. 4-1

From a physical and geographic point of view, Lot 3 of "Struma" Motorway runs through the South-Bulgarian province, Rila-Rhodope region, Mid-Struma subregion (according to Mishev, 1989).

The route of Lot 3 is located in an environmentally sensitive region. The greatest part of Lot 3 route length is located along the Struma River valley and within the strip, including the existing road E79 and the "Sofia-Kulata" railway line. The route has intersections with E79 and other national and municipal roads, rivers, railway lines, etc. The project routes pass through three hollows (the hollows of Blagoevgrad, Simitli, Sandanski) with flat nature and two mountain sections.

The project options, considered in the EIA, for "Improvement of 'Struma' Motorway Lot 3.2 Route", are related to the section that is last to be constructed of the whole motorway route and are subject to the current EIA procedure.

The project options, proposed by the Purchaser, have been evaluated equivalently in the EIA report, as follows: Option G20 – blue; Option G20 – red; Eastern Option G10.50; Long Tunnel Option and Eastern Option G20.

FEATURES OF THE PROJECT OPTIONS, PROPOSED BY THE PURCHASER

OPTION G20 – BLUE, "Pre-investment Study" Stage, 2014

The project route starts south of "Krupnik" road junction, km 376 + 000. In Kresna Gorge, one of the lanes, in its main part, follows the existing road E79 and the other lane runs on a new terrain with tunnels and facilities in the western massif of the gorge. After leaving Kresna Gorge, the above-mentioned route runs east of the town of Kresna and ends at "Kresna" r. j.

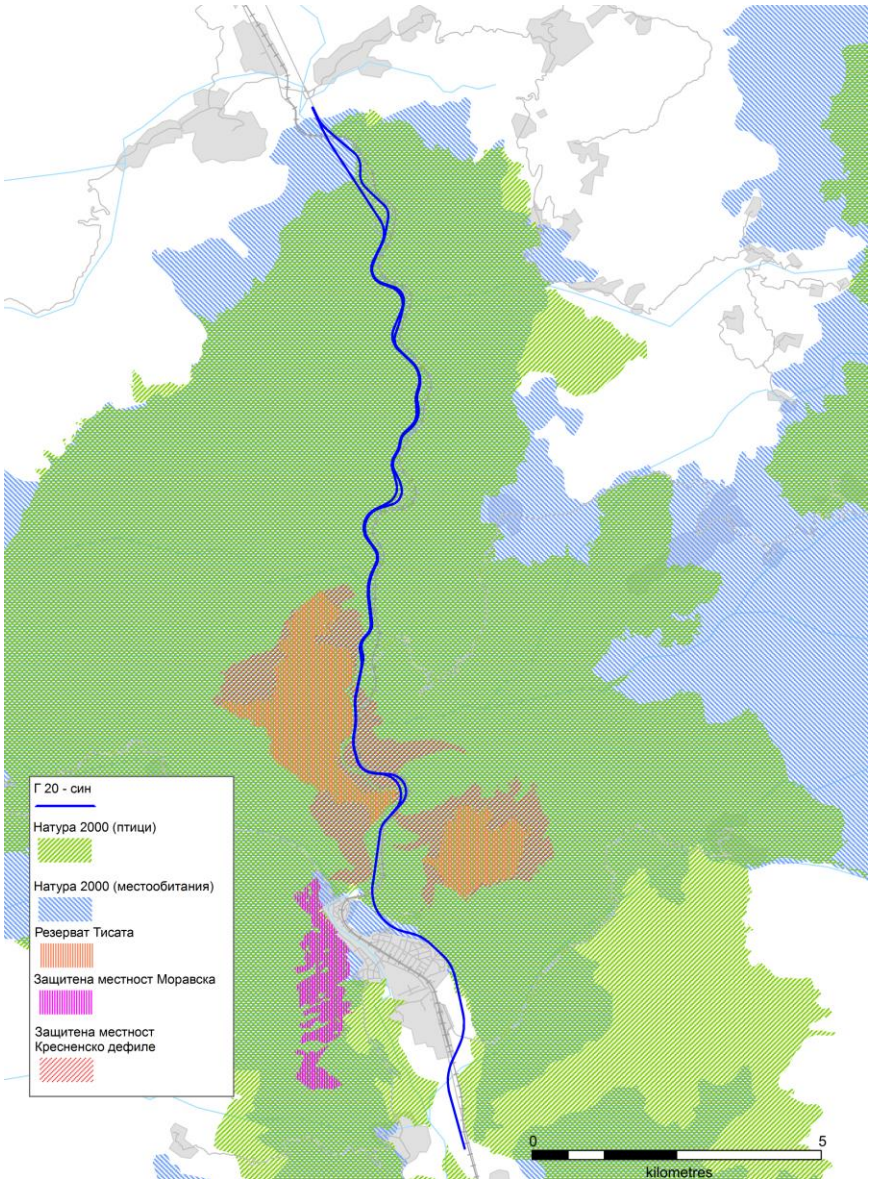


Figure No. 4-2. Situation of Option "D20" - Blue

We apply a situation of the project route – **option G20 – blue**, on a topographic map, at a scale of 1:25 000 – Annex No. 5.

The left lane length in kilometres differs from the right lane length in kilometres when taking into consideration the fact that the routes have different parameters, curves and therefore - different lengths.

According to a project of 2014, the start of the option is km 376+000.

Within the section from км 378+600 up to км 393+100, the two lanes have been developed independently of each other, moving away from each other and getting closer to one another situationally and niveletly. Where possible, the existing road is followed and used and tunnels and viaducts are stipulated in other sections. In some cases, retaining walls are stipulated towards the Struma River and the slopes.

Left lane:

The start of the section, being considered, is at km 376+000, after the existing "Krupnik" road junction where the beginning of Kresna Gorge is. The route of the left lane, in its main part, follows the existing road, using the existing bridge over the Struma River and the railway line from km 379 + 051 to km 379 + 271 and is along the existing road E79 to km 379 + 900. In the section from km 379 + 900 to 380 + 800, the existing road E79 has to be left, the passing along a new route being performed by means of two bridges and two tunnels. From km 380 + 700 to km 382 + 500, the existing road and existing bridges and tunnel are used. A new tunnel is stipulated from 382 + 565 to km 382 + 735. From km 382 + 800 to km 384 + 700, the existing road is used, from km 384 + 740 to km 384 + 810 – a new tunnel, from km 384 + 810 to km 388 + 360 – the route again is along the existing road. From km 388 + 360 to km 388 + 480, a new tunnel is stipulated and after it, the existing road is used again, to km 393 + 100.

The route ends at km 399+789 ≡ km 397+000 of Lot 3.3.

Right lane:

The right lane develops to the right of the existing road and is entirely on a new terrain, following situationally the left one and in separate cases – moving away from it. Niveletly, it is often on a second, higher level than the left one, in a trench or in a tunnel. At km 393 + 100, the two lanes are again parallel to one another and develop together to the end of the section, moving away from each other only in the cases of a tunnel solution.

The end of the section is about 2.5 km before the town of Kresna, leaving the existing road along the left bank of the Struma River, from km 394 + 050 to km 394 + 150, the river is pre-bridged and from km 394 + 360 to km 394 + 565 km – the route again passes over the Struma River, the existing road I-1 and "Sofia – Kulata" the railway line. From km 394 + 565 to km 394 + 700, a new tunnel is stipulated, after it the route crosses the Vlahinska River and the route encircles the town of Kresna from the northeast and from the east.

At km 398+200, the route runs above "Sofia – Kulata" railway line and at km 398+310 – above road I-1.

In 2016, after geodetic recording and elimination of an obvious factual error, the project route, in the sections along "Tisata" Reserve and PA"Kresna Gorge", is joined within the scope of the existing road E79 – Annex No. 4.

The route ends at km 399+789 ≡ km 397+000 of Lot 3.3.

Transverse profile

A section from км 378+600 up to км 399+000.

A dimension G20 has been adopted for a speed of 80 km/h:

- Lanes: 2 x (2x3.50) m;
- Guiding strips 2 x 0.50 m;
- Grass verges 2 x 1.50 m;
- Middle separating strip 1 x 2.00 m.

Total: 20 m
Общо: 20 м

A section from km 399+000 to km 399+789 ≡ 397+600.

The section dimension becomes A29 – the same as the dimension in the other sections of the "Struma" Motorway.

- 2x2 lanes - -2x(2x 3.75) = 15.00 m;
- 2x2 asphalt-paved guiding strips -2x(2x 0.75) = 3.00 m;
- 2x2 strips for forced stopping -2x2.50 = 5.00 m;
- 2x1 grass verges - 2x1.25 = 2.50 m;
- Middle separating strip - 1x3.50 = 3.50 m.

Total = 29.00 m

Pavement

The pavement structure has been dimensioned for a "very heavy" category of motion and a module of elasticity is required – E_H = 370 MPa, while preserving the homogeneity of the pavement in the previous sections of "Struma" Motorway:

- Split mastic asphalt (SMA) 0/11S with polymer additives 4 cm;
- Asphalt mixture for the lower layer (binder) 0/22 8 cm;
- Asphalt mixture for the basic layer Ao 18 cm;
- Crushed stone with selected grain size (0 – 63 mm) 20 cm;
- Crushed stone (0 – 63 mm) 20 cm;
- Area A – materials group A-1 50 cm.

Road junctions:

- road junction (r. j.) "Krupnik" at km 377+700, after the end of Lot 3.1 – km 376+000;
- r. j. "Oshtava" – at km 389+700;
- r. j. "Kresna" – at km 398+882.

Sites for long-lasting recreation and recreation with short duration

- Sites for long-lasting recreation at km 376+500 до 376+900;
- Sites for recreation with short duration at km 397+500 до 397+700.

There are no deep escavations (with a ramp height of over 8 – 10 m) and high embankments (with a height of over 2 m), according to Ordinance No. 1 of 26 May 2000 on road designing.

Balance of Earth Masses

The quantities of the main types of works are given in the table below.

Escavation, unsuitable for embankment	m^3	1 192 402.00
Escavation. suitable for embankment	m^3	917 500.00
Embankment	m^3	1 311 777.00
Material for landfilling	m^3	798 125.00

The implementation of Option G20 – blue is related to the construction and reconstruction of the following sites:

Viaducts new ones - 3 075 m′, existing ones - 554 m′;

Tunnels new ones - 7º345 m′, existing ones - 410 m′;

Walls – retaining ones new ones - 3º710 m′.

Large Facilities

Retaining and reinforcing walls

No.	From km to km		Explanatory Text	Side (Left, Right)	Length (m)
1	383+000	383+200	A new one, left lane	Left	200
2	383+420	383+600	A new one, left lane	Left	180
3	384+900	385+100	A new one, left lane	Left	200
4	385+200	385+300	A new one, right lane	Left	100
5	385+350	385+400	A new one, left lane	Left	50
6	385+420	385+520	A new one, right lane	Left	100
7	385+520	385+570	A new one, right lane	Left	50
8	385+570	385+620	A new one, right lane	Left	50
9	385+850	385+950	A new one, left lane	Left	100
10	386+620	386+720	A new one, right lane	Left	100
11	386+720	386+770	A new one, right lane	Left	50
12	387+250	387+350	A new one, left lane	Left	100
13	387+300	387+720	A new one, right lane	Left	420
14	387+350	387+500	A new one, left lane	Left	150
15	387+720	387+900	A new one, right lane	Left	180
16	387+900	387+990	A new one, right lane	Left	90
17	385+490	385+610	A new one, left lane	Right	120
18	388+850	388+950	A new one, left lane	Left	100
19	388+950	389+100	A new one, left lane	Left	150
20	389+040	389+120	A new one, right lane	Left	80
21	389+290	389+330	A new one, left lane	Right	40
22	390+340	390+390	A new one, right lane	Right	50
23	390+390	390+480	A new one, right lane	Right	90
24	390+480	390+530	A new one, right lane	Right	50
25	390+530	390+640	A new one, right lane	Right	110
26	390+640	390+850	A new one, right lane	Right	210
27	391+470	391+550	A new one, right lane	Right	80
28	392+900	392+950	A new one, left lane	Left	50
29	395+555	395+565	A new one, left lane and right lane	Right	10
30	395+565	395+630	A new one, left lane and right lane	Right	65
31	395+630	395+670	A new one, left lane	Right	40

No.	From km to km		Explanatory Text	Side (Left, Right)	Length (m)
			and right lane		
32	395+670	395+820	A new one, left lane and right lane	Right	150
33	395+885	395+925	A new one, left lane and right lane	Right	40
34	395+975	396+050	A new one, left lane and right lane	Right	75
35	396+665	396+685	A new one, left lane and right lane	Middle	20
36	396+725	396+785	A new one, left lane and right lane	Middle	60

Viaducts

No.	From km to km		Explanatory Text	Side Left / Right	Length (m)
1	379+040	379+180	A new one	Right	140
2	379+051	379+261	An existing one, milling, re-pavement	Left	210
3	380+400	380+445	A new one	Left	45
4	380+620	380+720	A new one	Left	100
5	381+020	381+130	An existing one, milling, re-pavement	Left	110
6	381+220	381+320	An existing one, milling, re-pavement	Left	100
7	389+920	390+140	A new one	Right	220
8	390+210	390+344	An existing one, milling, re-pavement	Left	134
9	392+195	392+585	A new one	Right	390
10	392+650	392+900	A new one	Left	250
11	394+050	394+150	A new one	Left / Right	100
12	394+340	394+530	A new one	Left / Right	190
13	394+750	394+970	A new one	Left / Right	220
14	395+16	395+320	A new one	Left / Right	160

No.	From km to km		Explanatory Text	Side Left / Right	Length (m)
	0				
15	395+965	395+975	A new one	Left / Right	10
16	396+115	396+250	A new one	Left / Right	135
17	398+200	398+350	A new one	Left / Right	150

Overpasses, Subways, Walkways

No.	km	Explanatory Text	Side Left/Right	Length (m)
1	379+482	The same wlkway with L=4 m, milling, re-pavement	Left	4
2	396+555	A new walkway with L=6 m	Left/Right	6
3	396+860	A new walkway with L=6 m	Left/Right	6
4	km 397+383 km 397+403	A new skewed subway with L=20 m	Left/Right	20
5	km 397+914 km 397+926	A new skewed subway with L=12 m	Left/Right	12
6	km 398+830	A new subway with L=24 m	Left/Right	24
7	km 389+950	A new skewed overpass with L=36 m	Left/Right	36

Tunnels

No.	From km to km		Explanatory Text	Side Left/Right	Length (m)
1	379+180	380+350	A new one	Right	1170
2	379+930	380+340	A new one	Left	410
3	380+455	380+455	A new one	Left	125
4	380+520	380+800	A new one	Right	280
5	381+130	381+200	An existing one	Left	70
6	380+950	381+020	A new one	Right	70
7	382+035	382+095	A new one	Right	60
8	382+565	382+735	A new one	Left	170
9	382+300	382+580	A new one	Right	280
10	382+740	383+220	A new one	Right	480
11	384+150	384+690	A new one	Right	540
12	384+740	384+810	A new one	Left	70
13	385+300	385+420	A new one	Right	120
14	385+890	386+570	A new one	Right	680
15	386+370	386+710	An existing one	Left	340

No.	From km to km		Explanatory Text	Side Left/Right	Length (m)
16	386+955	387+155	A new one	Right	200
17	387+995	388+195	A new one	Right	200
18	388+360	388+480	A new one	Left	120
19	388+220	388+310	A new one	Right	90
20	388+910	389+040	A new one	Right	130
21	394+565	394+700	A new, two-sided one	Left	135
22	394+750	395+000	A new one	Left	250
23	395+420	395+510	A new, two-sided one	Left	90
24	396+665	396+785	A new one	Left	120
25	396+685	396+725	A new one	Right	40

The construction of the tunnels will be carried out in a classic way with with drilling-blasting works and reinforced concrete lining. For shorter tunnels, ventilation and fire extinguishing equipment is not required, but only a lighting installation.

Bridges

No.	At km	Explanatory Text	Side Left/Right	Length (m)
1	386+030	An existing one	Left	8
2	388+493	A new one	Left	6
3	397+043	A new one	Left	6
4	398+560	A new one	Left	20
5	399+135	A new one	Right	10
6	399+610	A new one	Right	10

The description of the project option and the degree of detail of the data in this environmental impact assessment corresponds to the level of the study and designing.

Option G20 – blue (a joint route) has been moved in front of the town of Simitli so that it has a common start with the other, proposed by the Purchaser, project options, at km 373+300, so that all project options are evaluated equivalently in the EIAR (after Lot 3.1, the traffic follows the existing road E79 – from km 373+300 to km 376+000).

Option G20 – blue runs through the territory of Simitli municipality and the territory of Kresna municipality in Blagoevgrad region.

Reconstruction of Facilities of Other Authorities

Upon the implementation of the project, reconstructions will be necessary of electric power transmission networks, water supply systems, gas pipelines, irrigation canals, optical cables, etc. The reconstructions are:

- Reconstructions of high voltage (HV) – 110 kV networks. They are realized within the segment between km 378 + 500 and km 379 + 500. The reconstructions comprise installation of 9 new poles.
- Reconstructions of low voltage (LV) and middle voltage (MV) – 20 kV networks. The reconstructions take place all the way along the road, at 22 places. They comprise dismantling of poles and removal of shafts that happen to be located on the route, as well as construction of new shafts – 7 pieces and steel lattice poles – 13 pieces.

- Reconstructions of communication cables and facilities. Optical cables are involved. It is related to optical cables. The reconstructions take place all the way along the route. They comprise laying of pipes for optical cables with Ø40 – 13 pieces, PVC pipes with Ø110 mm in a concrete casing with Ø110 - 16 pieces and shafts - 37 pieces.
- Reconstructions of gas pipelines. The existing gas pipelines intersec in 3 places, the reconstruction including the construction of a protective concrete casing.
- Reconstructions of water supply systems. They comprise replacement of affected parts of the pipes where they intersec with the road route. The reconstructions are realized in sections from km 378 + 000 to km 378 + 500 and from km 397 + 500 to km 399 + 400. They comprise replacement of potable-water household plumbing with asbestos-cement pipes with Ø125; potable-water household pipelines with Ø80-asbestos cement, Ø32, Ø120, Ø150; supplying potable-water household pipeline - Ø250- asbestos cement.
- Reconstructions of irrigation systems. They comprise displacement of open irrigation canals and irrigation pipelines outside the scope of the route. The reconstructions are implemented in the sections from km 376 + 200 to km 378 + 500 and km km 394 + 000 to km 399 + 400. They comprise reconstructions of drainage canals from "Krupnik" Municipal Enterprise (ME) in 2 sections, Main Irrigation Canal "Left Pirin Railway Station" - 5 sections, Deviation of the Main Irrigation Canal "Left Pirin Railway Station" - 5 sections. The reconstruction of the pipelines is within the scope of the route where it is necessary to replace the parts of the pipelines that remain beneath the road body. The reconstructions comprise main irrigation pipeline PVC Ø250 - 2 intersections; internal irrigation pipeline Ø160 steel, internal irrigation pipeline Ø120 polyethylene (PE) and Ø140 PE.

OPTION G20 - RED, Stage of Preliminary/Conceptual Design, 2015

The project route will start south of Krupnik junction, km 376 + 000. In the Kresna Gorge one road lane follows in its main part the existing road E79 and the other is developing on a new terrain with tunnels and facilities in the western terrain of the gorge. Upon the exit of the Kresna gorge shall pass East of the town of Kresna and ends at road junction „Kresna".

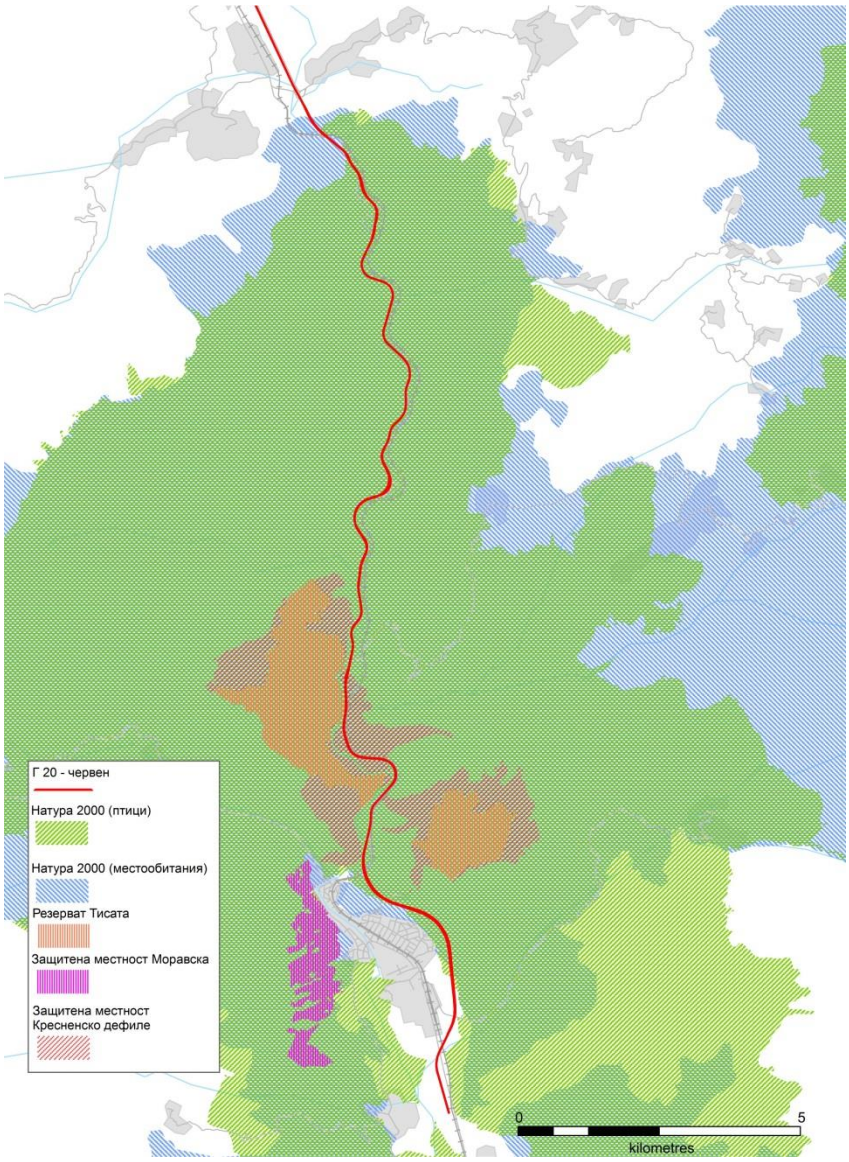


Figure No. 4-3. Situation of option G20 - red

We have enclosed a situation plan of the project route, **Option G20 - red**, upon a topographic map in scale M 1:25000 - Appendix No.6.

Under the 2015 project, the start of this option is km 376 + 000.
The route of G20 Option - red for Lot 3.2 of Struma Motorway is developing to the right of the existing road and parallel to it, passing east of the village of Krupnik. From km 376 + 400 to km 377 + 000 on both sides of the 'Struma' Motorway have been designed sites for short-term recreation. At km 377 + 480 (left) a motorway control center has been designed, which is connected to the existing road I-1, which is to be preserved in the area under consideration and is connected with road junction „Krupnik" at km 378+450. In the section of the short-term recreation sites from the East, the existing I-1 road shall be reconstructed.
In the section from km 378 + 035 to km 378 + 185 a new bridge should be built on the

Struma river. The levels in the area at km 376 + 000 have been aligned with the levels at the end of Lot 3.1, then go lower and follow the elevations of road I-1. In the water basin of the Struma river it will take into account the high waters of the river.

The overall dimensions in the section from km 376 + 000 to km 378 + 450 is a motorway type - A29.
At km 378 + 450 (Krupnik road junction) a switch is provided in two independent roadways, design speed 80 km / h.

Left road lane
The beginning of the area under consideration is at km 376 + 000 after the existing road junction "Krupnik", which is the beginning of the Kresna Gorge. From km 378 + 450 to km 380 + 200, the left lane follows the trail and the level of the existing road, using the existing bridges of the Rezena river and Struma river, as it passes over the 'Sofia-Kulata' railway line.
From km 380+190 up to km 380+340, a new bridge shall be provided on Struma river, from km 380 + 400 to km 380 + 520 - a new tunnel, parallel to the railway tunnel and again a new bridge on the Struma river (from km 380 + 570 to km 380 + 750), then switches to the existing road, using the existing two bridges and a tunnel. At km 381 + 000 and 381 + 260 are designed approaches to community camps, where the extreme kayaking and rafting are the popular water sports. From km 381 + 400 to km 385 + 800 the left lane follows the existing road that it rarely leaves.
Between km 386+330 and km 386+670 the lane uses the existing tunnel with length 340 m, and at km 387+780 it passes by the existing the "Kresna hanche". At km 389 + 950 is planned the construction of road junction "Oshtava".
This option ends at km 399+832 ≡ km 397+600 of Lot 3.3.

Right road lane
It will be developing on a new terrain, to the right of the existing road, as new bridges cross over the Rezena river (km 378 + 520), the Struma river and the railway Line "Sofia - Kulata" (from km 379 + 025 to km 379 + 225).
In the section from km 379 + 900 to km 380 + 230 (the left road lane), the right road lane goes to the left and passes right above it, then goes back to the level with it on its right side, and with a series of new four bridges and two new tunnels, reaching km 381 + 400. In the section from km 384 + 300 to km 385 + 800, the left road lane follows the existing road, which strongly winds, and the right road lane rises to the left and develops to the right in the slope. Up to km 386+310, the right lane runs parallel to the left lane and has overall dimensions G20 and follows the levelling of the existing road. A new tunnel follows to km 386+690, after which the right lane is constructed above the left one from km 386+680 (using the mileage of the left lane) up to km 387+470. Then the two roadways run parallel up to km 387 + 960, where the right road lane is in the slope above the left. From km 388 + 000 to km 388 + 820 (under the kilometers of the left road lane), a two-level facility is planned again, i.e. the right road lane above the left. Then the right road lane develops in parallel and in close proximity to the left road lane to km 390 + 000, where the Oshtava road junction is planned, which connects with the villages of Oshtava and Stara Kresna. The road lane shall be developed to the right (west) of the existing road, as its level passes higher, to the right of the slope and the flat above it, without affecting the existing road. The two roadways shall be completely

independent and have two separate and different levelling. Access roads shall be provided to the Struma river for exit of the people, descending the river with kayaks and rafting.

Section from km 390+000 to km 393+000.

The existing road shall be being developed in the vicinity of 'Kresnensko defile' /Kresna gorge/.

The project routes, in blue and red, are entirely within the range of the existing road, according to the geodetic planning of 2016 and the elimination of a clear actual error/ignorance of fact.

Road section from km 393+100 up to km 399+832 ≡ km 397+600 (Lot 3.3)

The road section starts just before the town of Kresna, bypassing the town from the east, with the two roadways situationally and horizontally developed, together with the G20 overall dimensions.

From km 393+100 to km 393+800, the motorway shall be developed around and above the existing road, with the two roadways running parallel to one another.

From km 393 + 900 to km 394 + 200 and from km 394 + 350 to km 394 + 620, crossing twice the Struma river.

About km 394 + 580, crosses the I-1 road and the Sofia-Kulata railway line, then crosses from km 394 + 750 to km 394 + 950, the Vlahinska river and develops on its left coast.

After km 395+800 three tunnels are provided for:

- the first - 400 m long;
- the second - 200 m long;
- the third - 240 m long.

After the last tunnel, a viaduct is projected with a length of 630 m to km 397 + 650. The route continues to the south after the town of Kresna.

At km 398 + 900, it crosses the railway line "Sofia-Kulata" and at km 399 + 165, road I-1, which will be reconstructed to build a road junction.

In 2016, after surveying and removing the obvious actual error/ignorance of fact in the project route, in the sections along the reserve 'Tissata' and Protected Area 'Kresna Gorge' is incorporated in the existing road E 79, Appendix 4.

This option ends at km 399+832 ≡ km 397+600 of Lot 3.3.

Outline dimensions of the road track

Overall dimensions G20

The road section from km 378+300 up to km 399+350 has been provided to be built with G20

- 2 x 2 traffic roadways — 2 x (2 x 3.25) = 13.00 m
- 2 x 2 asphalted leading roadways — 2 x (2 x 0.5) = 2.00 m
- 2 x 1 banked earth — 2 x 1.50 = 3.00 m
- Middle dividing strip — 1 x 2.00 = 2.00 m

Total=20.00 m

Overall dimensions A29

For the sections from km 376 + 000 to km 378 + 000 and from km 399 + 300 to km 399 + 979 ≡397 + 600, the overall dimensions become A29, as the overall dimensions in the other sections of the Struma Motorway

- 2 x 2 traffic roadways — 2 x (2 x 3.75) = 15.00 m
- 2 x 2 asphalted leading roadways — 2 x (2 x 0.75) = 3.00 m
- 2 x 2 emergency stop roadways — 2 x 2.50 = 5.00 m
- 2 x 1 banked earth strips — 2 x 1.25 = 2.50 m
- Middle dividing strip — 1 x 3.50 = 3.50 m

Total = 29.00 m

Road pavement

1. Direct route

The design of the road pavement has been dimensioned for a traffic category "very heavy" and required modulus of elasticity - En = 370 MPa, while preserving the homogeneity of the pavement in the previous sections of the 'Struma' Motorway:

- Split mastic (SMA)0/11S with polymer additives — 4.0 cm
- Asphalt mix for bottom layer (binder) 0/22 — 6.0 cm
- Asphalt mix for main layer Ao — 12.0 cm
- Crushed stone with cement stabilization (0-63mm) — 20.0cm
- Crushed stone (0-63mm) — 24.0cm

2. Roads of the National Road Network

- Asphalt mixture for wear layer "A" — 4.0 cm
- Asphalt mix for bottom layer (binder) 0/22 — 4.0 cm
- Asphalt mix for main layer Ao — 10.0 cm
- Crushed stone with selected grain size (0-63mm) — 36.0 cm;

3. *Municipal roads*

- Asphalt mixture for wear layer "A" — 4.0 cm
- Asphalt mix for bottom layer (binder) 0/22 — 6.0 cm
- Crushed stone with selected grain size (0-63mm) — 35.0cm

Road junctions

For three-way traffic junctions, it will be necessary to execute a cross-border crossing:

- Road junction „Krupnik" – km 378+423
- 'Oshtava' road junction - on the Road IV-10063 to the village of Stara Kresna and the village of Oshtava - km 389 + 940
- Road junction „Kresna" – of Road I-1 for the town of Kresna and the town of Kulata – km 398 + 975
- Entry and Exits from the highway to Route I-1 (Link to city of Kresna) - connections will be constructed for entering and exiting the highway for the directions Sofia-Kresna and Kresna-Sofia - approximately km 393 + 600

Road connections

- Road connection from road I-1 to the Traffic Control Center at km 377 + 480 of the Struma

Motorway

- Road connection to a gas station at km 379 + 082 (379 + 085)
- Road connection to the Rafting site, at km 381+000 and km 381+260
- Road connections to the Recreation site (left lane) from km 387+660 to km 388 + 000
- Road connections to the Rafting site (left lane) from km 389+100 To km 389 + 320
- Road connections with Road I-1 at km 394+004 (394+002)

• Additional approaches are provided for the exit of the participants in the extreme sports on the river. the Struma river at km 383+000 and km 386+000.

Sites for long-lasting and short-term recreation

- Sites for long-term recreation at km 376 + 500 to 376 + 900
- Short-term recreation areas at km 397 + 500 to 397 + 700

The implementation of option G20 - red is related to the construction and the reconstruction of the following sites:

Overhead roads new – 3800 m';
Viaducts new - 1165 m';
New tunnels - 2 892 m', existing - 410 m'
Walls - supporting - 8140 m'

Large facilities

Viaducts, overhead roads

No.	from km up to km		Clarifications text	Tunnel tube left/right	Length (m)
1.	386+680	387 + 460	A new overhead road on two levels, right road lane over the left, overall dimensions G10,49	Right	780
2.	388 + 000	388+820	A new overhead road on two levels, right road lane over the left, overall dimensions G10,50	Right	820
	392+791 (392+580)	392 + 930 (393 + 080)	New Viaduct, G10.50 overall dimensions, left and right road lane of different length. Odometer and length of the right road lane - in brackets.	left/right	139 (422)
3.	390 + 100	392 + 300	A new overhead road on two levels, right road lane above left, overall dimensions G10,50	Right	2200
4.	398 + 392 (398 + 681)	398 + 375 (398 + 690)	New Viaduct on Route I-1, railway crossing of the Sofia-Kulata Line and Sulun dere gully, overall dimensions: Left road lane 16.65 m; Right road lane - 11.15 m. Left and right road lane of different length. Odometer and length of the right road lane - in brackets.	Left/right	289 (315)

Overpasses, underpasses, interpasses

No.	Kilometres, km	Clarifications text	road lane Left/right

1	376 + 183	Agricultural road, overall dimensions G29	Left/right
2	378 + 423	Road overpass / 'Krupnik' Road Junction / Design of the new Krupnik junction - overpass over the 'Struma' Motorway, overall dimensions G29 / including 2 locks x3.5m /	Left/right
3	379 + 180	Agricultural underpass, Overall dimensions G10.50	
4	389 + 940	Road overpass / 'Oshtava' Road junction / Design of the new 'Oshtava' road junction - Overpass over the Struma Motorway, overall dimensions G20-blue + 2 locks x 3.5 m	Left/right
5	395 + 180	Agricultural underpass, overall dimensions G10.50	Left/right
6	396 + 553	Agricultural underpass, overall dimensions G10.50	Left/right
7	396 + 920	Agricultural underpass, overall dimensions L = 31m / 2x G10.50/	Left/right
8	397 + 340	Agricultural underpass, dimensions L = 24 m / 2 x G10.50 /	Left/right
9	397 + 857	Underpass of Road BLG2131, New road underpass, overall dimensions / 2x G10.50 /	Left/right
10	398 + 016	Agricultural underpass, overall dimensions 2x G10.50	Left/right
11	398 + 975	Road underpass / 'Kresna' Road Junction / Design of the new 'Kresna' road junction - underpass under the Struma Motorway, overall dimensions L = 22 m	Left/right
12	399 + 374	Agricultural underpass, overall dimensions G29	Left/right

Tunnels

No.	**from km up to km**		**Clarifications text**	**left tube/right**	**Length (m)**
1	380 + 399	380+524.70	New "Momina Skala", overall dimensions G10.50	Left	126
2	380+446.85	380+511.35	New "Momina Skala", overall dimensions G10.50	Right	64
3	381 + 100	381+570	Existing 'Zajchar', overall dimensions G10.50	Left	70
4	381+111.50	381+149.45	New 'Zajchar', overall dimensions G10.50	Right	38
5	386+325.	386 + 665	Existing 'Chervena skala', overall dimensions G10.50	Left	340
6	386+292.06	386+623.45	New 'Chervena skala', overall dimensions G10.50	Right	331
7	394+523.15	394 + 774	New "Tissata", overall dimensions G10.50	Left	248
8	394+544.20	394+767.50	New "Tissata", overall dimensions G10.50	Right	223
9	395+679.15	396+067.10	New 'Kresna 1', overall dimensions G10.50	Left	388
10	395+639.55	396 + 069.45	New 'Kresna 1', overall dimensions G10.50	Right	430
11	396+157.95	396+390.75	New 'Kresna 2', overall dimensions G10.50	Left	233
12	396+173.60	396+413.05	New 'Kresna 2', overall dimensions G10.50	Right	239
13	396+590.55	396+866.85	New 'Kresna 3', overall dimensions G10.50	Left	276
14	396+580.30	396+876.60	New 'Kresna 3', overall dimensions G10.50	Right	296

The construction of the tunnels will be made in the classical manner by drilling and blasting works and reinforced concrete lining. For shorter tunnels, ventilation and fire extinguishing equipment is not required, but only a lighting installation.

Bridges

No.	from km up to km		Clarifications text	Road lane left/right	Length (m)
1	378 + 049	378 + 188	A new bridge on the Struma river, Overall dimensions G29	Left/right	139
2	378 + 504	378 + 531	A new bridge on the Rezena river, overall dimensions G29 /including 2 locks x 3.5m /	Left/right	27
3	379 + 046	379 + 264	Existing bridge on the Struma river and the rail crossing of 'Sofia-Kulata' Line, road lane, overall dimensions G12	Left	167
4	379 + 037	379 + 260	A new bridge on Struma and railway line Sofia-Kulata, overall dimensions G10.50	Right	223
5	380 + 168	380+420.	A new bridge on the Struma river, overall dimensions G10.50	Right	252
6	380 + 180	380 + 345	A new bridge on the Struma river, overall dimensions G10.50	Left	165
7	380 + 568	380 + 679	A new bridge on the Struma river, overall dimensions G10.50	Left	111
8	380 + 560	380 + 748	A new bridge on the Struma river, overall dimensions G10.50	Right	188
9	380 + 973	381 + 077	Existing bridge on the Struma river, road lane, overall dimensions G12	Left	104
10	380 + 971	381 + 083	A new bridge on the Struma river, Overall dimensions G10,50	Right	112
11	381 + 175	381 + 259	Existing bridge on the Struma river, G12 overall	Left	84
12	381+176	381+256	A new bridge on the Struma river, overall dimensions G10.50	Right	80
13	385+990	386+000	New bridge L=10m, overall dimensions G10.50	Right	10
14	390 + 151	390 + 296	Existing bridge on the Struma river, overall dimensions G10.50 - to the overhead road in two levels	Left	145
15	393 + 966	394 + 495	A new bridge on the Struma river, overall dimensions G10.50	Left	529
16	393 + 959	394 + 508	A new bridge on the Struma river, overall dimensions G10.50	Right,	553
17	394 + 820	394 + 959	A new bridge on Vlachinska, overall dimensions G10.50	Left	139
18	391+350	394 + 938	A new bridge on Vlachinska, overall dimensions G10.50	Right	138

Support walls

- **Reinforced concrete supporting walls:**

No.	Kilometre situation		L (m)	Hmed. (m)	Location
	from km	to km			
Direct route					
1	376 + 000	376 + 050	50	5.0	Right
2	380 + 025	380 + 130	105	7.5	between the two roadways
3	380 + 150	380 + 170	20	2.0	left lane - left
4	380 + 345	380 + 370	25	4.0	left lane - right
5	380 + 410	380 + 430	20	4.0	right lane - right
6	380 + 670	380 + 710	40	4.0	left lane - left
7	380 + 765	380 + 810	45	7.0	Between the two roadways under the embankment
8	380+950	380 + 990	40	8.0	between the two roadways
9	381 + 085	381 + 095	10	6.0	right lane - left
10	381 + 570	381 + 670	100	6.5	left lane - left
11	381+890	382+070	180	5.5	left lane - left
12	382 + 170	382 + 490	320	5.0	left lane - left
13	382+750	382 + 835	85	4.5	left lane - left
14	382 + 870	382 + 970	100	9.0	between the two roadways
15	382 + 990	383+070	80	3.0	left lane - left
16	383 + 350	383 + 610	260	6.5	left lane - left
17	384 + 370	384 + 450	80	2.0	between the two roadways
18	384 + 990	385 + 110	120	9.0	between the two roadways
19	385 + 150	385+250	100	10.0	between the two roadways
20	385 + 350	385 + 450	100	4.5	left lane - left
21	385 + 470	385 + 570	100	10.0	between the two roadways
22	385 + 630	385 + 710	80	5.0	left lane - left
23	385 + 750	385 + 930	180	7.0	left lane - left
24	386 + 670	386 + 690	20	10.0	between the two roadways
25	387 + 490	387 + 710	220	7.8	between the two roadways
25	387 + 570	387 + 690	120	5.0	left lane - left
27	388 + 510	388 + 610	100	4.0	left L
28	388 + 770	388 + 810	40	10.0	between the two roadways L
29	388 + 950	389 + 090	140	7.0	left lane - left
30	389 + 090	389 + 190	100	3.0	between the two roadways L
31	389+410	389 + 450	40	5.0	Left
32	391 + 350	391 + 390	40	1.5	right-right L
33	391 + 510	391+550	40	2.5	right right L
34	392 + 410	392 + 450	40	4.5	between the two roadways
35	392 + 690	392 + 790	100	10.0	between the two roadways
36	392 + 930	393 + 070	140	3.0	between the two roadways L
37	393 + 810	393 + 830	20	5.0	right - under embankment
38	397 + 810	397 + 840	30	2.0	left lane - left
39	397 + 860	397 + 920	60	3.5	left lane - left
Road junctions					
'Oshtava' Road Junction - connection 5					
1	10	280	270	3.0	Right
Road connections with ROAD I-1 at km 394+004					
1	40	300	260	3.5	Right
Road connection to the Rafting site, at km 381+000					
1	70	150	80	2.5	Left

- **reinforced embankment walls**

No.	Kilometre situation		L (m)	Hmed. (m)	Location
	from km	to km			
1	379 + 850	380 + 025	175	7.5	between the two roadways
2	380 + 130	380 + 210	80	5.0	between the two roadways
3	380 + 670	380 + 765	95	7.5	between the two roadways
4	382 + 290	382 + 510	220	4.5	between the two roadways
5	382 + 690	382 + 870	180	8.0	between the two roadways
6	382 + 970	383 + 170	200	7.5	between the two roadways
7	383 + 230	383 + 530	300	4.5	between the two roadways
8	384 + 450	384 + 510	60	3.5	between the two roadways
9	384 + 560	384 + 650	90	7.5	between the two roadways
10	384 + 850	384 + 990	140	8.5	between the two roadways
11	385+250	385 + 470	220	8.5	between the two roadways
12	385 + 570	386 + 060	490	7.0	between the two roadways
13	388 + 810	389 + 090	280	7.5	between the two roadways
14	392 + 370	392 + 410	40	6.5	between the two roadways

- **anchored walls**

No.	Kilometre situation		L (m)	Hmed. (m)	Location
	from km	to km			
1	379 + 790	379 + 850	60	5.5	between the two roadways
2	380 + 810	380+950	140	7.5	between the two roadways
3	382 + 510	382 + 690	180	8.0	between the two roadways
4	383 + 170	383 + 230	60	7.5	between the two roadways
5	384 + 510	384 + 560	50	5.5	between the two roadways
6	384 + 650	384 + 850	200	8.0	between the two roadways
7	385 + 110	385 + 150	40	8.0	between the two roadways
8	386 + 060	386 + 260	200	10.0	between the two roadways
9	387 + 710	387 + 980	270	7.5	between the two roadways
10	388 + 740	388 + 770	30	9.0	between the two roadways

- **reinforcing walls**

No.	Kilometre situation		L (m)	Hmed. (m)	Location
	from km	to km			
Direct route					
1	382 + 110	382 + 210	100	6.0	Left
2	396 + 450	396 + 490	40	6.5	Left
Road connections					
Road connection to Gas-station					
1	350	450	100	2.0	Left

The description of the design Option and the degree of detail of the data in this environmental impact assessment is consistent with the level of the study and its design stage.

Option G20 - red (incorporated route) stretching before the town of Simitli

In order to have a common fair start with the other design options, offered by the Contracting Authority at km 373 + 300, in order to evaluate all project design options equally in the EIA Report (after Lot 3.1, the traffic shall be passing along the existing E79 road from km 373 + 300 to km 376 + 000).

Option G20 - red, passes through the Municipalities of Simitli and Kresna –

Blagoevgrad district.

Reconstruction of facilities of other authorities

The implementation of the project will require the reconstructions of electricity transmission networks, water mains, gas pipelines, irrigation channels, optical cables, etc. The reconstructions will be as follows:

- Reconstructions of networks HV - 110 kV. They shall be realized in the segment between km 378 + 500 and km 379 + 500. This will include the installation of 9 new pillars.
- Reconstruction of networks LV and Medium voltage. - 20 kV. The reconstructions will take place all the way along the road at 22 places. It will include dismantling of pillars and removal of shafts, comprised in the road track and construction of new shafts - 7 pcs. and steel-armoured pillars - 13 pcs.
- Reconstruction of communication cables and equipment. The optical cables shall be impacted. Reconstructions shall be carried out along the route. The design will include the installation of pipes for optical cables, of diameter Ø 40 - 13, PVC pipes of diameter Ø 110 mm in concrete casing of diameter Ø 110, in concrete casing - 16 units and shafts - 37 units.
- Reconstruction of gas pipelines. The existing gas pipelines intersect in three places, the reconstruction includes the construction of a protected concrete casing.
- Reconstructions of water mains. It will comprise replacing affected parts of the pipes, where they cross the road. It will be realized in sections from km 378 + 000 to km 378 + 500 and from km 397 + 500 to km 399 + 400. It will include the replacement of potable-water plumbing with asbestos-cement pipes of diameter Ø125; Drinking-water conduits of diameter Ø80-asbestos cement, of diameter Ø32, of diameter Ø120, of diameter Ø150; water Supply pipeline for drinking water - of diameter Ø250-asbestos cement;
- Reconstruction of irrigation systems. It would include the displacement of open irrigation channels and irrigation pipelines outside the track. It will be realized in the sections from km 376 + 200 to km 378 + 500 and from km 394 + 000 to km 399 + 400. It will include the reconstruction of drainage channels from the OP 'Krupnik' in 2 sections, the main irrigation pipeline - 'Left, Pirin Station' - 5 sections, diversion of the main irrigation channel 'Left Pirin Station' - 5 sections. Reconstruction of the pipelines shall be within the range of the track, where it is necessary to replace the parts of the pipeline that remain under the road body. It will include the main irrigation pipeline - made of PVC pipes, of diameter 250 - 2 crossing units; internal irrigation pipeline - of diameter Ø160, made of steel, internal irrigation al pipeline of diameter Ø120 PE and of diameter Ø140 PE.
- Existing Monitoring and Analysis Centers, with the 'West Aegean Basin Directorate' Blagoevgrad
  - ✓ UCAP - Underground chemical analysis point, underground chemical analysis falls within the scope of WPP Krupnik at km 378 + 380;
  - ✓ PMSW- Point of monitoring surface waters and PCBs - Point of Hydro-biological monitoring point of the Rezena river falls within the range of the road bed at km 378 + 535;

The West Aegean Basin Directorate has been notified and the reconstruction has been coordinated with the experts.

All reconstructions shall be carried out within the boundaries of the Detailed Urban Development Plans of the land properties and shall beagreed upon with the owners.

EASTERN OPTION G 10.50, Phase Feasibility Study,

2016In the beginning of 2016, the Road Infrastructure Agency assigned the development of the design (in the phase of Feasibility Study) of the new option for separation of traffic in Lot 3.2 of the "Struma" Highway. The new project option - Eastern Option G 10.50 divides the traffic in two roadways, whereas the right one (two lanes with one-way traffic from Sofia to Kulata) shall be provided with rehabilitation and strengthening of the existing E79 road with implementation of measures for biodiversity conservation and eastern bypass of the town of Kresna on a new terrain, and for the left roadway (two lanes with one-way traffic from Kulata to Sofia) a new design solution of the route has been projected on a new terrain - distanced to the east of the Kresna Gorge.

The design solution of 2016 proposes to implement two separate individual roadways, with the possibility of simultaneous execution in shorter terms. The separation of the roadways allows the traffic to be safely and freely secured, the traffic being passed on one road lane, the other road lane being executed and vice versa.

The separated roadways require cross-connections between them when changing direction of traffic and redirecting of traffic during crashes, natural disasters and others.

The developed option for the right road lane allows for maximum use of the existing road E79, whereas before the town of Kresna is designed an Eastern bypass of the town on a new terrain.

The left road lane shall be executed independently on a new terrain east of the Kresna Gorge, through the construction of tunnels and viaducts.

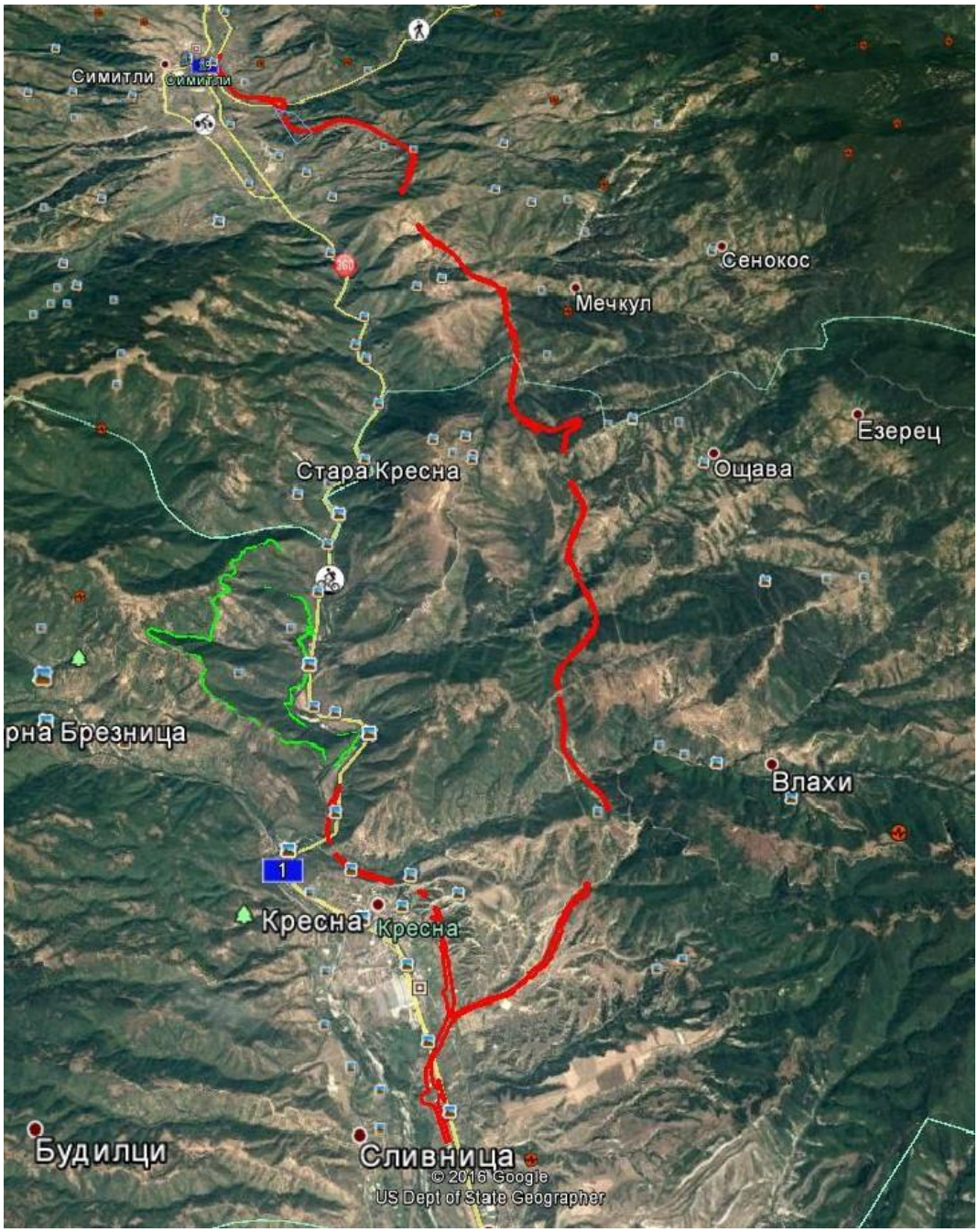


Figure No. 4-4. Situation of eastern Option G 10.50

We have enclosed a situation plan of the project route, **Eastern Option G 10.50**, upon a topographic map in scale M 1:25000 - Appendix No.7. The description of the project corresponds to the attached graphical part.

Road track

The project route should be developed as two independent roadways with overall dimensions 7 / 10.50 for Vp = 80 km / h.

The two roadways are developed independently of one another, one of the roadways taking full advantage of the existing road and the other situated on a new terrain and

requiring tunnels, viaducts, retaining walls and reinforcements.

Technical solution

- Design speed - Vdes=80 km/hour
- Maximum longitudinal inclination - 6 %
- Minimum longitudinal inclination - 0.5%
- Crosswise inclination in line - 2.5%
- Crosswise inclination in curve - according to R
- Minimum radius of horizontal curves - R= 350 м
- Minimum radius of vertical curves
  - ✓ convex vertical curves - R= 5000
  - ✓ concave vertical curves - R= 3000
- Minimum radius of curves without transition - 1,500 m

Outline dimensions 10.50

- Traffic lanes - 2 x 3.50 m;
- Third lane for slow-moving traffic - 1 x 3.00 m;
  - From km 376 + 500 to km 385 + 200
  - From km 392 + 500 to km 399 + 100
- Guiding strips (concrete-asphalt mixture) - 2 x 0.25 m;
- Banked earth strips - 2 x 1.50 m;
- Trenches
- Safety devices
- Slopes/inclinations

With regard to the construction of the tunnels, besides the main pipe has been designed a second one that performs the emergency function.

Longitudinal profile

The right lane follows the existing E79 road and its heights. The left road lane shall be on a new terrain and will follow its peculiarities. The levels of the highway shall meet the following requirements:

- ✓ Observing the main technical parameters, corresponding to V_{design}.
- ✓ Providing smoothness and homogeneity of the highway route;
- ✓ Providing draining of the road bed and the adjacent territories;
- ✓ Ensuring the necessary overall dimensions and clearances, when crossing agricultural and other roads from the Republican road network, railway lines;
- ✓ Ensuring the draining/outflow of maximum water quantities from bridges on rivers and water obstacles;
- ✓ Providing optimum balance of the earth masses in the excavations and embankments;
- ✓ Level positioning at optimum height in the use off the existing road.

Road pavement

Direct route

The design of the road pavement has been dimensioned for a traffic category 'very heavy' and required modulus of elasticity - En = 370 MPa, as it preserves the homogeneity of the pavement in the previous sections of the Struma

Motorway:

- Split mastic (SMA)0/11S with polymer additives - 4 cm;
- Asphalt mix for bottom layer (binder) 0/22 -8 cm;•
  Asphalt mix for main layer Ao - 18 cm
- Crushed stone with selected granulometry (0-63mm) -20 cm;
- Crushed stone (0-63mm) -20 cm;
- Zone A – materials of Group A-1 -50 cm

Roads of the National Road Network

- Asphalt mix for wearing layer, type "A" – 4 cm
- Asphalt mix for bottom layer (binder) 0/22 – 4 cm
- Asphalt mix for main layer Ao – 9 cm
- Crushed stone with selected granulometry (0-63mm) – 47 cm;
- Zone A – materials of Group A-1 - 50 cm

Municipal roads

- Asphalt mix for wearing layer, type "A" – 4 cm
- Asphalt mix for bottom layer (binder) 0/22 – 6 cm
-Crushed stone of selected granulometry (0-63mm) – 35 cm;

Right road lane

The start of the route is at km 373 + 300 (the end of Lot 3.1) and follows the existing road, passes through the town of Simitli and then develops along the existing road through the Kresna gorge, the two lanes being in the direction of the Hellenic Republic. The roadway shall be built by rehabilitation of the currently existing road, not leaving the current boundaries of the E79 road until the town of Kresna, where it exits the existing road and starts along a new route, similar to ***Option G20-red***, bypasses the populated area from the east, reaching Lot 3.3.

The new construction (Eastern bypass of the town of Kresna) starts at km 393 + 600, and after km 394 + 500 the course develops eastwards to km 396 + 000, passing through 4 tunnels that pass the road under the rock pyramids in the eastern periphery of the town of Kresna. Then the road continues in the south direction, and with a wide arc enters just before the viaduct, before the road junction 'Kresna' at km 400 + 371.81. The new construction of a town bypass will include the construction of viaducts, tunnels, bridges and other facilities. The road track ends at km 400 + 371.81 = km 397 + 000 from Lot 3.3.

The new construction of the bypass of the town of Kresna (after the planned rehabilitation of the right road lane) will include the construction of the following facilities:

Bridges	2 facilities - 691 m;
Viaducts	1 facility - 387 m;
Tunnels	4 facilities -1,266 m';
Supporting walls	245 m'.

Large facilities

- Tunnels

from km	to km	length (m)
394 + 544	394+787	243
395 + 628	396 + 081	453
396 + 162	396 + 412	220
396 + 568	396 + 888	320
TOTAL		***1,266***

The construction of the tunnels will be made in the classical manner by drilling and blasting works and reinforced concrete lining. For shorter tunnels, ventilation and fire extinguishing equipment is not required, but only a lighting installation.

- Bridges

from km	to km	length (m)	type of facility
393 + 959	394 + 512	553	A new bridge on the Struma river
391+350	394 + 938	138	A new bridge on Vlahinska river
TOTAL		***691***	

- Viaducts

from km	to km	Length (m)	Average height (m)
399 + 700	400 + 016	316	10.0
TOTAL		**316**	

- Overpasses, underpasses, interpasses

Kilometre distance	type of facility	Length (m)
395 + 195	Farming underpass-new inclined underpass with L = 8m, right	36
356 + 547	Farming underpass-new inclined underpass with L = 8m, right	36
396 + 935	Farming underpass-new inclined underpass with L = 8m, left and right	36
397 + 342	Farming underpass-new inclined underpass with L = 8m, left and right	24
397 + 849	New inclined underpass with L = 12m, left and right	24
398 + 104	Farming underpass-new inclined underpass with L = 8m, left and right	24
400 + 320	New inclined underpass with L = 23m, left and right	26
TOTAL		**206**

- Supporting and reinforcing walls - average height (3-6.5 m)

from km	to km	length (m)

393 + 870	394 + 020	200
396 + 430	396 + 475	45
TOTAL		*245*

Left road lane

The left road lane of Lot 3.2 of the 'Struma' Motorway is planned on a new terrain, East of the Kresna Gorge.

The left road lane begins at km 373 + 300 (100 m after the intersection with the railway line for Oranovo mine), to the left of the existing road and develops parallel to it up to km 373 + 600, then goes south-east, parallel to the Gradevska River, between the districts of Simitli - Oranovo and Dalga Mahala. At km 375 + 775 the road II-19 'Simitli - Predela - Gotse Delchev' is intersected on two levels, with a road junction, by setting up the road junction to connect the road track to the town of Bansko and vice versa.

After intersection of II-19 it enters the slope, using a tunnel of L = 350 m and after it a viaduct with L = 200 m.

The allowed longitudinal slopes in the road junction, the tunnel and the viaduct are 4%, then the slope is 5%, and a third strip is required for the downhill to Sofia direction, as well as the construction of emergency exits, if necessary.

From km 376 + 500, it takes a south-eastern direction, bypasses the village of Poleto, at km 379 + 880 crosses the road Poleto - Brezhani, and at km 380 + 840, it crosses the flow of the Brezhanska river. In the section from km 381 + 500 to km 385 + 500 there is a zone, a food habitat of vultures and a tunnel with length L = 1.330 m is being constructed. The longitudinal slope is about 4.35%, improving the technical solutions for the tunnel and the viaducts.

In the section from 385 + 500 to km 389 + 800, this Option evolves to the south After the food habitat of the vultures west of the village of Rakitna, developing parallel to the Rakitna - Mechkul road, crossing it at about km 383 + 900 km, passing west of the village of Mechkul, continuing to the south and east of the village of Stara Kresna.

In the section from km 384 + 100 to km 389 + 600, the road track is offset in the east direction, crossing the route of a transit gas pipeline once.

From km 389 + 600 to km 396 + 000, the option develops in the south direction. from km 396 + 000 to km 399 + 300, the option develops in the Southwest direction close to the existing road to Vlahi village. At km 399 + 300, it enters the right road lane (bypass of the town of Kresna).

This route ends at km 400 + 371.81 = km 397 + 000 from Lot 3.3.

In the places where the roadway passes into a tunnel, sites are formed around the portals to build the service infrastructure.

Due to the higher longitudinal slopes at the beginning and end of the track, in order to improve the throughput and to ensure safety, a third lane has been provided for slow-moving vehicles, in the following sections:

- From 376 + 500 to km 385 + 200 - 8.7 km;
- From 392 + 500 to km 399 + 100 - 6.6 km.

The new construction east of the gorge shall include the construction of the following

facilities:

Bridges	1 unit of - 96 m;	Viaducts 18 units. - 5,087 m';
Tunnels	5 units. - 4,200 m ';	Support walls - 943 m'.

Large facilities

- Tunnels

from km	**to km**	**length (m)**
375 + 900	376 + 250	350
380 + 892	382 + 022	1,130*
387 + 820	389 + 010	1,190 *
393 + 230	393 + 440	210
395 + 350	396 + 670	1,320 *
TOTAL		***4,200***

* The project provides for the construction of an emergency tube with the dimensions of the main tube.

The construction of the tunnels will be made in the classical manner by drilling and blasting works and reinforced concrete lining. For shorter tunnels, ventilation and fire extinguishing equipment is not required, but only a lighting installation.

- A Bridge

from km	**to km**	**length (m)**	**type of facility**
373 + 565	373 + 650	96	A bridge on the Gradevska river

- Viaducts

from km	**to km**	**Length (m)**	**average height (m)**
376 + 300	376 + 500	200	21.0
378 + 562	379 + 372	810	87.0
379 + 600	379+700	100	18.0
380 + 300	380 + 670	370	50.0
382 + 112	382 + 192	80	15.0
382 + 466	382 + 536	70	14.0
382+750	383 + 520	770	80.0
384 + 770	384 + 950	180	20.0
385 + 860	386 + 030	170	24.0
386 + 770	387 + 050	280	30.0
387 + 220	387 + 390	170	18.0
390 + 900	391 + 190	290	46.0
391 + 580	391 + 840	260	45.0
392 + 610	392 + 830	220	48.0
393 + 850	393 + 940	90	9.0
394 + 360	395 + 010	650	90.0
398 + 140	398 + 230	90	12.0
399 + 700	399 + 987	287	15.0
TOTAL		**5,087**	

- Overpasses, underpasses, interpasses

Kilometre distance	type of facility	Length (m)
373 + 835	Road underpass	20
375 + 775	Road underpass on road II-19	38
379 + 500	Road overpass	36
384 + 520	Road overpass	36
389 + 060	Road overpass	36
390 + 745	AOP (agricultural overpass)	70
391 + 315	AOP (agricultural overpass)	70
392 + 320	Road underpass	38
398 + 840	Road underpass	15
399 + 055	Road underpass	15
399 + 440	Road underpass	20
TOTAL		**394**

- Supporting and reinforcing walls - average height (3-6.5 m)

from km	to km	length (m)
377 + 925	377 + 975	50
TOTAL		50

- Reinforced embankment walls - average height (5-8 m)

from km	to km	length (m)
376 + 925	377 + 025	100
379 + 575	379 + 622	47
380 + 025	380 + 675	650
380 + 725	380 + 775	50
382 + 532	382 + 578	46
TOTAL		**893**

Small facilities and walkways for animals

For the draining/outflow of water from the gullies, drainage trenches and other low lands are provided for the construction of small facilities - culverts. After the detailed drainage plan for the motorway has been prepared, the exact number and type of facilities for this purpose shall be specified, as required for the draining and outflow of the water quantities from the trenches and gullies to the most adequate places.

The selected livestock facilities have been inspected for the design maximum dimensional quantities of water that are likely to pass with a 1% provisioning in the reduced cross-section without allowing the flooding of dry paths.

For this purpose facilities are provided with the following openings:

- *pipe culverts - of diameter Ø150 - 33;*
- *pipe culverts of diameter Ø 150 - facilities for wild animals - 9 units.*

Note: Tubular drain culverts /troughs/ that serve as a passage for animals will only carry water from the trench of

the motorway - in case of rain, snow, etc. The water that will pass through the gully will

be a small quantity and will not be constantly flowing, whereas in the better part of the year most of the facilities will be 'dry' and will not create any difficulties for the animals, passing through them.

- *Rectangular culverts*

✓ Rectangular drain culverts 200/200 - 3 units.
✓ Rectangular drain culverts, 400/250 - 2 units.
✓ Rectangular drain culverts, 200/200, animal facility - 16 pieces
✓ rectangular drain culvert, 300/250, animal facility - 2 pieces

Note: Rectangular drain culverts that serve as a walkway for animals are modified to provide dry passageways for animals and respectively - the water quantities passing through the facility are designed so that there would be no danger of flooding the dry passageway.

- **Road connections**

The design solution of eastern Option G 10.50 provides for two separate roadways, each providing the traffic in one direction, which determines the need for cross-connections between the two roadways on existing roads and the arrangement of road junctions (or two-way road links) in the **left** lane (Kulata - Sofia):

- Simitli Road junction - km 375 + 775;
- Road junction 'Poleto' - km 379 + 500;
- Mechkull Road Junction - km 384 + 000;
- Stara Kresna road junction - km 388 + 450;
- Kresna Road Junction - km 400 + 371.81.

The project provides for the construction of a road connection in the **right** road lane (The existing road E79) Sofia - Kresna - km 393 + 600.

Rehabilitation of existing roads, 'Preliminary Study of Lot 3.2 of the Struma Motorway - Eastern Option G 10.50, Stage of Feasibility Study, 2016

- **Right road lane: Rehabilitation of the existing E79 road in the Kresna Gorge**

The types of work that will be performed shall include as follows:

✓ Removal of the humus layer, including loading and transportation;
✓ A general, ordinary trench including loading and transportation;
✓ Excavation for trenches and drain culverts;
✓ Excavation for facilities in earth and rocky soils;
✓ Excavation for bringing down rocky soils;
✓ Excavation for the cleaning of grooves, drains, culverts and walls;
✓ Making of embankments in rock soils;
✓ Cleaning and profiling of banked earth strips;
✓ Removing an existing safety net for falling stones, loading and transport of a landfill;

- ✓ bringing down, loading and transportation of dangerously overhanging rocks and All related costs and expenses;
- ✓ Bringing down and removing rock fragments and debris under the Alpine method, including all related costs;
- ✓ Strengthening of rocky slopes with high-strength nets, anchoring blocks, horizontal and vertical steel ropes and all associated costs;
- ✓ Destruction of existing asphalt pavement, including Digging, loading, transport to landfill and unloading;
- ✓ Grindings / technological and preliminary repairs / of existing asphalt pavement, including loading, transportation, landfill unloading;
- ✓ Crushing of concrete curbs and concrete strips and transportation to depot/landfill;
- ✓ Dismantling a single steel safety fence and transporting to depot/landfill;
- ✓ Delivery and application of a binder for profiling and levelling of layers of different thickness and width;
- ✓ Supply and application of binder for patches of different thickness and width;
- ✓ Supply and laying of dense asphalt for wear layer;
- ✓ Supply and laying of dense asphalt for emergency bands, collaring and sites;
- ✓ Making a first bitumen spill;
- ✓ Making a second bitumen spill;
- ✓ Supply and laying of asphalt for the bottom layer;
- ✓ Supply and laying of base material with different width and thickness of the layer;
- ✓ Delivery and laying of banked earth base material with different width and thickness of the layer;
- ✓ Delivery and laying of concrete curbs of 8/16 size, including all related costs;
- ✓ Supply and installation of steel road restricting systems (SRRS), including all related costs;
- ✓ Supply and application of horizontal marking, including all related costs;
- ✓ Supply and installation of standard reflective road signs, including All related costs and expenses;
- ✓ Supply and installation of non-standard reflective road signs, including All related costs and expenses;
- ✓ Supply and installation of Italian grooves for drainage of road embankments, including all related costs;
- ✓ Making lined drainage trenches;
- ✓ Delivery and construction of transverse drain culverts;
- ✓ Making concrete rigs and all associated costs;
- ✓ Construction of new pipe culverts;

- ✓ Construction of new top structure of large bridge Facilities above the Struma river;
- ✓ Formwork on small and large facilities;
- ✓ Reinforcing works on large facilities;
- ✓ Concrete works in small and large facilities;
- ✓ Making waterproofing - asphalt primer + warm bitumen screed on the road slab, transitional slabs, pavement blocks, dilatation joints, incl. All related costs;
- ✓ Making clearance joints in bridge facilities;
- ✓ Delivery and installation of PVC pipes, diameter 50 mm and diameter 110 mm and all related costs;
- ✓ Delivery and installation of a combined railing;
- ✓ Reconstruction of TT cables and all related costs;
- ✓ Displacement, supply and installation of 20 kV power lines;
- ✓ Lifting of existing rainwater shafts.

- **Left road lane; Rehabilitation of municipal roads**

The following municipal roads will be rehabilitated, which also represent cross-connections between the two roadways:

- ✓ Road E79 – Poleto village – Brezhani village
- ✓ Road Mechkul village – Brezhany village
- ✓ Road E79 – Stara Kresna village – Oshtava village
- ✓ Road town of Kresna – Vlahi village.

The description of the design Option and the degree of detail of the data in this environmental impact assessment is consistent with the level of the study and its design stage.

The eastern Option G 10.50 passes through the municipalities of Simitli and Kresna - Blagoevgrad district.

Reconstruction of facilities of other authorities
EASTERN OPTION G 10.50 - LEFT ROADWAY
RECONSTRUCTION OF ELECTRICAL EQUIPMENT 0.4 kV and 20 Kv
Electrical equipment 0,4 kV: At km 379 + 000 and km 398 + 060

20 kV electrical equipment: Km 379 + 510; Km 382 + 000; Km 382 + 160; Km 382 + 410; Km 384 + 165; Km 388 + 405; Km 398 + 157; Km 398 + 847; Km 398 + 861; Km 399 + 480; Km 399 + 850; Km 399 + 870; Km 400 + 085.

Reconstruction of electrical equipment 110 kV and 400 kV
Verification of the vertical overall dimensions at the intersection of existing 400 kV and

110 kV overhead lines as follows:
Water Power Plant 400 kV "Pirin ": Km 378 + 430; Km 379 + 950; Km 380 + 000; Km 380 + 050; Km 382 + 500; Km 396 + 760.
Water Power Plant 110 kV "Granit": Km 398 + 860

Construction of power lines 20 kV and CTP 20 / 0.4 kV at road junctions and recreation grounds

- Road junction „Poleto“ - at km 379+490
- 'Mechkul' road junction at km 384 + 260
- 'Stara Kresna' junction at km 387 + 690
- Road connection 'Stara Kresna' at km 388 + 435
- Recreation area, town of Kresna, left road lane at 399 + 470

Lighting in the section of road junctions and recreation areas

The construction of street lighting is provided in the following places:

- Road junction „Poleto“ at km 379+500
- 'Mechkul' road junction at km 384 + 265
- 'Stara Kresna' junction at km 387 + 690
- Recreation area, left road lane at km 399 + 500

Reconstruction of communication facilities

- Reconstruction of optical cable at km 380 + 680
- Reconstruction of optical cable at km 384 + 270
- Reconstruction of optical cable at km 388 + 450
- Reconstruction of copper cable at km 399 + 115
- Reconstruction of copper cable from km 399 + 840 to 400 + 608
- Reconstruction of optical cable from km 400 + 110 to km 400 + 538

Water supply pipelines

- Reconstruction of the existing water pipeline Ø110, made of PE from Brezhany to 'Poleto' - km 379 + 500
- Reconstruction of the existing water supply pipeline, of diameter Ø100 ET for the village of Stara Kresna - 388 + 430
- Reconstruction of an existing water pipeline of diameter Ø150 for Slivnitsa village at km 400 + 870

Irrigation canals

- km 399 + 125 - reconstruction of the main irrigation channel, Left Railway Station 'Pirin'
- km 399 + 220 - reconstruction of the main irrigation channel, Left Railway Station 'Pirin'
- km 399 + 580, reconstruction of the main irrigation channel, deviation 'Left Railway Station Pirin'
- km 399 + 552 - reconstruction of the deviation of the main irrigation channel, Left Railway Station 'Pirin'
- From km 399 + 650 to km 399 + 715 - Deviation of main irrigation channel 'Left, 'Pirin' Rail Station'

PRESSURE IRRIGATION PIPELINES
Existing pressure irrigation pipelines, falling within the scope of the roadway:

- Main irrigation pipeline, PVC Ø250 from km 398 + 476 to km 398 + 544
- Internal irrigation pipeline of diameter Ø160, made of steel, at km 400 + 090
- Main pipeline PVC of diameter Ø280 from km 400 + 260 to 400 + 400

GAS PIPEWORK

- Reconstruction of Transit Gas Pipeline for Greece at km 390 + 170
- Reconstruction of the Transit Gas Pipeline for Greece at the intersection of Km 399 + 240
- Reconstruction of the existing transit gas pipeline for Greece with Diameter DN 700 and $P_{op.}$ = 5.4 MPa at km 400 + 130

BYPASS OF THE TOWN OF KRESNA - RIGHT ROADWAY
RECONSTRUCTION OF ELECTRICAL EQUIPMENT 0.4 kV and 20 kV

- At km 394 + 730 20 kV Overhead power line, 20 kV, 'Pastrec'
- At km 394 + 730 20 kV Overhead power line, 20 kV, 'Breznica'
- At km 395 + 380 Overhead power lines, 20 kV 'Breznica' and 20 KV "Pustrets"
- At km 395 + 520 Overhead power lines 20 kV 'Hans' and 20 KV "Defile"
- At km 396 + 530 Overhead power lines 20 kV 'Hanove' and 20 KV "Defile"
- At km 396 + 580 Overhead power lines 20 kV 'Breznica' and 20 km KV "Pustrets"
- At km 398 + 150 20 kV Overhead power lines, 'Pastrec' deviation for a train station

RECONSTRUCTION OF ELECTRICAL EQUIPMENT 110 kV

- 110 kV Overhead power line, 'Granite' at km - 396 + 725
- 110 kV Overhead power line 'Granite' at km - 396 + 930
- 110 kV Overhead power line 'Granite' at km 397 + 445

NEWLY PROJECTED ELECTRICAL EQUIPMENT 0.4 kV and 20 kV
Power lines 20 kV and CPT 20 / 0.4 kV at road junctions and recreational sites and 20 kV power lines for tunnels.

- At km 393 + 896 - Road connection north of town Kresna, new 20 kV cable line
- At km 395 + 690 Tunnel-1, Kresna, new overhead deviation from Water Power Plant 20 kV "Defile"
- At km 395 + 690 Tunnel-2, Kresna, new overhead deviation from Water Power Plant 20 kV "Defile"
- At km 397 + 590 Recreation area, right roadway, Kresna, New overhead deviation from the 20 kV 'Morava'

• At km 398 + 020 'Kresna' road junction, New overhead Deviation from the 20 kV 'Slivnitsa' Water Power Plant

RECONSTRUCTION OF COMMUNICATION FACILITIES
- Reconstruction of optical cable from km 393 + 850 to km 394 + 070
- Reconstruction of copper cable from km 393 + 850 to km 394 + 070
- Reconstruction of optical cable from km 394 + 200 to km 394 + 258
- Reconstruction of optical cable at km 394 + 550
- Reconstruction of copper cable at km 397 + 761

WATER SUPPLY PIPELINES
Reconstruction and displacement of the existing water and sewerage networks and facilities, crossing the Struma Motorway, Lot 3.2 and water supply and drainage of the recreation areas.
• Water supply to recreation areas in the section from km 397 + 590 to km
L = 823.704m

IRRIGATION CANALS
Reconstruction of the existing open irrigation
Agricultural land infrastructure managed by 'Irrigation Systems' EAD - Branch 'Struma - Mesta', town of Dupnitsa with hydro-technical area 'Sandanski'.
- from km 394 + 900 to km 395 + 035 - main irrigation channel 'Left Railway Station' 'Pirin'
- from km 395 + 433 to km 395 + 533 - main irrigation channel 'Left Railway Station' 'Pirin'
- from km 395 + 640 to km 395 + 736 - main irrigation channel 'Left Railway Station' 'Pirin'
- from km 396 + 050 to km 396 + 180 - main irrigation channel 'Left Railway Station' 'Pirin'
- from km 396 + 785 to km 396 + 920 - incoming pipeline to chief irrigation collector (CIC), of diameter Ø120 cm
- from km 397 + 100 to km 397 + 563 - main irrigation channel 'Left Railway Station' 'Pirin'
- km 397 + 350 - diversion of main irrigation channel 'Left Railway Station' 'Pirin'
- km 397 + 720 - deviation of the main irrigation channel 'Left Railway Station 'Pirin'
- km 397 + 755 - deviation of the main irrigation channel 'Left Railway Station''Pirin'
- km 397 + 920 - deviation of the main irrigation channel 'Left Railway Station''Pirin'
- km 397 + 950 - diversion of the main irrigation channel 'Left Railway Station' 'Pirin'

'LONG TUNNEL OPTION', TUNNEL 'KRESNA',
Phase Conceptual Design, 2015;
The beginning of the project area is km 376 + 000 at road junction Krupnik.
Passing through the Struma river at km 378+126 and the Rezena river at km 378+520. Between the two rivers is situated the existing road junction for Krupnik and Chernice. Before the portal crosses the Struma River, the railway Sofia-Kulata line and an asphalt road. The passage through the Kresna tunnel is from km
379 + 267.015 to km 394 + 605.00 / left tube and from km 379 + 255 to km 394 + 600,

right tube. After the exit of the Kresna tunnel, the highway crosses an existing third-class road and the Struma River with a bridge and immediately afterwards the construction of road junction Kresna.
The option is divided in road and tunnel part, where for each one a separate project is designed.
The road track starts at road junction Krupnik with a motorway (road) section (of overall dimensions G29). The beginning of the section is at km 376 + 000, the end of the section at km 379 + 225 north gate, right road lane of tunnel Kresna, km 379 + 267.015 north portal, left roadway of the Kresna tunnel.

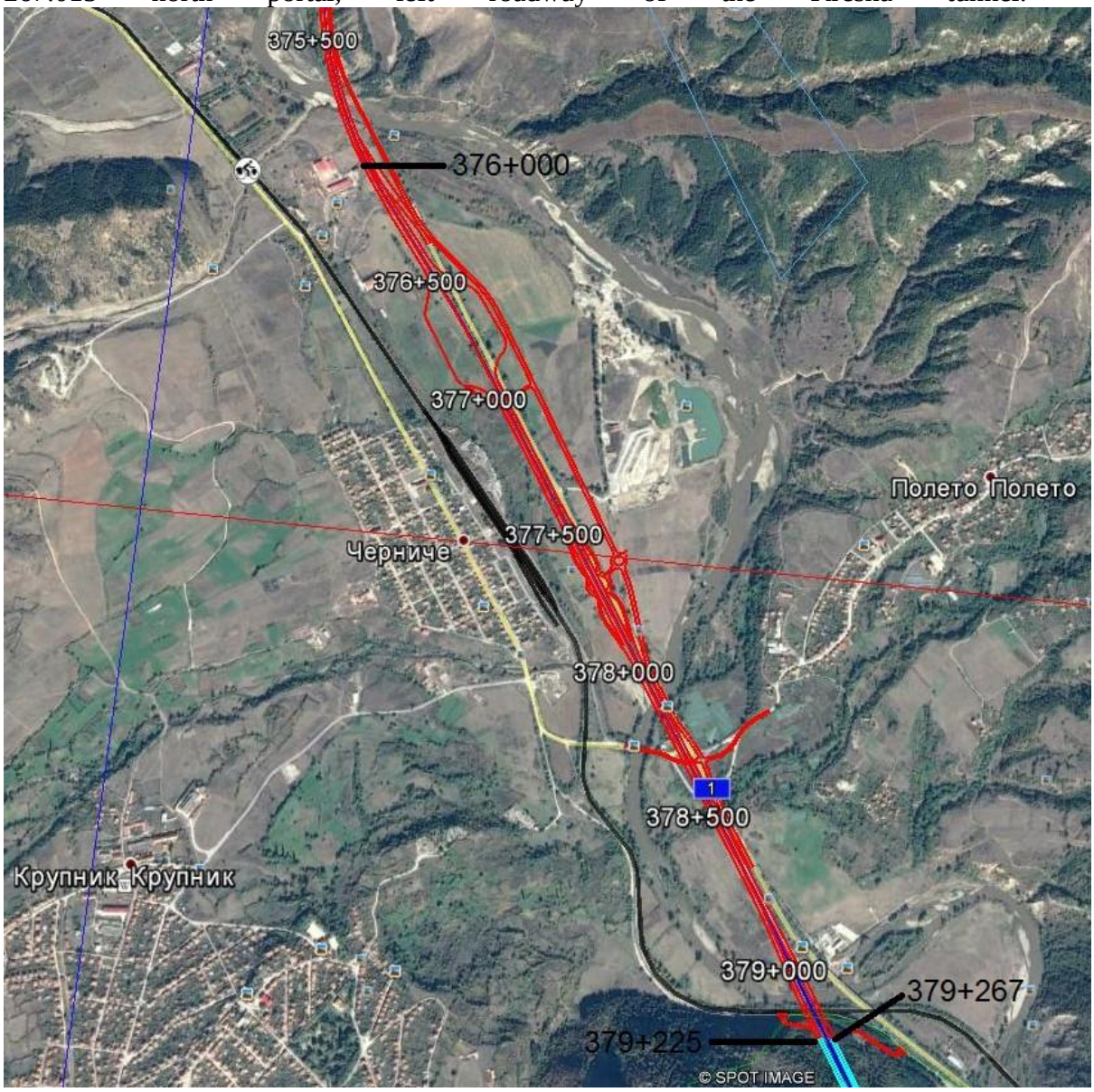


Figure No. 4-5. Situation of the road section, km 376 + 000, end of the section, km
379 + 225 north gate, right road lane of tunnel Kresna, km 379 + 267.015 north Portal, left roadway of the Kresna tunnel

- Support wall from km 376 + 000 to km 376 + 080, L = 80 m;
- Support wall from km 376 + 920 to km 377 + 000, L = 80 m;
- Underpass at km 379 + 000, L = 9 m;
- Bridge over Krupnik road junction, km 377 + 700, L = 100 m;
- Support wall from km 378 + 000 to km 378 + 060, L = 60 m;
- Bridge over the Struma river, km 378 + 195, L = 132 m;
- Support wall from km 378 + 190 to km 378 + 220, L = 30 m;
- underpass on the road Brezhani - Krupnik, km 378 + 340, L = 10 m;
- Bridge over the Rezena, km 378 + 520, L = 72 m;
- Support wall from km 378 + 540 to km 378 + 840, L = 300 m;
- Support wall to road E79, L = 160 m;
- Bridge over the Struma river, railway line Sofia - Kulata, km 379 + 000, left L = 330 m, right L = 297 m;

Small facilities
- Rectangular drain culvert 200/200 at km 376 + 140;
- Rectangular drain culvert 200/200 at km 376 + 330;
- Rectangular drainage 200/200 at km 376 + 710;
- Rectangular drain culvert 200/200 at km 377 + 250;
- Rectangular drain culvert 200/200 at km 377 + 810;

Recreation sites
- **Recreation area 2 units. - km 376 + 420 to km 376 + 920**

After the bridge facility on the Struma river, the highway route passes through a tunnel of 15.4 km. The Kresna tunnel is designed as a double tube tunnel with the possibility of evacuation in the second tube of the tunnel through transverse connections. The tunnel is located in the area of mountain areas and its parameters correspond to a design speed of 120 km / h.

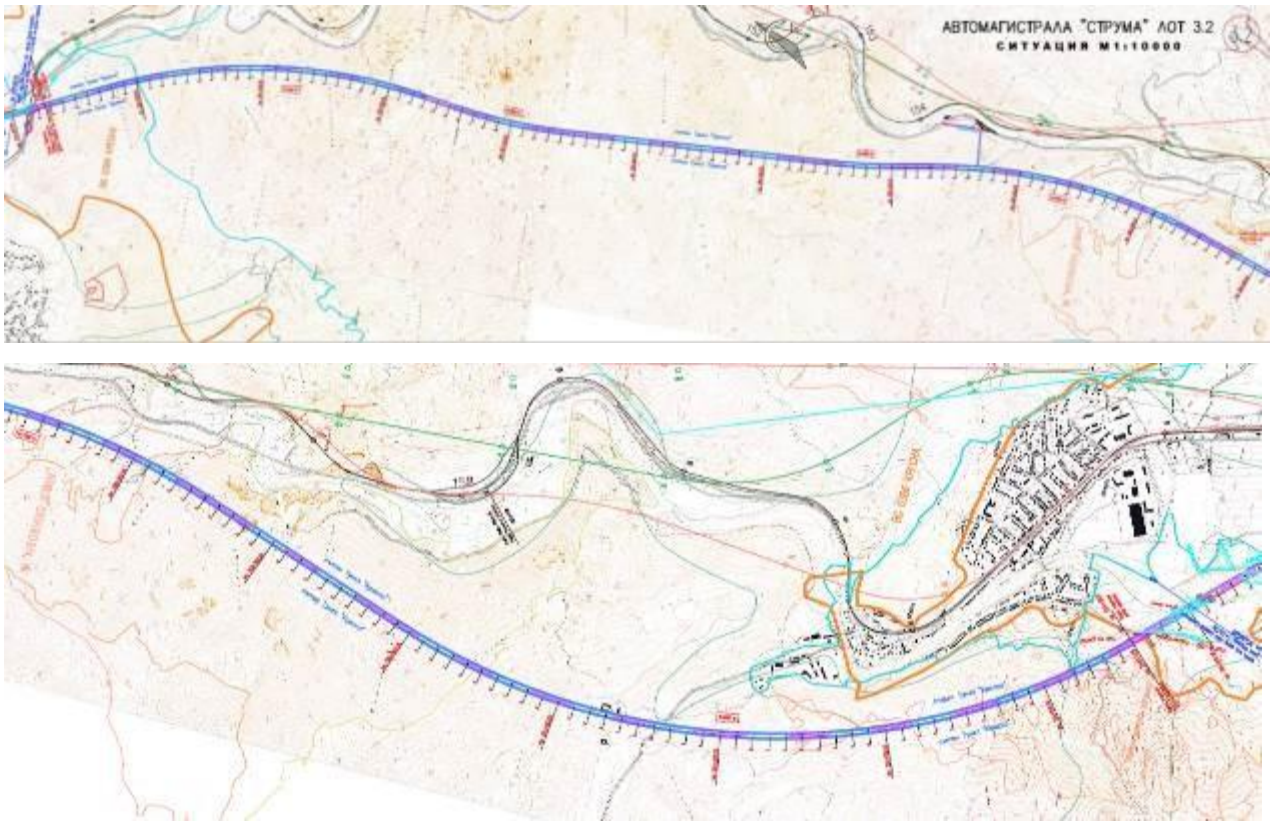


Figure No. 4-6. *Situation with a long tunnel option*

We have enclosed a situation plan of the project route, **a long tunnel option**, upon a topographic map in scale M 1:5000 - Appendix No.9.

The main elements of the tunnel design are the following:

- gates/portals and pre-portal sites;
- permanent access routes to the portals;
- two tunnel tubes;
- intermediate access roads for the digging of tunnel;
- permanent ventilation tunnel;
- the construction sites and the sites for permanent and temporary waste disposal.

The total length of the tunnel and mileage of the portals shall be as follows:

Right tunnel tube (Km distance)		
North portal	End of portal – beginning of tunnel	379 + 205
	Tunnel traffic gateway - the beginning of the traffic tunnel	379 + 227
South portal	Tunnel traffic portal - end of the traffic tunnel	394 + 605
	End of (portal) gantry – End of tunnel	394 + 625
Left tunnel tube (Km distance)		
North portal	End of portal – beginning of tunnel	379 + 243
	Tunnel traffic gateway - starting from the traffic tunnel	379 + 265

South portal	Tunnel traffic portal - end of the traffic tunnel	394 + 600
	End of (portal) gantry – End of tunnel	394 + 620
Total tunnel length [m]		
	Right tunnel tube	15,420.0
	Left tunnel tube	15,377.0
Travel section length [m]		
	Right tunnel tube	15,378.0
	Left tunnel tube	15,335.0
Length of sections under the open-cut method [m]		
North portal	Right tunnel tube	22.0
	Left tunnel tube	22.0
South portal	Right tunnel tube	20.0
	Left tunnel tube	20.0

The project is divided into a Structural and Technological part.

The Structural part of the project contains the following components:

Northern and southern gateways; Access route to the ventilation tunnel at km 386 + 664,986; double-tube tunnel; Transverse connections; Drainage of the tunnel and the pavement of the tunnel; Road pavement and curbs; Ventilation installations with technological centers on the northern and southern gateways; Cable trails at the northern and southern gateways; Fire-fighting installation and water supply system; External power supply; Access road at km 380 + 745,688; Access road at km 392 + 009.286.

The technological part of the project contains the following components: Tunnel electrical installations; Tunnel management and control system; Tunnel ventilation; Tunnel lighting; SOS cabins; Radio broadcasting and radio traffic; Fire alarm; Tunnel security system; Tunnel transformer station; Grounding system.

The Kresna Tunnel will be constructed in its full length by the classical tunnelling method with drill-blasting and reinforced concrete lining. 22 m long sections at the portals, respectively at the north and 20 m long at the southern portal will be executed by the open-cut method.

The Kresna Tunnel will be excavated from the two main tunnel portals (North and South Portals) and **from the intermediate access** (windows) **at km 380 + 745 km 386 + 664 and km 392 + 009** . The excavation of each tunnel tube will be carried out by eight work(ing) faces.

After the Kresna tunnel, the route continues with a motorway (road) section (with overall dimensions G29). The beginning of the road section is at km 394 + 605, the south portal, right roadway of the Kresna tunnel, km 394 + 600, south portal left roadway of the Kresna tunnel.

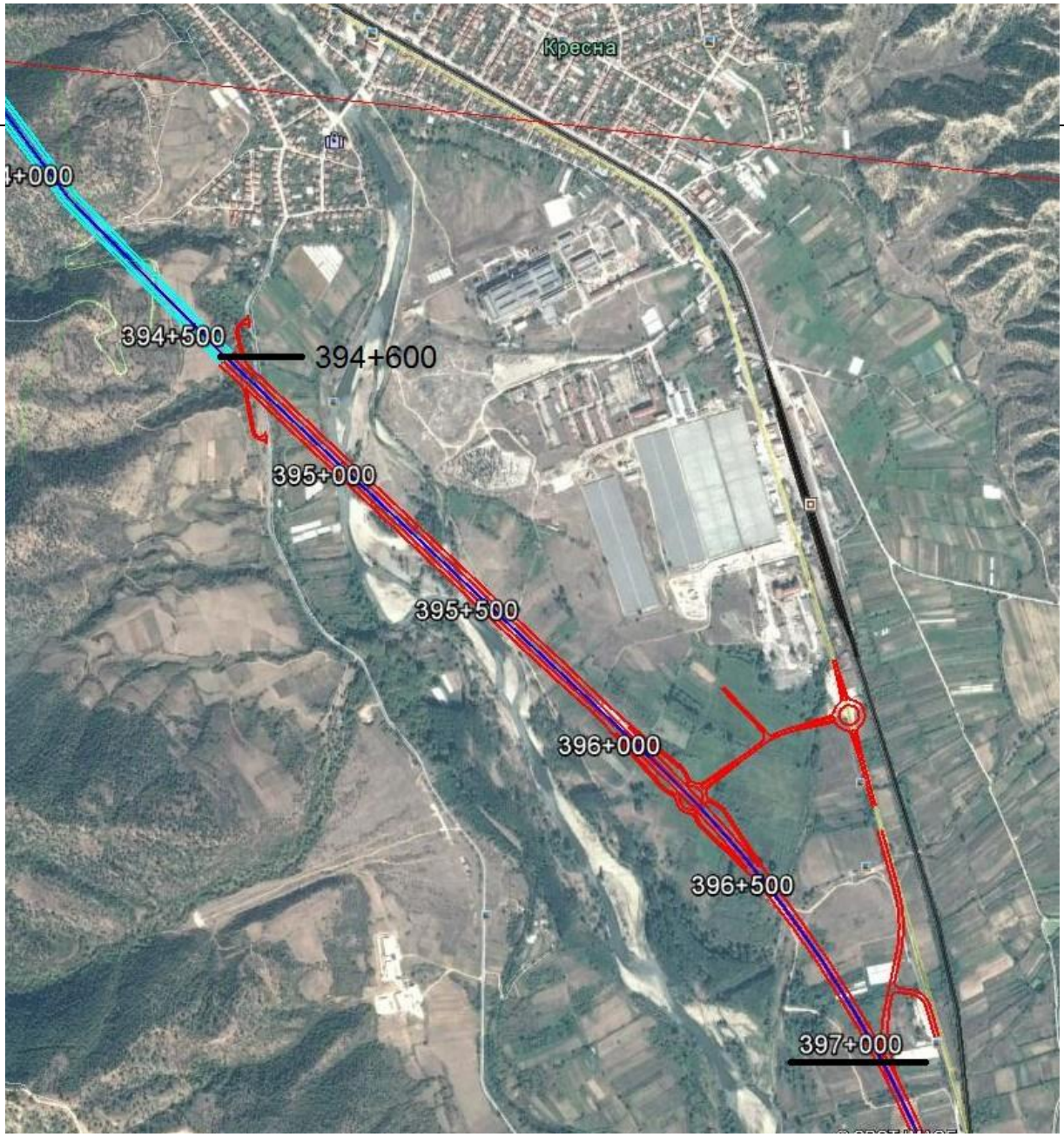


Figure No. 4-7. Situation of the road section, km 394 + 605 south portal, right roadway of Kresna tunnel, km 394 + 600 south portal left roadway of tunnel Kresna, end of route 397 + 000, where it enters Lot 3.3.

Large facilities

- Bridge over a gully, Kresna road - Slivnitsa, km 395 + 030, L = 396 ;
- Agricultural underpass, km 395 + 830, L = 8 m;
- Kresna road junction, km 396 + 232, L = 132 m;
- Bridge over gully, km 395 + 590, L = 78 m;

Small facilities

- Rectangular drain culvert 3x250 / 450 at km 394 + 660;
- Rectangular drain culvert 3x250 / 450 at km 395 + 785;
- Tubular culvert of diameter Ø150, at km 396 + 080;
- Tubular culvert of diameter Ø100, at km 0 + 485, toward road junction Kresna;

- Tubular culvert of diameter Ø100, at km 0 + 120, toward road junction Kresna;
- Tubular culvert of diameter Ø 150, at km 396 + 340;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 400;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 420;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 440;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 460;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 480;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 500;
- Plate culvert L = 1.5 / 1.5 m, km 369 + 520;
- Tubular culvert of diameter Ø 150, at km 396 + 740;
- Rectangular drain culvert 3x250 / 450 at km 396 + 893.

The project route ends at km 397 + 000, where it will be included in Lot 3.3.

Organization of implementation of the long tunnel option
Description of the accepted method of construction

The project provides for the excavation of the Kresna tunnel to be carried out under the New-Austrian Tunnelling Method (NATM), through drilling-blasting works and reinforced concrete lining.

The stages of work in this method shall be as follows: Excavation by drilling-blasting or tunnel excavator, removal of excavated masses; reinforcement of the vaults with anchors and steel frames; making a primary tunnel lining of sprayed concrete; waterproofing; making a secondary tunnel lining from reinforced concrete; draining and other finishing works.

Between the two tunnel tubes, escape passageways shall be made for people in the tunnel and for immediate access of the emergency teams in an emergency. After the construction of the reinforced concrete structure of the tunnel and the tunnel portals, the construction of the tunnel installations will start as follows: electrical;

Ventilation; Lighting installation; Fire extinguishing; Control and video-surveillance systems, warning lights and signalling to control the traffic, fire alarm, radio announcement and others.

After making the shafts and conduits, the bottom of the tunnel shall be filled with crushed stone and the traffic roadways will be built.

Intermediate access at km 380+745:

The construction of an access passage stems from the need to accelerate the construction of the Kresna Tunnel. Intermediate access will be used to transport the excavated material outside the tunnel and to deliver materials to the tunnel. Upon completion, the access will be closed and will not be used any further.

For intermediate access, power supply and water supply must be provided for technological purposes. The project provides to use as source of power supply to the portal the existing power line, located closely, at a distance of approximately 200 meters. A source of process water shall be the Struma River through an approximately 30 m long pipeline.

During the construction, there will be restrictions on the traffic rules on the existing E-79 road due to the movement of construction equipment.

The pre-access site of the intermediate access will be located on a section of the old E-79 roadway, which is not currently used for traffic and
serves as a bypass for the existing road tunnel.

Intermediate access at km 386+664 with ventilated tunnel:

The construction of an access passage stems from the need to accelerate the construction of the Kresna Tunnel. Intermediate access will be used to transport the excavated material outside the tunnel and to deliver materials to the tunnel. Upon completion of construction works, the access will be used as a continuous horizontal ventilation tunnel.

For intermediate access, power supply must be provided, as well as water supply for technological purposes. The project provides for the power supply to the portal to be the existing power line, which is located on the other side of the Struma river, at a distance of approximately 125 m. The project provides that the source of process water will be the Struma river, through a pipeline with a length of approximately 124 m.

The construction works will impose restrictions on the traffic of the existing E-79 road, due to the traffic of construction equipment.

The Intermediate Access Portal shall be the existing Exit for the recreation site on the E-79 road.

Intermediate access at km 392+009:

The construction of an access passage stems from the need to accelerate the construction of the Kresna Tunnel. Intermediate access will be used to transport the excavated material outside the tunnel and to deliver materials to the tunnel. Upon completion, the access will be closed and will not be used any further.

For intermediate access, power supply must be provided, as well as water supply for technological purposes. The project provides that the power supply to the portal will be the existing power line at a distance of approximately 125 m. The project also provides to use as a source of process water the Dryanovska river, through a pipeline of length, approximately 124 m.

During the construction, there will be restrictions on the traffic rules on the existing E-79 road due to the movement of construction equipment.

Long tunnel operation

The operation of the Kresna tunnel, including its operational parts (ventilation, lighting, etc.), is planned to be managed by a control center, located near the village of Cherniche (north of the Kresna Gorge). Using the IT system, the central control system shall be connected with the technological centers, located on the northern and southern portal of the Kresna tunnel, from which it will also be possible to control the tunnel's work.

Compliance with the EIA decision of 2008:

The route under the conceptual design for Lot 3.2 of the Struma Motorway in the Long Tunnel Option and the route, described in the EIA Decision No. 1-1 / 2008 differs in certain sections. Some of the changes in the route result from the implementation of conditions and measures in the EIA decision, another part is the result of additional studies during the design phase.

The conceptual design of the motorway route has been optimized, in order to
comply with the standards for the design of roads and tunnels, taking into account the

following requirements and criteria:

- not to interfere with existing buildings;
- not to affect the Kresna and Moravska protected areas;
- not to affect the existing mining concessions;
- field conditions to allow for the development of road junctions;
- to ensure the smooth transition from the optimized sections to those that will not be changing, both in the situational plan and in the elevation respect.

The changes in the optimized section of Lot 3.2 of the Struma Motorway shall be the following:

- From km 380 + 000 to km 388 + 300 - the changes have been made as a result of further study and design. Significant change from km 382 + 150 to km 385 + 500, compared to the route as a distance, as approved in Decision No 1-1 / 2008 of EIA. The change has been made in a section of the 'Kresna' tunnel (underground), in order to provide a larger terrestrial coverage of the tunnel.
- At the exit of the long tunnel, the route takes a direction to the west in order to avoid affecting the existing houses at km 394 + 500. Follows the road section from the EIA Decision;
- Efforts are made to avoid as much as possible the impact on the 'Kresna' Protected Zone, from km 396 + 600 to km 397 + 400, whereas the changes that have been made are consistent with the requirements, set out in the EIA Decision. The changes that have been made are consistent with condition No.I.3.1. of Decision No. 1- 1/2008 of EIA
- a Deviation/detour from km 380 + 000 to km 388 + 300, suggesting a tunnel of 15.4 km length, with an altered position of the northern and southern portals, located from km 379 + 255 to km 394 + 600. Significant distance change (more than 180 - 200 m) with respect to the route, approved in Decision No.1-1/2008 of EIA, in the section of 3,350 m (underground) in the scope of the 'Kresna' tunnel, in connection with the provision of larger terrestrial coverage of the tunnel.

Subsites, such as road junctions, resting/recreation sites, landfill sites of excess earth material, temporary storage sites for earth masses and construction waste, service roads for construction equipment, construction sites at the entrance and exit of the tunnel, construction sites for intermediate access during the construction of the 'Kresna' tunnel, including the construction technology itself, were not the subject of the EIA procedure in 2007.

The description of the design Option and the degree of detail of the data in this environmental impact assessment is consistent with the level of the study and its design stage.

The long tunnel option was extended to just before the town of Simitli, so that it would have a common start with the other design options, proposed by the Contracting Authority at km 373 + 300 to evaluate all design options equally in the EIA (The traffic after Lot 3.1 runs along the existing E79 road from km 373 + 300 to km 376 + 000).

The long tunnel option passes through the municipalities of Simitli and Kresna -

Blagoevgrad district.

RECONSTRUCTION OF EQUIPMENT OF OTHER AUTHORITIES

Reconstruction of 110 kV Power lines

- From km 378 + 840 to km 379 + 100 Water Power Plant, 110kV 'Granite'
- From km 379 + 900 to km 380 + 900 Water Power Plant 110kV 'Granite";

Reconstruction of Electrical power lines up to 110 kV

- Km 376 + 040 Water Power Plant, 20 kV, 'Tunela";
- From km 376 + 000 to km 376 + 200, 'Oranovo' Mine, two 20kV cables of the CPC;
- Km 376 + 308 Water Power Plant 20 kV, 'Tunnela';
- Km 378 + 000 Water Power Plant, 1 kV;
- From 378 + 200 to km 378 + 230 Water Power Plant, 1 kV;
- Km 378 + 460 Water Power Plant, 20kV, 'Defile';
- Km 378 + 520 Cable deviation from the Water Power Plant 20kV, 'Defile';
- Km 378 + 323 Water Power Plant, 20kV Shaft;
- From km 395 + 480 to km 395 + 720 Water Power Substation 20kV 'Chugun' and Water Power Substation 20kV 'Perun'; Water Power Substation 20kV 'Lear' and 'Morava';
- From km 396+508 to km 396 + 514 Water Power Substation 20kV 'Chugun' and Water Power Substation 20kV 'Perun'; Water Power Substation 20kV 'Lear' and 'Morava';
- Km 395 + 724 Hydro Power Substation 20kV 'Slivnitsa', 'Goreme'.

Power Cables and Lighting Lines

- From km 397 + 400 to km 397 + 700 underground cables of the National Railway Company (NRC).

Existing water supply lines and sewerage collectors, falling within the scope of the roadway

- km 378 + 207 - potable-water pipeline.

Irrigation pipelines and drainage channels

- From km 375 + 775 to km 377 + 311 - existing drainage channel;
- From km 394 + 670 to km 394 + 773 - existing irrigation channel;
- From km 395 + 635 to km 395 + 785 - existing irrigation pipeline;
- km 397 + 332 - Existing internal irrigation pipeline, made of PVC pipes of diameter Ø160;
- Km 395 + 000 - correction of berms, protective dikes and gabions -parts of the correction of the Struma river - sites for protection against the harmful effects of water;
- Km 395 + 465 - correction of berms, protective dikes and gabions - parts of the correction of the Struma river - sites for protection against the harmful impact of water.

Crossings and convergence of the 'Struma' highway with the Gas-supply and gas transmission facilities of gas transmission companies

- Km 378 + 006 - underground gas pipeline;
- Km 378 + 712 - optical cable in the channel network;
- Km 378 + 435 - underground gas pipeline (execution pending);
- Km 379 + 000 - underground gas pipeline;
- Km 379 + 070 - optical cable in the channel network;

- Km 395 + 790 - gas pipeline;
- Km 396 + 770 - gas pipeline.

Reconstruction of communication cables

- From km 372 + 200 to km 378 + 280, copper and fibre optic cables;
- Km 378 + 690 - copper cable;
- Km 378 + 690 - optical cable;
- Km 378 + 800 - optical cable;
- Km 379 + 160 - Copper and Optical Cables;
- Km 390 + 460 - optical cable;
- From km 372 + 200 to km 378 + 280, copper and fibre optic cables;
- Km 391 + 620 - optical cable;
- From km 394 + 700 to km 394 + 780 - copper and optical cables;
- From km 397 + 500 to 397 + 600 - copper cables;

EASTERN OPTION G20, OUT OF THE KRESNA GORGE, phase

Phase of Pre-investment study, 2016.

In connection with the consultations held in 2016, under the updated EIA Scope and Content Mandate, the RIA instructed the designer of the eastern Option G10.50 to submit a technical solution for the project route developed so that the two roadways (four roadways) On a new terrain outside the Kresna Gorge for V = 80 km / h.

The description of the Design Option and the rate of detail in the information of the present Environmental Impact Assessment (EIA) corresponds to the level of the study and its design.

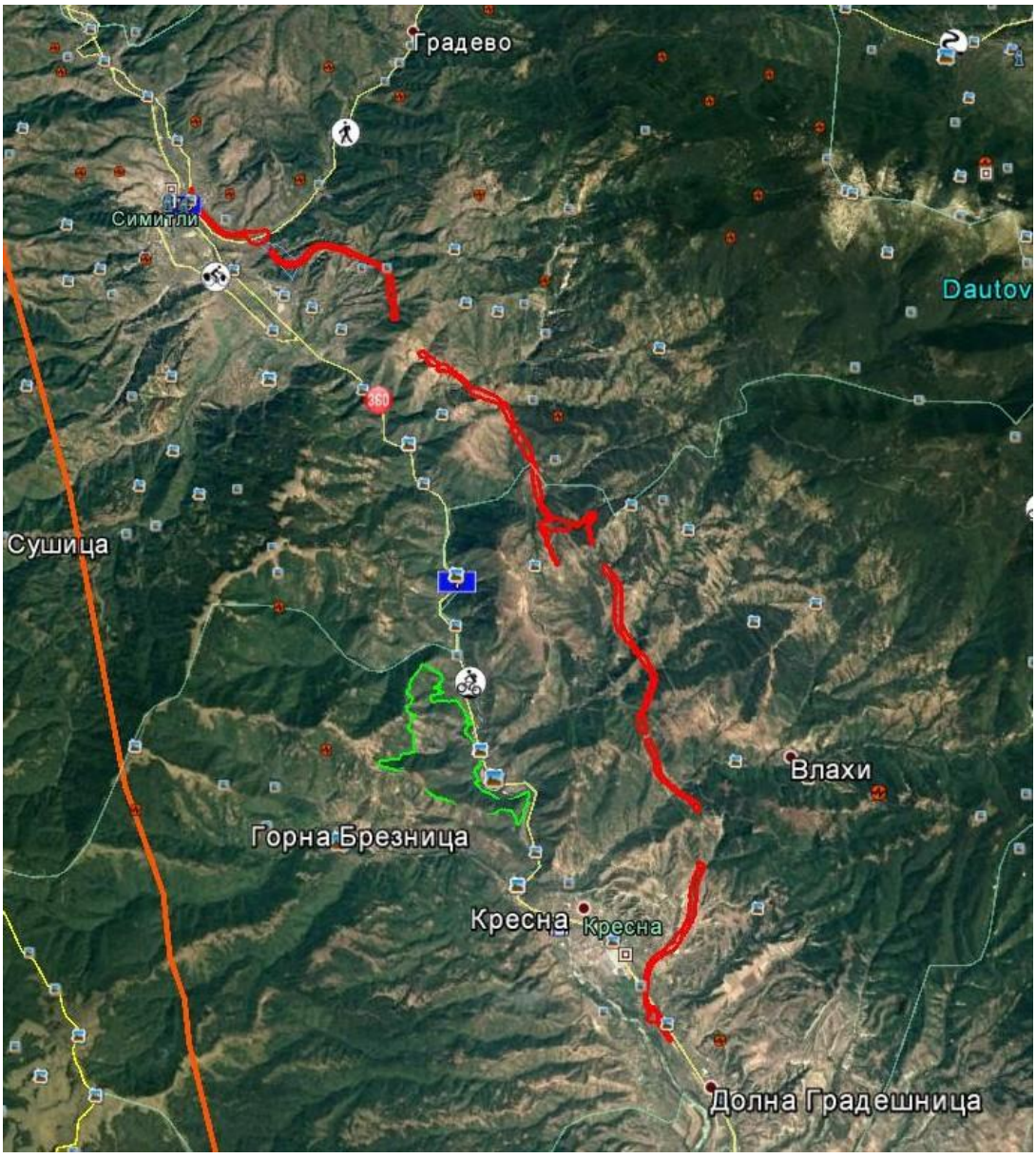


Figure No. 4-8. Situation plan of the eastern option G20

We have enclosed a situation plan of the project route, **Eastern Option G 20**, upon a topographic map in scale M 1:25000 - Appendix No.8. The description of the project corresponds to the attached graphical part.

The project route starts at km 373 + 300. This Option will include a new track on a new terrain with overall dimensions G 20 with two roadways, two lane each, providing the two directions of traffic (from Sofia to the Hellenic Republic and from the Hellenic Republic to Sofia), in the eastern direction around the villages of Brezhani, Stara Kresna and Oshtava for $V_{des.}$ = 80 km / h.
Overall dimensions G 20

- Traffic lanes - 2 x 2 x 3.50 m;
- A third, slow-traffic lane:
  - *From 376 + 500 up to km 385 + 200* - *2 x 3.00 m;*
  - *From 392 + 500 up to km 399 + 100* - *2 x 3.00 m;*
  - Guiding strips (made from asphalt concrete) - 2 x 0.25 m;

- Banked earth strips - 2 x 1.50 m;
- Middle dividing strip - 1 x 2.00 m;
- Trenches;
- Safety facilities;
- Slopes/inclinations.

The two road lane shall be on a new terrain and will follow its peculiarities.

The levels of the highway shall meet the following requirements:
- Observing the main technical parameters, corresponding to $V_{des.}$
- Providing smoothness and homogeneity of the highway route;
- Providing draining of the road bed and the adjacent territories;
- Ensuring the necessary overall dimensions and clearance altitudes at the intersection with agricultural and other roads from the Republican road network, railway lines;
- Ensuring the draining/outflow of maximum water quantities from bridges on rivers and water obstacles;
- Providing optimum balance of the earth masses in the excavations and embankments;
- Position of the level at the optimum height

The road track begins at km 373 + 300 (100 m after crossing the railway line for Oranovo mine), to the left of the existing road to develop parallel to it up to km 373 + 600, then goes south-east, parallel to the Gradevska river, between the districts of the town of Simitli - Oranovo and 'Dalga' neighbourhood. At km 375 + 775 the road II-19 'Simitli - Predela - Gotse Delchev' is intersected on two levels, with a road junction, connecting the Motorway with the town of Bansko and vice versa. After the intersection of II-19 it enters into the slope, using a tunnel of L = 350 m and after it a viaduct of L = 200 m.

The allowed longitudinal slopes in the road junction, the tunnel and the viaduct are 4%, then the slope is 5%, and a third strip is required for the downhill to Sofia direction, as well as the construction of emergency exits, if necessary.

From km 378 + 000, the option takes a southeast direction, bypasses the village of Poleto, at km 379 + 500 crosses the road Poleto - Brezhani, at km 380 + 470 and the Rezena river

Then follows a tunnel with a length of 1,130 m, whose road track has been optimized and has a longitudinal slope of 4.35%, improving the technical solutions for the tunnel and the viaducts around it.

In the section from 385 + 500 to km 389 + 800, this Option shall develop to the south, west of the village of Rakitna, parallel to the Rakitna - Mechkul road, intersecting at approximately km 383 + 900, passing west of the village of Mechkul, continuing South and East of the village of Stara Kresna at km 387 + 670, crossing the road from Stara Kresna to Oshtava, passing it by a tunnel

underneath.
From km 390 + 000 to km 396 + 000, this option continues to develop in
the southern direction. From km 396 + 000 to km 399 + 800, the route goes Southwest, near the existing road to the village of Vlahi. At km 399 + 800 it will be included in the Red Option from 2015. Kresna). The route ends at km 400 + 371.81 = km 397 + 000 of Lot 3.3.
In the places, where the roadway passes into a tunnel, a separate pipe shall be provided for each roadway, which in turn will impose their separation from one another in order to provide the necessary distance between the pipes. In front of the portals, sites are designed for the construction of service infrastructure.
Due to the higher longitudinal slopes at the beginning and end of the track, in order to improve the throughput and to ensure safety, a third lane has been provided for slow-moving vehicles in both directions, in the following sections:
- From 376 + 500 to km 385 + 200
- From 392 + 500 to km 399 + 100

LARGE FACILITIES

- Tunnels

from km	**to km**	**length (m)**
375 + 900	376 + 250	350
380 + 892	382 + 022	1130
387 + 820	389 + 010	1190
393 + 230	393 + 440	210
395 + 350	396 + 670	1320
TOTAL		***4,200***

The construction of the tunnels will be made in the classical manner by drilling and blasting works and reinforced concrete lining. For shorter tunnels, ventilation and fire extinguishing equipment is not required, but only a lighting installation.

- A Bridge

from km	**to km**	**length (m)**	**type of facility**
373 + 565	373 + 650	96	A bridge on the Gradevska river

- Viaducts

from km	**to km**	**Length (m)**	**average height (m)**
376 + 300	376 + 500	200	21.0
378 + 562	379 + 372	810	87.0
379 + 600	379+700	100	18.0
380 + 300	380 + 670	370	50.0
382 + 112	382 + 192	80	15.0

382 + 466	382 + 536	70	14.0
382+750	383 + 520	770	80.0
384 + 770	384 + 950	180	20.0
385 + 860	386 + 030	170	24.0
386 + 770	387 + 050	280	30.0
387 + 220	387 + 390	170	18.0
390 + 900	391 + 190	290	46.0
391 + 580	391 + 840	260	45.0
392 + 610	392 + 830	220	48.0
393 + 850	393 + 940	90	9.0
394 + 360	395 + 010	650	90.0
398 + 140	398 + 230	90	12.0
399 + 700	399 + 987	287	15.0
		TOTAL 5,087	

- Overpasses, underpasses, interpasses

Kilometre distance	**type of facility**	**Length (m)**
373 + 835	Road underpass	20
375 + 775	Road underpass on road II-19	38
379 + 500	Road overpass	36
384 + 520	Road overpass	36
389 + 060	Road overpass	36
390 + 745	AOP (agricultural overpass)	70
391 + 315	AOP (agricultural overpass)	70
392 + 320	Road underpass	38
398 + 840	Road underpass	15
399 + 055	Road underpass	15
399 + 440	Road underpass	20
TOTAL		**394**

- Supporting and reinforcing walls - average height (3-6.5 m)

from km	**to km**	**length (m)**
377 + 925	377 + 975	50
TOTAL		50

- Reinforced embankment walls - average height (5-8 m)

from km	**to km**	**length (m)**
376 + 925	377 + 025	100
379 + 575	379 + 622	47
380 + 025	380 + 675	650
380 + 725	380 + 775	50
382 + 532	382 + 578	46

TOTAL	**893**

SMALL FACILITIES AND WILD ANIMAL PASSAGEWAYS

For the draining/outflow of water from the gullies, drainage trenches and other low lands are provided for the construction of small facilities - culverts. After the detailed drainage plan for the motorway has been prepared, the exact number and type of facilities for this purpose shall be specified, as required for the draining and outflow of the water quantities from the trenches and gullies to the most adequate places.

Selected wild animal facilities have been inspected for the design maximum water quantities that may flow through

provisioning of 1% over the reduced cross-section without allowing the flooding of dry paths.

For this purpose facilities are provided with the following openings:

- pipe culverts - of diameter Ø 150 - 33 units.
- pipe culverts - of diameter Ø 150 - wild animal facilities - 9 units.

Note: The pipe culverts /troughs/ that would serve the purpose of wild animal passageway, will only carry the water from the trench of the highway formed by rain, snow, and so on. The water that will pass through the gully will be in small quantities and will not be constantly flowing, so that most of the facilities will be 'dry' for the majority of the year and will not create any difficulties for the animals, passing through them.

- *Rectangular culverts*

✓ Rectangular drain culverts 200/200 - 3 units.
✓ Rectangular drain 400/250 - 2 units.
✓ Rectangular drain culverts 200/200, animal facility - 16 units.
✓ Rectangular drain culverts 300/250, animal facility - 2 units**.**

Note: Rectangular drain culverts that would serve as a passageway for wild animals shall be modified to provide dry passageways for wild animals and respectively - the water quantities passing through the facility shall be designed so that there would be no danger of flooding the dry passageway.

ROAD JUNCTIONS

The present design solution provides for two separate roadways, each providing for traffic in one direction.

This would require cross-connections between the two roadways on the existing roads and the arrangement of road junctions (or road links on two

levels) in the left lane

✓ Road connection on the Mechkul - Brezhani road
✓ Road connection on the Mechkul - Rakitna road
✓ Road connection on the road 'Stara Kresna - Oshtava'
✓ Road connection on the Kresna - Vlahi village

ENGINEERING NETWORKS

The route implementation of the Struma Motorway in Lot 3.2 under this Option will affect the following engineering networks:

- Gas pipelines:

- Power lines
  - High Voltage (HV) 20 kV;
  - High Voltage (HV) 110 kV;
- water supply pipelines;
- Cables;
- irrigation canals.

REHABILITATION OF MUNICIPAL ROADS
The following municipal roads will need to be rehabilitated, they also represent a cross-connection between the Struma Motorway and the road
The Kresna Gorge:

- Road E 79 - Poleto - Brezhany;
- The Mechkul - Brezhany Road;
- The Road E79, from Stara Kresna to Oshtava;
- The Kresna - Vlahi Road.

The route of the Eastern Option G20 ends at km 400 + 400+371.81≡ km 397 + 000 from Lot 3.3.

The eastern Option G 20 will pass through the municipalities of Simitli and Kresna - Blagoevgrad district.

RECONSTRUCTION OF FACILITIES OF OTHER AUTHORITIES
RECONSTRUCTION OF ELECTRICAL EQUIPMENT 0.4 kV and 20 Kv
Electrical facilities 0.4 kV: km 379 + 000; Km 398 + 060.
20 kV electrical equipment: Km 379 + 510; Km 382 + 000; Km 382 + 160; Km 382 + 410; Km 384 + 165; Km 388 + 405; Km 398 + 157; Km 398 + 847; Km 398 + 861; Km 399 + 480; Km 399 + 850; Km 399 + 870; Km 400 + 085.

RECONSTRUCTION OF ELECTRICAL EQUIPMENT 110 kV and 400 kV
Verification of the vertical overall dimensions at the intersection of the existing 400 kV and 110 kV overhead lines as follows:
Water Power Plant 400 kV "Pirin ": Km 378 + 430; Km 379 + 950; Km 380 + 000; Km 380 + 050; Km 382 + 500; Km 396 + 760.
Water Power Plant 110 kV "Granit": Km 398 + 860

Construction of power lines 20 kV and CTP 20 / 0.4 kV at road junctions and recreation grounds

- Road junction „Poleto“ - at km 379+490
- 'Mechkul' road junction at km 384 + 260
- 'Stara Kresna' junction at km 387 + 690
- Road connection 'Stara Kresna' at km 388 + 435
- Recreation area, town of Kresna, left road lane at 399 + 470

Lighting in the section of road junctions and recreation areas
The construction of street lighting is provided in the following places:
- Road junction „Poleto“ - at km 379+500
- 'Mechkul' road junction at km 384 + 265
- 'Stara Kresna' junction at km 387 + 690
- Recreation area, left road lane at km 399 + 500

Reconstruction of communication facilities
- Reconstruction of optical cable at km 380 + 680
- Reconstruction of the optical cable at km 384 + 270
- Reconstruction of the optical cable at km 388 + 450
- Reconstruction of copper cable at km 399 + 115
- Reconstruction of copper cable from km 399 + 840 to 400 + 608
- Reconstruction of optical cable from km 400 + 110 to km 400 + 538

Water supply pipelines
- Reconstruction of the existing water pipeline, of diameter Ø110, made of PE from Brezhany to 'Poleto' - km 379 + 500
- Reconstruction of the existing water supply pipeline, of diameter Ø100 ET for the village of Stara Kresna - 388 + 430
- Reconstruction of the existing water pipeline of diameter Ø150 for the village of Slivnitsa at km 400 + 870

Irrigation canals
- km 399 + 125 - reconstruction of the main irrigation channel, Left Railway Station 'Pirin'
- km 399 + 220 - reconstruction of the main irrigation channel, Left Railway Station 'Pirin'
- km 399 + 580, reconstruction of the main irrigation channel, deviation 'Left Railway Station Pirin'
- km 399 + 552 - reconstruction of the deviation of the main irrigation channel, Left Railway Station 'Pirin'
- from km 399 + 650 to km 399 + 715 - deviation of the main irrigation channel 'Left, 'Pirin' Rail Station'

PRESSURE IRRIGATION PIPELINES
Existing pressure irrigation pipelines, falling within the scope
of the roadway:
- Main irrigation pipeline, made of PVC, diameter Ø250 from km 398 + 476 to km 398 + 544
- Internal irrigation pipeline of diameter Ø160, made of steel, at km 400 + 090
- Main irrigation pipeline, made of PVC, diameter Ø280 from km 400 + 260 to km 400 + 400

GAS PIPEWORK
- Reconstruction of the Transit Gas Pipeline for Greece at the intersection of Km 390 + 170

- Reconstruction of the Transit Gas Pipeline to Greece at km 399 + 240
- Reconstruction of the existing transit pipeline to the Hellenic Republic, of diameter DN 700

and $P_{op.}$. = 5.4 MPa at km 400 + 130

The description of the design solutions of the Contracting Authority on the "Improvement of the Route of Lot 3.2 of the Struma Motorway and the rate of detail in the information of the EIA and the EIA report corresponds to the level of the study and the design of the different options for the "Improvement of the Route of Lot 3.2 of the Struma Motorway". The preparation of the assessments has adequately taken into consideration the design and construction specifications of the linear sites, as well as the information, available at the relevant time from the design of the different options of Lot 3.2 of the Struma Motorway, and also the information, provided by the Contracting Authority, including the data, agreed upon with the Contracting Authority.

NECESSARY SITE AREAS FOR THE IMPLEMENTATION OF THE INVESTMENT PROPOSAL

The construction of the linear sites is related to the permanent involvement of the lands from the land and forest fund for the deployment of the elements of the road infrastructure.

Subject to the provisions of the Roads Act, the motorway shall comprise the area, on which the roadway is located and the restriction strips on both sides, together with the airspace above it, at a height, defined by the road design rules.

The width of the motorway outside the populated areas and within the boundaries of the urbanized areas with unregulated adjacent territories shall be determined with the road design. The road facilities and sites belonging to the road are included in the scope of the road, except for the maintenance sites of the national road network, the facilities for power supply and lighting and their adjacent areas and the snow protection facilities; these can be located outside the scope of the road.

The purpose of application of the agricultural lands, necessary for the construction and reconstructions of roads, shall be amended according to the provisions of the Law for the protection of agricultural lands, and the application of forest territories - in accordance with the provisions of the Forestry Act.

The Real estates, owned by natural or legal persons
that will be required for the construction and reconstruction of the National Road Network, shall be expropriated under the conditions and the provisions of the State Property Act.

For this purpose, a pre -development plot plot shall be made upon a sample of
the cadastre /maps/ of the restored ownership /CMRO/ and the cadastral maps of the drafted land properties, according to the Design Assignment, which determines the expected impact on land and soil, depending on the main characteristics and technical parameters of the linear part of the motorway and its facilities.

On the basis of the preliminary detailed development plans / DDPs/PUP / shall be determined: the size of the affected lands (by manner of permanent use, type of property, category), including recreation areas, sites for the deployment of the operation center, the lands, necessary for the reconstruction of affected engineering networks.

Motorways shall be categorized as first class constructions in accordance with the Territory Development Act (TDA), whereas construction works will only be possible if the construction permit has been obtained under the provisions of TDA. For the construction of Lot 3.2 of the

Struma Motorway, a building permit shall be obtained following the EIA decision, issued by the Minister of Environment and Water. The alignment and co-ordination of the project with the other interested parties/stakeholders was carried out according to the general provisions of the TDA.
The competent authority to issue the building permit for Lot 3.2 of the 'Struma' Motorway shall be the Minister of Regional Development and Public Works.
The project design options for Lot 3.2 pass through the land properties of
two municipalities (Simitli and Kresna) and nine populated areas (Simitli, Poleto, Rakitna, Mechkul, Stara Kresna, Oshtava, Vlahi, Gorna Breznitsa, Kresna) and intersects the existing elements of the infrastructure.
According to the main characteristics and technical parameters of the linear section of Lot 3.2 and its facilities for the realization of Option G**20-red** , the expected permanent violations of the balance of the affected lands and soils, provided by the Contracting Authority amount to **1,240.997 decares** . In Option **G20- blue, these** violations are **1,246.156 decares**. In **the Eastern Option G10.50**, these violations amount to **1,107.898 decares** and in the **Eastern Option G20 - these interruptions amounted to 2,817.765 decares**. In **the long tunnel Option**, the affected lands amount to **884.718 decares**.

During the construction of Lot 3.2, the existing roads of the National Road Network, the existing municipal roads, the existing forest, field and agricultural roads will be used. Also, the route under construction will be used. In case the construction and use of new access roads becomes necessary during the construction of Lot 3.2, the competent environmental authority should be notified and the environmental legislation applied accordingly.

The EIA Report has considered and evaluated the existing roads, serving the construction of the road track and its facilities, including the temporary organization of traffic.

Sites for storage of earth and rock material

Because of the nature of the construction, it will be expected to generate
certain quantities of land and rock materials that do not meet the design specifications for use in the construction of Lot 3.2, in respect to which, storage sites were explored and proposed.
The design of the long tunnel option has defined and situated
preliminary storage sites for earth and rock materials, a site at the northern gate, comprising 19.947 decares and two sites at the south portal, comprising 63.650 decares and 138.977 decares.
Also two storage sites for land and
rock materials, (to be used in the construction of Lot 3.1 and Lot 3.3 of the Struma Motorway), as follows: Site in the land of the village of Zheleznitsa with a capacity of 4, 500,000 m^3, total area of 454.780 decares and a site on the land of Ilindentsi village with capacity of 1,500,000 m^3, total area of 123.686 decares. These two sites are not currently existing and are not used for the storage of earth and rock materials.
Subject to the provisions of the Road Act, the scope of the road is the area, on which the roadway / road bed/ and the restricting boundary strips are located on both sides, together with the airspace above it at a height, defined by the Road Design Standards. The width of the road outside the populated areas and within the boundaries of the urbanized areas with unregulated adjacent

territories shall be determined by the road design. The road facilities and sites belonging to the road are included in the scope of the road, except for the maintenance sites of the national road network, the facilities for power supply and lighting and their adjacent areas and the snow protection facilities; these can be located outside the scope of the road.

At the moment of drafting the EIA, plot plans have not been prepared for any of the proposed design options, in accordance with the Territory Development Act/Spatial Planning Act /TDA/SPA/ and Ordinance No.8 / 14 June 2001 on the volume and content of the development plans and layout plans.

5. Stages of implementation of the investment proposal

In June 2013 the grant agreement was signed under project No.BG161PO004-2.0.01-0019 for the preparation of Lot 3 of Struma Motorway, as a part of Operational Programme Transport 2007 – 2013.

The implementation of the Investment Project for "Improvement of the Route of Lot 3.2 of Struma Motorway" is mainly in two stages.

- First state – Preparation, agreement and approval by the Contracting Authority of the investment project in the Draft Project phase, about 5 years;
- Second stage – Organization and performance of the construction, about 6 years.

6. Alternatives for implementation of the investment proposal

6.1. Development of the investment project

The design and construction of Struma Motorway is a process that continues more than 25 years.

Many surveys have been carried out with respect to the design of Struma Motorway:

- Pre-design survey drafted by "Patproject" (1990);
- Pre- design survey by the company SPEA (2000/2002);
- Options prepared by "Krasi-Bo" (2002);
- Simultaneously with the work done by SPEA, the Bulgarian design company carries out preliminary surveys;
- Surveys drawn up by "NSI-2000" (2007/2008);
- EIA decision (2008).

The consideration of the options proposed for implementation of the route of Lot 3.2 was started in 2013 by National Company Strategic Infrastructure Projects. In 2016, due to restructuring, National Company Strategic Infrastructure Projects was closed as an organization and the project implementation activities, incl. EIA, which had not been finished, were taken over by Road Infrastructure Agency. The procedure is described in a chronological order.

National Company Strategic Infrastructure Projects has developed terms of reference for the development of a design for Struma Motorway, Lot 3.2 that satisfies to the maximum possible extent the requirements of EIA Decision No.1-1/2008.

Most of Lot 3.2 passes through the Kresna Gorge – an area that is exceptionally sensitive in ecological terms. The conditions are further complicated by the complex physical-and-geographical characteristics (occurrence of landslips and landslides, narrow gorge, etc.), a fault zone having a complex geological structure and high seismic risk in tectonic terms.

All these conditions predetermine respectively high construction and operation risk and require a number of restrictions and conditions in the design of the route.

In the course of development of the design of the long tunnel in the Kresna Gorge assigned by National Company Strategic Infrastructure Projects a number of problems occurred in 2013 – 2015, which complicated the project implementation, as well as the operation of the facility in the future. The main problems established by the Contracting Authority of the project – National Company Strategic Infrastructure Projects, which concern the project solution with a long tunnel option, are:

- need of large areas for landfilling land and rocks;
- need of construction of temporary roads within Natura 2000 protected areas;
- heavy construction equipment passing through the gorge for a very long period of time, which, in addition to higher discomfort and increased risk of accidents for cars that pass by, increases also the risk of death of vertebrate animal species;
- need to complete the construction in a specific timeframe (by the end of the 2014 – 2020 programme period), including option N+3;
- exceptionally high and energy consuming operation and maintenance costs;
- significant geological risks (the area of the Kresna Gorge is among the most seismically active ones in the country).
- very high volumes of excavation works and the related areas for landfills and temporary roads – the expected volume of the excavated rock material is about 5 900 000 m^3;
- about 25% increase of the traffic of lorries through the gorge during the period of construction, i.e. for a period of no less than 6 – 7 years;
- the need of at least three interim accesses for digging the tunnel in order to ensure that it can be completed within the programme period will create even bigger trouble for the traffic in relation to the safe entry of the heavy equipment into the existing road I-1;
- it is well known that the tunnel is in the most seismically active zone of the country, as the additional geological surveys and expert examinations have shown that the seismic and general geological risk are significant;
- the geological surveys made have shown that the drainage waters from the tunnel will be about 11 000 m^3/day. This is not a merely technical issue but is also an ecological issue, as long as it is expected to bring about dewatering of the Tisata reserve on the surface, as well as upon the running of the waters in the Struma river;
- the conclusions of several experts (from the Bulgarian Academy of Science, Bulgarian seismologists and from international experts) contain serious reservations with respect to the construction of a very long tunnel in the gorge, as serious problems in the construction process, as well as risks in the operation, are expected.

In accordance with the Project Environmental Strategy for Lot 3 of Struma Motorway (developed by JASPERS and adopted in 2012), once the long tunnel design is completed, the environmental implications must be evaluated. On the basis of this evaluation a decision must be taken as to the continuation of the project development.

Bearing in mind the above considerations and after the Contracting Authority National Company Strategic Infrastructure Projects consulted the Ministry of Environment and Water, it was decided that an additional option had to be developed for passing through the Kresna Gorge, which would be subject to evaluation in terms of risk for human health and ecological parameters.

In 2014 National Company Strategic Infrastructure Projects assigned to Patproject 2000 OOD a pre-investment survey for a option of a solution for Struma Motorway in the area of the Kresna Gorge from km 378+600 to km 399+788.84=397+600.

The designer made surveys and proposed a new solution conformed to the legal requirements applicable to roads and optimal technical characteristics.

This design solution of 2014 proposes not a single long tunnel, but the construction of many short tunnels allowing their simultaneous construction in shorter terms. The division of the roadways allows trouble-free and conflict-free traffic as the traffic will be allowed in one of the roadways while construction is being performed on the other and vice-versa and the division of the roadways allows also stage-by-stage construction if need arises. The close distance between the roadways allows the quick switching of the traffic from one to the other, which secures the temporary arrangements during the construction of motorway, upon the road operation, as well as redirecting of the traffic in case of a car accident, emergencies, natural disasters, etc.

In the ***G20-blue option*** proposed in the end of 2014, the designed route is to be developed with a G20 clearance and for a designed speed of Vdes.=80 km/h. The two roadways are developed independently from each other, as the distance between them gets bigger and smaller in situational and grade line terms. The aim is to use as much as possible the route of the existing road to minimize the use of surrounding areas.

Where possible, the existing road is followed and used, and in other sections tunnels and viaducts are intended. Where necessary, bearing walls must be provided for.

The notice by National Company Strategic Infrastructure Projects to the Ministry of Environment and Water of the investment proposal "Improvement of the route of Lot 3.2 of Struma Motorway, under art.4 of the *Ordinance on the Conditions and Procedure for Performance of an Environmental Impact Assessment*, deals with two options for implementation of Lot 3.2: "Long tunnel option" and "Option G20" (design development of 2014), subsequently marked as ***G20-blue option***.

In 2015 the elaboration of an alternative option solution to ***G20-blue option*** was assigned**.** It has the same clearances and does not either provide for the construction of a long tunnel in the Kresna Gorge but offers other technical solutions.

In this relation an examination was made of the possibilities of using the terrains occupied by the existing road E79, so as to minimize the occupied territories in the Kresna Gorge.

In the same time a design solution is being sought for a option that, in addition to satisfying the ecological criteria, is technically feasible, compliant with the legal framework of road construction, the safety requirements and possibilities for maintenance of the roadway and the scope of the road.

In the end of 2015 an alternative option was developed for passing through the Kresna Gorge with clearance G20 - **G20-red option.**

On the basis of the notice of investment proposal submitted to the Ministry of Environment and Water instructions are given by a letter of the Ministry of Environment and Water with outgoing No.EIA-85/13 May 2015, in section II item 9: *"Propose and evaluate "alternative solutions" within*

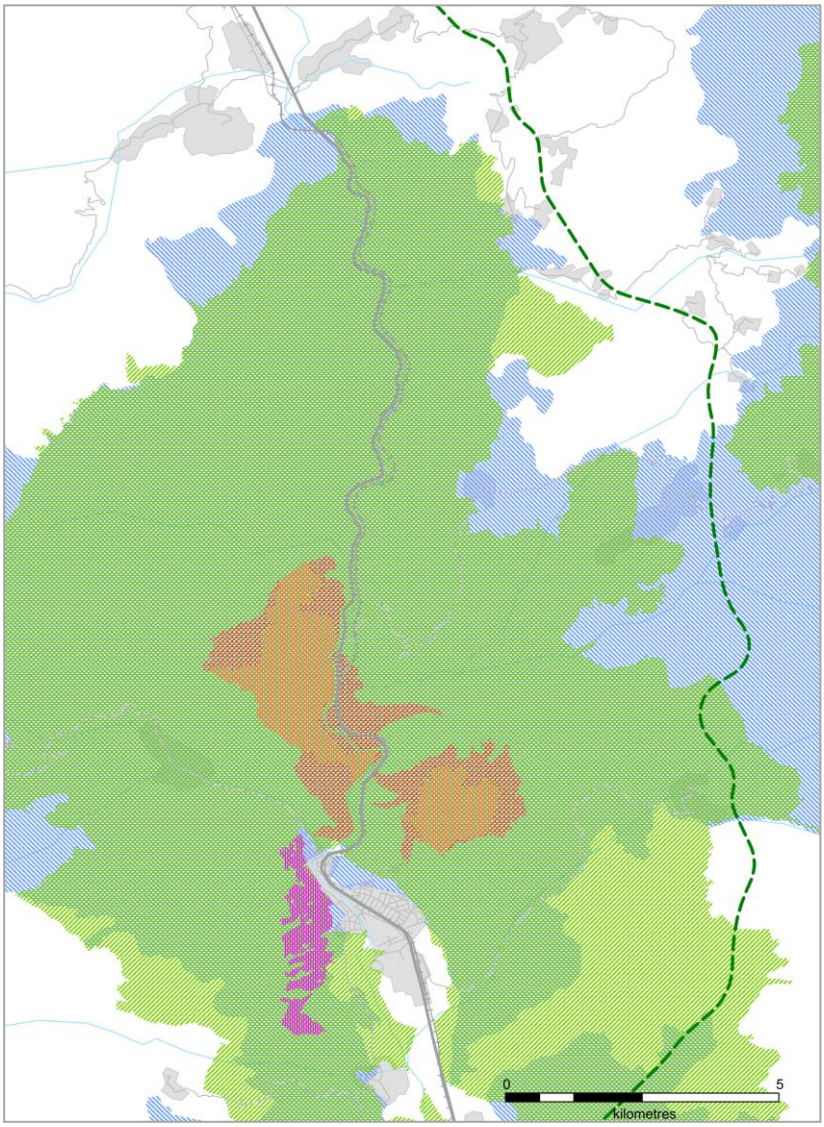
the meaning of § 3, subparagraph 7 of the Additional Provisions of the Ordinance on EIA, including different location of the route, different scales, incl. different clearance, model of performance of the activities or use of alternative technologies. Propose and evaluate an "alternative solution" for the passing of the route outside the Kresna Gorge, being in conformity with: Recommendation No. 98 (2002) of the Standing Committee, adopted on 5 December 2002, on the project to build a motorway through the Kresna Gorge (Bulgaria – in particular item 3; the requirement of condition item 3.2, bullet 7 of the EIA Decision, which provides of the possibility of the "future survey and design of options analogical to the presented "options", to the east from the Kresna Gorge and "Tisata".

In reply, the Contracting Authority National Company Strategic Infrastructure Projects examines three options:

- Eco A east optione*;
- Eco B east option;
- West option;

*Eco A east aoption affects the "Kresna Gorge" protected area. According to item b of the prohibitive regime introduced by Order No.130/22 February 1985 "the construction of buildings and roads is prohibited" within the protected area. In this relation and considering the circumstance that this option is related to the construction of a new route, it is inadmissible in view of the regime of the protected territory.

ECO B EAST OPTION

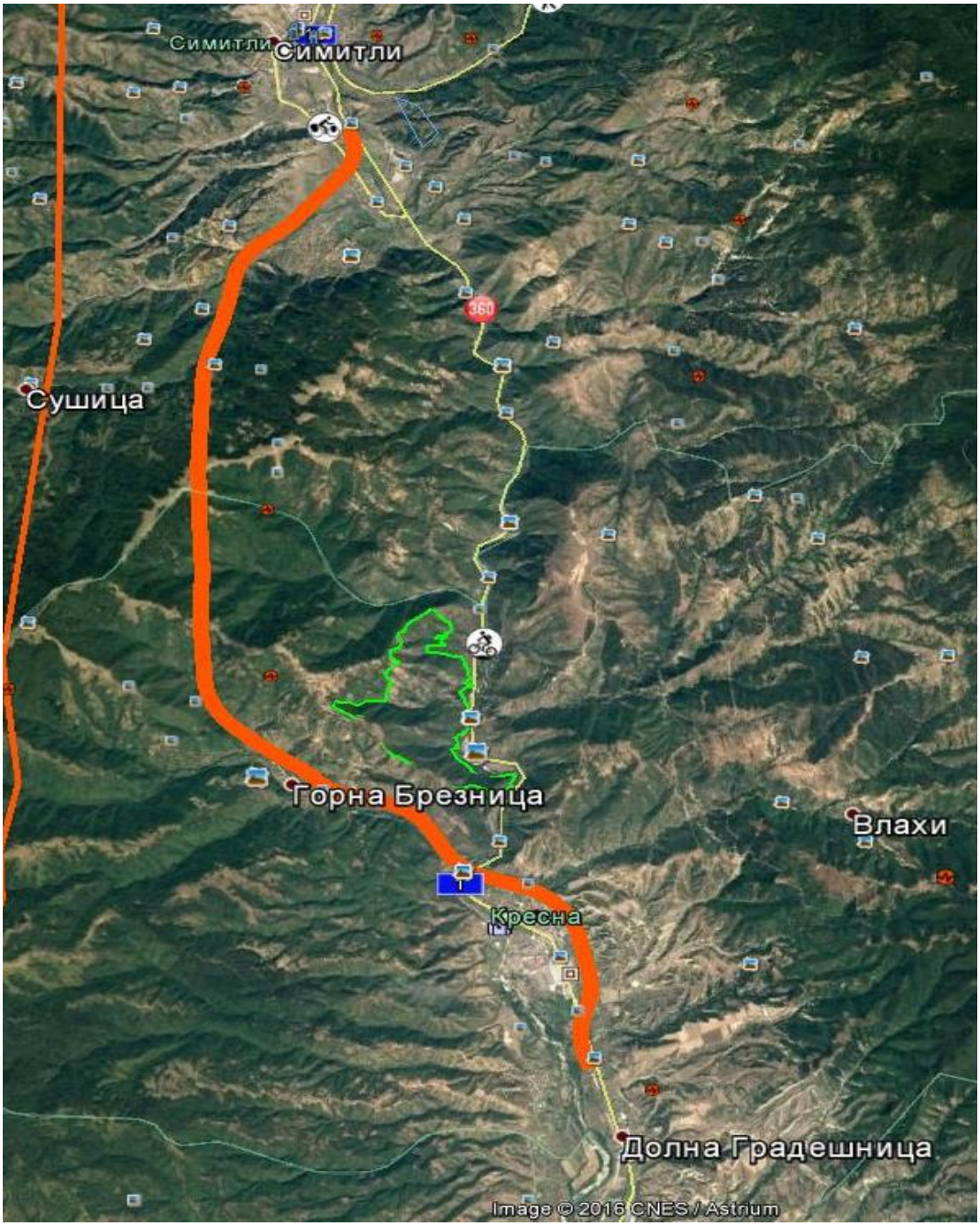


This option starts from a road junction at the town of Simitli at 300 m altitude, as it goes in a south-eastern direction to km 389+500. From there on the motorway makes a turn in an eastern direction to km 390+000 and afterwards – another turn in a southern direction. During this ascension, the slopes are quite steep, including a 2 km part with an inclination of 5%. At km 391+900 the route reaches its highest point at an altitude of 747 m. In order to reach this point the motorway passes through four bridges and viaducts (with lengths of 270, 390, 630, 510 m) and three tunnels (lengths of 495, 2 600, 1 330 m). The inclination of the prevailing part of the descend is 4.2%, as the motorway reaches the village of Strumyani at 130 m altitude. During the descend the route passes through three bridges and viaducts (with lengths of 660, 690, 480 metres) and three tunnels (with lengths of 3 140, 2 180, 8 500 m). The total length of the route is 32.608 km, with a motorway clearance A 29. The designed speed is 120 km/h, but the operational speed is expected to

be much lower, considering the extreme inclinations. In the tunnel sections the speed limit is accepted to be up to 80 km/h.

The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 “Kresna-Ilindentsi” and bird protected area BG0002003 “Kresna”. It does not affect the “Tisata” reserve, “Moravska” protected area and “Kresna Gorge” protected area.

WEST OPTION



In relation to the instructions of the competent authority for consideration of options of a route outside the Kresna Gorge in 2015 a new design option was surveyed. Considering the fact that the possibilities of bypassing the gorge from the east are surveyed, the survey was made on the western side of the gorge. The so called "West option" was thus obtained.

The design route is developed for two roadways having clearance G20 and Vdes.=120 km/hour.

It starts at km 276+000 after a bridge over the Struma river, goes in a south-western direction near the village of Cherniche, to the west from the village of Krupnik and the village of Polena and afterwards – to the south from km 380+000.

It crosses the mountain, goes to the north from the village of Gorna Breznitsa, follows the river valley of the Breznishka river. It crosses the Struma river, the existing road I-1 and the existing Sofia – Kulata railway, and then along the river valley of the Vlahinska river bypasses Kresna from the north-east and afterwards from east too. The option ends at km 400+200 (the beginning of Lot 3.3).

7 tunnels and 6 viaducts are to be constructed. The tunnels have a total length of 11275 m. The longest tunnel is the first one – 9 175 m, which starts from km 381+541. The other 6 tunnels have a length of less than 1000 m.

The viaducts have a length between 50 and 745 m. The total length of the viaducts is 2180 m.

Having applied a multi-criteria analysis (developed by consulting company ARUP and National Company Strategic Infrastructure Projects) the two options were rejected for financial, economic and ecological criteria. These option are not developed in detail.

Since the construction of Lot 3.2 of Struma Motorway is financed under Operational Programme Transport and Transport Infrastructure, the design is generally required to meet a number of requirements, which include not only ecological but also technical and economic criteria that cannot be ignored.

As regards linear facilities, including the road in the section through the Kresna Gorge (Lot 3.2 of Struma Motorway), the requirements of the Road Design Norms and Ordinance No.4 on the Scope and Contents of Investment Projects, as well as other legal instruments related to the design and evaluation of projects are taken into account as early as in the stage of pre-project surveys. On the basis of the known data and geographical characteristics of the area and the legal requirements an evaluation is made as to what options would be feasible given the known and available technologies, construction practices and construction materials, due consideration being also given to the Contracting Authority's financial capacities.

The designs are adopted by the Expert Technical and Economic Council (ETEC), which is competent to evaluate the design in its entirety and in all possible aspects.

Considering the financial parameters and the time limits set in the programme period for projects financed under OPTTI under the conditions of technically infeasible and economically unprofitable parameters of the options, there is no ground to require financing for their implementation. Under such conditions there may be no design, evaluation of the design, incl. under ecological parameters, and other feasible options are addressed.

In relation to the instructions given by the Ministry of Environment and Water by a letter with outgoing No.EIA-85/13 May 2015, in section II item 9: *"Propose and evaluate "option solutions" within the meaning of § 3, subparagraph 7 of the Additional Provisions of the Ordinance on EIA including different location of the route, different scales, incl. different clearance, model of performance of the activities or use of option technologies. Propose and evaluate an "option solution" for the passing of the route outside the*

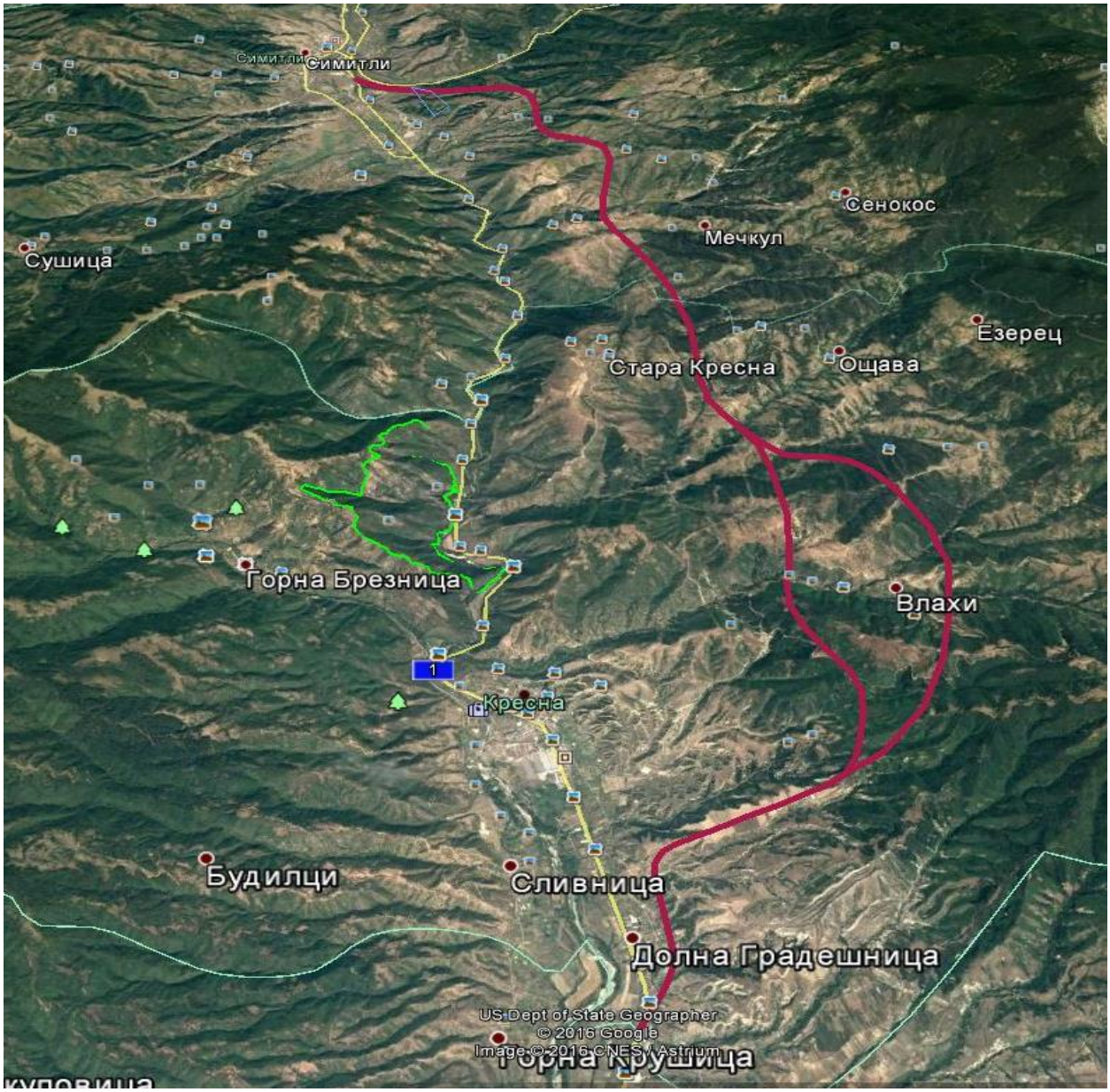
Kresna Gorge ……..“ Furthermore, during the conducted consultations for the updated Terms of Reference and contents of EIA, a proposal is made to consider a option, in which the two roadways are taken outside the Kresna Gorge.

The Contracting Authority Road Infrastructure Agency (successor of the activities started in National Company Strategic Infrastructure Projects) examined in 2016 two new options for passing of the route outside the Kresna Gorge, and namely:

- East version G 10.50 – left roadway along a new terrain outside the gorge and right roadway along the existing road E79 in the gorge and eastern bypass of the town of Kresna along a new terrain;
- East Version G 20 – left and right roadway outside the gorge.

These two options are addressed and evaluated in the EIA report and the Report on the evaluation of extent of the impact.

EAST VERSION OF NGOs OF 2002



The option is developed in 2002 by "Votan Consult" and is evaluated in the EIA procedure in 2007 for Struma Motorway. The description given below concerns the options addressed in the Environmental Impact Assessment Report of 2007 and the development of "Votan Consult".

•***Green - alternative option (Votan), length 29.41 km***

It envisages redirection of the route in about 4 km to the east from the gorge.

The route starts from the presently existing road E79 after interchange of a "semi-cloverleaf" type in the town of Simitli and heads eastwards, as it tangents "Dalgata Mahala" from south. Afterwards the route heads southwards, crosses the Brezhanskata river, enters from west the massif

of the Vartichovitsa peak (811,4) and heads southwards. A route is sought to the west from the existing road Brezhani-Mechkul-Senokos along the slopes of the adjacent mountain massifs. There is a situational crossing of the road Stara Kresna-Oshtava and the route passes to the west from the Hladkata Voda mineral spring, whereafter it passes by from east the other mineal spring – "Toplata Voda" too. The route continues west from the village of Vlahi, crosses the Vlahinska river to the east above the valley and heads towards the third mineral spring "Gradeshki Mineral Springs", where it passes from the eastern side and afterwards along the ridge of "Padinata" and heads towards the village of Dolna Gradeshnitsa. A tangential passage to the east from the village is proposed because the existing development around road E79 will not allow technically the running of a clearance of 25.5 metres. After passing by the village the route joins the existing road E79.

The highest level of passage is at km 10.146 and is 670.11 metres.

The difficult terrain results in the designing of 6 tunnels with respective lengths of 3 900 m; 305 m; 505 m; 565 m; 1 350 m and 4 300 m or a total length of 10 925 metres.

The length of the designed 8 bridge facilities is respectively 480 m; 480 m; 1320 m; 1 160 m; 240 m; 160 m; 480 m and 1 320 m or a total of 5 640 metres.

Given length of the route of 29.41 km and a total length of the facilities of 16 565 m, the length of the sections with the facilities compared to the entire length is about 56%.

It joins the routes of "Speya" at D. Gradeshnitsa – after the M4-M5 border.

•Green dotted line – alternative option (Votan) – length 31.32 km

This option is developed as a sub-option of the first one, as on the basis of an order made by the Investor an examination must be made of the possibility of passing to the east from the village of Vlahi.

The route of the II option is separated in situation and grade line terms from I option at km 15.4 and after it passes to the east from the village of Vlahi, it joins again the route of I option as a situation at the 27th km.

It passes to the east from the buffer zone of the "Tisata" and does not affect it;

The highest point of passage is the same as in the I option and is at km 10.146 and its attitude is 670.11 metres.

For the purpose of dealing with the complex terrain the option includes 6 tunnels with lengths of respectively 3 900; 305; 505; 2 850; 670 and 5 700 m or with a total length of 13 930 metres.

The designed bridge facilities are 8 and have respective lengths of 480 m; 480 m; 1 320 m; 1 200 m; 440 m; 480 m; 480 m; and 560 m or a total length of 5 440 m.

The total length of the facilities is 19 370 metres and compared to the length of the route of 31.32 km this makes 61.8% for facilities.

The option was rejected as unacceptable, which is also reflected by the issued Resolution 1-1/2008 of the Ministry of Environment and Water.

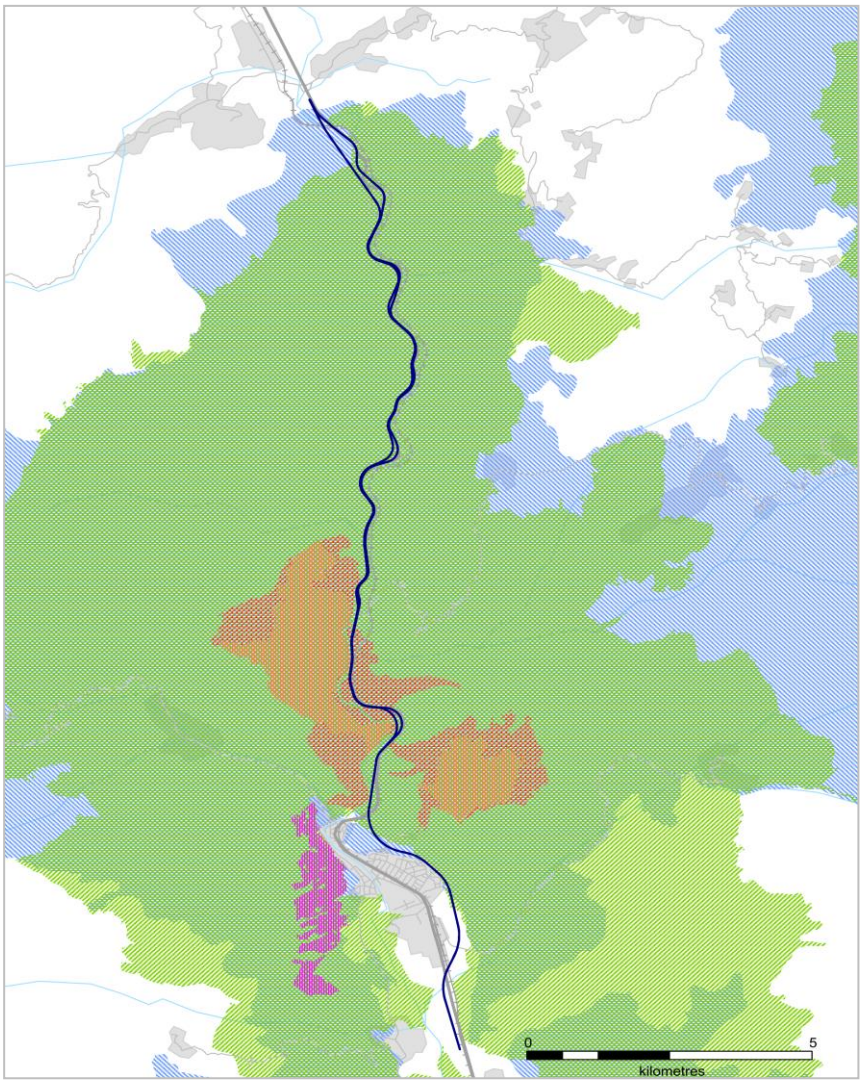
The arguments are stated in the Report on the evaluation of extent of the impact of 2007 and are related to the fact that this option does not satisfy the requirements of art.6 of Directive 92/43/EEC, because as regards certain species subject to protection in protected habitat area BG0000366 "Kresna-Ilindentsi", significant negative impacts remain, regardless of the possible mitigation measures and the application of compensatory measures within the meaning of art.6, par.4 of the directive is required.

In the meantime a conclusion is made that there is no need to apply art.33 of the Biological Diversity Act, respectively art.6.4 of Directive 92/43/EEC, as long as there are feasible options allowing the avoidance of the significant impacts on the protected areas subject to observance of the compulsory measures for decreasing the impacts.

6.2. Location alternatives under options

The options that are equally evaluated in the EIA Report and Report on the evaluation of extent of the impact are described in detail in item II.1. of the report, as follows:

OPTION G20 – BLUE



The route starts south from road interchange Krupnik with a road section (with clearance G20-blue, 2014), having a length of 0.6 km and crosses the Struma river by a bridge facility. In the Kresna Gorge one of the roadways follows the existing road E79, and the other goes independently with tunnels and facilities in western massif of the gorge. After leaving the Kresna Gorge it goes to the east from the town of Kresna and ends up at road interchange Kresna.

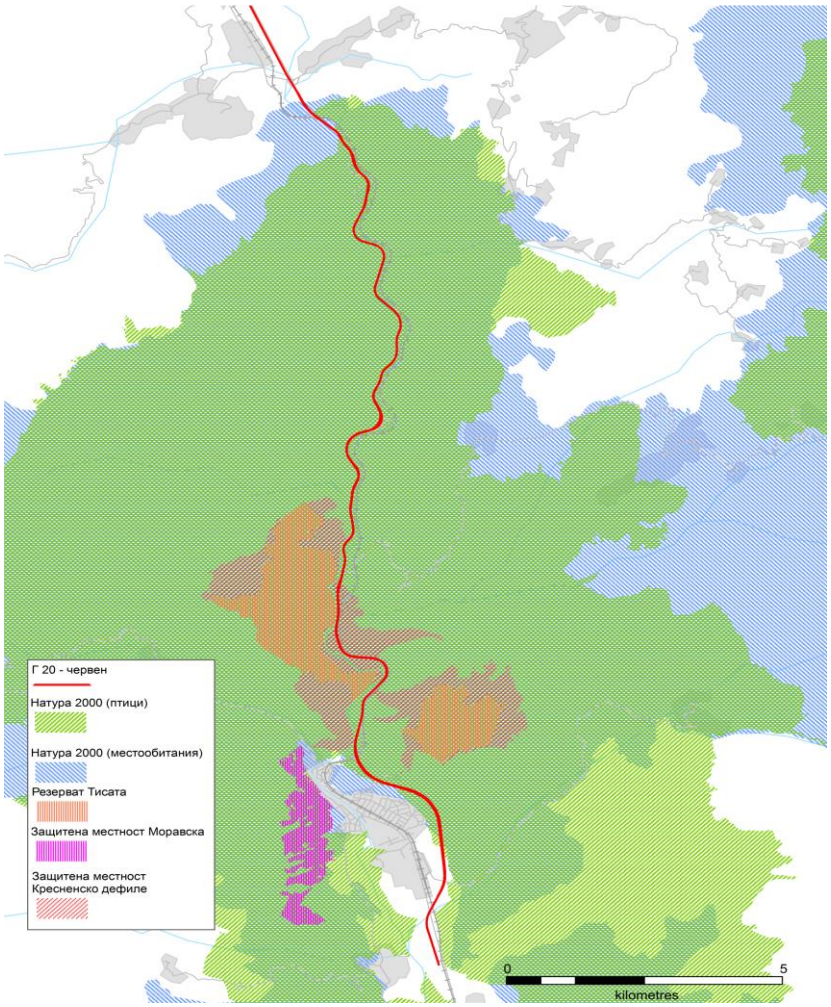
The purpose of the development of G20-blue option is to examine the possibilities for using the terrains occupied by the existing road E79, so as to take up minimum territories in the Kresna Gorge.

In the section from km 378+600 to km 393+100 the two roadways are developed independently from each other, as the distance between them gets bigger and smaller in situational and grade line terms. Where possible, the existing road is followed and used, and in other sections tunnels and viaducts are envisaged. In certain cases bearing walls are envisaged for the Struma river and the slopes.

The route is described in detail in item 4. Structure, Situational Position and Basic Technological Characteristics.

The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 "Kresna-Ilindentsi" and bird protected area BG0002003 „Kresna".

OPTION G20 – RED

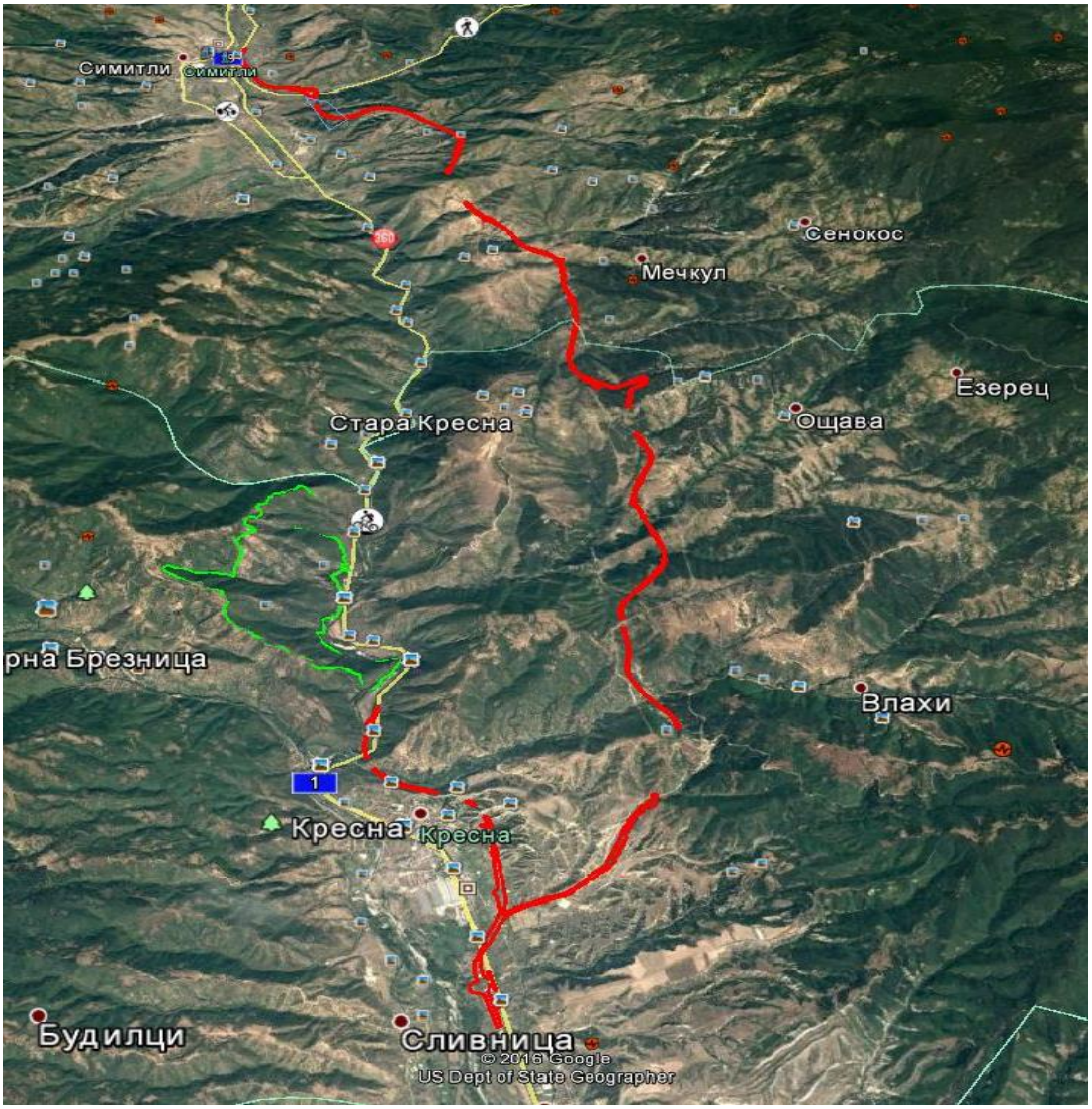


The work on the draft route for passaging through the Kresna Gorge continued in 2015 too for the purpose of designing an alternative option of the draft route of 2014 (option G20 – blue). In this relation the possibilities for using the terrains occupied by the existing road E79 were examined, so as to occupy minimum territories in the Kresna Gorge. In the same time a draft solution is being sought for a option that not only satisfies the ecological and health criteria but is also technically feasible, compliant with the legal framework of road construction, the safety requirements and the possibilities for maintenance of the roadway and the scope of the road.

The route is described in details in item 4. Structure, Situational Position and Basic Technological Characteristics.

The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 “Kresna-Ilindentsi” and bird protected area BG0002003 “Kresna”.

EAST OPTION G10.50



In 2016 “Patproject 2000” developed a new option for passing through the Kresna Gorge – **east option G10.50.**

The option is surveyed as two separate traffic roadways, one of which goes along the existing route of road E79 and an eastern bypass of the town of Kresna along a new terrain, while the other – two lanes to the east, away from the Kresna Gorge.

The route is described in details in item 4. Structure, Situational Position and Basic Technological Characteristics.

The designed route is developed as two separate roadways with a clearance of 10.50 for $V_{des.}$=80 km/hour, which does not ensure a motorway clearance and speed.

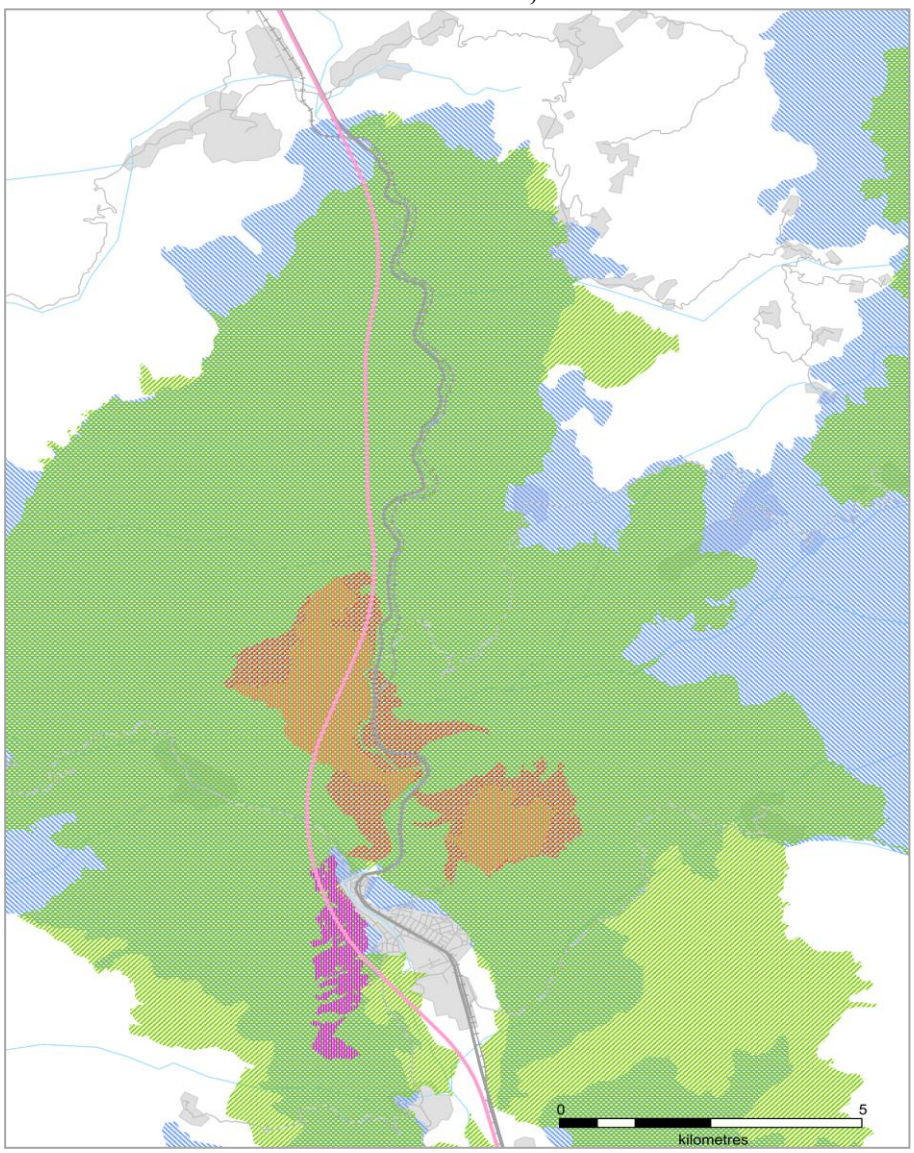
The right roadway from the end of Lot 3.1 follows the existing road through the Kresna Gorge, as the direction of both lanes is Sofia – the Republic of Greece. Before the town of Kresna the existing road is left and the route continues in an eastward direction along a new terrain, as it bypasses the town from its eastern side, and afterwards the bypass road of the town of Kresna connects to Lot 3.3. at road interchange “Kresna”.

The left roadway is constructed along a new terrain to the east from the gorge – around the village of Poleto, the village of Brezhani, the village of Rakitna, the village of Oshtava, the village of Stara Kresna and the village of Vlahi with a clearance of 10.50 and two one-way lanes ensuring the direction Republic of Greece – Sofia.

This option considerably reduces the traffic in the Kresna Gorge although the existing road is used because the cars in the direction from the Republic of Greece to Sofia are eliminated.

The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 “Kresna-Ilindentsi” and bird protected area BG0002003 “Kresna”.

LONG TUNNEL OPTION, "KRESNA" TUNNEL



The beginning of the section is immediately after the bridge over the Struma river, as the motorway uses the existing road, and the route of the existing road is moved parallel to it to the east.

The passage through the "Kresna" tunnel is from km 379+267.015 to km 394+605.00 /left tube and from km 379+255 to km 394+600 /right tube. After the exit of the "Kresna" tunnel the motorway crosses and existing third-category road and the Struma river as it passes to the east from it nearby the end of the town of Kresna, to the west from the existing road the section ends.

The existing road remains to the west from the route of the motorway.

The route is described in details in item 4. Structure, Situational Position and Basic Technological Characteristics.

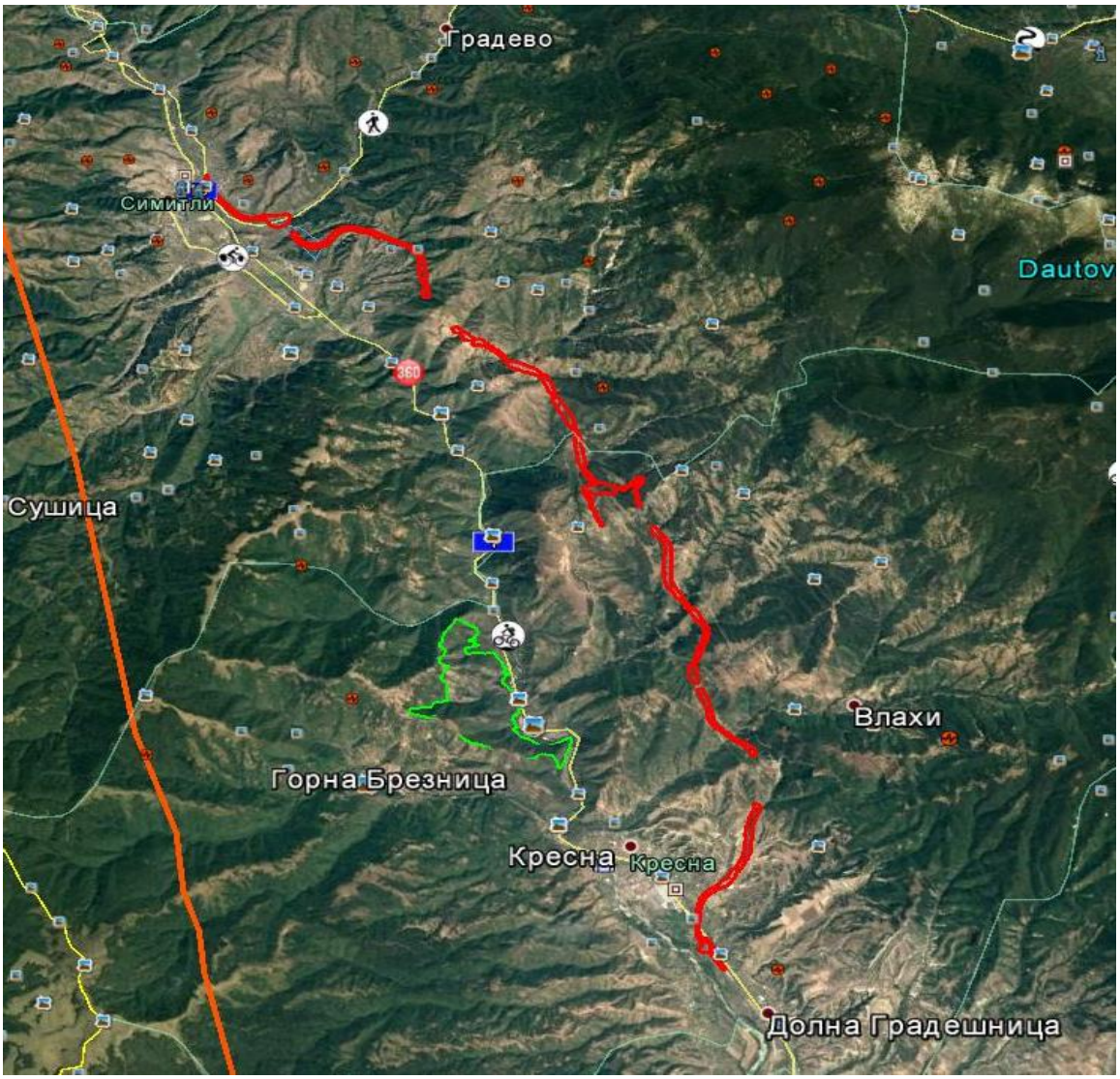
The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 "Kresna-Ilindentsi" and bird protected area BG0002003 "Kresna".

One of the major defects of this option is the need to need continue the use of the existing road E79 by lorries transporting hazardous substances that for security reasons must not use the long tunnel. The existing road will also be used by other motor vehicles whose drivers will refrain from passing through the tunnels for different reasons, incl. health related ones.

EAST OPTION G20

In relation to the consultations conducted in 2016 regarding the updated Terms of Reference for a scope and contents of the EIA, Road Infrastructure Agency assigned to the designer of east option G 10.50 to present a technical solution for the designed route develop so that both roadways go along a new terrain outside the Kresna Gorge for $V_{des.}$=80 km/hour.

In December 2016 a design entitled: "Pre-investment survey of Lot 3.2 of Struma Motorway – east option G20" was drawn up. The design envisages right and left roadways outside the Kresna Gorge.



The option includes a new route along a new terrain having clearance G 20 with two roadways, with two lanes each, securing the two traffic directions (Sofia – Republic of Greece and Republic of Greece – Sofia), to the east around the villages of Brezhani, Stara Kresna and Oshtava for $V_{des.}$=80 km/hour.

The route starts at km 373+300 (100 m after crossing the railway for the Oranovo mine), to the left of the existing road it goes in parallel to it until km 373+600, whereafter it heads in south-eastern direction, in parallel to the Gradevska river, between the Oranovo and Dalga Mahala quarters of the town of Simitli. At km 375+775 road II-19 "Simitli – Predela – Gotse Delchev" is crossed at two levels, as a road interchange is created for a link of the Motorway to the town of Bansko and back. After the II-19 crossing the slope is entered and a tunnel with L = 350 m is needed, as afterwards – a viaduct too with L = 200 m.

The admitted longitudinal inclinations in the interchange, tunnel and viaduct are 4%, whereafter the inclination is 5 % and a third lane is needed for those descending towards Sofia, as well as the construction of emergency exits if need arises.

From km 378+000 the option heads in a south-eastern direction, bypasses the village of Poleto, at km 379+500 it crosses the Poleto – Brezhani road, and at km 380+470 – the Rezena river too.

Next comes a tunnel with a length of 1 130 m whose route was optimised and there is a longitudinal slope of 4.35%, as the technical solutions for the tunnel and the viaducts around it are improved.

In the section from 385+500 to km 389+800 the option goes in southern direction, to the west from the village of Rakitna, in parallel to the Rakitna – Mechkul road, as around km 383+900 it crosses it, goes to the west from the village of Mechkul, continues southwards and to the east from the village of Stara Kresna at km 387+670 crosses the Stara Kresna – Oshtava road, as it passes by a tunnel under it.

From km 390+000 to km 396+000 the option continues going southwards. From km 396+000 to km 399+800 the route heads in a south-western direction near the existing road for the village of Vlahi. At km 399+800 in joins the red option of 2015 (Bypass of the town of Kresna).

At the points where the road route passes into a tunnel, a separate tube is envisaged for each roadway, which requires in turn an increase of the distance between them in order to secure the necessary distance between the tubes. Platforms are designed before the gates, which serve for the construction of the servicing infrastructure.

The route passes through two Natura 2000 protected areas – habitat protected area BG0000366 "Kresna-Ilindentsi" and bird protected area BG0002003 "Kresna".

The route is described in details in item 4. Structure, Situational Position and Basic Technological Characteristics.

6.3. Technology alternatives

The design options proposed by the Contracting Authority for consideration are conformed to an approved technology for construction of a road including also a motorway clearance, "very heavy" traffic category. The technology of construction of roads is regulated in "Road Design Norms" and Technical Specification for the respective clearance G10.50, G20 and A29 and Tunnel Design Norms 2014.

The legal instruments do not allow technology alternatives.

6.4. „"Zero" option

Struma Motorway is considered a strategic project and is a part of Trans-European Corridor number IV in the section Sofia-Kulata-Thessaloniki and provides and shortcut through Bulgaria to Aegean Sea. This is the route with the heaviest traffic in Bulgaria in the direction north-south.

The route is a part of priority project 7 of the European Union for the development of the Trans-European Transport Network, which includes motorway axis: Igumenitsa/Patra-Athens-Sofia-Budapest.

The existing first-category road E79 does not have the necessary technical features for provision of speed and freedom of troubles of the European road network. The geographic conditions and the characteristics of the relief along the existing route – the Kresna Gorge – determined a difficult road situation, caving of the by-road slopes, incl. collapsing of the roadway in the Struma river in case of high water and a high wave. Motor vehicles move along a series of small-radius turns, limited visibility and one traffic lane in each direction, as there is no division strip between the motor vehicle moving in the different directions, nor there is a possibility for an emergency stop.

The road features a high risk of car accidents, high rate of human victims and has no alternative so far for the route "Sofia – Kulata".

Data of Road Police for the period January 2010 – June 2015 show that in the area of the Kresna Gorge 366 car accidents happened, which resulted in 21 deaths and 139 cases of injuries. In annual terms this means about 68 accidents per year, 3,87 deaths per year and 26 cases of injuries per year. As a comparison, the average number of deaths (for the period 2009-2013) is 152 per year. Dividing it to the total length of the first-category road network of 2 975 km, this means about 0,051 deaths per year per kilometre. When applying this seam approach of the data from the Kresna Gorge (3,87 deaths per year divide by 19 km length), the obtained value is 0,204 deaths per year per kilometre, i.e. almost 4 times higher morbidity.

The adoption of a "zero" option will not only extend the risk period with respect to the motor vehicles using the road and their drivers and passengers, but it also makes pointless the funds and efforts invested so far in the construction of all the rest of Struma Motorway. The section under consideration is the last that is subject to construction, but is also the most risky of the entire route in terms of road safety and is exceptionally sensitive in terms of the biological diversity in the area.

A main principle in the Roads Act in art.2, par.2 is that the road network develops in accordance with the transport and social needs of the public, the infrastructure of the populated areas and the requirements in the legal instruments related to the national security, the environmental protection, human health and the traffic safety.

The selection and recommendation of the option for the implementaition of the IP is made in **item X Selection of the option to be implemented** of the EIA Report, as all the available data, analyses, estimations and impacts by individual compoennts and factors and the environment and human health, have been taken into consideration, as well as the conclusions of the Report on the CA.

7. Description, analysis and forecast assessment of the impacts on the environmental components and factors and on the material and cultural heritage that will be affected by the investment proposal

7.1. Atmospheric air

Brief description and analysis of the climate and meteorological factors relevant to the specific impact and the quality of the atmospheric air

Due to the considerable variations in the altitude (from 140 m at the village Dolna Gradeshnitsa to 2914 m at Vihren peak) and the deeply indented relief, the values of the climate elements around the Kresna Gorge vary in a wide range depending on the altitude and slope exposure. Therefore, high climate contrasts are observed at relatively small distances and the territory of Kresna Municipality falls within four different climate areas: - Climate area of the Struma valley – it covers the territory of the Sandanski-Petrich kettle hole up to 600 m altitude and the Kresna Gorge; - low-mountain climate area – it covers the slopes of Pirin and of Maleshevska mountain from 600 to 1000 m altitude; - Average mountain climate area – it covers the highest parts of the Maleshevska mountain and the medium-height parts of Pirin having an altitude of 1000 to 1800 m (a part of this climate area is included in the borders of Pirin National Park); High mountain climate area – it covers the highest parts of Pirin (over and above 1800 m altitude), which is fully included in the borders of Pirin National Park.

The area of the Investment Project for "Improvement of the Route of Lot 3.2 of Struma Motorway" is in part, in its northern part, in the most southern part of the Kyustendil-Blagoevgrad climate region of the Transitional-Continental Sub-Area of the European continental climate area. The climate in the region is continental with considerable Mediterranean influence penetrating along the valley of the Struma river. The winter is relatively soft with average temperatures in January of 0.5-1.0^{O}C. The winter precipitation (110-140 mm) is low but the snow cover is stable (30-35 days). The spring is cool and is accompanied by late spring chilly weather. The precipitations in the spring increase compared to the winter ones. The summer is hot with an average temperature for July of 21-23^{O}C. The sum of the summer precipitations is almost the same as the spring ones (120-160 mm). The autumn is considerably warmer than the spring with an average amount of precipitation of 130-180 mm. The average annual temperature of the air for the Blagoevgrad station is 12.4^{O}C, as the highest average monthly temperature is in July – 23^{O}C, and the lowest – in January – 0.5^{O}C. The average annual sum of the precipitations is about 560 mm.

The area of the Investment Project for "Improvement of the Route of Lot 3.2 of Struma Motorway" is in its southern part partly in the Petrich-Sandanski climate region of the South Bulgarian climate sub-area of the Continental-Mediterranean climate area. The Petrich-*Sandanski climate region* covers the southern part of the valley of the Struma river and is surrounded to the east by Prin, to the west – by Vlahina, Maleshevska and Ograzhden mountain, and to the south – by Belasitsa. The area is largely protected from the north by a whole group of mountain highlands. The southern exposure, the good protection of the area from cold penetrations and its relatively low altitude (on the average from 100 to 300 m altitude) determine its soft winter – the average temperature for January is about 2^{O}C, and the precipitations in the winter are mostly rain, as the snow cover remains for about 12-15 days and quickly melts away. The thickness of the snow cover rarely exceeds 10-15 cm.

The average annual temperature of air is about 13.0^{O}C, as the average monthly temperature of the coldest month (January) is positive (about 2,0 ºC), and of the hottest month (July) – about 24^{O}C. The average monthly temperature amplitude varies about 11.0^{O}C, as its highest value is reached in August (about 15.0^{O}C), and the lowest – December (about 8.0^{O}C). The higher the amplitude the lower the annual and the average monthly temperature amplitude.

The average temperatures of the monthly absolute high temperatures in January reach 17.5^{O}C, and in August – up to 42.4^{O}C. The warmings in the winter are due to the penetration along the Struma valley of relative warm Mediterranean air from south, and the high heat in the summer – to the retention of overheated continental air. The average temperatures of the monthly absolute low temperatures in January are -8.9^{O}C, but cold spells of down to -21.0^{O}C have been registered, due mostly to the penetration of cold continental air from north and temperature inversion due to the retention of the cold air in the low parts of the relief.

The summers comes here at the earliest time compared to all low plain areas – on the average before the end of February, the temperature of the air remains at sustainable values above 5^{O}C. However, the relative closed nature of the area determines sometimes quite late spring frosts. Nevertheless, the spring here is the warmest one among all lowlands – the average temperature in April is already 13.5 – 14^{O}C, and in May it is 18 to 18.5^{O}C. The spring sum of precipitations is about 140 mm – among the lowest in the country for this season due to the stated orographic reasons. The summer in the area is the hottest one for the entire country. In July the average temperature is about 25^{O}C, the maximum temperatures frequently exceed 35^{O}C, and in rare cases they may even hit up to 40 - 42^{O}C.

The hot sun and the scarce clouds create in this season and, in particular in its second half, very frequent and continuous drafts. For this reason the summer sum of precipitations is the lowest one for the country (100 - 125 mm). The autumn, especially in the beginning, is very hot and dry. The period with sustainable average 24-hour temperature over and above 10^{O}C continues as long as until the first ten days of November. This all explains the high temperature sums in the area.

Available data for the contamination of the atmospheric air in the area of the site. Sensitive zones

The terrain is in the south-western area for management and evaluation of the quality of the atmospheric air. Along the route of Lot 3.2 of Struma Motorway there are no permanent measurements points for the quality of the atmospheric air. The closest monitoring point is the automatic measuring station in the town of Blagoevgrad, in the yard of the National Institute of Meteorology and Hydrology – Bulgarian Academy of Science (Kyustendil branch). Blagoevgrad Automated Information System (AIS) carries out monitoring of the following controlled contaminants: FDP_{10}, (PAH), SO_2, NO_2/NO, C_6H_6 and O_3, standard set of meteorological parameters. The published Executive Environment Agency data shows that for the Blagoevgrad area fine dust particles (fine dust particles$_{10}$) are the most frequent contaminants whose value exceed the limit ones.

In administrative terms the route of Lot 3.2 of Struma Motorway falls within the territory of the Simitli Municipality and the Kresna Municipality.

Simitli Municipality

There is an industrial zone constructed in the town, which is on the territory of former barracks. The expectations of the Municipality are that different productions will be developed there

– metal processing, food industry, incl. confectionary, etc. Foreign investors has purchased large immovable assets from this industrial zone and investment projects are currently being prepared for the construction of new production capacities.

The enterprises on the territory of Simitli Municipality (Plan for development of the Simitli Municipality) are, as follows: - ORANOVO EOOD THE TOWN OF SIMITLI – coal mining. Oranovo mine extracts coals at the Oranovo section, which is a part of the Oranovo-Simitli sediment basin; - STRUMA METAL AD – producer of cold bent steel profiles, welded pipes and cold rolled steel coils; - ROSELA AD – production of early vegetables in greenhouses; - DYNAMIC TEX OOD – production of outer garments for women; - ODISEFS OOD – Production of sportswear; - M-MAXIMUM EOOD – production of sports and daily wear: blouses for women, men and children; trousers for women, children and men and other knitwear products; - SHARTBEVI ET – metal constructions, products made of metal, wood and wrought iron – fences, stairs, doors and facilities for children's playgrounds; - ET Ivo Toshev – Ivo Metal – it produces mixing plates for LPG car installations, nozzles for hydraulic hoses, any type of automat and entrenching tools; - VIATs EOOD 90% of the activity is production of shoe sheds; - ET Milan Sofi - glazing, frames, mirrors, aluminium window- and door-frames, commercial furniture, window shops, blinds, German PVC window- and door-frames Tissen; - FURNIR-PLAST OOD – production of veneer, plywood, laminar and sawed details for the furniture industry and other wood processing services; - Furnir Plast OOD implemtents the entire process of wood processing of wood for the obtaining of veneer; - Pirin Mine EAD – coal extraction; - Simstroy OOD – sale of ready-to-use concrete; - PK Macedonia – bakery, retail trade in and production of bread; - PEGO – Universal – bakery (former military unit); - Service station and car washes – 4 pcs.

Controlled facilities with emission measurement (in accordance with Ordinance No.1/2005) are, as follows: - asphalt plant of Pirinstoryengineering AD, which works on a seasonal basis and decrease of the emissions was established as a result from the putting into operation of a new asphalt mixing plant, with a purification facility – baghouse filters; a monthly sanction is currently imposed on Furnir plast EOOD; and – Rosela AD.

The trans-national pipeline to Greece passes through the territory of the municipality. The forthcoming construction of an automated gas-distribution station in the area of Simitli will have a favourable impact on the improvement of the quality of atmospheric air on the territory of the municipality. The direct costs for the production and the additional costs for limiting the harmful emissions upon the use of another type of fuel will be thereby decreased . The municipal budget will also be relieved by a decrease of the costs for heating of administrative buildings, schools, health institutions and other public buildings.

The gas stations on the territory of the municipality are set in conformity with the requirements for installation of facilities catching the petrol vapours (Phase I). The gas stations apeare set in conformity with Phase II of catching the petrol vapours.

In the winter heating season, the air contamination in the municipality is mainly due to households – for heating of residential and administrative buildings.

Kresna Municipality

The industry is secondary in the business structure of the Kresna municipality. The reasons for this are the insufficient manning, the production traditions of the population, the absence of rich raw material base in the area, etc. The intentions of Kresna municipality are related to priority

development of the tourism sector and rational use of the natural resources (Plan for development of the Kresna municipality).

The largest enterprise in the municipality is joint-stock company Energoremont-Kresna (170 people). The enterprise is created in 1971 as a foundry workshop, part of the Mir Industrial Plant in Blagoevgrad. Since 1977 the enterprise functions independently and a foundry workshop, steam heating station, electrical substation, etc. are gradually constructed. It is intended to produce details of carbon steels and steel alloys, tear-and-wear-resistant and grey cast iron, aluminium casts, etc. Marble processing is represented by the company "Greek Marble" and an enterprise with Greek participation in the village of Dolna Gradeshnitsa. Another enterprise operating in the town of Kresna is the enterprise for extraction and processing of natural stones ET Boyan Smilenov. The light-industry enterprises are mostly represented by dressmakers' workshops: - OF Tisata EOOD – dressmakers' enterprise for ready-made cloths for women and men, - ET Moda Actual – the town of Kresna, - Bulgarian-Greek Joint Limited Liability Company "Gentile" and workshops in Gorna Breznitsa and Slivnitsa.

The main environmental contaminants on the territory of the municipality are several production enterprises, road transport and households, some of them being controlled facilities with emission measuring (in accordance with Ordinance No.1/2005): - Energoremont Kresna AD makes its own periodical measurements in accordance with the conditions in the issued Complex Permit for, as follows: - dust content, sulphuric dioxide content, nitrogen oxide content, carbon oxide content, etc. in the emissions from the emitting devices from the foundry workshop and the metal melting furnaces, which show compliance with the limit rates; - Steam Boiler Plant in Alt Co AD running on natural gas performs its own periodical measurements that show compliance with the standards. The company has a greenhouse gas emission permit (GGEP); - Pellet plant ET Male Commerce – Iliyan Todoeov is found not to comply with the standards for admissible emissions with respect to the "dust" parameter, and a current monthly sanction has been imposed for that.

Other companies in the town of Kresna that contaminate the environment are the stone extraction and processing enterprise ET Boyan Smilenov (at the town exit in front of the railway station) and the metal scrap point of the company Paladiya OOD on the terrain of Toplivo AD in the town of Kresna, the companies Greek Marble EOOD and Bumar – the village of Dolna Gradeshnitsa, which emit mostly dust as a result from their production activity.

The gas stations on the territory of the municipality are set in conformity with the requirements for installation of facilities catching the petrol vapours (Phase I). The gas stations apeare set in conformity with Phase II of catching the petrol vapours.

One of the best natural routes for rafting all over Europe is located on the territory of the Simitli Municipality and the Kresna Municipality. Along Struma river valley in the Kresna Gorge there are several rafting sections with camps. Rafting is practiced in Struma for almost eight years but bases have only been constructed in the recent years thanks to several rafting clubs.

Own measurements along the route of the existing main road E79

Measurements of the condition of the atmospheric air in the scope of the route of main road E79 **(**own monitoring) were made in 2014 by a mobile automatic station in a road subsection of Lot 3.1 from km 368+840 to km 379+320, immediately before Lot 3.2 and after a count made in the section Krupnik – Kresna.

On the request of National Company Strategic Infrastructure Projects an examination was made of the quality of the atmospheric air by a mobile automatic station near the route of Struma

Motorway – Lot 3 (Blagoevgrad – Sandanski) under project BG161PO004-2.0.01-0019 (No.34/19 July 2013). The measurements were made for the purpose of making more precise the analysis after verification of the modelling for determination of the ground-level concentrations carried out by a model - **TRAFFIC ORACLE –** module **DIFFUSION.** The modelling base use was data for counts submitted by the Contracting Authority (National Company Strategic Infrastructure Projects) from points on road E79 in the section between the village of Krupnik and the town of Kresna for 19-20 September 2014 and for 20-21 September 2014.

The measurements (own monitoring) were carried out in 2014 at two points:

- At km 373+700 (new route of Struma Motorway) around existing residential buildings located 35 m and a hotel located 25 m away from main road I-79 in the direction of Oranovo quarter, before the exits for Simitli, and at road II-19 (Simitli-Razlog-Bansko). The average values of the measured concentrations, determined for two periods of 12 hours each, show: - increase of the average annual limit value of nitrogen oxides NOx (over and above the AALVPHH (average annual limit value for protection of human health) of 0.04 mg/m^3) is present in an area of about 25 – 30 m (Test report No.01-1570/30 September 2014); - there are no areas found with excessive concentrations in the ground-level air of fine dust particles$_{10}$ (over and above the AALVPHH of 0.05 mg/m^3) (Report No.01-1579/30 September 2014);

- At km 374+000 (new route of Struma Motorway) from the side of existing residential buildings of the quarter of Dalgata Mahala, about 25 m from main road I-1, away after the exit of road II-19 (Simitli-Razlog-Bansko). The average values of the measured concentrations, determined for two periods of 12 hours each, show: - no reported areas with excessive concentrations in the ground-level air for nitrogen oxides NOx (over and above the AALVPHH of 0.04 mg/m^3) (Test Report No.01-1571/30 September 2014); - no reported excessive concentrations in the ground-level air for fine dust particles$_{10}$ (over and above the AALVPHH of 0.05 mg/m^3) (Report No.01-1579/30 September 2014).

Sources of contamination of the atmospheric air related to the implementation of the investment proposal – during the construction and during the operation

Emissions in the construction of the road

Emissions in the construction of the road of options G20 blue/red

The excavation of land in the implementation of the route in accordance with the red option will cause the emission of dust, as follows: about 18 tones fine dust particles$_{2.5}$; about 183 tones fine dust particles$_{10}$; about 374 tones total suspended dust or a total of about 576 tones dust. The filling of land upon the implementation of the route in accordance with the red option will cause the emission of dust, as follows: about 20 tones fine dust particles$_{2.5}$; about 198 tones fine dust particles$_{10}$; about 402 tones total suspended dust or a total of about 619 tones dust. The landfilling of excessive land upon the implementation of the route in accordance with the red option will cause the emission of dust, as follows: about 2 tones fine dust particles$_{2.5}$; about 24 tones fine dust particles$_{10}$; about 48 tones total suspended dust or a total of about 74 tones dust.

The excavation of land in the implementation of the route in accordance with the blue option will cause the emission of dust, as follows: about 21 tones fine dust particles$_{2.5}$; about 215 tones fine dust particles$_{10}$; about 438 tones total suspended dust or a total of about 674 tones dust. The filling of land upon the implementation of the route in accordance with the blue option will cause the emission of dust, as follows: about 10 tones fine dust particles$_{2.5}$; about 95 tones fine dust

particles$_{10}$; about 193 tones total suspended dust or a total of about 298 tones dust. The landfilling of excessive land upon the implementation of the route in accordance with the blue option will cause the emission of dust, as follows: about 11 tones fine dust particles$_{2.5}$; about 107 tones fine dust particles$_{10}$; about 218 tones total suspended dust or a total of about 336 tones dust.

Emissions and ground-level concentrations upon the performance explosive works

The estimated volume of tunnel explosive works in the blue option will be about 290 000 m^3, and the total quantity of necessary explosives – about 350 tones. The estimated volume of tunnel explosive works in the red option will be about 250 000 m^3, and the total quantity of necessary explosives – about 300 tones. The anticipated number of explosions upon the performance of the tunnel works is about 1 200 times in the red option and about 1 400 times in the blue option. The explosive substance used will be oil-saltpetre blasting powder, the time interval between two explosions being at least 24 hours. The estimated single-explosion explosive substance is 250 kg explosive substance. The gases released per explosion will be about 250 m^3, of which toxic gases (CO and NOx) – 37 m^3 per explosion or about 29 500 litres CO and about 7 500 litres NOx.

The estimated volume of explosive works in the gorge in the blue option will be about 470 000 m^3, and the total quantity of necessary explosives – about 400 tones. The estimated volume of explosive works in the gorge in the red option will be about 400 000 m^3, and the total quantity of necessary explosives – about 340 tones. The expected number of explosions in the gorge is about 550 times in the red option and about 650 times in the blue option, as the explosive substance used will be ammonite 6, the time interval between two explosions being at least 48 hours. The estimated single-explosion explosive substance is 625 kg explosive substance, which is necessary for single-explosion volume of the explosive works of about 1 000 м^3. The gases released per one explosion will be about 500 m^3, of which toxic gases (CO and NOx) 75 m^3 per explosion or about 59 400 litres CO and about 15 600 litres NOx.

The graphical distribution of the designated zones around the tunnel exits in the blue option shows that in case of explosions made by the third shift and ventilation until morning-time (on a daily basis); about 250 kg/night explosive substance and ventilation through the south and north gates of the Kresna 1, Kresna 2 and Kresna 3 tunnel it is possible to affect the nearby located residential areas in the north and north-east part of the town of Kresna. In case of explosions made by the third shift and ventilation until morning-time (on a daily basis); about 250 kg/night explosive substance and ventilation through the north and south gates of the tunnel at Krupnik the closest residential areas in the village of Poleto and the village of Cherniche are not expected to be affected.

The graphical distribution of the designated zones around the tunnel exits in the red option shows that in case of explosions made by the third shift and ventilation until morning-time (on a daily basis); about 250 kg/night explosive substance and ventilation through the north and south gates of Kresna 1, Kresna 3 and the Tisata tunnel the nearby located residential areas in the north and north-east part of the town of Kresna are not expected to be affected. In case of ventilation through the north gate of Kresna 2 it is possible to affect the nearby located residential areas in the north-east part of the town of Kresna. In case of explosion of about 250 kg/night explosive substance and ventilation through the north and south gates of the Momina Skala tunnel the nearby located residential areas in the village of Poleto and the village of Cherniche are not expected to be affected.

Emissions in the construction of the road of options: east option G10.50 and east option G20

The excavation of land in the implementation of the route in accordance with east option G10.50 will cause the emission of dust, as follows: - about 24 tones fine dust particles$_{2.5}$; - about 242 tones fine dust particles$_{10}$; - 493 tones total suspended dust; - or a total of about 759 tones dust. The filling of land upon the implementation of the route in accordance with east option G10.50 will cause the emission of dust, as follows: - about 37 tones fine dust particles$_{2.5}$; - about 367 tones fine dust particles$_{10}$; - about 746 tones total suspended dust; - or a total of about 1 150 tones dust. The landfilling of excessive land upon the implementation of the route in accordance with east option G10.50 will cause the emission of dust, as follows: - about 17 tones fine dust particles$_{2.5}$; - about 17 tones fine dust particles$_{10}$; - about 167 tones total suspended dust; - or a total of about 524 tones dust.

The excavation of land in the implementation of the route in accordance with east option G20 will cause the emission of dust, as follows: - about 47 tones fine dust particles$_{2.5}$; - about 467 tones fine dust particles$_{10}$; - about 950 tones total suspended dust; - or a total of about 1 464 tones dust. The filling of land upon the implementation of the route in accordance with east option G20 will cause the emission of dust, as follows: - about 56 tones fine dust particles$_{2.5}$; - about 555 tones fine dust particles$_{10}$; - about 1 128 tones total suspended dust; - or a total of about 1 740 tones dust. The landfilling of excessive land upon the implementation of the route in accordance with east option G20 will cause the emission of dust, as follows: - about 26 tones fine dust particles$_{2.5}$; - about 264 tones fine dust particles$_{10}$; - about 538 tones total suspended dust; - or a total of about 828 tones dust.

Emissions and ground-level concentrations upon the performance of explosive works

The estimated volume of tunnel explosive works in east option G10.50 will be about 966 600 m^3, and the total quantity of necessary explosives – about 1 160 tones. The estimated volume of tunnel explosive works in east option G20 will be about 1 680 000 m^3, and the total quantity of necessary explosives – about 2 016 tones. The expected number of explosions upon the performance of the tunnel works is about 4 640 times in east option G10.50 and about 8 060 times in east option G20, as the explosive substance used will be oil-saltpetre blasting powder, the time interval between two explosions being at least 24 hours. The estimated single-explosion explosive substance is 250 kg explosive substance. The gases released per explosion will be about 250 m^3, of which toxic gases (CO and NOx) - 37 m^3 per explosion or about 29 500 litres CO and about 7 500 litres NOx.

The graphical distribution of the designated zones around the tunnel exits in east option G10.50 shows that in case of explosions made by the third shift and ventilation until morning-time (on a daily basis) of about 250 kg/night explosive substance and ventilation through the north gate of a tunnel at the quarter of Dalgata Mahala, it is possible to affect the nearby located residential areas in the south part of the quarter of Dalgata Mahala. In case of explosion of about 250 kg/night explosive substance and ventilation through the north and south gates of the tunnels at the village of Poleto, the village of Stara Kresna amd the village of Vlahi the residential areas in the village of Poleto, the village of Stara Kresna and the village of Vlahi are not expected to be affected.

The route of the right roadway of the bypass of the town of Kresna (after exiting the existing main road E79) in east option G10.50, coincides with the route of the right roadway of the G20-red

option, which is close to the town. The distribution of the ground-level concentrations upon the explosive works for the tunnels of the eastern bypass of the town of Kresna (after the existing E79) in east option G10.50 is analogical to the one for the G20-red option. The distribution of the tunnels along the left roadway of east option G10.50 coincides with one of east option G20 and only differs by the number of their tubes. The distribution of the ground-level concentrations upon the explosive works for the bi-tube tunnels under east option G20 will be with a double amount but is analogical as a quantity of explosive substance and ground-level concentrations to the above.

Emissions in the construction of the road of a long tunnel option

The excavation of land in the implementation of the road part of a long tunnel option will cause the emission of dust, as follows: about 4 tones fine dust particles$_{2.5}$; about 43 tones fine dust particles$_{10}$; about 90 tones total suspended dust or a total of about 137 tones dust. The filling of land upon the implementation of the road part of a long tunnel option will cause the emission of dust, as follows: about 22 tones fine dust particles$_{2.5}$; about 219 tones fine dust particles$_{10}$; about 444 tones total suspended dust or a total of about 685 tones dust. The landfilling of excessive land upon the implementation of the road part of a long tunnel option will cause the emission of dust, as follows: about 2 tones fine dust particles$_{2.5}$; about 20 tones fine dust particles$_{10}$; about 40 tones total suspended dust or a total of about 62 tones dust.

The excavation of land in the implementation of the route from the option of the route with a bi-tube tunnel will cause the emission of dust, as follows: about 21 tones fine dust particles$_{2.5}$; about 57 tones fine dust particles$_{10}$; about 567 tones total suspended dust or a total of about 1 777 tones dust. The filling of land upon the implementation of the option of the route with a bi-tube tunnel will cause the emission of dust, as follows: about 17 tones fine dust particles$_{2.5}$; about 175 tones fine dust particles$_{10}$; about 355 tones total suspended dust or a total of about 298 tones dust. The landfilling of excessive land upon the implementation of the option of the route with a bi-tube tunnel will cause the emission of dust, as follows: about 39 tones fine dust particles$_{2.5}$; about 392 tones fine dust particles$_{10}$; about 798 tones total suspended dust or a total of about 377 tones dust.

Emissions and ground-level concentrations upon the performance of explosive works

The estimated volume of tunnel explosive works in long tunnel option will be about 6 300 000 m^3, and the total quantity of necessary explosives – about 7 560 tones. The expected number of explosions upon the performance of the tunnel works is about 10 080 times, as the explosive substance used will be oil-saltpetre blasting powder or ammonite, the time interval between two explosions being at least 24 hours. The estimated single-explosion explosive substance is 750 kg explosive substance. The gases released per explosion will be about 750 m^3, of which toxic gases (CO and NOx) - 111 m^3 per explosion or about 88 500 litres CO and about 22 500 litres NOx. The simulations are carried out under the conditions of presumable free release of explosive gases (in the case of nitrogen oxide) under atmospheric pressure through the opening of one of the tunnel tubes after ventilation of working explosion section. The estimated single-explosion explosive substance is 750 kg explosive substance for the “Kresna” tunnel.

The graphical distribution of the designated zones around the tunnel exits in long tunnel option shows that in case of explosions made by the third shift and ventilation until morning-time (on a daily basis) of about 750 kg/night ammonite and ventilation through the north and south gates

of tunnels, it is expected to periodically affect the nearby located residential areas (the village of Poleto, and if a wind blows from the east – the south quarters of the town of Kresna too).

Emissions upon the performance of transportation activities related to the construction of different options

The transportation activities are related to the hauling-away of the respective quantities of land and rocks, determined in the design specifications for excavation and filling works in the construction of the roadways of the motorway. It is intended to use mostly dumpers and dumpcrete trucks with loading capacity of 20 tones and speed of movement of 40 km/hour. It is intended that each machine will make 8 courses per shift (two ways), as the work will be performed in two shifts – i.e. the working day will consist of 12 hours.

Emissions upon the performance of transportation activities related to the construction of options G20 blue and red

In the option solution – option G20 – red of 2015 it is intended to make a total of 417 792 courses, distributed, as follows: average machines – 193 courses per day, of which 50% passing through the village of Cherniche – E79 – the town of Simitli and about 50%, passing along E79 through Kresna. In the option solution – option G20 – blue of 2014 it is intended to make a total of 313 922 courses, distributed, as follows: - average machines – 145 pcs/day. When combining the route of the two options, due to the close numbers of the emissions the loading under option G20 – red was accepted.

Emissions upon the performance of transportation activities related to the construction in east option G10.50 and east option G20

Ground-level concentrations upon the performance of transportation activities under east option G10.50

It is accepted that the means of transport, which participate in the construction of the left roadway of east option G10.50 move along the servicing roads until their connection to a main road E79, and afterwards they enter it as additional traffic.

Upon the construction of the left roadway of east option G10.50 it is intended to make a total of 600 163 courses, distributed, as follows: - for construction sections No.1+No.2 - average machines – 317 courses per day; - for construction sections No.3+No.4+No.5 – 61 courses per day. It is accepted that the rehabilitation of the existing road E79 (construction section No.6) will require a total of 40,427 courses or 56 courses per day for 2 years rehabilitation.

Ground-level concentrations upon the performance of transportation activities under east option G20 – two roadways

It is accepted that the means of transport, which participate in the construction of east option G20 – two roadways move along the servicing roads until their connection to a main road E79, and afterwards they join its traffic it as additional traffic.

Upon the construction of the two roadways of east option G20 it is intended to make a total of 1 238 017 courses, distributed, as follows: - for construction sections No.1+No.2 - average machines – 656 courses per day; - for construction sections No.3+No.4+No.5 – 328 courses per day.

Emissions upon the construction of the road performance of transport activities related to the construction in a long tunnel option

The construction of a long tunnel option will be served mainly by main road E79 through the town of Kresna and through the town of Simitli. It is presumed that the tunnel will be constructed simultaneously through the two gates. The intensity of the transport traffic serving the construction

of a long bi-tube tunnel in this direction is conformed to the capacities of the envisaged Zheleznitsa landfill and Ilindentsi landfill.

Upon the construction of long tunnel option it is intended to make a total of 555 426 courses, distributed, as follows: - Road E79 – Krupnik – Zheleznitsa – 199 courses per day; - Road E79 - Kresna – Ilindentsi – 70 courses per day.

Evaluation of the impact on the atmospheric air and the climate factors in accordance with the norms and standards in effect in the country

Emissions in the period of operation

Two years of the submitted forecasts for the road traffic – 2030 and 2040 – are accepted as bases in the calculations and forecasts. The tables show the estimated percentage distribution of the car traffic for 2040, and as regards 2030 – only the distribution for nitrogen oxides is determined. The contaminants emitted from the exits of the tunnels along the motorway (including the so called "piston effect") are calculated with the help of Methodical guidelines for determination of the ventilation of road tunnels made available by the Contracting Authority.

For determination of the condition of the atmospheric air in territory around the route of Lot 3.2 of Struma Motorway published data from the Plan for development of the Simitli municipality and the Plan for Development of the Kresna municipality is used, as well as data from Own measurements along the route of the existing main road I-79. As a result from the analysis thereof a conclusion can be made that there is no published data in the area for the measurement of high background values of fine dust particles and nitrogen oxides, nor for excessive values of their ground-level concentrations. Excessive values of nitrogen oxides were only measured in the scope of main road I-79 in 2014, before the exits to Simitli and at road II-19 (Simitli-Razlog-Bansko). The measurements around the main road immediately before entry into the Kresna Gorge, which are carried out in the quarter of Dalgata Mahala, the town of Simitli show that there are not areas with reported excessive concentrations, either for the nitrogen oxide parameter and for fine dust particles.

Evaluation of the impact on the climate factors

The normal operation of the improved route of Lot 3.2 of Struma Motorway will be a source of emissions of harmful substances and greenhouse gases, as a result from the burnt gases released from the exhaust pipes of the motor vehicles. The forecast annual levels of emissions of greenhouse gases – carbon dioxide, methane and dinitrogen dioxide, compared to the base 2040, are determined in accordance with the length of the individual sections under options.

Emissions of greenhouse gases upon operation of G20-blue option

The route of option G20 – blue (design 2014) for Lot 3.2 of Struma Motorway starts at km 376+000, but for equal comparison to the other options of Lot 3.2 it is evaluated under the conditions of a beginning located in the end of Lot 3.1 at km 373+300 (before the town of Simitli). The total length of the three sections of the improved route of Lot 3.2 of Struma Motorway having a different clearance for G20-blue option are, as follows: - Section 1 (A29) with a length of 5.000 km; Section 2 (G20) with a length of 20.400 km; Section 3 (A29) with a length of 0.490 km. The total annual quantity of greenhouse gas emissions from Lot 3.2 of Struma Motorway – G20-blue option is 23 700 tones. The determined quantity of greenhouse gases from the motorway equivalent to carbon dioxide for the blue option is 24 230 tones.

Greenhouse gas emissions upon operation of G20-red option

The route of option G20 – red (design 2015) for Lot 3.2 of Struma Motorway starts at km 376+000, but for equal comparison to the other options of Lot 3.2 (e.g. east bypass starting from km 373+300), it is evaluated under the conditions of a beginning located in the end of Lot 3.1 - km 373+300 (before the town of Simitli). The total length of the three sections of the improved route of Lot 3.2 of Struma Motorway having a different clearance for the red option are, as follows: Section 1 (A29) with a length of 5.000 km; Section 2 (G20) with a length of 21.000 km; Section 3 (A29) with a length of 0.532 km. The total annual quantity of greenhouse gas emissions from Lot 3.2 of Struma Motorway – G20-red option is 21 290 tones. The determined quantity of greenhouse gases from the motorway equivalent to carbon dioxide for the red option is 24 830 tones.

Greenhouse gas emissions upon operation of east option G10.50

The design solution of east option G10.50 of 2016 proposes the performance of two separated independent roadways. As regards the right roadway it is intended to rehabilitate and strengthen the existing road E79 and to make an eastern bypass of the town of Kresna, and as regards the left roadway – a new project solution is envisages; two lanes – in an eastward direction far from the Kresna Gorge. The total length of the two roadways of east option G10.50 of Lot 3.2 from Struma Motorway having a different clearance is, as follows: Section 1 (G10.5) with a length of 3.200 km; Section 2 (additional lane) with a length of 8.700 km; Section 3 (G10.5) with a length of 15.172 km; Section 4 (rehabilitation of E79) with a length of 25.772 km. The total annual quantity of greenhouse gas emissions from Lot 3.2 of Struma Motorway – east option G10.50 is 24 154 tones. The determined quantity of greenhouse gases from the motorway in this section equivalent to carbon dioxide for the red option e 24 693 tones

Greenhouse gas emissions upon operation of long tunnel option

The long tunnel option passes through the Struma river where the existing road interchange for the village of Krupnik and the village of Cherniche is located. The passing though "Kresna" tunnel is from km 379+267 to km 394+605 (left tube) and from km 379+255 to km 394+600 (right tube). It is intended to construct the Kresna road interchange, after the exit of the "Kresna" tunnel. For the sake of completeness of the statement and in order to enable equal comparison to the other options of Lot 3.2 it is accepted that all options start at the same km 373+300 (before the town of Simitli) and end at the same road interchange after the town of Kresna. The total length of the three sections from the long tunnel option of Lot 3.2 from Struma Motorway are, as follows: Section 1 (A29) road part with a length of 5.960 km; Section 2 (G20) bi-tube tunnel with a length of 15.338 km left tube and 15.345 km right tube; Section 3 (A29) road part with a length of 2.900 km. The total annual quantity of greenhouse gas emissions from Lot 3.2 of Struma Motorway – long tunnel option is 22 756 tones. The determined quantity of greenhouse gases from the motorway in this section equivalent to carbon dioxide for the red option is 23 259 tones.

Greenhouse gas emissions upon operation of east option G20

The option includes a new route along a new terrain having clearance G20 with two roadways with two lanes each, ensuring the two traffic directions (Sofia – Republic of Greece and Republic of Greece – Sofia), in an eastward direction, through the construction of tunnels and viaducts. The total length of the two roadways of east option G20 of Lot 3.2 from Struma Motorway having a different clearance are, as follows: Section 1 (G20) with a length of 3.200 km; Section 2 (additional lane) with a length of 8.700 km; Section 3 (G20) with a length of 15.172 km. The total annual quantity of greenhouse gas emissions from Lot 3.2 of Struma Motorway – east option G20 is

24 780 tones. The determined quantity of greenhouse gases from the motorway in this section equivalent to carbon dioxide for the red option e 25 332 tones.

Impact

The impact in the operation with respect to the climatic changes would be positive or neutral and long-term, because it would on the one hand contribute to the greenhouse gas emissions (which will remain also in a zero option), but on the other hand the acceleration of the traffic in the area of the gorge (with the authorized speed of 80 km/hour), the good condition and the expansion of the roadway will contribute for optimizing the traffic through the Kresna Gorge.

The construction of such a facility of the communication-transport infrastructure may not cause considerable impacts and changes in climate, and for this reasons the analysis and evaluation of the impact on this environmental component is carried out in the form of stock-taking of greenhouse gases. However, this does not mean that the zero alternative, i.e. the preservation of the existing road E79 in its current state would bring about the discontinuation of the greenhouse gas emissions from the car transport in the area of the Kresna Gorge.

Evaluation of the impact on the atmospheric air in accordance with the norms and standards for admissible ground-level concentrations in effect in the country

The scope of evaluation of the impact includes: The territory falling within the envisaged design options of Lot 3.2 of Struma Motorway; The populated areas, near which the motorway passes, as well as the Territories, which excessive emissions from road traffic are likely to reach. In the conducted forecasting with modelling there were determined (as concentrations in the respective receptors at the points of approximation or crossing of residential areas) the potential possibilities and risk of exceeding the ground-level concentration limits for emitted contaminants (mainly nitrogen oxides) along the route of the motorway in the parts accepted for the various options.

Evaluation of the impact on the atmospheric air in the beginning of option G20 – blue/red (combined routes)

Part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2 of Struma Motorway from km 368+700 to km 378+000 – option G20 – blue/red

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2 -** option G20 – blue/red by the contaminants emitted by the motorway is high. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 25 to 45 m. In single residential buildings and residential areas from the quarter of Dalgata Mahala, the town of Simitli exceeding of the average annual limit value for protection of human life for nitrogen oxides is found (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 35 to 70 m given the forecasted traffic.

High significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route of **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2 -** option G20 – blue and option G20 – red (combined routes). Single

residential building and residential areas from the quarter of Dalgata Mahala, the town of Simitli are affected.

Evaluation of the impact on the atmospheric air along the route of option G20 – blue

Part I – Krupnik – Stara Kresna of Lot 3.2 of Struma Motorway from km 378+600 to km 388+000 – G20-blue option

Subsection I from km 378+600 to km 383+000 - G20-blue option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection I from part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-blue option by the contaminants emitted by the motorway is medium. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 35 to 50 m, and around the tunnel exits – in a zone of more than 100 m. Except for farm buildings and a single residential building, in the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 40 to 50 m given the forecasted traffic, and around the tunnel exits it exceeds 120 m.

Moderate significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection I from part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-blue option. Only farm buildings and a single residential building are affected.

Subsection II from km 383+000 to km 388+000 - G20-blue option-

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection II of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-blue option by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 35 to 75 m, and around the tunnel exits – in a zone from 90 to 150 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 40 to 90 m given the forecasted traffic, and around the tunnel exits it is in excess of 110 – 150 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection II of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-blue option**.**

Part II - Stara Kresna – Kresna of Lot 3.2 of Struma Motorway from km 388+000 to km 399+789 – G20-blue option

Subsection II1 from km 388+000 to km 394+500 - G20-blue option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection III of part II Stara Kresna - Kresna** of Lot 3.2 of Struma Motorway - G20-blue option by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 15 to 60 m, and around the tunnel exits – in a zone from 35 to 100 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 30 to 50 m given the forecasted traffic, and around the tunnel exits – from 35 to more than 100 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection III of part II Stara Kresna - Kresna** of Lot 3.2 of Struma Motorway - G20-blue option**.**

Subsection IV from km 394+500 to km 399+789 - G20-blue option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection IV from part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-blue option by the contaminants emitted by the motorway is high. The reported exceeding of the average annual limit value for protection of human health for nitrogen oxides n the selected year 2030, given the forecast traffic, is in a zone from 30 to 45 m, and around the tunnel exits – in a zone from 45 to 90 m. Within the territory of the north-east part of the residential zone of the town of Kresna, exceeding of the average annual limit value for protection of human life for nitrogen oxides is found (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 40 to 55 m given the forecasted traffic, and around the tunnel exits it is from 90 to 110 m.

High significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route of **IV from part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway – option G20 – blue. The north-east part of the residential zone of the town of Kresna, which is around the tunnel exits, is affected.

Evaluation of the impact on the atmospheric air along the route of G20-red option

Part I – Krupnik – Stara Kresna of Lot 3.2 of Struma Motorway from km 376+000 to km 388+500 – G20-red option

Subsection I from km 376+000 to km 383+000 - G20-red option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection I of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option by the contaminants emitted by the motorway is medium. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 35 to 40 m, and around the tunnel exits – in a zone from 45 to 50 m. Ezcept for single residential buildings, in the defined residential areas there is no reported exceeding of the average

annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 45 to 55 m given the forecasted traffic, and around the tunnel exits – from 90 to 100 m.

Moderate significance of the impact on the sites (receptors), the specified nearby located residential territories and/or areas around the route for **subsection I of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option. Only farming buildings and single residential buildings are affected.

Subsection II –- from km 383+000 to km 388+500 - G20-red option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection II of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 25 to 50 m, and around the tunnel exits – in a zone from 80 to 110 m. There is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) in the determined residential areas (given the forecast traffic for year 2040). The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 35 to 80 m given the forecasted traffic, and around the tunnel exits it is in excess of 120 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection II of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option**.**

Part II - Stara Kresna – Kresna of Lot 3.2 of Struma Motorway from km 388+500 to km 399+832 – option G20 – red

Subsection III–- from km 388+500 to km 394+500 - G20-red option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection III of part II Stara Kresna - Kresna** of Lot 3.2 of Struma Motorway - G20-red option by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 25 to 50 m, and around the tunnel exits – in a zone from 50 to 80 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 20 to 55 m given the forecasted traffic, and around the tunnel exits – from 60 to 90 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection III of part II Stara Kresna - Kresna** of Lot 3.2 of Struma Motorway - G20-red option**.**

Subsection IV from km 394+500 to km 399+832 - G20-red option

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection IV of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 20 to 70 m, and around the tunnel exits – in a zone from 30 to 100 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 25 to 90 m given the forecasted traffic, and around the tunnel exits it is from 100 to 120 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **IV from part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - G20-red option.

Evaluation of the impact on the atmospheric air along the route of east option G10.50

Part I Simitli– Mechkul/Krupnik of Lot 3.2 of Struma Motorway from km 373+300 to km 385+000 – east option G10.50

Upon performance of the modelling, part I Simitli – Mechkul/Krupnik from the route under consideration of Lot 3.2 of Struma Motorway from km 373+300 to km 385+000 is divided into two parts: subsection I left roadway (eastern bypass) and subsection II right roadway (existing road E79).

Subsection I - from km 373+300 to km 385+000 - east option G10.50

(left roadway)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of subsection I of part I Simitli– Mechkul/Krupnik of Lot 3.2 of Struma Motorway– east option G10.50, by the contaminants emitted by the motorway is medium. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 10 to 30 m. Except for two single residential buildings, in the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040 and due consideration being given to the cumulative effect in the areas falling between the left and the right roadway. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 15 to 40 m given the forecasted traffic.

Moderate significance of the impact on the sites (receptors), the specified nearby located residential territories and/or areas around the route for **subsection I of part I Krupnik– Stara Kresna** of Lot 3.2 of Struma Motorway - east option G10.50. Only two single residential buildings in the town of Simitli, which are between the left and the right roadway, are affected.

Subsection II –-from km 373+300 to km 383+000 – right roadway (existing road E79)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection II of part I Simitli - Krupnik** of Lot 3.2 of Struma Motorway - right roadway (existing road E79), by the contaminants emitted by the motorway is medium. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 10 to 15 m. Except for two single residential buildings, in the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040 and due consideration being given to the cumulative effect in the areas falling between the left and the right roadway. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 10 to 30 m given the forecasted traffic.

Moderate significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection I of part I Simitli - Krupnik** of Lot 3.2 of Struma Motorway - (existing road E79). Only two single residential buildings в the town of Simitli, which are between the left and the right roadway, are affected.

Part II Stara Kresna – Oshtava of Lot 3.2 of Struma Motorway from km 385+000 to km 395+000 – east option G10.50

Upon performance of the modelling, part II Stara Kresna – Oshtava from the route under consideration of Lot 3.2 of Struma Motorway from km 385+000 to km 395+000 is divided into two parts: subsection III left roadway (eastern bypass); and subsection IV right roadway (existing road E79).

Subsection III - from km 385+000 to km 395+000 –- east option G10.50 (left roadway)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of subsection III of part II Stara Kresna – Oshtava of Lot 3.2 of Struma Motorway– east option G10.5, by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 0 to 30 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 10 to 25 m given the forecasted traffic.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection III of part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway - east option G10.50.

Subsection IV north from km 383+000 to km 389+000 – right roadway (existing road E79)

Upon performance of the modelling, part II Stara Kresna – Oshtava from the...

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories in **subsection IV north of part II Stara Kresna - Oshtava** of Lot 3.2 of Struma Motorway - right roadway (existing road E79) by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 10 to 25 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 20 to 25 m given the forecasted traffic.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection IV of part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway - (existing road E79).

Subsection IV south from km 389+000 to km 394+000 – right roadway (existing road E79)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories в **subsection IV south of part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – right roadway (existing road E79), by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 10 to 20 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 20 to 30 m given the forecasted traffic.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection IV south of part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – (existing road E79).

Part III Oshtava – Kresna of Lot 3.2 of Struma Motorway from km 391+000 to km 400+372 – east option G10.50

Upon performance of the modelling, part III Oshtava – Kresna from the route under consideration of Lot 3.2 of Struma Motorway from km 391+000 to km 400+372 is divided into two parts: subsection V left roadway (eastern bypass) and - subsection VI right roadway (existing road E79).

Subsection V - from km 391+000 to km 400+372 – east option G10.50 (left roadway)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of subsection V of part III Oshtava – Kresna of Lot 3.2 of Struma Motorway– east option G10.50 by the contaminants emitted by the motorway is medium. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 10 – 40 m, due consideration being given to the cumulative effect with the right roadway. Except for a farm building adjacent to the road, in the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040 and due consideration being given to the cumulative effect in the areas falling between the left and the right roadway. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 25 to 80 m given the forecasted traffic.

Moderate significance of the impact on the sites (receptors), the specified nearby located residential territories and/or areas around the route for **subsection V of part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G10.50. Only a farm building adjacent to the road is affected.

Subsection VI - from km 390+000 to km 399+700 – right roadway (E79 with an eastern bypass of Kresna)

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **subsection VI of part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway - (E79 with an eastern bypass of Kresna), by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 20 to 85 m, due consideration being given to the cumulative effect with the left roadway (eastern bypass) and the tunnels. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 20 to 90 m given the forecasted traffic.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **subsection VI of part III Oshtava – Kresna** – right roadway (E79 with an eastern bypass of Kresna).

Evaluation of the impact on the atmospheric air along the route of a long tunnel option

Part I Simitli – Krupnik with "Kresna" tunnel from km 379+255 to km 394+600 of Lot 3.2 of Struma Motorway – long tunnel option

Upon performance of the modelling, part I Simitli – Krupnik with "Kresna" tunnel of Lot 3.2 of Struma Motorway covers not only the entry/exits of "Kresna" tunnel from km 379+255 to km 394+600, but also a road subsection (mainly along existing road E79) from km 373+300 to km

379+267/255. This section is also the beginning of long tunnel option for Lot 3.2. For the sake of completeness of the statement and in order to enable equal comparison to the other options of Lot 3.2 (e.g. an eastern bypass starting from km 373+300) the end of Lot 3.1 is also evaluated in its section passing through the town of Simitli.

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part I Simitli – Krupnik with "Kresna" tunnel** of Lot 3.1 / Lot 3.2 of Struma Motorway – long tunnel option, by the contaminants emitted by the motorway is high. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 25 to 45 m, and at the north gate of "Kresna" tunnel – to 270 - 340 m. In single residential buildings and residential areas of the town of Simitli exceeding of the average annual limit value for protection of human life for nitrogen oxides is found (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 35 to 100 m given the forecasted traffic.**).**

High significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route of **part I Simitli – Krupnik with "Kresna" tunnel** of Lot 3.1 / Lot 3.2 of Struma Motorway – long tunnel option. Single residential building and residential areas from the quarter of Dalgata Mahala, the town of Simitli are affected.

Part III Kresna – Slivnitsa with "Kresna" tunnel from km 379+255 to km 394+600 of Lot 3.2 of Struma Motorway – long tunnel option

Upon performance of the modelling, part III Kresna – Slivnitsa with "Kresna" tunnel of Lot 3.2 of Struma Motorway covers not only the entry/exits of "Kresna" tunnel from km 379+255 to km 394+600, but also a road subsection from km 394+600/605 to km 399+650. This section is also the end of long tunnel option for Lot 3.2. For the sake of completeness of the statement and in order to enable equal comparison to the other options of Lot 3.2 (e.g. an eastern bypass ending at km 400+372) the end of Lot 3.2 is also evaluated in its section passing by the town of Kresna.

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part III Kresna – Slivnitsa with "Kresna" tunnel** of Lot 3.2 of Struma Motorway – long tunnel option, by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 45 to 50 m, and around the south gate of "Kresna" tunnel- to 230 – 300 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 40 to 100 m given the forecasted traffic.

The closest inhabitable areas around this section at km 394+600 of the route of long tunnel option with the south gate of "Kresna" tunnel are a single building located at a distance of about 210-230 m from the exits of the tunnel and the residential areas of the town of Kresna – at about 340 – 350 m to the north/ north-east. When modelling the exit of "Kresna" tunnel at km 394+600 (with

forced vertical ventilation) and given about 3620 m of ventilated length through the exit of the tunnel, the zones with excessive concentrations for nitrogen oxides around the exit of the tunnel are about 100 – 130 m away. Upon ventilation of a half of the length of about 8000 m (interim air exchange point) through the exit of the tunnel – in a zone of about 160 – 200 m. In case of ventilation of the entire length (longitudinal ventilation system for 15400 m) through the exit of the tunnel without an interim air exchange point, the zones with excessive concentrations for nitrogen oxides around the exit of the tunnel are about 230 – 300 m away.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **part III Kresna – Slivnitsa with "Kresna" tunnel** of Lot 3.2 of Struma Motorway – long tunnel option.

Evaluation of the impact on the atmospheric air along the route of east option G20 – two roadways

Part I Simitli– Mechkul of Lot 3.2 of Struma Motorway from km 373+300 to km 385+000 – east option G20 – two roadways (four lanes)

The part being under consideration, and namely part I Simitli – Mechkul is located to the east of the Kresna Gorge and covers a route with a length of about 12.0 km – from km 373+300 to km 385+000.

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part I Simitli– Mechkul** of Lot 3.2 of Struma Motorway - east option G20 - two roadways (four lanes), by the contaminants emitted by the motorway is high. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 20 to 55 m. In single residential buildings and residential areas of the quarter of Dalgata Mahala and the Oranovo Quarter, the town of Simitli, exceeding of the average annual limit value for protection of human life for nitrogen oxides is found (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 35 to 70 m given the forecasted traffic.

High significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route of **part I Simitli– Mechkul** of Lot 3.2 of Struma Motorway – east option G20 – two roadways (four lanes). Affected are single residential buildings and residential areas of the quarter of Dalgata Mahala and Oranovo Quarter, the town of Simitli.

Part II Stara Kresna – Oshtava of Lot 3.2 of Struma Motorway from km 385+000 to km 395+000 – east option G20 – two roadways (four lanes)

The part being under consideration, and namely part II Stara Kresna – Oshtava of east option G20 – two roadways (four lanes) is located to the east from the Kresna Gorge and covers a route with a length of about 10.0 km – from km 385+000 to km 395+000.

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part II Stara Kresna – Oshtava** of east option G20 - two roadways (four lanes), by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 20 to

50 m, and around the tunnel exits – in a zone from 40 to 70 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 45 to 55 m given the forecasted traffic, and around the tunnel exits from 55 to 85 m.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **part II Stara Kresna – Oshtava** of east option G20 - two roadways (four lanes).

Part III Oshtava – Kresna of Lot 3.2 of Struma Motorway from km 391+000 to km 400+972 – east option G20 – two roadways (four lanes)

The part being under consideration, and namely part III Oshtava – Kresna is located to the east from the Kresna Gorge and covers a route with a length of about 10.0 km - from km 391+000 to km 400+972.

The extent of the impact on the sites (receptors), the specified nearby located inhabitable and/or residential territories and/or inhabitable zones around the route of **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G20 – two roadways (four lanes), by the contaminants emitted by the motorway is low. The reported exceeding of the average annual limit value for protection of human life for nitrogen oxides in the selected year 2040, given the forecast traffic, is in a zone from 25 to 45 m. In the defined residential areas there is no reported exceeding of the average annual limit value for protection of human health for nitrogen oxides (AALVPHH of 0.04 mg/m^3) given the forecast traffic for year 2040. The area with weighted average annual values of nitrogen oxides over and above the admissible limit values for protection of plants (limit value with a period of weighting of 1 year of 0.03 mg/m^3) is from 30 to 80 m given the forecasted traffic.

Low significance of the impact on the sites (receptors) in the specified nearby located residential territories and/or zones around the route for **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G20 – two roadways (four lanes).

Comparison of the options of Lot 3.2 of Struma Motorway in terms of significance of the impact as regards contamination of the atmospheric air (ground-level concentrations in sites subjects of impact)

The impact on the quality of the atmospheric air related to the construction of Lot 3.2 of Struma Motorway during the construction will be negative, short-term (6 years) and local, associated with the increase of the ground-level concentrations within the territory of the populated areas, due to the exhaust gases from the construction of the road, the construction and transportation equipment, the explosive works at the tunnels and the shaping of the bed of the road in the slope.

Comparison of the options of Lot 3.2 of Struma Motorway in terms of significance of the impact during construction

<u>Significance of the impact in option G20 – blue during construction</u>

Moderate significance of the impact in **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2** of Struma Motorway – option G20 – blue. During the transportation activities the

extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli.

Low significance of the impact in **part I – Krupnik – Stara Kresna** and in **subsection III** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – G20-blue option.

High significance of the impact in **subsection IV** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – option G20 – blue. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the town of Kresna. Upon conduction of the tunnel explosive works the extent of the impact is very high within the territory of the residential areas (high sensitivity receptors) of the town of Kresna.

The significance of the impact for **option G20 – blue** of Lot 3.2 of Struma Motorway during the construction is **Considerable**.

Significance of the impact in option G20 – red during construction

Moderate significance of the impact in **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2** of Struma Motorway – G20-red option. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around E79 of the quarter of Dalgata Mahala, the town of Simitli.

Low significance of the impact in **part I – Krupnik – Stara Kresna** and in **subsection III** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – G20-red option.

Moderate significance of the impact in **subsection IV** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – G20-red option. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the town of Kresna. Upon conduction of the tunnel explosive works, the extent of the impact is medium, within the territory of the residential areas (high sensitivity receptors) of the town of Kresna.

The significance of the impact for **G20-red option** of Lot 3.2 of Struma Motorway during construction is **Moderate.**

Significance of the impact in east option G10.50 during construction

Moderate significance of the impact in **part I Simitli– Mechkul/Krupnik of Lot 3.2** of Struma Motorway – east option G10.50. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli. Upon conduction of the tunnel explosive works the extent of the impact is high within the territory of the residential areas around road II-19 (medium sensitivity receptors) of the quarter of Dalgata Mahala.

Low significance of the impact in **part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – east option G10.50.

Moderate significance of the impact in **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G10.50. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the town of Kresna. Upon conduction of the tunnel explosive works, the extent of the impact is medium within the territory of the residential areas (high sensitivity receptors) of the town of Kresna.

The significance of the impact for **east option G10.50** of Lot 3.2 of Struma Motorway during construction is **Moderate**.

Significance of the impact in long tunnel option during construction

Moderate significance of the impact in **part I Simitli – Krupnik with "Kresna" tunnel of Lot 3.1 / Lot 3.2** of Struma Motorway – long tunnel option. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around E79 of the quarter of Dalgata Mahala, the town of Simitli. Upon conduction of the tunnel explosive works the extent of the impact is high within the territory of the residential areas (high sensitivity receptors) of the village of Poleto.

Moderate significance of the impact in **part III Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – long tunnel option. During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the town of Kresna. Upon conduction of the tunnel explosive works the extent of the impact is high within the territory of the residential areas (high sensitivity receptors) of the town of Kresna.

The significance of the impact for **long tunnel option** of Lot 3.2 of Struma Motorway during construction is **Considerable.**

Significance of the impact in east option G20 (two roadways) during construction

Moderate Significance of the impact in **part I Simitli– Mechkul/Krupnik of Lot 3.2** of Struma Motorway – east option G20 (two roadways). During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli. Upon conduction of the tunnel explosive works the extent of the impact is medium within the territory of the residential areas around road II-19 (medium sensitivity receptors) of the quarter of Dalgata Mahala.

Low significance of the impact in **part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – east option G20 (two roadways).

Moderate Significance of the impact in **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G20 (two roadways). During the transportation activities the extent of the impact is medium in the residential areas (medium sensitivity receptors) around road E79 of the town of Kresna.

The significance of the impact for **east option G20** (two roadways) of Lot 3.2 of Struma Motorway during construction is **Moderate**.

Comparison of the options of Lot 3.2 of Struma Motorway in terms of the significance of the impact during operation

Significance of the impact in option G20 – blue during operation

High significance of the impact in **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2** of Struma Motorway – option G20 – blue. During operation the extent of the impact is very high in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli.

Moderate significance of the impact in **part I – Krupnik – Stara Kresna** of Lot 3.2 of Struma Motorway – G20-blue option. During operation the extent of the impact is medium in farm buildings and a single residential building (low sensitivity receptors).

Low significance of the impact in **subsection III** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – option G20 – blue.

High significance of the impact in **subsection IV** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – option G20 – blue. During operation the extent of the impact is very high within the territory of the residential areas (high sensitivity receptors) of the town of Kresna.

The significance of the impact for **option G20 – blue** of Lot 3.2 of Struma Motorway during operation is **Considerable**.

Significance of the impact in option G20 – red during operation

High significance of the impact in **part 0 Common beginning Simitli – Cherniche of Lot 3.1/Lot 3.2** of Struma Motorway – option G20 – red. During operation the extent of the impact is very high in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli.

Moderate significance of the impact in **part I – Krupnik – Stara Kresna** of Lot 3.2 of Struma Motorway – option G20 – red. During operation the extent of the impact is medium in farm buildings and a single residential building (low sensitivity receptors).

Low significance of the impact in **subsection III** and in **subsection IV** of **part II Stara Kresna – Kresna** of Lot 3.2 of Struma Motorway – option G20 – red.

The significance of the impact for **option G20 – red** of Lot 3.2 of Struma Motorway during operation is **Considerable**.

Significance of the impact in east option G10.50 during operation

Moderate significance of the impact in **part I Simitli– Mechkul/Krupnik of Lot 3.2** of Struma Motorway – east option G10.50. During operation the extent of the impact is medium in two single residential buildings (medium sensitivity receptors) around road E79 in the town of Simitli.

Low significance of the impact in **part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – east option G10.50.

Moderate significance of the impact in **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G10.50. During operation the extent of the impact is medium in farm building adjacent to the road (low sensitivity receptors) around road Vlahi - Kresna.

The significance of the impact for **east option G10.50** of Lot 3.2 of Struma Motorway during operation is **Moderate**.

Significance of the impact in long tunnel option during operation

High significance of the impact in **part I Simitli – Krupnik with "Kresna" tunnel** of Lot 3.1 / Lot 3.2 of Struma Motorway – long tunnel option. During operation the extent of the impact is very high in the residential areas (medium sensitivity receptors) around road E79 of the quarter of Dalgata Mahala, the town of Simitli.

Low significance of the impact in **part III Kresna – Slivnitsa with "Kresna" tunnel** of Lot 3.2 of Struma Motorway – long tunnel option.

The significance of the impact for **long tunnel option** of Lot 3.2 of Struma Motorway during operation is **Considerable.**

Significance of the impact in east option G20 (two roadways) during operation

High significance of the impact in **part I Simitli – Mechkul"** of Lot 3.1/Lot 3.2 of Struma Motorway – east option G20 (two roadways). During operation the extent of the impact is very high in the residential areas (medium sensitivity receptors) of the quarter of Dalgata Mahala and Oranovo Quarter, the town of Simitli.

Low significance of the impact in **part II Stara Kresna – Oshtava** of Lot 3.2 of Struma Motorway – east option G20 (two roadways).

Low significance of the impact in **part III Oshtava – Kresna** of Lot 3.2 of Struma Motorway – east option G20 (two roadways).

The significance of the impact for **east option G20** (two roadways) of Lot 3.2 of Struma Motorway during operation is **Considerable**.

Preferred option for implementation of Lot 3.2 of Struma Motorway in terms of contamination of the atmospheric air – conclusion

The results from the establishment of the contamination of the atmospheric air, related to the exceeding of the respective limit values for protection of human health in case of inhabitable buildings and in residential areas (receptors), (including when cumulative effect is taken into account), show significance of the impact, as follows:

- for **option G20 – blue** of Lot 3.2 of Struma Motorway:
  - Significance of the impact during construction - **Considerable**;
  - Significance of the impact during operation - **Considerable.**

- for **option G20 – red** of Lot 3.2 of Struma Motorway:
  - Significance of the impact during construction - **Moderate**;
  - Significance of the impact during operation - **Considerable.**

- for **east option G10.50** of Lot 3.2 of Struma Motorway:
  - Significance of the impact during construction - **Moderate**;
  - Significance of the impact during operation - **Moderate.**

- for **long tunnel option** of Lot 3.2 of Struma Motorway:
  - Significance of the impact during construction - **Considerable**;
  - Significance of the impact during operation - **Considerable.**

- for **east option G20 (two roadways)** of Lot 3.2 of Struma Motorway:
  - Significance of the impact during construction - **Moderate**;
  - Significance of the impact during operation - **Considerable.**

Preferred option for implementation of Lot 3.2 of Struma Motorway in terms of contamination of the atmospheric air is **east option G10.50** with moderate/medium significance of the impact, as in accordance with the adopted methodology considerable impact during operation of the motorway is established in the other options.

Option G20 – red and **east option G20 (two roadways)** have moderate significance during the construction and high significance during operation. **Long tunnel option** and **option G20 – blue** have high significance during construction and operation.

Design Options for Lot 3.2 of the Struma Motorway with regards to climatic factors (greenhouse gas emissions)

The impact on climatic factors, related to the construction of **Lot 3.2 of the Struma Motorway** during construction works will be negative, short-time (only 6 years) and local, due to the waste gases from the construction and transport equipment, the blasting works in the tunnels and in the gorge, mainly due to the amount of greenhouse gas emissions.

The impacts on climate change during the operation of the Struma Motorway would be positive or neutral and long-term, since it would contribute to greenhouse gas emissions on one hand, yet on the other hand - the total or partial removal of traffic from the Kresna Gorge, the good condition and the several lanes of the roadway in one direction could contribute to optimizing traffic, which would in turn lead to a long-lasting positive effect, by reducing greenhouse gas emissions in the atmosphere from road transportation. The modernization of the communication and transport infrastructure would not have significant impacts and changes in the climate, therefore the impact analysis and assessment on this environmental component has been carried out in the form of an inventory of the greenhouse gas emissions during construction (transportation and blasting works) and during the full-time operation of the highway.

Impact under Option G20 - blue

The implementation of Option G20 - Blue in Lot 3.2 of the Struma Motorway, in approximately 6 years of construction time, will require about 313,922 transport courses (with load capacity of 20 tonnes). The carbon dioxide equivalent amount of greenhouse gas emissions for Option G20 - Blue in the time of construction will be 1,450 tonnes of equivalent CO_2 per year. The estimated volume of blasting works for the tunnels shall be about 350 tons of blasting/detonating powder and in the gorge - approximately 400 tons of blasting/detonating powder.

The carbon dioxide equivalent amount of greenhouse gas emissions for Option G20 - Blue in the operation of the Highway shall be 24,230 tonnes of equivalent CO_2 per year.

Impact under Option G20 - red

The implementation of Option G20 - Red in Lot 3.2 of the Struma Motorway, in approximately 6 years of construction time, would require approximately 417,792 transport courses (with load capacity of 20 tonnes). The carbon dioxide equivalent amount of greenhouse gas emissions for Option G20 - Red in the time of construction shall be 1,550 tonnes of equivalent CO_2 per year. The estimated volume of blasting works for the tunnels shall be approximately 300 tons of blasting/detonating powder and in the gorge - about 340 tons of blasting powder.

The carbon dioxide equivalent amount of greenhouse gas emissions for Option G20 - Red in the time of highway operation shall be 24,830 tonnes of equivalent CO_2 per year.

Impact under the Eastern Option G10.50

The implementation of Eastern Option G10.50 in Lot 3.2 of the Struma Motorway, in approximately 6 years of construction time, would require about 732,680 transport courses (with load capacity of 20 tonnes). The carbon dioxide equivalent amount of greenhouse gas emissions for the Eastern Option G10.50 in the time of construction shall be 1,900 tonnes of equivalent CO_2 per year. The estimated volume of blasting works for the tunnels shall be approximately 1,160 tons of blasting powder.

The carbon dioxide equivalent amount of greenhouse gas emissions for the Eastern Option G10.50 in the time of operation shall be **24,693** tonnes of equivalent CO_2 per year.

Impact under the Long Tunnel Option

The implementation of the Long Tunnel Option in Lot 3.2 of the Struma Motorway, in about 6 years of construction time, would require about 579,846 transport courses (with load capacity of 20 tonnes). The carbon dioxide equivalent amount of greenhouse gas emissions for the Long Tunnel Option in the time of construction shall be 1,500 tonnes of equivalent CO_2 per year. The estimated volume of blasting works for the tunnels shall be approximately 7,560 tons of blasting powder.

The carbon dioxide equivalent amount of greenhouse gas emissions for the Long Tunnel Option in the time of operation shall be **23,259** tonnes of equivalent CO_2 per year.

Impact under the Eastern Option G20 (two roadways)

For the implementation of the Eastern Option G20 (two roadways) in Lot 3.2 of the Struma Motorway, in about 6 years of construction time, will be necessary approximately 1,238,017 transport courses (with load capacity of 20 tonnes). The carbon dioxide equivalent amount of greenhouse gas emissions for the Eastern Option G20 in the time of construction shall be 2,200 tonnes of equivalent CO_2 per year. The estimated volume of blasting works for the tunnels shall be approximately 2,016 tonnes of blasting powder.

The carbon dioxide equivalent amount of greenhouse gas emissions for the Long Tunnel Option in the time of operation shall be **25,332** tonnes of equivalent CO_2 per year.

The results regarding the impact on climate factors, related to the emissions of greenhouse gases show that the five Options for the implementation of Lot 3.2 of the Struma Motorway during the construction and during the operation shall be **comparable** in terms of greenhouse gas emissions (their quantity, determined as carbon dioxide equivalent) . The exception is the **Long Tunnel Option,** due to the increased volume of blasting works during construction.

Atmospheric air –comparison of variants during construction

Atmospheric air					
During construction					
Criteria (pollution in settlements from transport operations and blasting works)	***Variant***				
	Variant G20 - Blue	**Variant G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	High (part 0) Low (part I) Low (part II) Very high during blasting works (part III)	High (part 0) Low (part I) Low (part II) Moderate during blasting works (part III)	Moderate during blasting works (part I) Low (part II) Moderate during blasting works (part III)	High during blasting works (part I) High during blasting works (part III)	Moderate during blasting works (part I) Low (part II) Moderate during transport (part III)
Territorial scope of impact:	Impact on **residential areas adjacent to E79 in the towns of Simitli** (part 0) and **Kresna** (part III). Probable impact on **residential areas in Kresna town during blasting works** (part III).	Impact on **residential areas adjacent to E79 in the towns of Simitli** (part 0) and **Kresna** (part III). Probable impact on **residential areas in Kresna town during blasting works** (part III).	Impact on **residential areas adjacent to E79 in the towns of Simitli** (part I) and **Kresna** (part III). Probable impact on **residential areas in Dalgata Mahala Neighborhood (**part I) **and Kresna town during blasting works** (part III).	Impact on **residential areas adjacent to E79 in the towns of Simitli** (part I) and **Kresna** (part III). Probable impact on **residential areas in Poleto village (**part I) **and Kresna town during blasting works** (part III).	Impact on **residential areas adjacent to E79 in the towns of Simitli** (part I) and **Kresna** (part III). Probable impact on **residential areas in Dalgata Mahala Neighborhood (**part I) **during blasting works.**
Duration of impact:	**Short**	**Short**	**Short**	**Short**	**Short**
Frequency of impact:	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure
Consequences:	**Negative**	**Negative**	**Negative**	**Negative**	**Negative**

Cumulative impacts:	With traffic on **existing E79 without completed MW**	With traffic on **existing E79 without completed MW**	With traffic on **existing E79 without completed MW**	With traffic on **existing E79 without completed MW**	With traffic on **existing E79 without completed MW**
Significance of impact	**Significant**	**Moderate/ median**	**Moderate/ median**	**Significant**	**Moderate/ median**

Atmospheric air –comparison of options during operation

Atmospheric air					
During operation					
Criteria (pollution in settlements)	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	Very high (part 0) Moderate (part I) Low (part II) High (part III)	Very high (part 0) Moderate (part I) Low (part II) Low (part III)	Moderate (part I) Low (part II) Moderate (part III)	Very high (part I) Ниска (част III)	Very high (part I) Low (part II) Low (part III)
Territorial scope of impact:	Affected **buildings and residential areas in the town of Simitli** (part 0). Affected **single buildings** (part I). Affected **residential area in the town of Kresna**	Affected **buildings and residential areas in the town of Simitli** (part 0). Affected **single buildings** (part I).	Affected **two single buildings** in the town of Simitli (part I). Affected **farmhouse** on the roadside (part III).	Affected **buildings and residential areas in the town of Simitli** (part I).	Affected **buildings and residential areas in the town of Simitli** (part I)
Duration of impact:	Long- term	Long- term	Long- term	Long- term	Long- term
Frequency of impact:	Continuous	Continuous	Continuous	Continuous	Continuous

Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None expected	None expected	None expected	None expected	None expected
Significance of impact	**Significant**	**Significant**	**Moderate/ median**	**Significant**	**Significant**

Climate factors – comparison of options during construction and operation

Climate factors					
During construction and during operation					
Criteria (greenhouse gas emissions by construction vehicles, blasting works and during operation)	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	**313 922** journeys during construction and **350+400** tons of explosives; **24 230** t CO_2 e/a during operation	**417 792** journeys during construction and **300+340** tons of explosives; **24 830** t CO_2 e/a during operation	**732 680** journeys during construction and **1 160** tons of explosives; **24 693** t CO_2 e/a during operation	**579 846** journeys during construction and **7 560** tons of explosives; **23 259** t CO_2 e/a during operation	**1 238 017** journeys during construction and **2 016** tons of explosives; **25 332** t CO_2 e/a during operation
Territorial scope of impact:	Local, within the scope of **Kresna Gorge**.	Local, within the scope of **Kresna Gorge**.	Local, **½** within the scope of **Kresna Gorge** and **½ in the low mountainous area to the east**	Local, on both sides of **Kresna Gorge**	Local, within the scope of **the low mountainous area to the east of Kresna Gorge**

Duration of impact:	**Short-term (6 years)**	**Short-term (6 years)**	**Short-term (6 years)**	**Short-term (6 years)**	**Short-term (6 years)**
Frequency of impact:	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure	**Periodic/transient** during construction of the facility and associated road infrastructure
Consequences:	**Negative**	**Negative**	**Negative**	**Negative**	**Negative**
Cumulative impacts:	Around existing E79 **in the towns of Simitli and Kresna** due to transportation activities during construction.	Around existing E79 **in the towns of Simitli and Kresna** due to transportation activities during construction.	Around existing E79 **in the towns of Simitli and Kresna** due to transportation activities during construction.	Around existing E79 **in the towns of Simitli and Kresna** due to transportation activities during construction.	Around existing E79 **in the towns of Simitli and Kresna** due to transportation activities during construction.
Significance of impact	**Moderate/ median**	**Moderate/ median**	**Moderate/ median**	**Significant**	**Moderate/ median**

According to the approved point scoring system for option selection, the preferred east option G10.50 receives 5 points. Option G20 – red and East Option G20 receive 4 and 3 points, respectively. The fourth ranking option with 2 points is the long tunnel option, and the fifth ranking one is Option G20-blue with 1 point. Section X Comparative table for selection of construction option of the Report presents in tabulated format the points assigned to each of five proposed project options by individual environmental and health components and factors.

7.2. Surface and ground waters

Summary of hydrological and hydrogeological status of water resources in the investment proposal region.

The region of the Investment Proposal (IP) for **Upgrade of Lot 3.2 of Struma MW** is in the scope of West Aegean River Basin Management Directorate headquartered in Blagoevgrad and responsible for ensuring compliance of water status and use with statutory requirements.

Baseline data on the status of surface and ground waters is derived from up-to-date documents defining integrated water management in the region and, more specifically, West Aegean River Basin Management Plan (2016-2021) and National Program of implementation measures adopted by Government Decision No. 1108 dated 29.12.2016, and West Aegean Flood Risk Management Plan (2016-2021) and National Programs of implementation measures adopted by Government Decision No. 1105 dated 29.12.2016.

On the basis of water legislation, the aforementioned plans and the level of completeness of the information provided by the Contracting Authority, assessment is made of IP impact on the status of surface and ground waters and the option entailing least impact on waters is recommended.

In this part of its course, the river Struma accepts several small tributaries due to the relatively limited area of associated catchments albeit with highly variable flows related to the strong dependency on the snow cover in Pirin Mountain.

Mainly left tributaries of Struma River are affected.

The investment proposal will not generate substantial quantities of industrial waste waters. Contaminated waters will be generated predominantly in the period of construction and then mainly during tunnel boring, and the said water quantities will be used for dust suppression during drilling of boreholes for explosives and also for dust suppression after blasting.

Vehicle washing, where required, before access to the republican road network (RRN) should also be considered.

Water pollution by the above activities will be mostly mechanical (undissolved substances) Замърсяването на водите, от горните дейности, ще е основно с механични примеси (неразтворени вещества) - rock particles, as well as petroleum products from construction equipment and vehicles.

Technological needs will be met by closed cycle waters.

During operation, waste waters will only be generated at recreation areas from sewage and in tunnels – from periodic washing and waters used in emergencies such as firefight and cleaning after major car accidents.

Surface waters

The Investment Proposal (IP) for **„Upgrade of Lot 3.2 of Struma MW** is located in the middle section of Struma riverbed, in the region of crossing the Kresna Gorge – in the section between the towns of Simitli and Kresna. There, it accepts several tributaries subject to impacts of various magnitudes under different options.

In north-south direction, in the IP region flow tributaries of Struma River, as follows: red tributaries: the rivers Sushichka, Divilska, Breznishka (Stara), and left- the rivers Gradevska, Brezhanska (Rezena), Ludata, Mechkulska, Dyavolska (Oshtavska), Vlahinska.

Right tributaries in IP region are not subject to direct impact, hence these are shown for information only.

Table No. 7.2-1 presents data of these surface water bodies, and figure No. 7.2-1 shows their locations relative to IP. All water bodies within IP scope are designated as "rivers". No water bodies are designated as artificial, and only one is designated as heavily modified water body.

Table No. 7.2-1: Surface water bodies located in IP region.

Surface waterbody code	**Type code**	**Type name**	**HMWB**	**River length, km**	**Catchment area, km^2**	**Geographic description of surface water body**
BG4ST500R1048	R5	Semi-mountainous rivers	no	23,88	172,04	River Struma from confluence point of Stara Reka to confluence point of the *river Sushichka* * **(probably meaning Oshtavska River)**
BG4ST500R053	R14	Sub-Mediterranean rivers	no	19,90	62,95	**(R)** Sushichka river from springs to confluence point with Struma River
BG4ST500R1052	R5	Semi-mountainous rivers	no	12,02	66,98	**(L)** Gradevska river from confluence point of Osenovska river to confluence point with Struma River
BG4ST500R054	R14	Sub-Mediterranean rivers	no	14,47	35,71	**(L)** Brezhanska river from springs to confluence into Struma River
BG4ST500R055	R14	Sub-Mediterranean rivers	no	8,96	14,22	**(L)** Ludata river from springs to confluence into Struma River
BG4ST500R1056	R3	Mountainous rivers	no	17,76	70,41	**(L)** Oshtavska (Dyavolska) river from altitude 1510 m to confluence with Struma River
BG4ST500R059	R3	Mountainous rivers	no	18,17	76,27	**(L)** Vlahinska river from point of confluence of Sinanishka River to confluence with Struma River

BG4ST500R060	R14	Sub-Mediterranean rivers	no	11,81	49,68	**(R)** Breznishka river from springs to confluence into Struma River
BG4ST500R057	R5	Semi-mountainous rivers	yes	19,30	148,74	Struma River from confluence point of Oshtavska river to confluence point of Belishka (Shashka) river.

Remarks: * In our opinion, the geographic description should read: *River Struma from confluence point of Stara Reka to confluence point of the river Oshtavska*, nevertheless, the name used in 2016=2021 RBMP will be used in this text, for consistency with the master document.

(R) – right tributary of the river Struma, with no or negligible significance for IP realization.

(L) – left tributary of the river Struma affected by east options.

The pressures on surface waters were identified by the model "Driver- Pressure- Status- Impact – Response" (DPSIR).

Pressure categories include:

- Pressure from point pollution sources;
- Pressure from diffuse pollution sources;
- Pressure from physical changes /hydromorphological pressure;
- Pressure from climate changes

In this case, diffuse impact from vehicles is important *(*data also derived from RBMP of EARBD 2016-2021).*

The said impact is identified as *load from vehicle traffic (motorways and first class roads) in the catchment of the surface water body expressed in kg/a.* **Based on data from scientific „Investigation and impact assessment of diffuse pollution sources on surface water status"(MEW), the competent authority, WERBD assumes that available data is insufficient and this pressure will not be considered.**

Regardless of the above statement, for general information purposes, the approach to evaluating vehicle traffic pollution is presented.

For quantification and assessment of traffic impact, Project "Diffuse emission in waters in E-PRTR (European register of emissions and transfer of pollutants)"and "Approach to processing of information from diffuse pollution sources o surface waters" were used.

Sources of diffuse pollution from road traffic (transport) include worn tires, worn brakes and motor oil leaks which release emissions of heavy metals and polycyclic aromatic hydrocarbons (PAH).

Deterioration of road cover is another diffuse source of pollution from traffic, which is not included in emission calculations on account of the fact that PAH emission are low (the top layer consists mainly of asphalt, mixture of > 95% mineral components (rock, sand and filler) and binder (<5%)) as opposed to PAH emissions from motor oil leaks and worn-out tires.

The main part of emission from vehicle traffic on motorways and rural roads enter the soil, and only a small part is discharged directly into surface waters. Project "Diffuse emission in waters in E-PRTR differentiates between surface waters and soils on the basis of

surface waters/soils ratio in the countries. As this ratio for Bulgaria is 0.96% or 0.0096 part, it is assumed to be the share of pollutants discharged in surface waters.

Traffic is the main source of soil and water pollution with petroleum products and hydrocarbons as well as with their degradation products.

Another source of impact and pollution from transport development deforestation along railways and roads with various type of pesticides.

Water protection areas

Water Framework Directive 2000/60/EC (WFD) and the Water Act (WA) define as particularly important, inter alia, compliance with regimes (bans and limitations) in water protection areas which may be identified as priority receptors.

Such water protection areas are defined in art. *119a WA*.

IP scope does not include areas designated for the abstraction of water intended for human consumption (including sanitary safety belts), areas designated as bathing waters, bodies of water designated as recreational waters and/or sports, areas designated for the protection of economically significant fish and other aquatic species, areas designated as nitrate-vulnerable zones.

The area of Struma River from the point of confluence of Dzherman River to the road bridge at Krupnik village is designated as sensitive.

IP region includes the following NATURA 2000 sites for protection and preservation of nature habitats and wild flora and fauna and for protection of wild birds, designated for achievement of the objectives set in art. 2, and pursuant to art. 12, par 6 with reference to art. 6, par 1, pp. 1-4 of the Biodiversity Act:

- BG0002003 „Kresna" for protection of wild birds designated by Order No. RD - 748 /24.10.2008 (SG # 97/2008) of the Minister of Environment & Waters;
- Protected Area BG0000366 „Kresna – Ilindentsi" for preservation of natural habitats and wild flora and fauna included in the list of protected areas approved by the Council of Ministers with Decision No. 122/02.03.2007 (SG #21/2007), as amended by Government Decision No. 811/2010 (SG #96/2010).

In consideration of the specifics of the said areas, we assume that conclusions concerning said areas in the special sections of *this report* as well as the conclusions in the *Impact Assessment Report* should be regarded as core for the protection of those areas.

Surface water status

The status of a surface water body is controlled on the basis of surface water monitoring – surveillance, operating, investigative, proprietary monitoring and RIEW monitoring of facilities discharging waste waters.

Surface water bodies of the min river Struma have poor and moderate status, and those forming the left catchment of the river are of good status.

Environmental objectives

Environmental objectives for surface water bodies in the region of the investment proposal for the period 2016 – 2021 are presented in table No. 7.2-2 along with measures for achievement thereof.

Table No. 7.2-2: Environmental Status/Potential and Chemical Status Objectives

Updated waterbody code	WB Name	Environmental status/potential 2015	Quality elements failing good environmental status/potential	Environmental status OBJECTIVE	Environmental status OBJECTIVE – Timeline	Chemical status (CS) 2015	Chemical status OBJECTIVE	Chemical status OBJECTIVE – Timeline
BG4ST500R053	Sushichka river from springs to confluence point with Struma River	**Good status**		Maintain good status and prevent deterioration	2015	**Unknown status**	Achieve good chemical status	2021
BG4ST500R054	Brezhanska river from springs to confluence into Struma River	**Good status**		Maintain good status and prevent deterioration	2015	**Unknown status**	Achieve good chemical status	2021
BG4ST500R055	Ludata river from springs to confluence into Struma River	**Good status**		Maintain good status and prevent deterioration	2015	**Good status**	Maintain good chemical status and prevent deterioration	2015
BG4ST500R057	Struma River from confluence point of Oshtavska river to confluence point of Belishka (Shashka) river	**Moderate potential**	BQE – MZB, PB, MP and Fish and main PC elements- dissolved O_2, N total, P-PO_4, P total	Achieve good potential of failed elements	2021	**Unknown status**	Achieve good chemical status	2021
BG4ST500R059	Vlahinska river from point of confluence of Sinanishka River to confluence with Struma River	**Moderate status**	BQE – MZB, PB and Fish;	Achieve good status of failed elements	2027	**Unknown status**	Achieve good chemical status	2021
BG4ST500R060	Breznishka river from springs to confluence into Struma River	**Good status**		Maintain good status and prevent deterioration	2015	**Unknown status**	Achieve good chemical status	2021

BG4ST500R1048	River Struma from confluence point of Stara Reka to confluence point of the river Sushichka	**Poor status**	BQE – MZB, PB, MP and Fish and main PC elements - pH, BPK5, N-total, P-PO_4, P total;	Achieve good status of failed elements	2027	**Unknown status**	Achieve good chemical status	2021
BG4ST500R1052	Gradevska river from confluence point of Osenovska river to confluence point with Struma River	**Good status**		Maintain good status and prevent deterioration	2015	**Unknown status**	Achieve good chemical status	2021
BG4ST500R1056	Oshtavska (Dyavolska) river from altitude 1510 m to confluence with Struma River	**Unknown status**		Achieve good environmental status	2021	**Unknown status**	Achieve good chemical status	2021

Areas at risk from floods

Development of 2016-2021 Flood Risk Management Plan for West Aegean River Basin includes section on identification of regions at potentially high flood risk. These are designated in compliance with the requirements of art. 146d WA. The regions at potentially high flood risk were designated by **Order RD-05-91/ 15.08.2013 of WERBD Director and approved by Order RD-746 / 01.10.2013 of the Minister of Environment & Waters.**

On West Aegean Region territory, adverse impact of waters has caused substantial material damage and human casualties. Major flood in IP region were registered in 1955 – by Vlahina River, and in 1915, 1954 rand 1975 - by Oshtavska River.

Table No. 7.2-3 presents description of affected RPHFR relative to proposed IP options.

Table No. 7.2-3: Regions at potentially high flood risk

RPHFR code	RPHFR Name	Settlement	Risk level
BG4_APSFR_ST_03	Struma River and tributaries at Kresna Town	Kresna	high
BG4_APSFR_ST_04	Struma River and tributaries from Simitli to Cherniche Village	Simitli Krupnik Poleto Cherniche	high

Ground waters

Investment Proposal for **Upgrade of Lot 3.2 of Struma MW** affects ground water bodies (GWB) predominantly in areas with deeper excavations and during tunnel boring. In both cases the impact may be assessed as insignificant on account of the specifics of IP region- relatively deep cut bed of the river Struma and associated hydrographic network in the region forming Kresna Gorge. Hence, the very river and its tributaries in that section adequately drain ground waters from its left and right banks. Furthermore, lithological characteristics of the strata forming the banks consist of magma and metamorphic formations with low filtration capacity where mostly fissure ground waters circulate. The specific and strongly expressed seismic-tectonic reshaping of the region further contributes to good strata draining.

Ground water bodies affected by the investment proposal are presented in table No. 7.2-4.

These groundwater bodies form in the middle course of the river Struma and, more specifically, are components of the hydrogeological systems in Simitli valley and Sandanski basin, and the mountain ranges of Pirin and Vlahina in between.

Table No. 7.2-4: Ground water bodies affected by IP realization:

GWB type	GWB name	GWB code	Total GWB area, km^2	Uncovered area , km^2	Covered area, km^2
Water bodies in alluvial sediment	Quaternary porous aquifers – Kresna- Sandanski formation	BG4G000000Q002	123,34	123,34	0

of rivers	Quaternary porous aquifers – Simitli	BG4G000000Q003	16,02	16,02	0
Water bodies in ridge-like depressions	Neogene porous aquifers - Sandanski	BG4G000000N012	632,33	513,66	118,67
	Neogene porous aquifers - Simitli	BG4G000000N013	69,24	53,22	16,02
Water bodies with fissure waters	Aquifers in fissures of Pirin formation	BG4G1PzC2Pg019	1118,71	936,98	181,73
	Aquifers in fissures in Vlahina-Orgrazhden- Maleshevsko-Osogovo metamorphyte formation	BG4G001PtPz125	3089,90	2357,99	371,91

The investment proposal has no impact on transboundary ground water bodies.

The approach used for estimation of pressures on ground waters is similar to the method described for surface waters.

Identified significant impacts on groundwater bodies' status are generally similar to the impact on surface waters. Pollution sources include point, diffusion, abstraction and climate changes.

Chemical status assessment is based on monitoring results, and in regard to quantitative status, the pressure identified as significant is any abstraction or group of abstractions in a given region where the operational index (the ratio of total abstraction from GWB/part of GWB and available resources ratio) exceeds 40 %

The assessment of groundwater bodies at risk from point and diffuse pollution sources (chemical status risk) and quantitative status is presented in tables No. No. 7.2-5 and 6.

Table No. 7.2-5

Groundwater body code	**Groundwater body name**	**Area of potential impact by diffuse sources as % of uncovered GWB area**	**Area of potential impact by point sources as % of uncovered GWB area**	**Established exceedances of quality standards in ground waters based on analysis of monitoring results GWB**	**General risk assessment for chemical status**
BG4G00000Q002	Quaternary porous aquifers – Kresna-Sandanski formation	80,58	20,67	-	**At risk**
BG4G00000Q003	Quaternary porous aquifers – Simitli	69,31	26,09	-	**Not at risk**
BG4G00000N012	Neogene porous aquifers - Sandanski	65,54	4,32	-	**Not at risk**
BG4G00000N013	Neogene porous aquifers - Simitli	34,86	0,72	-	**Not at risk**

BG4G1PzC2Pg019	Aquifers in fissures of Pirin formation	7,18	0,53	-	**Not at risk**
BG4G001PtPz125	Aquifers in fissures in Vlahina-Orgrazhden-Maleshevsko- Osogovo metamorphyte formation	26,31	0,08	-	**Not at risk**

Таблица No. 7.2-6

Groundwater body code	**Groundwater body name**	**Natural resources, l/s**	**Necessary quantities for ecosystems, l/s**	**Available resources, l/s**	**Permitted average annual flow rates [l/s]**	**Operational index [%]**
BG4G000000Q002	Quaternary porous aquifers – Kresna-Sandanski formation	276	43,6	232,4	33,0905	14,24
BG4G000000Q003	Quaternary porous aquifers – Simitli	61	5,2	55,8	54,604	97,86
BG4G000000N012	Neogene porous aquifers - Sandanski	93	0	93	30,642	32,95
BG4G000000N013	Neogene porous aquifers - Simitli	12	0	12	7,3	60,83
BG4G1PzC2Pg019	Aquifers in fissures of Pirin formation	446	68,8	377,2	88,283	23,41
BG4G001PtPz125	Aquifers in fissures in Vlahina-Orgrazhden- Maleshevsko- Osogovo metamorphyte formation	956	101,6	854,4	73,399	8,59

Water protection areas

Ground waters affected by the investment proposal options represent protected areas of groundwater intended for human use. The only exception is groundwater body with code BG4G000000N012 and name Neogene porous aquifers - Sandanski.

According to available information different options impact two sanitary security zones, one potable water abstraction source – Simitli Pumping Station, and sanitary security belts of mineral water sources – public municipal property "Oshtava- Hladka Banya".

Status of groundwater bodies

General assessment of the status of groundwater bodies is based on monitoring results. The assessment is made by comparing final assessments of chemical and quantitative status of GWB. The worse of the two assessments is considered definitive and leading for the overall status of each body of groundwater.

The status of groundwater bodies subject to impact by investment proposal options is presented in table No. 7.2-7.

Table No. 7.2-7.

GWB name	GWB code	Chemical status	Quantitative status	General status of GWB
Quaternary porous	BG4G000000Q002	GOOD	POOR	POOR

aquifers – Kresna-Sandanski formation				
Quaternary porous aquifers – Simitli	BG4G000000Q003	GOOD	POOR	POOR
Neogene porous aquifers - Sandanski	BG4G000000N012	GOOD	GOOD	GOOD
Neogene porous aquifers - Simitli	BG4G000000N013	GOOD	GOOD	GOOD
Aquifers in fissures of Pirin formation	BG4G1PzC2Pg019	GOOD	GOOD	GOOD
Aquifers in fissures in Vlahina-Orgrazhden-Maleshevsko-Osogovo metamorphyte formation	BG4G001PtPz125	GOOD	GOOD	GOOD

The status of protected areas of groundwater bodies is defined as good.

Environmental objectives for groundwater bodies

The objectives for the general status of groundwater bodies subject to impact by investment proposal options are presented in table No. 7.2-8.

Table No. 7.2-8.

GWB name	**GWB code**	**Objective for general status of GWB acc. to 2016-2021 RBMP**	**Deadline for achievement**	**Quantitative status objective and deadline for achievement**		**Chemical status objective and deadline for achievement**	
Quaternary porous aquifers – Kresna-Sandanski formation	BG4G00000Q002	Prevent deterioration	Less stringent objective	Prevent deterioration of quantitative status	Less stringent objective	Maintain good chemical status	2015
Quaternary porous aquifers – Simitli	BG4G00000Q003	Achieve good status	2021	Achieve good quantitative status	by 2021	Maintain good chemical status	2015

Neogene porous aquifers - Sandanski	BG4G00000N012	Maintain good status	2015	Maintain good quantitative status	2015	Maintain good chemical status	2015
Neogene porous aquifers - Simitli	BG4G00000N013	Maintain good status	2015	Maintain good quantitative status	2015	Maintain good chemical status	2015
Aquifers in fissures of Pirin formation	BG4G1PzC2Pg019	Maintain good status	2015	Maintain good quantitative status	2015 г.	Maintain good chemical status	2015
Aquifers in fissures in Vlahina-Orgrazhden-Maleshevsko- Osogovo metamorphyte formation	BG4G001PtPz125	Maintain good status	2015	Maintain good quantitative status	2015 г.	Maintain good chemical status	2015

Sources of drinking and industrial water supply for investment proposal needs. Necessary quantities.

Limited information is available in terms of necessary water quantities for each option of the investment proposal or in regard to water supply of specific sites using water. It is assumed that more detailed information is available for the Long Tunnel Option and therefore the main findings are based on the said option. For that option, water usage should be in the largest quantities.

During construction

- For technological needs

Water quantities for technological needs during construction will be supplied from the nearest surface water bodies, by utility operators or from municipal dams. *For this purpose, Abstraction Permits must be obtained from WA RBD, Municipality Mayor subject to Municipal Council approval, for water bodies, which are municipal property, supply contract with WSS operators or Irrigation Systems EAD.*

There are no quality requirements for industrial water. With regard to preservation of surface and groundwater bodies, the quality of such waters shall meet the minimum requirements for irrigation waters laid down in *ORDINANCE No. 18 dated 27.05.2009 concerning the quality of waters intended for irrigation of agricultural crops (promulgated, SG # 43/2009).* Industrial waters should be free of priority substances and specific pollutants' concentrations must not exceed the limits of *ORDINANCE on environmental quality standards for priority substances and other pollutants (promulgated, SG # 88/2010, as amended, SG # 88/2013).*

Industrial water quantities will be determined by the construction contractor depending on technological needs. Waters for technological needs will be used predominantly during construction.

In the process of tunnel boring drainage water will be used, depending on their chemical composition and quantity, preferably in closed cycle mode after precipitation of

mechanical (rock) particles contained therein. Where drained quantities are insufficient, water supply shall be provided as described above. *Permit for groundwater abstraction and Permit for discharge of waste waters in aquifers must be obtained.*

- Potable water

Supply of potable water will be ensured by delivery of bottled water or by water trucks. Wherever practical, administrative premises and amenities will be located in the neighboring settlements and water supply shall be provided by WSS network.

The final decision will be made by the construction contractor subject to compliance with statutory requirements – obtaining of water abstraction permits or signing of supply agreement with WSS operator.

During operation

- For technological needs

Technological needs during operation include tunnel services in terms of firefighting and washing. Water will be supplied by tanks.

The necessary quantities for firefighting purposes are estimated at ca. 10 l/s. These quantities will be supplied from prefilled tanks of the required capacity.

The necessary water quantities for tunnel washing are – for two lanes, 80 m^3/km (8 m^3/100 m). Water will be supplied by tanks.

- Potable water

Water quantities for these purposes will be necessary for recreation sites and will be supplied by the local WSS operator.

The necessary water quantities for each recreation site are 1.0 l/s, to be supplied by WSS operator.

Description, analysis and assessment of probably significant impacts on population and environment resulting from investment proposal realization.

Surface and ground waters

Impact on waters can generally be discussed in two aspects – qualitative (environmental) and quantitative. Accordingly, the assessment should be made in consideration of necessary water quantities during construction and subsequent operation of investment proposal - in terms of quantities and composition of waste waters discharged in aquifers and water bodies, and in terms of morphological changes occurring therein as a result of the realization of the recommended option.

The investment proposal under review in its different options requires water usage for which Permits should be obtained from RBD – West Aegean Region headquartered in Blagoevgrad. Water usage will be, as follows:

During construction

Water quantities (**abstraction**) are necessary for:

- Compaction of soils in embankments – quantities are to be estimated according to results from laboratory tests (waters of industrial and other (e.g. irrigation) quality will be required);
- Reduction of dust emissions in air - quantities are to be estimated according to specific weather situation (waters of industrial and other (e.g. irrigation) quality will be required);
- Water supply for tunnel boring needs.

Use of aquifers is necessary for:

- Construction of linear infrastructure for crossings- trestles, viaducts, riverbed corrections, bridges (including drains), transmission networks and conduits; *(pursuant to ORDINANCE on surface water usage (SG # 56/2011 / - „Reverbed correction shall mean change of situation and altitude of the river bed resulting from engineering and hydro- technical operations pursuing predefined objectives.);*
- Discharge of drainage waters from tunnels during construction;
- Drilling of hydrogeological boreholes.

During operation

Water abstraction is necessary for:

- Water supply of recreation sites;
- Firefighting and tunnel washing.

Use of aquifers is necessary for:

- Discharge of waste waters after treatment.

In addition to specific and important elements subject to impact and related to water status – other than construction of IP ad infrastructure and utilities (power transmission lines, water pipelines) owned by private individuals and legal entities, locations of monitoring points for water monitoring should be mentioned.

The new locations of monitoring points should be determined in consultation with RBD- WAR and MEW insofar as such points are subject to MEW Minister's approval.

Sources of water supply. Establishment of SSZ.

During construction

- For technological needs

Water quantities for technological needs during construction will be supplied from the nearest surface water bodies, by utility operators or from municipal dams. ***For this purpose, Abstraction Permits must be obtained from WA RBD, Municipality Mayor subject to Municipal Council approval, for water bodies, which are municipal property, supply contract with WSS operators or Irrigation Systems EAD.***

In the process of tunnel boring drainage water will be used, depending on its chemical composition and quantity, preferably in closed cycle mode after precipitation of mechanical

(rock) particles contained therein. Where drained quantities are insufficient, water supply shall be provided as described above. ***Permit for groundwater abstraction and Permit for discharge of waste waters in aquifers must be obtained.***

During operation

Water will be used for: hygienic purposes, tunnel washing, and firefighting.

- Hygienic needs

Water supply for hygienic purposes refers to supply of recreation sites located on both sides of the motorway.

- Sites for short rests from km 376+500 to km 376+900 (left and right) – Option G20 – Red;
- Motorway control center at km 377+480 (left) - option G20 – red;
- Site designated for recreation and business activities of surface area 9 da situated in the section from km 400+000 to km 400+300 – East option G10.50 – Kresna flank road;
- П Site designated for recreation and business activities of surface area 8 da at km 399+300 - East option G10.50 – left carriageway;
- 2 recreation sites – km 376+420 to km 376+920 – Long Tunnel Option;
- Sites for short rests from km 397+500 to km 397+700 (left and right) – Long Tunnel Option;

No information is available for Option G20- blue or East Option G20; however it may be assumed that recreation site will be similar to those planned for similar options - Option G20 – Red and East Option G10.50.

Water supply

Site water supply is planned to be ensured by construction of abstraction plant from Struma river terrace. Estimated quantities per site are 1.00 l/s. ***Permit should be obtained for hydrogeological survey and construction of the abstraction plant and, subsequently, Water Abstraction Permit.***

For Option G10.50, water for recreation sites will be supplied by Kresna WSS operator on contractual basis. Estimated quantities are 1.00 l/s.

Sewerage

Recreation site sewers will collect separately waste and rain waters. Rain waters from the site will be discharged in road drain ditches and systems.

Domestic waste water will subjected to biological treatment and after treatment-discharged into Struma River.

For this purpose, Permit for waste water discharge should be obtained.

Optional construction of sewer pit has also been discussed, under agreement with licensed contractor.

Establishment of SSB

Detailed information about existing SSB is provided in EIAR, *Section IV.2. – „Ground waters" – „Water Protection Areas"*, hence these areas will not be described again in this document. Table No. 7.2-9 presents affected SSB belts for each option.

Table No. 7.2-9

Project	Impact on SSB	Remark:
Option G20 - Blue	None	Before the starting point of LOT 3.2, belts II and III of Simitli PS are affected.
Option G 20 - Red	None	Before the starting point of LOT 3.2, belts II and III of Simitli PS are affected
East Option G10.50:	Impact on belts II and III of Simitli Pump Station and Oshtava- Hladka Banya Mineral Water Spring	
Long Tunnel Option	None	Before the starting point of LOT 3.2, belts II and III of Simitli PS are affected
East Option G 20	Impact on belts II and III of Simitli Pump Station and Oshtava- Hladka Banya Mineral Water Spring	

It will be necessary in these sections drain waters from the road to be fed into treatment facilities of mud and oil catcher type and thereafter discharged outside security belts. In this part, the road shall include impermeable layer to prevent pollutants entering the belts. Such preventive measures will guarantee protection against rainwaters and against pollution from accidental spills

Sources of pollution of surface and ground waters associated with investment proposal realization

Surface waters

During construction

The main impacts on surface water bodies and aquifers will occur in the period of construction. The latter is related predominantly to construction of river bridges. All project options for Lot 3.2. track envisage construction of large bridges (and viaducts). Construction works will discharge mainly undissolved substances from preparation of concreting of structures.

Use of substantial water quantities is not envisaged. Water usage is for the purpose of adjustment soil moisture or dust suppression without maximal saturation. After use, process water will evaporate in time and waste flows will not be generated.

The main potential pollution hazard for surface waters is the operation of defective construction equipment potentially leaking fuels and lubricants, improper storage of hazardous wastes described in p. V.6.

Negative impact may occur also if conditions and instructions of Permits for discharge are disregarded. Examples of infringement may be - disposal of earth in riverbeds, excessive felling of shrubbery, unauthorized riverbed corrections, etc.

Special care should be applied in abutment wall areas (mainly concern options G20-blue and G20-red) to be erected along the route which will also serve as riverbed corrections (according to WA definition, *"river bed" shall mean a terrestrial relief feature along which a surface water course is formed temporarily or permanently and which comprises a river channel and the flood plains).* Because of their substantial lengths for both options, failure to meet the conditions of Permits for discharge in surface water body may result in significant impact on water status by introducing undissolved substances. Pollution by undissolved substances is commensurate with elevated content thereof in full flow periods.

Potential pollution of surface waters may result from discharge of drainage and process waste waters during tunnel construction if treatment facilities are not maintained functional.

During operation

Hazardous emissions may be expected from road accidents (involving liquid cargo) or excessive use of de-icing agents for winter maintenance. Road accidents involving spills of liquid cargos and substances are extremely rare and cannot give rise to prolonged impact on surface water bodies' status. The climate in the region predicates limited use of such substances.

Draining of road surface and body is provided for the direct track of ME, sections on two levels, sections with overpassing carriageways, road nodes, crossing, rest sites, sites at tunnels, etc.

Draining will be carried out via crosswise and longitudinal gradient of the pavement, trench gradient, discharge of rainwater into collectors in suitable locations and installation of mud and oil catcher devices prior to final discharge.

Water quantities in ravines and rivers are determined by their recharge catchments (total 85 catchments are determined for options G20-Blue and G20-Red) and dimensioned with the necessary facilities – gutters and bridges. The main bridges are located along Struma river course.

Water in trenches shall pass through catcher devices and only then shall be discharged in river ravines. Maintenance (cleaning) of catcher devices shall take place by mobile pumps (truck pumps) which would be positioned in the emergency lane of the motorway. Signaling will be provided in the relevant section for the duration of servicing operations.

Winter maintenance proceeds according to established and environmentally friendly consumption rates. Main water pollutants during operation include undissolved substances and chlorine ions.

Use of salt and saline slurry for winter maintenance may be assessed as not entailing significant impacts on surface and ground water status for the following reasons:

- De-icing agents are used at temperatures below 0°C. With gradual warming of the weather they are washed out of the road; moreover the surface area of the

carriageway (or part thereof) is manifold smaller than the area of the adjacent catchment which promotes multiple dilution of these agents;

- Used in emergencies only;
- Dissolving slowly and gradually with as ambient temperatures increase;

It should be noted however, that the above statements were made subject to the following conditions:

- Compliance with regulations;
- Use of all available means for winter road maintenance;
- Water monitoring does not record elevated values of the components under review.

Ground waters

During construction

During construction impact on ground waters will be expressed predominantly in terms of draining thereof in slope undercut zones and during tunnel boring. These operation will proceed in practically drained parts of the landscape (except the Long Tunnel Option), resulting in low impact on ground waters. Available data from geological reports show low water content in strata where IP route will be located.

During operation

During operation probability of impact on the status of groundwater bodies is practically nonexistent. A limited impact is estimated for water supply of the two recreation sites. The latter would require survey based on ***Permit for hydrogeological survey and construction of abstraction plant and, subsequently, Groundwater Abstraction Permit.***

Impact of tunnels on groundwater will vary in magnitude depending on tunnel length and physical characteristics– cross section, diameter, etc. the longer the tunnel, the higher impact on water-bearing strata. The same applies to distance from hydrographic network – the closer the tunnel the smaller impact on groundwater, because the tunnels will pass through areas of natural draining, and vice versa - the farther away the tunnel, it will pass through water bearing areas and the draining effect will be significant.

Assessment of impact

In summary, the impact of the investment proposal for **Upgrade of Lot 3.2 of Struma MW** on waters may be assessed as not adverse for corrections of affected third party infrastructure - reconstructions of gas pipelines, heat supply pipelines, power supply lines, optic and data conduits, water supply pipelines, canals, irrigation fields, pump stations, etc.

Compliance shall be mandatory with the conditions of abstraction and discharge permits.

The measures laid down in RBMP should be made operational, including compliance with permission regime and measures for reduction flood risks. Use of construction materials free of priority substances is mandatory. Planned engineering solutions predicate compliance with these measures.

Depending on option, the magnitude of impact on surface and ground waters will vary.

These impact are associated mainly with crossing of surface water bodies, riverbed corrections, tunnel boring through groundwater bodies, water abstraction, and discharge of waste waters.

Assessment of impact on waters of the investment proposal for **Upgrade of Lot 3.2 of Struma MW** is presented in the tables below:

Surface waters					
During construction					
Criterion ***(impact on baseline status of surface waters)***	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	Low, proceeds on disturbed terrain	Very low, proceeds on disturbed terrain	Moderate, affects new undisturbed terrain	Very high, requires use of substantial quantities of process water, respectively discharges maximal volumes of polluted water	High, affects new undisturbed terrain twice the size of East Option G10.50 surface area
Territorial scope of impact:	Local, small territorial coverage in crossing points of surface water bodies;	Local, small territorial coverage in crossing points of surface water bodies;	Local in crossing points of surface water bodies; maximal territorial coverage compared to all other options and additional impact on 4 surface water bodies;	Local, small territorial coverage in crossing points of surface water bodies;	Local in crossing points of surface water bodies; maximal territorial coverage compared to all other options and additional impact on 4 surface water bodies over two times larger area than East Option G 10.50
Duration of impact:	Short-term	Short-term	Short-term	Short-term	Short-term
Frequency of impact:	Periodic/transient **(**during construction of the facility and associated	Periodic/transient **(**during construction of the facility and associated	Periodic/transient **(**during construction of the facility and associated	Periodic/transient **(**during construction of the facility and associated	Periodic/transient **(**during construction of the facility and associated

	road infrastructure)	road infrastructure)	road infrastructure)	road infrastructure)	road infrastructure)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None expected	None expected	None expected	None expected	None expected
Significance of impact	Insignificant	Insignificant	Moderate/ median	Significant	Significant

Surface waters					
During operation					
Criterion ***(impact on baseline status of surface waters)***	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	Low, practically nonexistent	Low, practically nonexistent	Moderate, in terms of possible use of large quantities of de-icing agents, higher probability of diffuse pollution of surface waters due to longer road	High, possible discharge of waste waters, re-distribution of groundwater recharges at tunnel portals	Moderate, in terms of possible use of large quantities of de-icing agents, higher probability of diffuse pollution of surface waters due to longer road
Territorial scope of impact:	Local, small territorial coverage	Local, small territorial coverage	Local, small territorial coverage	Local, small territorial coverage	Local, small territorial coverage

Duration of impact:	Short-term (incidental)	Short-term (incidental)	Short-term (incidental)	Short-term (incidental)	Short-term (incidental)
Frequency of impact:	Periodic (incidental)	Periodic (incidental)	Periodic (incidental)	Periodic (incidental)	Periodic (incidental)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None expected	None expected	None expected	None expected	None expected
Significance of impact	Insignificant	Insignificant	Moderate/ median	Significant	Moderate/ median

Recommended option

Comparison of impact of individual options on surface water status, **gives preference to Option G20- Red**. The option has no impact on sanitary safety belts, avoids crossing of areas with radioactive waters, and passes at suitable distance from residential buildings in Kresna Town.

Construction under the option is recommended to take place without overhead roads (trestles), which we consider unnecessary and - rather than improving the road - conducive to incidents. The option plans for construction on engineered route, includes the shortest tunnels (approx.. 3 302 m total) and, generally, small amounts of the so-called earth works. Includes construction of abutment walls which might be defined as "riverbed corrections" but are consistent with 2016-2021 RBMP requirements and measures for reducing of harmful impacts on waters in the zones at potential risk from floods.

The comparison was made between the five options and not with other similar sites.

According to the adopted point scoring system for option selection, the top ranking **Option G20- Red** receives **5 points**, based on the analysis of the significance of impacts as combination of the magnitude of impact and the sensitivity of the recipient.

Second ranking is **Option G10-blue**, which receives **4 points**. Rationale: at the beginning of the track, a tunnel crosses area with elevated radioactivity of ground waters, large volume of tunneling works, and closeness to residential buildings in Kresna Town. .

East Option G10.50 receives **3 points** on account of partially disturbing terrains not affected by anthropogenic activities. Moreover, 4 additional bodies of surface waters are affected.

East Option G20 scores **2 points**. Works will proceed on undisturbed land. Impacts 4 additional surface water bodies.

Long Tunnel Option – 1 point, high impact on surface and ground waters alike. Construction works will require significant quantities of process water and have high pollution potential.

Section X Comparative table for selection of construction option of the Report presents in tabulated format the points assigned to each of five proposed project options by individual environmental and health components and factors.

Ground waters					
During construction					
Criterion ***(impact on baseline status of ground waters)***	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	Low, proceeds on disturbed terrain, relatively long tunnels predicating groundwater drainage	Very low, proceeds on disturbed terrain , shortest tunnels, respectively lowest drainage volumes	Moderate, affects new undisturbed terrain , affects sanitary belts II and II of Simitli PS and Oshtava- Hladka Banya Mineral Water Springs	Very high, drained groundwater quantities estimated at ca. 129 l/s.	High, affects new undisturbed terrain twice the size of East Option G10.50 surface area , affects sanitary belts II and II of Simitli PS and Oshtava- Hladka Banya Mineral Water Springs

Territorial scope of impact:	Local, small territorial coverage	Local, small territorial coverage	Substantial territorial coverage in the area of long tunnels (>1000 m)	Large territorial coverage- practically the entire western part of Kresna Gorge	Substantial territorial coverage in the area of long tunnels (>1000 m)
Duration of impact:	Short-term	Short-term	Long-term	Long-term	Long-term
Frequency of impact:	Periodic/transient	Periodic/transient	Continuous	Continuous	Continuous
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None expected	None expected	None expected	None expected	None expected
Significance of impact	Insignificant	Insignificant	Moderate/ median	Significant	Significant

Ground waters					
During operation					
Criterion ***(impact on baseline status of ground waters)***	***Option***				
	Option G20 - Blue	**Option G20- Red**	**East Option G10.50**	**Long Tunnel Option**	**East Option G20**
Degree of impact:	Low, practically nonexistent	Low, practically nonexistent	Low, practically nonexistent	Moderate, no need for large water quantities for drilling, groundwater drainage rates remain ca.	Low, practically nonexistent

				129 l/s	
Territorial scope of impact:	Local, small territorial coverage	Local, small territorial coverage	Local, small territorial coverage provided water treatment is ensured in SSB zones	Large territorial coverage- practically the entire western part of Kresna Gorge	Local, small territorial coverage provided water treatment is ensured in SSB zones
Duration of impact:	Short-term	Short-term	Long-term	Long-term	Long-term
Frequency of impact:	Periodic/transient	Periodic/transient	Continuous	Continuous	Continuous
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None expected	None expected	None expected	None expected	None expected
Significance of impact	Insignificant	Insignificant	Insignificant	Moderate/ median	Insignificant

Recommended option

Comparison of impact of individual options on groundwater status, **gives preference to Option G20- Red**. The option has no impact on sanitary safety belts, avoids crossing of areas with radioactive waters, and passes at suitable distance from residential buildings in Kresna Town.

Construction under the option is recommended to take place without overhead roads (trestles), which we consider unnecessary and - rather than improving the road - conducive to incidents. The option plans for construction on engineered route, includes the shortest tunnels (approx. 3 302 m total) and, generally, small amounts of the so-called "earth works".

The comparison was made between the five options and not with other similar sites.

According to the adopted point scoring system for option selection, the top ranking **Option G20- Red** receives **5 points**, based on the analysis of the significance of impacts as combination of the magnitude of impact and the sensitivity of the recipient

Second ranking is **Option G20-blue**, which receives **4 points**. Rationale: at the beginning of the track, a tunnel crosses area with elevated radioactivity of ground waters, large volume of tunneling works, and closeness to residential buildings in Kresna Town.

East Option G10.50 receives **3 points** on account of partially disturbing terrains not affected by anthropogenic activities.

East Option G20 scores **2 points**. Works will proceed on undisturbed land. Sanitary belts will be affected

Long Tunnel Option – 1 point, high impact on groundwater. Construction works will require significant quantities of process water and have high pollution potential.

Section X Comparative table for selection of construction option of the Report presents in tabulated format the points assigned to each of five proposed project options by individual environmental and human health components and factors.

7.3. Earth's interior

Brief characteristics of geological conditions

The area of the investment proposal falls between the Northern parts of Pirin on the Eastern side, the Southern part of Vlahina Mountain and the Northern part of Malesh Mountain on the west side and extends in different proximity along the bed of the Struma River passing through Simitli and Sandanski Graben. The boundary between the two grabens is Kresna Horst cut by Kresna Gorge.

In tectonic terms, these are parts of Vlahi, Ograzhden and Pirin Fault Blocks.

Vlahi Block is made up of highly metamorphic rocks - gneiss, migmatites, amphibolites.

Ograzhden Block is made up of gneiss and migmatite complex.

The northern parts of Pirin Block are made up of the rocks of the Rhodopian overgroup, Paleozoic South Bulgarian granites and Upper Cretaceous and Paleogene granitoids.

The route of the investment proposal has been surveyed to varying degrees with respect to the specific options.

It should be noted that in the opinion of the designer of the long tunnel the engineering and geological surveys performed are not sufficient. The reason to this is also the access restrictions as to performing such surveys due to the fact that the surface above the tunnel is a NATURA 2000 protected area or a protected area under the Protected Areas Act (Tisata Reserve).

Tectonic characteristics of the area

The development of the area under consideration is the result of constant occurrence of tectonic movements since the Precambrian time.

The current situation is shaped by an early middle Alpine structural plan when the main tectonic units in the area - Vlahi, Ograzhden and Pirin Blocks acquire their present appearance. This shaping is heavily influenced by nappe movements where parts of these blocks overlap.

Later on, at the late Alpine stage dominated by fault block movements Brezhani graben was formed.

The final stage in the shaping of the area continues in the present time and is determined by Neotetonic movements.

The latter have a fault block nature as well. They take place along the Struma fault bundle as the following fault zones are important to the area: Struma, Gradeshntsa, Gara Pirin and West Pirin as well as the cross one, Brezhani fault zone, along which Simitli Graben is formed.

Natural resources

Various manifestation and certain increases in ore mineralization have been identified in the area. There is information about Kresna ore manifestation represented by copper skarn deposits, mainly in a vein form, with main ore minerals pyrite, chalcopyrite, sphalerite.

Breznitsa ore manifestation is related to Breznitsa plutonium, it has a vein-disseminated nature with mineralization by pyrite, chalcopyrite and less molybdenite, galena and sphalerite. Polymetallic mineralizations are attached to hydrothermal zones mainly with East-West and

submeridional direction. The zones are tracked at a small length (rarely over 1000 m) and their width ranges from 1 to 5-6 m. By mineral associations they are pyrite-molybdenum, copper and pyrite-chalcopyrite.
Coal deposits (Brezhani and Oranovo) are associated with the Paleogene and Neogene sediments.
Construction materials - sands, gravels are extracted from the alluvial deposits of the Struma River.
There are concessions of the following deposits of underground natural resources granted in the area of the investment proposal:

- Public extraction concession for PIRIN COAL BASIN, RAKITNA SECTION, Blagoevgrad Region, Simitli Municipality, Mechkul, Rakitna having the Minister of Economy, Energy and Tourism as the authority representing the concession grantor granted to KAM & KAM OOD for 15 years as from 23 Nov. 2011.

The route is in close proximity (less than 100 m) to the concession section Rakitna Section which is developed in an open way. The trench formed has unstable boards which can lead to compromising the road and its facilities.

Negative geodynamic phenomena
According to data from the Bulgarian Geological Hazards Map and the explanatory note thereto (edited by Acad. Bruchev) the main distribution in the area is the occurrence of collapses, landslides, mud stone streams, pronounced linear erosion activity, self-ignition of coal, subsiding above underground works, natural radioactivity.

Assessment of possible changes in the geological environment as a result of the implementation of the investment proposal
The investment proposal for **Improvement of Struma Motorway Lot 3.2 Route** is a routine road project regarding its construction and subsequent operation. The impact on the earth's interior depends on the quality of the preliminary engineering and geological survey, the constructive solutions and the performance quality of the construction works. Provided the regulatory requirements are complied with no negative impacts on the condition of the earth's interior should be expected.
Negative impact on the earth's interior is also not expected upon adjustments of the elements of the disturbed infrastructure of other legal entities - reconstructions of gas pipelines, heat transmission lines, power lines, optical and tt cables, water mains, canals, irrigation fields, pumping stations, etc.

- ✓ The protection of the earth's interior is arranged for in Article 46 of the Environmental Protection Act and includes the following main points:
- ✓ Protection and rational use of underground natural resources (including groundwater);
- ✓ Environmentally sound waste management and use;
- ✓ Restoration and/or rehabilitation of terrains affected while surveyed and used;
- ✓ Effective protection against natural disasters, accidents and other destructive processes as a result of human activity.

Based on the said points and regarding the nature, the amount of activities and the subsequent operation it is evident that the investment proposal for **Improvement of Struma Motorway Lot 3.2 Route** has an impact on the earth's interior mainly by:

- The earthworks performed under the project, including excavation and embanking operations, including tunneling;
- Treatment of unnecessary and/or inappropriate soil and rock masses excavated - by their appropriate disposal or subsequent use;

Changing the stability of the natural slopes as a result of the excavation works performed or incorrect construction of the high embankments, respectively.
The second main component is the permanent storage (disposal) of excavated excess soil mass. Particular attention should be paid to not building these landfills on productive agricultural land, floodplains, protected areas and protected zones. The optimal case is to have them redirected for other purposes - covering domestic waste landfills, leveling, backfilling, etc.
The selection of landfill site should comply with the requirements laid down in *Ordinance No 7 of 24 August 2004 on the requirements to be met by sites for installation of waste treatment facilities (published in State Gazette No 81/2004).*
The prohibition to use flooded landfills for waste disposal also arises from the requirements of the Water Act (published in State Gazette No 67/1999 as subsequently amended and supplemented), in view of *protecting water and water structures* (Chapter Eight) and *protection against harmful impact of water* (Chapter Nine).
The next main component as to limiting the impact on the earth's interior which is directly related to ensuring the safety of travelers and the traffic is the correct determination of the stability of the slopes in the conditions of deep excavations and high embankments, respectively, as well as their securing against bringing down and falling of rock masses. The proposed project solutions provide for securing the slopes by safety anchor nets.

During construction

Based on the above conclusions it can be said the impact on the earth's interior takes place mainly during the **construction period**. In relation to the performance of the excavation works the stability of the slopes is impaired and this may lead to occurrence of adverse geodynamic processes - landslides, collapses. The main measure against occurrence of such processes is compliance with the regulatory requirements in the process of research, design and construction of the investment proposal.
Tunneling is planned to be performed following the New Austrian Tunneling Method (NATM) through explosive activities. It is planed to use a protective heading anchor umbrella or a protective heading pipe umbrella to secure the arch of the near-entrance sections.

During operation

During operation there is practically no possibility of impact on the conditions of the earth's interior. It is recommended to monitor the condition of the slopes of deep excavations in order to prevent landslide processes in a timely manner.
Negative impacts can be expected in case of adverse impacts on the massif, mainly due to untypical and high intensity natural processes - mainly intensive rainfalls, sudden replacement of dry periods by long precipitations, etc.
As a result of consultations with the Ministry of Energy information has been received about the underground natural resources in and around the area of the investment proposal. Deposits and fields for searching for and exploration of underground natural resources are not affected.

Nature of impacts by Earth's Interior component,

The nature of the impacts on the condition of the earth's interior for the investment proposal **Improvement of Struma Motorway Lot 3.2 Route** is presented in the following tables.

Earth's interior					
During construction					
Criterion ***(presence of mineral deposits and geodynamic phenomena)***	***Option***				
	G20 - blue option	**G20 - red option**	**East G10.50 option**	**Long tunnel option**	**East G20 option**
Impact level:	Low - availability of information on the condition of the slopes of the massif, absence of deposits of underground natural resources	Low - availability of information on the condition of the slopes of the massif, absence of deposits of underground natural resources	Medium, absence of engineering and geological surveys, affecting a terrain unaffected by anthropogenic activity, going in close proximity (up to 100 m) to concession area Rakitna Section	Very high - extremely large amount of earthworks, a unique construction project, low extent of surveys in the designer's opinion, probability of crossing mineralized zones, including those with radioactive mineralization, high seismicity of the area	Medium - absence of engineering and geological surveys, affecting a terrain unaffected by anthropogenic activity, going in close proximity (up to 100 m) to concession area Rakitna Section
Territorial range of impact:	Local scale, with a small territorial range due to performance of activities on already used terrain	Local scale, with a small territorial range due to performance of activities on already used terrain	Local scale, with a significant territorial range due to performance of activities on a new terrain	Local scale, with a significant territorial range due to the need for landfills for excess rock masses	Local scale, with a significant territorial range due to performance of activities on a new terrain
Impact duration:	Short-term	Short-term	Short-term	Short-term	Short-term
Impact rate:	Periodic/temporary (during project construction and construction of the relevant road	Periodic/temporary (during project construction and construction of the relevant road	Periodic/temporary (during project construction and construction of the relevant road	Periodic/temporary (during project construction and construction of the relevant road	Periodic/temporary (during project construction and construction of the relevant road

	infrastructure)	infrastructure)	infrastructure)	infrastructure)	infrastructure)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	Not expected	Not expected	Not expected	Not expected	Not expected
Impact severity	Insignificant	Insignificant	Moderate/medium	Significant	Moderate/medium

Earth's interior					
During operation					
Criterion (occurrence of geodynamic phenomena)	***Option***				
	G20 - blue option	**G20 - red option**	**East G10.50 option**	**Long tunnel option**	**East G20 option**
Impact level:	Low, practically no impact	Low, practically no impact	Low, practically no impact	Low, practically no impact	Low, practically no impact
Territorial range of impact:	Local scale, with a small territorial range, occurrence of collapses	Local scale, with a small territorial range, occurrence of collapses	Local scale, with a small territorial range, occurrence of collapses	Local scale, with a small territorial range	Local scale, with a small territorial range, occurrence of collapses
Impact duration:	Short-term (accidental)	Short-term (accidental)	Short-term (accidental)	Short-term (accidental)	Short-term (accidental)
Impact rate:	Periodic (accidental)	Periodic (accidental)	Periodic (accidental)	Periodic (accidental)	Periodic (accidental)
Consequences:	Negative	Negative	Negative	Negative	Negative

Cumulative impacts:	Not expected	Not expected	Not expected	Not expected	Not expected
Impact severity	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

Preferred option Earth's Interior component

When comparing the impacts of the individual options on the condition of the earth 's interior **G20 - red option has been preferred for implementation**. The option has the smallest amount of "earthworks - tunnels", it does not affect deposits of underground natural resources, it is surveyed at "preliminary project" stage with an engineering and geological report prepared.

Comparing options has been done by comparing them to one another and not to other similar projects.

According to the point system accepted for the selection of an option for implementation the preferred **G20 - red option** has been awarded **5 points** according to the impact severity analysis as a combination of impact level and receptor area sensitivity.

G20-blue option ranks second being awarded **4 points**. The grounds are that at the beginning of the route the tunnel crosses an area with increased radioactivity content in groundwater which suggests the presence of rocks containing radioactive mineralization, the large range of tunneling works.

East G10.50 option has been awarded **3 points** due to partially affecting terrains practically unaffected by anthropogenic impact. It goes near an underground natural resources concession - Rakitna Section.

East G20 option has been awarded **2 points**. It runs entirely on a new terrain, goes near an underground natural resources concession - Rakitna Section.

Long tunnel option - 1 point, the impact of the implementation of this option is of high severity of impact on the earth's interior, it appears to be unique for the country. In the designer's opinion it is necessary to provide additional information about the geological environment through which the facility will run.

The points for each of the five project options proposed are presented in a tabulated form in Section X, Comparative Table of Selecting an Option for Implementation of the report per individual components and environmental and human health factors.

7.4. Land and soil

Characteristics of soil condition. Disturbed land. Contaminated land. Degradation processes.

Soil characteristics

According to the soil geographic zoning of the country the soil within the range of the investment proposal for the construction of Struma Motorway Lot 3.2 per the options considered refers to the Mediterranean Soil Sub-area, Struma-Mesta Province - South Bulgarian Xerothermic Area. The Mediterranean Soil Area is part of Europe's subtropical xerophyte forest soil sector. Struma-Mesta Province within the range of Lot 3.2 and the options considered includes the land from Simitli to Kresna. The complex relief, the presence of mountain ridges and the climate change in height determine the diversity of bioclimatic conditions and soil. Struma-Mesta Province is characterized by xerothermic soil cover. The predominant soil type in the plains and lower mountain sides is the cinnamon soil (calvaric, CMc and chromic, CMx) and the cinnamon ash gray soil (Chromic, LVx) and shallow soils (Leptosols) - lithosols, rankers under the dry forests and bushes. Mountain feet and sides up to 600 - 800 m above sea level covered by xerothermic oak forests of Hungarian oak *(Quercus frainetto),* Austrian oak *(Q. cerris),* pubescent oak *(Q. pubescens)* and bushes are covered by brown soil (eutric, CMe) and cinnamon-like luvisols (LVx). Among zonal soil types cinnamon soils (Chromic, CMx) and brown forest and dark soil (Cambisols, CM) prevail and among azonal ones alluvial soil (Fluvisols, FL) and delluvial soil (Colluvisols) prevail. In the

deforested areas with larger slopes due to the intensive erosion processes soil cover is presented in the form of isolated soil ranges - shallow soils being completely absent in some places where the source rock is shown on the surface.
The following are spread within the routes of Lot 3.2. for the options considered: alluvial soil of Fluvisols, FL type (rich - eutric, FLe and acid - dystric, FLd), shallow soil (Leptosols), cinnamon and ash gray soil - Luvisols, LV (cinnamon-like - Chromic, LVx, regular - Haplic, LVh) and anthropogenic soil (Anthrosols).

Disturbed land and soil
Within the range of Lot 3.2 for the options considered the permanently disturbed land is within the range of the existing E79 road (options G20 - blue, G20 - red), the start of the land route of the long tunnel option, the crossings of road sections (in East G10.50 and G20 options) as well as the urbanized land at Kresna Inns. The land to be disturbed during the construction of the structures as per the new investment proposal concerns land from the forestry and land fund, transport territories, surface water streams and urbanized territories on the land of nine settlements.

Contaminated land
The stripes where Lot 3.2 options will develop are remote from industrial centers with big atmospheric pollutants. There is no evidence of contamination of soils by heavy metals, pesticides, oil products, nitrates and other pollutants.
The transfer of pollutants into land and soil by road transport occurs mainly by air (from the exhaust gases from the internal combustion engines) or by the wastewater from the roadway. The affected soil is in close proximity to the roadway (10-20 m) and depends on the weather conditions and the intensity of road traffic.

Degradation processes and phenomena
At many places in the sections of the routes there is intensely developed linear erosion marked by numerous temporary streams and ravines on both sides of the valley of the Struma River and its tributaries. The formation of mud streams observed mainly at the beginning of Kresna Gorge is associated with linear erosion.
Actual soil loss due to the growth of urbanization together with infrastructure and transport is extremely high and ranks first in terms of rate for the past decade.
Average-level area deflation manifested on domed and steep slopes in sunny poor and dry habitats subjected to excessive grazing and areas along roads and settlements is typical to the territories which the road options go through. The land in the forest territories is relatively well-forested and there are no massive erosion processes. The ravine system is relatively underdeveloped, so, the erosion caused by surface running water is less pronounced.
Development of erosion is observed in the roadway sections when excavations and embankments are made and rehabilitation (including maintenance) and fortification works are not timely done.

Land use
The solutions in Lot 3.2 options go through the land of two municipalities (Simitli and Kresna) and nine settlements (Simitli, Poleto, Rakitna, Mechkul, Stara Kresna, Oshtava, Vlahi, Gorna Breznitsa, Kresna) and cross existing infrastructure elements.

Along the routes in Lot 3.2 options territories with the following permanent purpose of the territory are located: urbanized territories; agricultural territories; forest territories; protected areas and disturbed areas.
According to the set main characteristics and technical parameters of the linear part of Lot 3.2 and its facilities the expected permanent disturbance of land and soil for the implementation of G20 - red option amounts to **1240.997 decares**. The disturbance for **G20 - blue** option amounts to **1246,156 decares**. For **east G10.50** option - **1107,898 decares** and for **East G20** option - **2817,765** decares. For the **long tunnel option** disturbed land amounts to **884,718 decares**.
The investment proposal by the solutions in the options will be related to the acquisition of new areas subject to expropriation when it comes to the construction of projects - public state property. Expropriation begins after the Detailed Development Plan - Plot Plan takes effect. The design, construction and operation of motorways, including Struma Motorway Lot 3.2. take place in compliance with the requirements of the Roads Act (RA) as a special act and the Territorial Planning Act as well as the relevant secondary legislation.

Extent of land and soil disturbance. Change in purpose and use of land related to the implementation of the investment proposal.
Soil sensitivity is primarily related to the structure and geochemical composition of the soil, the hydrological processes and the nutrient circle they are involved in (e.g., whether the soil is prone to erosion, soil fertility, etc.). Similarly, sensitivity depends on land use and ecosystems showing how important (or valuable) the soil is relative to other systems. Soil sensitivity is related to the presence of soil-bound contamination as well.

Land and soil disturbance by linear structures.
The construction of linear structures is related to the permanent affecting of land from the land and forestry fund for the installation of the elements of the road infrastructure.
In accordance with the provisions of the Roads Act the range of the road is the area where the roadway and the road verges on both sides are located together with the airspace above at such height as defined by the road design standards. The width of the road range outside the settlements and within the urbanized areas with unregulated adjacent terrains will be determined by the road design. Road facilities and roadside accessories will be located within the road range except for the republican roads maintenance bases, power supply and lighting facilities along with their adjacent terrains and snow protection facilities that can be installed outside it.
In the construction of the linear road infrastructure projects at the construction stage the surface geological base, the land and the soil on the track of the route and immediately within the road range will be irreparably destroyed. The linear infrastructure is very long, however, due to the small width it actually covers a small area which will be irreversibly affected.
During construction the construction of the road route is associated with "soil isolation" leading to permanent soil loss, irretrievable loss of basic soil functions and soil diversity/biodiversity. The main and irreversible impact is the change of purpose and category of land. There are also risks of erosion, especially in deep excavations and high embankments. Practically, the soil on the track of the route and within the road range of Struma Motorway Lot 3.2 will be completely and irrevocably destroyed.
After the implementation of the project the land taken will be classified as **disturbed land** according to the accepted Damaged Land Classification (Instruction No RD-00-11 of 13 June 1994 of the Ministry of Agriculture and Forestry) the disturbance having the following nature:

"soil that has lost its soil profile and is totally or partially destroyed where disturbance may be of a permanent or temporary nature due to mechanical excavation of the soil."
The amount of the affected (agricultural and forest) land per options will be:
- G20 - blue option - **1246.156 decares**;
- G20 - red option - **1240,997 decares**;
- G10.50 option-East - **1107.898 decares**;
- Option G20-east - **2817.765 decares**;
- Long tunnel option - **884,718 decares**.

The construction of Struma Motorway Lot 3.2 will be related to permanent soil disturbance and the soil will be irreversibly lost as a non-renewable natural resource. By constructing the road the category of the land within its range will be changed.

Change in land use (expropriations/change of land purpose).
The purpose of the agricultural land necessary for the construction of roads will be changed according to the terms of the Law for Preservation of Agricultural Lands (LPAL) as arranged for by Article 17 of the Law and Article 25 of the Law on the Ownership and Use of Agricultural Land (LOUAL). For forest territories the exclusion from the forestry fund takes place according to the terms of the Forestry Act, Article 73, Paragraph 1.
Real estates owned by individuals or legal entities necessary for the construction of the republican roads, including expressways, shall be expropriated according to the terms and conditions of the State Ownership Act.

Removal and preservation of humus
In the preparation of the construction after cleaning the construction stripe from bush and tree vegetation the humus layer will be removed and deposited on temporary sites within the construction stripe or humus depots provided for this purpose. According to the regulations the humus layer is always to be removed except when its power is up to 10 cm and/or humus content is below 1.0% and/or it is medium to highly stony.
Given the fact that agricultural land will be affected it is important to remove and preserve the humus horizon removed which should be done according to the conditions of Article 15, Paragraph 1 and Paragraph 2 of *the Soil Act* and Ordinance No 26 *on rehabilitation of disturbed terrains*.
For the use of humus after an option is approved for implementation a project will be developed for rehabilitation of disturbed terrains and landscaping of the roadside areas, embankments and slopes.

Expected impacts - for all options considered
Construction period
Land and soil disturbance
Soil falling within the road range will be completely destroyed. In the adjacent verges by the side of the roadways the soil profile is also expected to be disturbed as a result of the excavation and embanking works and the accompanying construction and installation works. The area of soil disturbance will be larger in the sections with transport facilities such as road junctions, etc. Disturbance under the bridges will not be in large amount because there will be such at the foundation of the columns only and in the tunnels - at the portals only. Soil disturbance will also occur in the locations planned as temporary construction sites. The depth of disturbance will vary depending on the construction activities performed.

The main impacts on the soil as a result of the implementation of the investment project will be related to soil profile disturbance, changes in the physicochemical, water physical and biological processes occurring in the soil substrate, local deterioration of soil quality in the lands adjacent to the road route.
The following construction activities are planed for the construction of the linear part of the route and the facilities of Struma Motorway Lot 3.2, including:

- Excavation and embanking works;
- Explosive and drilling activities;
- Fortification activities;
- Pouring reinforced concrete foundations for facilities;
- Laying asphalt pavements.

The following impacts are expected during these activities:
Soil profile destruction and disturbance
- *Primary disturbance* - during acquisition of the new sections of the road route changes will be related to activities disturbing the integrity of the earth crust within the construction line and the accompanying temporary terrains. Practically, the soil on the track of the route will be completely and irreversibly destroyed.
- *Secondary disturbance* is possible - creating of conditions to cause erosion and gravitational processes in the locations with significant slope where shallow and erosion-prone soil is typical. To prevent this phenomenon the projects of the route options provide for supporting and fortification walls, armor walls and anchor walls.
- *Destruction of vegetation within the road range*. By deforestation of areas during performance of excavation and embanking works and other construction activities it is much likely to have changes occurring in the water and physical properties of the soil around excavations by their possible drying and increased degradation process and mainly soil erosion.
- *Pressing/compaction* - as a result of uncontrolled movement on construction and transport mechanization outside the building stripe and determined road approaches. Movements of transport and road construction machines will lead to secondary compaction of the soil in the zone of their operation (temporary roads, construction sites, around the depots for soil masses, construction and inert material). The greatest possible danger of secondary compaction exists for soil with heavy sand clay and light clay mechanical composition if movements of the construction machinery take place on wet plastic soil. Danger of compaction of the arrangement also exists for soils containing different-sized gravel particles.
- *Triggering erosion processes*. Soil profile disturbance of soils of lighter mechanic composition on sloping terrains will trigger acceleration of erosion processes. Destroying vegetation will help them. Damage is not expected to be great as the width of the disturbed stripes on the side of the route will not be great. On the other hand, the road built in embankment across the slope of the terrain will shorten the length of the natural slope along which the erosion water runoff will be formed and thus its digging and transporting power will be reduced. This feature applies to much of the road, so, no major erosion of the adjacent areas is expected. In these cases, however, it is very important to properly locate the culverts. Water erosion will pose danger mainly to the slopes of the embankments and excavations, respectively.
The impact on the soil during the project construction will be **direct, negative, with a medium level of impact for G20 - blue option, G20 - red option and East G10.50 option. For the long tunnel option the impact level is considered low* and for the East G20**

option it is considered high*. The impact will mainly be related to mechanical damage to land and soil with a change in their purpose within the range of the linear part and all necessary facilities such as road junctions, bridges, overhead roads, overpasses, flyovers, tunnels, etc. The impact on soil during the project construction will be locally in terms of place (within the construction stripe) and, short-term - for the construction period.
*The amount of disturbed land is used as criterion: G20 - red, G20 - blue and G10.50 - 1240.997 decares, 1246.156 decares and 1107.898 decares, respectively; LTO - 884.718 decares; East G20 - 2817.765 decares.

Contamination of soil during construction
Emissions during the road construction will be disorganized and related to laying the foundation of the road and the construction of the roadways - they are due to excavation and embanking works to prepare the foundation of the road; loading and unloading activities in respect of the materials necessary for the road body, laying of asphalt pavement, etc.
During the construction of the structures included within the road range the following emissions into the air are expected with deposition of pollutants on the adjacent land and soil:
• Dust - unorganized sources during construction works, mainly during excavation and embanking works. The amount of dust from the unorganized sources will have a temporary and local nature within the range of the construction sites only. Expected impacts are considered insignificant.
• Emissions from the operation of the engines of the construction mechanization - unorganized mobile sources for the implementation of the construction processes and transport means for delivery of materials, supplies, equipment, etc. Contamination by aerosols from exhaust gases in the process of construction will be insignificant and will not affect the quality of land considering the short construction timelimits.
• When laying and aligning the asphalt pavements vapors of various hydrocarbons and volatile organic compound (VOC) and polycyclic aromatic hydrocarbons (PAH) emissions are mainly released.
Organized sources of emissions are not expected during the construction stage. The impacts for the two options considered are the same in terms of level and severity, respectively. No significant and long-term impact is expected.
A possible source of negative impact on soil is domestic wastewater and domestic waste (from the living functions of workers) generated on the construction sites. The impact may be prevented by the use of mobile chemical toilets and regulated waste collection.
Close to the road route and within the construction verge contamination of soil by spills of oil products and hazardous substances (unforeseen construction machinery accidents) and/or contamination by wastes may occur. The most risky are the construction sites, the temporary or short-term stay sites or refueling of the construction machines. These impacts will be short-term and local. They can be limited and completely excluded when using a well functioning machinery and complying with the safety and control requirements.

Soil contamination during operation
The main pollutants will be automotive aerosols containing carbon dioxide, sulfur dioxide, nitrogen oxides, polycyclic aromatic hydrocarbons (mainly benzopyrene), aldehydes, lead, cadmium, zinc and their compounds, resinous substances, soot, etc.
A relatively small portion of the aerosols (about 20%) is concentrated in the close proximity to the road (up to 5 m). The remaining, prevailing finer portion (5-20 mm) remains longer as an aerosol in the air and is subsequently scattered and deposited over longer distances on the soil (up to 100 m). Due to the weaker mobility of lead determined by the relatively high

buffering of most of the soils within the area of the route options it can be assumed that its accumulation will mainly occur in the topsoil (0-5 cm).
The land and soil around the road route will be affected. The level of soil contamination by lead and other harmful substances from automotive aerosols apart from weather conditions (rainfalls, wind direction, fog, etc.), also depends on the characteristics of the road (in excavation, embankment or along the terrain) as well as the need for gear shifting. Vehicle depreciation also has an impact on the level of contamination caused by automotive aerosols. It is assumed that the trend of increasing the share of new cars will become more sustainable in the future.
In the process of operation the motorway represents a linear source of contamination emitting:
• **Continuously, however, with variable intensity** - COx, NOx, SO_2 and other gases and aerosols containing mainly lead (Pb) and cadmium (Cd), soot and others components from the engines of the passing vehicles and the wear of their tires on the roadway and the pavement itself.
Gases and aerosols emitted by the road will fall directly into the land and soil adjacent to the road. The results of the performed scattering modeling show that at a distance of 5 to 10 m from the verge the road stripe will be subjected to contamination as the concentration of the pollutants will decrease sharply as the distance increases (50, 100 m).
Expected lead and cadmium emissions in gases of vehicle that will pass along the road for all options will be negligible and will not lead to soil contamination by heavy metals in adjacent terrains. We believe that the other harmful substances - nitrogen dioxide, sulfur dioxide, particles (soot), etc. will also not damage the soil layer. The impact can be defined as insignificant, long-term, with small range in the adjacent terrains of the expressway.

• **Periodically (in the winter season)** - Cl, SO_4^{2-}, Na^+, Mg^{2+}, etc. from deicing substances used against icing on the roadway.
Contamination by the use of salt and lye for winter maintenance of the roadway is also a source of soil contamination in the adjacent terrains. They cannot cause noticeable changes in soil quality (apart from local pH change), given the limited amounts that are applied. As a consequence of the winter motorway maintenance changes in the ion exchange complex of soil with permanent treatment with sodium ions can occur directly around the roadway.

Erosion processes - brought-in erosion
Prerequisites to the occurrence of brought-in erosion will be the formed slopes to be constructed during the construction of the expressway. The nature of the terrain which the road routes will pass through provides for excavation and embanking work and formation of high slopes which is a prerequisite to the occurrence of erosion. Construction of supporting and fortification walls is planned.
The planned rehabilitation activities when timely performed will largely prevent the occurrence of erosion processes.

Contamination by waste
In the aspect of soil contamination by waste in the vehicles stay sections the roadside areas will be contaminated by domestic waste and in some places also by construction waste as a result of construction and repair activities on the road. In this respect, the roadside area of the motorway will not be an exception.

Contamination by wastewater

During the operation of the road it is possible to have the adjacent land and soil contaminated by the surface water from the road pavement and the roadside facilities for collection of such water and drainage of the roadway. This wastewater can be contaminated by hazardous and toxic materials from oil and fuel spills on the roadway, salts, insoluble substances or other mechanical impurities.
During operation it is possible contamination of adjacent land and soil by surface water from the road pavement to be allowed in case of improperly dimensioning and functioning of drainage facilities. Impact on soils is defined as negative.

In emergency situations
In the event of extreme situations (emergency spills on the roadway, fire, etc.), there is a risk of emergency contamination of the land and soil in the adjacent areas of the road. Impact on soil in these cases will be significant and short-term if rapid measures are taken to limit contamination and remove contaminated soil and treat it in accordance with the Waste Management Act. The said two major groups of pollutants have a negative impact on land and soil in adjacent areas around the road.

After the implementation of the investment proposal for the construction of Struma Motorway Lot 3.2 the soil along the road route (10-20 m from both sides) will be subjected to **long-term**, **permanent negative impact**. By implementation of the selected investment proposal option with the better technical parameters of the road some limitation of the amounts of gases emitted by the engines will be achieved. It is expected to reduce the risk of contamination of adjacent areas around the road body due to the fact that under the new legal requirements to the quality of the fuels used by the vehicles only unleaded gasoline is now available in Bulgaria.

Nature of impacts during construction and during operation:

Soil					
During construction					
Criterion *(Amount of disturbed land)*	***Option***				
	G20 - blue option	**G20 - red option**	**East G10.50 option**	**Long tunnel option**	**East G20 option**
Impact level	**Medium** disturbed land – 1246.156 decares	**Medium** disturbed land – 1240.997 decares	**Medium** disturbed land – 1107.898 decares	**Low** disturbed land – 884.718 decares	**High** disturbed land – 2817.156 decares
Territorial range of impact:	Local with insignificant territorial range	Local with insignificant territorial range	Local with insignificant territorial range	Local with insignificant territorial range	Local with insignificant territorial range
Impact duration:	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)	Temporary (medium-term)	Temporary (short-term)
Impact rate:	Temporary (during project construction only)	Temporary (during project construction only)	Temporary (during project construction only)	Temporary (during project construction only)	Temporary (during project construction only)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None	None	None	None	None
Impact severity	Moderate/medium	Moderate/medium	Moderate/medium	Insignificant	Significant

Soil					
During operation					
Criterion *(Contamination by harmful substances from road transport)*	***Option*** **G20 - blue option**	**G20 - red option**	**East G10.50 option**	**Long tunnel option**	**East G20 option**
Impact level	**Low** Low ground concentrations of nitric oxides	**Low** Low ground concentrations of nitric oxides	**Low** Low ground concentrations of nitric oxides	**Low** Low ground concentrations of nitric oxides	**Low** Low ground concentrations of nitric oxides
Territorial range of impact:	Local in the stripe from 50 to 100 m from the road	Local in the stripe from 50 to 100 m from the road	Local in the stripe from 50 to 100 m from the road	Local in the stripe from 50 to 100 m from the road	Local in the stripe from 50 to 100 m from the road
Impact duration:	Long-term	Long-term	Long-term	Long-term	Long-term
Impact rate:	Permanent	Permanent	Permanent	Permanent	Permanent
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative impacts:	None	None	None	None	None
Impact severity	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

Conclusion:

Preferred option

For selecting an option for implementation of the investment proposal, a limiting factor in respect of soil is the amount of disturbed land. For the options considered the disturbance is greatest for East G20 option - 2817.765 decares, followed by East G10.50 option where the disturbance amounts to 1107.898 decares. For G20 - red option it is 1240,997 decares and for G20 - blue option - 1246,156 decares.

For the long tunnel option the land and soil disturbance has an area of 884,718 decares which prioritizes this option over all others.

This is also supported by the fact that the affected land of high natural value for this option is 446,151 acres. For G20 - blue option it is 700.804 decares, for G20 - red option - 701.438, for East G10.50 option - 796.425 and for East G20 option - 2369.289 decares.

With regard to the expected contamination from nitrogen oxides emissions in the stripe along the road route for the considered options it ranges from 30-50-60 to 100 m in terms of the estimated traffic. It reaches up to and over 300 m at tunnel exits.

According to the accepted point system for the selection of an option for implementation the preferred option - a long tunnel has been awarded 5 points. Options G20 - red and East G10.50 rank second with 3 points. G20 - blue option ranks third with 2 points and East G20 option ranks last with 1 point. The points for each of the five project options proposed are presented in a tabulated form in Section X, Comparative Table of Selecting an Option for Implementation of the report per individual components and environmental and human health factors.

7.5. Plant and animal world

General characteristics of the plant world within the scope of the investment proposal

The route of Lot 3.2 of Struma Motorway is located in an ecologically sensitive area. The area of the investment proposal falls in the Southwestern part of Bulgaria comprising Kresna Gorge between Krupnik and Kresna and the surrounding mountains. For most of its length the route of the existing first-class road E79 is located close to valley of the Struma River and the Sofia - Kulata railway.

Options G20 - blue and G20 - red follow the route of the existing road with left and right extensions to reach the dimensions of an expressway. The altitude of Kresna Gorge is 185 m to 280 m.

For East G10.50 option and East G20 option the route is along an entirely new terrain moving along the lower western slopes of Pirin Mountain. The altitude ranges from 315 m in the district of Oranovo, 400 m in the area of Poleto, 680-700 m in St. Kresna and 200 m in Kresna.

The long tunnel option passes underground beneath the eastern slope of Malesh Mountain. The altitude of the land route before Kresna Tunnel - the North Portal is 300 m and after the South Portal - 250 m.

According to the geobotanical zoning of the country (Bondev, 2002), the area of the investment proposal refers to the Mediterranean Sclerophyllous Forest District, East Mediterranean Province, Mediun Struma District, Kresna Area. The prevailing vegetation is Mediterranean type in the zone of xerothermic oak forests. The area is characterized by xerothermic forest vegetation dominated by pubescent and virgil oak which for the most part is destroyed and currently there are only parts of it with a highly changed composition. In modern forest vegetation combined forests of pubescent oak, oriental hornbeam and fraxinus ornus with a subforest of evergreen

Mediterranean bushes are widely spread. Secondary bush vegetation of red juniper, Christ's thorn and terebinth has emerged in place of the destroyed forests.

Appearance of vegetation in affected areas for the project options considered

Oak forests dominated by pubescent oak

They occupy relatively large areas on steep rocky terrains. This habitat includes xerothermic forests dominated by pubescent oak which are found in places with transitional Mediterranean, transitional continental and euxinian climate. The following are found in the composition of the community: Austrian oak, fraxinus ornus, oriental hornbeam. Species typical to xerothermic oak forests are mainly found at the grass and bush level, including many Mediterranean species: jasmine, Christ's thorn, sumac, poaeta bulbosae, cock's-foot, crupina, cat thyme, cleavers, etc.

Xerothermic oak forests dominated by pubescent oak

The habitat is identified along the routes of all project options considered.

Balkan-Pannonian Austrian oak and sessile oak forests

These are the xerothermic and mesoxerothermic oak forests in the hilly plains, the foothills and the low mountains of South Bulgaria. These communities have a variety of flora composition, most often combined, but Hungarian oak is prevailing in most places or forms combined communities with the Austrian oak and at a higher altitude with the sessile oak. The Balkan-Pannonian Austrian oak and sessile oak forests occupy slopes of varying exposure and the ridges of the hills.

The habitat is identified along the routes of all options.

Riverside galleries of willows and poplars
Riverside forests are found in the plains and lowland with transitional continental climate in South Bulgaria. They take narrow stripes along the banks of the Struma River. They grow on rich alluvial soils. Periodic spring floods of varying duration are typical. The main prevailing species are white and black poplar, white and brittle willow.

Riverside galleries of willows and poplars

The habitat is identified along the routes of G20 - blue and G20 - red options, East G10.50 and G20 options and the long tunnel option.

Oriental plane forest
This habitat comprises riverside forests dominated by the oriental plane. The natural distribution of the plane's communities is related to the river valleys reaching altitudes up to 800-900 m. Soil is alluvial and alluvial-delluvial deposits along water streams and water sources with constant and temporary running water, with underground and surface humidification. The tree level of the community is dominated by the oriental plane with single presence of black alder, common walnut (secondary distribution), white willow, etc.

Oriental plane forests

The habitat is identified along the routes of G20 - blue, G20 - red and the long tunnel option.

Endemic Greek juniper forests

The Greek juniper and its phytocoenoses are found only in areas with a pronounced Mediterranean climate. In the Struma valley the association is spread in Kresna Gorge and in the lowest parts of the valleys of the Vlahi River, the Oshtava River and Moravska Protected Area. Groups of or single Greek junipers in the North reach the Mechkul River between Stara Kresna Stop and Krupnik. The most representative communities are in Tisata Reserve and in its former buffer zone (recategorized into a protected area).

***Greek juniper* (Juniperus excelsa)**

The habitat is identified along the routes of G20 - blue and G20 - red options, East G10.50 and East G20 options.

Alluvial forests with black alder and mountain ash

Riverside alder and mountain ash forests have a fragmentary distribution along rivers in foothills and lower mountain zone of most mountains in Bulgaria at an altitude of about 300 to about 1000 m. They represent combined riverside gallery communities with the black alder as a main prevailing species. In some places prevailing species and co-prevailing species are the white alder, the oriental plane and the common ash. There are also different types of willows, most commonly the brittle willow and the white willow.

Alluvial black alder forests - the Vlahi River

The habitat is identified in the floodplain of the Vlahi River along the routes of G20 - blue, G20 - red and East G10.50 and East G20 options outside the Kresna Gorge. The black alder is prevailing and there is also a white willow, a black poplar, an oriental plane, a walnut, etc.

White and black pine plantations

The range of natural coniferous formations is at more than 800-1000 m above sea level. Within the scope of the solutions in the options they are the result of afforestation in place of destroyed oak and hornbeam formations.

Bushes

Mediterranean and sub-Mediterranean sclerophyllous evergreen bushes with predominance of red juniper. They represent the final stage of the degradation of xerothermic oak forests in South Bulgaria. They grow on highly eroded cinnamon forest soils, rarely on rendzinas. In the communities there are no separate trees or groups of pubescent oak, virgil oak, oriental hornbeam, fraxinus ornus, etc., representing remains of the previous forests.

Bushes

The habitat is identified along the routes of East G10.50 and East G20 options.

Semi-natural dry grass and bush communities on limestone (*important habitats of orchids)
Xerothermic to mesoxerothermic grass communities. They are represented by continental or subcontinental pastures or meadow steppes as well as perennial grass communities on rocky slopes in the sub-Mediterranean areas. Many of these communities are secondary - in the place of destroyed forests. Their species composition is extremely varied. Phytocoenoses are mainly dominated by high tuft-like cereal grasses and other perennial grass species.

Semi-natural dry grass and bush communities

The habitat is identified along the routes of all project options considered.

Pseudostepes with cereal and annual class plants
This habitat represents xerothermic grass communities with predominance of annual cereal species such as: ovate goatgrass, three-awn goat grass, bromus inermis, compact brome, bristly dogstail grass, hare's-tail, psilurus incurvus, trachynia distachya, squirreltail fescue, rat's-tail fescue, etc. The soils on which the phytocoenoses grow are dry, shallow and often eroded with open gravel and stone base.

Pseudostepes with cereal and annual plants. Part of land in the Eastern passage of Kresna

The habitat is identified along the routes of East G10.50 and East G20 option outside Kresna Gorge.

Chasmophyte vegetation on silicate rocky slopes

Vegetation on the clefts of silicate rocks in the mountains referring to *Silenion lerchenfeldianae* union and *Androsacetalia vandelii* order. The vegetation is represented by open rock groups with varied flora composition. Plants: *Silene lerchenfeldiana, Potentilla haynaldiana, Geum bulgaricum, Saxifraga sancta ssp. Pseudosancta, S. pedemontata ssp. cymosa, Asplenium spp.*

The habitat is identified along the route of G20 - blue and G20 - red options.

Hydrophilic communities of high grasses in the plains and the mountain to the Alpine zone

A basic condition to the growing of high grass vegetation is the presence of high soil and air moisture. Most commonly high grass cenoses are formed along the banks of rivers and streams from plains up to 2500 m above sea level in the mountains. They usually occupy narrow stripes (up to 2-3 m) along running water and wet banks, most often on a gravel or clay primer. The species composition of the cenoses is very diverse and depends on altitude and lighting as well as the surrounding communities. Depending on this, three main subtypes are differentiated.

The habitat is identified along the route of G20 - blue and G20 - red options.

♦ **Expected impacts**

During construction

- disturbance of plant communities (phytocenoses) and habitats

The main impacts of all project options under assessment in regard to plant component will be generated in the process of terrain preparation for construction of the road and associated facilities (tunnels, bridges, viaducts, supporting walls, etc), when all habitats and plant communities in the scope of the motorway will be destroyed irreversibly. Option solutions differ only in terms of the size of affected habitat areas. All plants in the scope of the rad and associated engineering structures will be destroyed entirely with the removal of the soil layers. Moreover, existing habitats of wildlife fauna and individual species, including threatened species, will be destroyed.

- **Option G20-red**
- **Option G20-blue**

The impact of a particular site on the environment will depend directly on the nature, peculiarities and technical specification of the site itself. The positive aspect in this case is the fact that the territories, which the highway will pass through in both design the option, will be a narrow strip of long length, yet of small width. Consideration should also be given to the fact that vegetation, to one degree or another is adversely affected by the scope of the existing road.

- Direct destruction at the site of construction

The expected violations in the territories to be used in the construction of the road under Options G20-blue and G20-red, with respect to the forest habitats, occupied by hornbeam-oak communities are estimated to be **average** in both project design options. The affected forest communities under *Option G-20-red* comprise an area of **225.472 decares** and under the *G20 Option* - approximately **330 decares**. This impact has been assessed to be of an **average** rate.

The significance of the impact on affected forests of both varieties was assessed to be of **low extent** in both options.

The impact on riparian communities of willows and poplars, which would be affected by the construction of the bridged facilities on the Struma river under
the two project design options have been determined to be of **high rate**. With regard to the impact of the construction of bridge facilities upon the communities of the eastern plane tree, the assessment under Option G20-red and G20-blue is of **high-rated** impact. The alluvial forests of black alder and ash (Fraxinus) that will be affected by the overbridging of the Vlahinska river are covering a very small area, therefore the impact is determined to be **low in both options.**

The significance of impacts on affected grasslands in both options is determined to be **low.**

In places, affected by the construction of bridges and other plant communities, it will be possible to partially recover them in the medium
or long-term plan.

- Fragmentation

The realization of the right-hand road lanes of the speedway in both options *will not result* in the fragmentation of plant habitats, since they are already fragmented by the existing path. Fragmentation of the riparian habitats of willows, poplars and of eastern planar will occur in the places of bridge facilities in the area of the Struma river. Fragmentation will be **significant**, combined with the direct loss of habitats.

- *The effects of emitted pollutants* - dusting and diminishing the activity of photosynthesis and transpiration from construction activities and pollutants from internal combustion engines.

During construction, impacts on habitats and ecosystems through the air will not be significant. Air pollution with dust and deposition on vegetation will be present in the area of construction sites. Emitted dust emissions from these activities do not pose a significant hazard to habitats. Another source of air pollution will be the gases, emitted by internal combustion engines, serving the construction works - CO, NOx, hydrocarbons. Their impact will be negligible and temporary - until completion of the construction works. Pollution can occur in emergency situations - spillage of petroleum products, which will be local, temporary and insignificant in scope.

- **East Option G10.50**

- Direct destruction at the site of construction

The expected violations in the forest areas, which are to be used for the construction of the road, are **450,705 decares** . The impact is determined to be of **average (3)** rate. It should be emphasized that a large part of the forest habitats are artificial plantations of black and white pine. With regard to forest habitats, occupied by pubescent oak communities, the impact is assessed to be of average rate**,** and on the Balkan-Pannonian oak-durmast forests - **it has been determined to be of low rate.** The impact on the grassland communities with juniper participation is assessed to be of an **average rate.** The impact on affected grasslands is determined to be **average,** considering the significant areas affected, although some of them are significantly ruderalized. The impact upon riparian communities of willows and poplars that are affected by the construction of the river-bridging facilities are considered to be **low.** The impact on alluvial black alder forests, to be affected in the construction of bridge facilities on the Vlachinska river and other smaller rivers has been determined to be of an **average rate.**

- Fragmentation

The fragmentation of plant communities, combined with direct habitat loss and with possible changes in habitat functions, determines the rate of impact as **average**.

- *The effects of emitted pollutants* - dusting and diminishing the activity of photosynthesis and transpiration from construction activities and pollutants from internal combustion engines.

During construction the impacts on habitats and ecosystems through the air will not be significant. Air pollution with dust and deposition on vegetation will be present in the area of construction sites. Emitted dust emissions from these activities do not pose a significant hazard to habitats. Another source of air pollution will be the gases, emitted by internal combustion engines, serving the construction works - CO, NOx, hydrocarbons. Their impact will be negligible and temporary - until completion of the construction works. Pollution can occur in emergency situations - spillage of petroleum products, which will be local, temporary and insignificant in scope.

- **Eastern Option G20**

- Direct destruction at the site of construction

The affected forest communities of the Option comprise an area of **1,294.386** decares. The impact has been determined to be of **high value.** The expected disruptions in the areas to be used for the construction of the road, with respect to forest habitats, occupied by communities of pubescent oak (Quercus pubescens) have been assessed of **high** rate of impact and on the Balkan-Pannonian oak-durmast forests - it has been determined to be of

low rate. The impact on grasslands and juniper grasslands has been assessed to be of **high rate.** The impact upon riparian communities of willows and poplars that will be affected by the construction of the bridge facilities on the Gradevska river are considered to be of **low value.** The impact on alluvial black alder forests, to be affected in the construction of bridge facilities on the Vlachinska river and other smaller rivers has been determined to be of an **high value.**

- *Fragmentation*

The fragmentation of plant communities, combined with direct habitat loss and with changes in habitat functions, determines the rate of impact as **high**.

- *Effects of emitted pollutants* - dusting and decreasing the activity of photosynthesis and transpiration from construction activities and pollutants from internal combustion engines.

During construction, impacts on habitats and ecosystems through the air will not be significant. Air pollution with dust and deposition on vegetation will be present in the area of construction sites. The dust emissions from these activities do not represent significant hazards to habitats. Another source of air pollution will be the gases, emitted by internal combustion engines, serving the construction works - CO, NOx, hydrocarbons. Their impact will be negligible and temporary - until completion of the construction works. Pollution

Pollution can occur in emergency situations - spillage of petroleum products, which will be local, temporary and insignificant in scope.

- **Long Tunnelling Option**

A section from km 376+000 to km 378 + 126 - beginning of viaduct for the North portal of the Kresna Tunnel

- Direct destruction at the site of construction

The area of the plant habitat that will be affected during the realization of the IP shall be 4.087 decares in the area of the road section under the viaduct - the supports of the facility. The impact is defined as **a low-rate**, i.e. the affected area is small enough not to cause a change in habitat functions.

- *Fragmentation* - the realization of the IP will lead to a **low rate** of fragmentation of the habitat.

North Portal of the Kresna Tunnel

- Direct destruction at the site of construction

The area of the pubescent oak forest (Quercus pubescens) that will be affected by the realization of the northern portal of the tunnel shall be about 40.4 decares and of the Balkan-Pannonian oak-durmast forests - 2.75 decares. The remaining area of the construction site is occupied by white pine plantation. The impact is determined to be of **low value.**

The impact on riparian habitats of willows and poplars, to be affected in the crossing of the Struma river shall be **low.**

- *Fragmentation* - the realization of the IP will lead to partial - **low-**rate fragmentation of the habitats.

Southern portal of Kresna tunnel, km 394 + 620 to km 397 + 000 - end of Lot 3.2

- Direct destruction at the site of construction

The area of the portal and the service buildings and facilities comprises an area of 29.75 decares. The forest habitat of scattered xenothermal low-stem horn-oak forests will be

affected. The impact is determined to be **low.** The road section of the motorway to the bridge facility of the Struma river is occupied by pasture communities, and after the bridge over the Struma river, the motorway route and the Kresna road junction will only affect arable land. The impact is determined to be of **low value.**

- *Fragmentation* - There will be no fragmentation of the forest habitat,

Since it will affect the edge of a scattered forest area.

Intermediate access (IA2) at km 380+745.688

- Direct destruction at the site of construction

The total construction area for the realization of intermediate access (IA)2 will be 11.896 decares. In the scope of the forest habitat will be affected 0.737 decares for the portal of the intermediate access. The impact is determined to be of **low value.** The two landfill sites for rock material are located in the widening of the river terrace, in the immediate vicinity of the Struma river. The territories are partially grassed, significantly anthropogenically influenced by their use to park the vehicles of the rafting grounds. No riverside habitats will be affected.

- *Fragmentation* - There **will be no** fragmentation of the forest habitat, since it will affect the outskirts of a highly sparse forest area.

Intermediate access IA5 km 386 + 664.986

- Direct destruction at the site of construction

It is situated in the southern end of the small 'Kresna' inns and represents almost a vertical slope above the road. Field investigations have shown a strongly altered species composition of the pubescent oak (Quercus pubescens) forest community. The common construction area for realization of IA5 is 3.896 decares in which the existing vegetation will be destroyed. The impact is determined to be of **low value.**

- *Fragmentation* - **there will be no** fragmentation.

Intermediate access IA7 at km 392+009.286

- Direct destruction at the site of construction

Most of the construction site for the intermediate access comprises arable land, with a section of common pasture/land, affected in the south-east. The total construction area for the implementation of IA7, where the existing vegetation will be destroyed shall be 1.346 decares. The impact is determined to be of **low value.**

The landfill site (3.029 decares) is located on the river terrace of the Breznishka river and will affect the community of eastern platanus *(Platanus orientalis).*

The impact is determined to be of **high value.**

- *Fragmentation* - there will be a **high rate** of fragmentation for the Eastern plane tree.

Depot North Portal of the 'Kresna' Tunnel

- Direct destruction at the site of construction

Of the total area of the landfill - 19.913 decares, 12.724 decares are on the territory of the Protected Area - 'Kresna- Ilindentsi'. It will affect the grassy habitat of pseudo-steep grains and annual plants. The impact is defined as **a medium-rate**, i.e. the affected area shall be large enough and is possible to cause a change in habitat functions.

- *Fragmentation* - there will be an **average rate of** fragmentation in the affected

habitat.

Depot No. 1 - Southern portal of the 'Kresna' tunnel

- Direct destruction at the site of construction

The property has an area of 63,650 decares, with manner of permanent use - "other territories, occupied by agricultural farming". For years on end, the terrain has been used as an unregulated landfill for construction and household waste. There will be no impact on plant habitats.

Depot No 2 - Southern portal of the 'Kresna' tunnel

- Direct destruction at the site of construction

The total area of the plant habitats, affected by the construction of the landfill shall be 138.977 decares, of which 8.543 decares are within the scope of the gully, occupied by eastern plane tree. The impact is determined to be **high.**

- *Fragmentation* - fragmentation of the habitat of the eastern plane tree - a **high degree**.

- *The effects of emitted pollutants* - dusting and diminishing the activity of photosynthesis and transpiration from construction activities and pollutants from internal combustion engines.

During construction the impacts on habitats and ecosystems through the air will not be significant in all considered project design options. Air pollution with dust and deposition on vegetation will be present in the area of construction sites. Released dust emissions from these activities do not pose a significant hazard to habitats. Another source of air pollution will be the gases, emitted by internal combustion engines, serving the construction works - CO, NOx, hydrocarbons. Their impact will be negligible and temporary - until completion of the construction works. Pollution can occur in emergency situations - spillage of petroleum products, which will be local, temporary and insignificant in scope.

Operating period for all evaluated design options

In the operations on the road, the following impacts are to be expected:

- Degradation of plant communities

The large-scale excavation works on the roadway will deteriorate the condition of neighbouring plant communities (most often about 20-40 m from the road track). The hazard exists that the traffic of people and equipment may damage and threaten communities that are further away from the road track, yet on the access routes. Degradation of the neighbouring vegetation communities is also caused by periodic cleaning of vegetation in banked earth strips, conscious or unconscious introduction of foreign and atypical species, possible fires and contamination, resulting from accidents.

- *Changing the biotic and abiotic structure of habitats* due to maintenance activities of the route or due to accidents and fires.

- *Effects of the maintenance mode - sanding / salting.*

Contamination from the use of winter maintenance means for the roadway is also a source of soil contamination, respectively, of the vegetation in the lands, adjacent to the road. They would not cause noticeable changes in the quality of vegetation given the limited quantities used.

- *Effects of emitted dust and aerosols from road traffic*

As a linear source of pollution and as a road, intensely loaded with traffic, the road will cause varying degrees of negative impact on the plant component,

adjacent to the road. It has been established (Beshkov et al. 2007) that the stripes on both sides of the busy road sections at a distance of up to 50 m from the roadway are mostly polluted. The extent of this impact coincides with the extent of the pathway in which the vegetation will be affected during the construction works.

It should be noted that Bulgaria has no standards for the contents of pollutants in biomass. The Sanitary norms for the Content of Harmful Substances in Vegetation (Vegetables) are defined by Ordinance No. 5 of the Ministry of Public Health (MNH) of 1984.

According to the modelling of the pollutants from the internal combustion engine, the zone with average daily values of nitrogen oxides above the allowed standards for protection of soils and vegetation (the standard for soil and vegetation protection with approximating period of 1 year is 0.03 mg/m^3) in the different road sections vary from 35 to 50 m and 55 to 90 m from the road axis in the projected traffic. At the exits of the tunnels it reaches 300 m. The remaining pollutants are well below the permissible standards.

Conclusions:

In order to choose an option for the implementation of the investment proposal, a limiting factor with respect to vegetation shall be the size of the natural forest communities to be destroyed, as well as the natural and semi-natural grass communities.

Options G20- red and G20- blue

The affected **forest** formations (Pubescent oak (Quercus pubescens), Balkan-Pannonian oak-durmast forests, Forests with Oak (Quercus frainetto)) under the *G20-Red Option* **cover an** area of **225.472 decares** and under the *G20 Option* approximately **330 decares**. The impact has been assessed to be of **average value.** The impact on riparian communities of willows and poplars that will be affected by the construction of the bridge facilities on the Struma river under both design options is determined to be of **high rate.** With regard to the eastern plane tree communities, affected by the construction of bridges, both options will have the same impact of **high rate.** The alluvial forests of black alder and ash (Fraxinus) that will be affected by the overbridging of Vlachinska river are on very small area, therefore the impact is determined to be of **low rate** in both options. The natural and semi-natural **grasslands,** affected by the*Option* G20-blue are **700.804 decares** and in the *Option G20-red* - **701.438**. The impact has been assessed to be of **low rate** due to their ruderalization.

Eastern Option G10.50

Affected **forest** communities (pubescent oak (Quercus pubescens)) in the Eastern Option G10.50 have an area of **450.705 decares.** The impact has been assessed to be of **average value.** Forests of *pubescent oak (Quercus pubescens)* with the participation of *juniper tree* affects an area of **2.9 decares**. The impact is determined to be of **low value.** The impact on alluvial black alder forests, to be affected in the construction of bridge facilities on the Vlachinska river and other smaller rivers are determined to be of **high rate,** and on the affected riparian communities of willows and poplars - of **low rate.** The impact on the **grassland communities** (657.193 decares) is assessed to be of **average rate**, and those on juniper communities - of **medium rate.**

Eastern Option G20

In the Eastern Option G20, the **forest** communities of (pubescent oak (Quercus pubescens))

affected comprise an area of **1,294.386 decares**. The impact has been determined to be of **high value.** Forests of pubescent oak (Quercus pubescens) with the participation of *juniper tree* are affected on an area of **12.6 decares**. The impact has been assessed to be of **average value.** The impact on alluvial black alder forests, to be affected in the construction of bridge facilities on the Vlachinska river and other smaller rivers has been determined to be of an **high value.** The impact on **grasslands** and juniper grasslands has been assessed to be of **high rate.** Affected are **1,523.38 decares.**

Long Tunnelling Option

In the long tunnelling Option, the affected **forest** communities have an area of **92.183 decares** and the natural and semi-natural **grass** formations comprise an area of **446.151 decares.** The impact is determined to be of **low value.** The impact on the habitats of the *Eastern plane tree* **(11.5 decares)**, affected by the Option have been determined to be of a **high rate.**

Impact Rate of affected plant habitats

Habitats	**Option G20 - Red**	**Option G20- blue**	**Eastern Option G10.50**	**Eastern Option G20**	**Long Tunnel Option**
Total forest	3	3	3	4	2
Pubescent oak (Quercus pubescens) Forests	3	3	3	4	2
Pubescent oak (Quercus pubescens) Forests with Participation of tree juniper	2	2	2	3	0
Balkan-Pannonian oak-durmast forests	2	2	2	2	2
Forests with Oak (Quercus frainetto)	2	2	0	0	0
Forests of plane tree	4	4	0	0	4
Alluvial forests with black alder	2	2	3	4	0
Riverside habitats with willows and poplars	4	4	2	2	2
Total grass	2	2	3	4	2
Shrubs of juniper	0	0	3	4	0
Semi-natural dry grasses on limestone	2	2	2	3	2
Pseudostepes with annual cereals	0	0	3	4	1
A general condition for the development of high-grass vegetation of high grass	2	2	0	0	0
Hasmophite growth on silicate rocks	2	2	0	0	0
Silicate rocks with pioneer vegetation	2	2	0	0	0
Fragmentation	2-4	2-4	3	4	2-3
Protected plant species	6 types	6 types	3 types	3 types	1 type

The comparative analysis and the tables on the nature of the impacts during the construction and during the operation of the implementation of the investment proposal under the evaluated design options, have demonstrated that **the most favourable option** for the implementation is the **Long Tunnel Option** . The affected plant habitats will be of **low** impact. This option only affects the conservation of the habitat of the eastern plane tree *(Platanus orientalis)* in the range of the landfills of IA....(?) and IA7, *the* impact on which is determined to be of **high rate**.

In the **Eastern option G10.50, the** affected forest habitats are larger than those in the long tunnel option. The participation of artificial plants of white and black pine is significant, which is why the impact is determined to be of**average rate.** The impact on pubescent oak (Quercus pubescens) forests and *forests with juniper trees* shall be **moderate**.

The natural habitats of high-impact will not be affected, making it **possible for implementation.**

According to the accepted point system* for selecting the implementation option, the preferred option - the Long Tunnel Option has received 5 points. In the second place - Options G20-red and the Eastern Option G10.50 with 3 points. In the third place - Option G20-blue with 2 points and in the last place - the Eastern Option G20 with 1 point.

*Section X, 'Comparison Table for the Selection of Option' of the report presents in tabular form the points of each of the proposed five project design options for the different components and the factors of the environment and human health.

Nature of impacts during construction works and during operation:

Vegetation					
During construction works					
Criterion Number/Size of destroyed plant habitats	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact	**Average** Forest territories - 330 decares, grass and grasslands - 700.804 decares	**Average** Forest territories - 225.472 decares, grass and grasslands 701.438 decares	**Average** Forest territories - 450.705 decares, grass and grassland 657.193 decares	**Low** Forest territories - 92.183 decares, grassland - 446.151 decares	**High** Forest territories - 1,294.386 decares, grass and grassland 1,523.38 decares
Territorial Scope of Impact:	Local, within the dimensions of the road	Local, within the dimensions of the road	Local, within the dimensions of the road	Local within the dimensions of the road	Local, within the dimensions of the road
Duration of impact:	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)	Temporary (mid-term)	Temporary (short-term)
Frequency of impact:	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative Impacts:	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact
Significance of impacts	Moderate / Average	Moderate / Average	Moderate / Average	Insignificant	Significant

Vegetation					
During operation					
Criterion (Pollution by harmful substances on the adjoining vegetation)	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact	**Low rate** Low ground concentrations of nitrogen oxides	**Low rate** Low ground concentrations of nitrogen oxides	**Low rate** Low ground concentrations of nitrogen oxides	**Low rate** Low ground concentrations of nitrogen oxides	**Low rate** Low ground concentrations of nitrogen oxides
Territorial Scope of Impact:	Locally In the strip, 20 to 100 meters of the road	Locally In the strip, 20 to 100 meters of the road	Locally In the strip, 20 to 100 meters of the road	Locally In the strip, 20 to 100 meters of the road	Locally In the strip, 20 to 100 meters of the road
Duration of impact:	Long-term	Long-term	Long-term	Long-term	Long-term
Frequency of impact:	always	always	always	always	always
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative Impacts:	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact
Significance of impacts	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

Animal world
➨Invertebrates *(Invertebrata)*
Water Invertebrates

The impacts on the species of aquatic invertebrates subject to conservation in the Protected Areas have been considered in detail in the EIA report.

Option G20 - Red

Impacts during construction works:
- direct destruction of habitats

During construction works there will be excavation activities in and around the river sections in the area of intersection and cleaning of the river banks of wood and shrub vegetation, for the construction of bridge facilities and retaining walls. The affected area will amount to 1,240.997 decares (the tunnels are excluded, as the habitats above them will not be affected), of which the freshwater basins (mostly the Struma river, but also the Divilska river, Vlachinska river and Rezena river) shall be 2%. The habitats of species, inhabiting semi-mountainous pebble-type rivers will be affected (the Struma river and the downstreams of Vlahinska river), as well as the sub-Mediterranean small and medium rivers. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other species of significance, subject to conservation, there will be impacts on the habitats of the *Heptagenia coerulans* and the medical leech (*Hirudo medicinalis*). The impacts during the construction works will be temporary with the possibility of a rapid restoration of the affected habitats, therefore it is assessed as insignificant.

- pollution of habitats

In the process of construction works, water bodies may possibly be contaminated with soil masses, building materials or leaks / leakages of petroleum products from construction machines in case of accidents. Contamination of water bodies with soil masses shall be analogous to pollution in heavy rainfall, torrential rains and floods and would not lead to a change in their environmental condition according to the standards and provisions of Enclosure 2 of Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for the specification of surface water. In case of operating equipment with malfunctions and failures during construction works, due to the volatility of petroleum products, even the smallest amounts of leakages would cause local pollution with petroleum products. In compliance with the Health and Safety Plan (HSP), accompanying each project, drawn up on the basis of the Health and Safety Regulations Act and Ordinance No. 2 of the MLSP and the MRDPW, the probability of leakage of petroleum products shall be insignificant.

- fragmentation of habitats

Fragmentation will be related to the temporary damage of habitat parts during the construction of bridge facilities, but their recovery will occur quickly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned. Fragmentation will not practically be present.

- barrier effect

The construction of hydraulic structures (building of retaining walls and pillars of bridges) would not involve the complete blocking of water streams or the creation of differences in the levels, which will not prevent the possibility of moving the invertebrate aquatic environment from one to another river section. All types of insects, whose larval stage

is related to the presence of an aquatic environment have good flying capabilities and the construction of the investment proposal will not have a barrier effect. Given the temporary nature of the impact for the other groups, it is considered to be insignificant.

- Mortality of individual numbers of the species

In the construction phase, mainly in excavation activities, along with excavated earth masses, bottom deposits will be discharged on the land, including the invertebrates, inhabiting the bottom substrate. The relatively small affected area implies a relatively small number of individual occurrences of the species, for which destruction is possible. Since invertebrates are part of the food chains for fish, amphibians, birds and mammals, the loss of individual numbers of the species would not alter the parameters of their populations due to the evolutionary mechanisms of compensation. Upon completion of construction activities in the water bodies, re-colonization of benthic fauna in the affected areas is expected in several subsequent life cycles / seasons and restoration of the affected populations. The mortality of individual numbers of the species will be insignificant and within the limits of the natural changes in the number of their populations.

Impacts during operation:

- direct destruction of habitats

During the operation, the areas affected by the construction of the bridge facilities will recover, as habitats of individual species, except for those, occupied by the bridge pillars. The affected areas will be much smaller afterwards than during construction, respectively direct impact on the aquatic invertebrates will be insignificant.

- pollution of habitats

During the operation of the Motor Highway it is possible to contaminate surface waters in case of accidents, without changing the environmental condition of the Struma river and its tributaries, according to the standards in Enclosure No.2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for surface water characterization. The impact, if any, shall be insignificant. It could be prevented by appropriate measures. Subject to the rules on the transport of dangerous goods by road, the possibility of dangerous substances entering the rivers shall be excluded.

- fragmentation of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no fragmentation.

- Barrier effect

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no barrier effect.

- Mortality of individual numbers of the species

Mortality will be present in the warmer months among daily flying insects, which occur in extremely large numbers near water bodies - *Ephemeroptera, Chironomidae* , *Simuliidae* and *Culicidae)* due to their collision with the vehicles. Due to the short life span and enormous reproductive capabilities of these species, and based on the observations in the area of passers-by the water sites (where these species are well presented), we could make the conclusion that this mortality will be irrelevant to the populations, identified in these territories and the impacts due to their mortality will be insignificant. Impacts on other groups are not expected.

Option G20 - Blue

Impacts during construction works:

- direct destruction of habitats

During construction works there will be excavation activities in and around the river sections in the area of intersection and cleaning of the river banks of wood and shrub vegetation, for the construction of bridge facilities and retaining walls. The affected area will amount to 1,246.156 decares (the tunnels are excluded, because the habitats above them will not be affected), from which the freshwater basins (mostly the Struma river, but also the Divilska river, Vlachinska river and Rezena river) shall be 2%. The habitats of species, inhabiting semi-mountainous pebble-type rivers will be affected (the Struma river and the downstreams of Vlahinska river), as well as the sub-Mediterranean small and medium rivers. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other species of significance, subject to conservation, there will be impacts on the habitats of the *Heptagenia coerulans* and the medical leech (*Hirudo medicinalis*). The impacts during the construction works will be temporary with the possibility of a rapid restoration of the affected habitats, therefore it is assessed as insignificant.

- pollution of habitats

In the process of construction works, water bodies may possibly be contaminated with soil masses, building materials or leaks / leakages of petroleum products from construction machines in case of accidents. Contamination of water bodies with soil masses shall be analogous to pollution in heavy rainfall, torrential rains and floods and would not lead to a change in their environmental condition according to the standards and provisions of Enclosure 2 of Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for the specification of surface water. In case of operating equipment with malfunctions and failures during construction works, due to the volatility of petroleum products, even the smallest amounts of leakages would cause local pollution with petroleum products. In compliance with the Health and Safety Plan (HSP), accompanying each project, drawn up on the basis of the Health and Safety Regulations Act and Ordinance No. 2 of the MLSP and the MRDPW, the probability of leakage of petroleum products shall be insignificant.

- fragmentation of habitats

Fragmentation will be related to the temporary damage of habitat parts during the construction of bridge facilities, but their recovery will occur quickly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned. Fragmentation will not practically be present.

- Barrier effect

The construction of hydraulic structures (building of retaining walls and pillars of bridges) would not involve the complete blocking of water streams or the creation of differences in the levels, which will not prevent the possibility of moving the invertebrate aquatic environment from one to another river section. All types of insects, whose larval stage is related to the presence of an aquatic environment have good flying capabilities and the construction of the investment proposal will not have a barrier effect. Given the temporary nature of the impact for the other groups, it is considered to be insignificant.

- Mortality of individual numbers of the species

In the construction phase, mainly in excavation activities, along with excavated earth masses, bottom deposits will be discharged on the land, including the invertebrates, inhabiting the bottom substrate. The relatively small affected area implies a relatively small number of individual occurrences of the species, for which destruction is possible. Since invertebrates

are part of the food chains for fish, amphibians, birds and mammals, the loss of individual numbers of the species would not alter the parameters of their populations due to the evolutionary mechanisms of compensation. Upon completion of construction activities in the water bodies, re-colonization of benthic fauna in the affected areas is expected in several subsequent life cycles / seasons and restoration of the affected populations. The mortality of individual numbers of the species will be insignificant and within the limits of the natural changes in the number of their populations.

Impacts during operation:

- direct destruction of habitats

During the operation, the areas affected by the construction of the bridge facilities will recover, as habitats of individual species, except for those, occupied by the bridge pillars. The affected areas will be much smaller afterwards than during construction, respectively direct impact on the aquatic invertebrates will be insignificant.

- pollution of habitats

During the operation of the Motor Highway it is possible to contaminate surface waters in case of accidents, without changing the environmental condition of the Struma river and its tributaries, according to the standards in Enclosure No.2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for surface water characterization. The impact, if any, shall be insignificant. It could be prevented by appropriate measures. Subject to the rules on the transport of dangerous goods by road, the possibility of dangerous substances entering the rivers shall be excluded.

- fragmentation of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no fragmentation.

- Barrier effect

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no barrier effect.

- Mortality of individual numbers of the species

Mortality will be present in the warmer months among daily flying insects, which occur in extremely large numbers near water bodies - *Ephemeroptera, Chironomidae* , *Simuliidae* and *Culicidae)* due to their collision with the vehicles. Due to the short life span and enormous reproductive capabilities of these species, and based on the observations in the area of passers-by the water sites (where these species are well presented), we could make the conclusion that this mortality will be irrelevant to the populations, identified in these territories and the impacts due to their mortality will be insignificant. Impacts on other groups are not expected.

Eastern Option G10.50

Impacts during construction works:

- direct destruction of habitats

During construction works there will be excavation activities in and around the river sections in the area of intersection and cleaning of the river banks of wood and shrub vegetation, for the construction of bridge facilities and retaining walls. The affected area will amount to 1,107.898 decares (the tunnels are excluded, as the habitats above them will not be affected), of which the freshwater basins (including the Struma river) are below 1%. The habitats of all types of aquatic invertebrates, the areal of which falls within the scope of the

investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other species of significance, subject to conservation, there will be impacts on the habitats of the *Heptagenia coerulans* and the medical leech (*Hirudo medicinalis*). The impacts during the construction works will be temporary with the possibility of a rapid restoration of the affected habitats, therefore it is assessed as insignificant.

- pollution of habitats

In the process of construction works, water bodies may possibly be contaminated with soil masses, building materials or leaks / leakages of petroleum products from construction machines in case of accidents. Contamination of water bodies with soil masses shall be analogous to pollution in heavy rainfall, torrential rains and floods and would not lead to a change in their environmental condition according to the standards and provisions of Enclosure 2 of Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for the specification of surface water. In case of operating equipment with malfunctions and failures during construction works, due to the volatility of petroleum products, even the smallest amounts of leakages would cause local pollution with petroleum products. In compliance with the Health and Safety Plan (HSP), accompanying each project, drawn up on the basis of the Health and Safety Regulations Act and Ordinance No. 2 of the MLSP and the MRDPW, the probability of leakage of petroleum products shall be insignificant.

- fragmentation of habitats

Fragmentation will be related to the temporary damage of habitat parts during the construction of bridge facilities, but their recovery will occur quickly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned. Fragmentation will not practically be present.

- Barrier effect

The construction of hydraulic structures (building of retaining walls and pillars of bridges) would not involve the complete blocking of water streams or the creation of differences in the levels, which will not prevent the possibility of moving the invertebrate aquatic environment from one to another river section. All types of insects, whose larval stage is related to the presence of an aquatic environment have good flying capabilities and the construction of the investment proposal will not have a barrier effect. Given the temporary nature of the impact for the other groups, it is considered to be insignificant.

- Mortality of individual numbers of the species

In the construction phase, mainly in excavation activities, along with excavated earth masses, bottom deposits will be discharged on the land, including the invertebrates, inhabiting the bottom substrate. The relatively small affected area implies a relatively small number of individual occurrences of the species, for which destruction is possible. Since invertebrates are part of the food chains for fish, amphibians, birds and mammals, the loss of individual numbers of the species would not alter the parameters of their populations due to the evolutionary mechanisms of compensation. Upon completion of construction activities in the water bodies, re-colonization of benthic fauna in the affected areas is expected in several subsequent life cycles / seasons and restoration of the affected populations. The mortality of individual numbers of the species will be insignificant and within the limits of the natural changes in the number of their populations.

Impacts during operation:

- direct destruction of habitats

During the operation, the areas affected by the construction of the bridge facilities will recover, as habitats of individual species, except for those, occupied by the bridge pillars. The affected areas will be much smaller afterwards than during construction, respectively direct impact on the aquatic invertebrates will be insignificant.

- pollution of habitats

During the operation of the Motor Highway it is possible to contaminate surface waters in case of accidents, without changing the environmental condition of the Struma river and its tributaries, according to the standards in Enclosure No.2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for surface water characterization. The impact, if any, shall be insignificant. It could be prevented by appropriate measures. Subject to the rules on the transport of dangerous goods by road, the possibility of dangerous substances entering the rivers shall be excluded.

- fragmentation of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no fragmentation.

- Barrier effect

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no barrier effect.

- Mortality of individual numbers of the species

Mortality will be present in the warmer months among daily flying insects, which occur in extremely large numbers near water bodies - *Ephemeroptera, Chironomidae* , *Simuliidae* and *Culicidae)* due to their collision with the vehicles. Due to the short life span and enormous reproductive capabilities of these species, and based on the observations in the area of passers-by the water sites (where these species are well presented), we could make the conclusion that this mortality will be irrelevant to the populations, identified in these territories and the impacts due to their mortality will be insignificant. Impacts on other groups are not expected.

Long Tunnel Option, 'Kresna' tunnel

Impacts during construction works:

- direct destruction of habitats

During construction works there will be excavation activities in and around the river sections in the area of intersection and cleaning of the river banks of wood and shrub vegetation, for the construction of bridge facilities and retaining walls. The affected territory will amount to 1,044.650 decares (temporary landfills at the tunnel portals are included), of which the freshwater basins (the Struma river) are 8%. Only the habitats of species, inhabiting semi-mountainous pebble-type rivers will be affected (the Struma river). The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other species of significance, subject to conservation, there will be impacts on the habitats of the *Heptagenia coerulans* and the medical leech (*Hirudo medicinalis*). The impacts during the construction works will be temporary with the possibility of a rapid restoration of the affected habitats, therefore it is assessed as insignificant.

- pollution of habitats

In the process of construction works, water bodies may possibly be contaminated with soil masses, building materials or leaks / leakages of petroleum products from construction

machines in case of accidents. Contamination of water bodies with soil masses shall be analogous to pollution in heavy rainfall, torrential rains and floods and would not lead to a change in their environmental condition according to the standards and provisions of Enclosure 2 of Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for the specification of surface water. In case of operating equipment with malfunctions and failures during construction works, due to the volatility of petroleum products, even the smallest amounts of leakages would cause local pollution with petroleum products. In compliance with the Health and Safety Plan (HSP), accompanying each project, drawn up on the basis of the Health and Safety Regulations Act and Ordinance No. 2 of the MLSP and the MRDPW, the probability of leakage of petroleum products shall be insignificant.

- fragmentation of habitats

Fragmentation will be related to the temporary damage of habitat parts during the construction of bridge facilities, but their recovery will occur quickly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned. Fragmentation will not practically be present.

- Barrier effect

The construction of hydraulic structures (building of retaining walls and pillars of bridges) would not involve the complete blocking of water streams or the creation of differences in the levels, which will not prevent the possibility of moving the invertebrate aquatic environment from one to another river section. All types of insects, whose larval stage is related to the presence of an aquatic environment have good flying capabilities and the construction of the investment proposal will not have a barrier effect. Given the temporary nature of the impact for the other groups, it is considered to be insignificant.

- Mortality of individual numbers of the species

In the construction phase, mainly in excavation activities, along with excavated earth masses, bottom deposits will be discharged on the land, including the invertebrates, inhabiting the bottom substrate. The relatively small affected area implies a relatively small number of individual occurrences of the species, for which destruction is possible. Since invertebrates are part of the food chains for fish, amphibians, birds and mammals, the loss of individual numbers of the species would not alter the parameters of their populations due to the evolutionary mechanisms of compensation. Upon completion of construction activities in the water bodies, re-colonization of benthic fauna in the affected areas is expected in several subsequent life cycles / seasons and restoration of the affected populations. The mortality of individual numbers of the species will be insignificant and within the limits of the natural changes in the number of their populations.

Impacts during operation:

- direct destruction of habitats

During the operation, the areas affected by the construction of the bridge facilities will recover, as habitats of individual species, except for those, occupied by the bridge pillars. The affected areas will be much smaller afterwards than during construction, respectively direct impact on the aquatic invertebrates will be insignificant.

- pollution of habitats

During the operation of the Motor Highway it is possible to contaminate surface waters in case of accidents, without changing the environmental condition of the Struma river and its tributaries, according to the standards in Enclosure No.2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for surface water characterization. The impact, if

any, shall be insignificant. It could be prevented by appropriate measures. Subject to the rules on the transport of dangerous goods by road, the possibility of dangerous substances entering the rivers shall be excluded.

- fragmentation of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no fragmentation.

- Barrier effect

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no barrier effect.

- Mortality of individual numbers of the species

Mortality will be present in the warmer months among daily flying insects, which occur in extremely large numbers near water bodies - *Ephemeroptera, Chironomidae* , *Simuliidae* and *Culicidae)* due to their collision with the vehicles. Due to the short life span and enormous reproductive capabilities of these species, and based on the observations in the area of passers-by the water sites (where these species are well presented), we could make the conclusion that this mortality will be irrelevant to the populations, identified in these territories and the impacts due to their mortality will be insignificant. Impacts on other groups are not expected.

Eastern Option G20

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 2,817.765 decares (the tunnels are excluded, since the habitats above them will not be affected). Predominantly natural forests will be affected, including Riparian galleries and xerophilic low-stem forests - about 34%. Then come the grasslands - about 26%, including abandoned arable land and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) and shrubs - 17%, arable lands (fields and vineyards) and anthropogenic sites (existing roads, etc.) - 3%, and freshwater basins - less than 1%.

During construction works there will be excavation activities in and around the river sections in the area of intersection and cleaning of the river banks of wood and shrub vegetation, for the construction of bridge facilities and retaining walls. The affected area will amount to 2,817.765 decares (the tunnels are excluded, because the habitats above them will not be affected), from which the freshwater basins (excluding the Struma river) are below 1%. The habitats of species inhabiting mountain-type mountain rivers and sub-Mediterranean small and medium rivers will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will only be habitats of the medical leech (*Hirudo medicinalis*). The impacts during the construction works will be temporary with the possibility of a rapid restoration of the affected habitats, therefore it is assessed as insignificant.

- pollution of habitats

In the process of construction works, water bodies may possibly be contaminated with soil masses, building materials or leaks / leakages of petroleum products from construction machines in case of accidents. Contamination of water bodies with soil masses shall be analogous to pollution in heavy rainfall, torrential rains and floods and would not lead to a

change in their environmental condition according to the standards and provisions of Enclosure 2 of Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for the specification of surface water. In case of operating equipment with malfunctions and failures during construction works, due to the volatility of petroleum products, even the smallest amounts of leakages would cause local pollution with petroleum products. In compliance with the Health and Safety Plan (HSP), accompanying each project, drawn up on the basis of the Health and Safety Regulations Act and Ordinance No. 2 of the MLSP and the MRDPW, the probability of leakage of petroleum products shall be insignificant.

- fragmentation of habitats

Fragmentation will be related to the temporary damage of habitat parts during the construction of bridge facilities, but their recovery will occur quickly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned. Fragmentation will not practically be present.

- Barrier effect

The construction of hydraulic structures (building of retaining walls and pillars of bridges) would not involve the complete blocking of water streams or the creation of differences in the levels, which will not prevent the possibility of moving the invertebrate aquatic environment from one to another river section. All types of insects, whose larval stage is related to the presence of an aquatic environment have good flying capabilities and the construction of the investment proposal will not have a barrier effect. Given the temporary nature of the impact for the other groups, it is considered to be insignificant.

- Mortality of individual numbers of the species

In the construction phase, mainly in excavation activities, along with excavated earth masses, bottom deposits will be discharged on the land, including the invertebrates, inhabiting the bottom substrate. The relatively small affected area implies a relatively small number of individual occurrences of the species, for which destruction is possible. Since invertebrates are part of the food chains for fish, amphibians, birds and mammals, the loss of individual numbers of the species would not alter the parameters of their populations due to the evolutionary mechanisms of compensation. Upon completion of construction activities in the water bodies, re-colonization of benthic fauna in the affected areas is expected in several subsequent life cycles / seasons and restoration of the affected populations. The mortality of individual numbers of the species will be insignificant and within the limits of the natural changes in the number of their populations.

Impacts during operation:

- direct destruction of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. There will be no impact since no bridges will be built on the river under this option. Struma river, and at the crossing of the tributaries, no bridge pillars will be built in the riverbeds because of their small width and due to the long length of the bridge facilities, respectively their elements.

- pollution of habitats

During the operation of the Motor Highway it is possible to contaminate surface waters in case of accidents, without changing the environmental condition of the Struma river and its tributaries, according to the standards in Enclosure No.2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of ORDINANCE No. H-4 of 14 September 2012 of the MOEW for surface water characterization. The impact, if any, shall be insignificant. It could be prevented by appropriate measures. Subject to the rules

on the transport of dangerous goods by road, the possibility of dangerous substances entering the rivers shall be excluded.

- fragmentation of habitats

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no fragmentation.

- Barrier effect

During the operation, the territories, affected by the construction of bridge facilities will be restored as habitats of individual species. Water bodies will restore their connectivity. There will be no barrier effect.

- Mortality of individual numbers of the species

Mortality will be present in the warmer months among daily flying insects, which occur in extremely large numbers near water bodies - *Ephemeroptera, Chironomidae* , *Simuliidae* and *Culicidae)* due to their collision with the vehicles. Due to the short life span and enormous reproductive capabilities of these species, and based on the observations in the area of passers-by the water sites (where these species are well presented), we could make the conclusion that this mortality will be irrelevant to the populations, identified in these territories and the impacts due to their mortality will be insignificant. Impacts on other groups are not expected.

Nature of impacts:

Water invertebrates
During construction works   ***For all options***
Rate of impact: Rate of impact on the objects (receptors) - **low** ;   *Territorial Scope of Impact:* On a local scale, with a small territorial range at the sites of intersection of surface water bodies;   *Duration of impact:* Short-term within the boundaries of construction activities;   *Frequency of impact:* Periodical / temporary impact (during the construction of the site);   *Consequences:* Within the limits of natural changes;   *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation   ***For all options***
Rate of impact: Rate of impact on the objects (receptors) - **low** ;   *Territorial Scope of Impact:* On a local scale, with a small territorial scope;   *Duration of impact:* Short-term (incidental);   *Frequency of impact:* Periodical;   *Consequences:* Within the limits of natural changes;   *Cumulative Impacts:* No cumulative impacts are to be expected.

Preferred option

The implementation of the route under the 5 projected Options will have insignificant impact on the areas of habitats of the aquatic invertebrates. The measures, provided in Section VII exclude the possibility of changing the environmental condition of the Struma river and its tributaries, according to the standards in Annex 2 to Art. 4, Para. 2-5, Art. 5, Para. 1, Art. 10, Para. 1 and Art. 11, Para. 3 (Surface Water Condition) of Ordinance No. H-4 of 14 September 2012 of the MOEW for the characterization of surface waters and the induction of mass mortality of individual number of species, as a result of contamination from discharge of polluted oil products or due to accidents. The habitats of species, for which the availability of an aquatic environment is a prerequisite for their existence, will be restored after completion

of the construction works. The operation-induced mortality rate among the species in their adult stage is not relevant to the population size.

Comparative table of the degree of impact for the implementation of the IP under the evaluated options

Impact	G20-Red	G20-blue	G10.50-Eastern	G20-Eastern	Long tunnel
Construction works					
Loss of habitats	1	1	1	1	1
Deterioration of the habitat quality	1	1	1	1	1
Fragmentation of the habitats	1	1	1	1	1
Operation / Accidents					
Direct destruction of individual numbers of the species	1	1	1	1	1
Deterioration of water quality	1	1	1	1	1

Terrestrial invertebrates

The impacts on the species of terrestrial invertebrates subject to conservation in the Protected Areas have been considered in detail in the EIA report.

Option G20 - Red

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial invertebrates within the boundaries of works will be destroyed. The affected area will amount to 1,240.997 decares (the tunnels are excluded, since the habitats above them will not be affected). The impact will be mainly on the territories, occupied by the transport infrastructure (the existing road and railway line and other anthropogenic sites), accounting for approximately 29% of the total affected area. Following are the natural forests, including Riparian galleries and xerophyte low-stem forests - 20%, grassy places - 15%, including abandoned arable lands and various ruderal, (field) boundary strips and / or cramped areas, forest plantations of artificial origin (acacia, pine etc.) - 13%, bushes - 11%, arable lands (fields, gardens and vineyards) - 10%, freshwater basins (the Struma river) - 2% and rocky territories - less than 1%. The habitats of almost all types of terrestrial invertebrates, which are within the scope of the investment proposal, will be affected, especially Orthoptera, Lepidoptera, Coleoptera, Pulmonata and Mollusca. The impact will be direct and irreversible, long-lasting, and insignificant for widespread species with multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will be impacts on potential habitats of 11 species: *Saga pedo* - about 220 decares, *Mantispa perla* - about 160 decares, *Parnassius mnemosyne* - about 30 decares, *Zerynthia polyxena* - about 210 decares, *Apatura metis* - about 70 decares, *Maculinea arion* - about 40 decares, *Proserpinus proserpina* about 70 decars, *Perisomena caecigena* - about 110 decares, *Formica rufa* - about 130 decares, *Pachycarus cyaneus* - about 40 decares, *Propomacrus bimucronatus* - about 20 decares. The potential habitats of two species, occurring at higher altitudes will not be affected - *Isophya andreevae* (Chobanov et al. 2016) and *Parnassius apollo* (Nakonieczny et al. 2007). For one species - *Dicyphus martinoi*, there are no data on its biology, respectively its potential habitats. Most of the species concerned use widespread habitats in the area. The impact on their habitats has been determined as insignificant. More vulnerable

are *Pachycarus cyaneus*, which inhabits the open stony-grassy xerophyte plant formations of the Mediterranean or Sub-Mediterranean type with altitudes up to 250-300 m (Golemanski 2011), and *Propomacrus bimucronatus*, whose larvae develop in the rotting wood of old trees, mainly Oak (*Quercus sp.*) and plantain (Nardi et al. 2010, Šípek 2010). The impact on them has been assessed as **average**, given the small area affected.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

During the construction, mortality of individual numbers of the species is possible, affecting widespread invertebrate representatives, from which fast-moving species will be trapped in adjacent track areas. The impacts, associated with direct destruction of species will mainly affect slow-moving forms, insect larvae, and the representatives of the surface layer worms that have high reproductive potential without affecting the size of their populations. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. All invertebrate species are part of the food chains of amphibians, reptiles, birds and mammals, so the loss of a small number of individual numbers of the species would not lead to significant changes in their population characteristics, as invertebrate evolutionary mechanisms have been introduced to ensure the survival of species. The rate of impact on populations would be low.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with others, more adaptable species. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial invertebrates, inhabiting the region will be insignificant. The effects on *Pachycarus cyaneus* and *Propomacrus bimucronatus* will remain **moderate**.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the red Option develops

along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

In the warmer months, there will be mortality of species due to vehicle crashes among the active adult flying species, mainly beetles of the order of Coleoptera, the order of Orthoptera and butterflies. Due to the short life span and the enormous productive capacities in these groups, this mortality will be irrelevant to the populations found in the area, and the impacts due to mortality will be insignificant. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. The rate of impact on populations would be low.

Option G20 - Blue

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial invertebrates within the boundaries of works will be destroyed. The affected area will amount to 1,246.156 decares (the tunnels are excluded, since the habitats above them will not be affected). There will be mainly territories, occupied by the transport infrastructure (the existing road and railway line and other anthropogenic sites), accounting for approximately 28% of the total affected area. Following are the natural forests, including Riparian galleries and xerophyte low-stem forests - 27%, grassy places - 15%, including abandoned arable lands and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) - 13%, shrubs - 10%, arable lands (fields, gardens and vineyards) - 5%, freshwater basins (the Struma river) - 2% and rocky territories - less than 1%. The habitats of almost all types of terrestrial invertebrates, which are within the scope of the investment proposal, will be affected, especially Orthoptera, Lepidoptera, Coleoptera, Pulmonata and Mollusca. The impact will be direct and irreversible, long-lasting, and insignificant for widespread species with multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will be impacts on potential habitats of 11 species: *Saga pedo* - about 200 decares, *Mantispa perla* - about 190 decares, *Parnassius mnemosyne* - about 30 decares, *Zerynthia polyxena* - about 230 decares, *Apatura metis* - about 40 decares, *Maculinea arion* - about 50 decares, *Proserpinus proserpina* about 40 decars, *Perisomena caecigena* - about 130 decares, *Formica rufa* - about 170 decares, *Pachycarus cyaneus* - about 50 decares, *Propomacrus bimucronatus* - about 40 decares. The potential habitats of two species, occurring at higher altitudes will not be affected - *Isophya andreevae* (Chobanov et al. 2016) and *Parnassius apollo* (Nakonieczny et al. 2007). For one species - *Dicyphus martinoi*, there are no data on its biology, respectively

its potential habitats. Most of the species concerned use widespread habitats in the area. The impact on their habitats has been determined as insignificant. More vulnerable are *Pachycarus cyaneus*, which inhabits the open stony-grassy xerophyte plant formations of the Mediterranean or Sub-Mediterranean type with altitudes up to 250-300 m (Golemanski 2011), and *Propomacrus bimucronatus*, whose larvae develop in the rotting wood of old trees, mainly Oak (*Quercus sp.*) and plantain (Nardi et al. 2010, Šípek 2010). The impact on them has been assessed as **average**, given the small area affected.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

During the construction, mortality of individual numbers of the species is possible, affecting widespread invertebrate representatives, from which fast-moving species will be trapped in adjacent track areas. The impacts, associated with direct destruction of species will mainly affect slow-moving forms, insect larvae, and the representatives of the surface layer worms that have high reproductive potential without affecting the size of their populations. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. All invertebrate species are part of the food chains of amphibians, reptiles, birds and mammals, so the loss of a small number of individual numbers of the species would not lead to significant changes in their population characteristics, as invertebrate evolutionary mechanisms have been introduced to ensure the survival of species. The rate of impact on populations would be low.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with others, more adaptable species. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial invertebrates, inhabiting the region will be insignificant. The effects on *Pachycarus cyaneus* and *Propomacrus bimucronatus* will remain **moderate**.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the red Option develops along the existing road, thus affecting small parts of the periphery of the potential habitats of the species present in the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

In the warmer months, there will be mortality of species due to vehicle crashes among the active adult flying species, mainly beetles of the order of Coleoptera, the order of Orthoptera and butterflies. Due to the short life span and the enormous productive capacities in these groups, this mortality will be irrelevant to the populations found in the area, and the impacts due to mortality will be insignificant. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. The rate of impact on populations would be low.

Eastern Option G10.50

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial invertebrates within the boundaries of works will be destroyed. The affected area will amount to 1,107.898 decares (the tunnels are excluded as the habitats above them will not be affected). Predominantly natural forests will be affected, including Riparian galleries and xerophilic low-stem forests - about 31%. Then come the grasslands - about 23%, including abandoned arable land and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) and shrubs - 16%, arable lands (fields, gardens and vineyards) - 11%, anthropogenic sites (existing roads, etc.) - 3%, and freshwater basins - less than 1%. The habitats of almost all types of terrestrial invertebrates, which are within the scope of the investment proposal, will be affected, especially Orthoptera, Lepidoptera, Coleoptera, Pulmonata and Mollusca. The impact will be direct and irreversible, long-lasting, and insignificant for widespread species with multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will be impacts on potential habitats of 12 species: *Isophya andreevae* - about 420 decares, *Saga pedo* - about 540 decares, *Mantispa perla* - about 540 decares, *Parnassius apollo* - about 180 decares, *Parnassius mnemosyne* - about 60 decares, *Zerynthia polyxena* - about 500 decares, *Apatura metis* about 90 decars, *Maculinea Arion* - about 360 decares, *Proserpinus proserpina* - about 90 decares, *Perisomena caecigena* - about 320 decares, *Formica rufa* - about 440 decares, *Propomacrus bimucronatus* - about 10 decares. There are no potential habitats of *Pachycarus cyaneus* , which inhabits the open, rocky and herbaceous xerophyte plant formations of the

Mediterranean or sub-Mediterranean type of altitudes up to 250-300 m (Golemanski 2011). For one species - *Dicyphus martinoi*, there are no data on its biology, respectively its potential habitats. Most of the species concerned use widespread habitats in the area. The impact on their habitats has been determined as insignificant. More vulnerable is *the Propomacrus bimucronatus* , whose larvae develop in the rotting wood of old trees, mostly oak (*Quercus sp.*) and plane tree (Nardi et al. 2010, Šípek 2010). The impact on them has been assessed as insignificant, given the small area affected.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. Among this species, of importance and subject to conservation is the *Saga pedo*, which reproduces, using parthenogeneis and as a result does not make large migration movements (Richard 2010), and *Isophya andreevae*, which does not migrate (Chobanov et al. 2013). The impact is considered insignificant.

- Mortality of individual numbers of the species

During the construction, mortality of individual numbers of the species is possible, affecting widespread invertebrate representatives, from which fast-moving species will be trapped in adjacent track areas. The impacts, associated with direct destruction of species will mainly affect slow-moving forms, insect larvae, and the representatives of the surface layer worms that have high reproductive potential without affecting the size of their populations. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. All invertebrate species are part of the food chains of amphibians, reptiles, birds and mammals, so the loss of a small number of individual numbers of the species would not lead to significant changes in their population characteristics, as invertebrate evolutionary mechanisms have been introduced to ensure the survival of species. The rate of impact on populations would be low.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with others, more adaptable species. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial invertebrates, inhabiting the region will be insignificant.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the large number of

tunnels and viaducts, provided by the project will restore the connectivity of part of the polygons on both sides of the track. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. Among this species, of importance and subject to conservation is the *Saga pedo*, which reproduces, using parthenogeneis and as a result does not make large migration movements (Richard 2010), and *Isophya andreevae*, which does not migrate (Chobanov et al. 2013). The large number of tunnels and viaducts, designed by the project will prevent the complete isolation of the subpopulations that inhabit the two sides of the track. The impact is considered insignificant.

- Mortality of individual numbers of the species

In the warmer months, there will be mortality of species due to vehicle crashes among the active adult flying species, mainly beetles of the order of Coleoptera, the order of Orthoptera and butterflies. Due to the short life span and the enormous productive capacities in these groups, this mortality will be irrelevant to the populations found in the area, and the impacts due to mortality will be insignificant. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. The rate of impact on populations would be low.

Long Tunnel Option, 'Kresna' tunnel

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial invertebrates within the boundaries of works will be destroyed. The affected area will amount to 1,044.650 decares (the temporary landfills at the tunnel portals are also included). Impacts will occur mainly on territories, occupied by grassland - about 56%, including abandoned arable land and various ruderal, field boundaries, and / or trodden areas. Followed by arable lands (fields and vineyards) - 19%, freshwater basins (the Struma river) - 8%, bushes - 7%, natural forests, including Riverside galleries and xerophyte low-stem forests - 6%, anthropogenic sites (existing roads, etc.), - 4% and forest plantations of artificial origin (acacia, etc.) - less than 1%. The habitats of almost all types of terrestrial invertebrates, which are within the scope of the investment proposal, will be affected, especially Orthoptera, Lepidoptera, Coleoptera, Pulmonata and Mollusca. The impact will be direct and irreversible, long-lasting, and insignificant for widespread species with multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will be impacts on potential habitats of 11 species: *Saga pedo* - about 190 decares, *Mantispa perla* - about 70 decares, *Parnassius mnemosyne* - about 20 decares, *Zerynthia polyxena* - about 190 decares, *Apatura metis* - about 10 decares, *Maculinea arion* - about 40 decares, *Proserpinus proserpina* about 20 decars, *Perisomena Caecigena* - about 40 decares, *Formica rufa* - about 60 decares, *Pachycarus cyaneus* - about 40 decares, *Propomacrus bimucronatus* - about 10 decares. The potential habitats of two species, occurring at higher altitudes will not be affected - *Isophya andreevae* (Chobanov et al. 2016) and *Parnassius apollo* (Nakonieczny et al. 2007). For one species - *Dicyphus martinoi*, there are no data on its biology,

respectively its potential habitats. Most of the species concerned use widespread habitats in the area. The impact on their habitats has been determined as insignificant. More vulnerable are *Pachycarus cyaneus*, which inhabits the open stony-grassy xerophyte plant formations of the Mediterranean or Sub-Mediterranean type with altitudes up to 250-300 m (Golemanski 2011), and *Propomacrus bimucronatus*, whose larvae develop in the rotting wood of old trees, mainly Oak (*Quercus sp.*) and plantain (Nardi et al. 2010, Šípek 2010). The impact on them has been assessed as **average**, given the small area affected. By implementing conservation measures for the natural habitats and species, protected in the Protected Zones, the impact on these two species will be reduced to **insignificant**.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the route under this option affects very small parts of the periphery of the potential habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the route under this option affects very small parts of the periphery of the potential habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

During the construction, mortality of individual numbers of the species is possible, affecting widespread invertebrate representatives, from which fast-moving species will be trapped in adjacent track areas. The impacts, associated with direct destruction of species will mainly affect slow-moving forms, insect larvae, and the representatives of the surface layer worms that have high reproductive potential without affecting the size of their populations. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. All invertebrate species are part of the food chains of amphibians, reptiles, birds and mammals, so the loss of a small number of individual numbers of the species would not lead to significant changes in their population characteristics, as invertebrate evolutionary mechanisms have been introduced to ensure the survival of species. The rate of impact on populations would be low.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with others, more adaptable species. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial invertebrates, inhabiting the region will be insignificant.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. In addition, the route under this option affects very small parts of the periphery of the potential habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. An example of the species of significance, subject to conservation, is the *Saga pedo*, which reproduces using parthenogenesis and as a result does not make large movements (Richard 2010). In addition, the route under this option affects very small parts of the periphery of the potential habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Mortality of individual numbers of the species

In the warmer months, there will be mortality of species due to vehicle crashes among the active adult flying species, mainly beetles of the order of Coleoptera, the order of Orthoptera and butterflies. Due to the short life span and the enormous productive capacities in these groups, this mortality will be irrelevant to the populations found in the area, and the impacts due to mortality will be insignificant. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. The rate of impact on populations would be low.

Eastern Option G20

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial invertebrates within the boundaries of works will be destroyed. The affected area will amount to 2,817.765 decares (the tunnels are excluded, since the habitats above them will not be affected). Predominantly natural forests will be affected, including Riparian galleries and xerophilic low-stem forests - about 34%. Then come the grasslands - about 26%, including abandoned arable land and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) and shrubs - 17%, arable lands (fields and vineyards) and anthropogenic sites (existing roads, etc.) - 3%, and freshwater basins - less than 1%. The habitats of almost all types of terrestrial invertebrates, which are within the scope of the investment proposal, will be affected, especially Orthoptera, Lepidoptera, Coleoptera, Pulmonata and Mollusca. The impact will be direct and irreversible, long-lasting, and insignificant for widespread species with multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the other significant species, subject to conservation, there will be impacts on potential habitats of 12 species: *Isophya andreevae* - about 1,080 decares, *Saga pedo* - about 1400 decares, *Mantispa perla* - about 1,500 decares, *Parnassius apollo* - about 670 decares, *Parnassius mnemosyne* - about 250 decares, *Zerynthia polyxena* - about 1,450 decares, *Apatura metis* about 50 decares, *Maculinea* a*rion* - about 1,170 decares, *Proserpinus proserpina* - about 70 decares, *Perisomena caecigena* - about 870 decares, *Formica rufa* - about 1,200 decares, *Propomacrus bimucronatus* - about 30 decares. There are no potential

habitats of *Pachycarus cyaneus* , which inhabits the open, rocky and herbaceous xerophyte plant formations of the Mediterranean or sub-Mediterranean type of altitudes up to 250-300 m (Golemanski 2011). For one species - *Dicyphus martinoi*, there are no data on its biology, respectively its potential habitats. Most of the species concerned use widespread habitats in the area. The impact on their habitats has been determined as insignificant. More vulnerable is *the Propomacrus bimucronatus* , whose larvae develop in the rotting wood of old trees, mostly oak (*Quercus sp.*) and plane tree (Nardi et al. 2010, Šípek 2010). The impact on its habitats has been determined as average.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small size and / or their dependence on specific micro-habitats. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. Among this species, of importance and subject to conservation is the *Saga pedo*, which reproduces, using parthenogeneis and as a result does not make large migration movements (Richard 2010), and *Isophya andreevae*, which does not migrate (Chobanov et al. 2013). The impact is considered insignificant.

- Mortality of individual numbers of the species

During the construction, mortality of individual numbers of the species is possible, affecting widespread invertebrate representatives, from which fast-moving species will be trapped in adjacent track areas. The impacts, associated with direct destruction of species will mainly affect slow-moving forms, insect larvae, and the representatives of the surface layer worms that have high reproductive potential without affecting the size of their populations. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. All invertebrate species are part of the food chains of amphibians, reptiles, birds and mammals, so the loss of a small number of individual numbers of the species would not lead to significant changes in their population characteristics, as invertebrate evolutionary mechanisms have been introduced to ensure the survival of species. The rate of impact on populations would be low.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with others, more adaptable species. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial invertebrates, inhabiting the region will be insignificant. The effects on *Pachycarus cyaneus* and *Propomacrus bimucronatus* will remain **moderate**.

- fragmentation of habitats

Most of the terrestrial invertebrates occurring in the area of the road route do not have specific requirements for the minimum area of the habitats they occupy because of their small

size and / or their dependence on specific micro-habitats. In addition, the large number of tunnels and viaducts, provided by the project will restore the connectivity of part of the polygons on both sides of the track. Therefore, the impact is considered insignificant.

- Barrier effect

The construction of the highway will not cause a barrier effect for insects that have good flying capabilities in the adult stage. The ground-based invertebrates, not capable of active movement will occupy the new terrains passively - transported by mammals and birds, attached to their fur and feathers, to which they are attached by means of wind, water currents, attrition of eggs to plant debris and soil, etc. These groups of invertebrates adhere to areas of more organic matter and do not move over long distances until the end of their life cycle. Among this species, of importance and subject to conservation is the *Saga pedo*, which reproduces, using parthenogeneis and as a result does not make large migration movements (Richard 2010), and *Isophya andreevae*, which does not migrate (Chobanov et al. 2013). The large number of tunnels and viaducts, designed by the project will prevent the complete isolation of the subpopulations that inhabit the two sides of the track. The impact is considered insignificant.

- Mortality of individual numbers of the species

In the warmer months, there will be mortality of species due to vehicle crashes among the active adult flying species, mainly beetles of the order of Coleoptera, the order of Orthoptera and butterflies. Due to the short life span and the enormous productive capacities in these groups, this mortality will be irrelevant to the populations found in the area, and the impacts due to mortality will be insignificant. Significant species, subject to conservation occur rarely and have very low population densities, so the likelihood of their destruction is insignificant. The rate of impact on populations would be low.

Assessment of impacts

Terrestrial invertebrates
During construction works   ***For Option G20 red, G20 blue and Eastern Option G20***
Rate of impact: The rate of impacts on the objects (receptors) is **average** ;   *Territorial Scope of Impact:* On a local scale, with small territorial range along the entire route;   *Duration of impact:* Short-term within the boundaries of construction activities;   *Frequency of impact:* Periodical / temporary impact (during the construction of the site);   *Consequences:* Within the limits of natural changes;   *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Eastern Option G10.50 and the Long Tunnel Option
Rate of impact: The rate of impacts on the objects (receptors) is **low**;   *Territorial Scope of Impact:* On a local scale, with small territorial range along the entire route;   *Duration of impact:* Short-term within the boundaries of construction activities;   *Frequency of impact:* Periodical / temporary impact (during the construction of the site);   *Consequences:* Within the limits of natural changes;   *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation   ***For Option G20 red, G20 blue and Eastern Option G20***
Rate of impact: The rate of impacts on the objects (receptors) is **average** ;   *Territorial Scope of Impact:* On a local scale, with small territorial range along the entire route;

Duration of impact: Long-term; *Frequency of impact:* Permanent; *Consequences:* Within the limits of natural changes; *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Eastern Option G10.50 and the Long Tunnel Option
Rate of impact: The rate of impacts on the objects (receptors) is **low**; *Territorial Scope of Impact:* On a local scale, with small territorial range along the entire route; *Duration of impact:* Long-term; *Frequency of impact:* Permanent; *Consequences:* Within the limits of natural changes; *Cumulative Impacts:* No cumulative impacts are to be expected.

Preferred option

The implementation of the route under the 5 projected Options will have impact on the areas of potential habitats of the terrestrial invertebrate fauna. In the case of invertebrate fauna, options G20 - Red, G20 - Blue and Eastern G20 are the most unfavourable, as the proposed route affects mostly habitats of terrestrial invertebrates with high conservation status. The mortality of individual invertebrate fauna types, caused during the construction and operation is not relevant to the population size of the species present. Because of the minor deviations in the affected areas of the invertebrates with high conservation status, the Eastern Option G10.50 and the Long Tunnel Option provide equivalent conditions to terrestrial invertebrates.

➨ **Fish *(Pisces)***

For the purposes of assessment, the fish in the region of the investment proposal are grouped according to their sensitivity by the different rate, magnitude and duration of impact, as follows:

- Highly sensitive species - Balkan trout, the Asp (Aspius aspius), Nemacheilus angorae bureschi, the common nase (Chondrostoma nasus);
- Middle sensitivity species - the Marica barbel, the Marica hausen, the Prespa spirlin, Alburnoides prespensis,, the Common minnow (Phoxinus phoxinus)
- Species with low sensitivity - the Amur bitterling (Rhodeus sericeus), the Struma ray-finned fish (Cobitis strumicae), the European chub/the river grey mullet (Squalius cephalus), the European Catfish.

Expected impacts:

The expected impacts from the five analysed project options are of varying scope and intensity, yet very similar in terms of duration and reversibility criteria.

Construction period

The expected negative impacts on the Ichthyofauna during the construction will be mainly related to the works in the riverbeds and on the banks in the construction of the bridge structures and of supporting walls on the river banks, namely - the excavation works in the riverbed and dredging of river debris, temporary shifting of the river flow, consolidation (concreting) of the river banks, passage of heavy construction and transport equipment.

Potential impacts will be:

✓ <u>Direct</u>

- *Destruction of individual types (including caviar)*

It can be expected in the places, where works are carried out in the river beds during the breeding period of the fish. The expected impact shall be of local effect in the area of bridge support construction.

Option G20 - Blue

Scope - in the areas of bridge supports above the Struma river. The impacts will be temporary and reversible after the completion of construction. All fish species will be affected eventually, Struma river along the track. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - average.

Option G20 - Red

Scope - in the areas of bridge supports above the Struma river. Due to the smaller number of bridges in Option G20 - Red, the range is smaller than for Option G20 - Blue. The impacts will be temporary and reversible after the completion of construction. All fish species will be affected eventually, Struma river along the track. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - average.

Eastern Option G10.50

Scope - in the areas of bridge supports above the Struma river and its tributaries. The impacts will be temporary and reversible after the completion of construction. Eventually will be affected all fish species, inhabiting Struma river and its tributaries, crossed by the road track. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Long Tunnelling Option

Scope - in the areas of bridge supports above the Struma river. Due to the smaller number of bridge structures, the range is smaller than for Option G20 - Red and Option G20 - Blue. The impacts will be temporary and reversible after the completion of construction. Eventually will be affected all fish species, inhabiting Struma river along the track. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Long Tunnel Option. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Eastern Option G20.

Scope - in the areas of bridge supports over the tributaries of the Struma river. The impacts will be temporary and reversible after the completion of construction. Potentially affected will only be fish species, inhabiting the Struma tributaries, crossed by the road track - the Balkan trout *Salmo trutta fario*, the Marica barbell *Barbus cyclolepis*, the *Cobitis strumicae*, the Common minnow *Phoxinus phoxinus*, the (Prespa) Spirlin*Alburnoides bipunctatus*. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

✓ Indirect

- *Deterioration of the environment*

It is associated with increased water turbidity and oil pollution from the construction and transport equipment. The expected impact range may include the entire construction site, also downstream of the source of contamination, temporarily and reversibly upon completion of the construction.

Option G20 - Blue

Scope - the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity (as referred to above), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Option G20 - Red

Scope - the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity (as referred to above), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Eastern Option G10.50

Scope - the Struma river and its tributaries in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity (as referred to above), inhabiting Struma river and its tributaries. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Long Tunnelling Option

Scope - the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity (as referred to above), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Long Tunnel Option. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Eastern Option G20.

Scope - the tributaries of the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be the fish species of high and medium sensitivity, inhabiting the tributaries - the Balkan trout *Salmo trutta fario*, the Marica barbel *Barbus cyclolepis*, the Common minnow *Phoxinus phoxinus*, the Schneider/Spirlin *Alburnoides bipunctatus*. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

- *Damage to habitats and reduction of the area of potential spawn places* in the areas of construction activities.

It is connected with the diversion of the river and the drainage of the construction sites. The expected impact shall be local in scope - only in the area of construction activities, temporarily and reversibly after completion of the construction.

Option G20 - Blue

Scope - in the areas of bridge supports above the Struma river. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity, inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. It could be limited or even prevented by appropriate measures. In

addition, measures can be projected for a faster recovery of affected populations. Rate of impact upon the habitats of the Asp (Aspius aspius) and Nemacheilus angorae bureschi - high, upon the habitats of other species - medium.

Option G20 - Red

Scope - in the areas of bridge supports above the Struma river. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity, inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. Due to the smaller number of bridges in Option G20 - Red, the range is smaller than for Option G20 - Blue. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact upon the habitats of the Asp (Aspius aspius) and Nemacheilus angorae bureschi - high, upon the habitats of other species - medium.

Eastern Option G10.50

Scope - the Struma river and its tributaries in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity, inhabiting Struma river and its tributaries. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Long Tunnelling Option

Scope - the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected shall be fish species of high and medium sensitivity, inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Long Tunnel Option. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Eastern Option G20.

Scope - the tributaries of the Struma river in the area of the construction site and downstream of the source of contamination. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be the fish species of high and medium sensitivity, inhabiting the tributaries - the Balkan trout *Salmo trutta fario*, the Marica barbel *Barbus cyclolepis*, the Common minnow *Phoxinus phoxinus*, the Schneider/Spirlin *Alburnoides bipunctatus*. It could be limited or even prevented by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

- *Fragmentation of habitats / interruption of bio-corridors.*

Fragmentation will be related to the temporary drying and or damage of habitat parts during the construction of bridge facilities, yet their recovery will be made promptly after the completion of construction works. Because of the large area of the fragmentations formed, they will form temporary semi-autonomous habitats, allowing for the normal existence of the local populations of the species concerned.

Option G20 - Blue

Scope - in the areas of bridge supports above the Struma river. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be predominantly the most migratory species (the common nase *(Chondrostoma nasus)*, the Marica barbel, the Marica hausen, the Asp *(Aspius aspius)*), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. It could be limited by appropriate measures. In

addition, measures can be projected for a faster recovery of affected populations. Rate of impact upon the habitats of the Asp (Aspius aspius) and (Nemacheilus angorae bureschi) - high, upon the habitats of other species - low.

Option G20 - Red

Scope - in the areas of bridge supports above the Struma river. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be predominantly the most migratory species (the common nase *(Chondrostoma nasus)*, the Marica barbel, the Marica hausen, the Asp *(Aspius aspius)*), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. Due to the smaller number of bridges in Option G20 - Red, the range is smaller than for Option G20 - Blue. It could be limited by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact on fish habitats - low.

Eastern Option G10.50

Scope - the Struma river and its tributaries in the construction area. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be predominantly the most migratory species (the Balkan trout, the Common nase *(Chondrostoma nasus)*, the Marica barbel, the Marica hausen, the Asp *(Aspius aspius)*), inhabiting Struma river and its tributaries. It could be limited by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. It could be limited or even prevented by appropriate measures. Rate of impact - low.

Long Tunnelling Option

Scope - the Struma river in the construction site. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be predominantly the most migratory species (the common nase *(Chondrostoma nasus)*, the Marica barbel, the Marica hausen, the Asp *(Aspius aspius)*), inhabiting the Struma river. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Long Tunnel Option. It could be limited by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Eastern Option G20.

Scope - the tributaries of Struma river in the construction area. The impacts will be temporary and reversible after the completion of construction. Potentially affected will be predominantly the most migratory species (Marica barbel and Balkan trout), inhabiting the tributaries of the Struma river. It could be limited by appropriate measures. In addition, measures can be projected for a faster recovery of affected populations. Rate of impact - low.

Period of operation and emergency situations

The expected negative impacts on the Ichthyofauna in the Kresna gorge during the period of operation of the Struma Highway shall be related to the permanent and irreversible removal of a small area of the bottom habitats of fish from the built-up bridge pillars and also the eventual accidental contamination of the river water in case of vehicle accidents/car crashes.

The potential impacts could be:

✓ Direct

- *Direct destruction of individual numbers of the species*

It can be expected that the river will contaminate fish-toxic substances in the event of vehicle accidents.

Option G20 - Blue

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the

negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the effect will depend on the type and quantity of the pollutant. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Option G20 - Red

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the effect will depend on the type and quantity of the pollutant. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Eastern Option G10.50

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the effect will depend on the type and quantity of the pollutant. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Long Tunnelling Option

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the effect will depend on the type and quantity of the pollutant. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Eastern Option G20.

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. The fish species, inhabiting the Struma tributaries, intersected by the route, shall be potentially affected and the impact will depend on the type and quantity of the pollutant. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

- ✓ Indirect:
- *Deterioration of the environment*

Water with non-toxic substances can be expected to be contaminated.

Option G20 - Blue

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the

negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the most vulnerable species being the most sensitive ones. The Balkan trout, whose habitats in

the upper flows of the tributaries are outside the zone of the road track in Option G20 - Blue. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Option G20 - Red

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the most vulnerable species being the most sensitive ones. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Eastern Option G10.50

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting Struma river and its tributaries, the most sensitive species being the most vulnerable. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Long Tunnelling Option

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. Eventually will be affected all fish species, inhabiting the Struma river, the most vulnerable species being the most sensitive ones. The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

Eastern Option G20.

The scope of the impact shall be local, mostly at the site of pollutant leakage, yet it may extend downstream. The impact will have an occasional, temporary nature and the negative effects shall be reversible upon its termination. The fish species, inhabiting the Struma tributaries, intersected by the route, shall be potentially affected, the most sensitive species being the most vulnerable. It could be prevented by appropriate measures. Additionally, measures could be provided for a faster recovery of affected populations. Because of the incidental nature and the low probability of occurrence, the rate of impact shall be very low.

- *Permanent destruction of habitats of fish species*.

It is related to the removal of part of the area of the river's bed from the built-up bridge pillars.

Option G20 - Blue

The range of impact shall be local, in the locations of the bridge pillars above the Struma river. The impact will have a permanent and irreversible nature. Potentially affected

will be all possible spawn places of all species, inhabiting the Struma river, as well as the permanent habitats of the demersal species - the Marica barbell *(Barbus cyclolepis)*, the Struma ray-finned fish (*Cobitis strumicae)*, the Nemacheilus angorae bureschi, the Marica hausen, the common nase (Chondrostoma nasus). The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Blue. The rate of impact shall be average.

Option G20 - Red

The range of impact shall be local, in the locations of the bridge pillars above the Struma river. The impact will have a permanent and irreversible nature. Potentially affected will be all possible spawn places of all species, inhabiting the Struma river, as well as the permanent habitats of the demersal species - the Marica barbell *(Barbus cyclolepis)*, the Struma ray-finned fish (*Cobitis strumicae)*, the Nemacheilus angorae bureschi, the Marica hausen, the common nase (Chondrostoma nasus). The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Option G20 - Red. The rate of impact shall be average.

Eastern Option G10.50

The range of impact shall be local, in the locations of the bridge pillars above the Struma river. The impact will have a permanent and irreversible nature. Potentially affected will be all possible spawn places of all species, inhabiting the Struma river, as well as the permanent habitats of the demersal species - the Marica barbell *(Barbus cyclolepis)*, the Struma ray-finned fish (*Cobitis strumicae)*, the Nemacheilus angorae bureschi, the Marica hausen, the common nase (Chondrostoma nasus). The fish habitats in the tributaries will not be affected, as bridge supports are not designed for their river beds. The affected territories in the Struma river shall be significantly smaller than those for Option G20 - Blue and G20 - Red. The rate of impact shall be low.

Long Tunnelling Option

The range of impact shall be local, in the locations of the bridge pillars above the Struma river. The impact will have a permanent and irreversible nature. Potentially affected will be the spawn places of all species, inhabiting the Struma river, as well as the permanent habitats of the demersal species - the Marica barbell *(Barbus cyclolepis)*, the Struma ray-finned fish (*Cobitis strumicae)*, the Nemacheilus angorae bureschi, the Marica hausen, the common nase (Chondrostoma nasus). The exception is the Balkan trout, whose habitats in the upper streams of the tributaries are outside the road track of the Long Tunnel Option. The affected territories in the Struma river shall be significantly smaller than those for Option G20 - Blue and G20 - Red. The rate of impact shall be low.

Eastern Option G20.

There will be no impact since no bridges will be built on the Struma river, and at the crossing of the tributaries, no bridge pillars will be built in the riverbeds because of their small width and due to the long length of the bridge facilities, respectively their elements.

Summary of expected impacts:

Fish
During construction works   ***For Option G20 - Red and G20 - Blue***
Rate of impact: Rate of impact on species and their habitats - low to medium;   *Territorial Scope of Impact:* On a local scale, for some impacts - on a regional scale, along the affected rivers;   *Duration of impact:* Short-term;   *Frequency of impact:* One-time / Temporary - when building the components of the site in the riverbeds or near them;

Consequences: Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Eastern Option G10.50, the Long Tunnel Option and the Eastern Option G20
Rate of impact: Rate of impact on species and their habitats - low; *Territorial Scope of Impact:* On a local scale, for some impacts - on a regional scale, along the affected rivers; *Duration of impact:* Short-term; *Frequency of impact:* One-time / Temporary - when building the components of the site in the riverbeds or near them; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation ***For Option G20 - Red and G20 - Blue***
Rate of impact: Rate of impact on species and their habitats - low to medium; *Territorial Scope of Impact:* On a local scale, for some impacts - on a regional scale, along the affected rivers; *Duration of impact:* Short-term or permanent; *Frequency of impact:* Accidental / permanent; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Eastern Option G10.50, the Long Tunnel Option and the Eastern Option G20
Rate of impact: Rate of impact on species and their habitats - low to very low; *Territorial Scope of Impact:* On a local scale, for some impacts - on a regional scale, along the affected rivers; *Duration of impact:* Short-term or permanent; *Frequency of impact:* Accidental / permanent; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.

Summary of expected impacts on Ichthyofauna:

Construction works

- Type direct, indirect, reversible
- Scope local and expanded, downstream
- Duration short-term
- Frequency one-time
- Consequences negative
- Rate low
- No cumulative effect is expected

Operation

- Type direct and indirect, reversible and irreversible
- Scope local or expanded, downstream
- Duration short and permanent
- Frequencyintermittent / incidental, for some - permanent
- Consequences negative
- Rate low to very low
- No cumulative effect is expected

Preferred option

The analysis of the impact of the investment proposal on Ichthyofauna shows that with regard to the conservation of fish communities, options ***G20 - Blue and G20 - red*** are not preferred due to their larger scope and higher impact. Generally, in this aspect, Option G10.50, the Long Tunnel Option and the Eastern G20 Option are almost identical, as the expected cumulative impacts are relatively equal.

➨ **Class Amphibians *(Amphibia)***

During the field studies in the range of proposed options, were identified most of the amphibian species known to the region and an expert assessment was made of the quality and connectivity of their habitats. The possible impacts are assessed as follows:

- Loss of habitats:

During the construction works, irreversible destruction of habitats is to be expected, which will be greatest in the implementation of Option G20 - Blue and Option G20 - Red and least in the Long Tunnel Option; the middle place being taken by the Eastern Option G10.50 and the Eastern Option G20. As far as none of the options imply the direct and lasting destruction of wetlands or parts of them, a significant impact on amphibians is not expected. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

No additional habitat loss is to be expected during the operation, regardless of the choice of implementation option.

- Fragmentation:

During construction, fragmentation of both aquatic and terrestrial habitats of amphibians can be expected. The impact shall be short-term and reversible. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

During the operation, no fragmentation of water habitats is expected, since the projected bridges, viaducts and culverts are suitable for the free passage of amphibians. Fragmentation of terrestrial habitats is *expected* of a number of species, predominantly those whose life-styles are mainly terrestrial (*Salamandra salamandra*, *Pelobates syriacus*, *Bufo bufo*, *Bufotes viridis*, *Hyla arborea* and *Rana dalmatina*). As a result of the intense road traffic, the motorway will be practically an insurmountable barrier for those species. The impact rate can be defined as very low for the Long Tunnel Option, as average for the Eastern Option G20 and as high for the G20 - Blue, G20-Red and Eastern G10.50 Options. The implementation of mitigation measures may be effective in implementing the Eastern Option G20, but not in the implementation of Options G20 - Blue and G20 - Red. In the Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire Option (including the right roadway) to guarantee unimpeded crossing of the amphibian and reptile roadway.

- Interruption of bio-corridors:

During construction, disruption of local bio-corridors is to be expected (all gullies, crossing the projected route). The impact shall be short-term and reversible. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

During operation, disruption of local bio-corridors for amphibians is not expected (designed bridges, viaducts and culverts are suitable for the free passage of amphibians along the rivers). However, the implementation of Options G20 - Blue, G20 - Red and Eastern G10.50 (right roadway) will lead to significant disturbance of the bio-corridor function of the Kresna Gorge with regard to the Syrian spade-footed toad (*Pelobates syriacus*), whose

habitats only cover the lowest parts of the gorge. The impact rate as a whole can be defined as very low for the Long Tunnel Option and for the Eastern G20 Option, and as high for the G20 - Blue, G20-Red and Eastern G10.50 Options. Applying mitigation measures in the realization of G20 Blue and G20 Red will not be effective due to the nature of the territory for most of the length of these options. Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing of the amphibians and reptiles.

- Mortality:

During the construction works, unintentional destruction of individual numbers of the species is expected, which will be greatest in the implementation of Option G20 - Blue and Option G20 - Red and least in the case of the Long Tunnel Option; the middle position being taken by the Eastern Option G10.50 and the Eastern Option G20. In all cases, the impact will be short-term and will be of a random nature. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

During the operation, it is expected that specimen of different species will be systematically run over, the most affected will probably be the Syrian spade-footed toad (*Pelobates syriacus*), the toad frog (*Bufo bufo* and *Bufotes viridis*) and the big water frog (*Pelophylax ridibundus*). The rate of impact can be defined as very low for the Long Tunnel Option and as high for each of the other Options. The implementation of mitigation measures may be effective in implementing the Eastern Option G20, but not in the implementation of Options G20 - Blue and G20 - Red. In the Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing of the amphibians and reptiles.

Preferred Option

In general, the least impact on amphibians will have the realization of the Long Tunnel Option. The impact will be of moderate rate in the implementation of the Eastern G20 option and of high rate in the realization of each of the options: G20 - Blue, G20 - Red and Eastern Option G10.50. The implementation of mitigation measures can be sufficiently effective only in the realization of the Long Tunnel Option and of the Eastern Option G20. In the Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities and fencing can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing and preventing the exit of amphibians and reptiles. Therefore, the options that ensure minimal impact on amphibians are the Long Tunnel Option (very low impact and options to apply additional mitigation measures) and the Eastern Option G20 (possibility to mitigate the impact through measures down to very low).

Amphibians - ***Options G20 - Blue and G20 - Red***
During construction works
Rate of impact: **Low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **High**. *Territorial Scope of Impact:* Regional. *Duration of impact:* Long-term. *Frequency of impact:* Permanent.

Consequences: Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Amphibians - ***the Eastern Option G10.50***
During construction works
Rate of impact: **Low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **High**. *Territorial Scope of Impact:* Regional. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Amphibians - the *Long Tunnel Option*
During construction works
Rate of impact: **Very low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **Very low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Amphibians - ***the Eastern Option G20***
During construction works
Rate of impact: **Low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **Average**. *Territorial Scope of Impact:* Local. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative.

Cumulative Impacts: No cumulative impacts are to be expected.

➧ **Class Reptiles (*Reptilia*)**

During the field studies in the range of proposed options, were identified most of the reptile species, known to the region and an expert assessment was made of the quality and connectivity of their habitats. The possible impacts are assessed as follows:

- Loss of habitats:

During the construction works, irreversible destruction of habitats is to be expected, which will be greatest in the implementation of Option G20 - Blue and Option G20 - Red and least in the Long Tunnel Option; the middle place being taken by the Eastern Option G10.50 and the Eastern Option G20. The negative impact of the construction of G20 - Blue and G20 - Red shall be intensified by the fact that these options cover most of the potential areas for herding and wintering of the most rare and threatened species in the Kresna Gorge: striped grass-snake (*Elaphe quatuorlineata*), leopard grass-snake (*Zamenis situla*), and *the cat* snake (*Telescopus fallax*). The impact rate can be defined as very low for the Long Tunnel Option, as low for the Eastern G10.50 and Eastern G20 and as moderate for the G20 - Blue and the G20 - Red Options. The nature of the impact was such that it could not be mitigated by the implementation of measures.

No additional habitat loss is to be expected during the operation, regardless of the choice of implementation option.

- Fragmentation:

During construction works, fragmentation of both aquatic and terrestrial habitats of reptiles can be expected. The impact shall be short-term and reversible. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

During the operation, due to the intense road traffic, most of the length of the highway will be a practically insurmountable barrier for reptiles. It would means that the habitats of a number of species (including the rarest and threatened) in most of the Kresna gorge will be divided in two parts (east and west), which will probably result in their populations being fragmented, i.e. two subpopulations will be formed, largely isolated, whose long-term possibilities in some species would be doubtful. In the highest rate, this would refer to options G20 - Blue, G20 - Red and Eastern G10.50 (right roadway), and in the lowest rate - for the Long Tunnel Option; the middle position being taken by the Eastern G20 Option. The impact rate in general can be defined as very low for the Long Tunnel Option, as moderate for the Eastern G20 Option, and as very high for the G20 - Blue, G20-Red and Eastern G10.50 Options (right roadway). The implementation of mitigation measures may be effective in implementing the Eastern Option G20, but not in the implementation of Options G20 - Blue and G20 - Red. Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing of the amphibians and reptiles.

- Interruption of bio-corridors:

Disruption of local bio-corridors is expected during construction (the gullies shall be crossed by the projected route), as well as disruption of the bio-corridor function of the Kresna Gorge as a whole. The impact shall be short-term and reversible. The rate of impact can be defined as very low for the Long Tunnel Option and as low for each of the other Options.

During the operation of the Motorway, most local bio-corridors will not be disrupted (the projected bridges and viaducts, and possibly part of the drain culverts shall be suitable for the free passage of reptiles through the gullies). However, the implementation of the G20 - Blue, G20 - Red and of Eastern Option G10.50 (right roadway) would lead to a significant

disruption of the Kresna Gorge bio-corridor function with respect to the most rare and threatened species, such as the striped grass-snake *(Elaphe quatuorlineata*), the leopard grass-snake (*Zamenis situla*) and the cat snake (*Telescopus fallax*), whose habitats predominantly cover the lowest parts of the gorge. The impact rate in general can be defined as very low for the Long Tunnel Option, as moderate for the Eastern G20 Option, and as very high for the G20 - Blue, G20-Red and Eastern G10.50 Options (right roadway). The implementation of mitigation measures may be effective in implementing the Eastern Option G20, but not in the implementation of Options G20 - Blue and G20 - Red. Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing of the amphibians and reptiles.

- Mortality:

During the construction works, unintentional destruction of individual numbers of the species is expected, which will be greatest in the implementation of Option G20 - Blue and Option G20 - Red and least in the case of the Long Tunnel Option; the middle position being taken by the Eastern Option G10.50 and the Eastern Option G20. The impact will be short-lived, but with regard to the G20 - Blue and G20 Red options it will be significant, given the fact that the planned routes pass through the places of most diverse reptile species (the low parts of the Kresna Gorge). The impact rate can be defined as very low for the Long Tunnel Option, as moderate for the Eastern G10.50 and Eastern G20 and as very high for the G20 - Blue and the G20 - Red Options.

During the motorway's operation, systematic running over specimens of all reptile species is to be expected. The impact rate can be defined as very low for the Long Tunnel Option, as moderate for the Eastern G20 Option, and as very high for the G20 - Blue, G20-Red and Eastern G10.50 Options (right roadway). The implementation of mitigation measures may be effective in implementing the Eastern Option G20, but not in the implementation of Options G20 - Blue and G20 - Red. In the Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing of the amphibians and reptiles.

Preferred Option

In general, the least impact on reptiles will have the implementation of the Long Tunnel Option. The impact will be of moderate rate in the implementation of the Eastern Option G20 and of very high rate in the realization of each of the (other) options: G20 - Blue, G20 - Red and Eastern Option G10.50. The implementation of mitigation measures can be sufficiently effective only in the realization of the Long Tunnel Option and of the Eastern Option G20. In the Eastern Option G10.50, the impact can only be mitigated if effective defragmentation facilities and fencing can be designed for the entire option (including the right roadway) to guarantee unimpeded crossing and preventing the exit of amphibians and reptiles. Therefore, the options that ensure minimal impact on amphibians are the Long Tunnel Option (very low impact and options to apply additional mitigation measures) and the Eastern Option G20 (possibility to mitigate the impact through measures down to very low).

Reptiles - ***options G20 - Blue and G20 - Red***
During construction works
Rate of impact: **Very high**. *Territorial Scope of Impact:* Regional impact. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

During operation
Rate of impact: **Very high**. *Territorial Scope of Impact:* National. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Reptiles - ***the Eastern Option G10.50***
During construction works
Rate of impact: **Average**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **Very high**. *Territorial Scope of Impact:* National. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Reptiles - ***the Long Tunnel Option***
During construction works
Rate of impact: **Very low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation
Rate of impact: **Very low**. *Territorial Scope of Impact:* Local. *Duration of impact:* Long-term. *Frequency of impact:* Permanent. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.

Reptiles - ***the Eastern Option G20***
During construction works
Rate of impact: **Average**. *Territorial Scope of Impact:* Local. *Duration of impact:* Short term. *Frequency of impact:* One-time. *Consequences:* Negative. *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation

Rate of impact: **Average**.
Territorial Scope of Impact: Local.
Duration of impact: Long-term.
Frequency of impact: Permanent.
Consequences: Negative.
Cumulative Impacts: No cumulative impacts are to be expected.

➧Class Birds *(Aves)*
⇨ Option G20 - Red

Characteristics of the territory

The designed motorway route passes through a wide variety of habitats. The ornithofauna in the area of the 'Struma' Motorway - Kresna Gorge is characteristic for the low parts of the mountains in this part of the country, and during the autumn-winter period some species come here, from the surrounding mountains and the more northern latitudes, for wintering or only pass during the seasonal migration. The following groups of bird species are present:

1) species, inhabiting deciduous forests, including riparian - day-time birds of prey (shorthair and small hawk, buzzard, eagle); woodpecker (Syrian Spotted woodpecker, large spotted woodpecker, etc.); dove, cuckoo and sparrows (chinchilla, cormorant, nightingale, goldfinch/thistle-finch *(Carduelis carduells)*, titmouse *(Parus caeruleus)*, the fly-catcher, blackbirds, thrush *(Turdus musicus)*, eel singer, forest mason).

2 / species, inhabiting coniferous forests, including coniferous forest crops: Red-breasted, Syrian Spotted Woodpecker, King-bird, titmouse (Parus caeruleus);

3 / Species, inhabiting xerophytic or mesophilic shrub communities: Quail/rock partridge, three species of magpie *(Pica rustica)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

4 / Species, inhabiting open areas with or without insignificant number of trees, vineyards and garden yards: the forest lark, the mag-pies, the garden warbler *(Sylvia borin)*, the goldfinch/ thistle-finch *(Carduelis carduells)*, greenhead, the blackbird *(Turdus merala)*, the magpie *(Pica rustica)*;

5 / Species, inhabiting outdoor, dry grassy habitats, fields and arable lands: the Eurasian skylark *(Alauda arvensis)*, the greater short-toed lark *(Calandrella brachydactyla)*, the calandra lark *(Melanocorypha calandra)*, the pipits *(Anthus cervinus)*, the isabelline wheatear *(Oenanthe isabellina)*, the Eurasian stone-curlew; The open territories also offer a trophic base for a number of birds of prey.

6 / Species, inhabiting mountain and rocky territories: the Eurasian crag martin *(Ptyonoprogne rupestris)*, the he common rock thrush *(Monticola saxatilis)*, some falcon species, the raven, the Griffon Vulture, etc.;

7) Species, inhabiting rivers or pebbles and sandy beaches and islands: The white and the grey wagtail *(Motacilla cinerea)*, the white-throated dipper *(Cinclus cinclus)*, sand martin *(Riparia riparia)*, the bee-eater *(Merops apiaster)*, the common sandpiper *(Actitis hypoleucos)* and waterfowl, looking for food during migration and wintering - the great and small cormorant, the mallard or wild duck *(Anas platyrhynchos)*, the gray duck, the black stork, the green-legged duck, etc.

8 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

9 / Migratory species: Waterfowl species , big cormorant , small cormorant , gray heron , little egret , big egret , night heron , small water bull , black stork , swan pony , mute swan , gray goose , moth; Rapacious birds - big spotted eagle , Imperial eagle , reed harvester, Field harrier , meadow barker, graylist , common buzzard, Dalmatian falcon , Mediterranean falcon , evening kestrel , small eagle , black cannon , red kite.

10 / Wintering: Great Cormorant, Gray Heron, Little Egret, Great Egret, Duck, Duchess, etc.

Affected habitats during construction

Under Option G20 during the construction phase, most severely affected will be the forest territories (225 decares), followed by the dry grasslands, beaten paths or ruderal grasslands, excavations with sparse or no vegetation and then - the acacia, the poplar crops and conifers. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. Xerophyte and mesophyte shrubs of hawthorn, hawthorn, thistle and rosehip, as well as woody juniper forests are habitats for the following species: Quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*; The juniper tree will be affected to a very small extent (0,01 decares) and the water territories - 74 decares. Some migratory and wintering bird species, seeking food or resting in the river and its shores will be disturbed during the construction works (the white-throated dipper *(Cinclus cinclus)*, gray and little egret *(Ardea egretta)*, the mallard or wild duck *(Anas platyrhynchos)*, the great and small cormorant, and the greater sand plover *(Charadrius leschenaultii*). The disturbance will be temporary and the birds will probably move to other parts of the river.

Affected habitats during the operation

During the operation of the highway, under Option G20 most severely affected will be the forest territories, followed by the dry grasslands, beaten paths or ruderal grasslands, excavations with sparse or no vegetation and in the third place by rate of impact - the acacia, the poplar crops and conifers. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. Xerophyte and mesophyte shrubs of hawthorn, hawthorn, thistle and rosehip, as well as woody juniper forests are habitats for the following bird species: Quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

Option G20 - Red crosses the 'Kresna' Protected Area BG0002003, for the protection of wild birds. Impact Assessment for this Option on the significant and subject to conservation bird species that are protected in the area has been made in the Conformity Assessment Report of the IP. In total, the affected areas will be **1,240 decares** .

Impacts:

The nature of activities, related to the implementation of the investment proposal implies the following impacts on the birds and their populations:

- Temporary destruction of habitats of bird species at the site of construction

When constructing the route of the road, with its elements - temporary landfills and temporary roads (if any), reconstruction of engineering networks, construction sites, etc., there will be a temporary destruction of existing bird habitat types in the places, where the route goes beyond the boundaries of the existing road. Some migratory and wintering bird

species, seeking food or resting in the river and its shores will be disturbed during the construction works (the white-throated dipper *(Cinclus cinclus)*, gray and little egret *(Ardea egretta)*, the mallard or wild duck *(Anas platyrhynchos)*, the great and small cormorant, and the greater sand plover *(Charadrius leschenaultii*). The disturbance will be temporary and the birds will probably move to other parts of the river. **Moderate impact level (2).**

- Permanent destruction of the habitats of bird species at the site, where the route goes beyond the existing road.

There will be permanent destruction of habitats of bird species. The areas in decares of the relevant habitats of bird species have been specified before. **Moderate rate of impact.** The affected areas will be only 5 decares less than Option G20-blue, so here the estimate remains 2.

- Fragmentation of habitats of bird species

When a site (polygon), occupied by a habitat of some species is affected, so that the remaining part / parts thereof are insufficient to maintain / preserve their habitat characteristics for that species. With birds, the fragmentation of habitats is not strongly expressed to such an extent as in the slow-moving animals, such as reptiles and amphibians. With some of the nesting birds such as the corncrake, quail, partridge, larks and others, the fragmentation of nesting habitats from the construction of the motorway could only occur if it is a new route, passing through the habitats of these species. **Rate of impact - very low.**

- Barrier effect

When the road route crosses locations that play or may play a role in bio-corridors so that individual number of the species concerned may not migrate freely. It may be due to the inability of individual numbers of some species to overcome the route and / or the accompanying facilities, or the high mortality of those individual numbers that cross it, or the "reluctance", caused by anxiety. The results are inability or difficult migration (in the broad sense of the word, it may be over-the-clock, nutritionally related or seasonal, associated with certain abiotic factors or reproduction or displacement) and / or fragmentation of the populations of the species concerned. Birds are not expected to have a barrier effect, as they are the most migrant group of animals and will move to other parts of the appropriate habitats, bypassing the construction sites and the disturbance will not lead to changes in the populations of these species. **Rate of impact - very low.**

Anxiety

As a result of the noise, the presence of construction and transport equipment and people during construction and traffic during operation, as well as light pollution in the construction works (when operating at night or illuminating the construction sites) and in the operation. The expulsion of birds due to increased human presence is expected with the birds of prey, mostly in forest areas at a distance of about 300 to 400 m from the track range. Anxiety will vary considerably between species, but never less than 30% (Reijnen et al. 1997). The same authors also found that the disturbance distance for birds, inhabiting open spaces varies between 30 and 2,180 m, when there are 10,000 vehicles per day on the road (the distance significantly increases at 50,000 vehicles per day - from 75 to 3,530 m), while for forest birds it is between 30 and 1,500 m with the same number of vehicles. **Rate of impact - low.**

- Mortality of individual numbers of species

When building the road and its adjacent facilities and traffic during operation. That risk exists with birds, especially with their young population, but to a lesser extent in reptiles and amphibians. The most frequent victims of traffic shall be widespread bird species with multiple populations in the area of the investment proposal, such as the Struma Motorway, represented by the following species: White wagtail, big titmouse (Parus caeruleus), long-legged titmouse, green-eyed bird, black-bird, magpie, mountain wagtail, tern, red-eagle,

nightingale, (Karaivanov 2015). The most vulnerable are the birds and their young. Feathered birds often hunt insects on the roadway or low above it. Also, they fly low when moving from one place to another and cross the roadway to the point of direct collision with cars. Young birds are the more frequent victim of road traffic due to the fact that they are not yet good pilots and that they cannot estimate the threat of moving cars. During the operation of the motorway, there will be road victims of bird species with larger populations; This will not, however, disturb their population structure, as most of them are widespread species with multiple populations; In general, the road now takes much more casualties than would be taking after the new route is constructed, because measures will be taken to secure the facility with bird nets. **Rate of impact - average.**

Nature of impacts

The nature of the effects on birds in **Option G20 - Red** may be classified with the following characteristics:

Birds
During construction works
Type of impact: Direct, reversible; *Territorial Scope of Impact:* on a local scale; *Duration of impact:* Short-term; *Frequency of impact:* Temporary (when building the sites); *Consequences:* Negative; *Rate of impact:* **Low (average score);** *Cumulative Impacts:* Are not expected.
During operation
Type of impact: direct, indirect, irreversible; *Territorial Scope of Impact:* Locally; *Duration of impact:* long-term; *Frequency of impact:* Permanent; *Consequences:* Negative; *Rate of impact:* **Low (average score);** *Cumulative Impacts:* Are not expected.

⇨ Option G20 - Blue

Characteristics of the territory

The designed motorway route passes through a wide variety of habitats. The ornithofauna in the area of the 'Struma' Motorway - Kresna Gorge is characteristic for the low parts of the mountains in this part of the country, and during the autumn-winter period some species come here, from the surrounding high mountains and from the more northern latitudes, for wintering or only pass during the seasonal migration. The following groups of bird species are present:

1) species, inhabiting deciduous forests, including riparian - day-time birds of prey (shorthair and small hawk, buzzard, eagle); woodpecker (Syrian Spotted woodpecker, large spotted woodpecker, etc.); dove, cuckoo and sparrows (chinchilla, cormorant, nightingale, goldfinch/thistle-finch *(Carduelis carduells)*, titmouse *(Parus caeruleus)*, the fly-catcher, blackbirds, thrush *(Turdus musicus)*, eel singer, forest mason).

2 / species, inhabiting coniferous forests, including coniferous forest crops: Red-breasted, Syrian Spotted Woodpecker, King-bird, titmouse (Parus caeruleus);

3 / Species, inhabiting xerophytic or mesophilic shrub communities: Quail/rock partridge, three species of magpie *(Pica rustica)*, the olive-tree warbler *(Hippolais*

olivetorum), the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

4 / Species, inhabiting open areas with or without insignificant number of trees, vineyards and garden yards: the forest lark, the mag-pies, the garden warbler *(Sylvia borin)*, the goldfinch/ thistle-finch *(Carduelis carduells)*, greenhead, the blackbird *(Turdus merala)*, the magpie *(Pica rustica)*;

5 / Species, inhabiting outdoor, dry grassy habitats, fields and arable lands: the Eurasian skylark *(Alauda arvensis)*, the greater short-toed lark *(Calandrella brachydactyla)*, the calandra lark *(Melanocorypha calandra)*, the pipits *(Anthus cervinus)*, the isabelline wheatear *(Oenanthe isabellina)*, the Eurasian stone-curlew; The open territories also offer a trophic base for a number of birds of prey.

6 / Species, inhabiting mountain and rocky territories: the Eurasian crag martin *(Ptyonoprogne rupestris)*, the he common rock thrush *(Monticola saxatilis)*, some falcon species, the raven, the Griffon Vulture, etc.;

7) Species, inhabiting rivers or pebbles and sandy beaches and islands: The white and the grey wagtail *(Motacilla cinerea)*, the white-throated dipper *(Cinclus cinclus)*, sand martin *(Riparia riparia)*, the bee-eater *(Merops apiaster)*, the common sandpiper *(Actitis hypoleucos)* and waterfowl, looking for food during migration and wintering - the great and small cormorant, the mallard or wild duck *(Anas platyrhynchos)*, the gray duck, the black stork, the green-legged duck, etc.

8 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

9 / Migratory species: Waterfowl species , big cormorant , small cormorant , gray heron , little egret , big egret , night heron , small water bull , black stork , swan pony , mute swan , gray goose , moth; Rapacious birds - big spotted eagle , Imperial eagle , reed harvester, Field harrier , meadow barker, graylist , common buzzard, Dalmatian falcon , Mediterranean falcon , evening kestrel , small eagle , black cannon , red kite.

10 / Wintering: Great Cormorant, Gray Heron , Little Egret , Great Egret, Duck, Duchess, etc.

Affected habitats during construction

Under Option G20 - Blue during the construction phase, most severely affected will be the forest territories (281.5 decares), followed by the dry grasslands, beaten paths or ruderal grasslands, excavations with sparse or no vegetation and then followed in third place by the acacia, the poplar crops and conifers. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. Xerophyte and mesophyte shrubs of hawthorn, hawthorn, thistle and rosehip, as well as woody juniper forests are habitats for the following species: Quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*; The juniper tree shall be affected to a small extent (1.4 decares), yet more than under the G20 - Red Option and the water territories - significantly more than under the G20 - Red Option. Some migratory and wintering bird species, seeking food or resting in the river and its shores will be disturbed during the construction works (the white-throated dipper *(Cinclus cinclus)*, gray and little egret *(Ardea egretta)*, the mallard or wild duck *(Anas platyrhynchos)*, the great and small cormorant, and the greater sand plover *(Charadrius leschenaultii*). The disturbance will be temporary and the birds will probably move to other parts of the river.

Affected habitats during the operation

During the operation of the Motorway under Option G20 - Blue, most severely affected will be the forest territories of the hornbeam/yoke-elm, (cerris) oak and Pubescent oak *(Quercus pubescens)*, followed by the dry grasslands, beaten paths or ruderal grasslands, excavations with sparse or no vegetation and then followed in the third place by the acacia, the poplar crops and conifers. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. Xerophyte and mesophyte shrubs of (Christ's) thorny bush, hawthorn, thistle and rosehip, as well as woody juniper forests are affected in a smaller area. These are the habitats of the following species: Quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*; The total affected territory shall be **1,246 decares** - 5 decares more than in Option G20 - Red.

Option G20 - Blue also crosses the 'Kresna' Protected Area BG0002003, for the protection of wild birds. Impact Assessment for this Option on the significant and subject to conservation bird species that are protected in the area has been made in the Conformity Assessment Report of the IP.

Impacts:

The nature of activities, related to the implementation of the investment proposal implies the following impacts on the birds and their populations:

- Temporary destruction of habitats of bird species at the site of construction

When constructing the route of the road with its elements - temporary landfills and temporary roads (if any), reconstruction of engineering networks, construction sites, etc., there will be a temporary destruction of existing bird habitat types at the site, where the route goes beyond the boundaries of the existing road, servitudes. The areas in decares of the relevant habitats of affected bird species have been specified above. **Rate of impact - average.**

- Permanent destruction of habitats of bird species at the site where the route goes beyond the existing road

There will be permanent destruction of habitats of bird species. The areas in decares of the relevant habitats of bird species have been specified before. **Rate of impact - average.** The affected areas are only 5 decares more than the previous option.

- Fragmentation of habitats of bird species

When a site (polygon), occupied by a habitat of some species is affected, so that the remaining part / parts thereof are insufficient to maintain / preserve their habitat characteristics for that species. With birds, the fragmentation of habitats is not strongly expressed to such an extent as in the slow-moving animals, such as reptiles and amphibians. With some of the nesting birds such as the corncrake, quail, partridge, larks and others, the fragmentation of nesting habitats from the construction of the motorway could only occur if it is a new route, passing through the habitats of these species. **Rate of impact - low.**

- Barrier effect

When the road route crosses locations that play or may play a role in bio-corridors so that individual number of the species concerned may not migrate freely. It may be due to the inability of individual numbers of some species to overcome the route and / or the accompanying facilities, or the high mortality of those individual numbers that cross it, or the "reluctance", caused by anxiety. The results are inability or difficult migration (in the broad sense of the word, it may be over-the-clock, nutritionally related or seasonal, associated with certain abiotic factors or reproduction or displacement) and / or fragmentation of the

populations of the species concerned. Birds are not expected to have a barrier effect, as they are the most migrant group of animals and will move to other parts of the appropriate habitats, bypassing the construction sites and the disturbance will not lead to changes in the populations of these species. **Rate of impact - very low.**

- ***Anxiety***

As a result of the noise, the presence of construction and transport equipment and people during construction and traffic during operation, as well as light pollution in the construction works (when operating at night or illuminating the construction sites) and in the operation. The expulsion of birds due to increased human presence is expected with the birds of prey, mostly in forest areas at a distance of about 300 to 400 m from the track range. Anxiety will vary considerably between species, but never less than 30% (Reijnen et al. 1997). The same authors also found that the disturbance distance for birds, inhabiting open spaces varies between 30 and 2,180 m, when there are 10,000 vehicles per day on the road (the distance significantly increases at 50,000 vehicles per day - from 75 to 3,530 m), while for forest birds it is between 30 and 1,500 m for the same number of vehicles. **Rate of impact - low.**

- ***Mortality of individual numbers of species***

When building the road and its adjacent facilities and traffic during operation. That risk exists with birds, especially with their young population, but to a lesser extent in reptiles and amphibians. The most frequent victims of traffic shall be widespread bird species with multiple populations in the area of the investment proposal, in the case of the Struma Motorway, they are represented by the following species: White wagtail, big titmouse (Parus caeruleus), long-legged titmouse, green-eyed bird, black-bird, magpie, mountain wagtail, tern, red-eagle, nightingale, (Karaivanov 2015). The most vulnerable are the birds and their young. Feathered birds often hunt insects on the roadway or low above it. Also, they fly low when migrating from one place to another and cross the roadway to the point of direct collision with cars. Young birds are the more frequent victim of road traffic due to the fact that they are not yet good pilots and that they cannot estimate the threat of moving cars. **Rate of impact - average.**

Nature of impacts

The nature of the effects on birds in **Option G20 -** Blue may be classified with the following characteristics:

Birds
During construction works
Type of impact: Direct, irreversible; *Territorial Scope of Impact:* on a local scale; *Duration of impact:* Short-term; *Frequency of impact:* Temporary (when building the sites); *Consequences:* Negative; *Rate of impact:* **Low to medium (average score);** *Cumulative Impacts:* Are not expected.
During operation
Type of impact: direct, indirect, irreversible; *Territorial Scope of Impact:* Locally; *Duration of impact:* long-term; *Frequency of impact:* Permanent; *Consequences:* Negative; *Rate of impact:* **Low to medium (average score);**

Cumulative Impacts: Are not expected.

⇨ Eastern Option G10.50

Characteristics of the territory

The designed motorway route in this Option passes through a wide variety of habitats. The ornithofauna in the area of the 'Struma' Motorway is characteristic for the low west parts of the Pirin mountains, and during the autumn-winter period some species come here, from the surrounding high mountains and from the more northern latitudes, for wintering or only pass during the seasonal migration. The following groups of bird species are present:

1) species, inhabiting deciduous forests, including riparian - day-time birds of prey (shorthair and small hawk, buzzard, eagle); woodpecker (Syrian Spotted woodpecker, large spotted woodpecker, etc.); dove, cuckoo and sparrows (chinchilla, cormorant, nightingale, goldfinch/thistle-finch (Carduelis carduells), titmouse (Parus caeruleus), fly-catcher, blackbirds, thrush (Turdus musicus), eel singer, forest mason).

2 / species, inhabiting coniferous forests, including coniferous forest crops: Red-breasted, Syrian Spotted Woodpecker, King-bird, titmouse (Parus caeruleus);

3 / Species, inhabiting xerophytic or mesophilic shrub communities: Quail/rock partridge, three species of magpie *(Pica rustica)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

4 / Species, inhabiting open areas with or without insignificant number of trees, vineyards and garden yards: the forest lark, the mag-pies, the garden warbler *(Sylvia borin)*, the goldfinch/ thistle-finch *(Carduelis carduells)*, greenhead, the blackbird *(Turdus merala)*, the magpie *(Pica rustica)*;

5 / Species, inhabiting outdoor, dry grassy habitats, fields and arable lands: the Eurasian skylark *(Alauda arvensis)*, the greater short-toed lark *(Calandrella brachydactyla)*, the calandra lark *(Melanocorypha calandra)*, the pipits *(Anthus cervinus)*, the isabelline wheatear *(Oenanthe isabellina)*, the Eurasian stone-curlew; The open territories also offer a trophic base for a number of birds of prey.

6 / Species, inhabiting mountain and rocky territories: the Eurasian crag martin *(Ptyonoprogne rupestris)*, the he common rock thrush *(Monticola saxatilis)*, some falcon species, the raven, the Griffon Vulture, etc.;

7) Species, inhabiting rivers or pebbles and sandy beaches and islands: the white and the grey wagtail *(Motacilla cinerea)*, the white-throated dipper *(Cinclus cinclus)*, the sand martin *(Riparia riparia)*, the bee-eater *(Merops apiaster)*, the common sandpiper *(Actitis hypoleucos*);

8 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

9 / Migratory species: Waterfowl species , big cormorant , small cormorant , gray heron , little egret , big egret , night heron , small water bull , black stork , swan pony , mute swan , gray goose , moth; Rapacious birds - big spotted eagle , Imperial eagle , reed harvester, Field harrier , meadow barker, graylist , common buzzard, Dalmatian falcon , Mediterranean falcon , evening kestrel , small eagle , black cannon , red kite.

10 / Wintering: Great Cormorant, Gray Heron , Little Egret , Great Egret, Duck, Duchess, etc.

Affected habitats during construction

The agricultural lands, affected by Option G10.50 during construction shall be approximately 613 decares, which represents 55% of the total land affected. A small part of these agricultural lands present monocultures and therefore these habitats are not characterized by a large variety of species. These are food search sites for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and habitats of some songbirds (polish lark, yellow wagtail, honeycomb wood-lark, etc.). Most of the agricultural lands are pastures, covered by xerophyte grassland communities and pastures with shrubs - juniper and (Christ's) thorny bush, which are occupied by the habitats of the mountain quail/rock partridge, three species of shrikes *(Lanius excubitor),* the olive-tree warbler *(Hippolais olivetorum),* the European stonechat *(Saxicola rubicola),* the garden warbler *(Sylvia borin*), the garden corn bunting *(Emberiza)* and larks. Secondly, there are forest areas, where about 451 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. This means that very small areas (less than 1%) of the suitable habitats for bird species along the route are affected, compared to the existing ones. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. A small territory of water bodies is affected - 21.2 decares, less area, compared to the red and blue option.

Affected habitats during the operation

Mostly affected from the operation of the Motorway in Option G10.50 shall be the agricultural lands, (approximately 613 decares), which represent 55% of the total land affected. These agricultural lands present food search places for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and also habitats of some songbirds (the polish lark, the yellow wagtail, the honeycomb wood-lark, etc.). Secondly, there are forest areas, where about 451 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. This means that very small areas (less than 1%) of the suitable habitats for bird species along the route are affected, compared to the existing ones. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. The impact will be insignificant for the widespread species of multiple populations. In total, the affected areas under this Option shall be 1,108 decares (less then the previous two options).

The impact on species, subject to conservation in the 'Kresna' Protected Area BG0002003, has been given due consideration in the Assessment of Conformity.

Impacts:

The nature of activities, related to the implementation of the investment proposal implies the following impacts on the birds and their populations:

- Temporary destruction of habitats of bird species at the site of construction

When constructing the route of the road with its elements - temporary landfills and temporary roads (if any), reconstruction of engineering networks, construction sites, etc., there will be a temporary destruction of existing bird habitat types at the site, where the route goes beyond the boundaries of the existing road, servitudes. The areas in decares of the relevant habitats of bird species have been specified above. **Rate of impact - low.**

- Permanent destruction of habitats of bird species at the site where the route goes beyond the existing road

There will be permanent destruction of habitats of bird species. In general, smaller areas are affected than under the previous two options and, in particular, less riparian habitats

that appear to be habitats of the most migratory bird species. The areas in decares of the relevant habitats of bird species have been specified above. **Rate of impact - low.**

Fragmentation of habitats of bird species

When a site (polygon), occupied by a habitat of some species is affected, so that the remaining part / parts thereof are insufficient to maintain / preserve their habitat characteristics for that species. With birds, the fragmentation of habitats is not strongly expressed to such an extent as in the slow-moving animals, such as reptiles and amphibians. For some of the terrestrial breeding birds, such as the Eurasian stone-curlew, the corncrake, the quail, the partridge, the larks and some typical forest species, such as woodpeckers, the semicollared flycatcher (Ficedula semitorquata) and others. Under this option, the fragmentation of nesting and / or trophic habitats following the construction and operation of the motorway shall be less, compared to the red and blue options, because here the overall fragmentation is affected and in particular, the fragmentation of Riparian habitats. **Rate of impact - very low.**

- Barrier effect

When the road route crosses locations that play or may play a role in bio-corridors so that individual number of the species concerned may not migrate freely. It may be due to the inability of individual numbers of some species to overcome the route and / or the accompanying facilities, or the high mortality of those individual numbers that cross it, or the "reluctance", caused by anxiety. The results are inability or difficult migration (in the broad sense of the word, it may be over-the-clock, nutritionally related or seasonal, associated with certain abiotic factors or reproduction or displacement) and / or fragmentation of the populations of the species concerned. Birds are not expected to have a barrier effect, as they are the most migrant group of animals and will move to other parts of the appropriate habitats, bypassing the construction sites and the disturbance will not lead to changes in the populations of these species. **Rate of impact - very low.**

- Anxiety

As a result of the noise, the presence of construction and transport equipment and people during construction and traffic during operation, as well as light pollution in the construction works (when operating at night or illuminating the construction sites) and in the operation. The expulsion of birds due to increased human presence is expected with the birds of prey, mostly in forest areas at a distance of about 300 to 400 m from the track range. Anxiety will vary considerably between species, but never less than 30% (Reijnen et al. 1997). The same authors also found that the disturbance distance for birds, inhabiting open spaces varies between 30 and 2,180 m, when there are 10,000 vehicles per day on the road (the distance significantly increases at 50,000 vehicles per day - from 75 to 3,530 m), while for forest birds it is between 30 and 1,500 m for the same number of vehicles. **Rate of impact - low.**

- Mortality of individual numbers of species

In the construction of the road and its adjacent facilities and in the traffic during operation. That risk exists with birds, especially with their young population, but to a lesser extent in reptiles and amphibians. The most frequent victims of traffic shall be widespread bird species with multiple populations in the area of the investment proposal,in the case of the Struma Motorway, they are represented by the following species: White wagtail, big titmouse (Parus caeruleus), long-legged titmouse, green-eyed bird, black-bird, magpie, mountain wagtail, tern, red-eagle, nightingale, (Karaivanov 2015). The most vulnerable are the birds and their young. Feathered birds often hunt insects on the roadway or low above it. Also, they fly low when migrating from one place to another and cross the roadway to the point of direct collision with cars. Young birds are the more frequent victim of road traffic due to the fact that they are not yet good pilots and that they cannot estimate the threat of moving cars. During the operation of the highway there will be road victims of bird species with multiple populations; This will not disturb their population structure. **Rate of impact - average.**

Nature of impacts

The nature of the effects on birds in Eastern Option G10.5 may be classified with the following characteristics:

Birds
During construction works
Type of impact: Direct, irreversible; *Territorial Scope of Impact:* on a local scale; *Duration of impact:* Short-term; *Frequency of impact:* Temporary (when building the sites); *Consequences:* Negative; *Rate of impact:* **Low rate of impact (average score);** *Cumulative Impacts:* Are not expected.
During operation
Type of impact: direct, indirect, irreversible; *Territorial Scope of Impact:* Locally; *Duration of impact:* long-term; *Frequency of impact:* Permanent; *Consequences:* Negative; *Rate of impact:* **Low rate of impact, average score;** *Cumulative Impacts:* Are not expected.

⇨ Eastern Option G20

Characteristics of the territory

The designed motorway route in this Option passes through a wide variety of habitats. The ornithofauna in the area of the 'Struma' Motorway is characteristic for the low west parts of the Pirin mountains, and during the autumn-winter period some species come here, from the surrounding high mountains and from the more northern latitudes, for wintering or only pass during the seasonal migration. The following groups of bird species are present:

1) species, inhabiting deciduous forests, including riparian - day-time birds of prey (shorthair and small hawk, buzzard, eagle); woodpecker (Syrian Spotted woodpecker, large spotted woodpecker, etc.); dove, cuckoo and sparrows (chinchilla, cormorant, nightingale,

goldfinch/thistle-finch *(Carduelis carduells)*, titmouse *(Parus caeruleus)*, the fly-catcher, blackbirds, thrush *(Turdus musicus)*, eel singer, forest mason).

2 / species, inhabiting coniferous forests, including coniferous forest crops: Red-breasted, Syrian Spotted Woodpecker, King-bird, titmouse (Parus caeruleus);

3 / Species, inhabiting xerophytic or mesophilic shrub communities: Quail/rock partridge, three species of magpie *(Pica rustica)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

4 / Species, inhabiting open areas with or without insignificant number of trees, vineyards and garden yards: the forest lark, the mag-pies, the garden warbler *(Sylvia borin)*, the goldfinch/ thistle-finch *(Carduelis carduells)*, greenhead, the blackbird *(Turdus merala)*, the magpie *(Pica rustica)*;

5 / Species, inhabiting outdoor, dry grassy habitats, fields and arable lands: the Eurasian skylark *(Alauda arvensis)*, the greater short-toed lark *(Calandrella brachydactyla)*, the calandra lark *(Melanocorypha calandra)*, the pipits *(Anthus cervinus)*, the isabelline wheatear *(Oenanthe isabellina)*, the Eurasian stone-curlew; The open territories also offer a trophic base for a number of birds of prey.

6 / Species, inhabiting mountain and rocky territories: the Eurasian crag martin *(Ptyonoprogne rupestris)*, the he common rock thrush *(Monticola saxatilis)*, some falcon species, the raven, the Griffon Vulture, etc.;

7) Species, inhabiting rivers or pebbles and sandy beaches and islands: the white and the grey wagtail *(Motacilla cinerea)*, the white-throated dipper *(Cinclus cinclus)*, the sand martin *(Riparia riparia)*, the bee-eater *(Merops apiaster)*, the common sandpiper *(Actitis hypoleucos*);

8 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

8 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

9 / Migratory species: Birds of prey/Rapacious birds - the big spotted eagle, the imperial eagle, the reed harvester, the Field harrier, the meadow barker, the common buzzard (Buteo buteo), the Dalmatian falcon, the Mediterranean falcon, the evening kestrel, the small eagle, the black cannon, the red kite.

Affected habitats during construction

Mostly affected from the construction of the Motorway in the Eastern Option G20 shall be the agricultural lands, (approximately 1,417 decares), which represent 50% of the total land affected. These agricultural lands present food search places for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and also habitats of some songbirds (the polish lark, the yellow wagtail, the honeycomb wood-lark, etc.). Most of the agricultural lands are pastures, covered by xerophyte grassland communities and pastures with shrubs - juniper and (Christ's) thorny bush, which are occupied by the habitats of the mountain quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin*), the garden corn bunting *(Emberiza)* and larks. Secondly, there are forest areas, where about 1,294 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. That would mean

that **significant areas** (more than 2.7%) of relevant habitats for bird species along the track are affected. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. There are also large areas of aquatic and semi-aquatic habitats - 47.9 decares.

Affected habitats during the operation of the road

Mostly affected from the operation of the Motorway in the Eastern Option G20 shall be the agricultural lands, (approximately 1,417 decares), which represent 50% of the total land affected. These agricultural lands present food search places for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and also habitats of some songbirds (the polish lark, the yellow wagtail, the honeycomb wood-lark, etc.). Most of the agricultural lands are pastures, covered by xerophyte grassland communities and pastures with shrubs - juniper and (Christ's) thorny bush, which are occupied by the habitats of the mountain quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin*), the garden corn bunting *(Emberiza)* and larks. Secondly, there are forest areas, where about 1,294 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. That would mean that **significant areas** (more than 2.7%) of relevant habitats for bird species along the track will be affected. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. The impact will be negligible (Rate of impact=1) for widespread species with multiple populations, but for rare species, the impact rate will reach 2 (average). The total area of affected territories under this design option shall be **2,817 decares**.

The impact on species, subject to conservation in the 'Kresna' Protected Area BG0002003, has been given due consideration in the Assessment of Conformity.

Impacts:

The nature of activities, related to the implementation of the investment proposal implies the following impacts on the birds and their populations:

- Temporary destruction of habitats of bird species at the site of construction

When constructing the route of the road with its elements - temporary landfills and temporary roads (if any), reconstruction of engineering networks, construction sites, etc., there will be a temporary destruction of existing bird habitat types at the site, where the route goes beyond the boundaries of the existing road, servitudes. The areas in decares of the relevant habitats of bird species have been specified above. **Rate of impact - high.**

- Permanent destruction of habitats of bird species at the site where the route goes beyond the existing road

There will be permanent destruction of habitats of bird species. Permanently destroyed habitats in this design option will be significantly larger than under the other design option. Impact - the loss of habitats in some rare species, such as *Monticola solitaries* , *Monticola saxatilis* , *Sitta neumayer* , *Sylvia hortensis* , *Alectoris graeca* , the white-spotted shrike (*Lanius nubicus*) can be classified as indirect, but **significant**. These species are inhabiting the rocky areas, in combination with bush-like vegetation of the Mediterranean type, which is characteristic of the Kresna Gorge. If this design option would be selected, significant compensatory measures shall be needed, namely to include new territories (with an area of approximately 500-800 decares) within the 'Kresna' Protected Site with habitats, in the particular - 'rocky areas, in combination with bush-like vegetation of Mediterranean type'. **Rate of impact - high.**

- Fragmentation of habitats of bird species

When a site (polygon), occupied by a habitat of some species is affected, so that the remaining part / parts thereof are insufficient to maintain / preserve their habitat characteristics for that species. With birds, the fragmentation of habitats is not strongly expressed to such an extent as in the slow-moving animals, such as reptiles and amphibians. In part of the land breeding birds, such as the Eurasian stone-curlew, the corncrake, the quail, the partridge, the larks and some typical forest species such as woodpeckers, the semicollared flycatcher (Ficedula semitorquata) , etc., as well as the above-mentioned rare species inhabiting shrub-lands, there will probably be fragmentation of nesting and / or trophic habitats from the construction and operation of the motorway, as we are going to destroy the largest areas of certain habitats (deciduous and coniferous forests, dry grasslands, steppe-type vegetation and shrubs). **Rate of impact - average**.

- Barrier effect

When the road route crosses locations that play or may play a role in bio-corridors so that individual number of the species concerned may not migrate freely. It may be due to the inability of individual numbers of some species to overcome the route and / or the accompanying facilities, or the high mortality of those individual numbers that cross it, or the "reluctance", caused by anxiety. The results are inability or difficult migration (in the broad sense of the word, it may be over-the-clock, nutritionally related or seasonal, associated with certain abiotic factors or reproduction or displacement) and / or fragmentation of the populations of the species concerned. Birds are not expected to have a barrier effect (Impact rate=0), as they are the most migrant group of animals and will move to other parts of the appropriate habitats, bypassing the construction sites and the disturbance will not lead to changes in the populations of these species**. Rate of impact - very low.**

- Anxiety

As a result of the noise, the presence of construction and transport equipment and people during construction and traffic during operation, as well as light pollution in the construction works (when operating at night or illuminating the construction sites) and in the operation. The expulsion of birds due to increased human presence is expected with the birds of prey, mostly in forest areas at a distance of about 300 to 400 m from the track range. Anxiety will vary considerably between species, but never less than 30% (Reijnen et al. 1997). The same authors also found that the disturbance distance for birds, inhabiting open spaces varies between 30 and 2,180 m, when there are 10,000 vehicles per day on the road (the distance significantly increases at 50,000 vehicles per day - from 75 to 3,530 m), while for forest birds it is between 30 and 1,500 m for the same number of vehicles. The anxiety/disturbance, caused by such a large construction site, which would occur in completely untouched habitats so far, will cause considerable anxiety/disturbance to birds and they will leave the area. **Rate of impact - average**.

- Mortality of individual numbers of species

In the construction of the road and its adjacent facilities and in the traffic during operation. That risk exists with birds, especially with their young population, but to a lesser extent in reptiles and amphibians. The most frequent victims of traffic shall be widespread bird species with multiple populations in the area of the investment proposal, in the case of the Struma Motorway, they are represented by the following species: White wagtail, big titmouse (Parus caeruleus), long-legged titmouse, green-eyed bird, black-bird, magpie, mountain wagtail, tern, red-eagle, nightingale, (Karaivanov 2015). The most vulnerable are the birds and their young. Feathered birds often hunt insects on the roadway or low above it. Also, they fly low when migrating from one place to another and cross the roadway to the point of direct collision with cars. Young birds are the more frequent victim of road traffic due to the fact that they are not yet good pilots and that they cannot estimate the threat of moving cars. Although safety nets will be installed at certain locations, we expect mortality

under this design option to be greater than the other design option as it passes through new areas that have not yet been influenced, and the birds are not used to this barrier**. Rate of impact - average.**

Nature of impacts

The nature of the effects on birds in the Eastern Option G20 may be classified with the following characteristics:

Birds
During construction works
Type of impact: Direct, irreversible; *Territorial Scope of Impact:* on a local scale; *Duration of impact:* Short-term; *Frequency of impact:* Temporary (when building the sites); *Consequences:* Negative; *Rate of impact:* **High rate of impact;** *Cumulative Impacts:* Are not expected.
During operation
Type of impact: direct, indirect, irreversible; *Territorial Scope of Impact:* Locally; *Duration of impact:* long-term; *Frequency of impact:* Permanent; *Consequences:* Negative; *Rate of impact:* **Moderate to high rate of impact;** *Cumulative Impacts:* Are not expected.

⇨ The Long Tunnelling Option

Characteristics of the territory

The ground route of Lot 3.2 of the motorway before and after the Kresna tunnel passes through a variety of habitats, arable land, common pastures, forest boundaries, riparian habitats.

The following groups of bird species are present:

1 / Species, inhabiting open areas with or without insignificant number of trees, vineyards and garden yards: the forest lark, the mag-pies, the garden warbler *(Sylvia borin)*, the goldfinch/ thistle-finch *(Carduelis carduells)*, greenhead, the blackbird *(Turdus merala)*, the magpie *(Pica rustica)*;

2 / Species, inhabiting outdoor, dry grassy habitats, fields and arable lands: the Eurasian skylark *(Alauda arvensis)*, the greater short-toed lark *(Calandrella brachydactyla)*, the calandra lark *(Melanocorypha calandra)*, the pipits *(Anthus cervinus)*, the isabelline wheatear *(Oenanthe isabellina)*, the Eurasian stone-curlew; The open territories also offer a trophic base for a number of birds of prey.

3) Species, inhabiting rivers or pebbles and sandy beaches and islands: the white and the grey wagtail *(Motacilla cinerea)*, the white-throated dipper *(Cinclus cinclus)*, the sand martin *(Riparia riparia)*, the bee-eater *(Merops apiaster)*, the common sandpiper *(Actitis hypoleucos*);

4 / Species, inhabiting populated areas: the village and town sand martin *(Riparia riparia)*, the white stork, the domestic and field sparrow, the blackbird *(Turdus merala)*, the greenhead, goldfinch/ thistle-finch *(Carduelis carduells)*, the dove, the Syrian woodpecker *(Dendrocopos syriacus)*, etc.

15.4 km of the Kresna tunnel runs under the eastern slopes of Malashevska mountain. The entrance to the tunnel (North portal) is situated in a forested steep slope over the right bank of the Struma rive that is approached with a overhead road.

The portal to the Kresna tunnel and the construction site mainly concern a forest habitat, inhabited by:

1) species, inhabiting deciduous forests, including riparian - day-time birds of prey (shorthair and small hawk, buzzard, eagle); woodpecker (Syrian Spotted woodpecker, large spotted woodpecker, etc.); dove, cuckoo and sparrows (chinchilla, cormorant, nightingale, goldfinch/thistle-finch (Carduelis carduells), titmouse (Parus caeruleus), fly-catcher, blackbirds, thrush (Turdus musicus), eel singer, forest mason).

2 / species, inhabiting coniferous forests, including coniferous forest crops: Red-breasted, Syrian Spotted Woodpecker, King-bird, titmouse (Parus caeruleus);

3 / Species, inhabiting xerophytic or mesophilic shrub communities: Quail/rock partridge, three species of magpie *(Pica rustica)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin)*, the garden corn bunting *(Emberiza)*;

4 / Species, inhabiting mountain and rocky territories: the Eurasian crag martin *(Ptyonoprogne rupestris)*, the he common rock thrush *(Monticola saxatilis)*, some falcon species, the raven, the Griffon Vulture, etc.;

The southern portal of the tunnel, km 394 + 620, falls into a section of deciduous, low-stemmed deciduous trees and shrubs (Fig. No V.5.2-1). This range includes bird habitats predominantly associated with shrub plantation and those associated with more open grass-shrub phytocenoses.

Figure No. V.5.2-1. Exit of the Kresna Tunnel.

After the bridge of the Struma river, the motorway route and the Kresna road junction will only affect arable land.

Intermediate access (IA2) at km 380+745.688

The territory that will be affected during the implementation of the IA2 includes a mountain slope covered with xerothermic low-stem forests and the river bank of the Struma, where two landfills are planned for deposition of waste. The two landfills are totally deforested and anthropogenically influenced by their use for parking on rafting grounds.

Intermediate access IA5 km 386 + 664.986

It is situated in the southern end of the small 'Kresna' inns and represents almost a vertical slope above the road.

Intermediate access IA7 at km 392+009.286

The territory includes the foothills of a watered-down forest slope. Most of the construction site for the intermediate access comprises arable land, with a section of common pasture/land, affected in the south-east.

Depot North Portal of the 'Kresna' Tunnel

Place has been projected for the storage of earth-rock masses at the northern Kresna tunnel portal on an area of 19,913 decares. The landfill is in immediate proximity to the existing road. The site is occupied by xerothermic grasslands.

Depot No 1 - Southern portal of the 'Kresna' tunnel

Road Exit 5.51 in the land of Kresna, Kresna municipality. The property is owned by the Ministry of Defense and covers an area of 63,650 decares with a permanent use of "other territories, occupied by agriculture". The property is located on the left bank of the Struma River, and in the northwestern part of the river lies a sleeve of the Struma river. For years on end, the territory has been used as an unregulated landfill for construction and household waste.

Depot No 2 - Southern portal of the 'Kresna' tunnel

Land property 0.26 on the territory of the village of Slivnitsa, municipality of Kresna. The territory is a rugged cone with shallow eroded deluvial-meadow soils. The area of the landfill is 138.977 decares. It comprises shrub vegetation, with predominantly *Paliurus spina-christi* . Grass vegetation is represented by fragmented xerothermic grass communities.

Affected habitats during construction

Mostly affected from the construction of the Motorway in the **Long Tunnel Alternative** shall be the agricultural lands, (approximately 477 decares), which represent 55% of the total land affected under this option. Most of the agricultural lands are pastures, covered by xerophyte grassland communities and pastures with shrubs - juniper and (Christ's) thorny bush, which are occupied by the habitats of the mountain quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin*), the garden corn bunting *(Emberiza)* and larks. These agricultural lands are occupied by monocultures and therefore these habitats are not characterized by a large variety of species. These are food search sites for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and habitats of some songbirds (polish lark, yellow wagtail, honeycomb wood-lark, etc.). Secondly, there are forest areas, where approximately 100 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. That would mean that very small areas (less than 1%) of the suitable habitats for bird species along the route will be affected, compared to the existing ones. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. Affected water areas - 21.1 decares - the Struma river - considerably less than the Eastern G20 Option.

Affected habitats during the operation

Mostly affected from the operation of the Motorway in **the Long Tunnel Option** shall be the agricultural lands, (approximately 477 decares), which represent 55% of the total land affected under this option. Most of the agricultural lands are pastures, covered by xerophyte grassland communities and pastures with shrubs - juniper and (Christ's) thorny bush, which are occupied by the habitats of the mountain quail/rock partridge, three species of shrikes *(Lanius excubitor)*, the olive-tree warbler *(Hippolais olivetorum)*, the European stonechat *(Saxicola rubicola)*, the garden warbler *(Sylvia borin*), the garden corn bunting *(Emberiza)* and larks. These agricultural lands are occupied by monocultures and therefore these habitats are not characterized by a large variety of species. These are food search sites for some day-time birds of prey (the buzzard (Buteo), some falcon species), some dove species and habitats of some songbirds (polish lark, yellow wagtail, honeycomb wood-lark, etc.). Secondly, there are forest areas, where about 100 decares will be destroyed and / or altered. For comparison, the deciduous forests in the Kresna Protected Zone occupy an area of 4,464 ha. That would mean that very small areas (less than 1%) of the suitable habitats for bird species along the route will be affected, compared to the existing ones. These are the habitats of bird species, most of them singing bird species, but also of day-time birds of prey, woodpeckers, doves, pigeons, etc., as listed above. The impact will be insignificant for the widespread species of multiple populations. The total affected areas of the variant are **885 decares** .

The impact on species, subject to conservation in the 'Kresna' Protected Area BG0002003, has been given due consideration in the Assessment of Conformity.

Impacts:

The nature of activities, related to the implementation of the investment proposal implies the following impacts on the birds and their populations:

- Temporary destruction of habitats of bird species at the site of construction

When constructing the route of the road with its elements - temporary landfills and temporary roads (if any), reconstruction of engineering networks, construction sites, etc., there will be a temporary destruction of existing bird habitat types at the site, where the route goes beyond the boundaries of the existing road, servitudes. The areas in decares of the relevant habitats of bird species have been specified above. **Rate of impact - low.**

- Permanent destruction of habitats of bird species at the site where the route goes beyond the existing road

There will be permanent destruction of habitats of bird species. The areas in decares of the relevant habitats of bird species have been specified above. **Rate of impact - low.**

- Fragmentation of habitats of bird species

When a site (polygon), occupied by a habitat of some species is affected, so that the remaining part / parts thereof are insufficient to maintain / preserve their habitat characteristics for that species. With birds, the fragmentation of habitats is not strongly expressed to such an extent as in the slow-moving animals, such as reptiles and amphibians. This design option should not produce such impacts. **Rate of impact - very low.**

- Barrier effect

When the road route crosses locations that play or may play a role in bio-corridors so that individual number of the species concerned may not migrate freely. It may be due to the inability of individual numbers of some species to overcome the route and / or the accompanying facilities, or the high mortality of those individual numbers that cross it, or the "reluctance", caused by anxiety. The results are inability or difficult migration (in the broad sense of the word, it may be over-the-clock, nutritionally related or seasonal, associated with certain abiotic factors or reproduction or displacement) and / or fragmentation of the populations of the species concerned. Birds are not expected to have a barrier effect, as they

are the most migrant group of animals and will move to other parts of the appropriate habitats, bypassing the construction sites and the disturbance will not lead to changes in the populations of these species. **Rate of impact - very low.**

- Anxiety

As a result of the noise, the presence of construction and transport equipment and people during construction, blasting operations in the tunnel excavations and in the traffic during operation, as well as light pollution in the construction works (when operating at night or illuminating the construction sites) and in the operation of the highway. The expulsion of birds due to increased human presence is expected with the birds of prey, mostly in forest areas at a distance of about 300 to 400 m from the track range. Anxiety will vary considerably between species, but never less than 30% (Reijnen et al. 1997). The same authors also found that the disturbance distance for birds, inhabiting open spaces varies between 30 and 2,180 m, when there are 10,000 vehicles per day on the road (the distance significantly increases at 50,000 vehicles per day - from 75 to 3,530 m), while for forest birds it is between 30 and 1,500 m for the same number of vehicles. **Rate of impact - low.**

- Mortality of individual numbers of species

In the construction of the road and its adjacent facilities and in the traffic during operation. That risk exists with birds, especially with their young population, but to a lesser extent in reptiles and amphibians. The most frequent victims of traffic shall be widespread bird species with multiple populations in the area of the investment proposal,in the case of the Struma Motorway, they are represented by the following species: White wagtail, big titmouse (Parus caeruleus), long-legged titmouse, green-eyed bird, black-bird, magpie, mountain wagtail, tern, red-eagle, nightingale, (Karaivanov 2015). The most vulnerable are the birds and their young. Feathered birds often hunt insects on the roadway or low above it. Also, they fly low when migrating from one place to another and cross the roadway to the point of direct collision with cars. Young birds are the more frequent victim of road traffic due to the fact that they are not yet good pilots and that they cannot estimate the threat of moving cars. Given that most of the road passes through a tunnel, **the impact will be low.**

Nature of impacts

The nature of the effects on birds in the Long Tunnel Option may be classified with the following characteristics:

Birds
During construction works
Type of impact: Direct, irreversible; *Territorial Scope of Impact:* on a local scale; *Duration of impact:* Short-term; *Frequency of impact:* Temporary (when building the sites); *Consequences:* Negative; *Rate of impact:* **Low grate of impact;** *Cumulative Impacts:* Are not expected.
During operation
Type of impact: direct, indirect, irreversible; *Territorial Scope of Impact:* Locally; *Duration of impact:* long-term; *Frequency of impact:* Permanent; *Consequences:* Negative; *Rate of impact:* **Low grate of impact;** *Cumulative Impacts:* Are not expected.

Conclusions

The comparative analysis of the expected impacts on implementation of one of the five project options for the Struma Motorway road track shows that if we take into account the loss of habitats of bird species, we **would prefer the Long tunnel options** because we have the least affected areas with potential Habitats of birds. The second place is taken by Option G20 red.

Comparative table for the impact on birds under the five design options.

Nature of impact	**Rate of impact**				
	Option G20 - Red	**Option G20 - Blue**	**Eastern Option G10.50**	**The Long Tunnel Option**	**Eastern G20 Option**
Temporary destruction of habitats of bird species at the site of construction	Moderate.	Moderate.	Low	Low	High
Permanent destruction of habitats of bird species.	Moderate.	Moderate.	Low	Low	High
Fragmentation of habitats of bird species	Very low	Low	Very low	Very low	Moderate.
Barrier effect	Very low	Very low	Very low	Very low	Very low
Anxiety	Low	Low	Low	Low	Moderate.
- Mortality of individual numbers of species	Moderate.	Moderate.	Moderate.	Very low	Moderate.
Averaged	**Low**	**Low to Moderate/Average**	**Very low to low**	**Very low**	**Moderate/Average to High**

➨**Class *Mammals (Mammalia)***.

The impacts on the species of terrestrial mammals, subject to conservation in the Protected Areas have been considered in detail in the EIA report.

Option G20 - Red

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 1,240.997 decares (the tunnels are excluded, since the habitats above them will not be affected). The impact will be mainly on the territories, occupied by the transport infrastructure (the existing road and railway line and other anthropogenic sites), accounting for

approximately 29% of the total affected area. Following are the natural forests, including Riparian galleries and xerophyte low-stem forests - 20%, grassy places - 15%, including abandoned arable lands and various ruderal, (field) boundary strips and / or cramped areas, forest plantations of artificial origin (acacia, pine etc.) - 13%, bushes - 11%, arable lands (fields, gardens and vineyards) - 10%, freshwater basins (the Struma river) - 2% and rocky territories - less than 1%. In fact, the habitats of all types of mammals, the areal of which falls within the scope of the investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the remaining protected species will be affected the habitats of the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). Although registered in the Red Book, the wild cat is a relatively multi-number species (about 4,000 individual numbers of species; Golemanski 2011) and uses a variety of habitats for both hunting and breeding (Peshev and colleagues 2004, Lozano 2010; Lozano et al. 2003, Yamaguchi et al. 2015). The impacts on the later shall be insignificant. The weasel and the hedgehog are also widespread, using diverse, widespread habitats, including residential areas (personal observations). The impact on their habitats has been determined as insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, under this Option, the route develops along the existing road, thus affecting small parts of the periphery of the suitable habitats of the species, present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the construction, there may be a temporary disruption of bio-corridors of all terrestrial mammals, occurring in the area of the construction site. The impact will be localized only at the site of the route. For most of the larger and more flexible species it will only be during the day, while the construction works are in operation. At night, when most mammals are active, impacts are not expected. Thus the barrier effect during construction works will be insignificant.

- Anxiety

Anxiety during construction will be caused by the presence and the noise of the transportation equipment and the people in the places of construction of the road. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. At night, when most mammals are active, impacts are not expected. The impact is considered insignificant.

- Mortality of individual numbers of the species

During construction, mortality of individual numbers from smaller and slower species is possible. Only the hedgehog presents protected species. The species is widespread and numerous, so the impact on its population in the area is estimated to be insignificant.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with other species - e.g. mice and rodents. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial mammals, inhabiting the region will be insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, under this Option, the route develops along the existing road, thus affecting small parts of the periphery of the suitable habitats of the species, present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the operation, the route will in principle disrupt the local bio-corridors of all species of terrestrial mammals, occurring in the area, protected species such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). In terrestrial mammals, the barrier effect will be due to increased mortality as a result of increased traffic. The number of tunnels and bridges, projected under this design option, as well as the widespread distribution of the species concerned on both sides of the highway, determine the impact as insignificant.

- Anxiety

Anxiety during the operation of the highway will be caused by traffic. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. On the other hand, the route under this design option evolves along the existing path, which implies a certain adaptation of the individual number of species, inhabiting the area due to traffic disturbance. The impact shall be insignificant.

- Mortality of individual numbers of the species

During the operation of the motorway, mortality of individual numbers of the species, predominantly of smaller and slower species, but also of larger ones, is possible, such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). The impact on local populations of these species may be significant, especially in combination with the barrier effect. The impact can only be mitigated, if effective defragmentation and partitioning devices are designed to guarantee the smooth passage and prevention of small and medium-sized mammals from leaving the roadway.

Option G20 - Blue

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 1,246.156 decares (the tunnels are excluded, since the habitats above them will not be affected). There will be mainly territories, occupied by the transport infrastructure (the existing road and railway line and other anthropogenic sites), accounting for approximately 28% of the total affected area. Following are the natural forests, including Riparian galleries and xerophyte low-stem forests - 27%, grassy places - 15%, including abandoned arable lands and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) - 13%, shrubs - 10%, arable lands (fields, gardens and vineyards) - 5%, freshwater basins (the Struma river) - 2% and rocky territories - less than 1%. In fact, the habitats of all types of mammals, the areal of which falls within the scope of the investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the remaining protected species will be affected the habitats of the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). Although registered in the Red Book, the wild cat is a relatively multi-number species (about 4,000 individuals) and uses a variety of habitats for both hunting and breeding. The impacts on the later shall be insignificant. The

weasel and the hedgehog are also widespread, using diverse, widespread habitats, including residential areas. The impact on their habitats has been determined as insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, under this Option, the route develops along the existing road, thus affecting small parts of the periphery of the suitable habitats of the species, present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the construction, there may be a temporary disruption of bio-corridors of all terrestrial mammals, occurring in the area of the construction site. The impact will be localized only at the site of the route. For most of the larger and more flexible species it will only be during the day, while the construction works are in operation. At night, when most mammals are active, impacts are not expected. Thus the barrier effect during construction works will be insignificant.

- Anxiety

Anxiety during construction will be caused by the presence and the noise of the transportation equipment and the people in the places of construction of the road. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. At night, when most mammals are active, impacts are not expected. The impact is considered insignificant.

- Mortality of individual numbers of the species

During construction, mortality of individual numbers from smaller and slower species is possible. Only the hedgehog presents protected species. The species is widespread and numerous, so the impact on its population in the area is estimated to be insignificant.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with other species - e.g. mice and rodents. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial mammals, inhabiting the region will be insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, under this Option, the route develops along the existing road, thus affecting small parts of the periphery of the suitable habitats of the species, present in the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the operation, the route will in principle disrupt the local bio-corridors of all species of terrestrial mammals, occurring in the area, protected species such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). In terrestrial mammals, the barrier effect will be due to increased mortality as a result of increased traffic. The number of tunnels and bridges, projected under this design option, as well as the widespread distribution of the species concerned on both sides of the highway, determine the impact as insignificant.

- Anxiety

Anxiety during the operation of the highway will be caused by traffic. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. On the other hand, the route under this design option evolves along the existing path, which implies a certain adaptation of the individual number of species, inhabiting the area due to traffic disturbance. The impact shall be insignificant.

- Mortality of individual numbers of the species

During the operation of the motorway, mortality of individual numbers of the species, predominantly of smaller and slower species, but also of larger ones, is possible, such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). The impact on local populations of these species may be significant, especially in combination with the barrier effect. The impact can only be mitigated, if effective defragmentation and partitioning devices are designed to guarantee the smooth passage and prevention of small and medium-sized mammals from leaving the roadway.

Eastern Option G10.50

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 1,107.898 decares (the tunnels are excluded as the habitats above them will not be affected). Predominantly natural forests will be affected, including Riparian galleries and xerophilic low-stem forests - about 31 %. Then come the grasslands - about 23%, including abandoned arable land and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) and shrubs - 16%, arable lands (fields, gardens and vineyards) - 11%, anthropogenic sites (existing roads, etc.) - 3%, and freshwater basins - less than 1%. In fact, the habitats of all types of mammals, the areal of which falls within the scope of the investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the remaining protected species will be affected the habitats of the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). Although registered in the Red Book, the wild cat is a relatively multi-number species (about 4,000 individuals) and uses a variety of habitats for both hunting and breeding. The impacts on the later shall be insignificant. The weasel and the hedgehog are also widespread, using diverse, widespread habitats, including residential areas. The impact on their habitats has been determined as insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. Some fragmentation will occur in forest habitats, but since the species that are found in the area are not narrowly specialized within them and use more sparse forests and open areas, the impact is considered insignificant.

- Barrier effect

During the construction, there may be a temporary disruption of bio-corridors of all terrestrial mammals, occurring in the area of the construction site. The impact will be localized only at the site of the route. For most of the larger and more flexible species it will only be during the day, while the construction works are in operation. At night, when most mammals are active, impacts are not expected. Thus the barrier effect during construction works will be insignificant.

- Anxiety

Anxiety during construction will be caused by the presence and the noise of the transportation equipment and the people in the places of construction of the road. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. Among the protected species is the wild cat (*Felis silvestris*). Anxiety during operation of the road will result in temporary loss of breeding habitats. At night, when most mammals are active, impacts are not expected. The impact is considered insignificant.

- Mortality of individual numbers of the species

During construction, mortality of individual numbers from smaller and slower species is possible. Only the hedgehog (*Erinaceus concolor*) is protected species. The species is widespread and numerous, so the impact on its population in the area is estimated to be insignificant.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with other species - e.g. mice and rodents. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial mammals, inhabiting the region will be insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. Some fragmentation will occur in forest habitats, but since the species that are found in the area are not narrowly specialized within them and use more sparse forests and open areas, the impact is considered insignificant.

- Barrier effect

During the operation, the route will in principle disrupt the local bio-corridors of all species of terrestrial mammals, including protected species such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). In terrestrial mammals, the barrier effect will be due to increased mortality as a result of increased traffic. The number of tunnels and bridges, projected under this design option, as well as the widespread distribution of the species concerned on both sides of the highway, determine the impact as insignificant.

- Anxiety

Anxiety during the operation of the highway will be caused by traffic. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. Among those of conservation significance is the wild cat (*Felis silvestris*). Anxiety during operation of the road will result in the functional loss of breeding habitats. The impact will be insignificant, given the wide spread of such habitats (deciduous forests, including riparian ones, shrubs) in the area.

- Mortality of individual numbers of the species

During the operation of the motorway, mortality of individual numbers of the species, predominantly of smaller and slower species, but also of larger ones, is possible, such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). The impact on local populations of these species may be significant, especially in combination with the barrier effect. The impact can only be mitigated, if effective defragmentation and partitioning devices are designed (also for the right roadway) to

guarantee the smooth passage and prevention of small and medium-sized mammals from leaving the roadway.

Long Tunnel Option, 'Kresna' tunnel

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 1,044.650 decares (the temporary landfills at the tunnel portals are also included). Impacts will occur mainly on territories, occupied by grassland - about 56%, including abandoned arable land and various ruderal, field boundaries, and / or trodden areas. Followed by arable lands (fields and vineyards) - 19%, freshwater basins (the Struma river) - 8%, bushes - 7%, natural forests, including Riverside galleries and xerophyte low-stem forests - 6%, anthropogenic sites (existing roads, etc.), - 4% and forest plantations of artificial origin (acacia, etc.) - less than 1%. In fact, the habitats of all types of mammals, the areal of which falls within the scope of the investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the remaining protected species will be affected the habitats of the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). Although registered in the Red Book, the wild cat is a relatively multi-number species (about 4,000 individuals) and uses a variety of habitats for both hunting and breeding. The impacts on the later shall be insignificant. The weasel and the hedgehog are also widespread, using diverse, widespread habitats, including residential areas. The impact on their habitats has been determined as insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, the route under this option affects comparatively small parts of the periphery of the suitable habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the construction, there may be a temporary disruption of local bio-corridors of all terrestrial mammals, occurring in the area of the construction site. The impact will be localized only at the sites, where the route is being constructed, such as the tunnel portals, landfills and interconnections between the neighbouring lots in anthropogenically loaded areas. For most of the larger and more flexible species the impact will only be during the day, while the construction works are in operation. At night, when most mammals are active, impacts are not expected. Thus the barrier effect during construction works will be insignificant.

- Anxiety

Anxiety during construction will be caused by the presence and the noise of the transportation equipment and the people in the places of construction of the road. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. The impact will be localized only at the sites, where the route is being constructed, such as the tunnel portals, landfills and interconnections between the neighbouring lots in anthropogenically loaded areas. At night, when most mammals are active, impacts are not expected. The impact is considered insignificant.

- Mortality of individual numbers of the species

During construction, mortality of individual numbers from smaller and slower species is possible. Only the hedgehog presents protected species. The species is widespread and numerous, so the impact on its population in the area is estimated to be insignificant.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with other species - e.g. mice and rodents. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial mammals, inhabiting the region will be insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. In addition, the route under this option affects comparatively small parts of the periphery of the suitable habitats of species, inhabiting the area. Therefore, the impact is considered insignificant.

- Barrier effect

During the operation of the highway, the route will generally disrupt the local bio-corridors of all species of terrestrial mammals, inhabiting the area. The fact that most of the route will be underground determines the impact on all terrestrial mammals as insignificant.

- Anxiety

Anxiety during the operation of the highway will be caused by traffic. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. The fact that most of the route will be underground determines the impact on all terrestrial mammals as insignificant.

- Mortality of individual numbers of the species

During the operation of the motorway, mortality of individual numbers of the species, predominantly of smaller and slower species, but also of larger ones, is possible, such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). By applying the measures, envisaged to reduce the mortality of the species, subject to conservation in the Protected Zones, the impact on all terrestrial mammals will be reduced to insignificant.

Eastern Option G20

Impacts during construction works:

- direct destruction of habitats

During the construction, the vegetation, respectively the habitats of the species of terrestrial mammals within the range will be destroyed. The affected area will amount to 2,817.765 decares (the tunnels are excluded, since the habitats above them will not be affected). Predominantly natural forests will be affected, including Riparian galleries and xerophilic low-stem forests - about 34%. Then come the grasslands - about 26%, including abandoned arable land and various ruderal, marshy and / or cramped areas, forest plantations of artificial origin (acacia, pine, etc.) and shrubs - 17%, arable lands (fields and vineyards) and anthropogenic sites (existing roads, etc.) - 3%, and freshwater basins - less than 1%. In fact, the habitats of all types of mammals, the areal of which falls within the scope of the investment proposal, will be affected. The impact will be insignificant for the widespread species of multiple populations. The impact on species subject to conservation in the Protected Areas has been given consideration in the Assessment of Conformity. Of the

remaining protected species will be affected the habitats of the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). Although registered in the Red Book, the wild cat is a relatively multi-number species (about 4,000 individuals) and uses a variety of habitats for both hunting and breeding. The impacts on the later shall be insignificant. The weasel and the hedgehog are also widespread, using diverse, widespread habitats, including residential areas. The impact on their habitats has been determined as insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. Some fragmentation will occur in forest habitats, but since the species that are found in the area are not narrowly specialized within them and use more sparse forests and open areas, the impact is considered insignificant.

- Barrier effect

During the construction, there may be a temporary disruption of local bio-corridors of all terrestrial mammals, occurring in the area of the construction site. The impact will be localized only at the site of the route. For most of the larger and more flexible species it will only be during the day, while the construction works are in operation. At night, when most mammals are active, impacts are not expected. Thus the barrier effect during construction works will be insignificant.

- Anxiety

Anxiety during construction will be caused by the presence and the noise of the transportation equipment and the people in the places of construction of the road. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. Among the protected species is the wild cat (*Felis silvestris*). Anxiety during operation of the road will result in temporary loss of breeding habitats. At night, when most mammals are active, impacts are not expected. The impact is considered insignificant.

- Mortality of individual numbers of the species

During construction, mortality of individual numbers from smaller and slower species is possible. Only the hedgehog (*Erinaceus concolor*) is protected species. The species is widespread and numerous, so the impact on its population in the area is estimated to be insignificant.

Impacts during operation:

- direct destruction of habitats

During operation, vegetation, respectively the habitats of the species within the overall boundaries will remain permanently removed. The territories within the range of the project could be populated with other species - e.g. mice and rodents. The territories, affected by the construction of bridge facilities (outside the project scope) will also be recovered as habitats of different species. The affected territories will be much smaller afterwards than during construction, respectively direct impact on the terrestrial mammals, inhabiting the region will be insignificant.

- fragmentation of habitats

None of the terrestrial mammals, inhabiting the area of the route have specific requirements for the nature of habitats or the minimum area they occupy. Some fragmentation will occur in forest habitats, but since the species that are found in the area are not narrowly specialized within them and use more sparse forests and open areas, the impact is considered insignificant.

- Barrier effect

During the operation of the highway, the route will generally disrupt the local bio-corridors of all species of terrestrial mammals, inhabiting the area. By applying the measures, envisaged to reduce the barrier effect on the species, subject to conservation in the Protected Zones, the impact on all terrestrial mammals will be reduced to insignificant.

- Anxiety

Anxiety during the operation of the highway will be caused by traffic. Sensitive to such impact are larger species, which will seek shelter far away from the construction site. Among the protected species is the wild cat (*Felis silvestris*). Anxiety during operation of the road will result in the functional loss of breeding habitats. The impact will be insignificant, given the wide spread of such habitats (deciduous forests, including riparian ones, xerophyte low forests, shrubs) in the area.

- Mortality of individual numbers of the species

During the operation of the motorway, mortality of individual numbers of the species, predominantly of smaller and slower species, but also of larger ones, is possible, such as the wild cat (*Felis silvestris*), the weasel (*Mustela nivalis*) and the hedgehog (*Erinaceus concolor*). The impact on local populations of these species may be significant, especially in combination with the barrier effect. By applying the measures, envisaged to reduce the mortality of the species, subject to conservation in the Protected Zones, the impact on all terrestrial mammals will be reduced to insignificant.

Summary of expected impacts:

Mammals
During construction works ***For Options G20 - Red, G20 - blue, Eastern Option G10.50 and Eastern Option G20***
Rate of impact: Rate of impact on species and their habitats - low; *Territorial Scope of Impact:* On a local scale, for the disturbance on some species - regional; *Duration of impact:* Short-term; *Frequency of impact:* One-time / temporary impact - during the construction of the site; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Long Tunnel Option
Rate of impact: Rate of impact on species and their habitats - low; *Territorial Scope of Impact:* On a local scale; *Duration of impact:* Short-term; *Frequency of impact:* One-time / temporary impact - during the construction of the site; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
During operation ***For Options G20 - Red, G20 - blue, Eastern Option G10.50 and Eastern Option G20***
Rate of impact: Rate of impact on species and their habitats - low to high (mortality); *Territorial Scope of Impact:* Local scale, for some impacts - regional; *Duration of impact:* Permanent; *Frequency of impact:* Permanent; *Consequences:* Negative; *Cumulative Impacts:* No cumulative impacts are to be expected.
For the Long Tunnel Option
Rate of impact: Rate of impact on species and their habitats - low to moderate (mortality); *Territorial Scope of Impact:* On a local scale; *Duration of impact:* Permanent;

Frequency of impact: Permanent;
Consequences: Negative;
Cumulative Impacts: No cumulative impacts are to be expected.

➨Class Bats (Chiroptera)

The main impacts on bats in the implementation of the five options of the track (Options G20 red, Option G20 blue, Eastern Option G 10.50, the Long tunnel Option and the Eastern option G20) are as follows:

- Permanent loss of areas of potential and hunting habitat of species. This impact will be demonstrated during the construction stage of the preliminary activities for the preparation of the construction route by destroying the natural vegetation in its scope. The impact shall be lasting and virtually irreversible, as the roadway and adjacent road facilities will lose its potential as hunting habitats for the bat species inhabiting the Kresna Gorge.
- Destruction of shelters No known underground bat shelters will be destroyed in the five project routes. Forest vegetation will be destroyed, which provides favourable conditions for the shelter of the *Myotis, Pipistrellus, Nyctalus, Vespertilio, Eptesicus, Barbastella* genera.
- Fragmentation of the habitats. The construction activities will completely destroy the vegetation within the road track, which will lead to the corresponding proportional reduction of the habitual abundance in the habitats, which may cause changes in its functional characteristics.
- Anxiety/disturbance/. Contemporary environmental studies in the UK (Berthinussen & Altringham 2012) show that hunting bats avoid not only the roadway, but also neighbouring areas, which may be due to the noise and traffic lights, as well as the perception of cars as a direct threat. According to the authors, the territorial scope of this impact, especially the noise, is limited to 100 m on either side of the road, depending on the relief, the type of bats, etc. (Berthinussen & amp; Altringham 2012, Kerth & Melber 2009).
- Deterioration of the natural favourable characteristics of potential and hunting habitat. This impact is directly related to the anxiety of individuals in areas adjacent to the route of the Motorway on both sides. The main factors behind this are the noise and increased air pollution from the exhaust fuel. Mortality of individual numbers of species It is to be expected under each of the five options. It is closely related to the direct collision or running over of hunting and migrating individuals from the vehicles.
- Barrier effect. It is expected that a partial barrier effect will occur in the operational stage in all five options due to the increased mortality rate of hunting or migrating individuals, as a result of vehicle crashes, combined with demolition of the physical characteristics of local bio-corridors. Modern environmental studies in the UK (Berthinussen & Altringham 2012) show that the activity and species diversity of hunting bats decrease with approaching the roadway, which is explained by the disappearance of bat colonies, adjacent to the road as a result of the aforementioned impacts.

We have presented in the table below a comparative analysis of the impacts on bats in the eventual implementation of the options (Option G20 red, Option G20 blue, Eastern option G 10.50, the Long tunnel Option and Eastern Option G20) during the construction and operational stages.

Nature of impact	Option G-20 - Red	Option G-20 - Blue	Eastern Option G 10.50	The Long Tunnel Option	The Eastern Option G 20
Direct destruction of habitats	Stage of construction: *Rate of impact:* **Low rate** of impact on a hunting habitat**.** *Territorial scope:* Local, within the dimensions of the road route. *Duration:* Permanent Frequency: one-time impact Consequences: negative *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: No further destruction is expected.	Stage of construction: *Rate of impact:* **Low rate** of impact on a hunting habitat**.** *Territorial scope:* Local, within the dimensions of the road route. *Duration:* Permanent Frequency: one-time impact Consequences: negative *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: No further destruction is expected.	Stage of construction: *Rate of impact:* **Low rate** of impact on a hunting habitat**.** *Territorial scope:* Local, within the dimensions of the road route. *Duration:* Permanent Frequency: one-time impact Consequences: negative *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: No further destruction is expected.	Stage of construction: *Rate of impact:* **Low rate** of impact on a hunting habitat**.** *Territorial scope:* Local, within the dimensions of the road route. *Duration:* Permanent Frequency: one-time impact Consequences: negative *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: No further destruction is expected.	Stage of construction: *Rate of impact:* **Moderate rate** of impact on a hunting habitat**.** *Territorial scope:* Local, within the dimensions of the road route. *Duration:* Permanent Frequency: one-time impact Consequences: negative *Cumulative effect:* Further IPs are expected to have **moderate impact on** hunting habitats. Stage of Motorway operation: No further destruction is expected.
Destruction of shelters	Stage of construction: Underground shelters will not be destroyed. It is possible to have **low-rate impact among** species of bats. Stage of Motorway operation: No impact is to be expected	Stage of construction: Underground shelters will not be destroyed. It is possible to have **low-rate impact among** species of bats. Stage of Motorway operation: No impact is to be expected	Stage of construction: Underground shelters will not be destroyed. It is possible to have **low-rate impact among** species of bats. Stage of Motorway operation: No impact is to be	Stage of construction: Underground shelters will not be destroyed. It is possible to have **low-rate impact among** species of bats. Stage of Motorway operation: No impact is to be expected under any of the five options.	Stage of construction: Underground shelters will not be destroyed. It is possible to have **low-rate impact among** species of bats. Stage of Motorway operation: No impact is to be expected under any of the five options.

	under any of the five options.	under any of the five options.	expected under any of the five options.		
Fragmentation of the habitats	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. Frequency: one-time impact *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: *Rate of impact:* Low. *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. Frequency: one-time impact *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: *Rate of impact:* Low. *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats.	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. Frequency: one-time impact *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate impact on** hunting habitats. Stage of Motorway operation: *Rate of impact:* Low. *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. Frequency: one-time impact *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats. Stage of Motorway operation: *Rate of impact:* Low. *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats.	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. Frequency: one-time impact *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate impact on** hunting habitats. Stage of Motorway operation: *Rate of impact:* Low. *Territorial scope:* Local - the range of the road and up to 100 m on both sides. *Duration:* Permanent. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low impact on** hunting habitats.
Anxiety	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. In the range of the track in forest areas. *Duration:* Short-term. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* No	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. In the range of the track in forest areas. *Duration:* Short-term. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* No	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local. In the range of the track in forest areas. *Duration:* Short-term. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* No	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. In the range of the track in forest areas. *Duration:* Short-term. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* No	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local. In the range of the track in forest areas. *Duration:* Short-term. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* No

	cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Permanent, long-term. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Permanent, long-term. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Permanent, long-term. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Permanent, long-term. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Permanent, long-term. *Frequency:* Continuous. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.
Mortality of individuals	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Short-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Short-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Short-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Short-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Short-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected. Stage of Motorway operation: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* Accidental. *Consequences:* Negative. *Cumulative effect:* No cumulative impacts are to be expected.
Barrier effect	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* One time.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* One time.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* One time.	Stage of construction: *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* One time.	Stage of construction: *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term. *Frequency:* One time.

	Consequences: Negative. *Cumulative effect:* Further IPs are expected to have **low-rate impact**, by depriving areas from the hunting habitats**.** <u>Stage of Motorway operation:</u> *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term for the whole stage. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate-rate impact**, by depriving areas from the hunting habitats**.**	*Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low-rate impact**, by depriving areas from the hunting habitats**.** <u>Stage of Motorway operation:</u> *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term for the whole stage. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate-rate impact**, by depriving areas from the hunting habitats**.**	*Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low-rate impact**, by depriving areas from the hunting habitats**.** <u>Stage of Motorway operation:</u> *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term for the whole stage. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate-rate impact**, by depriving areas from the hunting habitats**.**	*Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low-rate impact**, by depriving areas from the hunting habitats**.** <u>Stage of Motorway operation:</u> *Rate of impact:* **Low.** *Territorial scope:* Local. *Duration:* Long-term for the whole stage. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **low-rate impact**, by depriving areas from the hunting habitats**.**	*Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate-rate impact**, by depriving areas from the hunting habitats**.** <u>Stage of Motorway operation:</u> *Rate of impact:* **Moderate.** *Territorial scope:* Local. *Duration:* Long-term for the whole stage. *Frequency:* Permanent. *Consequences:* Negative. *Cumulative effect:* Further IPs are expected to have **moderate impact, by depriving** hunting habitats.
Significance of impacts	**Moderate rate**	**Moderate rate**	**Moderate rate**	**Insignificant**	**Moderate rate**

Preferred Option

The comparative analysis of the expected impacts on bats in the eventual implementation of one of the five design options of the 'Struma' Motorway has demonstrated that the **'Long Tunnel Option", Kresna tunnel** has the lowest rate to a negligible degree of impact with respect to all evaluation criteria**.** This conclusion derives from the smallest area of impact occurrence, as well as from the insignificant rate of impact on the structural and functional characteristics of bat populations.

Protected Areas

- **The Tissata Reserve**

Option G20 - Red

The route in this option passes near the eastern boundary of the western part of the Rreserve, while in the sixth bridge (for the first time is accepted the one at the village of Krupnik) over the Struma river, the scope (coinciding with the scope of the existing road) is tangent along at about 30 m.

Impacts:

The route under this option does not directly affect areas of the Reserve (the Protected Site). Its close location implies indirect effects on the vegetation, subject to conservation in the Protected Area, due to particulate matter and exhaust emissions, at least in the part, tangent to the road track. The impact will not differ significantly from the existing one, and is considered to be **insignificant** .

Option G20 - Blue

The route in this option passes near the eastern boundary of the western part of the Protected Site, while in the sixth bridge (for the first time is accepted the one at the village of Krupnik) over the Struma river, the scope (coinciding with the scope of the existing road) is tangent along at about 30 m.

Impacts:

The route under this option does not directly affect areas of the Reserve (the Protected Site). Its close location implies indirect effects on the vegetation, subject to conservation in the Protected Area, due to particulate matter and exhaust emissions, at least in the part, tangent to the road track. The impact will not differ significantly from the existing one, and is considered to be **insignificant**.

Eastern Option G10.50

The right roadway in this option passes near the eastern boundary of the western part of the Protected Site, while in the fourth bridge (for the first time is accepted the existing road at the village of Krupnik) over the Struma river is tangent to it by about 30 m. The left roadway is more than 500 m from the boundaries of the reserve.

Impacts:

The route under this option does not directly affect areas of the Reserve (the Protected Site). Its close location implies indirect effects on the vegetation, subject to conservation in the Protected Area, due to particulate matter and exhaust emissions, at least in the part, tangent to the road track. The impact will not differ significantly from the existing one, and is considered to be **insignificant**.

Long Tunnel Option, 'Kresna' tunnel

The road route under this option is distanced more than 2,000 m from the boundaries of the reserve. Of the other elements (landfills, intermediate accesses), the closest, intermediate access 5 is more than 850 m from the boundaries of the reserve.

Impacts:

The route under this option does not directly affect areas of the Reserve (the Protected Site). Its remote location does not imply indirect impacts on the vegetation, subject to conservation in the Protected Site (the Reserve). There will be **no impact**.

Eastern Option G20

The road route under this option is distanced more than 500 m from the boundaries of the reserve.

Impacts:

The route under this option does not directly affect areas of the Reserve (the Protected Site). Its remote location does not imply indirect impacts on the vegetation, subject to conservation in the Protected Site (the Reserve). There **will be no impact**.

• 'Kresna Gorge' Protected Site

Option G20 - Red

The road route under this option affects the peripheral part of the Protected Site, with 19.045 decares of the range falling within its boundaries.

Impacts:

The route under this option directly affects the territories of the Protected Area, this being mainly the existing road. A small part of it (3.882 decares) is mapped as *forests of Platanus orientalis*. The discrepancy determined is the result of improperly reflected and recorded scope of the existing road on the available sketch /excerpt of the Local Development Plan/ to the order for announcement of a protected area and Map of Restituted Properties. Its location also implies indirect effects on vegetation as a result of particulate matter and exhaust emissions. The impact on them has been assessed as **insignificant**, given the small area affected.

Option G20 - Blue

The road route under this option affects the peripheral part of the Protected Site, with 48.305 decares of the range falling within its boundaries.

Impacts:

The route under this option directly affects the territories of the Protected Area, this being mainly the existing road. A small part of it (3.289 decares) is mapped as *Platanus orientalis* forests and even smaller (0.165 decares) - as riverside galleries of *Salix alba* and *Populus alba*. The discrepancy determined is the result of improperly reflected and recorded scope of the existing road on the available sketch /excerpt of the Local Development Plan/ to the order for announcement of a protected area and Map of Restituted Properties. Its location also implies indirect effects on vegetation as a result of particulate matter and exhaust emissions. The impact has been assessed as **moderate**.

Eastern Option G10.50

The right roadway (the existing road) of this option passes through the periphery of a portion of the Protected Area. The left roadway is more than 200 meters from its boundaries.

Impacts:

The right roadway (the existing road) of this option passes through the periphery of a portion of the Protected Area. The discrepancy determined is the result of improperly reflected and recorded scope of the existing road on the available sketch /excerpt of the Local Development Plan/ to the order for announcement of a protected area and Map of Restituted Properties. Its location also implies indirect impact on vegetation as a result of contamination with particulate matter and exhaust emissions. The impact will not differ significantly from the existing one, and is considered to be **insignificant**.

Long Tunnel Option, 'Kresna' tunnel

The road route under this option is distanced more than 1,700 m from the boundaries of the Protected Site. Of the other elements (landfills, intermediate accesses), the closest, intermediate access 5 is more than 500 m from the boundaries of the Protected Site.

Impacts:

The route under this option does not directly affect areas of the the Protected Site. Its remote location does not imply indirect effects on vegetation. There **will be no** impact.

Eastern Option G20

The road route under this option is distanced more than 150 m from the boundaries of the Protected Site.

Impacts:

The route under this option does not directly affect areas of the the Protected Site. Its remote location does not imply indirect effects on vegetation. There **will be no** impact.

• 'Moravska' Protected Site

The route under all optiona does not directly affect areas of the Protected Site. The closest option (the Long tunnel option) is approximately 20 m from the boundaries of the Protected Site (distance between the nearest points in the scope of the option and the boundary of Protected Site).

Impacts:

The route under all optiona does not directly affect areas of the Protected Site. Its remote location does not imply indirect effect on the vegetation, subject to conservation in it (the range under the Long Tunnel Option is more than 100 m from the boundaries of the Protected Site). **There will be no** impact under any of the options.

- **Natural monument/Landmark 'Momina Skala'**

The route under all options does not directly affect areas of the Protected Site. The closest option (the G20- Blue option) is approximately 50 m from the boundaries of the Protected Site (distance between the nearest points in the scope of the option and the boundary of Protected Site).

Impacts:

The route under all options does not directly affect areas of the the Protected Site. Its remote location and the subject of conservation of IP do not imply indirect impacts. **There will be no** impact under any of the options.

- **Protected Site 'Natural habitat of the plane tree *(Platanus orientalis)* - Buyna'**

The route under all options does not directly affect areas of the Protected Site. The closest (G20 - blue) is more than 3,000 m from the boundaries of the Protected Site. Of the other elements (landfills, intermediate accesses), the closest, intermediate access No.7 is distanced more than 2,800 m from the boundaries of the Protected Site.

Impacts:

The route under all options does not directly affect areas of the Protected Site. Its remote location does not imply indirect impacts on the vegetation, subject to conservation in the Protected Site. **There will be no** impact under any of the options.

Protected areas

The route of Lot 3.2 under all evaluated project options passes through Natura 2000 protected areas, as follows:

• Protected zone 'Kresna-Ilindentsi' (identification code BG0000366) - Protected zone under Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora;

• Protected zone 'Kresna' (identification code BG0002003) - Protected zone under Directive 2009/147 / EC (The Birds Directive).

According to letter of outgoing reference No.EIA -85 / 13 May 2015 of the Ministry of Environment and Water for the investment proposal **'Improvement of the Structure of Lot 3.2 of the 'Struma'** Motorway on the assessed project options - a *Report was developed on the rate of impact with subject-matter and objectives for the conservation of protected areas*, an integral part of the EIA report.

7.6. Waste

On the territory of the project options: Option G20 - blue, Option G20 - Red, Eastern Option G10.50, the Long Tunnel Option and the Eastern Option G20 that will be affected by the investment proposal, there are no non-organized landfills that will have a negative impact on the environment.

The scope of the project options is affected by forest lands and agricultural lands, used for intensive farming, cultivating: technical cultures; orchards and vineyards, urbanized areas and water areas.

The scope of the projected design options concerns the territory of two municipalities - the municipality of Simitli and the municipality of Kresna, Blagoevgrad region.

The waste, generated in the affected municipalities shall be transferred over to the regional waste management systems, following the waste management hierarchy in order to prevent, reduce or limit their harmful effects on human health and the environment.

The Regional Waste Management Systems (RWMS), where waste is treated and will be transferred for treatment waste, generated on the territory of municipalities, affected by the investment proposal - Blagoevgrad and Sandanski.

Expected types of waste, generated during the construction and operation of the investment proposal. Classification of waste

The implementation of the investment proposal includes two phases of its implementation, construction and operation, where waste generation is expected to also occur in emergency situations.

Generation of waste during construction

During the construction and assembly works on the road track and the facilities in Lot 3.2 of the Struma Motorway will be generated different types of waste in the clearing and preparation of construction sites, the execution of excavation activities, the construction of the road body, construction of bridge and road facilities (tunnels, viaducts, overpasses, bridges, retaining walls, overpasses, underpasses, culverts, etc.), reconstruction of engineering networks of other departments/authorities, railway crossings, storage sites for building materials, temporary assembly sites, road junctions, storage/depot sites for road and construction, and assembly equipment, as well as in the places for temporary household camps of workers.

Construction waste, generated during the excavation, embankment, formwork, reinforcement, concrete, asphalt &concrete works and other construction and installation works, performed on the construction sites: Excavated earth and rock masses that do not meet

the design specifications for use in the construction (material, excavated inappropriately for embankment); concrete; metal wastes; wood material; asphalt mixtures. In the initial phase of construction, biodegradable waste will be generated in the preparation of the track and the removal of tree and shrub vegetation.

Household waste, generated on construction sites, temporary camps and storage sites for the transportation, construction and installation equipment from the day-time activities of construction workers.

Hazardous waste, mainly charged-off rechargeable batteries and waste oils from the construction machinery in case of emergency replacement, as well as packaging, containing residues of dangerous substances or contaminated by dangerous substances.

The following waste will be generated only **one-time** during the construction works in Lot 3.2 of the Struma Motorway.

A / Hazardous waste

As hazardous waste in the construction of Lot 3.2 of Struma Motorway, the road facilities - tunnels, viaducts, overpasses, bridges, overpasses, underpasses, etc. and reconstruction of affected facilities of other departments/authorities will mainly generate hazardous waste from the maintenance of construction and assembly equipment and service transportation vehicles.

Hydraulic oils: Used hydraulic oils (unchlorinated, synthetic and other hydraulic oils) will be generated in the emergency / unexpected replacement of hydraulic oils from the hydraulic systems of transportation, construction and assembly equipment and other hydraulic oils, generated in unforeseen replacement. Waste composition - petroleum products, high molecular weight hydrocarbons.

Gear oils: Used engine oils from gears, motors and gearboxes (non-chlorinated, synthetic and other engine oils) will be generated in the emergency / unexpected replacement of oils from automotive, construction and assembly equipment. Waste composition - petroleum products, high molecular weight hydrocarbons.

Earth masses, containing dangerous substances

Contaminated land mass (dredged soil from polluted sites) will be generated in emergency situations of construction, assembly and transportation equipment, associated with leakage of oils / products and dredging of contaminated earth material. Waste composition - petroleum products, hydrocarbons of high molecular weight.

Oil filters: Used oil filters will be generated in the emergency / unexpected replacement of waste oils from the automotive, construction and fitting equipment and the replacement of waste oil filters. Waste composition - petroleum products, hydrocarbons of high molecular weight and impregnated cellulose.

Brake Fluids: Used brake fluids will be generated in emergency / unexpected brake fluid replacement in faulty braking systems of service vehicles and construction equipment.

Rechargeable batteries: The waste will be generated in the event of unexpected replacement of charged off rechargeable batteries from the land transportation, the construction and assembly equipment. Waste composition - lead, sulphuric acid.

Packages, containing residues of dangerous substances or contaminated by dangerous substances: Plastic / metal packages of paints, lacquers will be generated after the use of delivered paints and varnishes for the finishing works on the facilities of the Lot 3.2 track of the Struma Motorway. Waste composition: Hydrocarbons, plastics, steel and others.

B / Construction waste

Earth and rock masses that meet the design specifications for use in the construction of the road

In the construction of the track, when carrying out earthworks for the layout of the road bed and the construction of the road facilities - tunnels, viaducts, overpasses, bridges, overpasses, underpasses, etc. and in the reconstruction of affected facilities of other departments/authorities, earth and rock masses will be generated. In the construction of Lot 3.2 of the Struma Motorway, earth and rock masses will be deposited in embankments.

Earth and rock masses that meet the design specifications for use in the constructions

For tracing and shaping the road, excavating earthworks, excavating earth soils for bringing down excavations, digging trenches and drainages, excavating for facilities in soil soils, etc., waste land and rock masses that do not meet design specifications for use in the construction will be generated as waste. The waste shall be transported for recovery and / or disposal (to landfills). Waste composition - earth soil, rock mass and others.

Earth masses, containing dangerous substances

When executing earth works on Lot 3.2 it is possible to generate earth masses, containing dangerous substances.

Waste concrete: The construction of large and small facilities on Lot 3.2 of the Struma Motorway will generate waste concrete. Concrete (waste) will also be generated in case of destruction of concrete trenches, canals, concrete suspension beams, concrete drain culverts, banked earth base material and trench base, destruction of waterproofing on cement screed. The waste shall be transported to the landfill or to the recycling site. Waste composition - cement, sand, gravel, mineral additives, reinforced concrete.

Asphalt mixtures: The waste will be generated when laying asphalt concrete flooring and when milling the existing asphalt pavement in the areas of road crossing. Residues of asphalt (binding asphalt layer - binder and wear layer) will also be generated in the surface application of asphalt coatings. Waste composition - mineral fractions, mineral flour, bitumen, tar, asphalt and polymers.

Metal waste: Metal waste will be generated in the dismantling of existing railings and the single elastic barrier, removing of restrictive systems, road signs and advertising signs, culverts, massive buildings, steel and concrete structures, removal of existing concrete bridge structures within the scope of the new bridges and tunnels, viaducts, overpasses, bridges, retaining walls, overpasses, underpasses, culverts, etc., shuttering operations in the installation of the single elastic barrier, protective steel railings and road signs and reconstruction of engineering networks of other authorities, crossing the railway line. Iron and steel will also drop out of steel reinforcement and high-strength reinforcing steel during the construction of the Lot 3.2 facilities of the Struma Motorway. Waste composition - iron and steel, non-ferrous metals.

Wood material: Waste wood (beams, boards) will be generated from the shuttering activities in the construction of tunnels, viaducts, overpasses, bridges, retaining walls, overpasses, subways, culverts, etc. Waste composition - wood, cellulose/pulp/.

C / Other non-hazardous waste, generated during construction

Forestry waste: Waste shall be generated when tracing the road and clearing the terrain, associated with the cutting of tree and shrub vegetation. The waste shall be transported for recovery (composting) to the Regional Waste Management System.

Disused tires: Disused tires will be generated by the transport and construction equipment in the unexpected replacement of unusable tires. Waste composition - solid waste, elastomers, hydrocarbons.

In addition to the waste considered, waste will also be generated in the area of construction activities (for the individual construction sites) after the completion of construction works on Lot 3.2 of the Struma Motorway, from the facilities and the reconstruction of affected engineering networks of other departments/authorities. These are waste, generated during the final cleaning of the temporary pre-storage sites, the humus layer and waste, storage areas for inert building materials and adjacent areas.

D / Municipal waste

During the construction phase of Lot 3.2 of the Struma Motorway, household waste will be generated from large and small facilities and in the reconstruction of affected facilities of other departments/authorities, from the domestic life of workers, as well as in the temporary camps and home depots for the transportation, construction and installation equipment.

Generation of waste during road operation

During the operation of the route and the facilities in Lot 3.2 of the Struma Motorway, different types of waste will be generated from the traffic and during the repair of the roadway. The different types of waste, to be generated in the operation of the track and equipment are divided into: domestic waste; non-hazardous and hazardous waste, mixed construction waste from repairs.

A / Hazardous waste

During the operation in Lot 3.2 of the Struma Motorway, liquid and solid wastes will be generated as follows:

♦ Hydraulic oils, engine and lubricating oils, gear oils, brake fluids, antifreeze fluids and other substances, caused by leaks from faulty or damaged vehicles, as well as from cars that have suffered crashes. Spillages / leakages from tanks and trucks, carrying hazardous waste, hazardous substances, including fuels.

♦ sludges from cleaning of sludge and oil separators from the drainage system of the roadway and the tunnels

B / Other wastes, generated in the process of road operation

- Spills / leakage / spillage from tanks and trucks, carrying liquid or wetted materials.
- Aggregates and parts of cars and worn-out equipment, out-of operation vehicles (road accidents), automotive consumables, bumpers and others.
- Worn and torn tires;
- Wastes from cleaning the roadside ditches and the dividing strip;
- Sludge from water-tight septic tank cleaning.

Waste in carrying out repairs during operation

Mixed construction waste, generated during the repairs of the roadway and the facilities within are mainly ground asphalt pavement, waste concrete, metal waste and others.

C / Municipal waste

- Discharged from motor vehicles, on and along the roadway household waste, including in the resting places;
- Discharged from motor vehicles, packaging of foodstuffs, beverages and cigarettes - plastic, glass, metal and paper.

Spilled/scrapped and disposed of motor vehicles on the road and by the road, including in the resting places, are in small quantities, mostly blown by the wind or washed away by the rain. Some of the waste is retained around the road or in the roadside ditches.

In order to reduce the pollution of the area near Lot 3.2 of the Struma Motorway, the maintenance services remove the accumulated waste.

Bursting of multiple pollution occurrences will only be seen in the road accidents or emergency situations, involving vehicles, transporting hazardous substances and hazardous waste or in the case of criminal discharge of hazardous waste. In case of emergency situations, the competent services shall be immediately notified (the Police, the National Fire Brigade, the Civil Protection Agency, the MoEW, the MH and the Council of Ministers).

The solid waste, generated during the operation in Lot 3.2 of the Struma Motorway will be collected by the organization, responsible for the maintenance of the roadside and will be transferred for subsequent recovery and / or disposal.

Preventing the generation of waste during the construction and operation of the investment proposal

In order to minimize waste generation during the construction of the investment proposal (Lot 3.2 of the Struma Motorway), the Contractor of construction works should prepare a Construction Waste Management Plan, which will contain an assessment of the generated volumes and method of treatment. The construction organization shall apply a hierarchical order for the management of construction waste, according to Art. 10 of the Ordinance on Construction Waste Management and the Use of Recycled Building Materials.

To prevent the formation of hazardous waste (oils, batteries/accumulators/, etc.) on the individual construction sites, properly functioning transport and construction equipment should be used after, which has passed thorough overhaul and maintenance in the main building of the construction organization.

To minimize the generation of waste during the operation of the investment proposal, the roadway and its facilities must be maintained in good technical condition to prevent the generation of waste.

Collection, transportation, recovery and disposal of waste

The Contractor, responsible for the construction in Lot 3.2 of the Struma Motorway and for the construction of related adjacent facilities - tunnels, overpasses, underpasses, viaducts, bridges, for the construction of recreational sites and the reconstruction of affected facilities of other departments/authorities should perform planned repairs of the construction equipment and planned replacement of oils, accumulator batteries, automotive tires and other components of service vehicles and of the transportation and construction equipment in its own base facility.

Collection, transportation and recovery of waste during construction

A / Hazardous waste

Mineral-based, non-chlorinated hydraulic oils, synthetic hydraulic oils, other hydraulic oils, non-chlorinated engine, mineral and lubricating gear oils, synthetic motor, gear and lubricating oils and other motor, gear and lubricating oils, oil filters, brake fluids, accumulator batteries.

Generated waste in emergency / unintentional replacement (of oils/oil filters) shall be collected separately at the place of formation (in the home depot or on the Lot's site) in closed metal drums / containers and based on written agreements, shall be handed over for

subsequent treatment to the persons, holding the relevant document under Art. 35 of the Waste Management Act (WMA).

Emergency replacement of consumables shall be carried out on sites with compacted insulating material that prevents the penetration of petroleum products into the soil.

Earth masses, containing dangerous substances

In case of emergency situations of construction and transport equipment, contaminated with petrochemicals waste shall be collected in due time and handed over for subsequent treatment to the entities, holding the respective permit documents under Art. 35 of the WMA, based on written agreements.

Contaminated soil and earth masses, generated during excavation activities on the construction site shall be collected in good time and handed over for subsequent treatment to the entities, holding the respective permit licences under Art. 35 of the WMA, based on written agreements.

Packages, containing residues of dangerous substances or contaminated by dangerous substances

Plastic / metal packages of paints, lacquers will be generated after the use of delivered paints and varnishes for the finishing works on the facilities in Lot 3.2 of the Struma Motorway. The packaging shall be stored at a designated pre-storage site and handed over for subsequent treatment to the entities, holding the relevant permit documents under Art. 35 of the Waste Management Act (WMA), based on written agreements.

Separate collection of waste at the place of its formation, its timely transportation and handing over for subsequent treatment, according to WMA - Art. 7, Para. 1, Para. 4, Art. 8, Para. 2, Art. 35 and Art. 40 and in accordance with the Ordinance of the Municipal Council (Article 22 of the WMA) shall be carried out by the owner of the construction waste or by another person,, meeting the requirements of Art. 35 of the WMA on the basis of a written agreement, according to Art. 40 of the Waste Management Act and in accordance with the Ordinance of the Municipal Council on the Terms and Procedure for Collection, Transportation, Utilization and Disposal of Construction Waste, During the Construction of the Site (Lot 3.2 of the Struma Motorway).

B / Construction waste (non-hazardous waste)

Dredged earth and rock masses

Earth masses that meet the design specifications for use in the construction works shall be stored at sites within the reach of the road or at temporary sites, prior to their transportation and use for embankments, as well as their use for site reclamation purposes.

Excess land and rock masses will be transported and landfilled on the project sites, designated for construction landfills. The Construction landfill sites, as well as the temporary landfills for earth masses and rock masses (outside the motorway range) will be agreed upon by the municipal administration, on whose territory the respective landfill is located, in accordance with Art. 19, Para. 1 of the WMA. We recommend the transfer of unnecessary earth and rock masses as priority for the recovery (construction of other sites) prior to their disposal (to landfills).

In the construction of the site shall be generated earth masses that do not meet the design specifications for use in the construction of the road. These earth masses shall be transported and stored on storage sites (which will also be used for the construction of Lot 3.1

and Lot 3.3 of the Struma Motorway) or taken away for recovery and / or disposal to the Regional Waste Management System.

Waste concrete

The generated waste concrete in the construction of concrete facilities, the construction of tunnels, overhead roads, bridges, destruction of concrete trenches, channels, concrete suspension strips, destruction of existing concrete culverts, banked earth base materials, reconstruction of facilities of other departments/authorities, and others shall be collected separately and preliminary stored at a designated depot within the scope of the site until their handing over to legal entities, implementing the waste management hierarchy and / or to be transferred to the Regional Waste Management System for the purpose of its recovery in accordance with the Ordinance on Construction Waste Management and for the use of recycled building materials.

Asphalt mixtures

Asphalt waste (asphalt binder and wear layer) in the destruction of the existing asphalt pavements and the surface laying of asphalt coatings to be collected in metal containers and handed over for subsequent treatment to the entities, holding the relevant permit documents under Art. 35 of the Waste Management Act (WMA) on the basis of written agreements.

Metal waste

Metal waste, generated in the dismantling of existing railings and the super-rail steel road barriers, removing road safety restriction devices, road signs and advertising signs, culverts, massive buildings and concrete structures, removal of existing concrete bridge structures within the scope of the new bridges and tunnels, viaducts, overhead road/pipework facilities, bridges, retaining walls, overpasses, underpasses, culverts, etc., shuttering operations in the installation of the super-rail road barriers, protective steel railings and road signs, in the reconstruction of engineering networks of other authorities/departments, crossing the railway line, as well as iron and steel wastes, rejected from steel reinforcement and high-strength reinforcing steel, shall be collected separately and sent for further treatment to the entities, holders of relevant permit documents under Art. 35 of the Waste Management Act (WMA) on the basis of written agreements.

Wood material

Waste wood (beams, boards), generated in the formwork activities, in the construction of road facilities, of drainage facilities and others shall be collected separately and pre-stored on designated sites until the quantities are accumulated and submitted for subsequent treatment to the entities, holding the relevant permit documents under Art. 35 of the Waste Management Act (WMA) on the basis of written agreements.

The treatment of construction waste should be carried out in accordance with the approved Waste Management Plan.

C / Other non-hazardous waste, generated during the construction

Wastes from "forestry"

Waste from tree-shrub vegetation, formed by clearing the areas within the scope of the road, associated with cutting of vegetation and grass mowing, shall be collected at a designated site and transported to the Regional Waste Management System for reuse (composting).

Old, unusable tires:

Old, unusable tires will be collected separately in a metal container, pre-stored on a designated site and transported to the main building of the Contractor of the Road Construction. The generated waste shall be stored at a designated pre-storage site and handed

over for subsequent treatment to the entities, holding the relevant permit documents under Art. 35 of the Waste Management Act (WMA), based on written agreements.

After completion of the construction works in Lot 3.2 of the Struma Motorway, the road facilities and the reconstruction of facilities of other departments/authorities will generate waste in the final cleaning of temporary sites, pre-storage sites for earth masses, humus layer and waste, storage areas for aggregate building materials and adjacent territories. Waste, generated after the construction shall be transported by the holder of waste (the construction organization) and handed over to the companies, implementing the waste management hierarchy and / or handed over to the Regional system for waste management in preparation for reuse and source materials for the recycle facility of construction waste, in accordance with *the Ordinance on Construction Waste Management Prior to Starting Construction Works and / or Removing a Building* and the reuse of recycled building materials.

D / Municipal waste

Domestic waste, generated from the life of workers, carrying out excavation, construction and assembly works shall be collected in Beaver-type metal containers and transferred for separation (separation of paper, metal, plastics for recycling, separation of biodegradable waste with the purpose of composting and reducing the amount of biodegradable waste, provided for deposition to landfills) in the Regional Waste Management System and disposal of the residual fractions to a regulated landfill for non-hazardous domestic waste, together with the municipal waste from the relevant municipality.

The regional waste management systems, to which the generated municipal waste will be transferred are described in Section IV, item 6.

Collection, transport and recovery of waste during road use

Different types of waste, generated in emergencies or road accidents shall be scattered / spilled along the roadway and roadside areas. Spilled liquid waste shall be collected by adsorbents. The formed agglomerates of waste and adsorbents shall be collected in metal containers / drums and handed over for subsequent treatment to the companies, holding the relevant permits/licences under Art. 35 of the Waste Management Act (WMA), on the grounds of written agreements.

The construction waste, generated in the road repair activities and from road facilities - mainly concrete, asphalt pavement taken off (by grinding) and metallic waste, should be collected and directly transported by the waste holder (the Contractor's organization performing the repairs), according to Art. 40 of the WMA and the Ordinance of the Municipal Council in accordance with Art. 22 of the Waste Management Act (WMA).

Spilled and discarded wastes on the road and around the road shall be in small quantities, mostly blown by the wind or washed away by the rain. Some of the waste shall be retained around the road or in the roadside ditches. In order to reduce the pollution of the roadside space, the road service departments/authorities shall remove the solid waste, generated in the ditches during the operation in Lot 3.2 of the Struma Motorway and take them away for subsequent treatment or disposal.

At the recreation sites in Lot 3.2 of the Struma Motorway, the domestic wastewater, containing faecal matter will pass through a local treatment plant with biological treatment of waste water or in the water-tight disposal pits. The sludge shall be dredged with specialized equipment from the water and sewerage operators on the grounds of their (written) agreement.

The treatment of waste from Lot 3.2 of the Struma Motorway, generated during operation, including generated household waste, will be transported (by the organization responsible for the maintenance of the roadway) for utilization and / or disposal of the Regional Management System for waste, to the respective municipalities, according to Art. 12, Para. 1 of WMA.

The organization, authorized by the road owner, responsible for the maintenance of the roadway shall provide containers for collection of waste and transportation to facilities for their treatment, according to Art. 12, Para. 2 of the WMA.

In the process of operation in Lot 3.2 of the Struma Motorway, waste management shall be designed on a national level, according to Art. 12 of the WMA and Art. 8, Para. 1, Subpara. 2 of the Road Act.

The treatment of the waste, generated during the operation in Lot 3.2 of the Struma Motorway should be carried out in compliance with the requirements of the WMA and the statutory regulations for its implementation.

Transportation scheme for waste transportation. Need for landfill sites to store waste

The transportation scheme for the transport of construction waste should be agreed upon between the Contracting Authority and the Contractor of construction works, under an approved design, defined routes on existing roads, storage depots and temporary sites for the storage of construction waste. Only the existing roads should be used for the transport of waste.

The routes and organization of transportation, including designation of sites for treatment (recovery / disposal) of construction waste will be agreed upon with the respective municipal administration, in accordance with the Ordinance under Art. 22 of the WMA.

Need for landfills and land masses

The construction in Lot 3.2 of the Struma Motorway, including all necessary facilities to it and reconstruction of facilities of other departments/authorities, determines the need for storage sites of generated waste from the construction activities.

Landfills for the storage of construction waste

Because of the nature of the construction, it will be expected to generate certain quantities of land and rock materials that do not meet the design specifications for use in the construction of Lot 3.2, in respect to which, storage sites were explored and proposed.

The designed Long Tunnel Option has provided for pre-storage sites of earth and rock masses, one site at the northern portal and two sites at the southern portal.

There are also two storage sites for earth and rock mass (which will be used for the construction of Lot 3.1 and Lot 3.3 of the Struma Motorway) as follows:

1. Site on the land of the village of Zheleznitsa with a capacity of 4, 500,000 m^3. Total area of 454.780 decares.

2. Site in the land of the village of Ilindentsi with capacity of 1.500,000 m^3. Total area of 123.686 decares.

These two sites are not currently existing and are not used for the storage of earth and rock materials.

The total amount of excavated earth and rock masses, which correspond to the design specifications for incorporation in the construction, under three of the options considered, will

be used on the site. Prior to use, earth and rock masses will be stored on temporary sites in the range of the road. Temporary off-site depots shall be specified by the Contractor's organization for the road construction works (in the preparation of the Schedule for Organization and Execution of Construction Works) in accordance with the tender documentation, prepared by the Contracting Authority.

Sites for pre-storage of aggregate materials and waste from construction works may be specified by the Contractor's organization, carrying out the construction activities (in the preparation of a Schedule for the organization and execution of construction works) in accordance with the tender documentation, prepared by the Contracting Authority. The sites are presented in the Construction Waste Management Plan, coordinated and approved by the respective municipal administration and by the RIEW - Blagoevgrad.

The design provides for recreational sites within the scope of the road, which can be used as storage sites for building materials and wastes during the construction works, before they are finally constructed for their intended purpose.

Impact assessment for waste storage

The impact of construction waste on pre-storage on environmental components is classified as insignificant and temporary over the construction period. Pre-storage sites for construction waste, subject to the instructions and implementation of the proposed measures to prevent or reduce negative impacts on environmental components, do not imply a negative impact on the purity of air, soil, surface and groundwater, and human health.

After the completion of construction works in Lot 3.2 of the Struma Motorway and the reconstruction of facilities of other departments/authorities, the temporary storage sites for waste, aggregate building materials, humus layer, earth and rock masses will be cleaned and reclamation activities will be carried out.

Preferred option

When comparing the quantities of generated earth and rock masses for the whole construction period, the different design options have determined that:

- The amounts of land and rock masses that **meet** the design specifications for use in the construction are smallest for Option G20 - red and Option G20 - blue;
- the amounts of land and rock masses that **do not meet** the design specifications for use in the construction are smallest for Option G20 - Red and Option G20 - blue;

Comparing the quantities of generated waste during construction - earth masses and rock masses *that are not in compliance with the design specifications for use in the construction*, under the Eastern Option G10.50 - 1,856,432 m^3, the Long Tunnel Option - 4,579,586 m, the Eastern Option G20 - 2,936,137 m^3, Option G20 - Red - 262,688.40 m^3 and option G20 - blue - 1,192,402 m^3, the preferred **option shall be Option G20 - Red** with significantly smaller volumes of **waste** earth and rock masses.

According to the accepted point system for selecting the implementation option, the preferred option - the G-20 - Red Option has received 5 points. Taking into account the expected amount of waste earth and rock masses, the second position is taken by Option G20 - Blue with 4 points. The third position is taken by the Eastern Option G10.50 with 3 points. The fourth position is taken by the Eastern Option G20 with 2 points. The Long Tunnel Option is in the 5^{th} position with 1 point.

In Section X, "Comparative Table for Selection of a Implementation Option", the report presents the points for each of the proposed five design options for the individual components and the environmental and human health factors.

Nature of impacts

The nature of the impacts can be classified as direct and reversible with the following characteristics:

Nature of impacts

The nature of the impacts can be classified as direct and reversible with the following characteristics:

Waste					
During construction works					
Criterion (Earth and rock masses that do not meet the design specifications for use in the constructions)	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	**MODERATE.** A considerable amount of excavated earth and rock masses -1, 192,402 m^3, whereas the storage will affect large areas.	**LOW.** Insignificant volumes of excavated earth and rock masses - 262,688.40 m^3, given the nature of the Investment Proposal. Storage will affect minor areas. Short-term residual impact.	**MODERATE.** A considerable amount of excavated earth and rock masses -1, 856,432 m^3, the storage will affect large areas.	**VERY HIGH.** Very large volumes of excavated earth and rock masses - 4,579,586 m^3. The storage will affect much larger areas and resources that have the potential to affect other environmental components due to the increased content of natural radionuclides in these rock masses.	**HIGH IMPACT RATE.** Larger excavated earth and rock masses - 2,936,137 m^3. Storage will affect much larger areas.
Territorial Scope of Impact:	On a local scale, with a large territorial scope;	On a local scale, with insignificant territorial scope;	On a local scale, with a large territorial scope;	On a local scale, with a very large territorial scope;	On a local scale, with greater territorial scope;
Duration of impact:	Short-term;	Short-term;	Short-term;	Long-term	Long-term
Frequency of impact:	Periodical / temporary	Periodical/ Temporary	Periodical/ Temporary	always	always
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative Impacts	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Moderate / Average	Insignificant	Moderate / Average	Significant	Significant

Waste					
During operation					
Criterion (Amount of waste generated)	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	**LOW.** Minor short-term impact - timely removal of waste from roadside.	**LOW.** Minor short-term impact - timely removal of waste from roadside.	**LOW.** Minor short-term impact - timely removal of waste from roadside.	**LOW.** Minor short-term impact - timely removal of waste from roadside.	**LOW.** Minor short-term impact - timely removal of waste from roadside.
Territorial Scope of Impact:	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;
Duration of impact:	Short term	Short term	Short term	Short term	Short term
Frequency of impact:	Permanent.	Permanent.	Permanent.	Permanent.	Permanent.
Consequences:	Negative.	Negative.	Negative.	Negative.	Negative.
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

Assessment of environmental and human health impacts

The separate collection, transportation and pre-storage of waste at the site of formation in the preferred option for the above-mentioned route in Lot 3.2 of the Struma Motorway, its facilities and the reconstruction of facilities of other departments/authorities, as well as during the operation in Lot 3.2 of the Struma Motorway and the transfer of waste for subsequent treatment, to companies, holding the relevant permit documents under Art. 35 of the Waste Management Act (WMA), under written agreements, does not imply a negative impact on the components of the environment and human health.

7.7. Dangerous substances

The design for the construction of the road track in Lot 3.2 of the Struma Motorway, the construction of adjacent facilities and the reconstruction of facilities of other departments/authorities, does not provide for the use of prohibited hazardous chemicals, preparations and products. The construction in Lot 3.2 of the Struma Motorway does not project for the storage of hazardous substances on the construction sites.

During the construction in Lot 3.2 of the Struma Motorway, mainly fuels - gasoline, diesel fuel, propane-butane, non-chlorinated motor and lubricating oils will be used as dangerous substances. The chemicals and mixtures to be used during the construction are classified according to their physiochemical, toxicological and ecotoxicological properties, in accordance with Art. 2 and Art. 5 of the Law on Protection from the Harmful Impact of Chemical Substances and Mixtures (Official gazette, no. 10 of 4 February 2000, as amended, SG, nos. 12 of 3 February 2017).

During the period of operation in Lot 3.2 of the Struma Motorway, activities with hazardous chemical substances will not be carried out.

Provided that the Long Tunnel Option will be implemented during the operation in Lot 3.2 of the Struma Motorway, the dangerous goods will be transported along the existing E79 road in both directions, in compliance with the conceptual design. The conceptual design of the Long Tunnel Option excludes the transportation of dangerous goods through the Kresna Tunnel.

The use of hazardous substances and mixtures (e.g. fuels, oils, bitumen and permanent marking materials) should be carried out in accordance with the measures on the control of exposure, specified in the Safety Data Sheets and the Safety Instructions, including the measures in Emergency Release or Spills of (dangerous substances).

Toxicological characteristics of fuels, used by means of transportation, construction and assembly equipment, during the construction of the highway

Petroleum products - high concentrations of hydrocarbons are lethal. In smaller concentrations - headache, nausea and mental arousal. Chronic poisoning causes functional disturbances.

At high concentrations of vapours, immediate poisoning is possible. Loss of consciousness and rapid transition to death if the victim remains in the poisoned atmosphere.

Alkali (propane and butane) are quite powerful drugs, but their effects on the human body are weakened due to the low solubility in the blood. Under normal conditions, they appear to be practically harmless.

Benzines/gasolines **-** Naphtha of low boiling point - not certified [Ingredient combination of hydrocarbons, principally composed of paraffins, cycloparaffins, aromatic hydrocarbons and olefins, of carbon-chain length predominantly in the range of C3 and boiling point in the range of approximately 30°C to 260°C.]

The combustion gas develops in depth to form a constantly increasing layer of the same temperature. Burning petroleum products and splashes on a significant area are effectively extinguished by air-mechanical foam.

Substances, known to cause inhalation toxicity to humans or to be considered as causing an inhalation toxicity.

Health hazards: Skin corrosion / irritation. Can cause cancer. Mutagenicity in germinative cells. Carcinogenecity, Aspiration hazard

Acute toxicity: Reproductive toxicity. Aspiration Risk. Inhalation of high concentrations may cause dizziness, headache, nausea and loss of coordination. Prolonged inhalation may lead to loss of consciousness. Irritating effect on the skin. May cause irritation and stomach pain, vomiting, diarrhoea and nausea. Evidence for humans indicates that this product has very low acute oral, dermal or inhalation toxicity. However, it may cause serious damage if infused into the lungs, in the form of a liquid and can lead to deep central nervous system depression, in prolonged exposure to high levels of fumes

Physical hazards: Flammable liquid

Environmental hazards: Hazard to aquatic environment, long-term hazard to aquatic environment. The product does not dissolve in water and will spread to the water surface, although some of the components will eventually settle in the water systems. Volatile components of the product will spread to the atmosphere. It is expected to fall apart. It has the potential for bioaccumulation. It has low absorption potential in the soil. Not a persistent, bioaccumulative and toxic (PBT) or highly persistent and highly bioaccumulative (vPvB) substance or mixture. Toxic to aquatic life with long lasting effects. The product contains volatile organic compounds that have the potential to synthesize photochemical ozone. In general, oil spills are dangerous to the environment.

Diesel

Fuels, diesel, gas oil - not certified

[A complex combination of hydrocarbons from the distillation of crude oil. It consists of hydrocarbons, having carbon numbers predominantly in the range of C9 through C20 and boiling in the range of approximately 163 ° C to 357 ° C.]

Inhalation of high concentrations of evaporations may cause dizziness, headache, nausea and loss of coordination. Prolonged inhalation may lead to loss of consciousness. Prolonged or repeated skin contact may cause redness, itching, irritation, eczema / cracking and acne. Ingredients of the product can penetrate the body through the skin.

Health hazards: Corrosiveness, skin irritation. Carcinogenecity. May cause liver damage. Suspected hazards of cancer. Harmful: May cause lung damage if swallowed. Aspiration into the lungs of the product by ingestion or vomiting can cause serious chemical pneumonia. Occupational exposure of the substance or mixture may cause harmful effects on human health.

Acute toxicity : Acute toxicity, inhalation. Harmful if swallowed: May enter the lungs if swallowed or vomited. Inhalation of high concentrations may cause dizziness, headache, nausea and loss of coordination. Prolonged inhalation may lead to loss of consciousness. May cause irritation and stomach pain, vomiting, diarrhoea and nausea.

Physical hazards: Flammable liquid and vapours.

Environmental hazards: Hazard to aquatic environment, long-term hazard to aquatic environment. Toxic to aquatic life with long-term effect.. May cause long-term adverse effects in the aquatic environment. Not a persistent, bioaccumulative and toxic (PBT) or highly persistent and very persistent and very bioaccumulative (vPvB) substance or mixture.

Propane - butane - (propane, butane and butane, containing butadiene (0,1%) - liquefied gas under pressure. The physical and chemical characteristics of liquefied hydrocarbons are in accordance with BDS 5670-83.

Direct contact with the liquid can cause frostbite. Inhalation can quickly lead to asphyxiation. Due to its physical form, the product does not pose a risk of inhalation.

Health hazards: Carcinogenecity Can cause cancer. May cause heritable genetic damage. Mutagenicity in germinative cells. May cause generic defects. May harm the fetus during pregnancy.

Acute toxicity : Inhalation of high concentrations may cause dizziness, headache, nausea and loss of coordination. Prolonged inhalation may lead to loss of consciousness. Irritating effect on the skin. May cause irritation and stomach pain, vomiting, diarrhoea and nausea. Evidence for humans indicates that this product has very low acute oral, dermal or inhalation toxicity. However, it may cause serious damage if infused into the lungs, in the form of a liquid and can lead to deep central nervous system depression, in prolonged exposure to high levels of fumes

Physical hazards: Extremely flammable gas. Contains gas under pressure; May explode when heated.

Environmental hazards: Easily breaks down. Not a persistent, bioaccumulative and toxic (PBT) or highly persistent and very persistent and very bioaccumulative (vPvB) substance or mixture. It does not spread in the soil. The product is a volatile organic compound with a potential for formation of photochemical smog.

Machine oils

Light (naphtha) oil-containing petroleum distillates, acid-treated; Unrefined and semi-refined base oils; (Ingredient combination of hydrocarbons, obtained as raffinates, using sulphuric acid treatment methods. It consists of hydrocarbons, having carbon numbers predominantly in the range of C15 through C30, and produces a finished product with viscosity of less than 19cSt at 40°C). Contains relatively few normal paraffins.)

Health hazards: Skin irritation. Harmful in contact with skin and inhalation. Allergens. They damage the nervous system, the liver. Mutagenic and carcinogenic. Contain polycyclic aromatic hydrocarbons.

Acute toxicity: Serious eye damage. Serious eye irritation. It is unlikely to cause skin damage in short contact, prolonged contact or repeated exposure can cause dermatitis. It is unlikely to be dangerous if swallowed in small doses, but if swallowed in larger amounts can cause nausea and vomiting. If inhaled at normal ambient temperatures, this product is unlikely to be harmful, as it has low volatility. Harmful, if inhaled, if exposure to fumes, fog or vapour is the result of decomposition of heat insulating products.

Chronic toxicity : Combustion products, resulting from the operation of internal combustion engines pollute engine oils during operation. Used motor oils contain many hazardous ingredients that can potentially cause skin cancer. Frequent or prolonged contact with all types of used machine oils should be avoided and also a high level of personal hygiene should be maintained.

Environmental hazards: Toxic to aquatic organisms with long-term effect. Spills can form an oil film on the water surface, which can cause physical damage to organisms. Transmission of oxygen is also impeded.

No risk is possible under normal conditions.

Grease

Lubricants; Greases;

[A complex combination of hydrocarbons, having carbon numbers, predominantly in the range of C12 through C50. It may contain organic salts of alkali metals, alkaline earth metals and / or aluminum compounds].

Inhalation of the oily mist or vapours upon heating of the product irritates the respiratory system and causes cough.

Health hazards: Carcinogenecity. Skin irritation. Allrgic slic reaction. Serious eye irritation

A product that has penetrated under the skin under the influence of high pressure can cause serious cell damage or subcutaneous damage. Prolonged or frequent skin contact may cause redness, irritation, eczema, cracking. In the case of skin contact, grease is not absorbed through the skin in acute toxic amounts.

Contact with eyes may cause temporary eye irritation.

Environmental hazards: Harmful to aquatic organisms, with long lasting effects.

Method of storage

During the construction of Lot 3.2 of the Struma Motorway, the construction and assembly equipment will use ancillary materials, engine oils and greases. Maintenance of machinery and equipment will be carried out on the base site of (Contractor's) Construction organisation. Hazardous waste, generated during emergency / unexpected replacement of oils/oil filters shall be collected separately at the site of their formation (at the home base or on the site) in closed metal drums / containers and will be transported to the base site of the Contractor of construction and assembly works, and taken away for subsequent treatment to the companies, implementing the waste management hierarchy.

No machine oils and greases will be stored at the construction sites in Lot 3.2 of the Struma Motorway.

During the period of operation in Lot 3.2 of the Struma Motorway, activities with hazardous chemical substances will not be carried out.

7.8. Physical factors

- **Noise**

Currently the main noise emitting sources in the area of implementation of the IP, are the transport flows along I-1 (E79) in the section 'Krupnik - Kresna', road II-19 'Simitli - Razlog' and the railway line 'Radomir - Sandanski - Kulata'.

The EIA report specifies the noise characteristics of these sources and the main objects of noise impact from the transport flows upon them.

The implementation of the investment proposal in its two phases - construction and operation shall be related to noise emissions in the environment. The main source of environmental noise in the construction of Lot 3.2 of the Struma Motorway - the road route and facilities (tunnels, bridges, viaducts, retaining walls, etc.) shall be the used road construction equipment (excavators, bulldozers, concrete laying machinery, asphalt compactor, etc.), emitting noise at high levels (80 - 105 dBA). In the construction of the roadway under all options, a certain amount of blasting is projected. The specific activity shall be carried out under a specialized design and a blasting system, ensuring occupational safety, so as to prevent negative impacts (seismic impact, flying off and spread of rock throw-out) on people, buildings, facilities. A source of noise at this stage is also the transport service for the construction activities - transportation of materials and transportation of waste, including excavated earth and rock mass in blasting operations. For all options (Option G20 - red, Option G20 - blue, the Long Tunnel Option, the Eastern Option G10.50 and Eastern

Option G20) the noise characteristics of this transportation were determined based on the number of their courses and their speed of movement.

The EIA report also takes into consideration the noise level impacts of the construction and production sites on the nearby sites with standardized levels of noise.

Construction work is done during the daytime. The EIA report has assessed the noise impact of the construction activity for each site of impact in all options for the route of the future road in accordance with the requirements of Bulgarian legislation. The location of the facility has been specified (in kilometres), the maximum distance from the roadway, the expected noise level reaching it and the exceedance probability of the noise limits for the day-time period.

In the construction phase, the noise impact shall be negative, short-term, only during the day.

The main sources of environmental noise during the operation of the site shall be the automobile transport flows on the Struma Motorway, Lot 3.2, Road II-19 Simitli - Razlog and the railway transport on the Radomir - Kulata railway line. The projected noise characteristics (equivalent noise level in dBA) of these noise sources, determined for 2040, by calculations based on the future load data, provided by the Contracting Authority and specified in the EIA report for daytime and night-time.

The assessment of expected noise impacts from the transport flow in Lot 3.2 of the Struma Motorway on the territories with standardized noise levels, under the different options, was made for 2040. The assessment has taken as determinant the night-time period with more stringent noise requirements. At this stage for each object of impact are specified: the location, the maximum distance from the roadway, the expected exceeding of the statutory noise levels for all options.

The EIA report makes a comparison of the different options in terms of noise impact on a number of objects with exceedance probability of noise level and rate of exceedance probability. The options have also been listed by priority under the above mentioned criteria. It has been noted that the separation of the two roadways in the Eastern Option G10.50 shall increase the number of objects with exceedance probability of noise limitation (respectively the number of required noise protection devices), yet it will have lower values of exceedence.

In the Eastern Option G20, the standard values are exceeded by approximately 3 dBA, compared to the Eastern Option G10.50.

In terms of noise impact, the number of objects and expected exceedances of noise limits, the analysis of the obtained results brings forward the Long Tunnel Option. Yet the Eastern Option G10.50 has some advantages, i.e. exceedences of the limit values are lower (by approximately 3 dBA), which is more feasible, when implementing the noise protection measures for the sites of impact.

The EIA report also considers the cumulative effect of superimposing noise levels from the road transportation, the railroad and Road II-19, as well as the simultaneous construction of the final sections of Lot 3.1 and commencing Lot 3.2, finalizing Lot 3.2 and commencing Lot 3.3.

The EIA report also describes the measures projected to mitigate, reduce and terminate, where possible, the harmful environmental impacts.

According to the accepted point system for selecting the implementation option, the preferred option - the G-10 Eastern Option has received 5 points. The Long Tunnel Option and Options G20 - Red have respectively received 4 and 3 points. The fourth position is taken by the Eastern Option G20 with 2 points and the fifth position - by Option G20 - Blue with 1 point. In Section X, "Comparative Table for Selection of a Implementation Option", the report

presents the points for each of the proposed five design options for the individual components and the environmental and human health factors.

Nature of impacts under the Noise factor

The nature of impacts on sites with standardized noise levels can be classified as *direct* and *reversible impact*, with the following characteristics in the tables below:

Harmful physical factors					
During construction works					
Criterion (**Excessive noise emissions from construction equipment and service transportation)**	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	Moderate. The impact is short-term and reversible.	Moderate. The impact is short-term and reversible.	Moderate. The impact is short-term and reversible.	Moderate. The impact is short-term and reversible.	Moderate. The impact is short-term and reversible.
Territorial Scope of Impact:	Locally, near the construction site.	Locally, near the construction site	Locally, near the construction site	Locally, near the construction site	Locally, near the construction site
Duration of impact:	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)	Temporary (mid-term)	Temporary (short-term)
Frequency of impact:	Periodically (only during the day)	Periodically (only during the day)	Periodically (only during the day)	Periodically (only during the day)	Periodically (only during the day)
Consequences:	Negative because it changes the existing acoustic environment by exceeding the limit values	Negative because it changes the existing acoustic environment by exceeding the limit values	Negative because it changes the existing acoustic environment by exceeding the limit values	Negative because it changes the existing acoustic environment by exceeding the limit values	Negative because it changes the existing acoustic environment by exceeding the limit values
Cumulative Impacts:	A cumulative effect can be expected from the superimposing of noise levels from the simultaneous construction in the finalization of Lot 3.1 and the commencement of Lot 3.2 of the Struma Motorway, as well as the simultaneous execution of construction works in the finalization of Lot 3.2 and the commencement of Lot 3.3 of the 'Struma' Motorway	A cumulative effect can be expected from the superimposing of noise levels from the simultaneous construction in the finalization of Lot 3.1 and the commencement of Lot 3.2 of the Struma Motorway, as well as the simultaneous execution of construction works in the finalization of Lot 3.2 and the commencement of Lot 3.3 of the 'Struma' Motorway	A cumulative effect can be expected from the superimposing of noise levels from the simultaneous construction in the finalization of Lot 3.1 and the commencement of Lot 3.2 of the Struma Motorway, as well as the simultaneous execution of construction works in the finalization of Lot 3.2 and the commencement of Lot 3.3 of the 'Struma' Motorway	A cumulative effect can be expected from the superimposing of noise levels from the simultaneous construction in the finalization of Lot 3.1 and the commencement of Lot 3.2 of the Struma Motorway, as well as the simultaneous execution of construction works in the finalization of Lot 3.2 and the commencement of Lot 3.3 of the 'Struma' Motorway	A cumulative effect can be expected from the superimposing of noise levels from the simultaneous construction in the finalization of Lot 3.1 and the commencement of Lot 3.2 of the Struma Motorway, as well as the simultaneous execution of construction works in the finalization of Lot 3.2 and the commencement of Lot 3.3 of the 'Struma' Motorway
Significance of impacts	Moderate / Average	Moderate / Average	Moderate / Average	Moderate / Average	Moderate / Average

Harmful physical factors					
During operation					
Criterion **(Number of sites with exceedance probability of the noise level and exceedence rate)**	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	Moderate to high The project route affects the two large populated areas in the region (the town of Simitli and the town of Kresna). Exceeding the regulated noise level limits requires the construction of noise protection devices.	Moderate. The transportation traffic on the two traffic lanes is in one roadway, which passes through the regulation of the town of Simitli Exceeding the regulated noise level limits requires the construction of noise protection devices.	Low The traffic of transportation vehicles has been divided in two roadways, along separate routes (remote from each other) and passing through the regulation of the town of Simitli Exceeding the regulated noise level limits requires the construction of noise protection devices.	Moderate. The transportation traffic on the two traffic lanes is in one roadway, which passes through the regulation of the town of Simitli Exceeding the regulated noise level limits requires the construction of noise protection devices.	Moderate. The transportation traffic on the two traffic lanes is in one roadway, which passes through the regulation of the town of Simitli Exceeding the regulated noise level limits requires the construction of noise protection devices.
Territorial Scope of Impact:	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;
Duration of impact:	Long-term (permanent)	Long-term (permanent)	Long-term (permanent)	Long-term (permanent)	Long-term (permanent)
Frequency of impact:	Continuous	Continuous	Continuous	Continuous	Continuous
Consequences:	Negative (modifies the existing acoustic environment around the road track, but does not exceed the noise limits at the locations of impact	Negative (modifies the existing acoustic environment around the road track, but does not exceed the noise limits at the locations of impact	Negative (modifies the existing acoustic environment around the road track, but does not exceed the noise limits at the locations of impact	Negative (modifies the existing acoustic environment around the road track, but does not exceed the noise limits at the locations	Negative (modifies the existing acoustic environment around the road track, but does not exceed the noise limits at the locations of impact

	when performing the intended noise protection measures)	when performing the intended noise protection measures)	when performing the intended noise protection measures)	of impact when performing the intended noise protection measures)	when performing the intended noise protection measures)
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	It is expected from the noise, emitted by transport on road II-19 at km 373 + 900	No cumulative impacts are to be expected.	It is expected from the noise, emitted by transport on road II-19 at km 373 + 900
Significance of impacts	Moderate / Average	Moderate / Average	Insignificant	Moderate / Average	Moderate / Average

♦ **Vibrations**

During construction works

In the construction of the new route of Lot 3.2 of the Struma Motorway, including tunnels, bridge facilities, overpasses and underpasses, and reconstructions of facilities of other departments/authorities, the vibrations emitted during the operation of certain machines and equipment present a factor of the working environment, when carrying out certain specific activities and concern only those working with them. The impact shall be only on the construction workers on these machinery. Construction activity is not a source of environmental vibrations.

During the operation of the Struma Motorway

The transport flow along the route of Lot 3.2 of the Struma Motorway is not a source of environmental vibrations. By design, the construction of the roadway (ground bed and road pavement) ensures a rapid dampening of the ground vibrations. The road in its operation is not a source of vibrations, no vibrational effects in the environment are expected.

♦ **Seismic impacts**

When using a blasting method, the design sizing of drilling and blasting works shall be carried out according to the requirements of Appendix No. 7 of Art. 141 of the current Labour Safety Regulations for blasting works, so as to prevent any negative impact (seismic impact, flying off and spread of rock throw-out) on people, buildings, facilities, infrastructural sites and others. The legal framework requires the preparation of a separate design for drilling and blasting works, which shall be carried out by specialized companies. For areas, located in close proximity to residential territories and other protected sites, special blasting plans are developed.

♦ **Radiation**

During construction works

Illuminated building sites are a source of light radiation. Light pollution is characterized by a detrimental impact on the living environment and a change in biological rhythm. This type of impact will be local and will affect a very small part of the area, adjacent to the construction site. The impact shall be insignificant, medium and reversible.

During the operation of the Struma Motorway

During operation, traffic on the road of Lot 3.2 of the Struma Motorway shall be a source of light rays. The excessive increase in artificial lighting at night alters the natural environment of the night creatures. Many animal species are disoriented by the night lighting. The impact in constant traffic is permanent and inevitable.

During the construction and operation of Lot 3.2 of the Struma Motorway, construction activities and traffic are not a source of other radiation.

♦ **Radiation**

Radiation sources

For the section of Lot 3.2 of the Struma Motorway, an assessment of the natural radioactivity of rocks has been made. The active faults at Krupnik and the Yavorov Station have long been studied for the presence of radioactive elements and mainly for the emission of radon (Rn).

The relative contribution of radioactive elements on the natural radioactive background in population irradiation is distributed as follows - 22% gamma radiation, 19%

indoor radiation, 11% cosmic rays, and also to be noted, in particular, the serious percentage of **radon and thorium - 43%.**

Radioactivity in the air is mainly related to the presence of radon and the products of its decay.

As an element of the uranium-radon series, radon is spread all over the earth. Part of Radon diffuses into the earth's crust and rocks, reaching the surface and passing into the ground air layer.

According to the United Nations Scientific Committee for Atomic Radiation Impact, more than half of the natural background radiation of the population in the average of 2.4 mSv / year is due to atmospheric air and **radon** in particular**,** and in some cases it can reach 10mSv / year. The risk of developing lung cancer increases by 8-16% for every 100 Bq/m^3 of increase in radon activity.

Specific field and laboratory studies have been conducted to assess the content of radionuclides in the rocks and soils around the Kresna Gorge.

Measurements of the gamma radiation dose were made by the National Center of Radio-Biology and Radiation Protection with the Ministry of Health, by highly qualified specialists, guided by Ass. Prof. Badulin.

The background intensity values of gamma radiation dose are measured in the populated areas in the region and in the vicinity of arable lands. The average value of the parameter is 0.12 μSv / h.

Most of the studied rocks are granites, weathered granites, syenite (dacite). Measured values for the intensity of gamma rays in the vicinity of the rocks are 2 to 3 times above the background values for the area.

The specific activity of natural radionuclides has been determined by samples, taken from the territory of the Struma Motorway and partially from the drilling, made in the region of the village of Gorna Breznitsa. The results of analyses were evaluated according to the standards in Ordinance 1 of 15 November 1999 for the presence of radioactivity in different zones of the Republic of Bulgaria.

The Kresna Gorge is surrounded from the north, east and south with Uranium granites of high radioactive background, 6.5 times the normal levels. Uranium deposits have been found in the region of the proposed long tunnel variant of the Struma Motorway, Lot 3.2.

Health hazards and criteria for health hazards of the population in the area are correlated to the opinions of other experts, who have prepared this EIA report.

The results from the studies of radioactivity dose intensity and the analysis of the specific activity of natural radionuclides show values 2 to 3 times higher than the background ones. The increased content of natural radionuclides will pose serious risks for long tunnel constructions and will require the construction of special landfills for the disposal of rock masses, which will be 4,580,000 m^3 of excavation masses in the long tunnel option.

With respect to health and sanitation, the construction of a tunnel in the Kresna Gorge region is related to the existence of possible sites with varying degrees of radiological air pollution. This would require, to a lesser or greater extent, the possibility of limiting such pollution by identifying the Long Tunnel Option as particularly dangerous from a health care perspective.

7.9. Landscape

Description of the main features of landscape in the area of the investment proposal

- ***Option G20-Blue and G20-Red***

The existing Road I-1 (E-79), as well as the two options of the route - G20-blue and G20-red - are located in the riverside of the Struma river - the Kresna Gorge. The considered Options of Lot 3.2 start from the Krupnik junction, then enter the Kresna Gorge and end at the Kresna road junction.

The nature of the landscape characteristic of the area of the investment site is mixed - natural and anthropogenic. The anthropogenic components of the landscape are expressed in the existing road E79, passing through the Kresna gorge, other infrastructure sites, constructions with roadside facilities, forestry activity, the immediate vicinity of the town of Kresna at the end of the section. The landscape has undergone alterations both in terms of vegetation cover and in terms of its surface displacement.

- ***Option G10.50 - Eastern***

Right roadway - in the direction of the Hellenic Republic

From the end of Lot 3.1 the road follows Road E79, passes through the town of Simitli and then develops along the existing road through the Kresna Gorge.

It starts at km 373 + 300 and runs along the existing Route E79 until the town of Kresna, from where on a new terrain from km 393 + 600 to km 400 + 371.81.

The roadway shall be constructed by rehabilitation of the existing road.

Left roadway - direction Sofia

It starts at km 373 + 300 (100 meters after crossing the railway line to Oranovo mine). The route of the road passes through a mountainous terrain on the lower western slopes of the Pirin mountains and proceeds entirely on a new terrain, east of the Kresna Gorge. The altitude is in the range of 315 m in the neighbourhood of Oranovo, 400 m near the village of Poleto, 680-700 m at St. Kresna and 400 m near the town of Kresna. Kresna. At km 399 + 880, turn to the right roadway (bypass of the town of Kresna). The option is finished at km 400 + 371.81.

- ***Option G20-East***

It starts at km 373 + 300 (100 meters after crossing the railway line to Oranovo mine). The route of the road passes through a mountainous terrain on the lower western slopes of the Pirin mountains and proceeds entirely on a new terrain, east of the Kresna Gorge. The altitude is in the range of 315 m in the neighbourhood of Oranovo, 400 m near the village of Poleto, 680-700 m at St. Kresna and 400 m near the town of Kresna. Kresna. At km 399 + 300, it converges with the right roadway (bypass of the town of Kresna). The option is finished at km 400 + 371.81.

- ***Long Tunnelling Option***

The beginning of the section (km 376 + 000) is immediately after the Struma river bridge, whereas the highway uses the existing road, and the route of the existing road is taken out to the east in parallel to the existing road. The passage through the Kresna Tunnel (under the Malashevska Mountains) is from km 379 + 267,015 to km 394 + 605,00 / left pipe and from km 379 + 255 to km 394 + 600 - right tube. After the exit of the Kresna tunnel (South portal), the highway crosses the existing third-class road and the Struma River, passing east of it. Near the end of the town of Kresna, west of the existing road, ends the section with road junction 'Kresna' (km 397 + 000).

According to the Landscape Division of the country, Lot 3.2 of the Struma Motorway, the evaluated options fall within the South-Bulgarian mountain-valley zone, Osogovo-Mid-

Struma sub-district with Pogledsko-Vlachinski and Maleshevski regions, and the Pirin subdistrict, West Pirin region.

According to the classification system of the landscapes in Bulgaria, the regions in which the design options of the investment proposal will be implemented are related to:

Class - Valley landscapes

Type - Landscapes of sub-Mediterranean meadow-steppe and forest-meadow steppe valley bottoms;

Subtype - Landscape of the meadow-steppe type, mainly hilly bottoms of the inner-mountain valleys;

Group - Landscapes of the meadow-steppe bottoms of the inner-mountain valleys with unspoiled Quaternary deposits and a high degree of agricultural utilization;

Group - Landscapes of the meadow-steppe bottoms of the inner-mountain valleys with Pliocene sandy-clayey deposits and a high degree of agricultural utilization.

Class - Mountain Landscapes

Type - landscapes of sub-Mediterranean low-mountain forests;

Subtype - landscapes of low mountainous xerophyte shrub forests;

Group - landscapes of the low mountainous xerophyte shrub forests on metamorphic rocks with a relatively low degree of agricultural utilization.

Assessment of expected landscape changes

Landscape is a natural system with generally sustainable structures that does not change rapidly. Roads form linear, specific landscapes. They are industrial structures, impressive with their constantly changing nature of appearance of the surrounding environment. The interaction of technogenic structures, as a functional system and the landscape, as a territorial system bring about not only economical, but also technical problems, as well as environmental and aesthetic. The implementation of these modern communication systems leads to significant environmental changes in the landscape, due to changes in relief, loss of land and soil, disturbances of natural habitats of plants and animals, increased pollution of the environment.

Depending on the degree of impact, the receptors in the area of the design options for the road can generally be classified in two groups:

Non-artificial natural landscapes, including:

•Forest landscapes (landscape of residual deciduous and coniferous forests, artificially created crops, etc.);

•Landscapes of meadow landscapes;

•Aqua Landscape;

•Natura 2000 protected areas.

Anthropogenous and anthropogenic, including the following types of landscapes:

•Agrarian (agricultural) landscape;

•Residential landscape;

•Transport Communication Landscape.

Agrarian landscapes (arable farmland) have a low sensitivity. In these landscapes, there are mainly crop plants or weed and ruderal species that are widely distributed and highly adaptable to the environment.

The areas of the meadow landscape have low sensitivity (common pasture) to medium (natural meadows) sensitivity. Affected areas of highly ruderalized pastures and meadows, located near the residential territories and the roads.

Forest landscapes (landscapes of residual deciduous and coniferous forests) on the territory of route options can be classified as middle-sensitivity landscapes as they are habitats of plant communities and habitats of animal species.

The aquatic landscapes, affected by the road shall be the surface water bodies. They have moderate sensitivity as landscape characteristics, as they have recreational significance, and water resources support the diversity of flora and fauna populations.

Landscapes in Natura 2000 Protected Areas can be classified as highly sensitive landscapes because they are designated to protect valuable habitats and species. The rate of impact on these landscapes can be determined as medium to significant.

The activities, related to the realization of the highway and its sites will be related to two phases of landscape changes:

- In the process of construction - carrying out significant excavation and bulk activities (negative and positive forms) in the construction of new routes in places with local relief changes; with the employed building mechanization and transportation for construction works, which will have a temporary effect on the overall landscape condition.

- The second phase will be related to the operation of the road with the introduction of new technogenic elements of the landscape - road junctions, bridges, overpasses, underpasses, overhead roads, tunnels. This stage of works shall be associated with a constant change in the state of the environment and visual changes in the state of the landscape as a result of the constructed road. Technogenic structures will stand out against the background of the surrounding landscape, reproducing and enhancing the urban environment.

Impacts on landscape features

During construction works

The realization of the site will involve the disturbance of significant areas of land, alterations to the lithogenic basis in the road construction, destruction of the existing vegetation, which is preserved on non-arable lands. By removing the humus layer, the existing vegetation will be completely destroyed. The new routes of the road will take away agricultural lands and forest areas.

Construction will bring about irreversible mechanical disruption of the surface geological environment and penetration into the geological structures in the excavation of tunnels. The construction of the new roadways will be related to the excavation and bulk-works, related to the maintenance of a certain construction strip for the transportation of heavy machinery and mechanization. The whole process will be associated with local and temporary changes in the overall state of the environment as well as in places with relief changes. Impacts on landscape features during construction will essentially be the same, but to varying degrees in the different road design options.

The activities that will impact the physical characteristics of the landscapes in the area of the road will be:

- Preparation for the construction, which will remove the vegetation and the humus layer - the surface soil layer;
- The construction of the road route and the adjacent facilities - excavations and embankments;
- Blasting activities in the construction of tunnels and entry of the route into adjacent slopes;

- Construction traffic;
- Formation of transport communication landscape type in the process of construction;
- Reclamation activities.

The construction of new roadways on the road will lead to changes in the existing landscape as a result of the construction of the new sites. These changes will be expresses in the disturbance of the organization of territories, related to the deprivation of agricultural lands and forest areas. In the same scope, the construction will be related to taking away the humus layer, through which the soil function as a unique earth battery and energy distributor, associated with humus and necessary for the normal exchange and circulation of substances in nature.

In the areas, where blasting will be carried out, the construction of tunnels through mountainous terrain will be related to changes in relief. The impacts of blasting on landscape features will also be the result of dust emissions in blasting works, the noise, the vibrations that will be felt by the people, living in nearby areas and by the animals, inhabiting the area. The impact will be direct, negative, temporary, short-term (only during construction works), local (only in some locations along the route).

When constructing new stretches of the road track and especially when building bridges, overpasses and other overground facilities, the typology of the landscape will be permanently changed. The landscapes will be transformed into the transport communication type - formed in the process of construction works and in the operation of transport sites. The impact will be direct, due to the specificity of the construction works - the deprivation of new terrains, which changes the structure and functioning of the landscapes. This impact will be temporary and short-term, whereas the damaged areas resulting from the construction works will be reclamated.

Design projections provide for insignificant contamination of the landscape components with dust in the course of construction activities (in the excavation and bulk operations, removal of the humus layer and removal of the planned vegetation), soot from the construction and maintenance equipment. The expected impact of pollutants on the landscape will result from the use of heavy machinery and equipment to perform construction activities (noise, dust, aerosols).

The process of construction of the sites of the investment proposal will also be related to a temporary change in the overall state of the environment without changing the horizontal and vertical structures of the landscape. Changes in landscape dominance are not expected. The impacts during the construction will be direct, short-time and negative. Expected disturbances will be of local nature, will only be within the scope of the investment proposal's route and will not cause general landscape degradation.

The impact in the construction stage will be negative, both direct and indirect, temporary (in the construction period) and short-term. The impact rate varies from insignificant to moderate, and for most of the receptors it is low.

After the completion of the construction phase, the sites will be subjected to recovery and reclamation of territories. This will be a positive impact, which will also be permanent, long-term, local, direct and moderate.

During operation

Upon the completion of construction works, the landscape features will be significantly changed in *Options G20-Blue and Red*, due to the construction of a large number of new technogeneous objects, yet the type of the existing landscape will not change. As a whole, the landscape will not be genuinely new and will remain an anthropogenic type.

Eastern Option G10.50 and *Eastern Option G20* will be fully implemented on a new terrain in the western lower slopes of Pirin, where it will appear as a new anthropogenic structure and will lead to significant changes in the type of the existing natural landscape.

The implementation of the *long tunnel option* will be the most gentle in terms of expected changes in the landscape, rather in the relief, where the tunnel portals will be located. The ground parts of the track before and after the tunnel develop in an environment, anthropogenically influenced by the residential agglomerations of Simitli and Kresna.

The operation of the road will be related to two main points: visual perception of the road by traffic participants, of the associated large facilities, of traffic organization facilities and migration of pollutants into the landscape.

This stage of works shall be associated with a constant change in the state of the environment and visual changes in the state of the landscape as a result of the constructed road. Technogenic structures will stand out against the background of the surrounding landscape, reproducing and enhancing the urban environment. Opportunities are created for constant changing of views with different visual range. The proximity and moderate visual range include the forested areas, the river, the rock formations, agricultural areas and residential territories. The distanced visual range (albeit poorly expressed) across the stretches of the track will include panoramic views of the surrounding heights, river meanders and other landscape features.

Shaping the landscape in the close vicinity of the roadway shall be necessary to improve visual tracing, screen unpleasant views, direct the view to certain accents and create driver support points.

According to the accepted point system* for selecting the implementation option, the preferred option - the 'Kresna' Long Tunnel Option has received 5 points. In the second place are Options G20-blue and G20-red with 3 points. In the third place is the Eastern Option G10.50 with 2 points and in the fourth place - the Eastern Option G20 with 1 point.

*In Section X, "Comparative Table for Selection of a Implementation Option", the report presents the points for each of the proposed five design options by individual components, factors of environmental and human health factors.

Nature of impacts during construction works and during operation:

Nature of impacts during construction works and during operation:

Landscape					
During construction works					
Criterion *(Anthropogenic Landscape Changes) - relief and visual impacts)*	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact	**Moderate** Excavation activities for the construction of 13 new road facilities and 8,140 m of new retaining walls	**High** Excavation activities for the construction of 40 new road facilities and 3,710 m of new retaining walls	**High** Excavation activities for the construction of 35 new road facilities and 893 m of new retaining walls	**Low rate** Excavation activities for the construction of 1 tunnel and three intermediate accesses.	**High** Excavation activities for the construction of 32 new road facilities and 1,140 m of new retaining walls
Territorial Scope of Impact:	Local	Local	Local	Local	Local
Duration of impact:	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)	Temporary (short-term)
Frequency of impact:	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)	Temporary (only at the time of construction works)
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative Impacts:	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact
Significance of impacts	Moderate / Average	Significant	Significant	Insignificant	Significant

Landscape					
During operation					
Criterion *(Anthropogenic Landscape Changes)*	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact	**Moderate** 13 new anthropogenic structures and 8,140 m of new retaining walls	**Moderate** 40 new anthropogenic structures and 3,710 m of new retaining walls	**High** 35 new anthropogenic structures and 893 m of new retaining walls	**Low rate** 1 tunnel and 3 intermediate access units	**High** 32 new anthropogenic structures and 1,140 m of new retaining walls
Territorial Scope of Impact:	Locally	Locally	Regional impact	Locally	Regional impact
Duration of impact:	Long-term	Long-term	Long-term	Long-term	Long-term
Frequency of impact:	always	always	always	always	always
Consequences:	Negative	Negative	Negative	Negative	Negative
Cumulative Impacts:	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact	there is no cumulative impact
Significance of impacts	Moderate / Average	Moderate / Average	Significant	Insignificant	Significant

Conclusions:

The construction of Lot 3.2 of the Struma Motorway will have a negative impact on the landscape, yet with acceptable changes in its typology and permissible changes in its spatial structures, the view and the scenery.

The impacts on the landscape under design options **G20-Red and G20-Blue** are identical. The differences in landscape changes under both scenarios will come as a result of the different anthropogenic elements of the road - road junctions, overpasses and underpasses, bridges, viaducts, tunnel portals, etc. The main landscape type will not be altered, there will be no significant changes in the landscape structure and functioning of the landscapes that will cause further disturbances in the environmental balance. The local landscapes will be affected in part - the agricultural, forestry, aquatic areas, which will undergo changes in the direction of anthropogenic landscapes with a transport subsystem.

In the Eastern Option G10.50 and Eastern Option **G20** the road track will be fully implemented on a new terrain in the western lower slopes of Pirin, where it will appear as a new anthropogenic structure and will lead to significant changes in the type of the existing natural landscape.

The **Long tunnelling option is the most sparing in terms of expected landscape changes.** Changes in the relief will only exist in the places, where the North and South Portals of the Kresna Tunnel will be located.

7.10. Cultural heritage - the presence of cultural monuments and architecture within the scope of the investment proposal

The analysis of the status of cultural heritage sites on the investment proposal to improve the route of Lot 3.2 of the Struma Motorway shows that there is a high concentration of archaeological sites in the region. This suggests that in the construction works could also be affected unknown ones.

The implementation of each of the **Options G20 - blue** and **G20 - red** of the road route will create a danger for affecting the territory of two of the famous archaeological sites. While the implementation of Eastern Option **G10.50, right roadway** and **Option G 10.50 - left roadway** , as well as Eastern Option **G20** may each threaten a cultural heritage site. In case a decision is taken to construct a **tunnel through the Kresna Gorge,** it is not expected that certain archaeological sites and their environment will be disturbed. However, there is a real danger of affecting previously unknown cultural heritage sites.

Construction work will create significant danger of disturbing the integrity of cultural assets. The most serious threat to archaeological sites is the so-called *Earthworks.* All the types of excavation works can affect the cultural heritage layers, can destroy archaeological structures, or destroy artefacts. The hazard will be greatest for the sites in the closest vicinity of the territories, where active construction activities will be carried out - the territories to be crossed by the route of Lot 3.2 of the Struma Motorway.

Prevention measures to prevent negative impacts on cultural heritage sites must take place mainly before the commencement of construction works. Due to the established significant density of archaeological sites and in compliance with the requirements of Art. 161, Para. (1) of the Cultural Heritage Act (CHA), it will be mandatory to carry out specialized archaeological studies (search for archaeological sites) along the route of the selected option for the passing of Lot 3.2 of the Struma Motorway, prior to commencing construction works. The studies will localize all archaeological sites that could be established on the site and the issue of how the route and the scope (the servitude) of Lot 3.2 of the Struma Motorway communicate with the territory of archaeological sites and to what extent

the construction will endanger their integrity, shall be clarified. Based on that, specific measures will be established to protect each of the endangered sites, including conducting **rescue excavations** prior to commencing construction works.

Under the provisions of Art. 161, Para. 2 of the Cultural Heritage Act (CHA), the course of construction activities should be **monitored by archaeologists**.

It is possible, during excavation and construction works to encounter an archaeological site, not previously registered due to its peculiarities. In such a case, the provisions of Art. 72 and 73 of the CHA shall be followed.

The analysis of available data on cultural heritage shows that, with regard to the preservation of immovable cultural heritage, the preferred option for the implementation of Lot 3.2 of the road track of the Struma Motorway is the **Eastern Option G 10.50**. The reason is that only one of the famous sites of cultural heritage can be threatened in its execution, and only if the tunnel in this area will be executed by the open-cut method. It is preferred to the Eastern Option of G20, because it will cover significantly less area and the possibility of a threatened archaeological site is much smaller. Although the implementation of the long tunnel option will not threaten significant cultural values, it is not recommended due to the fact that its implementation will require significant areas for depositing in landfills huge amounts of earth and rock masses. Taking into account the established high density of archaeological sites in the region of Sredna Struma, it is likely that these landfills will cover the territory of unknown archaeological cultural values. The implementation of any other option shall be acceptable subject to strict compliance with the above-mentioned measures for the conservation of cultural heritage sites.

The operation of the Struma motorway will not pose a direct threat to cultural heritage values. As an 'indirect' impact upon cultural heritage sites, environmental pollution must be considered first. As indirect impact, we should note the changes in the cultural and traditional landscapes in the vicinity of important monuments, as a result of the construction of Lot 3.2 of the Struma Motorway. On the other hand, the construction of the entire highway and the commissioning of Lot 3.2 of the Struma Motorway will facilitate and make easier the access to representative cultural assets, located nearby.

Preferred option

The analysis of available data on cultural heritage shows that, with regard to the preservation of immovable cultural heritage, the preferred options for Lot 3.2 of the road track of the Struma Motorway is Eastern Option G 10.50. The reason is that only one of the famous sites of cultural heritage can be threatened in its execution, and only if the tunnel in this area will be executed by the open-cut method. It is preferred to the Eastern Option of G20 because it will cover significantly less area and the possibility of a threatened archaeological site is much smaller. Although the implementation of the long tunnel option will not threaten significant cultural values, it is not recommended due to the fact that its implementation will require significant areas for depositing in landfills huge amounts of earth and rock masses. Taking into account the established high density of archaeological sites in the region of Sredna Struma, it is likely that these landfills will cover the territory of unknown archaeological cultural values.

When comparing all options with respect to the requirements for the conservation of cultural heritage sites and according to the accepted point system for choosing an implementation options, **Eastern Option G 10.50** , which receives 5 points, is most acceptable. In the second position is the **Eastern Option G20** with 4 points. In the third place is the **Long tunnel option** with 3 points. In the fourth position is **Option G20 - red** with 2 points. In the fifth position, the most inappropriate from the point of view of cultural heritage

protection is **Option G20 - blue** with 1 point. In Section X, "Comparative Table for Selection of a Implementation Option", the report presents the points for each of the proposed five design options for the individual components and the environmental and human health factors.

Conclusions

The analysis of available data on cultural heritage shows that, with regard to the preservation of immovable cultural heritage, the preferred options for Lot 3.2 of the road track of the Struma Motorway is Eastern Option G 10.50. The reason is that only one of the famous sites of cultural heritage can be threatened in its execution, and only if the tunnel in this area will be executed by the open-cut method. It is preferred to the Eastern Option of G20 because it will cover significantly less area and the possibility of a threatened archaeological site is much smaller. Although the implementation of the long tunnel option will not threaten significant cultural values, it is not recommended due to the fact that its implementation will require significant areas for depositing in landfills huge amounts of earth and rock masses. Taking into account the established high density of archaeological sites in the region of Sredna Struma, it is likely that these landfills will cover the territory of unknown archaeological cultural values.

It is also clear that future construction, depending on the choice of the route option, could endanger two or one of the famous archaeological sites. For this reason and under the provisions of Art. 161, Para. of the CHA it shall be mandatory to carry out a specialized archaeological survey (search for archaeological sites) along the route of the selected option for the implementation of Lot 3.2 of the Struma Motorway, prior to commencing construction works (no archeological research is carried out for the proposed project options, during the preparation of the EIA report). As a result of this study, it will be clarified to what extent the construction will threaten each of the sites within the scope of Lot 3.2 of the Struma Motorway and specific measures will be specified for their preservation.

The nature of the impacts can be classified as direct and reversible with the following characteristics:

Cultural Heritage					
During construction works					
Criterion (Affecting a security zone or a territory of archaeological sites)	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	**High** The road track of the Struma Motorway passes through the territory of two archaeological sites	**High** The road track of the Struma Motorway passes through the territory of two archaeological sites	**Low rate** The route of Struma Motorway passes 80 m from the territory of an archaeological site	**Moderate** The landfills for the excavated rock masses will occupy vast areas, which may contain unknown archaeological sites	**Moderate** The route of Struma Motorway passes 80 m from the territory of an archaeological site
Territorial Scope of Impact:	Local scale, with coverage in the areas of intersection of the territory of the sites	Local scale, with coverage in the areas of intersection of the territory of the sites	Local scale, with coverage in the areas of intersection of the territory of the sites	Local scale, with coverage in the areas of intersection of the territory of the sites	Local scale, with coverage in the areas of intersection of the territory of the sites
Duration of impact:	Short-term;	Short-term;	Short-term;	Short-term;	Short-term;
Frequency of impact:	Temporary (when building the relevant road infrastructure)	Temporary (when building the relevant road infrastructure)	Temporary (when building the relevant road infrastructure)	Temporary (when building the relevant road infrastructure)	Temporary (when building the relevant road infrastructure)
Consequences:	Negative.	Negative.	Negative.	Negative.	Negative.
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Significant	Significant	Insignificant	Moderate / Average	Moderate / Average

Cultural Heritage					
During operation					
Criterion (Affecting a security zone or a territory of archaeological sites)	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	**Low rate** The operation of the Struma Motorway will not directly threaten cultural values	**Low rate** The operation of the Struma Motorway will not directly threaten cultural values	**Low rate** The operation of the Struma Motorway will not directly threaten cultural values	**Low rate** The operation of the Struma Motorway will not directly threaten cultural values	**Low rate** The operation of the Struma Motorway will not directly threaten cultural values
Territorial Scope of Impact:	Small territorial scope. In local areas in case of maintenance and maintenance works	Small territorial scope. In local areas in case of maintenance and maintenance works	Small territorial scope. In local areas in case of maintenance and maintenance works	Small territorial scope. In local areas in case of maintenance and maintenance works	Small territorial scope. In local areas in case of maintenance and maintenance works
Duration of impact:	Short-term (incidental);	Short-term (incidental);	Short-term (incidental);	Short-term (incidental);	Short-term (incidental);
Frequency of impact:	Rarely	Rarely	Rarely	Rarely	Rarely
Consequences:	Negative.	Negative.	Negative.	Negative.	Negative.
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant

7.11. Health and hygiene aspects

In the present EIA report, a health assessment of the investment proposal for 'Improving the road track of the Struma Motorway, Lot 3.2' has been carried out, with proposed design options as follows: Option G20 - Blue, Option G20 - Red, Eastern Option G10.50, Long Tunnel Option, and Eastern G20 option.

The main objective of the health and safety consideration in the project implementation shall be to provide safety for construction workers and installers, as well as for the population, living in the residential territories in close proximity to the considered options, in the region of the town of Kresna and the town of Simitli

The overall assessment of (field) hygiene and the results of the specialized studies confirm the advantages or the shortcomings of the Options, considered in the EIA report, giving preference to the Eastern Option G10.50 and rejecting the Long tunnel option from a health-care point of view, whereas the design solutions for construction and rationalization have been analysed in detail.

The EIA report does not specify any health problems that are impossible to limit and overcome, especially in the case of recommendations for noise abatement equipment.

The main risk factor for the health of workers, employed in the implementation of the investment proposal are dust, toxic hazard/harmfulness, noise, general and local vibrations, adverse micro-climate, physical loads.

Medical health protection measures include: undergoing of preliminary medical examinations (with a chosen professional), according to the requirements and in strict adherence to the limitation of non-admission on the site of persons with contraindications for the nature of works and persons with respiratory, digestive, nervous and cardiovascular diseases, liver diseases, kidney problems and skin conditions; conducting routine (periodical) medical examinations once every 12 months with the participation of a therapist, otolaryngologist and dermatologist; the application of specific methods of high informative value, allowing early dosing of diagnosed threatened contingents; organizing a rational schedule and rhythm of work and rest; setting up an appropriate nutritional balance of food and drink; control over the use of personal protective equipment - protective headphones, protective gloves, helmets, protective face masks, protective goggles, observance of favourable micro climate, etc.

The eventual **operation of X-ray** defectoscopes in qualifying welding properties should be done by trained specialists under a developed program and safety measures. Similar approach should be applied **to blasting workers as well.**

Risk factors for the health of the population during the construction and operation of the highway are mainly the potentially polluted air environment, exceeding of noise level limitations and radiological emissions.

It has been estimated that during the operation of Lot 3.2 of the Struma Motor, the so-called 'hot spots' in construction and assembly activities will have extremely limited values and would be surmountable.

The following positive facts should be taken into account in view of public health and hygiene considerations:

- The construction of the route of Lot 3.2 of the Struma Motorway will take place in most of the cases outside of residential areas and residential territories, with planned preventive measures;

- The scientifically justified choice of the Eastern Option G10.50 for the route of Lot 3.2 of the Struma Motorway, mainly with the construction of tunnels and rejected long tunnel option;
- The construction and installation activities will make use of the most advanced technical solutions, modern equipment and safety during construction, limiting and reducing dust contamination;
- Safety measures have been developed for the population in the operation of the roadway;
- The projected significant number of road junctions, viaducts, bridges, tunnels and outflows are favourable from a health-care point of view in preventing health risks for the workers and the population;
- Use of special asphalt mixtures, limiting crashes;
- Implementation of an information and alert system for emergency situations, snow and icing on the road, as well as information on the points/sites of recreation.

According to the accepted point system for selecting the implementation option, the preferred option - the G-10 Eastern Option has received 5 points. Options G20 - Red and Eastern option G20 have received 3 points, which puts them in the second and third position. The fourth position, is taken by Option G20 - Blue, receiving 2 points. The long tunnel option is in the fifth position with 1 point. In Section X, "Comparative Table for Selection of a Implementation Option", the report presents the points for each of the proposed five design options for the individual components and the environmental and human health factors.

Nature of impacts

The nature of impacts on human health during construction can be classified as direct and reversible, with the following characteristics:

Nature of impacts

The nature of impacts on human health during construction can be classified as direct and reversible, with the following characteristics:

Human health					
During construction works					
Criterion *(Air pollution in populated areas, exceedance rate of the noise level)*	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	**MODERATE** Short-term reversible impacts on site workers and the affected population of toxic and physical pollutants.	**MODERATE** Short-term reversible impacts on site workers and the affected population of toxic and physical pollutants.	**MODERATE** Short-term reversible impacts on site workers and the affected population of toxic and physical pollutants.	**VERY HIGH.** Nervous-mental stress with elevated radionuclide content in the rock masses and residual traces in the tunnel walls, requiring long-term recovery efforts with an unacceptable risk to human health	**MODERATE** Short-term reversible impacts on site workers and the affected population of toxic and physical pollutants.
Territorial Scope of Impact:	On a local scale, with small territorial scope around the road track	On a local scale, with small territorial scope around the road track	On a local scale, with small territorial scope around the road track	On a local scale, with small territorial scope around the road track	On a local scale, with small territorial scope around the road track
Duration of impact:	Short term	Short term	Short term	Short term	Short term

Frequency of impact:	Periodical;	Periodical;	Periodical;	Periodical;	Periodical;
Consequences:	Negative;	Negative;	Negative;	Negative;	Negative;
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Moderate / Average	Moderate / Average	Moderate / Average	Significant	Moderate / Average

Human health					
During operation of the Motorway					
Criterion *(Air pollution in populated areas, exceedance rate of the noise level)*	***Option***				
	Option G20 - Blue	**Option G20 - Red**	**Eastern Option G10.50**	**Long Tunnelling Option**	**Eastern Option G20**
Rate of impact:	HIGH IMPACT RATE. Permanent and unacceptable Impact on residential territories with concentrations of Nitrogen Oxide, exceeding the limits	HIGH IMPACT RATE. Permanent and unacceptable Impact on residential territories with concentrations of Nitrogen Oxide, exceeding the limits	LOW. Permanent and permissible impact, there are no excess concentrations of nitrogen oxides and exceedence of noise levels.	VERY HIGH. Unpredictable direct and indirect incidents with risk to travellers, as well as impact from the increased radionuclide content for maintenance workers and travellers through the tunnel. Impact on the residential area in the town of Simitli with excessive concentrations of nitrogen oxides.	HIGH IMPACT RATE. Permanent and unacceptable Impact on residential territories with concentrations of Nitrogen Oxide, exceeding the limits

Territorial Scope of Impact:	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;	On a local scale, with a small territorial scope;
Duration of impact:	Long-term.	Long-term.	Long-term.	Long-term.	Long-term.
Frequency of impact:	Continuous	Continuous	Continuous	Continuous	Continuous
Consequences:	Negative;	Negative;	Positive	Negative;	Negative;
Cumulative Impacts:	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.	No cumulative impacts are to be expected.
Significance of impacts	Significant	Significant	Insignificant	Significant	Significant

7.12. Cumulative effects

The evaluation of the potential cumulative effects of existing, approved or in a process of approval and/or development projects on the components/factors of the environment, includes an analysis of the relation to the existing electricity transmission, gas transmission, communication, water-supply grids in the area, as well as the presence of a railway line. There is no information of any other facilities near the routes.

The cumulative effect on the biodiversity is reviewed in the Report on the Assessment of the Impact Degree /RAID/.

The following elements were reviewed when performing the assessment of the impact on the environment:

- Cumulative effects – the total effect of the various impacts on each individual component/factor of the environment.

There is no accumulation of the various impacts on the:

- surface waters;
- ground waters;
- geological foundation;
- soils;
- waste;
- hazardous substances;
- landscape;
- cultural heritage.

The functions of the road infrastructure – vehicle traffic and the functions of the engineering facilities have no interrelations.

The engineering (utility) facilities have been operating for years. The construction of the road and the subsequent road traffic thereon and the operation of the engineering facilities will not cause any cumulative effects of the impact on the aforesaid components of the environment.

- Superimposing effects:

There is no accumulation of similar impacts, resulting in a new and significant impact on the:

- surface waters;
- ground waters;
- geological foundation;
- soils;
- waste;
- hazardous substances;
- landscape;
- cultural heritage.

There is no joint construction of routes of utility services of other authorities and the route of the road. The road traffic does not affect in any way the electricity transmission, gas transmission, communication, water-supply grids in the area and does not affect their functioning, which results in similar impact on components of the environment

No cumulative effects are expected to arise from the construction and operation of the road and the operation of the existing utility grids near the route – gas-, electricity

transmission lines, telecommunications, water-supply and sewage etc., as well as from the presence of a railway line near the route, with respect to the components and factors of the environment, apart from insignificant effects, as detailed in item V.12.1., V.12.2. and V.12.3 of the EIA Report.

The reconstruction of the engineering infrastructures, related to the construction of the road is coordinated with the respective owners and does not involve any activities, related to the construction or operation, which may affect the aforesaid components of the environment and which may have an additional cumulative effect on either of them.

The road infrastructure does not have similar functions as the engineering facilities of other authorities and there are no reasons to expect accumulation of the effects on the environments, resulting from the operation of the facilities.

No cumulative effect is expected, as analysed by components, as detailed in the EIA Report in item *V. Description, analysis and evaluation of the possible significant impact on the population and environment, as a result of the implementation of the investment proposal*.

7.12.1. Ambient air

Upon the construction of the Lot 3.2 route which will complete the overall construction of Struma Motorway, it will take over the bulk of the transit road traffic, while the existing main road E-79 will handle only the remaining local traffic in the sections where the motorway does not follow its track. The intersecting local roads within the scope of Lot 3.2 will have insignificant impact on the pollution from the main road sections. The expected cumulative effect of the Lot 3.2 route, given the intensity of the estimated 2040 traffic, will occur mainly in relation to main road II-19 in the region of the town of Simitli and in relation to the existing main road E-79 in the region of the town of Kresna with the residual traffic on it. The expected cumulative effects will be due to the baseline traffic "with no motorway in place" and the additional traffic on main road E-79 supporting the construction.

Cumulative effects in terms of ambient air pollution in case of Option G20 – blue/red

Cumulative effects during the construction process due to the additional traffic on main road E-79 in the region of Simitli - Option G20 – blue/red (joint routes) during the construction.

The expected cumulative effect from the traffic supporting the construction in the sub-section of main road E-79 is assessed at sub-section 0 of the Simitli – Cherniche section at the end of Lot 3.1, within the scope of the settlements located close to the route of E-79 (Oranovo neighbourhood and Dalga Mahala neighbourhood, town of Simitli). The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) around the route are around the roadway in the Dalgata mahala neighbourhood, town of Simitli some 15-25 m away from its axis. In 2020 over 97% of this excess will be due to the baseline traffic load on the E-79 road (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution generated by the traffic on Lot 3.1 in the region of the town of Simitli

The expected cumulative effect at the sub-section between the route of Option G20 – blue/red (combined routes) and main road II-19 (Simitli-Razlog-Bansko) has a common zone of superposition of the near ground concentrations between 0.04 and 0.01 mg/m^3 (100-20% of the average annual limit value for the protection of human health -AALVPHH), at the places of intersection, close proximity or parallel location of main road II-19 and the roadway of Lot

3.2 of the Struma Motorway. A zone with near ground concentrations exceeding the respective limit values persists above the Dalga Mahala neighbourhood, town of Simitli.

Cumulative effects in terms of ambient air pollution generated by the traffic remaining on the existing road E-79 in the town of Kresna

Cumulative effects in terms of ambient air pollution: Option G20 - blue

The expected cumulative effect in the sub-section between the route of Option G20 - blue and the existing road I-1 (E-79) has a common zone of superposition of the near ground concentrations between 0.008 and 0.01 mg/m^3 (25-50% of AALVPHH), at the places of intersection and close proximity between main road E-79 and Lot 3.2 of Struma Motorway, which is out of the settlements near the route.

Cumulative effects in terms of ambient air pollution: Option G20 - red

The expected cumulative effect in the sub-section between the route of Option G20 - red and the existing road I-1 (E-79) has a common zone of superposition of the near ground concentrations between 0.008 and 0.01 mg/m^3 (25-50% of AALVPHH), at the places of intersection of main road E-79 and Lot 3.2 of Struma Motorway, which is out of the settlements near the route.

Cumulative effects during the construction due to the additional traffic on main road E-79 in the region of the town of Kresna, Option G20 – blue/red – during the construction.

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) are around the roadway of E-79 in the downtown area of Kresna (approximately 15-25 m away from its axis) and in the southern part of the town of Kresna (approximately 10-20 m away from its axis). In 2020 over 95% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution in the case of the Eastern Option G10.50 - left and right roadway

Cumulative effects during the construction due to the additional traffic on main road E-79 in the region of the town of Simitli, Eastern Option G10.50

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) in orange colour around the route of the two roadways are around the roadway in the town of Simitli and at the beginning of the gorge around the village of Krupnik (approximately 10-15 m away from its axis). In 2020 over 95% of this excess will be due to the baseline traffic load E-79 (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution generated by the traffic on main road II-19 in the region of the town of Simitli, Eastern Option G10.50

The expected cumulative effect in the sub-section between the route of Eastern Option G10.50 (left and right roadway and main road II-19 (Simitli-Razlog-Bansko) concerns a common zone of superposition of the near ground concentrations between 0.04 and 0.01 mg/m^3 (100-20% of AALVPHH), at the places of intersection, close proximity and parallel location of main road II-19 and the left and right roadways of Lot 3.2 of Struma Motorway. The zone with the near ground concentrations identified above, without reported exceeding of the relevant limit values, is situated in the Dalga Mahala neighbourhood and the Oranovo neighbourhood, town of Simitli.

Cumulative effects in terms of ambient air pollution generated by the traffic remaining on the existing road E-79 in the region of the town of Kresna, Eastern Option G10.50

The expected cumulative effect in the sub-section between the route of Eastern Option G10.50 (left and right roadway) and the existing road I-1 (E-79) concerns a common zone of superposition of the near ground concentrations between 0.008 and 0.01 mg/m^3 (25-50% of AALVPHH), at the places of intersection of main road E-79 and Lot 3.2 of Struma Motorway, which are out of the settlements near the route.

Cumulative effects during the construction due to the additional traffic on main road E-79 in the region of Kresna, Eastern Option G10.50

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) in orange colour are around the roadway in the gorge and in the north-western part of the town of Kresna (approximately 10-20 m away from its axis). In 2020 over 93% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution under the long tunnel option

Cumulative effects during the construction of the tunnel due to the additional traffic on main road E-79 in the region of the town of Simitli - long tunnel option, in the construction period

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) around the route are around the roadway of main road E-79 in the town of Simitli, approximately 10-20 m away from its axis. In 2020 over 97% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution due to the traffic on main road II-19 in the region of the town of Simitli

The expected cumulative effect in the sub-section between the route of the long tunnel option and main road II-19 (Simitli-Razlog-Bansko) concerns a common zone of superposition of the near ground concentrations between 0.04 and 0.01 mg/m^3 (100-20% of AALVPHH), at the places of intersection and close proximity between main road II-19 and the two roadways of Lot 3.2 of Struma Motorway. A zone of near ground concentrations exceeding the relevant limit values persists over the Dalga Mahala neighbourhood, town of Simitli

Cumulative effects in terms of ambient air pollution due to the traffic remaining on the existing road E-79 in the region of the town of Kresna, long tunnel option

The expected cumulative effect in the sub-section between the route of the long tunnel option and the existing road I-1 (E-79) concerns a common zone of superposition of the near ground concentrations between 0.01 and 0.04 mg/m^3 (25-100% of AALVPHH), at the places of close proximity between the main road E-79 and Lot 3.2 of Struma Motorway, which covers the south-eastern part of the town of Kresna.

Cumulative effects in the construction period due to the additional traffic on main road E-79 in the region of the town of Kresna, long tunnel option, during the construction.

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) are around the roadway in the gorge and in the north-western part of the town of Kresna (approximately 20-25 m away from its axis). In 2020 over 88% of this excess will be due to the baseline traffic on E-79 (with no motorway in place).

Cumulative effects in terms of ambient air pollution under the Eastern Option G20 - two roadways (four lanes)

Cumulative effects in the construction period due to the additional traffic on main road E-79 in the region of the town of Simitli, Eastern Option G20 - two roadways (four lanes)

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) around the route of the two roadways are situated around the roadway in the town of Simitli approximately 15-20 m away from its axis) and in the beginning of the gorge around the village of Krupnik (approximately 20-25 m away from its axis). In 2020 over 95% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

Cumulative effects in terms of ambient air pollution due to the traffic on main road II-19 in the region of the town of Simitli, Eastern Option G20 - two roadways (four lanes)

The expected cumulative effect in the sub-section between the route of Eastern Option G20 - two roadways (four lanes) and main road II-19 (Simitli-Razlog-Bansko), as well as main road E-79, concerns a common zone of superposition of the near ground concentrations between 0.08 and 0.04 mg/m^3 (200-100% of AALVPHH) – in orange colour, at the places of intersection, close proximity and parallel location of main road II-19 and the two roadways of Lot 3.2 of Struma Motorway. A zone with excessive near ground concentrations persists in the Dalga Mahala neighbourhood and in the Oranovo neighbourhood, town of Simitli.

Cumulative effects in terms of ambient air pollution due to the residual traffic on the existing road E-79 in the region of the town of Kresna

The expected cumulative effect in the sub-section between the route of the Eastern Option G20 - two roadways (four lanes) and the existing road I-1 (E-79) concerns a common zone of superposition of the near ground concentrations between 0.008 and 0.01 mg/m^3 (25-50% of AALVPHH) – in yellow colour, at the places of intersection of main road E-79 and Lot 3.2 of Struma Motorway, which is out of the settlements near the route.

Cumulative effects in the construction period due to the additional traffic on main road E-79 in the region of the town of Kresna

The areas with concentrations of over 100% of the limit values (Average annual limit value for the protection of human health - 0.04 mg/m^3) are located around the roadway in the gorge and in the north-western part of the town of Kresna (approximately 20-25 m away from its axis). In 2020 over 88% of this excess will be due to the baseline traffic on E-79 (with no motorway in place).

Comparison among the options of the improved route of Lot 3.2 with reported cumulative effects in terms of ambient air pollution

Conclusion on a reported cumulative effect related to the extension of the route with the rest of the motorway sections. The reported near ground concentrations in general receptors with and without extension (end of Lot 3.1 and beginning of Lot 3.3) create the same zones with exceeded average annual limit value for the protection of human health regarding nitrogen oxides.

Conclusion on a reported cumulative effect regarding ambient air pollution, **Option G20 – blue/red**. The forecast results in terms of ambient air pollution in the period of operation show no cumulative effect generated by the streamlined route of Lot 3.2 and the

residual traffic on main road E-79 (with motorway in place), related to a significant change in the zones with concentrations over 100% of AALVPHH in settlements. A zone with near ground concentrations exceeding the relevant limit values persists over the Dalga Mahala neighbourhood, town of Simitli.

The expected cumulative effect is generated by the additional traffic on main road E-79 during the construction of the motorway. The zones with excessive concentrations (higher than ALMPHH) in the period of construction around the roadway of E-79 are: approximately 15-25 m away from its axis in the Dalga Mahala neighbourhood, town of Simitli; approximately 15-25 m away from its axis in the downtown of Kresna; approximately 10-20 m away from its axis in the southern part of the town of Kresna. In 2020 over 95-97% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place)

Conclusion on a reported cumulative effect regarding ambient air pollution – **Eastern Option G10.50 (left and right roadway) –** The forecast results in terms of ambient air pollution in the operation period show no cumulative effect generated by the two roadways of Lot 3.2 and the residual traffic on main road E-79 (with motorway in place), related to a significant change in the zones with concentrations of over 100% of AALVPHH in settlements.

The expected cumulative effect is generated by the additional traffic on main road E-79 during the construction of the motorway. The zones with excessive concentrations (higher than AALVPHH) in the construction period around the roadway of E-79 are: approximately 10-15 m away from its axis in the Dalga Mahala neighbourhood, town of Simitli; approximately 10-20 m away from its axis in the south-western part of the town of Kresna. In 2020 over 93-95% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

Conclusion on a reported cumulative effect regarding ambient air pollution – **long tunnel option**. The forecast results in terms of ambient air pollution in the operation period show no cumulative effect generated by the roadway of Lot 3.2 (out of the tunnel exits) and the residual traffic on main road E-79 (with motorway in place), related to a significant change in the zones with concentrations of over 100% of AALVPHH in settlements. A zone with near ground concentrations exceeding the relevant limit values persists over the Dalga Mahala neighbourhood, town of Simitli.

The expected cumulative effect is generated by the additional traffic on main road E-79 during the construction of the motorway. The zones with excessive concentrations (higher than AALVPHH) in the construction period around the roadway of E-79 are: approximately 10-20 m away from its axis in the Dalga Mahala neighbourhood, town of Simitli; approximately 20-25 m away from its axis in the north-western part of the town of Kresna. In 2020 over 88-97% of this excess will be due to the baseline traffic on E-79 (with no motorway in place).

Conclusion on a reported cumulative effect regarding ambient air pollution – **Eastern Option G20, two roadways (four lanes) –** The forecast results in terms of ambient air pollution in the period of operation show no cumulative effect generated by the two roadways of Lot 3.2 and the residual traffic on main road E-79 (with motorway in place), related to a significant change in the zones with concentrations of over 100% of AALVPHH in settlements. A zone with excessive near ground concentrations persists in the Dalga Mahala neighbourhood and in the Oranovo neighbourhood, town of Simitli.

The expected cumulative effect is generated by the additional traffic on main road E-79 during the construction of the motorway. The zones with excessive concentrations (higher than AALVPHH) in the period of construction around the roadway of E-79 are: approximately 20-25 m away from its axis in the Dalga Mahala neighbourhood, town of Simitli; - approximately 20-25 m away from its axis in the north-western part of the town of Kresna. In 2020 over 88-95% of this excess will be due to the baseline traffic load on E-79 (with no Lot 3.2 of Struma Motorway in place).

7.12.2. Noise

There are conditions for a cumulative effect in terms of noise due to the superposition of the noise from the motor transport along the new roadway of Lot 3.2 of Struma Motorway and the railroad at the village of Cherniche and the Stara Kresna stop. No cumulative effect is expected in relation to either object of impact, since the comparison of the expected levels reaching their residential areas from both sources of noise shows that the noise from the railway traffic is the determining type.

One can expect a cumulative effect from the superposition the noise from the traffic flows on the new roadway of Struma Motorway and Road II-19 Simitli – Razlog, in relation to several residential areas in the town of Simitli, at km 373+900, with input from Road II-19:

- Under the Eastern Option G10.50 – left roadway: about 2 dBA.
- Under the Eastern Option G20: about 1 dBA.

A cumulative effect may be expected from the superposition of the noise during the simultaneous construction of the end of Lot 3.1 and the beginning of Lot 3.2 of Struma Motorway, as well as during the simultaneous execution of the construction works at the end of Lot 3.2 and the beginning of Lot 3.3 of Struma Motorway.

7.12.3. Population and human health

The cumulative effect on the ambient air and noise directly affects the population of the Dalgata Mahala District of Simitli and the north-western part of Kresna. The impact will continue during the period of construction and is mainly related to the quality of ambient air, as the estimations show that after the finalization of this stage and the commencement of the operation stage, no cumulative effects can be expected.

8. Plan for the implementation of the measures intended to prevent, reduce or, where possible, eliminate significant adverse effects on the environment

Plan for the implementation of the measures under Art. 96(1)(6) of the Environmental Protection Act

No	Measures	Implementation period/phase	Result
1.	The construction machinery to be used should meet the requirements of Ordinance No10/2004 as aligned with Directive 2002/88/EC, supplementing Directive 97/68	Construction	Reduction of gaseous and particulate pollutants, including greenhouse gases from internal combustion engines
2.	Execution of blasting operations after preliminary calculation of the amount	Construction	Reduction of the extra dust and nitrogen oxides load on

	of explosive depending on the distance to residential areas		residential areas
3.	Loads of oversized bulk materials should not be allowed	Construction	Limiting of dust emissions
4.	In dry and windy weather, bulk materials and construction waste should be wetted at the places designated for temporary storage	Construction	Limiting of dust emissions in ambient air
5.	In dry and windy weather land should be besprinkled during excavation and transportation operations	Construction	Limiting of dust emissions in ambient air
6.	Upon completion of the construction works on certain construction sites, the temporary storage sites for aggregates and construction waste should be cleaned in a timely manner and the waste should be transported to the sites designated for treatment of construction waste in accordance with the Waste Management Act.	Construction	Soil and air protection
7.	Suitable asphalt mixtures resistant to high temperatures and pressure are to be used in the plain areas outside the Kresna Gorge.	Construction	Reduction of the additional hydrocarbon load and of the risk of softening and deformation of the roadway during climatic anomalies.
8.	Control on the heating, preparation and application of the asphalt coating	Construction	Reduction of the additional hydrocarbon load of ambient air.
9.	Preparation of an Environmental Management Plan and Self-monitoring Plan	Before construction starts	Monitoring and control of impacts on the environment and human health
10.	Controls (according to the Environmental Management Plan and Self-monitoring Plan) of the ambient air quality in populated areas of the residential districts of Simitli and Kresna that are in direct proximity to the roadway	Before construction starts and after putting the motorway into operation	Health risk assessment for population by the factor of atmospheric pollution caused by heavy traffic
11.	Compliance with the conditions laid down in Water Body Use Permits and Water Abstraction Permits	Construction	Conservation of water bodies
12.	The quality of industrial water used for the construction in sanitary protection zones (SPZs) should be coordinated with the Basin Direcorate when using water on the basis of a permit	Construction	Soil and water protection
13.	No construction materials containing priority and harmful substances should	Construction	Soil and water protection

	be used and compliance with the prohibitions of Art. 118a of the Water Act concerning the pollution with priority substances should be ensured. The requirements of Art.134 and Art.143 of the Water Act should be complied with		
14.	Observation of working designs	Construction	Conservation of water bodies
15.	Conduction of surveys of the content of radioactive substances in drainage water	Periodically, during tunnel work	Conservation of water bodies
16.	During the design phase an additional hydrogeological study will be carried out in order to assess the impact of the investment proposal during the construction and subsequent operation on the quality and flow-rate of the mineral waters in the “Oshtava (Cool Water)“ and “Oshtava (Hot Spring)“ Deposits – Blagoevgrad Region, Simitli Municipality, and if necesaryh of the “Gradeshka Banya“ Deposit – Blagoevgrad Region, Kresna Municipality, Village of Gorna Gradeshnitsa and the “Breznitsa“ Deposit – Blagoevgrad Region, Kresna Municipality, Village of Gorna Breznitsa. The results of the hydrogeological studies and the proposed measures should be coordinated with the WERBD and together with the statement of the basin directorate, these shall be submitted to the Minister of Health for reference	Design	Conservation of mineral waters
17.	During the construction and operation, all applicable prohibitions, constraints and the limitaitons, if proved necessary, according to the requirements of annex No. 2 to art. 10, para. 1 of Ordinance No. 3 on the terms and conditions and the applicable rules for the study, design, approval and operation of the sanitary protection areas near water sources and facilities for potable water supply and water spurces of mineral waters, used for therapeutic, prophylactic, drinking and hygiene needs (SG, issue	Construction and operation	Conservation of the Oshtava Hladka Banya Resort

	No. 88 of 2000), as well as the prohibitions and limiations, according to the requirements of art. 25, para. 1 and art. 26, para. 1 and para. 2 of Ordinance No. 14 on the resort resources, resourt areas and resorts (SG, issue No. of 1987, as amended and supplemented SG, issue No. 70 of 2004).		

18.	Building of waterproof layers as part of the road surface when crossing SPZs	Design and construction	Conservation of water protection zones
19.	Design of a lined waterproof drainage system of the road surface and road facilities in the scope of the investment proposal in the zones when crossing the 2nd and 3rd belt of SPZ, subject to the provision of oil and sediment separators before discharging that water into the hydrographic network	Design and construction	Compliance with regulatory requirements and conservation of water protection zones
20.	Maintenance of the water treatment facilities in optimal process conditions. Oil and sediment separators should be regularly inspected and cleaned if necessary	Operation	Conservation of water bodies
21.	Preventing the disposal of waste containing priority, dangerous and harmful substances generated in the process of construction within the SPZ. If there are no specific SPZs of sources of drinking and potable water and mineral water, the recommendations of the Basin Directorate for Water Management should be observed.	Construction	Conservation of water bodies
22.	Provision of chemical toilets for the working personnel.	Construction	Conservation of water bodies
23.	Compliance with the regulatory operational requirements as regards the use of winter maintenance materials – salt and ley	Operation	Conservation of water bodies
24.	Observation of the requirements laid down in the licences to discharge waste water	Operation	Conservation of water bodies
25.	Timely informing of competent authorities in the event of accidents	Operation	Protection of surface and underground water from

	with spill of fuels and lubricants or other chemical substances		pollution
26.	Compliance with working designs in order to prevent the development of negative geodynamic processes	Construction	Conservation of earth resources
27.	Compliance with the conditions for disposal of dredging spoils and rock – in authorized landfills and subject to the provision of stability	Construction	Conservation of earth resources
28.	Use of rocks that are suitable for the construction, which is ensured by using building materials from concession fields while there is a shortage of suitable dredging spoils	Construction	Conservation of earth resources
29.	When opening rock while preparing the route and constructing tunnel works, the grading of the latter should be made in a volume and approach similar to a survey of fields for building materials	Construction	Conservation of earth resources
30.	Conduction of surveys of the content of radioactive substances or increased contents of ore mineralization in rocks before their incorporation in embankments at the site and/or landfilling	Construction	Conservation of earth resources
31.	Preparation of a regulation on the treatment of rocks with a higher content of natural radionuclides or increased content of ore mineralization	Construction	Conservation of earth resources
32.	Monitoring of the erosion control structures and bluffs of the earthwork along the road route	Operation	Conservation of earth resources
33.	Monitoring of tunnel works	Operation	Conservation of earth resources
34.	For transportation of inert and building materials, dredging spoils, rock and building waste during construction, only the route under construction and the existing roads should be used.	Construction	Prevention of disruption of habitats
35.	If the need for construction and use of new access roads should arise during construction of Lot 3.2, the competent environmental authority should be informed.	Design and construction	Enforcement of environmental legislation
36.	Roadworthy construction machinery should be used. Prevention of spill of fuels and	Construction	Decrease in harmful emissions in ambient air. Soil and water protection.

	lubricants from construction machines, as well as carrying out of repairs for transport equipment and machinery in the construction area.		Prevention of river pollution and conservation of the natural characteristics of habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
37.	Prevention of washing of transport and construction machines in river beds	Construction	Conservation of water bodies. Prevention of river pollution and conservation of the natural characteristics of habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
38.	Provision should be made for periodical cleaning of road drainage and wastewater treatment systems. Road surface cleanliness control.	Operation	Limitation of dust emissions and protection of waters. Prevention of river pollution and conservation of the natural characteristics of habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
39.	Prevention of depositing of inert minerals and disposal or landfilling of excess dredging spoils and rock, other	Construction	Prtection of water bodies. Limitation of dust emissions and protection of waters.

	construction and household waste into the river beds (river bed and flood coastlines)		Prevention of river pollution and conservation of the natural characteristics of habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
40.	In preparation of the project for rehabilitation of the existing road E79 (right roadway of Eastern variant G 10.50), design and installation during construction of the proposed defragmentation and barrier devices for unhindered crossing and preventing amphibians and reptiles from going into the roadway (Table No. VII-1). The place and design of suggested mitigating measures were determined by experts. Graphical appendix No. 8 in the Report for assessment of the degree of impact was prepared by a road engineer in conformity with expert requirements. The measures proposed are feasible, agreed with and approved by the Employer. In the next design phase, where necessary, deviations up to 30 m will be allowed from the proposed location of a transmission facility.	Design.	Mitigation of the impact of fragmentation and barrier effect for amphibians and reptiles, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone. The location and size of the foreseen facilities, in combination with existing bridges and tunnels, will provide a connection between part of populations of the species concerned, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone. Prevention of the risk of a collision of a vehicle with amphibians and reptiles, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone. The foreseen barrier devices will prevent amphibians and reptiles from going into the roadway.
41.	The route range from km 384+300 to km 384+470, and from km 389+130 to km 389+280 (left roadway) should be reduced to the vehicle size.	Design.	Reduction of the affected area of habitat 91E0* to 2.997 dca, or 0.33% of the area of habitats in Kresna-Ilindentsi Protected Zone; minimization of the imact of direct destruction and fragmentation of the habitat.
42.	No construction sites and roads in	Construction.	Guarantee of no direct

	areas of natural habitats beyond already assessed areas should be constructed.		distruction of natural habitats that are subject to conservation in Kresna-Ilindentsi Protected Zone in areas beyond those already assessed.
43.	Placement of fire protection equipment at tunnel portals.	Operation.	Possibility to limit the imact on natural habitats and habitats of species that are subject to conservation in Kresna-Ilindentsi Protected Zone and Kresna Protected Zone in the event of fire
44.	During construction of bridge structures, river courses should be protected from increased turbidity by installation of the so-called turbidity curtains or appropriate construction work.	Construction.	Reduction of the risk of mortality and pollution, and also the degraded land of potential habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
45.	Bridge structures should be provided with a system for collection of surface run-off water and its conduction for treatment in oil and sediment separators.	Design.	Prevention of river pollution and conservation of the natural characteristics of habitats of aquatic invertebrates and fish, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of pollution in habitats of fish species that are subject to conservation in Kresna-Ilindentsi Protected Zone.
46.	Construction of bridge structures should be carried outside the fish breeding period from 15th April to 10th June.	Construction	Reduction of the impact on fish species, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone, including caviar loss, mortality of larvae and youngs.

47.	Design and construction of columns and bridge structures outside the beds of left tributaries of the Struma River	Design and construction	Prevention of long-term destruction of fish habitats in tributaries
48.	Monitoring of the populations of the two species of tortoises and two species of snakes that are subject of protection in the zone, in the area of the right roadway (existing road). The monitoring should start in the Spring of 2018 and will continue for at least 5 years after putting the right roadway into operation. Its design should allow tracking of population trends of target species and degree of isolation (or its absence) of subpopulations west and east of the right roadway, and to enable assessment of the actual effectiveness of the envisaged defragmentation and barrier devices. The effectiveness of the proposed mitigation measures should be assessed on an annual basis (during the monitoring period) after the second year of commissioning of the right roadway.	Before and during construction, and during operation.	Possibility to assess the actual effectiveness of envisaged defragmentation and barrier devices along the roadway. If proved ineffective, corrective measures should be taken, including alternative options.
49.	Design and construction of temporary thick fences* around the range of the route from km 396+600 to km 399+100 (left roadway) and around the range of Kresna bypass (right roadway), as well as subsequent organization of actions for collection and moving of animals that remained in fenced areas. *Fence characteristics: Continuous, smooth, vertical surface, 120 cm in height above ground, and underground part of 20 cm (buried). It may be made of planes (plexiglass, sheet iron, etc.), concrete elements or fine net (with openings no smaller than 0.5/0.5 cm). No joints, creases, supports, etc. between different elements. The fence should be so located that the openings of all drain pipes remain outside in relation to the roadway. Method of carrying out the actions for moving animals: Walking around the entire area falling within the fencing	Before construction.	Minimizing, as far as is possible, the risk of destruction of specimens amphibias and reptiles, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone, during construction.

	and collection of the largest possible number of the notices amphibias and reptiles. Releasing the collected animals as soon as possible in the area located from 0.5 to 1.5 km west of km 397+000. That activity should be carried out at least thre times in May in the year of strating the construction, as well as in the month preceding the start of construction (unless in winter) and it should involve as many people as possible. In all cases such activity should be planned and carried out in charge of a qualified herpetologist.		
50.	Design and construction of thick fences on both sides of the motorway in the following sections: from km 382+192 to km 382+466; from km 383+520 to km 384+770; from km 386+050 to km 386+770; from km 387+100 to km 387+220; from km 389+000 to km 390+900; from km 391+200 to km 391+580; from km 391+840 to km 392+610; from km 392+830 to km 393+250; from km 393+450 to km 393+850; from km 393+940 to km 394+360; from km 396+670 to km 398+140; from km 398+230 to km 399+050 (left roadway); around the range of Kresna bypass (right roadway). Fence characteristics: Continuous, smooth, vertical surface, 120 cm in height above ground, and underground part of 20 cm (buried). It may be made of planes (plexiglass, sheet iron, etc.), concrete elements or fine net (with openings no smaller than 0.5/0.5 cm). No joints, creases, supports, etc. between different elements. The fence should be so located that the openings of all drain pipes remain outside in relation to the roadway.	Design.	Minimizing, as far as is possible, the risk of destruction of specimens amphibias and reptiles, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone, during operation of Lot 3.2; minimization of the impact of mortality on populations of the species of tortoises and snakes that are subject to conservation in Kresna-Ilindentsi Protected Zone (in combination with measures 39 and 49).
51.	Design and placement of extra drain pipes under the road surface (if there is no design facility capable to perform a defragmenting function), located as follows (+/- 25 m): km 383+750; km 384+200; km 384+450; km 384+650;	Design.	Minimization of the negative effects of the operation of Lot 3.2. in terms of fragmentation and breaking biocorridors of amphibias and reptiles, including those that are

	km 386+200; km 386+300; km 386+400; km 386+500; km 386+650; km 389+150; km 389+300; km 389+400; km 389+500; km 389+600; 389+700; km 389+800; km 389+900; km 390+050; km 390+150; km 390+250; km 390+450; km 390+550; km 390+650; km 390+750; km 390+900; km 391+500; km 392+050; km 392+150; km 392+250; km 392+350; km 392+450; km 392+550; km 392+950; km 393+050; km 393+150; km 393+550; km 393+650; km 393+750; km 394+050; km 394+150; km 396+850; km 396+950; km 397+050; km 397+150; km 397+250; 397+350; km 397+450; km 397+550; 397+650; km 397+750; km 397+850; km 397+950; km 398+050; km 398+350; km 398+450; km 398+550; km 398+650; 398+900 (left roadway); km 393+800; km 395+050; km 395+200; km 395+400; km 395+550; km 397+100 (Kresna bypass). Chartacteristics of drain pipes: Rectangular (min. 150/150 cm) or tubular (diameter of at least 150 cm), without vertical shafts (if required, at least one of the wall of each shaft should be with a gradient of no more than 45 grades).		subject to conservation in Kresna-Ilindentsi Protected Zone; minimization of the impact of fragmentation and breaking biocorridors of the species of tortoises and snakes that are subject to conservation in Kresna-Ilindentsi Protected Zone (in combination with measure 39).
52.	No illuminated billboards should be placed along the body of the road within the protected zones.	Operation.	Prevention of swarms of insects in illuminated sections next to the road and minimization of the risk of collision of hunting bats, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone, with motor vehicles.
53.	Any roadside lighting equipment should be installed at a height of at least 10 meters from the road surface, and at a distance of at least 5 meters from the last right/emergency lane.	Design.	Prevention of swarms of insects in illuminated sections next to the road and minimization of the risk of collision of hunting bats, including those that are subject to conservation in Kresna-Ilindentsi Protected

			Zone, with motor vehicles.
54.	A 2 m hight noise-protection wall is to be installed from km 398+590 to 399+170, to the left, in the direction of the increase of the number of kilometers, left roadway.	Design	Elimination of the disturbance to the refuges of Rhinolophus ferrumequinum.
55.	Two-side security of bridge structures at the Struma River (including those existing on the right roadway) and the Vlahinska River north of Kresna by security fences 3 m in height. When using transparent or semi-transpatent materials (e.g. net), security fences should be provided with outlines of rapacious birds in order to avoid collision of birds.	Design.	Minimization of the risk of collision of bats and birds, including those that are subject to conservation in Kresna-Ilindentsi Protected Zone and Kresna Protected Zone, with passing motor vehicles.
56.	The construction in the separate sections should commence outside the reproductive period of birds (1 May – 15 August for the species, expected to be most affected by disturbance and/or destruction of nests with eggs/young birds). Construction may only start in this period, if in the days, immediately before that, an ornithological monitoring has been performed, evidencing the absence of any nesting in a perimeter of 300 m from the boundaries of the construction site. The monitoring method and the monitoring itself shall be selected and performed by an expert(s) ornithologist(s). The methods are to be approved in advance by the competent authority.	Construction	Preventing the significant disturbance and/or destruction of nests with eggs/young birds of the species Ciconia nigra, Aquila pomarina, Circaetus gallicus, Hieraaetus pennatus, Pernis apivorus, Accipiter brevipes, Accipiter nisus, Falco subbuteo, Burhinus oedicnemus, Actitis hypoleucos, Bubo bubo, Alcedo atthis, Coracias garrulus, Dryocopus martius, Picus canus and Calandrella brachydactyla. Reduction of the impact to insignificant.
57.	The security fence on the left roadway from km 386+020 to km 387+225, and from km 389+000 to km 398+000, (out of tunnels and viaducts) should be at least 2.4 m in height.	Design.	Reduction of the risk of collision with a motor vehicle for the wolf and minimization of the effects on its population in Kresna-Ilindentsi Protected Zone.
58.	The routes for approach roads to construction sites should be properly marked.	Construction	Conservation of biodiversity and habitats
59.	Facilities (drain pipes, passages, etc.) and fences should be maintained passable.	Operation	Conservation of biodiversity
60.	No construction sites, temporary	Construction	Prevention of uptaking

	depots and parkings for construction machinery and vehicles should be opened outside the range of the road within protected zones.		additional areas and destrcution of natural habitats and habitats of species, including birds that are subject to conservation in protected areas
61.	The removed layer of humus should be kept at designated depots and subsequently used for recultivation of derelict lands.	Construction	Soil conservation
62.	Execution of construction work outside the range of the road should not be allowed.	Construction	Prevention of soil damaging outside the construction zone
63.	Timely performance of recultivation activities of embankments within the road.	Construction	Prevention of erosion processes
64.	No construction sites, temporary depots and parkings for construction machinery and vehicles should be opened outside the range of the road.	Construction	Conservation of agricultural land
65.	Development of a Building Waste Management Plan in conformity with Art. 11, para 1 of the Waste Management Act in a range and content determined by the ordinance on building waste management and on the use of recycled building materials. Building waste treatment should be performed according to an endorsed building waste management plan, included in the range of investment projects under Chapter VIII of the Territories Development Act, approved in accordance with Art. 11, para 7 of the Waste Management Act (promulgated SG, issue No. 53 of 13.07.2012, effective as of 13.07.2012, as amended and supplemented in issue No. 13 of 07.02.2017). According to art. 11. art. 2, the Construction Waste Management Plan /CWMP/ is approved by the mayor of the municipality or another authorized official at the request of the Contracting Authority/Employer for the construction project, after the effective date of the construction permit and prior to the opening of the construction site and/or prior to the	Design and construction	Waste management in accordance with the Waste Management Act and the requirements of the waste management regulations

	commencement of the activities for the construction or removal of a structure. Also, according to art. 11, art. 7, for structures, situated on the territory of more than one municipality, the CWMP is to be approved by the mayors of the respective municipalities or by authorized officials, for the part of the construction project, to be carried out in the territorial scope of the respective municipality.		
66.	Before construction starts, the location of temporary depos for earth and rock that will be used for the site and depos for storage of dredging spoils and rock that do not meet the project specifications for using in the construction should be agreed with the respective municipal administration where the depot is situated, in accordance with Art. 19, para 1 of the Waste Management Act.	Before construction starts	Waste management in accordance with the Waste Management Act
67.	Waste generated should be collected separately and stored at sites till their disposal for treatment, according to the requirements of the Waste Management Act and its implementing regulations.	During construction	Collection and storage of waste in conformity with the requirements of the waste management regulations.
68.	Waste generated should be disposed fror further treatment based on written agreements to persons holding the respective document according to Art. 35 of the Waste Management Act.	During construction	Waste management in accordance with the Waste Management Act
69.	Roadworthy vehicles should be used for the transportation of hazardous and industrial waste in the territory of the construction sites and outside them. Transportation of hazardous waste should only be made in closed metal containers/tanks.	Construction	Protection of soils and water.
70.	Construction waste should be treated and disposed by the employer, by the owner of construction waste or another person who satisfies the requirements of Art. 35 of the Waste Management Act based on a written agreement, Art. 19 of the Waste Management Act and	Construction	Waste management in accordance with the Waste Management Act and its implementing regulations.

	in conformity with the Ordinance under Art. 22 of the Waste Management Act.		
71.	Sites for temporary storage of building materials and waste should be situated within the road range, in the expropriated zone with sufficient areas.	During construction	Waste management in accordance with the Waste Management Act
72.	Waste petrol oils generated from emergency oil change should be collected in a manner allowing their regeneration – in closed containers that are chemically resistant, preventing spill or leakage, labelled and stored in a covered place.	Construction	Soil and water conservation.
73.	In the events of accidential release на of oils or other pollutants, the contaminated earth should be immediately removed and transported to a waste site licensed under Art. 35 of the Waste Management Act for that type of waste.	Construction	Soil and water conservation.
74.	After completion of construction work, sites for temporary keeping of inert materials and building waste should be cleaned in due time, and waste will be transported to building waste treatnment facilities pursuant to the Waste Management Act. To recultivate the sites using the preserved humus.	Construction	Soil and air conservation. Recultivation of derelict land.
75.	The organization responsible for the maintenance of the road surface should provide waste containers and transportation to waste treatment facilities according to Art. 12, item 2 of the Waste Management Act.	Operation	Minimization of the harmful effects of waste on human health and environment.
76.	The use of dangerous substances and mixtures (e.g. fuel and oil, bitumen, paints and varnishes, permanent marking materials, explosive substances) should be made in conformity with the measures to prevent accidents, spillage or leakage and exposure controls, as identified by the respective regulatory/administrative act, in Safety Data Sheets and safety instructions.	Construction	Human health and environmental protection from the impact dangerous substances and mixtures

77.	The contracting authority/employer/operator should carry out classification of the facility, in accordance with art. art. 103, para. 1 of the EPA, when performing drilling and blasting works, using explosives. In the cases of facilities of low or high risk potential, the contracting authority/employer/operator should also submit a notice of classification and evaluation pursuant to art. 99б of the EPA and – if necessary – to undertake additional technical measures to limit the identified risks for human health or for the environment.	Before starting the construction activities	Compliance with the regulatory requirements and limiting the identified risks for human health and for the environment.
78.	Prepration of individual designs of noise protection screens for target areas, for the selected option of route of Lot 3.2 of Struma Motorway.	Design	Minimization of abnormal noise impact on the sites
79.	Freight transport servicing the construction of Lot 3.2 of Struma Motorway should operate at restricted speed up to 30 km/h when passing across localities as its routes should be agreed with the respective municipalities and local authorities	Construction	Minimization of the noise impact on residential areas surrounding the freight transport route.
80.	Construction work should be carried out in daytime	Construction	Minimization of the environmental noise impact
81.	The noise protection screens envisaged should be provided in conformity with the existing designs	Construction	Minimization of abnormal noise impact on the sites
82.	Modern machinery should be provided in conformity with the requirements of Ordinance on the essential requirements and compliance assessment of machinery and equipment working outdoors, in terms of noise emitted by them in the air (SG issue 11/2004).	Construction	Minimization of the environmental noise impact
83.	Landscaping of the route and recultivation of derelict land should only be provided by native species.	Design and construction	Preservation of the nature of vegetation and natural habitats and non-admission of aliean and invasive species.
84.	Preliminary archaeological studies	Before construction starts	Localization of all on-site visible archaeological sites and clarifying how the route

			and the range of Lot 3.2 of Struma Motorway communicate with their area and to what extent the construction would endanger their integrity.
85.	Saving excavations	Before construction starts	Проучване of cultural layers and archaeological structures in the range of Lot 3.2 of Struma Motorway.
86.	Archaeological surveillance	Construction	Not to allow the destruction of unknown archaeological sites or structures.
87.	Operating staff, according to the work specifics, to be equipped with personal and collective protective equipment	Construction and operation	Protection of health and reduction of the health risk for workers exposed to harmful effects.
88.	Ambient air quality analysis before starting road construction works (baseline conditions) and after commissioning – in priority for content of nitrogen oxides and fine dust particles in close proximity to residential areas.	Construction and operation	Promotion of human health and prevention of health risk
89.	Workers should be equipped with working clothes appropriate for the season	Construction	Reduction of the health risk in a working environment
90.	Good interaction with the responsible occupational health service: regular medical check-ups (personnel selection) subject to the reqruiements by strict compliance with the nonadmission of persons having contraindications for the typw of work; regular medical check-ups within the required time, amount of tests and specialists; organization of a rational schedule of work and rest; organization of a corresponding dietary regime	Construction	Reduction of the health risk in a working environment
91.	Technical measures: • Warning signs with indication of construction activities, also including explosive activities. • During motorway operation, maintenance of fencing structures to restrict	Construction and operation	Population health risk prevention

	the access to the route.		
92.	Monitoring of the noise, dust and gas (from motor vehicles) pollution (e.g. with a mobile station at different points), as the results should be compared, analyzed and interpreted.	Construction and operation	Population health risk prevention by reducing the physical and toxic and chemical load.
93.	Regular maintenance of the cleanness and good order of the roadway, as it will considerably reduce the dust particle concentrations, including fine dust particles in ambient air.	During operation	Population health risk prevention.
94.	Introduction of a good working organization system, good repair of building machinery and transportation vehicles, as well as regular monitoring of the qualities of the working environment and surroundings.	Construction and operation	Population and occupational health risk prevention.
95.	In reference with the numerous tunnels in Lot 3.2 of Struma Motorway, it is required to make public clarification for the prevention of the risk of unregulated pedestrian traffic.	Construction and operation	Population health risk prevention.

9. Conclusion on the type and degree of negative impact in accordance with the criteria, set out in art. 22 of the Ordinance on the Conditions and Order for Performing Assessment of the Conformity of Plans, Programmes, Projects and Investment Proposals to the subject matter and objectives of the conservation of protected areas

The EIA Report for the investment proposal "Improvement of the route of Lot 3.2 of Struma Motorway" is accompanied by Report of the Assessment of the Impact Degree of the considered investment proposal on the subject and objectives for conservation of protected areas BG0000366 "Kresna Ilindentsi" for the protection of the natural habitats and the wild flora and fauna, and BG0002003 "Kresna" for the protection of wild birds.

The procedure for the preparation of the RAID of the investment proposal „Improvement of the route of Lot 3.2 of Struma Motorway" is **combined** with the Environmental Impact Assessment procedure, according to art. 38 of the Ordinance on the Conditions and Order for Performing Assessment of the Conformity of Plans, Programmes, Projects and Investment Proposals to the subject matter and objectives of the conservation of protected areas, according to Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC on the conservation of wild birds.

The Report of the Assessment of the Impact Degree defines the area and degree of impact and the degree of effects on the respective protected zone by options. As a result of the assessment it has been determined that the long tunnel option and eastern option G10.50 are compatible with the subject and objectives for the conservation of protected zone BG0000366 "Kresna - Ilindentsi" and protected zone BG0002003 „Kresna", as follows:

- **Long tunnel option**
- **Protected zone BG0000366 „Kresna - Ilindentsi"**

Degree of impact on the protected zone

The implementation of the investment proposal for the construction of Struma Motorway, Lot 3.2 according to the Long tunnel option affects the territorial integrity of protected zone „Kresna - Ilindentsi" on a total area of **298.789 decares**, or **0.06%** of the entire territory of the protected zone.

Area and degree of impact

Types of natural habitats

The implementation of the Struma Motorway, Lot 3.2 according to the Long tunnel option will have a **moderate** impact on habitat 92C0, subject to conservation in the PZ. By applying appropriate measures, the impact will be reduced to **insignificant**.

Species, subject of conservation

The implementation of the Struma Motorway, Lot 3.2 according to the Long tunnel option will have a **moderate** impact on two species of reptiles and one fish species, subject to conservation in in the PZ. By applying appropriate measures, the impact will be reduced to **insignificant**.

By applying appropriate measures, the implementation of the Struma Motorway, Lot 3.2 according to the Long tunnel option will have an insignificant impact on the integrity and structure of the zone, as well as the natural habitats and species, subject to conservation therein. The IP according to the Long tunnel option is compatible with the subject and objectives of conservation of the protected zone BG 0000366 „Kresna - Ilindentsi".

- **Protected zone BG0002003 „Kresna"**

Degree of impact on the protected zone

The implementation of the investment proposal for the construction of Struma Motorway, Lot 3.2 according to the Long tunnel option affects the territorial integrity of protected zone „Kresna" on a total area of **340.594 decares**, or **0.14%** of the entire territory of the protected zone.

Area and degree of impact

The implementation of the Struma Motorway, Lot 3.2 according to the Long tunnel option will have a **significant** impact on 11 species of birds, subject to conservation in in the PZ. By applying appropriate measures, the impact will be reduced to **insignificant**.

By applying appropriate measures, the implementation of the Struma Motorway, Lot 3.2 according to the Long tunnel option will have an insignificant impact on the integrity and structure of the zone, as well as on the species of birds, subject to conservation therein. The IP according to the Long tunnel option is compatible with the subject and objectives of conservation of the protected zone BG0002003 „Kresna".

- **Eastern option G10.50**
- **Protected zone BG0000366 „Kresna - Ilindentsi"**

Degree of impact on the protected zone

The implementation of the investment proposal for the construction of Struma Motorway, Lot 3.2 according to the Eastern option G10.50 affects the territorial integrity of protected zone „Kresna - Ilindentsi" on a total area of **525.279 decares** (excluding the area of

the right roadway, which coincides with the existing road), or **0.11%** of the entire territory of the protected zone.

Area and degree of impact

Types of natural habitats

The implementation of the Struma Motorway, Lot 3.2 according to the Eastern option G10.50 will have a **significant** impact on habitat 91E0*, subject to conservation in in the PZ. By applying appropriate measures, the impact will be reduced to **insignificant**.

Species, subject of conservation

The implementation of the Struma Motorway, Lot 3.2 according to the Eastern option G10.50 will have a **significant** impact on four species reptiles, subject to conservation in in the PZ. The impact may only be mitigated if effective defragmentation and barrier facilities are ensured for the entire option (incl. the right roadway).

By applying appropriate measures, the implementation of the Struma Motorway, Lot 3.2 according to the Eastern option G10.50 will have an insignificant impact on the integrity and structure of the zone, as well as the natural habitats and species, subject to conservation therein. The IP according to the Eastern option G10.50 is compatible with the subject and objectives of conservation of the protected zone BG0000366 „Kresna - Ilindentsi", provided only that effective defragmentation and barrier facilities are ensured for the entire option (incl. the right roadway).

- **Protected zone BG0002003 „Kresna"**

Degree of impact on the protected zone

The implementation of the investment proposal for the construction of Struma Motorway, Lot 3.2 according to the Eastern option G10.50 affects the territorial integrity of protected zone „Kresna" on a total area of **519.120 decares** (excluding the area of the right roadway, which coincides with the existing road), or **0.22%** of the entire territory of the protected zone.

Area and degree of impact

The implementation of the Struma Motorway, Lot 3.2 according to the Eastern option G10.50 will have a **significant** impact on 16 bird species, subject to conservation in in the PZ. By applying appropriate measures, the impact will be reduced to **insignificant**.

By applying appropriate measures, the implementation of the Struma Motorway, Lot 3.2 according to the Eastern option G10.50 will have an insignificant impact on the integrity and structure of the zone, as well as on the species of birds, subject to conservation therein. The IP according to the Eastern option G10.50 is compatible with the subject and objectives of conservation of the protected zone BG0002003 „Kresna".

Options G20 blue and red and eastern option G20 are not compatible with the subject and objectives for the conservation of protected zone BG0000366 "Kresna - Ilindentsi". Options G20 blue and red are compatible with the subject and objectives for the conservation of protected zone BG0002003 „Kresna", and eastern option G20 is not compatible with the subject and objectives of conservation of the protected zone BG0002003 „Kresna".

10. Selection of an option for implementation

In line with the assessment of the impact of the project options proposed by the Contracting Authority on the components and factors of the environment and on human health an option has been selected as a preferred option for implementation of the investment proposal for "*Improvement of the route of Lot 3.2 of Struma Motorway"*.

The reasons of the experts in selecting an option as a preferred option for implementation are presented in summary in the table below by component and factor of the environment and human health.

Component	**Preferred option**	**Reasons**
Ambient air	Eastern option G10.50	The results of the forecast based on the Eastern Option G10.50 in the period of operation, including those with reported cumulative effect, do not indicate exceeding of the relevant limit values for ambient air in residential areas. Significant impact during operation has been found for the other options: Option G20-blue yields exceeding of AALVPHH for nitrogen oxides in the town of Simitli and in the northeastern part of the town of Kresna. In the case of Option G20-red and the long tunnel option there is a danger of ambient air pollution in the residential areas in the Dalga Mahala neighbourhood, town of Simitli (around main road E-79), and under the Eastern Option G20 in the Oranovo neighbourhood.
Surface water	Option G20 - red	Option G20-red is assessed as having *"**insignificant***" impact as a result of the ***low*** rate of impact: affecting of portions of surface water bodies that are actually being utilized, need to use small volumes of water quantities and discharge of insignificant emissions in the surface water consisting mostly of suspended solids, in view of the ***low*** sensitivity rate of the receptors ensuing from the state of the water courses, the minimum waste water, the measures envisaged for its treatment and the degree of utilization of these affected water bodies, the absence of water protection areas around surface sources of potable water. The option will contribute to the improvement of the traffic conditions, respectively to the limitation of incidental breakdowns and car accidents, provided that trestle facilities are not implemented.
Ground water	Option G20 - red	Option G20-red is assessed as having *"**insignificant***" impact as a result of the ***low*** rate of impact: affecting of portions of ground water bodies that are actually being utilized, need to use small volumes of water quantities and discharge of insignificant emissions in the ground water consisting mostly of suspended solids, in view of the ***low*** sensitivity rate of the receptors ensuing from the

		state of the water courses, the minimum waste water, the measures envisaged for their treatment and the degree of utilization of these affected water bodies, the absence of water protection areas around sources of potable water and/or around mineral water deposits. The option will contribute to the improvement of the traffic conditions, respectively to the limitation of incidental breakdowns and car accidents, provided that trestle facilities are not implemented.
Earth bowels	Option G20 - red	Option G20-red is assessed as having *"**insignificant***" impact on the bowels of the earth as a result of the ***low*** rate of impact, in view of the ***low*** sensitivity rate of the receptors (availability of information about the state of the massif slopes, absence of deposits of underground natural resources). It is recommended, provided that trestle facilities are not implemented.
Land and soil	Long tunnel option	The selection of the option preferred for implementation has been made on the basis of the size of the disturbed land within the scope of the ground route. A total of 884.714 decares will be affected in the case of the long tunnel option.
Plant life	Long tunnel option	This option would involve the smallest number of plant community types. The analysis of the expected impacts on the plant communities under the option subject to assessment reveals a low rate of impact. This option would affect only one habitat designated for priority conservation - that of the oriental pane, the impact on which is assessed as being of high rate. The scope of the route would affect only one plant species protected by law.
Animal life	Long tunnel option	The smallest area of directly affected habitats of animal species, the smallest impact as a result of disturbance and mortality of individual animals, absence of barrier effect.
Waste	Option G20 - red	The preferred route option is that of option G20 - red due to the considerably smaller magnitude of generated earth and rock quantities, *which do not comply with the project specifications for construction input* as compared to the other project options.
Noise, Energy sources involving risk	Eastern option G10.50	From the perspective of noise impact, the analysis, based on the number of sites and the expected exceeding of the regulated limit values for the noise level, brings to the fore the long tunnel option. But the Eastern option G10.50 has a certain advantage over it, since the excess of the limit values is somewhat smaller (by approximately 3 dBA), which is more favourable when applying the noise protection measures to the affected areas.

Landscape	Long tunnel option	The long tunnel option is the most friendly one in view of the expected changes in the landscape. The topography will be modified only at the locations of the Kresna Tunnel portals, northern and southern.
Health and hygiene aspects	Eastern Option G10.50	The forecast results for the Eastern Option G10.50 regarding ambient air pollution in all settlements, including those with reported cumulative effect, do not reveal ambient air pollution in residential areas related to excessive limit values. The forecast results for the other options show estimates of excessive concentrations in the town of Kresna.
Cultural heritage	Eastern Option G10.50	The implementation of the Eastern Option G10.50 may endanger only one of the well-known cultural heritage sites. In the case of Option G20–blue and red, two of the cultural heritage assets may be affected. The implementation of the long tunnel option will require large areas for the disposal of huge quantities of earth and rock materials with a real chance that their landfilling may cover the area of unknown archaeological cultural assets. The Eastern Option G20 covers an area that is more than twice as big as that under the Eastern Option G10.50 and the probability that an archaeological site may be endangered is by far higher.
All components and factors of the environment	--	Rejection of a "zero" option due to the retention of the existing crossing of settlements by Road I-1 (E-79) which is associated with: - exceeding of the average annual nitrogen oxide limit values for the protection of human health in the residential areas crossed by the road; - danger of ambient air pollution in case of adverse weather conditions (the maximum possible pollution close to a residential environment); - burst pollution of the air; - exceeding of the noise level limit values for the residential areas; - contamination of residential areas with hazardous substances in cases of accidents and car crashes;

The preferred options by individual components and factors of the environment and human health are:

- Option G20–red: surface water; ground water; earth bowels; waste;
- Eastern Option G10.50: ambient air; noise/energy sources involving risk; cultural heritage; health and hygiene aspects;
- Long tunnel option: plant life; animal life; land and soil; landscape.

For the purpose of option selection, a scoring system has been used to rank the options in accordance with the expected impacts by component and factor of the environment and human health as identified in Section V. The option preferred for implementation gets 5 points. The second ranking option gets 4 points. The third, fourth and fifth ranking options get 3, 2 and 1 point respectively. Some of the options have an equal score due to similar impacts.

Component/factor	**Option G20–Blue[1/]**	**Option G20–Red[1/]**	**Eastern option G10.50**	**Long tunnel option**	**Eastern option G20[1/]**
Ambient air	1	4	5	2	3
Surface water	4	5	3	1	2
Ground water	4	5	3	1	2
Earth bowels	4	5	3	1	2
Land and soil	2	3	3	5	1
Plant life	2	3	3	5	1
Animal life	1	2	4	5	3
Waste	4	5	3	1	2
Noise, energy sources involving risk	1	3	5	4	2
Landscape	3	3	2	5	1
Cultural heritage	1	2	5	3	4
Health and hygiene aspects	2	3	5	1	3
Total:	**29**	**43**	**44**	**34**	**26**

[1/] ***Option G20 - blue and red and the Eastern option G20 are not consistent with the subject and objectives of conservation of the affected protected areas.***

As a result of the environmental impact assessment performed in Section V and in accordance with the report on the degree of impact, the identified feasible options of the investment proposal are Eastern option G10.50 and the Long tunnel option, and according to the scoring system in the EIAR the Eastern option G10.50 gets 44 points while the Long tunnel option gets 34 points.

Summary assessment of the feasible options by specific component and factor of the environment and human health
Ambient air

The carbon dioxide equivalent amount of greenhouse gases for the **Eastern Option G10.50** in the construction period is estimated at **1 900** tons of CO_2-eq per year. The estimated volume of blasting operations for the tunnels is about **1 160** tons of explosives.

Moderate impact significance for the Eastern Option G10.50 of Lot 3.2 of Struma Motorway in the construction period. **Moderate** impact significance for the Eastern Option G10.50 of Lot 3.2 of Struma Motorway in the operation period. There is an adverse effect on only two single residential buildings around Road E79 in the town of Simitli and on an adjacent farm building around the Vlahi - Kresna road. The carbon dioxide equivalent amount of greenhouse gases for the Eastern Option G10.50 in the operation period is estimated at **24 693** tons of CO_2-eq per year.

The carbon dioxide equivalent amount of greenhouse gases for the **Long tunnel option** in the construction period is estimated at **1 500** tons of CO_2-eq per year. The estimated volume of blasting operations for the tunnels is about **7 560** tons of explosives.

High impact significance for the Long tunnel option of Lot 3.2 of Struma Motorway in the construction period**.** During the execution of the tunnel blasting operations it is possible for the village of Poleto and the residential areas in the town of Kresna to be affected adversely. **High** impact significance for the Long tunnel option of Lot 3.2 of Struma Motorway in the operation period. There will be an adverse effect on the residential areas of the Dalga Mahala neighbourhood in the town of Simitli situated around Road E79. The carbon dioxide equivalent amount of greenhouse gases for the Long tunnel option in the operation period is estimated at **23 259** tons of CO_2-eq per year.

Due to the above, upon comparison of the two ranked options on the basis of the ambient air component, it is recommended that the Eastern Option G10.50 should be implemented.

Surface water

The insufficient degree of exploration of the massif where the **Long tunnel option** is planned to be implemented may lead to the drainage of right bank tributaries of the Struma river: the Divilska river, the Breznishka river, as well as other smaller tributaries when crossing the rift areas where these tributaries usually run. Regardless of the implementation of tunnel lining, this drainage will be handled by the draining system situated outside of the lining (between the rock massif and the lining).

In the case of the **Eastern Option G10.50**, the surface water courses: the Gradevska, Brezhanska, Ludata, Mechkulska, Oshtavska (Dyavolska) and Vlahinska rivers intersect mainly bridges and vieducts and there is no impact on their drainage volumes. There will be an impact only in the construction period.

Due to the above, upon comparison of the two ranked options on the basis of the surface water component, it is recommended that the Eastern Option G10.50 should be implemented.

Ground water

The drainage of the ground water will begin simultaneously with the launching of the construction works under the **Long tunnel option**. The magnitude of this drainage upon completion of the facility is estimated at approximately 129 l/s, and parallel with that there will be drainage focused at the tunnel portals (along the drainage system). Unlike the possible drainage of surface waters for which there is no evidence

of pollutants, groundwater can contain pollutants (U, NH4 - according to analytical data). The drainage will be conducted "inwards" into the massif, away from the Struma River, and therefore the drainage effect will be more pronounced.

The tunnel work envisaged along the **Eastern Option G10.50** will take place in the "high" parts of the region (the inter-mountain valleys of the Brezhinska and Oshtavska rivers), above the erosion base: the Struma river, and the drainage effect will be considerably lower while the tunnel parameters such as length and cross section are incomparably smaller than those of the Long Tunnel Option.

Due to the above, upon comparison of the two ranked options on the basis of the ground water component, it is recommended that the Eastern Option G10.50 should be implemented.

Earth bowels

The implementation of the **Long tunnel option** is associated with an extremely large volume of earthworks that will yield about 4.5 million cubic meters of unnecessary rock material with unknown mineral and chemical composition, also as regards the existence and diffusion of radioactive substances. Due to the late construction phase of Struma Motorway, it cannot be used as embankment of the facilities and should be landfilled, with the sites required for that purpose being in the range of tens to hundreds of decares. The existing experience in the construction of similar sites - highways and other road projects, reveals a distinct trend of manifestation of the unregulated phenomenon of "geological surprises", which requires modification of the structural features of the roadway and its facilities – such as lots of Struma Motorway, demanding additional activities of drying the earth foundation, or removing a coal layer and the like. In the situation of construction of the Long tunnel option these "geological surprises" are virtually impossible to assess due to the small number of the drilled exploration wells driven by environmental considerations: their implementation in protected areas. Last but not least, the complexity of the facility and the lack of experience in building tunnels of such length and dimensions.

The insufficient degree of exploration of the massif is a prerequisite both for accidents and for human casualtiese during such accidents, which is essential in this case.

The specialized sources (Assic. Prof. K. Angelov, PhD, Eng. Geoecology, Sofia 2009) quote such examples, also involving casualties. The following extracts from the source can be added:

"... at the intersection of two rift areas at the Vitinya tunnel the caving material tore completely the recently built lining at a section of 200 m."

"...74 workers lost their lives during the construction of the Batak Hydropower Cascade."

"Hundreds died in the beginning of the construction works of the undergrounds in Moscow, London, Berlin and many more."

The points made above: higher requirements to exploration, probability of occurrence of "geological surprises", probability of occurrence of fatal accidents, are also valid for the implementation of the tunnelwork envisaged in the **Eastern Option G10.50**, but in this case the length of the tunnels does not exceed 1320 m and their parameters, such as length and cross-section are incomparably smaller than those of the Long tunnel option. Last but not least, this option generates a shortage of earth material (the volume of earth required for embankments is greater than the excavated quantities), due to which the unusable earth quantities, which will require a landfilling site, will be incomparable.

Due to the above, upon comparison of the two ranked options on the basis of the earth bowels component, it is recommended that the Eastern Option G10.50 should be implemented.

Waste

The estimated quantities of waste generated in the construction period: earth and rock volumes *non-compliant with the project specifications for input in the facilities* for the two ranked options are: **Eastern Option G10.50** – 1 856 432 m^3 and **Long tunnel option** – 4 579 586 m^3.

The excavated earth and rock quantities under the Long tunnel option, which do not comply with the project specifications for input in the facility, the results of the studies on the dose rate of gamma radiation and the analysis of the specific activity of natural radionuclides show values that are two to three times higher than the background ones and the excess earth and rock material cannot be used as input in facilities under construction.

The large content of natural radionuclides in these rock quantities will pose a serious risk for the implementation of the Long tunnel option and will require pre-construction of a special landfill for disposal of rock volumes. Such a landfill can be built after the adoption of an EIA decision for the landfill itself and can be put into operation upon issuance of a Combined Permit.

Due to the above, upon comparison of the expected quantities of generated earth and rock materials, which fail to comply with the project specifications for input in the facility under construction in the two ranked options, it is recommended that the Eastern Option G10.50 should be implemented.

Noise

In the course of implementation of the **Long tunnel option** the expected excess above the statutory limit values of the noise level is up to 29.0 dBA. It is expected that in the course of implementation of the construction works under the **Eastern Option G10.50** the excess above the statutory limit values of the noise level will be up to 26.0 dBA.

In the operation period the expected excess for the **Long tunnel option** is up to 16.0 dBA, and for the **Eastern Option G10.50** it is up to 13.0 dBA.

Due to the above, upon comparison of the expected excess in the statutory limit values of the noise level in the two ranked options, it is recommended that the Eastern Option G10.50 should be implemented.

Health assessment

The construction works envisaged in the implementation of the **Long tunnel option** pose serious risk for the health of the on-site workers for the following reasons:

- The geological structure poses the risk of manifestation of "geological surprises," including probable collapses and landslides during the construction of the tunnels, which may lead to many casualties among the construction workers;

- The available data of high values of radioactive substances in drainage water obtained during the monitoring of the water in the area of closed down uranium mining sites – “Simitli” and “Senokos” or from some exploration sites, for example “Brezhani”, as well as from the

exploration of the "Kresna" tunnel (Long tunnel option), where one of the water samples has shown values exceeding the limits for water radioactivity, indicate a potential risk of excessive radioactivity of the water in the region used for irrigation and household purposes;

- The results of the studies on the dose rate of radioactive radiation and the analysis of the specific activity of natural radionuclides show values that are two to three times higher than the background ones.

The large content of natural radionuclides will pose serious risks for the full-shift workers during the performance of longer tunnel work as a consequence of their long-term exposure to the excessive radioactive radiation.

In the operation period the gravest risks for the health of the population are associated with:

- The accidents and car crashes in the long tunnel facilities, which have adverse consequences not only for the drivers and passengers in the motor vehicles involved in accidents, but also for the other people passing through the tunnel facility due to the rapid concentration and diffusion of toxic gases in the confined space of the tunnel;

- The maintenance of the life supporting parameters of the ambient air environment in the long tunnel requires fault-free operation of the ventilation system which depends on the power supply. Any blocking of the ventilation system (power system failure, terrorist attack or defect) will result in very rapid depletion of the oxygen in the tunnel tubes, with consequent risks for the health and lives of those traveling through them at that point of time.

In the case of the **Eastern Option G10.50** the longest tunnel work section is 1320 m, which reduces drastically the risks related to the period of impact on those involved in the construction works and particularly to the operation period, when even in cases of incidents by far fewer people will be exposed to risk and to a much smaller extent.

Due to the above, upon comparison of the risks related to the population and human health, under the two ranked options it is recommended that the Eastern Option G10.50 should be implemented.

During the selection of an option for implementation of Lot 3.2 of Struma Motorway, as a result of the environmental impact assessment and the assessment of the rate of impact on the protected areas, it has been found that the **Eastern Option G10.50 has certain advantage.**

11. Conclusion in compliance with Article 83(5) of the Environmental Protection Act

The Report on the environmental impact assessment of the investment proposal of the Road Infrastructure Agency for **Improvement of the route of Lot 3.2 of Struma Motorway** presents the investment proposal by project option: Option G20 – blue; Option G20 – red; Eastern Option G10.50; Long tunnel option and Eastern Option G20, its essence and the expected results of assessing the impacts on the components and factors of the environment and human health as a result of the construction and operation of Lot 3.2 of Struma Motorway with respect to the following aspects:

- State of the components and factors of the environment and forecast on the impact in the implementation period of the investment proposal ;
- Implementation and consistence with the effective regulatory instruments in Bulgaria;
- The impact on the ambient air in the construction and operation period of the investment proposal has been assessed;
- The impact on the surface and ground water as a result of the construction and operation of Lot 3.2 of Struma Motorway, including that on the crossing of surface water bodies, has been assessed;
- The expected disturbances of the land and soil as a result of the construction and the expected pollution of the land and soil as a result of the discharge of harmful emissions in the ambient air by the motor traffic are assessed;
- The impact on the biodiversity as a result of the construction and operation of Lot 3.2 of Struma Motorway has been assessed;
- An analysis and comparative assessment of the health status of the population in the affected municipalities are presented on the basis of the average indicators for Bulgaria and other regions in the country;

The independent experts that have developed the assessment are familiar with the written opinions submitted by the competent authorities and other specialized ministries/organizations and these opinions have been taken into account in the process of development of the EIA Report;

On the basis of the analyses, forecasts and assessments the independent experts have proposed measures that are to guarantee the operation of Lot 3.2 of Struma Motorway and the performance of the construction works in compliance with the best available practices and to minimize the adverse impacts to the levels provided for in the regulatory instruments of Bulgaria and the EU.

The impact of the pollutants emitted in the construction and operation periods on the components of the environment can be qualified as insignificant, short-term for the construction period, continuous in the operation period, direct and reversible, with a small geographical scope, with insignificant cumulative effect, consistent with the approved national and EU regulatory requirements, and implying no adverse impacts on human health and on the components and factors of the environment.

The construction and operation of Lot 3.2 of Struma Motorway by applying the **Eastern Option G10.50** will have an insignificant impact on the integrity and structure of the affected protected areas from the Natura 2000 environmental network,

as well as on the natural habitats and habitats of species, subject to protection in them, in case of implementation of the recommended measures and conditions. The investment proposal is consistent with the subject and goals of conservation of the protected areas of "Kresna" and "Kresna - Ilindentsi" given implementation of the recommended measures and conditions for the Eastern Option G10.50.

In conclusion, guided by the principles of preventing the risk for human health and ensuring sustainable development in line with the effective national standards of environmental quality we believe that the activities envisaged in the investment proposal comply with the regulatory requirements of the Bulgarian and European environmental legislation. Along these lines, there are no expectations of significant adverse impact on the components and factors of the environment and human health, both on the territory of the roadway and close to the road, and in cross-border context.

On the basis of the analysis and assessment of the investment proposal for "*Improvement of the route of Lot 3.2 of Struma Motorway"*, the surveys, exploration, studies, calculations and the estimate of the impact of the site on the components and factors of the environment and human health and in compliance with the environmental legislation, including the conclusions drawn in the Compatibility Assessment Report, the authors of the EIA Report propose to the esteemed Supreme Environmental Expert Council at the MoEW to approve the implementation of the investment proposal for "*Improvement of the route of Lot 3.2 of Struma Motorway"* **according to the Eastern option G10.50.**

List of Annexes:

Annex No 1	Letter of MoEW, Ref. EIA-85/13 May 2015
Annex No 2	Letter of MoEW, Ref. EIA-85/13 January 2017
Annex No 3	Letter of Ministry of Health, Ref.12-00-2/13 January 2017
Annex No 4	Maps from November 2016 and 2017 presenting a situation of a blue and red option in the sections along the "Tisata" reserve and the "Kresna Gorge" protected area
Annex No 5	Situation of the project route, Option G20 - blue, on a topographic map, scale 1:25000
Annex No 6	Situation of the project route, Option G20 - red, on a topographic map, scale 1:25000
Annex No 7	Situation of the project route, Eastern Option G10.50, on a topographic map, scale 1:25000
Annex No 8	Situation of the project route, Eastern Option G20, on a topographic map, scale 1:25000
Annex No 9	Situation of the project route, Long tunnel Option, on an orthophotography map, scale 1:5000