# SUPPLEMENTED UPDATED TERMS OF REFERENCE

# ON THE SCOPE AND CONTENTS OF THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF INVESTMENT PROPOSAL FOR

# "IMPROVING THE ROUTE OF LOT 3.2 OF THE "STRUMA MOTORWAY"

Sofia
January, 2016

**Table of Contents:**

**List of abbreviations**

| Abbreviation | Meaning |
|---|---|
| MW | Motorway |
| BAS | Bulgarian Academy of Sciences |
| BQE | Biological quality elements |
| WABD | West-Aegean Basin Directorate |
| BSPB | Bulgarian Society for the Protection of Birds |
| GRA | General Roads Administration |
| SG | State Gazette |
| ICE | Internal combustion engines |
| EIAR | Environmental Impact Assessment Report |
| RDIA | Report on the Degree of Impact Assessment |
| EEC | European Economic Community |
| EC | European Commission |
| EC | European Community |
| BDA | Biological diversity Act |
| WA | The Water Act |
| CHA | Cultural Heritage Act |
| PA | Protected Area |
| EPA | Environmental Protection Act |
| TDA | Territorial Development Act |
| EEA | Executive Environmental Agency |
| IP | Investment Proposal |
| AAQ | Ambient air quality |
| EPC | Environmental Protection Committee (EPC) |
| VOC | Volatile organic compounds |
| ME | Ministry of Energy |
| MOH | Ministry of Health |
| MPOH | Ministry of Puplic Health |
| MOEW | Ministry of Environment and Water |
| MV | Motor vehicle |
| NAIM-BAS | National Archaeological Institute and Museum at the Bulgarian Academy of Sciences |
| NEN | National Ecological Network |
| NIICH | The National Institute of Immovable Cultural Heritage |
| NCSIP | National Company of Strategic Infrastructural Projects |
| NCR | The National Concession Register) |
| NMVOC | Non-methane volatile organic compounds |
| NSI | National Statistical Institute |
| NCPHA | National Centre for Public Health and Analysis |
| EIA | Environmental Impact Assessment |
| OP | Operational Programme |
| CA | Compatibility Assesment |
| DCM | Decree of the Council of Ministers |
| RV | Road vehicle |
| TA | Traffic accident (RA) |
| RBMP | River basin management plan |
| FRMP | Flood risk management plan |
| PCB | Polychlorinated Biphenyls |
| WFD | The Water Framework Directive |
| RHI | Regional Health Inspectorate |

| | |
|---|---|
| ASFRP | Area with significant flood risk potential |
| RIEW | Regional Inspectorate on Environment and Water |
| RWMS | Regional Waste Management System |
| WHO | World Health Organization |
| SPZ | Sanitary Protection Zone |
| AUP | Agricultural underpass |
| POP | Persistent organic pollutants |
| PM | Particulate matter |
| RB | The Red Book |
| PAC | Polycyclic aromatic hydrocarbons |

## Introduction

The present **Updated Terms of Reference** for the scope and content of EIA has been prepared in accordance with Art. 10, para. 1 and par. 3 of the *Ordinance on conditions and procedures for implementing an environmental impact assessment* (SG, issue 25/2003, further amended and supplemented SG, issue 12/2016), on the grounds of Art.95, Para.2 of the Environmental Protection Act (EPA, SG, issue 91/2002, further as amended and supplemented SG, issue 101/2015 and in connection with letter of the Ministry of Environment and Water (MOEW) Ref. No. OBOC-85/13 May 2015 (Appendix No.1). The updated Terms of Reference refer to the investment proposal for **„Improving the route of Lot 3.2 of the Struma Motorway"**, the Contracting Authority of which is the Road Infrastructure Agency (RIA).

On the scope and content of EIA of the investment proposal for "Improvement of the route of Lot 3.2 of the "Struma" Motorway in 2015 consultations have been carried out with the specialized departments, the representatives of the public stakeholders, including NGOs, in accordance with Art. 9, Para . 1 and Para. 4 of the *Ordinance on the conditions and procedures for implementing an environmental impact assessment.*

In the beginning of 2016, the Road Infrastructure Agency assigned the development of the project (phase Feasibility study) of the new variant for separation of traffic in Lot 3.2 of the Struma Motorway. The newly designed alternate version - East Alternative G 10.50 shall separate the traffic in two lanes, whereas the right lane (two lanes, one-way traffic from Sofia to Kulata) shall be provided with rehabilitation and strengthening of the existing E79 road with the implementation of measures to protect biodiversity and an Eastern bypass of the town of Kresna on a new terrain and the left lane (two lanes, one-way traffic from Kulata to Sofia) shall be designed under a project solution of the route on a new terrain - to the East of the Kresna Gorge.

The present Updated Terms of Reference on the scope and content of EIA shall include information for the conduct of consultations on the scope and content of EIA of the investment proposal (the design alternatives, proposed by the Contracting Authority, including the new project version - Eastern Alternative G 10.50 from 2016) with the specialized departments, the representatives of the public stakeholders, including NGOs, in accordance with Art. 9, Para. 1 and Par. 4 of the *Ordinance on conditions and procedures for implementing an environmental impact assessment.*

Information, received during the consultations under Art. 9, pursuant to Art. 10, Para. 2 of the *Ordinance on the conditions and procedures for implementing EIA*, will be used to supplement, if necessary, the Terms of Reference on the scope and content of EIA. In conjunction with consultations, carried out during 2016 on the Updated Terms of Reference on the scope and content of EIA, the RIA assigns the designer to provide a technical solution for the project route designed so that both road lanes (four traffic lanes) to be developed over a new terrain outside the Kresna Gorge . In December 2016 has been elaborated a project: "Pre-investment Study of Lot 3.2 of Struma Motorway - east alternative G20. The Eastern Alternative G20 is included in this Updated Terms of Reference on the scope and content of EIA in the "Alternatives" Section.

The supplemented updated Terms of Reference shall be discussed by the Contracting Authority in consultations with the competent Environmental Authority (MOEW) and the Ministry of Health pursuant to Art. 10, Para. 5 and Para. 7 of the *Ordinance on the conditions and procedures for implementing EIA*, following which, a final Terms of Reference on the scope and content of EIA will be prepared.

The report on the EIA (EIAR) and the finalized Terms of Reference on the scope and content of EIA shall reflect and also take into account the remarks and recommendations of the consultations, carried out during 2016 with the competent authorities on the scope and content of the EIA.

The work on the EIA report shall take into account the relevant to the Investmant Proposal conditions and measures of the Observations of the EC No. 1-1 / 2010, by which the General

Transport Master Plan has been complied with and Observations of the EC No. 10-6 / 2014, by which the Operational Programme "Transport and transport infrastructure" for the period 2014 to 2020 has been complied with.

By Letter No. OBOC-85/13 May 2015, the MOEW has also ordered the preparation of a Report on the Degree of Impact Assessment (RDIA) of the investment proposal on the affected protected areas that fall within the scope of the route:

- Protected area BG0002003 „Kresna" for the conservation of wild birds, announced by Order No. РД -748 of 24 October 2008 (SG, issue 97/2008) of the Minister of Environment and Water.
- Protected area 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 with Decree No. 122/2 March 2007 (SG, issue 21/2007), amended and supplemented by Decree of the Council of Ministers No. 811/2010 (SG, issue 96/2010).

As a separate Appendix to the Report on EIA shall be annexed the RDIA of the investment proposal on the affected protected areas, in accordance with Art. 12, Para. 2, item 6 of the *Ordinance on the conditions and procedures for implementing environmental impact assessment.*

The preparation of the updated Terms of Reference on the scope and contents of EIA, as well as the preparation of the EIA Report and Report on the Degree of Impact Assessment (RDIA) has been assigned by the "Road Infrastructure" Agency (the receiver of the activities of the restructured at the beginning of 2016 the National Company "Strategic Infrastructure Projects") to "DANGO PROJECT CONSULT EOOD", city of Sofia.

**Information on the Contracting Authority**
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# 1. Parameters of the Investment proposal

## 1.A. Description of the physical characteristics of the investment proposal and the necessary areas (such as utilized land, agricultural land, woodland, etc.) during the construction phase and during the operation phase

**Lot 3.2 of the Struma Motorway – General Information**

The length of Struma Motorway is approximately 150 km, it is located in the southwest part of the country between the junction of "Daskalovo" (next to the town of Pernik) and the border between Bulgaria and Greece at the village of Kulata. The motorway passes parallel to the Struma River, including through natural landmarks like the Kresna Gorge.

Struma Motorway has been divided into four lots:

- Lot 1, from Dolna Dikanya to Dupnica;
- Lot 2, from Dupnica to Blagoevgrad;
- Lot 3, from Blagoevgrad to Sandanski;
- Lot 4, from Sandanski to the crossing of the Greek border at Kulata.

Lot 1, Lot 2 and Lot 4 have been completed and in operation.

Road section Blagoevgrad-Sandanski of Lot 3 of Struma Motorway which is not constructed yet, starts from km 359+000 (end of Lot 2 – south of the Barakovo village and east of the Struma River) up to km 420+624 (beginning of Lot 4, at about 500 m from the Novo Delchevo village) with total length of approx. 61.624 km.

Lot 3 has been additionally divided to the following sections, as shown on the map below (Figure No. 1.A-1):

- Lot 3.1 between Blagoevgrad and Krupnik - from km 359+000 up to km 376+000;
- Lot 3.2 from Krupnik to Kresna - subject to the present EIA (from km 376+000 up to km 397+000). This section passes through rugged country, its main part being in the Kresna gorge;
- Lot 3.3 between Kresna and Sandanski - from km 397+000 to km 420+624.

The project for the construction of Struma Motorway is part of the Operational Programme "Transport" 2007-2013, which has provided the funds for the implementation of Lots 1, 2 and 4, as well as for the preparation of Lot 3.The implementation of Lot 3 is planned for the 2014 - 2020 program period.

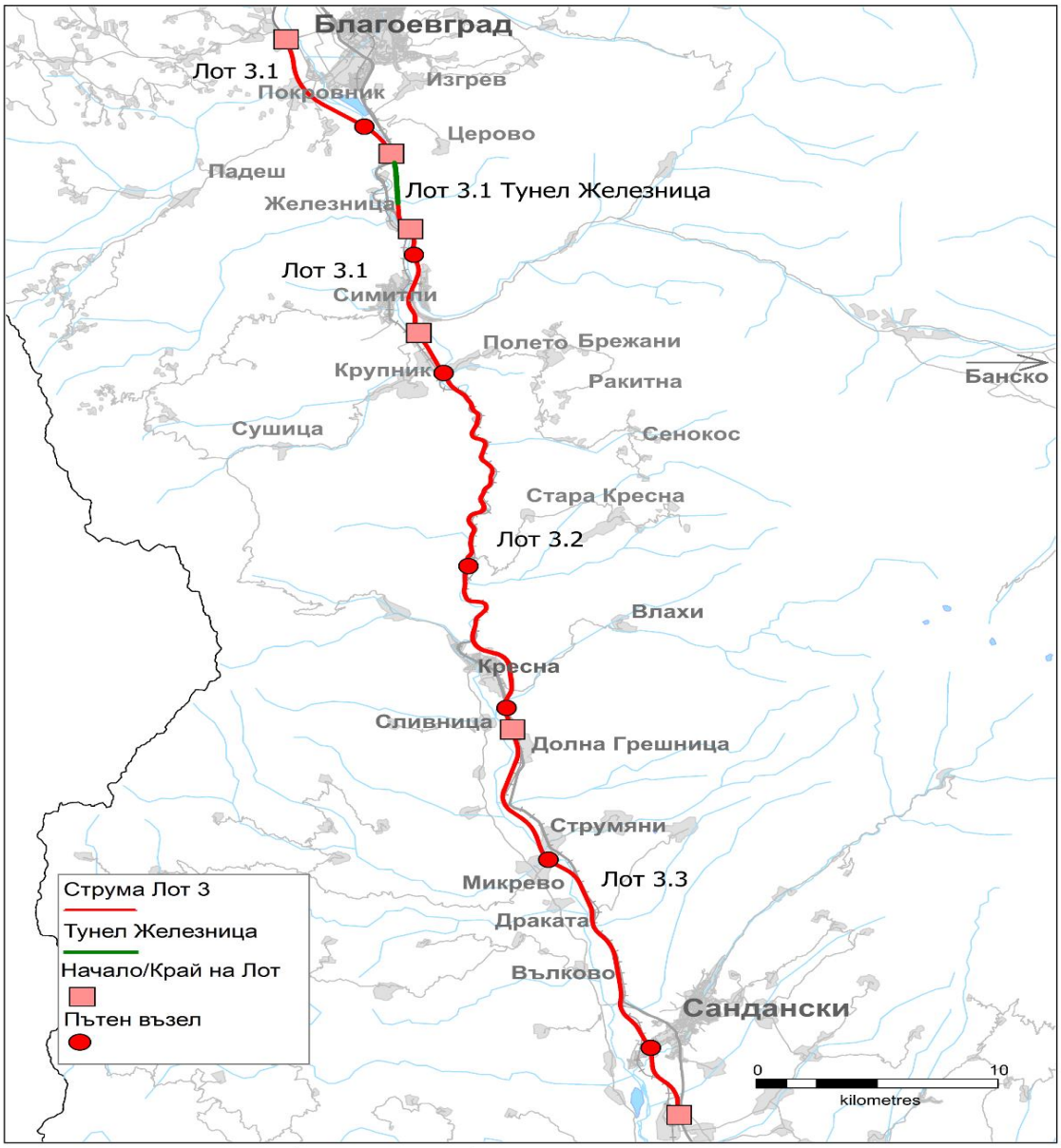



*Figure No. 1.A-1. Lot 3 of the "Struma" Motorway*

In physico-geographic terms - Lot 3 of Struma Motorway passes through the South Bulgarian Province, the Rila-Rhodope area, the Medium-Struma sub-area (according to Mishev, 1989).

The route of Lot 3 is situated in a sensitive region, from an environmental point of view. For its greater part the route passes close to the Struma River valley, within the land strip of the existing E79 road and the Sofia-Kulata railway line. The route intersects E79 and other republican and municipal roads, Rivers, railways, pipelines and others. The design routes pass through three valleys (of the towns of Blagoevgrad, Simitli and Sandanski) with a plain topography, and two mountain sectors.

In the area of the IP for the route of Lot 3.2 there are three Protected Areas within the meaning of the Protected Areas Act, which will be addressed in the Environmental Impact Assessment Report (EIAR). The protected territories are as follows :

- National protected site “Kresna Gorge”, declared a buffer zone of the “Tisata” Reserve with Order No. 130/22.02.1985 of the Chairman of EPC (SG, issue 24/ 1985), amended by Order No. 844/31.10.1991 (SG, issue 24/1985) of the Minister of Environment and with category changed to protected area by Order No. РД-56/ 30.01.2008 (SG, issue 29/2008) of the Minister of Environment and Water.

- the “Tisata”, reserve, declared by Decree No. 6663/5 December 1949 of the Ministry of Forests, Order No. 440 of 9 December 1977 (SG, isuue 6/20.01.1978) of EPC and Order No. 844 from 31 October 1991 (SG, issue 93/12.11.1991) of the ME for change of the land area;
- National protected site „Moravska”, declared a natural landmark by Order No.133 of EPC dated 22.02.1985 (SG, Issue 26/1985), re-classified into protected area by Order No. 727 from 28 September 1991 of the ME (SG, Issue 87 of 1991).

The route of Lot 3.2 passes through protected areas under NATURA 2000, as follows:

- Protected area „Kresna-Ilindentsi” (identification code BG0000366) –. Protected area under Directive 92/43/EEC on the conservation of natural habitats, and of wild fauna and flora (The Habitats Directive);
- Protected area „Kresna” (with identification code BG0002003) – defined by Directive 2009/147 / EC on the conservation of wild birds (the Birds Directive).

The considered Lot 3.2 in this updated Terms of Reference on the scope and content of the EIA, subject of investment proposal for "Improving the route of Lot 3.2 of Struma Motorway shall be the last road section to be constructed of the scope of the entire motorway route and is subject to the present procedure of EIA.

The design and construction of the investment proposal for the “Improving the route of Lot 3.2 of Struma Motorway” will be financed as a priority permissible activity under the Operational Programme “Transport and Transport Infrastructure”and also in the 2014 - 2020 programming period and also includes and the grace period. The construction will be implemented until 2023

## CHARACTERISTICS OF THE PROJECT ALTERNATIVES PROPOSED BY THE CONTRACTING AUTHORITY

**Variants G20 - blue and red**

The main part of the projected route in the two alternative variants G20 - blue and G20 - red have been developed for design speed Vdesign = 80 km / h and overall dimensions G20. The road lanes shall be developed independently of one another, by distancing itself and approximating each other in situational terms and with respect to their grade lines, and in some places the two lanes are comprised in one facility in two levels. This is aimed at maxumum utilization of the route of the existing road, minimum use of the adjacent terrains and economy of the solution

Where possible, the existing road is followed and used, and in other sections - tunnels and viaducts are envisioned. Where necessary, supporting walls have been provided.

From km 389 + 920 (right lane) and km 390 +200 (left lane) in order to maintain the boundaries of the existing road and avoid the protected area of "Kresna gorge" the traffic shall move on two levels or by another acceptable solution.

Technical elements for Vdesign=80 km/hour

- Overall dDimensions G20
- Maximum longitudinal inclination - 5 %
- Minimum longitudinal inclination - 0.5%
- Crosswise inclination in the line - - 2.5%
- Crosswise inclination in the curve - - pursuant to R
- Minimum radius of horizontal curves - 250 m
- Minimum radius of vertical curve
  - convex - 4,400 m
  - concave - 1,300 m
- Minimum radius of curves without transition - 1,500 m

The south part of the variants with overall dimensions G20 in the region of the town of Kresna, has been developed under significantly more favourable terrain conditions and with significantly lower possibility of impacting natural landscapes. Thus in a shorter section it transitions to a higher design speed and motorway dimensions, as follows:.

Technical elements for Vdesign=120 km/hour

- Overall dimensions A29
- Middle separation strip - 3,50 m
- Leading strips - 4 x 0,75 m
- Traffic lanes - 2 x 2 x 3,75 m
- Stopping strips - 2 x 2,50 m
- Banquettes - 2 x 1,25 m
- Minimum radius of horizontal curves - 720 m
- Minimum length of circular curves - 65 m
- Minimum radius of horizontal curves without transitional curves – 3,000 m
- Maximum longitudinal inclination - 4 %
- Minimum radius of convex vertical curves – 16,000 m
- Minimum radius of concave curves - 8 800 m
- Crosswise inclination in line - 2.5%

The following technical solutions regarding the situation of lanes on the road are proposed:

- The left lane shall follow the existing road;
- The right lane in separate cases is higher than the left lane and there is a batter or a wall between them .
- The right lane is upon the left lane, in three road sections.

The elevation of Lot 3.2 corresponds to the following requirements:

- Keeping the main technical parameters, corresponding to Vdesign;
- Providing smoothness and homogeneity of the route;
- Providing drainage of the road bed and the adjacent territories;
- Providing the necessary dimensions and heights at the intersection of agricultural and other roads of the national road network, railways;
- Providing permeability of maximum water quantities from the bridges at Rivers and water obstacles;
- Providing optimum balance of earth masses in excavations and embankments;
- The situating of elevation at the optimal height while using the existing road.

*The description of the design solutions for "Improving the route of Lot 3.2 of Struma Motorway and the level of detail of the data in the present Terms of Reference corresponds to the level of the study and design.*

The two project alternatives: Version G20 - blue and version G20 - red, pass through the Municipalities of Simitli and Kresna – district of Blagoevgrad.

**ALTERNATIVE G20 - BLUE**

The route starts south of the „Krupnik" road junction. In the Kresna gorge, one lane follows in its main part the existing Road E79 and the other develops on new terrain with tunnels and facilities in the western massif of the gorge. Upon the exit of the Kresna gorge passes east of the town of Kresna and ends at road junction „Kresna".

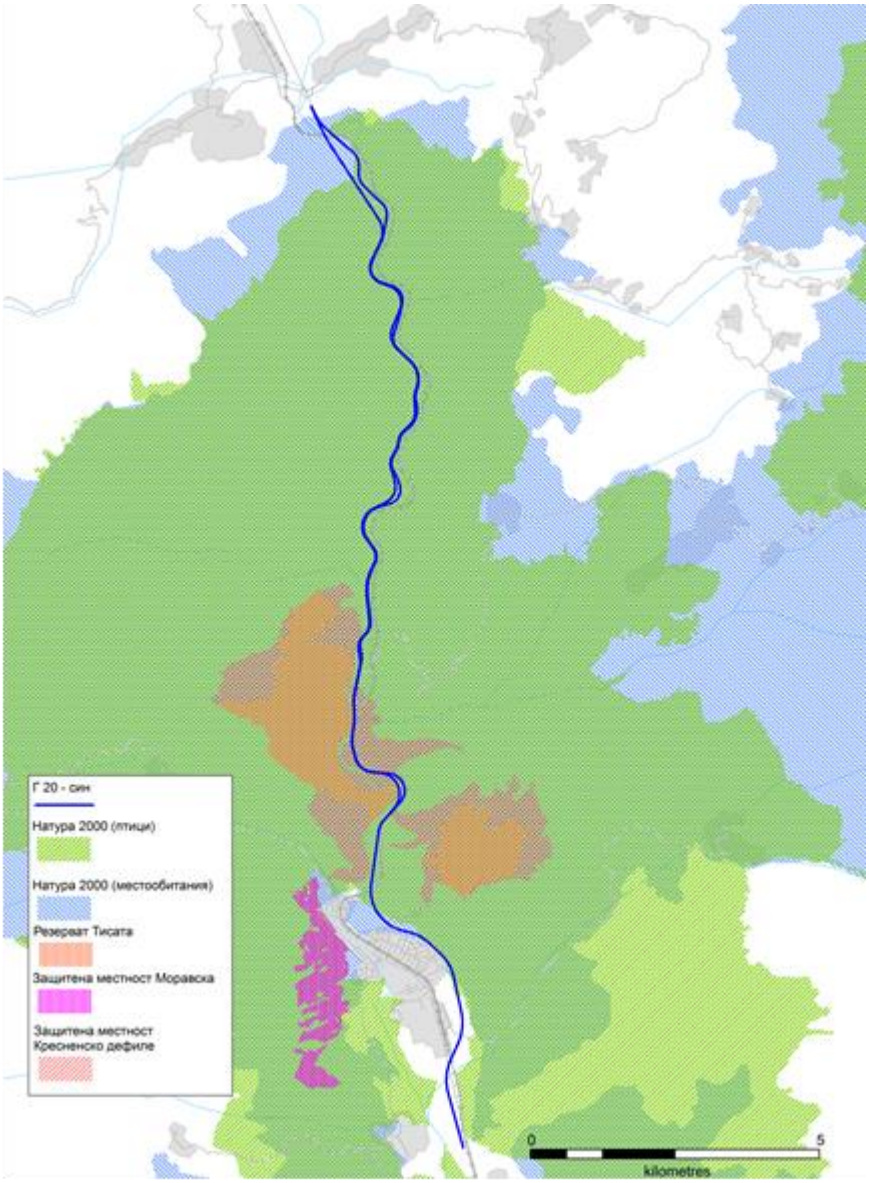



*Figure No. 1.A-2. Situation of alternative G20 - blue*

We enclose a situation plan of the project route, Alternative G20 - blue, on topographic map in scale M 1:25000 - Appendix No.2.

*The mileages in the left and right lane differ, given the fact that the routes have different parameters, curves and thus different lengths.*

In the section from km 378+600 to km 393+100 the two lanes are developed separately from one another, as they get closer or differ in situational and levelling aspect. Where possible, the existing road is followed and used, and in other sections - tunnels and viaducts are envisioned. In some cases support walls are envisaged toward the Struma River and the slopes.

**Left road lane:**

The beginning of the section considered is at km 378 +600 after the existing road junction "Krupnik", where the beginning of the Kresna gorge is. The route of the left lane, in its main part follows the existing road and uses the existing bridge over Struma River and the railway line from km 379+051 to km 379+271 and the existing road E79 to km 379+900. In the section from km 379+900 to km 380+800 the route leaves the existing Road E79 and enters a new route through two

bridges and two tunnels. From km 380+700 to km 382+500 the existing road and the existing bridges and tunnel are used. From 382+565 to km 382+735 a new tunnel is envisioned. From km 382+800 to km 384+700 the existing road is used, from km 384+740 to km 384+810 – new tunnel, from km 384+810 to km 388+360 the route again uses the existing road. From km 388+360 to km 388+480 a new tunnel is planned and after that the existing road will be used to km 393+100.

**Right road lane:**

It is developed on the right of the existing road and is entirely on a new terrain, as it situationally follows the left and in separate cases runs apart from it.. In respect of the levelling, it is frequently in a second, higher level from the left, in a trench or in a tunnel. At km 393+100 the two lanes again run parallel to each other and develop together to the end of the road section, as they run apart only in the case of tunnel solution.

The end of the road section is approximately 2.5 km before the town of Kresna, whereas leaving the existing road on the left bank of the Struma River, from km 394+050 to km 394+150 is bridged over, and from km 394+360 to km 394+565 again passes above the Struma River, the existing Road I-1 and the railway line „Sofia – Kulata". From km 394+565 to km 394+700 a new tunnel is envisioned, after which the Vlahinska River is crossed and the route surrounds from the north-east and east the town of Kresna.

At km 398+200 passes above the railway line „Sofia – Kulata", and at km 398+310 – above Road I-1.

At km 399+789 the route enters into Lot 3.3.

***Cross section***

*Section from km 378+600 to km 399+000.*

Accepted overall dimensions G20 for speed 80 km/h:

- Traffic lanes 2 x (2x3.50) m;
- Leading strips 2 x 0.50 m;
- Banquettes 2 x 1.50 m;
- Middle dividing strip 1 x 2.00м.

Total: 20 m

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

The overall dimensions in the road section becomes A29, the same as the overall dimensions in the other sections of the Struma Motorway

- 2x2 traffic lanes - -2x(2x 3.75) = 15.00 m
- 2x2 asphalted leading strips -2x(2x 0.75) = 3.00 m
- 2x2 emergency stopping lanes -2x2.50 = 5.00 m
- 2x1 banquette - 2x1.25 = 2.50 m
- middle dividing strip - 1x3.50 = 3.50 m

Total = 29.00 m

***Road surface***

The structure of the road surface is designed and calculated for "very heavy" traffic category, with required elasticity modulus - Ep = 370 MPa, preserving the homogeneity of the road surface in the preceding road 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

*Road junctions*

- Road junction Krupnik at km 377+700, after the end of Lot 3.1 – km 376+000
- Road junction Oshtava – at km 389+700
- Road junction Kresna – at km 398+882

No deep excavations and embankments, and no high embankments.

*Balance of earth masses*

The table below shows the amounts of the main types of work.

| | | |
|---|---|---|
| Excavation, not suitable for embankment | $m^3$ | 1 192 402.00 |
| Excavation, suitable for embankment | $m^3$ | 917 500.00 |
| Embankment | $m^3$ | 1 311 777.00 |
| Material for disposal | $m^3$ | 798 125.00 |

***The implementation of alternative G20 - blue is related to the construction and reconstruction of the following sites:***

Viaducts new - 3 075 m′, existing - 554 m′
Tunnels new - 7 345 m′ existing - 410 m′
Walls supporting walls new - 3 710 m′

***Large facilties***

Supporting and reinforcing walls

| No. | From km to km | | Clarifications text | Side (left, right) | Length (m) |
|---|---|---|---|---|---|
| 1 | 383+000 | 383+200 | new, left road lane | Left | 200 |
| 2 | 383+420 | 383+600 | new, left road lane | Left | 180 |
| 3 | 384+900 | 385+100 | new, left road lane | Left | 200 |
| 4 | 385+200 | 385+300 | new, right road lane | Left | 100 |
| 5 | 385+350 | 385+400 | new, left road lane | Left | 50 |
| 6 | 385+420 | 385+520 | new, right road lane | Left | 100 |
| 7 | 385+520 | 385+570 | new, right road lane | Left | 50 |
| 8 | 385+570 | 385+620 | new, right road lane | Left | 50 |
| 9 | 385+850 | 385+950 | new, left road lane | Left | 100 |
| 10 | 386+620 | 386+720 | new, right road lane | Left | 100 |
| 11 | 386+720 | 386+770 | new, right road lane | Left | 50 |
| 12 | 387+250 | 387+350 | new, left road lane | Left | 100 |
| 13 | 387+300 | 387+720 | new, right road lane | Left | 420 |
| 14 | 387+350 | 387+500 | new, left road lane | Left | 150 |
| 15 | 387+720 | 387+900 | new, right road lane | Left | 180 |
| 16 | 387+900 | 387+990 | new, right road lane | Left | 90 |
| 17 | 385+490 | 385+610 | new, left road lane | Right | 120 |
| 18 | 388+850 | 388+950 | new, left road lane | Left | 100 |
| 19 | 388+950 | 389+100 | new, left road lane | Left | 150 |
| 20 | 389+040 | 389+120 | new, right road lane | Left | 80 |
| 21 | 389+290 | 389+330 | new, left road lane | Right | 40 |

| No. | From km to km | | Clarifications text | Side (left, right) | Length (m) |
|---|---|---|---|---|---|
| 22 | 390+340 | 390+390 | new, right road lane | Right | 50 |
| 23 | 390+390 | 390+480 | new, right road lane | Right | 90 |
| 24 | 390+480 | 390+530 | new, right road lane | Right | 50 |
| 25 | 390+530 | 390+640 | new, right road lane | Right | 110 |
| 26 | 390+640 | 390+850 | new, right road lane | Right | 210 |
| 27 | 391+470 | 391+550 | new, right road lane | Right | 80 |
| 28 | 392+900 | 392+950 | new, left road lane | Left | 50 |
| 29 | 395+555 | 395+565 | new, left road lane | Right | 10 |
| 30 | 395+565 | 395+630 | new, left road lane | Right | 65 |
| 31 | 395+630 | 395+670 | new, left road lane | Right | 40 |
| 32 | 395+670 | 395+820 | new, left road lane | Right | 150 |
| 33 | 395+885 | 395+925 | new, left road lane | Right | 40 |
| 34 | 395+975 | 396+050 | new, left road lane | Right | 75 |
| 35 | 396+665 | 396+685 | new, left road lane | In the middle | 20 |
| 36 | 396+725 | 396+785 | new, left road lane | In the middle | 60 |

Viaducts

| No. | From km to km | | Clarifications text | Side left/right | Length (m) |
|---|---|---|---|---|---|
| 1 | 379+040 | 379+180 | new | Right | 140 |
| 2 | 379+051 | 379+261 | existing, milling, re-coating | Left | 210 |
| 3 | 380+400 | 380+445 | new | Left | 45 |
| 4 | 380+620 | 380+720 | new | Left | 100 |
| 5 | 381+020 | 381+130 | existing, milling, re-coating | Left | 110 |
| 6 | 381+220 | 381+320 | existing, milling, re-coating | Left | 100 |
| 7 | 389+920 | 390+140 | new | Right | 220 |
| 8 | 390+210 | 390+344 | existing, milling, re-coating | Left | 134 |
| 9 | 392+195 | 392+585 | new | Right | 390 |
| 10 | 392+650 | 392+900 | new | Left | 250 |
| 11 | 394+050 | 394+150 | new | left/right | 100 |
| 12 | 394+340 | 394+530 | new | left/right | 190 |
| 13 | 394+750 | 394+970 | new | left/right | 220 |
| 14 | 395+160 | 395+320 | new | left/right | 160 |
| 15 | 395+965 | 395+975 | new | left/right | 10 |
| 16 | 396+115 | 396+250 | new | left/right | 135 |
| 17 | 398+200 | 398+350 | new | left/right | 150 |

Overpasses, underpasses, inter passes

| No. | km | Clarifications text | Side | Length (m) |
|---|---|---|---|---|

| | | | left/right | |
|---|---|---|---|---|
| 1 | 379+482 | the existing inter pass of L=4 m, milling, re-coating | Left | 4 |
| 2 | 396+555 | new inter pass of L=6 m, | left/right | 6 |
| 3 | 396+860 | new inter pass of L=6 m, | left/right | 6 |
| 4 | km 397+383<br>km 397+403 | new skewed underpass with L=20 m, | left/right | 20 |
| 5 | km 397+914<br>km 397+926 | new skewed underpass with L=12 m, | left/right | 12 |
| 6 | km 398+830 | new underpass with L=24 m, | left/right | 24 |
| 7 | km 389+950 | new skewed overpass with L=36 m, | left/right | 36 |

Tunnels

| No. | From km to km | | Clarifications text | Side (left, right) | Length (m) |
|---|---|---|---|---|---|
| 1 | 379+180 | 380+350 | new | Right | 1170 |
| 2 | 379+930 | 380+340 | new | Left | 410 |
| 3 | 380+455 | 380+455 | new | Left | 125 |
| 4 | 380+520 | 380+800 | new | Right | 280 |
| 5 | 381+130 | 381+200 | existing | Left | 70 |
| 6 | 380+950 | 381+020 | new | Right | 70 |
| 7 | 382+035 | 382+095 | new | Right | 60 |
| 8 | 382+565 | 382+735 | new | Left | 170 |
| 9 | 382+300 | 382+580 | new | Right | 280 |
| 10 | 382+740 | 383+220 | new | Right | 480 |
| 11 | 384+150 | 384+690 | new | Right | 540 |
| 12 | 384+740 | 384+810 | new | Left | 70 |
| 13 | 385+300 | 385+420 | new | Right | 120 |
| 14 | 385+890 | 386+570 | new | Right | 680 |
| 15 | 386+370 | 386+710 | existing | Left | 340 |
| 16 | 386+955 | 387+155 | new | Right | 200 |
| 17 | 387+995 | 388+195 | new | Right | 200 |
| 18 | 388+360 | 388+480 | new | Left | 120 |
| 19 | 388+220 | 388+310 | new | Right | 90 |
| 20 | 388+910 | 389+040 | new | Right | 130 |
| 21 | 394+565 | 394+700 | new, two-way | Left | 135 |
| 22 | 394+750 | 395+000 | new | Left | 250 |
| 23 | 395+420 | 395+510 | new, two-way | Left | 90 |
| 24 | 396+665 | 396+785 | new | Left | 120 |
| 25 | 396+685 | 396+725 | new | Right | 40 |

Bridges

| No. | At km | Clarifications text | Side left/right | Length (m) |
|---|---|---|---|---|
| 1 | 386+030 | existing | Left | 8 |
| 2 | 388+493 | new | Left | 6 |
| 3 | 397+043 | new | Left | 6 |
| 4 | 398+560 | new | Left | 20 |
| 5 | 399+135 | new | Right | 10 |

| No. | At km | Clarifications text | Side left/right | Length (m) |
|---|---|---|---|---|
| 6 | 399+610 | new | Right | 10 |

Alternative G20 - blue, passes through the municipalities of Simitli and Kresna – district of Blagoevgrad.

The construction will be implemented until 2023

**ALTERNATIVE G20 - RED**

The route starts south of the „Krupnik" road junction. In the Kresna gorge, one lane follows in its main part the existing Road E79 and the other develops on new terrain with tunnels and facilities in the western massif of the gorge. Upon the exit of the Kresna gorge passes east of the town of Kresna and ends at road junction „Kresna".

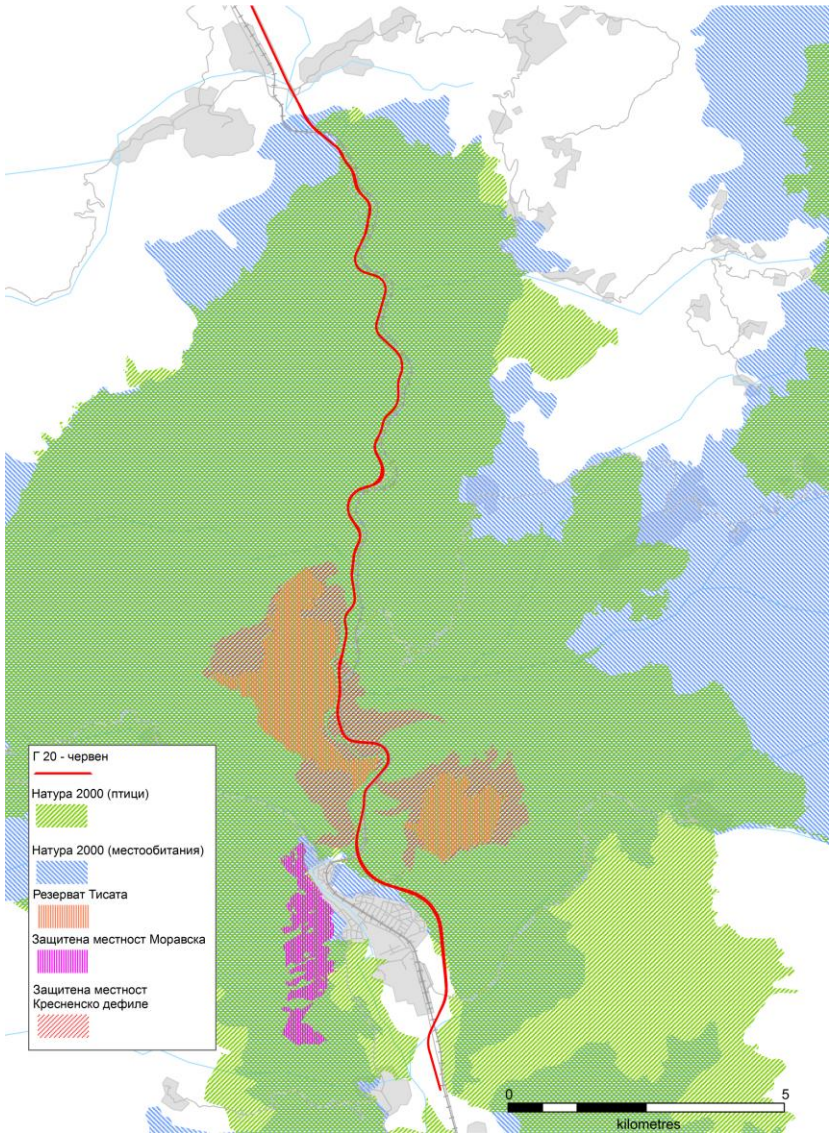



*Figure No. 1.A-3. Situation of alternative G20 - red*

We enclose a situation plan of the design route, **Alternative G20 - red**, on topographic map in scale M 1:25000 - Appendix No.3.

Km 376+000 marks the end of Lot 3.1 and the beginning of Lot 3.2.

The route of Alternative G20 – red for the Lot 3.2 of Struma Motorway is developed on the right of and parallel to the existing road and passing to the east of the Krupnik village. From km 376+400 to km 377+000 resting sites on both lanes of Struma Motorway are planned. At km 377 + 480 (left) - a control center of the motorway is envisaged and the access to it will be via the existing road I-1, which in this road section remains unchanged and connects to the road junction Krupnik at km 378+450. The existing road I-1 will be reconstructed in the road section of the resting sites, on the east.

In the road section from km 378+035 up to km 378+185 a new bridge will be constructed over Struma River. The leveling in the section at km 376+000 conforms with the leveling at the end of Lot 3.1; further it lowers and follows the leveling of I-1 road. In the road section of Struma River, it will take into account the high waters of the River.

The overall dimensions in the road section from km 376+000 to km 378+450 is the motorway dimension – A29.

The switch to the „speed road" = 80 km/h with two independent lanes is at km 378+450 (road junction Krupnik).

***Left road lane***

From km 378+450 to km 380+200, the left lane follows the track and the level of the existing road, by using the existing bridges of Rezena River and Struma River, also passing over the „Sofia – Kulata" railway line.

From km 380+190 to km 380+340, a new bridge is envisaged over the Struma River, from km 380+400 up to km 380+520 - a new tunnel, parallel to railway tunnel and again a new bridge over the Struma River (from km 380 + 570 to km 380 + 750), then switches to the existing road, by using the existing two bridges and a tunnel. The approaches to the camps of the community practising extreme water sports – kayaking and rafting are planned at km 381+000 and km 381+260. From km 381+400 to km 385+800 the left lane follows the existing road, with only a few small exceptions.

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 inn „Kresnensko hanche". The construction of road junction „Oshtava" is planned at km 389+950.

***Right road lane***

It is developed on new territories, on the right side of the existing road via new bridges over the Rezena River (km 378+520), Struma River and Sofia-Kulata railway line (from km 379+025 to km 379+225).

In the road section from km 379 +900 up to km 380 + 230 ((using the mileage nomenclature of the left lane), the right lane develops next to the left and passes to the right over it, and then again descends to the same level with the left lane from its right side and via a succession of four new bridges and two new tunnels reaches up to km 381 + 400. In the road section from km 384 +300 to km 385 + 800, the left lane follows the existing road, which winds significantly and and the right lane, developed in right slope, uplifts in leveling aspect compared to the left lane. 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) to km 387+470. Further the two lanes develop in parallel to km 387+960, where the right lane passes in the slope above the left lane. From km 388 +000 to km 388 + 820 (using the mileage nomenclature of the left lane) the road is planned again in two levels, i.e. the right lane above the left lane. Then the right lane runs in parallel and adjacent to the left lane up to km 390 +000, where the road junction Ostrava is planned, which connects the village of Oshrava with the village of Stara Kresna. The lane runs to the right (west) of the existing road and at higher elevation; the lane is on the right, on the slope and the plateau above it without touching the existing road. The two lanes are completely independent and have two separate and different levelling. Access roads to Struma River for exit of the people, descending the River with kayaks and rafting, are planned.

***Road section from km 390+000 to km 393+000.***

The existing road runs through the protected area "Kresna gorge".

The project routes of blue and red Alternative, falls entirely within the scope of the existing road, according to geodesic survey performed in 2016 and the removal of obvious factual error.

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

The road section starts just before the town of Kresna, bypasses the town on the east, where the two lanes are developed together in terms of situation and leveling, with overall dimensions G20.

From km 393+100 to km 393+800, the motorway develops around and on the existing road, with the two lanes running parallel to one another.

From km 393+900 to km 394+200 and from km 394+350 to km 394+620, the road crosses Struma River twice.

Around km 394+580 the road crosses Road I-1 and Sofia-Kulata railway line, thereafter from км 394+750 to km 394+950 crosses Vlakhinska River and proceeds on its left bank.

After km 395+800 three tunnels are envisaged:

- The first - with length 400 m;
- The second - with length 200 m;
- The third - with length 240 m.

After the last tunnel, a viaduct with length 630 m is planned up to km 397+650. After passing Kresna Town the route continues in southern direction.

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

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

***Dimensions of the route***

*Overall dimensions G20*

***The road section from km 378+300 up to km 399+350 is planned to be built with G20***

- 2 x 2 traffic lanes 2 x (2 x 3.25) = 13.00 m
- 2 x 2 asphalted leading lanes 2 x (2 x 0.5) = 2.00 m
- 2 x 1 banquette 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 road section from km 376+000 to km 378+000, and from km 399+300 to km 399+979 ≡ km 397+600, the dimension is A29, just as the dimensions in the other sections of Struma Motorway***

- 2 x 2 traffic lanes 2 x (2 x 3.75) = 15.00 m
- 2 x 2 asphalted leading lanes 2 x (2 x 0.75) = 3.00 m
- 2 x 2 emergency stopping lanes 2 x 2.50 = 5.00 m
- 2 x 1 banquette 2 x 1.25 = 2.50 m
- Middle dividing strip 1 x 3.50 = 3.50 m

**Total = 29.00 m**

***Road surface***

*1. Direct route*

The structure of the road surface is designed and calculated for "very heavy" traffic category, with required elasticity modulus - Ep = 370 MPa, preserving the homogeneity of the road surface in the preceding 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) 24.0см

2. *Roads of the National Road Network*
   - Asphalt mix for wearing 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 mix for wearing layer „A" 4.0 cm
   - Asphalt mix for bottom layer (binder) 0/22 6.0 cm
   - Crushed stone with selected grain size (0-63mm) 35.0 cm;

***Road junctions***

Three road junctions need to be constructed for the sake of trouble-free crossing:

- Road junction Krupnik – km 378+423
- Road junction Oshtava – on Road IV-10063 to Stara Kresna village and Oshtava village - km 389+940
- Road junction Kresna – on Road I-1 to the town of Kresna and the town of Kulata - km 398+975
- Entry in and exit junction from "speed road" to road I-1 (connection to the town of Kresna) - connections for entry in and exit from the speed road for directions Sofia - Kresna and Kresna - Sofia will be constructed - approximately at km 393+600

***Road connections***

- Road connection from Road I-1 to the control centre at km 377+480 of Struma Motorway
- Road connection to gas-station at km 379+082 (379+085)
- Road connections to rafting site at km 381+000 and km 381+260
- Road connection to the resting area (left lane) from km 387+660 to km 388+000
- Road connections to 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 access roads shall be provided for the exit of participants in extreme sports along Struma River at km 383+000 and km 386+000.

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

Motorway crossings new – 3000 m′;
Viaducts new - 1165 m′;
Tunnels new – 2,892 m′, existing - 410 m′
Walls - supporting – 8140 m′

***Large facilties***

Viaducts, motorway crossings

| No. | From km to km | | Clarifications text | Road lane left/right | Length (m) |
|---|---|---|---|---|---|
| 1. | 386+680 | 387+460 | New motorway crossing on two levels, right lane above the left lane, overall dimensions G10,49 | Right | 780 |

| No. | From km to km | | Clarifications text | Road lane left/right | Length (m) |
|---|---|---|---|---|---|
| 2. | 388+000 | 388+820 | New motorway crossing on two levels, right lane above the left lane, overall dimensions G10, 50 | Right | 820 |
| | 392+791 (392+580) | 392+930 (393+080) | A new viaduct, overall dimensions G10.50, left and right lanes with different length. Distance in km and length of the right lane - in brackets. | left/right | 139 (422) |
| 3. | 390+100 | 392+300 | New motorway crossing on two levels, right lane above the left lane, overall dimensions G10, 50 | Right | 2200 |
| 4. | 398+392 (398+681) | 398+375 (398+690) | New viaduct on road I-1, railway line Sofia-Kulata and Sulunsko dere River, Overall dimensions: left lane 16.65 m; right lane - 11.15 m. Left and right lane of different length. Distance in km and length of the right lane - in brackets. Distance in km and length of the right lane - in brackets. | left/right | 289 (315) |

Overpasses, underpasses, inter passes

| No. | Mileage km | Clarifications text | Road lane left/right |
|---|---|---|---|
| 1 | 376+183 | Agricultural Road, overall dimensions G29 | left/right |
| 2 | 378+423 | Road overpass /road junction Krupnik/ Designing a new road junction Krupnik - overpass over Struma Motorway, overall dimensions G29 /including 2 gateways x 3.5 m/ | left/right |
| 3 | 379+180 | **Agricultural underpass, Overall dimensions G10.50** | |
| 4 | 389+940 | Road overpass /road junction Oshtava/ Designing a new road junction Oshtava - overpass over Struma Motorway, overall dimensions G20-blue + 2 gateways 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=31 m /2 x G10.50/ | left/right |
| 8 | 397+340 | Agricultural underpass Overall 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 /road junction Kresna/ Designing a new road junction Kresna - underpass under Struma Motorway, overall dimensions L=22m | left/right |
| 12 | 399+374 | Agricultural underpass, Overall dimensions G29 | left/right |

Tunnels

| No. | From km to km | | Clarifications text | Tunnel tube left/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+170 | Existing „Zaichar”, Overall dimensions G10.50 | Left | 70 |
| 4 | 381+111.50 | 381+149.45 | New - „Zaichar”, Overall dimensions G10.50 | Right | 38 |
| 5 | 386+325. | 386+665 | Existing - „Chervena skala”, Overall | Left | 340 |

| No. | From km to km | | Clarifications text | Tunnel tube left/right | Length (m) |
|---|---|---|---|---|---|
| | | | dimensions G10.50 | | |
| 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 |

Bridges

| No. | From km to km | | Clarifications text | Road lane left/right | Length (m) |
|---|---|---|---|---|---|
| 1 | 378+049 | 378+188 | New bridge over Struma River, Overall dimensions G29 | left/right | 139 |
| 2 | 378+504 | 378+531 | New bridge over Rezena River, Overall dimensions G29 /including two gateways x 3.5m/ | left/right | 27 |
| 3 | 379+046 | 379+264 | Existing bridge over Struma River and Sofia-Kulata railway line, road lane, overall dimensions G12 | Left | 167 |
| 4 | 379+037 | 379+260 | New bridge over Struma River and Sofia-Kulata railway, overall dimensions G12 | Right | 223 |
| 5 | 380+168 | 380+420. | New bridge over Struma River, Overall dimensions G10.50 | Right | 252 |
| 6 | 380+180 | 380+345 | New bridge over Struma River, Overall dimensions G10.50 | Left | 165 |
| 7 | 380+568 | 380+679 | New bridge over Struma River, Overall dimensions G10.50 | Left | 111 |
| 8 | 380+560 | 380+748 | New bridge over Struma River, Overall dimensions G10.50 | Right | 188 |
| 9 | 380+973 | 381+077 | Existing bridge over Struma River, road lane, overall dimensions G12 | Left | 104 |
| 10 | 380+971 | 381+083 | New bridge over Struma River, Overall dimensions G10.50 | Right | 112 |
| 11 | 381+175 | 381+259 | Existing bridge over Struma River, overall dimensions G12 | Left | 84 |
| 12 | 381+176 | 381+256 | New bridge over Struma River, Overall dimensions G10.50 | Right | 80 |
| 13 | 385+990 | 386+000 | New bridge L=10m, overall dimensions G10.50 | Right | 10 |

| No. | From km to km | | Clarifications text | Road lane left/right | Length (m) |
|---|---|---|---|---|---|
| 14 | 390+151 | 390+296 | Existing bridge over Struma River, overall dimensions G10.50 - to the motorway crossing in two levels | Left | 145 |
| 15 | 393+966 | 394+495 | New bridge over Struma River, Overall dimensions G10.50 | Left | 529 |
| 16 | 393+959 | 394+508 | New bridge over Struma River, Overall dimensions G10.50 | Right | 553 |
| 17 | 394+820 | 394+959 | New bridge over Vlahinska River, Overall dimensions G10.50 | Left | 139 |
| 18 | 394+800 | 394+938 | New bridge over Vlahinska River, Overall dimensions G10.50 | Right | 138 |

Supporting walls

- Supporting walls of reinforced concrete:

| No. | Km situation | | L (m) | Hav (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 road lanes |
| 3 | 380+150 | 380+170 | 20 | 2.0 | left road lane - left |
| 4 | 380+345 | 380+370 | 25 | 4.0 | right road lane - right |
| 5 | 380+410 | 380+430 | 20 | 4.0 | right road lane - right |
| 6 | 380+670 | 380+710 | 40 | 4.0 | left road lane - left |
| 7 | 380+765 | 380+810 | 45 | 7.0 | between the two road lanes - under the embankment |
| 8 | 380+950 | 380+990 | 40 | 8.0 | between the two road lanes |
| 9 | 381+085 | 381+095 | 10 | 6.0 | right road lane - left |
| 10 | 381+570 | 381+670 | 100 | 6.5 | left road lane - left |
| 11 | 381+890 | 382+070 | 180 | 5.5 | left road lane - left |
| 12 | 382+170 | 382+490 | 320 | 5.0 | left road lane - left |
| 13 | 382+750 | 382+835 | 85 | 4.5 | left road lane - left |
| 14 | 382+870 | 382+970 | 100 | 9.0 | between the two road lanes |
| 15 | 382+990 | 383+070 | 80 | 3.0 | left road lane - left |
| 16 | 383+350 | 383+610 | 260 | 6.5 | left road lane - left |
| 17 | 384+370 | 384+450 | 80 | 2.0 | between the two road lanes |
| 18 | 384+990 | 385+110 | 120 | 9.0 | between the two road lanes |
| 19 | 385+150 | 385+250 | 100 | 10.0 | between the two road lanes |
| 20 | 385+350 | 385+450 | 100 | 4.5 | left road lane - left |
| 21 | 385+470 | 385+570 | 100 | 10.0 | between the two road lanes |
| 22 | 385+630 | 385+710 | 80 | 5.0 | left road lane - left |
| 23 | 385+750 | 385+930 | 180 | 7.0 | left road lane - left |
| 24 | 386+670 | 386+690 | 20 | 10.0 | between the two road lanes |
| 25 | 387+490 | 387+710 | 220 | 7.8 | between the two road lanes |
| 26 | 387+570 | 387+690 | 120 | 5.0 | left road lane - left |
| 27 | 388+510 | 388+610 | 100 | 4.0 | Left L |
| 28 | 388+770 | 388+810 | 40 | 10.0 | between the two road lanes L |
| 29 | 388+950 | 389+090 | 140 | 7.0 | left road lane - left |
| 30 | 389+090 | 389+190 | 100 | 3.0 | between the two road lanes 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 road lanes |
| 35 | 392+690 | 392+790 | 100 | 10.0 | between the two road lanes |
| 36 | 392+930 | 393+070 | 140 | 3.0 | between the two road lanes L |
| 37 | 393+810 | 393+830 | 20 | 5.0 | right - under embankment |
| 38 | 397+810 | 397+840 | 30 | 2.0 | left road lane - left |
| 39 | 397+860 | 397+920 | 60 | 3.5 | left road lane - left |

| Road junctions | | | | | |
|---|---|---|---|---|---|
| **Road junction Oshtava - connection 5** | | | | | |
| 1 | 10 | 280 | 270 | 3.0 | Right |
| **Poad connection with Road I-1 at km 394+004** | | | | | |
| 1 | 40 | 300 | 260 | 3.5 | Right |
| **Road connection with rafting site, at km 381+000** | | | | | |
| 1 | 70 | 150 | 80 | 2.5 | Left |

- Reinforcede embankment walls

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

- Anchored walls

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

| | | | | | |
|---|---|---|---|---|---|
| | | | | | lanes |

- Reinforcing walls

| No. | Km situation | | L (m) | Hav (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 |

***Organization of the implementation of the project alternative - Alternative G20 - red***

The design solution proposes construction of multiple short tunnels at much lower construction cost, allowing for their simultaneous construction in shorter terms. The division of the road lanes provides for accident-free and conflict-free traffic, with continuous traffic in one of the lanes while the other is under construction and vice-versa.

The separation of the road lanes allows also to phase the construction, if necessary.

At the same time the development of both road lanes allows quick switching of the traffic between the lanes, which provides for the temporary organization of the construction works of Lot 3.2, as well as temporary organization of the road's operation, namely traffic detour in cases of traffic accidents, natural disasters and others.

The alternative, developed for Vdes = 80 km/hour of the left lane, allows for maximum utilization of the existing road.

The right lane is to be constructed separately in close proximity to the left, allowing for minimum earthworks and maximum alignment with the terrain.

The maximum use of the existing road (by the left lane), the maximum use of the land and the development of the right lane to the left as a succession of tunnels and viaducts will allow maximum alignment with the surrounding terrain.

***Technology of construction***

*Stage I*

Construction of right lane:

Constructed on an entirely new terrain, and the traffic shall be carried out along the existing road. Reaching the new terrain will be ensured through the existing road along the new road sections abandoned at its reconstruction. These unused road sections will act as construction sites in front of the tunnels and viaducts.

*Stage II*

Construction of left lane:

The traffic will be transferred to the newly built right lane - a two-way traffic and the left lane will be constructed, using to a maximum extent the existing road that will be closed.

The construction of tunnels will be carried out in the classical manner with drilling and blasting works and concrete lining. In the shorter tunnels, ventilation and fire-fighting equipment will not be required, only lighting installation.

In the section, where the second road lane will be constructed over the first road lane, short-term redirection of traffic may be required to the bypass route. The impact of the redirecting on all components will be explored in detail in the EIAR.

Alternative G20 - red, passes through the municipalities of Simitli and Kresna – district of Blagoevgrad.

The construction will be implemented until 2023

**EAST ALTERNATIVE G 10.50**

The design solution from 2016 proposes the construction of two separate independent lanes, with the possibility of their simultaneous execution in shorter terms. The division of the road lanes provides for accident-free and conflict-free traffic, with continuous traffic in one of the lanes while the other is under construction and vice-versa.

For the right road lane (two lanes) it is planned a rehabilitation and strengthening of the existing Road E79 with the implementation of measures to protect biodiversity and an Eastern bypass of the town of Kresna and the left road lane – new design solution, (two lanes) - eastwards away from the Kresna Gorge.

The separated lanes shall require crosswise connections between them when changing the traffic direction and redirection of traffic in cases of road accidents, natural disasters and others.

The developed alternative for the right lane allows for maximum use of the existing road E79, without increasing its scope, and before the town of Kresna has been projected a town bypass from the east along a new route.

The left lane is to be performed independently on a new terrain, east of the Kresna Gorge, by construction of tunnels and viaducts.

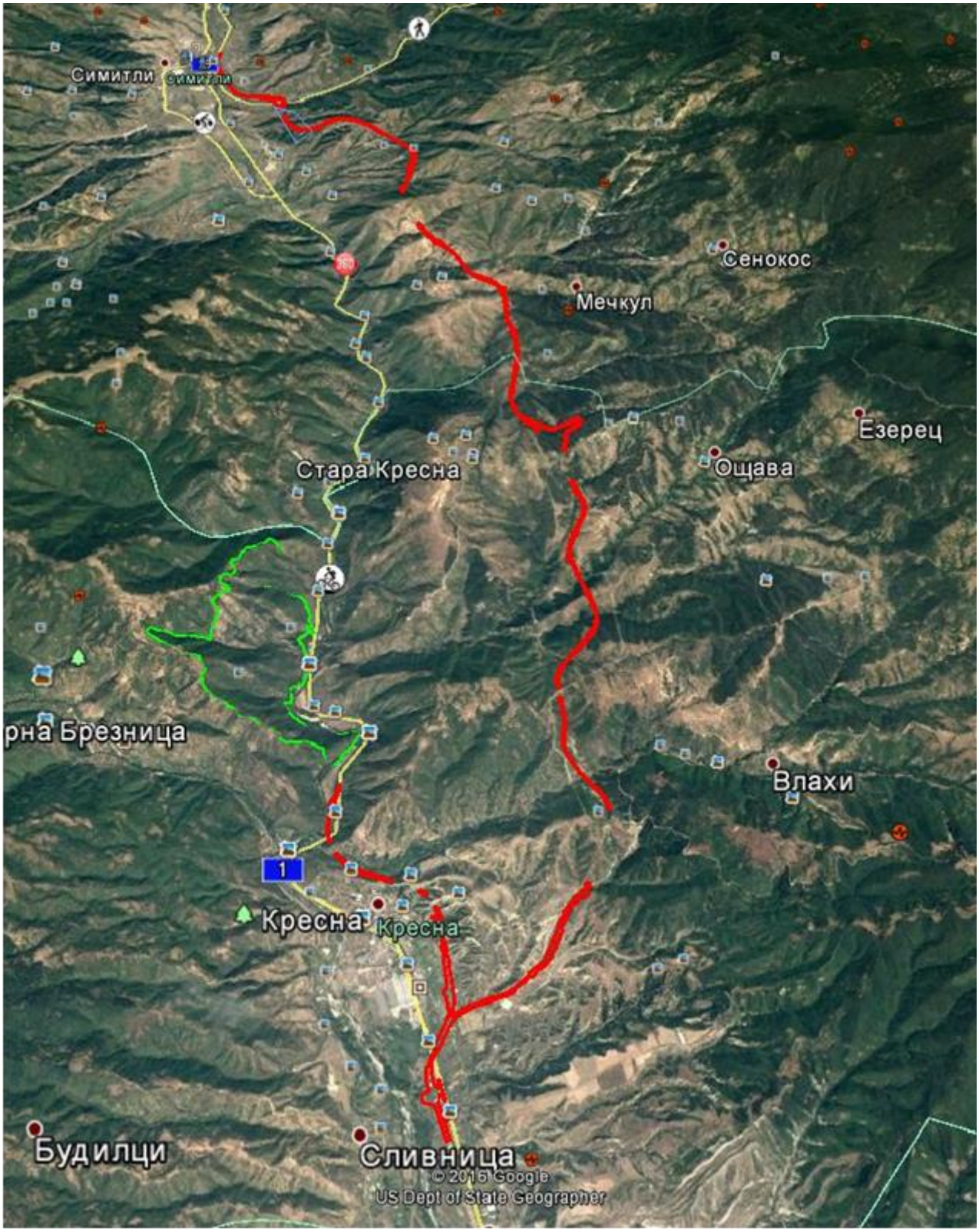



***Figure No. 1.A-4. Situation of Alternative G 10.50***

We enclose a situation plan of the design route, **East Alternative G 10.50 -**, on topographic map in scale M 1:25000 - Appendix No.4.

***Road route***

The design route shall be developed as two separate lanes of overall dimensions 7/10.50 for Vdesign=80 km/hour.

The two lanes will be developed independently from one another, where one of the lanes will use the existing road in its entirety and the other lane will be on a new terrain, thereby necessary to provide tunnels, viaducts, supporting walls and anchored embankments.

***Technical solution***

- Design speed - Vdes=80 km/hour
- Maximum longitudinal inclination - 6 %
- Minimum longitudinal inclination - 0.5%
- Crosswise inclination in the line - - 2.5%
- Crosswise inclination in the curve - - pursuant 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 R=- 1,500 m

***Dimensions 10.50***

- Traffic lanes - 2 x 3.50 m;
- Third lane for slow-moving vehicles - 1 x 3.00 m;
  - from km 390+500 to km 385+200.
  - km 392+500 to km 399+100.
- Leading strips (concrete-asphalt mixture) - 2 x 0.25 m;
- Banquettes 2 x 1.50 m;
- Excavations
- Protective facilities
- Slopes

Regarding the construction of tunnels apart from the main pipe it is provided to design a second one that performs the function of an emergency tunnel pipe.

***Longitudinal profile***

The right road lane follows the existing road E79 and its levelling.

The left lane is developed on a new terrain and follows its peculiarities.

The levelling of the motorway corresponds to the following requirements:

✓ Observing the main technical parameters, corresponding to Vdesign;

✓ Providing smoothness and homogeneity of the route;

✓ Providing drainage of the road bed and the adjacent territories;

✓ Providing the necessary dimensions and heights at the intersection of agricultural and other roads of the national road network, railway lines;

✓ Providing permeability of maximum water quantities from the bridges at Rivers and water obstacles;

✓ Providing optimum balance of earth masses in excavations and embankments;

✓ Situation of levelling at the optimal height while using the existing road.

***Road surface***

*Direct route*

The structure of the road surface is designed and calculated for “very heavy” traffic category, with the required elasticity modulus - Ep = 370 MPa, preserving the homogeneity of the road surface in the preceding 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 (0-63 mm) - 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 grain size (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 grain size (0-63mm) – 35 cm;

***Right road lane***

From the end of Lot 3.1, the route follows the existing road, passes through the town of Simitli and then develops on the existing road through the Kresna Gorge, as the two lanes are in the direction to the Republic of Greece. The road lane being constructed by rehabilitation of the currently existing one with the implementation of measures to protect biodiversity, not leaving the current range of E79 until to the town of Kresna, where it leaves the existing road and on a new route similar to Alternative G20 - red bypasses the populated place from the east, and reaching 3.3 Lot.

The new construction (eastern bypass of the town of Kresna) starts after km 393 +600, as after km 394 +500 the route has develops in an easterly direction to km 396 +000, passing through four tunnels that set a path into the rock pyramids on the eastern periphery of the town of Kresna. Then the road continues in southerly direction and by an wide arc is included in just before the viaduct at road junction "Kresna" at km 400+ 371.81. The new construction of the town detour includes construction of viaducts, tunnels, bridges and others facilities.

***The new construction of the bypass of the town of Kresna (after provided rehabilitation on the right road lane) includes the construction of the following facilities:***

Bridges 2 pcs. - 687 m;
Viaducts 1 pc. - 387 m′;
Tunnels 4 pcs. - 1266 m′;
Supporting walls 245 m′.

***Large facilties***

- Tunnels

| from km | to km | length (m) |
|---|---|---|
| 394+544 | 394+787 | 243 |
| 395+628 | 396+081 | 453 |
| 396+162 | 396+412 | 250 |
| 396+568 | 396+888 | 320 |
| ***TOTAL*** | | ***1266*** |

- Bridges

| from km | to km | length (m) | type of facility |
|---|---|---|---|
| 393+959 | 394+508 | 549 | New bridge over Struma River |
| 394+800 | 394+938 | 138 | New bridge over Vlahinska River |
| ***TOTAL*** | | ***687*** | |

- Viaducts

| from km | to km | Length (m) | Average height (m) |
|---|---|---|---|
| 399+700 | 400+010 | 387 | 10.0 |
| **TOTAL** | | **387** | |

- Overpasses, underpasses, inter passes

| Mileage | type of facility | length (m) |
|---|---|---|
| 395+195 | AUP - new skewed underpass with L=8m, right | 36 |
| 356+547 | AUP - new skewed underpass with L=8m, right | 36 |
| 396+935 | AUP - new skewed underpass with L=8m, left and right | 36 |
| 397+342 | AUP - new skewed underpass with L=8m, left and right | 24 |
| 397+849 | new skewed underpass with L=12m, left and right | 24 |
| 398+104 | AUP - new skewed underpass with L=8m, left and right | 24 |
| 400+320 | new skewed 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 lane of Lot 3.2 of the Struma Motorway on the new terrain is projected to the east of Kresna Gorge.

The left lane begins at km 373 +300 (100 m past the intersection with the railroad for the Oranovo mine), to the left of the existing road and will be developed parallel to it up to km 373 +600, then to the south-east, parallel to Gradevska River between the neighbourhoods of the town of Simitli - Oranovo and Dalga mahala. At km 375+775 it crosses road II-19 „Simitli – Predela – Gotse Delchev“ in two levels, by arranging a road junction for connection to the route of Lot 3.2 with the town of Bansko and vice versa.

Following the intersection of Road II-19 it enters the slope by tunnel of L = 350 m, and afterwards a viaduct of L = 200 m.

The longitudinal inclinations, permitted in the road junction, tunnel and viaduct are 4%, then the inclination will be 5% and a third lane is needed, descending towards Sofia, and also the construction of emergency exits, if necessary.

From km 376 +500 it runs to south-east, bypasses the village of Poleto, at km 379 + 880 it crosses the road Poleto - Brezhani and at km 380 + 840 crosses the feeder of Brezhanska River. In the section from km 381 +500 to km 385 +500 is feeding habitat of vultures that is passed with building a tunnel with a length of L = 1130 m. Longitudinal gradient is about 4.35%, as the technical solutions for tunnels and viaducts are improved.

In the section from 385 +500 to km 389 + 800 the alternative is developed south after area of vultures, to the west from Rakitna River is developing parallel to the road Rakitna - Mechkul and around km 383 +900 crosses it, passes on the west from Mechkul village, continues to the south and to the east of Stara Kresna village.

In the section from km 384 +100 to km 389 +600 the route has been shifted east, where it crosses once a transit gas pipeline.

From km 389+600 to km 396+000 the alternative develops in the south direction. From km 396+000 to km 399+800 the alternative develops in southwest direction near the existing road to he Vlahi village. At km 399 + 520 it enters to the right road lane (detour of the town of Kresna). The alternative ends at km 400+ 371.81.

In places where the road route passes in a tunnel, around the portals platforms are formed, aimed the construction of service infrastructure.

Because of the higher longitudinal gradients, which are located at the beginning and at end of the route in order to improve throughput and to ensure safety is provided third lane for slow-moving vehicles in the following areas:

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

***The new construction on the east of the gorge includes the construction of the following facilities:***

Bridges 1 pc. - 96 m;
Viaducts 18 pcs. - 5064 m′;
Tunnels 5 pcs. – 4200 m′;
Supporting walls 943 m′.
Overpasses, underpasses, inter passes - 394 m′.

***Large facilties***

- 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*** | | ***4200*** |

- Bridge

| from km | to km | length (m) | type of facility |
|---|---|---|---|
| 373+565 | 373+650 | 96 | New bridge over 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+672 | 372 | 50.0 |
| 382+112 | 382+192 | 80 | 15.0 |
| 382+466 | 382+532 | 66 | 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+000 | 230 | 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 | 400+010 | 316 | 15.0 |
| **TOTAL** | | **5064** | |

- Overpasses, underpasses, inter passes

| **Mileage** | **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 | Agricultural overpass | 70 |
| 391+315 | 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** |

***Smaller facilities and passageways for animals***

To conduct water from the gullies, drainage ditches and other low areas, to build small facilities - culverts are provided. After drawing up a detailed plan for the drainage of the motorway, is determined and the exact number and type of equipment that is needed to conduct the water quantities of trenches, ravines, to the most suitable sites for that purpose.

The selected facilities for animals were been checked for the design maximum dimensional water quantities that could pass with certainty by 1% through the reduced cross-section without allowing spreading water on dry trails.

For this purpose are provided facilities with the following openings:

- *pipe culverts – ø150 – 33 pcs.;*
- *pipe culverts – ø150 - facilities for animals - 9 pcs.*

***Notes:*** Pipe culverts that carry out the intended purpose of inter passes for animals will conducted only water quantities from the motorway trench - in rain, snow, etc. The water that will passes through the culvert will be small quantity and will not be constantly running, and during most of the year the facilities will be "dry" and will not create difficulties for the passing of the animals through.

- *Rectangular culverts*

- ✓ Rectangular culvert 200/200 – 3 pcs.
- ✓ Rectangular culvert 400/250 – 2 pcs.
- ✓ Rectangular culvert 200/200, facilities for animals – 16 pcs.
- ✓ Rectangular culvert 300/250, facilities for animals – 2 pcs.

Note: Rectangular culverts that carry out the intended purpose of inter passes for animals are modified to provide dry passageways of the animals and consequently the water quantity passing through the facility are sized so that there is no danger of flooding the dry path.

- **Road connections**

The design solution of the East Alternative G 10.50 provides for two independent lanes, each providing movement in one direction, which determines the need for cross connections between the two lanes along the existing roads and the arrangement of road junctions (or road connections in two levels) of the **left** lane (from Kulata to Sofia):

- ✓ Road junction „Simitli“ - km 375+775
- ✓ Road junction „Poleto“ - km 379+500
- ✓ Road junction „Mechkul“ - km 384+000
- ✓ Road junction „Stara Kresna“ - km 388+450
- ✓ Road junction „Kresna“ - km 400+371.81

The project envisages setting up a road connection of the right lane (the existing road E79) „Sofia - Kresna“ – at km 393+600.

- **Engineering networks**

In the implementation of the route of Struma Motorway, Lot 3.2 the following engineering networks will be affected:

- ✓ Gas pipelines;
- ✓ Power lines: BH 20 kVBH 110 kV;
- ✓ Water supply pipelines;
- ✓ Cables;
- ✓ Irrigation canals.

**Rehabilitation of the existing roads, Pre-investment Study of Lot 3.2 of Struma Motorway - east alternative G 10.50, Pre-investment Study , 2016.**

- Rehabilitation of the existing road E79 in the Kresna Gorge, without increasing its scope.

Rehabilitation activities include:

- ✓ rehabilitation activities in the roadway, banquettes and drainage of the route;
- ✓ strengthening the roadside slopes
- ✓ Rehabilitation of the existing pavement - replacement of asphalt coating and concrete elements - curbstones, stripes, trenches, etc .;
- ✓ shuttering, reinforcement, concrete work on small and large facilities;
- ✓ rehabilitation of large facilities;
- ✓ rehabilitation of 2 tunnels;
- ✓ waterproofing on the road plate, transition plates, paving blocks, dilatation joints;
- ✓ joints on bridges;
- ✓ mounting of combined guardrail;
- ✓ reconstruction of TT cables;
- ✓ displacement and installation of power lines 20 kV;
- ✓ raising the existing rain gully;
- ✓ construction of new pipe culverts.

- Rehabilitation of municipal roads

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

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

- Implementation of measures to protect biodiversity - for example, facilities for limiting the risk of mortality of animals, to reduce disturbance, etc. This will be used and the results of studies of mortality on the existing road E-79 in the period 2013-2016

The Eastern Alternative G 10.50 passes through the municipalities of Simitli and Kresna – district of Blagoevgrad.

The construction will be implemented until 2023

**ALTERNATIVE „LONG TUNNEL ALTERNATIVE", THE „KRESNA" TUNNEL**

The beginning of the section is immediately after the bridge of Struma River.

Passes 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 entrance, it crosses consecutively the Struma River, the Sofia-Kulata railway line and an asphalt road. The passing through Kresna tunnel is from km 379 + 267.015 + 394 to km 605.00/left pipe and from km 379 + 255 to km 394 +600/right tube. After the exit of the "Kresna" tunnel, the motorway crosses the existing third-class road, the Struma River by a bridge and immediately thereafter - a construction of the road junction of Kresna is planned.

The alternative is divided into a road and a tunnel part, as for each one a separate project is designed.

The route starts at road junction Krupnik with motorway (road) section (with dimensions G29), with length 1.5 km and after the bridge facility of Struma River, the route passes through a tunnel with length 15.4 km. The "Kresna" tunnel is designed as a tunnel with two tubes with the possibility of evacuation in the second tube of the tunnel through crosswise connections. The tunnel is located in the mountain areas and its parameters correspond to the design speed of 120 km/h.

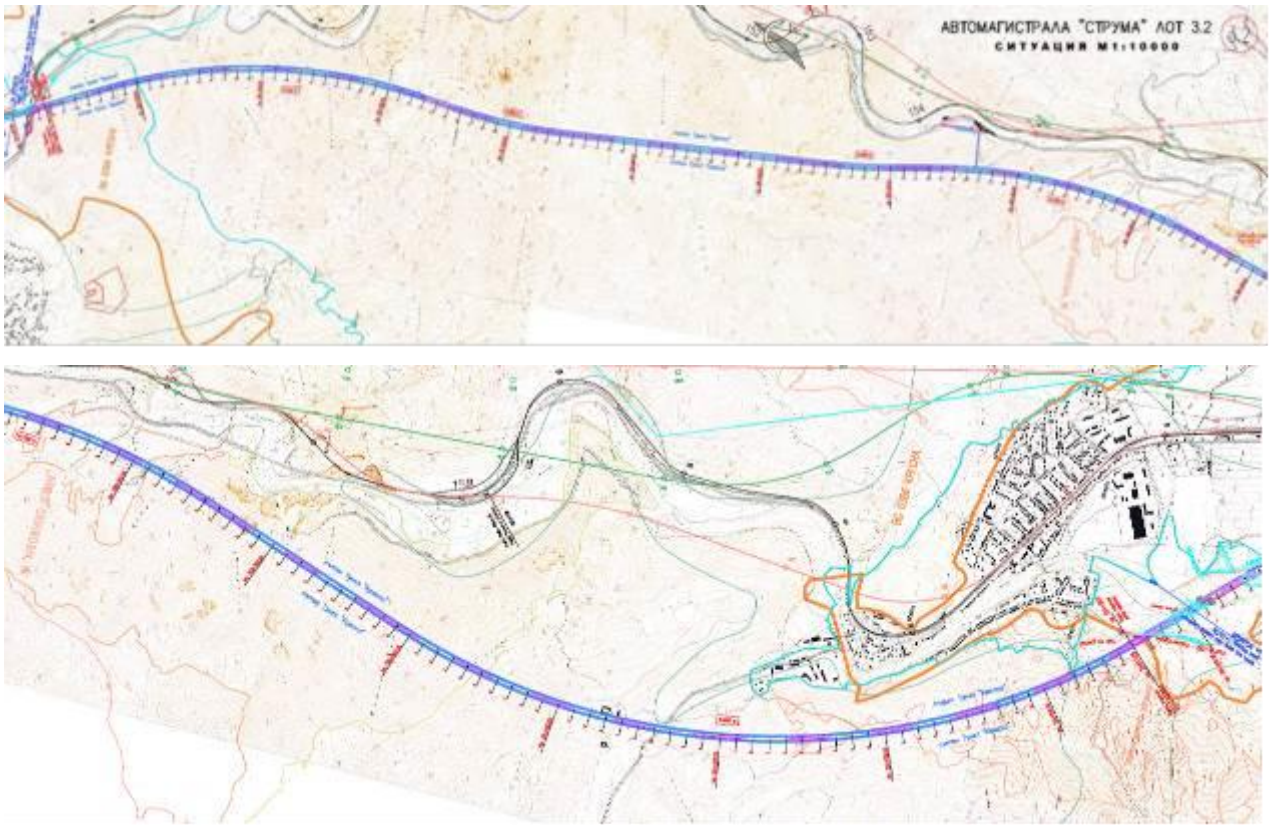


*Figure No. 1.А-5. Situation of a long tunnel alternative*

We enclose a situation plan of the design route, a long tunnel alternative, on topographic map in scale M 1:5000 - Appendix No.5.

**The main elements of the tunnel design are the following:**

- portals and pre-portal sites;
- permanent roads for access to the entrances;
- two tunnel tubes;
- intermediate access roads for digging of the tunnel;
- permanent ventilation tunnel;
- the construction sites and the sites for temporary storage of earth spoils.

**The overall length of the tunnel and mileage of portals are as follows:**

| | | |
|---|---|---|
| **Right tunnel tube (Mileage)** | | |
| **North portal** | End of portal – beginning of tunnel | 379+205 |
| | Portal for tunnel traffic - beginning of traffic tunnel | 379+227 |
| **South portal** | Portal for tunnel traffic - end of traffic tunnel | 394+605 |
| | End of entrance – End of tunnel | 394+625 |
| **Left tunnel tube (Mileage)** | | |
| **North portal** | End of portal – beginning of tunnel | 379+243 |
| | Portal for tunnel traffic - beginning from the traffic tunnel | 379+265 |
| **South portal** | Portal for tunnel traffic - end of traffic tunnel | 394+600 |
| | End of entrance – End of tunnel | 394+620 |
| **Total tunnel length [m]** | | |
| | Right tunnel tube | 15,420.0 |
| | Left tunnel tube | 15,377.0 |
| **Length of the traffic section [m]** | | |
| | Right tunnel tube | 15,378.0 |
| | Left tunnel tube | 15,335.0 |
| **Length of the road sections, constructed by the 'cut-and-cover' method** | | |
| **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 is comprised of the following components:**

- Northern and Southern portal;
- Access road to the ventilation tunnel at km 386+664.986;
- Double tube tunnel;
- Crosswise connections;
- Drainage of the tunnel and the tunnel pavement;

- Road surface and side-walks;
- Ventilation installations with technological centers at the Northern and Southern portals;
- Cable tracks at the Northern and Southern portals;
- Fire-fighting installation and water supply;
- External power supply network;
- Access road at km 380+745.688;
- Access road at km 392+009.286.

**The technological part of the project is comprised of the following components:**

- electrical installations of the tunnel;
- tunnel Control System;
- tunnel ventilation;
- tunnel lighting;
- SOS cabins;
- radio emissions and radio traffic;
- fire-alarm installation;
- system of tunnel security;
- tunnel transformer sub-station;
- earthing system.

The "Kresna" tunnel, in its entire length will be constructed in the classical tunnel method, by exploding. 22 m long sections at the entrance in the Northern portal and 20 m-long sections in the Southern portal shall be constructed in the open method.

The "Kresna" tunnel will be dug from the two main portals (north and south portal) and from three **intermediate access** (windows) **at km 380 + 745, km 386 + 664 and km 392 + 009.** The digging of each tube of the tunnel will be performed from eight down holes.

**Organisation of the implementation of the long tunnel alternative:**

**Description of the accepted method of construction**

The digging of the "Kresna" tunnel is scheduled by drilling and blasting works.

The stages of work in this method are as follows:

- excavation through drilling and explosive works and a tunnel excavator, removal of excavated masses;
- reinforcement of the arches with anchorage and steel frames;
- making primary tunnel lining of shotcrete;
- hydro-insulation;
- making secondary tunnel lining of reinforced concrete;
- drainage and other finishing works.

Between the two tunnel tubes, emergency passages for evacuation of people, who are in the tunnel will be made and for external access to the emergency teams in emergencies.

After the construction of the reinforced concrete structure of the tunnel and the portals, the gradual construction of tunnel installations will start as follows:

- electrical;
- ventilation;
- lighting;
- fire-fighting;
- systems for monitoring and control - surveillance, light signalling for traffic management, fire alarm, radio announcement and others.

Further to making shafts and ducts, the end of the tunnel shall be packed with crushed stone and the road lanes for the traffic of vehicles.

**Intermediate access at km 380+745:**

The construction of an access passage comes from the necessity to speed up the construction works of the Kresna tunnel. The intermediate access shall serve for transporting the excavated material outside of the tunnel and for delivery of materials into the tunnel. Following the completion of construction works, the access shall be closed and will not be used any further.

The intermediate access will required electrical power supply and water supply for process needs. An existing power line shall be provided as power source to the entrance, which is located in close proximity to the place, at a distance of approximately 200 m. A process water source shall be the Struma River via a pipeline of length approximately 30 m.

During the construction works, restrictions shall be required, governing the traffic on the existing Road E-79 due to the movement of construction equipment.

The pre-entrance site of the intermediate access shall be located at part of the old road track of Road E-79, which is not used for traffic at the moment, and serves as a bypass road for the existing road tunnel.

**Intermediate access at km 386+664 with ventilated tunnel:**

The construction of an access passage comes from the necessity to speed up the construction works of the Kresna tunnel. The intermediate access shall serve for transporting the excavated material outside of the tunnel and for delivery of materials into the tunnel. Upon completion of construction, the access shall be used as a permanent horizontal tunnel ventilation.

The intermediate access will required electrical power supply and water supply for process needs. An existing power line shall be provided as power source to the entrance, which is located on the other side of the Struma River, distanced at approximately 125 m. We have provided that the source of water supply for technological requirements shall be the Struma River, by a pipeline of length approximately 124 m.

During the construction works, restrictions shall be required, governing the traffic on the existing Road E-79 due to the movement of construction equipment.

The entrance of the intermediate access shall be located at the existing exit to road E-79.

**Intermediate access at km 392+009:**

The construction of an access passage comes from the necessity to speed up the construction works of the Kresna tunnel. The intermediate access shall serve for transporting the excavated material outside of the tunnel and for delivery of materials into the tunnel. Following the completion of construction works, the access shall be closed and will not be used any further.

The intermediate access will required electrical power supply and water supply for process needs. An existing power line shall be provided as power source to the entrance, which is located in close proximity to the place, at a distance of approximately 125 m. We have provided that the source of water supply for the technological requirements shall be the Dryanovska River, by a pipeline of length approximately 124 m.

During the construction works, restrictions shall be required, governing the traffic on the existing Road E-79 due to the movement of construction equipment.

**Long tunnel operation:**

The functioning of the “Kresna” tunnel, including its technological parts (ventilation, lighting, etc.) shall be expected to be managed from a control center, located at the Chernice village (north of the Kresna gorge) in the range of Lot 3.1 of the Struma Motorway. Using the information system, the central control system shall be connected to the technological centers, located respectively on the North and South entrances of the "Kresna" tunnel, where it will also be possible to control the operation of the tunnel.

**Correspondence with the decision under EIA from 2008:**

The motorway route in the conceptual design of Lot 3.2 of the "Struma" Motor motorway in the Long Tunnel Alternative and the route, described in the decision on the EIA No. 1-1 / 2008 differ in certain road sections. Some of the changes in the motorway route result from the implementation of the conditions and measures in the decision on the EIA, while others result from additional studies during the design.

The conceptual design has optimized the road section of the motorway to comply with the standards for the design of roads and tunnels, by taking into account the following requirements and criteria:

- no existing buildings should not be impacted;
- the protected territories „Kresna" and „Moravska" should not be impacted;
- the existing exploration concessions should not be influenced;
- the conditions of the terrain should allow for the deployment of road junctions;
- the smooth transition shall be provided from the optimized road sections to those, which have not changed, both in situational and in levelling respect.

The changes in the optimized road section of Lot 3.2 of the "Struma" motorway shall be the following:

- from km 380+000 up to km 388+300 - the changes, resulting from further investigation and design. A significant change from km 382 +150 up to km 385 +500, compared to the approved design in Decision No. 1-1 / 2008 of the EIA route as a distance. The change is in the section of the „Kresna" tunnel (underground), in order to provide better land coverage of the tunnel.
- At the exit of the long tunnel, the motorway route was moved to the west, in order to avoid interference with the existing houses at km 394 +500. Follows the road section from the EIA Decision;
- The "Kresna" protected area shall be avoided to the maximum from km 396+600 up to km 397+400, whereas the changes have been complied with the terms and conditions in the Decision for the EIA. The changes made are in compliance with Clause No. I.3.1. of Decision No. 1-1/2008 of the EIA
- A deviation from km 380 +000 up to km 388 +300, where a 15.4 km-long tunnel was proposed with the changed location of the North and South entrances, to be situated from km 379 + 255 up to km 394 +600. The significant change as a distance (more from 180-200 m), compared to the road track, approved in Decision No. 1-1 / 2008 on the EIA in road section from 3,350 m (underground) in the scope of the "Kresna" tunnel, with respect to the provision of more land cover of the tunnel.

Sub-sites such as road junctions, resting places, sites for disposal of excess earth masses, sites for temporary storage of earth and construction waste, service roads for the movement of construction equipment, construction sites at the entrance and exit of the tunnel, construction sites at the intermediate access during the construction of the "Kresna" tunnel, incl. the technology of construction, were not subject to the EIA and CA procedure in 2007.

The Long Tunnel Alternative passes through the Municipalities of Simitli and Kresna – district of Blagoevgrad.

Long tunnel Alternative should be implemented until 2023

*The description of the four design solutions for "Improving the route of Lot 3.2 of Struma Motorway and the level of detail of the data in the present Terms of Reference corresponds to the level of its study and design.*

**Reconstruction of facilities of other institutions in the implementation of the investment proposal**

The Environmental Impact Assessment Report (EIAR) shall consider the provided reconstruction of the engineering networks of utility companies, what activities shall be related to them and what environmental impacts are to be expected.

***Lands needed for the implementation of the investment proposal***

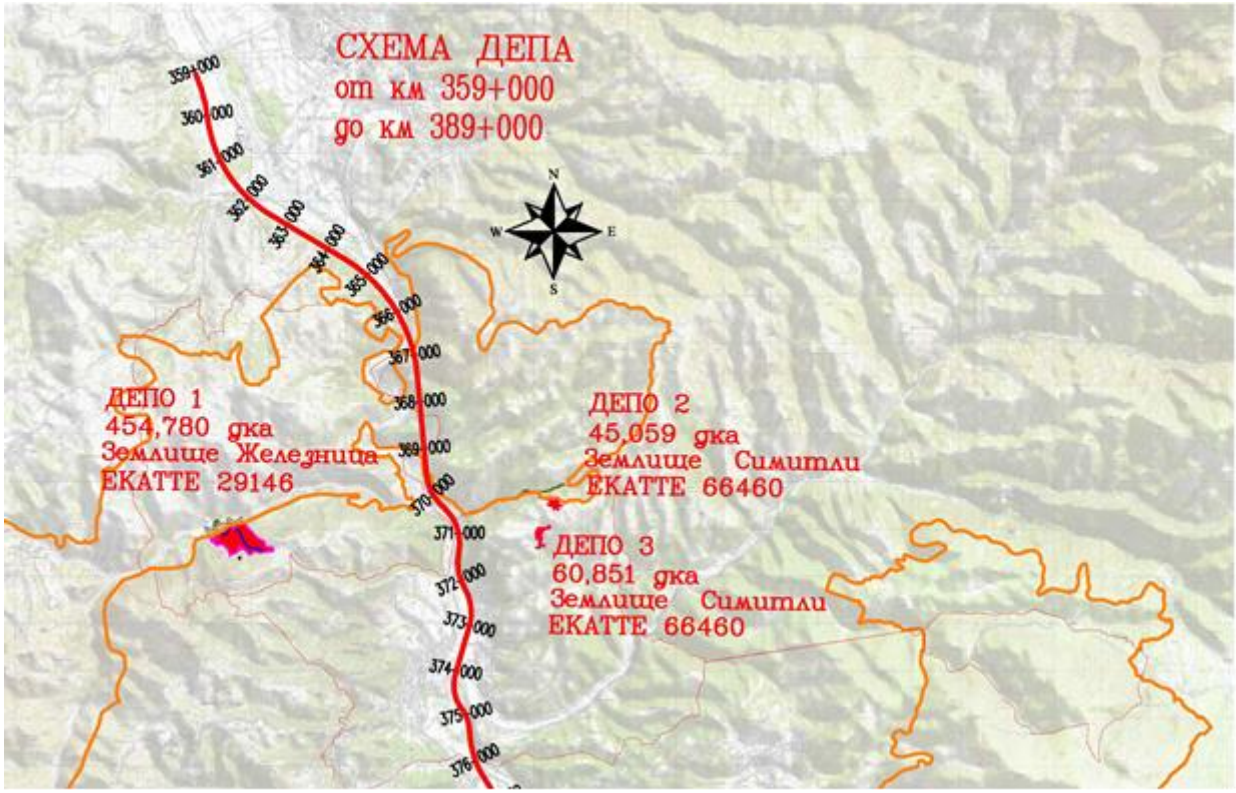
The construction of linear objects shall be related to the permanent damage, caused to significant areas of land and forest on the deployment of elements of the road infrastructure. The expected violations of land and soil integrity shall be considered and discussed in the Environmental Impact Assessment Report (EIAR)

***Sites for storage of earth and rock material***

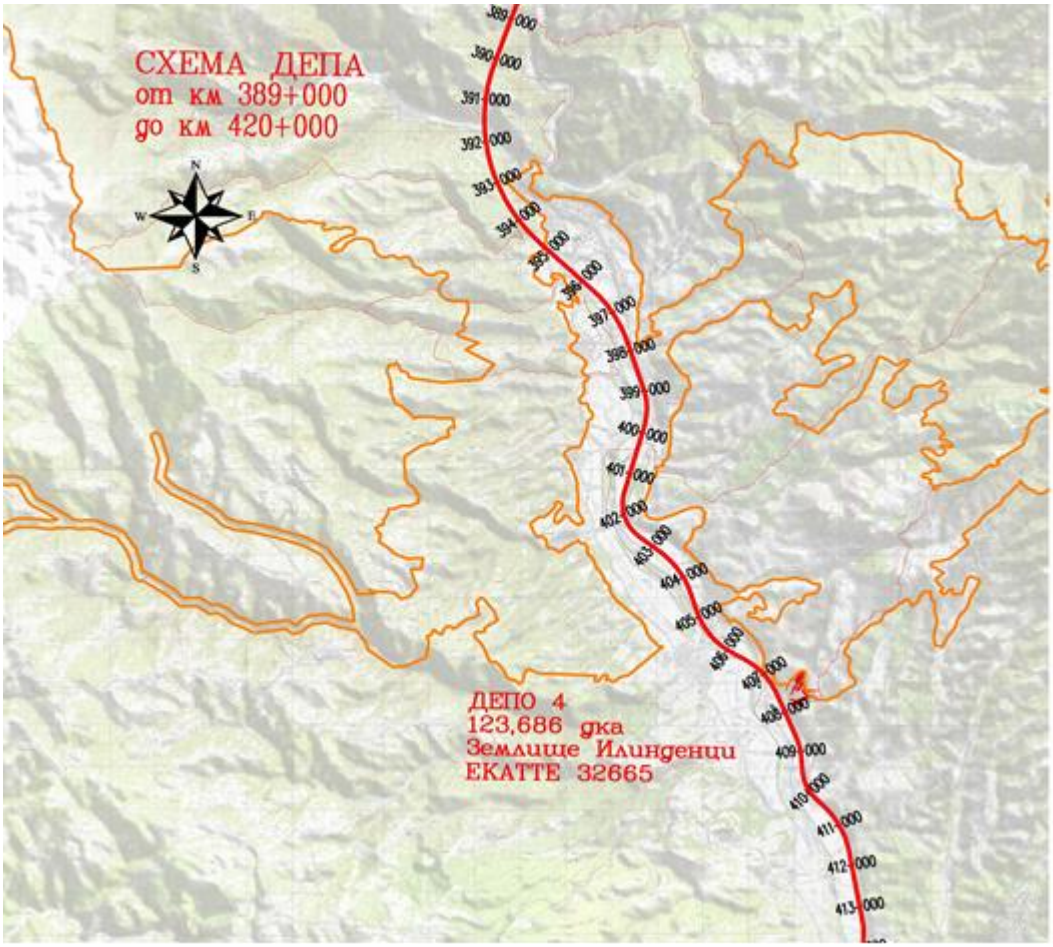
Due to the nature of construction, certain amounts of earth and rock shall be expected to be generated that do not meet the design specifications for use in the construction of the road in respect of which sites for storage have been studied and proposed.

Two sites have been proposed for the storage of earth and rock materials (which also will be used in the construction of Lot 3.1 and Lot 3.3 of the "Struma" Motorway) as follows:

1. Construction site on the land territory of the village of Zheleznica with capacity of 4 500 000 $m^3$. Total area 454.780 decares




2. Construction site on the land territory of the Ilindentsi village with capacity of 1 500 000 $m^3$. Total area of 123.686 decares.




Complying with the provisions of the Roads Act, the scope of the road shall mean the area on which the road bed is situated and the stripes on both sides of it, together with the air space over it at a height determined by the norms of road design. The width of the scope of the road outside city limits and inside city limits when bordering on unregulated terrains shall be established by the road design. All road facilities and accessories shall be contained within the scope of the road with the exception of facilities for maintaining republican roads, power delivery and lighting equipment and plots on which they are located as well as snow-barrier equipment which may be placed outside of the scope of the road.

At the time of drafting the present updated terms of reference still not drawn up a register of affected lands for any proposed design alternatives and has not started preparing the parcel plans according to the *Spatial Planning Act* (SPA) and *Ordinance No. 8/14.06.2001 on the volume and contents of the cadastral schemes and plans.*

***Affected terrains during the construction of the design routes***

According the specified basic characteristics and technical parameters of the route and the facilities to it, the anticipated damages on land and soils will include the direct route, the zones before the tunnel portals, the reconstructions and road junctions. The affecting of the land will be addressed in the EIAR, according to prepared and submitted by the designer balance of the affected land as types of territory.

In the EIA report will be discussed and evaluated existing and serving the construction roads during the construction of the route and its facilities which will be used during the construction period, including in temporary traffic organization.

**1.B. Description of the main characteristics of the production processes, for instance, the type and quantity of the prime and raw materials used, including of dangerous substances listed in Annex No. 3 to EPA, which will be available in the undertaking/facility as well as the capacity of facilities for their storage and use in cases under art. 99b of EPA**

Transport construction and operation of the road arteries is a specific activity for this type of infrastructure projects. The main construction activities carried out during the construction of the route are:

- Removal of the humus layer;
- Excavations - earth and rock;
- Backfilling works - road foundation from crushed stone;
- Asphalt works - for the dense and non-dense asphalt concrete is used polymer modified bitumen; in terrestrial soils must be built zone "A" with thickness of 50 cm; in rocky sections zone "A" is missing;
- Drainage work - drainage pipes, concrete for drainage discharge, concrete base, reinforcement, trenches lining, prefabricated items;
- Large facilities - bridges, overpasses, underpasses, tunnels, viaducts;
- Small facilities - culverts, supporting walls from reinforced embankment, concrete for facilities;
- Reconstruction of engineering networks;
- Biological reclamation of batters;
- Landscape shaping;
- Signaling and marking

For the construction works should be used the following prime and raw materials:

- Excavations in earth and rock soils. The excavation masses will be used for embankments in reclamation carried out;
- •Construction materials: cohesionless materials; bituminous binding materials; concrete curbs; drainage pipes - PVC; concrete pipe; prefabricated concrete elements for Italian drainage channels; concrete - different classes; concrete for facilities; reinforcement for facilities; formwork; metal elements; safety fence; bars; safety net; marking and traffic signs. For the construction of the considered section of Struma motorway is provided a new road construction with the usage of: dense asphalt concrete; non-dense asphalt concrete; bituminous crushed stone; unsorted crushed stone with continuous particle size distribution. Delivery of materials will be done by construction bases in the region.
- Water volumes necessary to ensure the fire protection of the tunnels, as for the Kresna tunnel is provided a water tank with a capacity of 230 m3, and in case of fire will be used additional quantities listed in the maintenance technology, including for other tunneling works.

Quantities of raw materials and materials used are not determined for all of the proposed design alternatives.

During the construction of the route is used a limited amount of water, mainly in the construction of embankments for artificial compacting of the construction soil and during dry periods to limit the dusting at the movement of construction and transport equipment.

During the operation, in case of carrying out repair work are used the same prime and raw materials as in the construction, and during the permanent maintenance of the road the replacing or installation of new marking and traffic signs is performed.

During winter season for the normal operation of the route are provided the necessary quantities of sand, lye and others.

## 1.C. Determination of the type and the quantity of the expected waste and emissions (pollution of waters, air and soils; noise; vibrations; radiations) as a result of the construction and exploitation of the investment proposal

**Waste**

***During the construction*** of the route and facilities of Lot 3.2 of the Struma Motorway mainly will be generated waste types typical for excavation and construction works, namely: excavated excess earth and rock masses; excavated earth and rock masses that do not meet the design specifications for use in construction (excavated material, unsuitable for embankment); concrete; metal waste; lumber; asphalt mixtures. In the initial phase of construction will be generated also biodegradable waste in the preparation of the route and removal of trees and shrubs.

Expected quantities of earth and rock masses that do not meet the design specifications for use in construction (construction waste), in accordance with project developments proposed by the Contracting Authority alternative solutions, are as follows:

- Alternative G20 - blue 1 192 402 $m^3$
- Alternative G20 - red 262 688 $m^3$
- East alternative G 10.50: 1 856 432 $m^3$
- Long tunnel alternative: 4 736 522 $m^3$
- East alternative G 20: 2 936 137 $m^3$

Municipal waste will be generated on the construction sites, in temporary camps and at home places of the transport equipment, construction and assembly equipment, from the vital activity of workers and builders.

Also will be generated and insignificant amounts of hazardous waste, particularly of waste oils from the construction machinery and waste in its cleaning and amortized rechargeable batteries, as well as from packaging of prime and raw materials.

During construction in both alternatives G20 (blue and red), are expected significant amounts of construction waste from the destruction of the roadbed of the existing road E79 prior construction of the new roadway. Also in implementing the eastern Alternative G 10.50 is expected generating of construction waste in the rehabilitation of the existing road E79 through the gorge.

The expected quantity construction waste in implementation of the blue and red alternatives is approximately 5000 m3 asphalt coatings that will be completely recycled in the new road pavements and approximately 11 000 m3 of crushed stone which will be completely used in the new embankments.

For temporary (preliminary) storage of the waste will be used the above specified sites for storage of earth and rock masses, above mentioned in item 1.A.

***During the operation period*** will be generated waste from the traffic and at maintenance and repairs of the lane. During normal operation of Lot 3.2 is expected to be generated the following waste types: assemblies and parts of motor vehicles, automotive consumables, car bumpers, etc .; worn and torn tires; hydraulic and engine oils, cleaned using adsorbent materials, brake fluids and other as a result of leaks from defective cars; waste from cleaning of roadside ditches and dividing strip from improperly disposed municipal waste on and alongside the road route, including and resting places

In case of accidents, traffic accidents or failures of vehicles carrying dangerous substances and hazardous waste will be generated different by types waste, depending on the nature of the goods transported. Will be generated and waste from spills/leakage/spillage from tank trucks and trucks carrying liquid or watered materials. To the generated waste can be assigned assemblies and parts of motor vehicles, as well as out of use motor vehicles that have suffered traffic accidents.

When carrying out repair work on the roadway and the road facilities will be generated construction waste, mainly milled asphalt pavement, concrete waste, metal scrap.

The quantities of the generated different by types waste are not subject to forecasting and are a result of emergency situations and/or traffic accidents and of the volume of the repair works performed.

**Emissions in the atmosphere air**

***During the construction period*** will be carried out different by types activities, as a result, emissions into the atmosphere air will be only fugitive emissions:

- excavation works for preparation the road foundation and for dug into the slopes; excavations for the supporting walls and foundations of viaducts and bridges: will be emitted a dust with different fractional composition when using earthmoving machines and handwork; along with this, will be released exhaust gases, typical for combustion processes in internal combustion engine (nitrogen oxides, carbon monoxide, sulfur oxides, soot, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), persistent organic pollutants (POPs), etc.);
- Loading and transport of construction waste and inert materials from the excavation works:will be emitted a dust and pollutants from internal combustion engines;
- unloading of bulk construction materials, unloading of construction waste in landfill, movement of vehicles on terrains without pavement, laying, spreading and compaction of inert materials : will be emitted a dust and pollutants from internal combustion engines;
- blasting works for tunnels digging and massive blasting works outside the tunnels, as well as loading/transport of excess material to the place of their laying or until the respective landfill: will be emitted mainly nitrogen oxides, carbon monoxide and particulate matter;
- preparation, laying and leveling of asphalt pavements: these processes are related in some cases to the bitumen melting, preparation of supplying asphalt mixtures, their laying and machine leveling - will be mainly emitted vapors of various hydrocarbons (including VOCs, PAHs, POPs, dioxins and furans and polychlorinated biphenyls (PCBs)).

Emissions of these pollutants of the atmospheric air during this period will be short-living and localized in the work sections. Quantity of emissions from the construction works will depend directly on the excavation/embankment works performed (fill and cut balance) as well as from their distribution in time and on the route. The emission of contaminants in blasting works will be periodically during ventilation of working sections and will depend on the quantities of explosives which will be used.

During the operation period the types of pollutants emitted by the road as a linear object (source) are as follows: NOx – nitrogenium oxides; VOCs – volatile organic compounds; NMVOCs – non methane volatile organic compounds; CH4 – methane; CO – carbon monoxide; CO2 – carbon dioxide; N2O – dinitrogenium oxide; SO2 – sulfur dioxide; NH3 – ammonia; Cd - cadmium; Pb – lead; PAH- polycyclic aromatic hydrocarbons; PAHs- Benzo (α) pyrene, Benso (β) fluoranthene + Benzo (κ) fluoranthene, indeno (1, 2, 3-cd) pyrene; Diox – dioxins and furans; $PM_{10}$ – particulate matter (soot).

The quantities of harmful substances emitted from these linear sources depend on the so-called static and dynamic factors. Static factors to be considered when modeling are the gauges of the road segment, the tilt in the different sections and the type of the region (outside urban). To the dynamic factors can be attributed: design speed; category of the traffic; structure of the traffic flow and mainly predicted traffic volume (determined by counting in points and/or predicted change in the years by road sections).

**Water**

***Surface water***

***During the construction period***

The main impact on surface water bodies will now be performed during the construction period, regardless of which of the options proposed by the Contracting Authority will be elected. This impact is associated with the construction of bridges on the Rivers - Struma and its left tributaries in this part of its River valley between the town of Simitli and town of Kresna, as well as in construction of supporting walls in the River bed.

During the tunnelling works will probably have usage of surface water for technological needs - drilling, suppressing dust formation of under ground, etc.

Such impact can be obtained by drained groundwater discharging into surface water receiver during the tunneling. During the construction the main emissions into the water are from insoluble substances in preparing the foundation of the facilities and from drained of water if the latter are directly discharged without sedimentation of these particles.

In emergency situations involving faulty construction equipment mainly is expected emissions from petroleum products.

It is necessary all variants to be consulted regarding the affected sanitary protection zones around water sources and facilities for the water extraction for drinking water from surface water bodies.

Such consultation is compulsory in respect of the affected areas in risk of flooding.

***During the operation period,*** regardless of which of the variants proposed by the Contracting Authority will be elected, can be expected emissions of harmful substances, mainly in cases of emergency (mainly liquefied cargo), or excessive usage of materials for winter maintenance of passability of the roads. Cases of accidents, particularly those with spills of liquefied substances and cargo are extremely rare and can cause long-lasting impact on the condition of surface water bodies. Winter maintenance is performed on expenditure norms approved and consistent with environmental protection. The main emissions into the water during operation are mainly from insoluble substances and chlorine ions. Considering the climatic characteristics of the region - - mainly temperatures around 0°C and above it, then the use of substances for winter maintenance on the route are unlikely or in limited quantity.

In case of electing the "Long tunnel" variant can be expected abstraction of large quantities of water from the Struma River in case of fire extinguishment in the tunnel or the portal areas, respectively formation of wastewater with unpredictable composition in practice.

***Groundwaters***

***During the construction period***

The impact on groundwater during construction period will consist mainly regarding their drainage in the zones for construction of the tunnels. This will reflect mainly on the quantitative condition of groundwater, and mainly during the tunnelling works prior construction of their cladding and waterproofing. Considering that these workings, regardless of which of the variants proposed by the Contracting Authority will be elected, will be carried out relatively close to the surface and the surrounding massifs are drained mostly in the deep valleys of Struma River and its tributaries as well as considering the big number of railway tunnels of the Sofia-Kulata railroad in the left slope of the River valley it can be concluded that the impact on groundwater during construction will be insignificant.

The above prerequisite is not valid for variant “long tunnel” as far as the construction will continue for extended period of time, will be performed at great depths under ground surface, the workings are with longer length and cross section and preliminary forecasts (although they are a quite tentative, in the opinion of researchers) indicate significant values of the drainaged groundwater, which can lead to a change in their composition and the drying of the rock massif over the long tunnel.

It is necessary all variants to be consulted regarding the affected sanitary protection zones around water sources and facilities for the water extraction for for drinking purposes or around the localities of mineral waters.

***During the operation*** there was no real likelihood of impact on the groundwater bodies, except for the above mentioned cases of potential emergencies and winter maintenance of the road.

Due to the specifics of the region, which characterizes with temperatures above 0°C, the use of substances for winter maintenance is unlikely.

Upon selecting of "Long tunnel" variant it can be expected the drainage of the groundwater to be continued, regardless the construction of waterproofing and cladding of the walls of the tunnel. Drainage quantities were evaluated for guidance due to lack of necessary volume of hydrogeological information, but constitute an essential volume. The composition of these waters also is determined

by a limited number of analyzes,which makes it difficult the preparation a forecast for its amendment.

**Geological Settings**

Impact on the subsurface is mainly performed ***during the construction period*.** Regardless of which of the alternatives proposed by the Contracting Authority will be elected, this impact is related to carrying out so-called "earthworks" where as a result of excavation works, the stability of the slopes will be disturbed and this can result in occurrence of undesired geo-dynamic processes – landslides, landslips, rockfalls and collapsing of the tunneling workings, overloading the weaker parts of the massif with large volumes of embankments.

It is necessary all alternatives to be consulted regarding the affected deposits of underground resources or areas for exploration and research of underground ones.

During the operation period impacts on the subsurface are unlikely.

**Soils**

***During the construction period***

Two types of emissions in atmospheric air are expected that may result in deposition of pollutants on the adjacent land and soil:

- dust – from non-organized sources during construction, mainly during excavation-backfilling works along the route of the Lot 3.2;
- emissions from the engines of the construction machines – fugitive emissions from mobile sources – machines and vehicles involved in the construction works and in the transport of raw resources, materials, equipment, etc.

Temporary and local emission of dust from non-organized sources are expected only within the construction sites.

***During operation period***

Contamination in the soil adjacent to the road may occur due to the gases emitted from the traffic, from the possible spills of fuels and oils, dirt from de-icing substances used for winter maintenance of the roadbed, flushed away with the surface runoff from the roadway.

During operation the Lot 3.2 is considered a linear source of pollution, emitting:

continuous, but with variable intensity, COx, NOx, $SO_2$ and other gasses and aerosols which contain mainly Cd, soot and other compounds from the engines of the passing vehicles as well as from the wearing of the tires on the road lane and the road surface.

- periodically (during the winter season) - Cl, $SO_4^{2-}$, $Na^+$, $Mg^{2+}$ etc. from the defrosting substances used to prevent the icing of the road lane.

As regards the soil contamination with waste, such is expected in the road sections envisaged for resting. In the roadside spaces, the soil is likely to be polluted with domestic waste and in some locations – with construction waste from construction and repair activities of the road.

The specifics of the topography crossed by the route require excavation and backfilling as well as shaping of high slopes, which is a pre-condition for initiation of erosion. Reclamation activities shall be planned and their timely implementation will prevent to a great extent the occurrence of this phenomenon.

**Risky Energy Sources**

♦ **Noise**

Noise emissions in the environment are expected during both phases of implementation of the investment proposal – construction and operation of the proposed by Contracting Authority different alternatives.

***During the construction period***

Sources of environmental noise during the road construction and the changes in the accompanying infrastructure are the various types of construction works (excavation, backfilling, laying of concrete, laying of asphalt, transportation) and the construction machines they traditionally

use (excavators, bulldozers, rollers, asphalt layer machine, trucks, etc); the noise emission levels of the latter are in the range of 80 ÷ 105 dBA. The machines used, except for the servicing transport, will be concentrated at the construction sites in the respective road sections of the Lot 3.2. Receptors of the noise emission due to the activities carried out on the construction sites will be the nearby areas with regulated noise regime from the territory of the nearby towns and villages (mainly residential area, area for education, industrial-warehouse area).

***During operation period***

The main source of environmental noise in the vicinity of the route of the investment proposal and its sections will be the transport flow on the road. The noise emitted will be varying. The noise characteristics (equivalent noise level, dBA) depends on its dynamic parameters: intensity (number of vehicles per hour), structure (percentage of heavy vehicles and buses in the general flow), speed of the traffic flow. The parameters of the road, such as type of road surface and longitudinal slope, are also taken into account.

- **Vibrations**

***During the construction period***

The vibrations emitted during the operation of some of the machines and equipment are a factor of the working environment. The construction activity is not a source of vibrations in the environment.

***During operation period***

The transport flow along the road is not a source of vibration in the environment. The design of the roadway (ground bed, road pavement) will provide for the fast attenuation of the vibrations in the ground.

- **Radiation**

***During the construction period***

The lit construction sites are a source of light radiation.

***During operation period***

During operation, the traffic along the Lot 3.2 is a source of light radiation.

The construction activities and the traffic are not a source of other types of radiation during construction and operation of the Lot 3.2.

# 2. Alternatives for Implementing the Investment Proposal

## 2.1. Project development

Designing and construction of the Struma Motorway is a process lasting more than 25 years.

Regarding the designing of the Struma Motorway were carried out numerous surveys:

- Feasibility study drafted by Patproekt (1990)
- Feasibility study of SPEA company (2000/2002);
- Variants drafted by Krassi-Bo (2002);
- Bulgarian design company carried out preliminary studies in parallel with the work carried out by SPEA;
- Studies drafted by NSI-2000 (2007/2008);
- EIA Decision (2008).

Based on the recommendations of the EIA and DIA reports and related studies for assessment from 2007, with EIA Decision № 1-1 / 2008 an approval of variant for the entire length of the Struma Motorway has been provided, which is a combination of several already studied alternatives of the route, as the combination mainly is based on brown alternative, developed by "Krassi-Bo". This EIA Decision 1-1/2008 also includes numerous recommendations for improving the route at the next stages of study and design.

In 2013, the National Company Strategic Infrastructure Projects (NCSIP) begins examination of the proposed for the implementation of the route of Lot 3.2 alternatives. In 2016, as a result of restructuring NCSIP was closed as an organization and the activities on implementation the projects including EIA not yet completed being transferred to the Road Infrastructure Agency. The procedure is chronologically described.

National Company Strategic Infrastructure Projects develops terms of reference for the development of Struma Motorway project, Lot 3.2, which maximally satisfies the requirements of EIA Decision No. 1-1 / 2008.

The major part of Lot 3.2 route passes through the Kresna Gorge area, which is extremely sensitive from environmental point of view. The conditions are further aggravated by complicated physical-geographical characteristics (presence of landslides and landslips, narrow gorge etc.), a fractured zone with a complex geological structure and high seismic risk from tectonic point of view.

All these conditions also determine high risk during construction and operation and impose a number of limitations and conditions in the route designing.

The decision to develop a tunnel was taken in 2008 (EIA Decision No.1-1/2008 of MOEW) and is based on very limited environmental and technical and data. At that time it took into account only the environmental effects from the operation of the tunnel, without considering the impacts due to its very construction, as well as the sophisticated engineering facility maintenance .

In carrying out the progress of the assignment by the National Company of Strategic Infrastructural Projects (NCSIP) project of the long tunnel in the Kresna Gorge in 2013 - 2015, the number of problems were occurred that complicate the implementation of the project as well as operation of the site in the future.

The main problems identified by the Contracting Authority of the project NCSIP concerning project decision with long tunnel alternative are as follows:

- the need of large areas to deposit earth and rock mass;
- the need of constructing multiple temporary roads within the borders of protected areas of Natura 2000;
- the movement of heavy construction machines through the gorge during construction over a very long period, which in addition to the increased discomfort and risk of incidents for the passing vehicles will increase the risk of loss of various animal vertebrate species;
- the need for completion of the construction within a specified timeframe (by the end of the programme period 2014-2020), including grace period;
- extreme high expenses and energy consumption of operation and maintenance;
- significant geological risks (the area of Kresna Gorge is one of the most seismically active areas in Bulgaria);

The main issues identified by the Contracting Authority of the project - NCSIP related to construction of the Long Tunnel alternative are summarized in terms of quality and quantity characteristics and are listed below:

- very big amount of excavation works and areas for the related spoil disposal sites and temporary roads – the expected volume of excavated rock material is approx. 5 900 000 $m^3$;
- about 25% increase in the traffic of heavy trucks through the gorge during construction, i.e. for a period not less than 6-7 years;
- at least three intermediate access locations for the tunneling are needed to ensure construction within the framework of the programme period; this will result in even bigger traffic issues, related to the safe exit of the heavy construction machines on the existing road I-1
- it is well known that the tunnel is located in the seismically most active zone of the country, and after the conducted additional geological surveys and expert analyses, it turned out that the seismic and the general geological risks are significant;

- the performed geological surveys proved that the water drained from the tunnels will amount to approx. 11 000 $m^3$/day. This, in addition to the related entirely technical issues, poses an environmental problem too since it is expected to result in dry out of the surface area of Tisata Reserve as well as at the territories of water drainage by Struma River;
- the conclusions of several expert studies (performed by Bulgarian seismologists from Bulgarian Academy of Science, as well as international experts) expressed serious concerns to the construction of a long tunnel in the gorge, expecting significant problems during construction and risks during operation;

In accordance with the Strategy for the Environment for the project for Lot 3 of Struma Motorway (developed by JASPERS and adopted in 2012) after completion of the project for the long tunnel, the environmental effects must be evaluated. Based on this evaluation must be decided how to continue the development of the project.

Taking into account above considerations and after consultation of the Contracting Authority NCSIP with the MOEW has been accepted it should be developed an additional variant of passing through the Kresna Gorge, which to be assessed from the perspective of risk to human health and environmental indicators.

In 2014 NCSIP has assigned to Patproekt 2000 OOD a pre-investment study for the variant solution of the Struma Motorway in the region of Kresna Gorge from km 378 +600 to km 399 + 788.84 = 397 + 600.

The designer carried out the relevant studies and offers new solution that complies with the regulatory requirements for the roads and the optimal technical specifications.

This design solution from 2014 proposes instead one long tunnel to be constructed numerous short tunnels, which would allow their simultaneous construction in shorter terms. The division of the road lanes provides for accident-free and conflict-free traffic, with continuous traffic in one of the lanes while the other is under construction and vice-versa, and the separation of the road lanes allows also to phase the construction, if necessary. The proximity of the two road lanes next to each other allows quick switching of the traffic between the lanes, which provides for the temporary organization of construction of the motorway, as well as for the temporary organization of the road operation, namely traffic detour in cases of traffic accidents, natural disasters, etc

The proposed in the end of 2014 ***Alternative G20-blue,*** the project route should be developed with dimension G20 and design speed Vpr. = 80 km/h. The both lanes are developed separately from each other, as moving away and approaching each other in terms of location and leveling aspect. This aims at optimal use of the route of the existing road, minimal use of additional new areas.

Wherever possible, the existing road is followed and in the other road sections tunnels and viaducts are planned. Support walls shall be envisaged as well, where required.

The notification of NCSIP to MoEW regarding the investment proposal for „Improving the route of Lot 3.2 of Struma Motorway", under Art. 4 of the *Ordinance on the conditions and order for implementing an environmental impact assessment,* discussed two alternatives for implementation of Lot 3.2: Long Tunnel alternative and G20 alternative (project development from 2014) further referred to as ***Alternative G20 – Blue***.

In 2015 has been assigned the development of alternative variant decision against ***Alternative G20 – Blue.*** The latter has the same dimensions and also does not envisages construction of a long tunnel in the Kresna Gorge, but proposes other technical solutions.

In this regard the potential for utilization of the territories occupied by the existing road E-79 is studied in order to minimize the lands in Kresna Gorge acquired by the project.

Parallel to this, a design solution was sought for an alternative, which is compliant to the environmental and human health criteria and is technically feasible, in line with the regulations on road construction, safety requirements and requirements to the maintenance of the road and its scope.

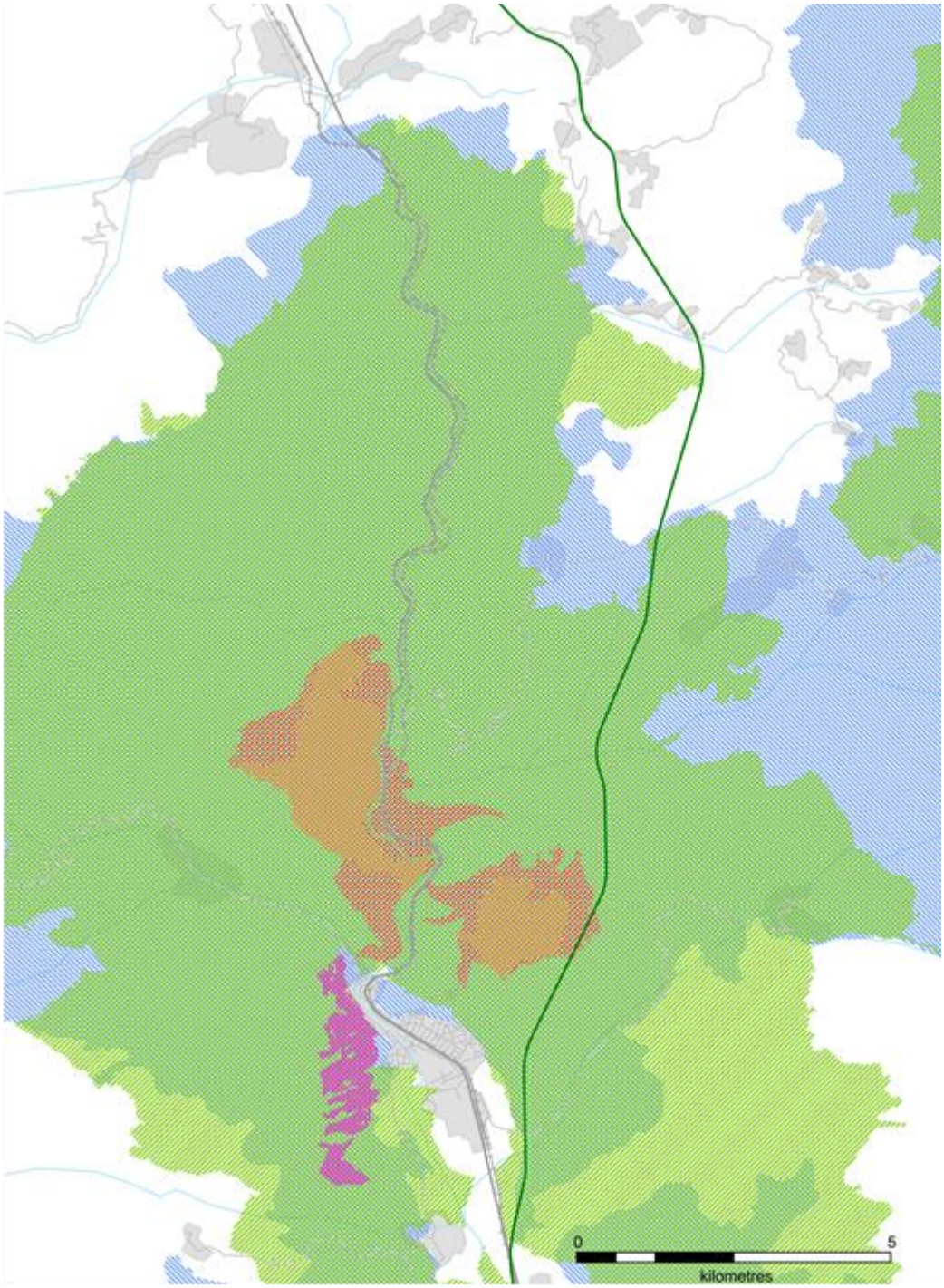
In the end of 2015 an alternative option for crossing of Kresna Gorge was developed, with dimension G20, **Alternative G20 - Red.**

On the grounds of presented in MoEW notification of the investment proposal, guidance are given in Section II item 9 of the letter Ref No. No. OBOC-85/13.05.2015 г., Section II item 9: *„To propose and assess "alternative solutions" in the meaning of § 3, item 7 of the Additional provisions of the DIA Ordinance, including different location of the route, different scale, including different road dimension, different way of implementing the activities or use of alternative technologies. To propose and assess „alternative solution" for the route passing outside of Kresna Gorge, complying with: Recommendation No. 98 (2002) of the Standing Committee of the Bern Convention, - especially item 3 - (Recommendation No. 98 (2002) of the Standing Committee, adopted on 5 December 2002, on the project to build a motorway through Kresna Gorge (Bulgaria); the requirement of condition item 3.2, bullet 7 of the Decision on EIA, where the possibility is envisaged for "future investigation and design of options similar to the presented „alternatives", east of Kresna Gorge and „Tisata".*

As a result, the Contracting Authority NCSIP examines three alternatives:

- ECO A eastern alternative;
- ECO B eastern alternative;
- Western alternative.

## ECO A EASTERN ALTERNATIVE



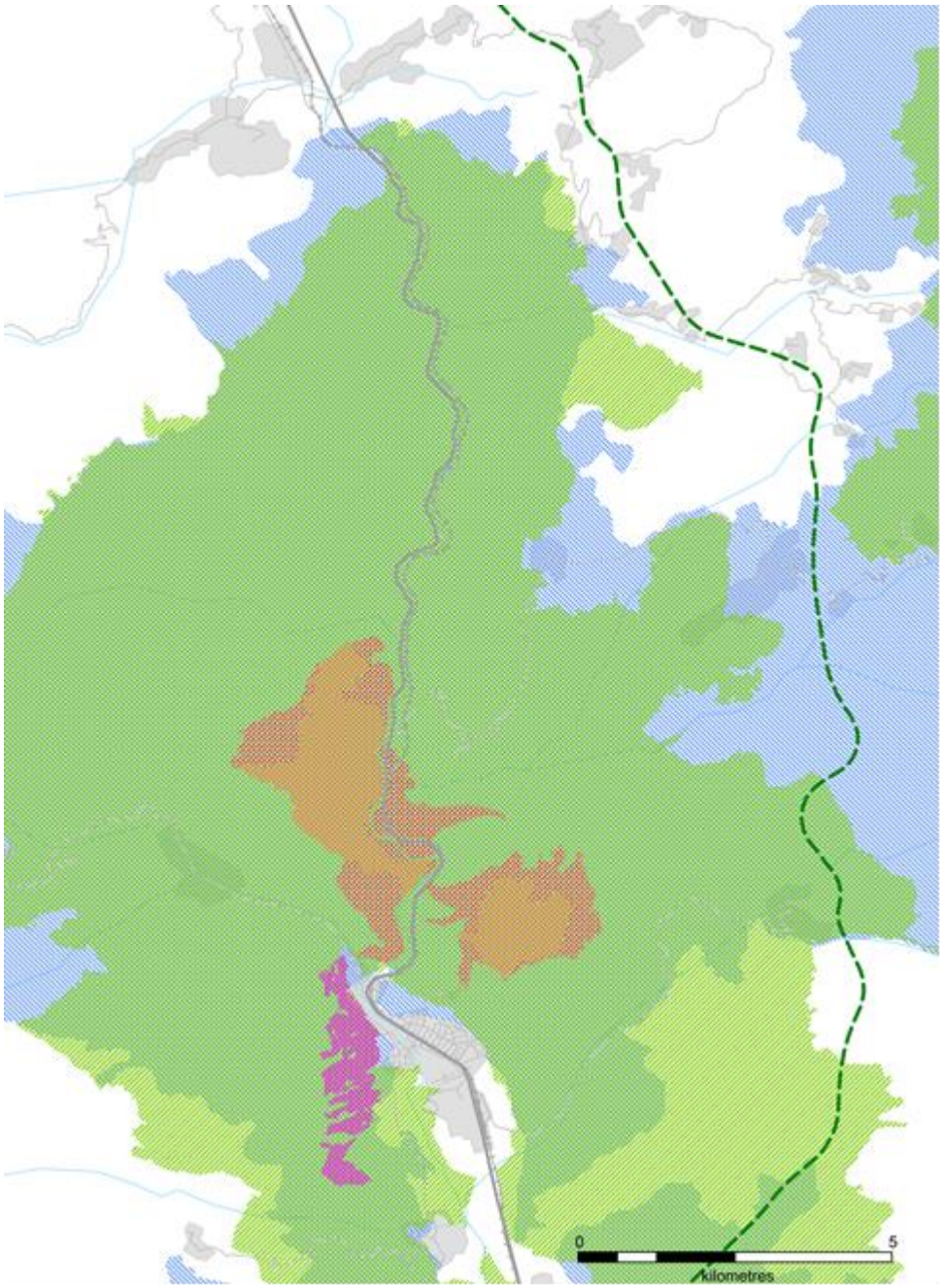

This alternative starts from road junction at the town of Simitli at 300 m above sea level. From there the alignment continues southeast and begins a steep ascend, sometimes with gradients of 5%, until it finally reaches km 389+900 – the highest point of the section at 674 m above sea level. To reach this point, the motorway passes through five bridges and viaducts (lengths of 270, 390, 630, 450, 420 metres) and three tunnels (lengths of 495, 2 600, 1 435 metres). From there the route begins a steep descent, with gradients of about 5%, heading due south. The route passes near the Tisata Reserve and east of the town of Kresna. At km 403+500 it connects into road junction in town of Kresna, at 180 m above sea level. During its descent the alignment passes through 5 bridges and viaducts (lengths of 270, 2 400, 360, 240, 1 800 metres) and 4 tunnels (lengths 1 185, 2 360, 2 750, 2 040 metres). The total length of the entire route is 28.658 km with motorway standard of A29. The design speed is 120 km/h but the operational speed is expected to be much lower because of the extreme gradients. In the tunnel sections the speed limit is assumed 80 km/h. The maximum gradient of up to 5% is expected to significantly affect the operational speeds

The route passes through two NATURA 2000 sites - habitat protection area (SCI) BG0000366 “Kresna-Ilindenci” and bird protection area (SPA) BG0002003 “Kresna”. The

alternative does not affect Tisata Reserve and protected area Moravska but affects protected area Kresna Gorge. This means that the construction of the route would conflict with the regime of the protected area Kresna Gorge (designated as a buffer zone of the Tisata Reserve by the means of Order No. 130/22.02.1985 of the Chairman of EPC (SG, issue 24/1985), amended by Order No. 844/31.10.1991 (SG, issue 24/1985) of the Minister of Environment and with category changed to protected locality by Order No. РД-56/ 30.01.2008 (SG, issue 29/2008 of the Minister of Environment and Water.

"ECO A eastern alternative" affects the protected area "Kresna Gorge." According item b of the prohibitive regime introduced by the aforementioned Order No. 130 / 22.02.1985 within the boundaries of the protected area "it is prohibited the construction of buildings and roads." In this context, and given the circumstance that this alternative is related to the construction of a new road - the same is **inadmissible** against the regime of the protected area. In this connection "ECO A Eastern alternative" will not be considered in the EIA Report.

**ECO B EASTERN ALTERNATIVE**

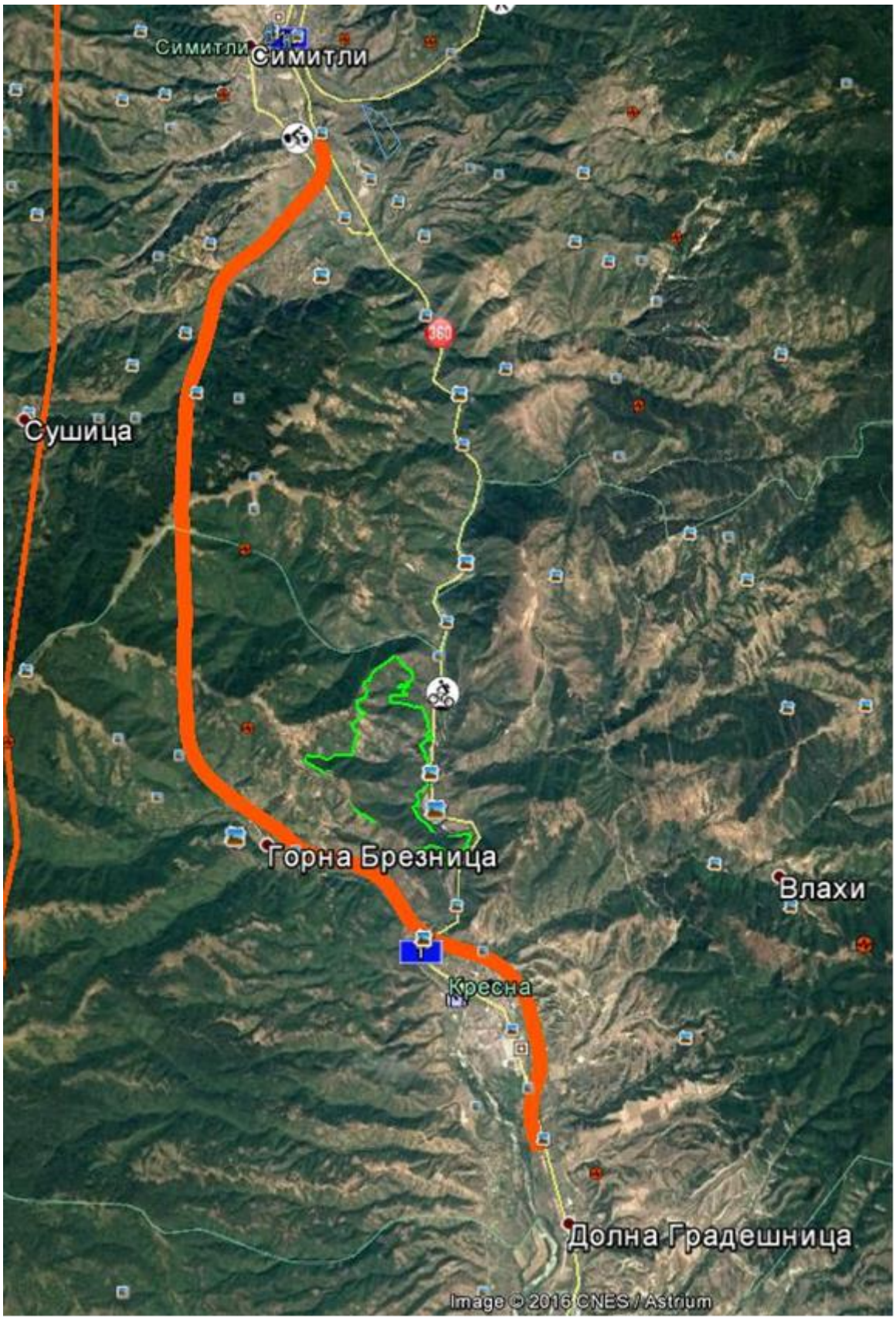



This alternative begins with a route, similar to that of the Eco A Eastern alternative – starting from road junction in town of Simitli at elevation 300 m above sea level, then going southeast to km 389+500 From there the alignment makes a turn to the east to km 390+000 and then another turn to the south. This is a steep ascend and includes a section of about 2 km with gradient of 5%. At km 391+900 the route reaches its highest point at 747 m above sea level. To reach this point, the motorway passes through four bridges and viaducts (lengths of 270, 390, 630, 510 metres) and three tunnels (lengths of 495, 2 600, 1 330 metres). The gradient of the descent is 4.2% for most of its length and the motorway reaches the Strumyani village at 130 m above sea level. During its descent the alignment passes through three bridges and viaducts (lengths of 660, 690, 480 metres) and three tunnels (lengths 3 140, 2 180, 8 500 metres). The total length of the entire route is 32.608 km with motorway dimension of A29. The design speed is 120 km/h but the operational speed is expected to be much lower because of the extreme gradients. In the tunnel sections the speed limit is assumed 80 km/h.

The route passes through two NATURA 2000 sites - habitat protection area (SCI) BG0000366 “Kresna-Ilindenci” and bird protection area (SPA) BG0002003 “Kresna”. The

alternative does not affect Tisata Reserve and protected area Moravska and protected area Kresna Gorge.

**WESTERN ALTERNATIVE**



Pursuant to the instructions of the competent authority to investigate of variant of alignments outside Kresna Gorge, **a new project alternative was studied in 2015.** Considering the fact that the possibilities for bypassing the gorge from the east have already been investigated, the study focused on the west side of the gorge. Thus was obtained so-called Western alternative.

The project route is designed for two road lanes with dimension G20 and Vpr = 120 km/h.

The route starts at km 276 +000 after the bridge on the Struma River, then continues southwest along Cherniche village, the west of the Krupnik village and Polena village, then from km 380 +000 the direction becomes southern.

Crosses the mountain, passes north of Gorna Breznitsa village, continues along the Breznishka River valley. Crosses the Struma River, the existing road I -1 and the existing railway line Sofia - Kulata, then along the Vlahinska River valley bypasses Kresna from northeast and then of east. The variant ends at km 400+200 (the beginning of LOT 3.3).

The construction of 7 tunnels and 6 viaducts is planned. The tunnels have a total length of 11,275 m. The longest is the first tunnel - 9 175 m, starting from km 381 + 541. The others 6 tunnels have a length less than 1 000 m.

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

*After application of multi-criteria analysis (developed by ARUP and NCSIP) the three alternatives are rejected by financial, economic, and ecological criteria. These alternatives are not developed in detail.*

*Since the construction of Lot 3.2 of Struma Motorway is financed by the Operational Programme "Transport and Transport Infrastructure", the design should meet, in general, a number of requirements, which among the environmental criteria include technical and economic criteria that cannot be ignored.*

*In linear projects, including road section through the Kresna Gorge (Lot 3.2 "Struma"), yet at the stage of feasibility studies are taken into account the requirements of standards for design of roads and Ordinance № 4 for the scope and content of investment projects, and other normative documents related to the design and costing of the projects. On the basis of available occurrence data and geographic characteristics the region and statutory requirements shall be assessed which alternatives could be implemented with the known and available technologies, construction practices and building materials, taking into account and the financial possibilities of the Contracting Authority.*

*The projects are accepted by the Expert Technical and Economic Council (ETEC), which has jurisdiction to assess the project in its entirety and from all possible aspects.*

*Considering the financial parameters and time limits laid down in the programming period for projects funded under the OP Transport and transport infrastructure in case of technically impracticable and economically unprofitable variants' indicators, there are no grounds to request financing for their implementation. Under these conditions design, assessment of the project, including environmental indicators is not performed and proceeds to an examination of other possible variants.*

In connection with the instructions of the MoEW by letter Ref. No. OBOC-85/13.05.2015 г., Section II item 9: *„To propose and assess "alternative solutions" in the meaning of § 3, item 7 of the Additional provisions of the DIA Ordinance, including different location of the route, different scale, including different road dimension, different way of implementing the activities or use of alternative technologies.* To propose and assess „alternative solution" for the route passing outside of Kresna Gorge *……..." The Contracting Authority RIA (receiver of the activities started in National Company of Strategic Infrastructural Projects (NCSIP).) in 2016 explored two new alternatives for passage of the route outside the Kresna Gorge, namely:*

- East Alternative G 10.50 - left road lane on new terrain outside the gorge and right road lane on the existing road E79 in the gorge and eastern detour of town of Kresna in new terrain;
- East Alternative G 20 - left and right road lane outside the gorge.

These two alternatives (eastern Alternative G10.50 and G20) are included in this updated Terms of Reference for the scope and content of the EIA.

From 2008 to present, the development of the project for Lot 3.2 of the Struma Motoway is carried out in a transparent manner with the involvement of interested parties which were been regularly informed on progress - EC, JASPERS, municipalities, NGOs, etc.

The main documents taken into account in its development are:

- The Decision on EIA No. 1-1/2008;

- Strategy on the Environment for the project on Lot 3 of Struma Motorway", developed by JASPERS and adopted in 2012.;

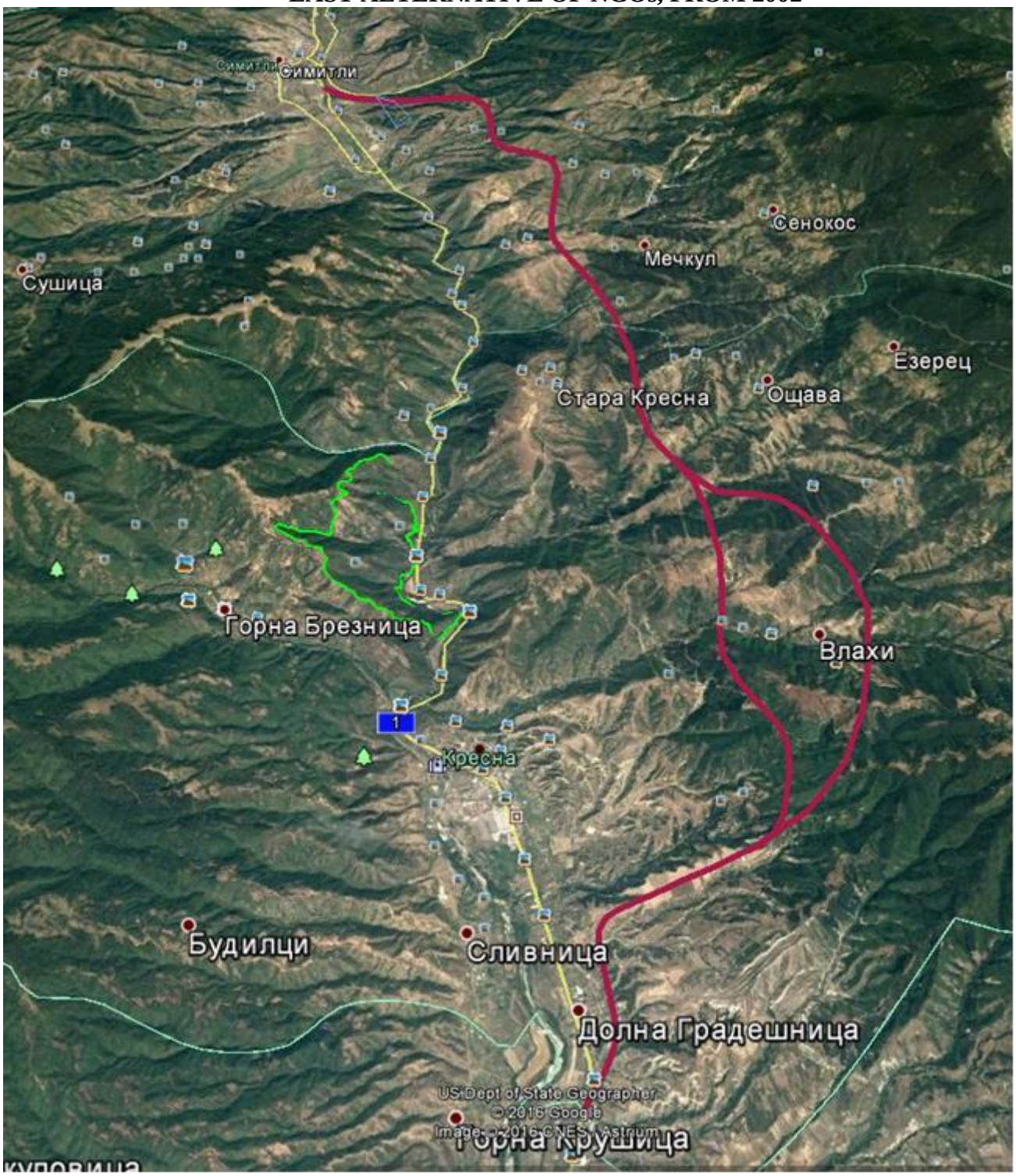
Recommendation No. 98 (2002) of the Standing Committee of the Bern Convention;

- The results of the performed "Monitoring, analysis and assessment of mortality of the animal species in the area of E-79 (I-1) passing through protected areas Kresna and Kresna - Ilindentsi for 2013 - 2016."

The development of the project is driven by environmental considerations:

- Carrying out of a preliminary assessment of the expected impact;
- Identifying and implementation of corrective and mitigating measures in order to ensure minimal interference with priority natural habitat types and associated species;
- Consultations with NGOs and representatives of the scientific community, including together visiting on the site.

**EAST ALTERNATIVE OF NGOs, FROM 2002**




The alternative was developed in 2002 by "Votan Consult" and has been evaluated in the EIA procedure in 2007 for Struma Motorway. **The description below is on the alternatives discussed in the EIA Report from 2007 and the development of the Votan Consult.**

*The alternative was rejected as unacceptable, which is reflected in the issued Decision 1-1 / 2008 of the MoEW.*

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

Provides realignment of the route towards about 4 km east of the gorge.

The route starts from the existing road E79 after road junction "semi-cloverleaf" type in the town of Simitli and headed east, as tangents "Dalgata mahala" from the south. Then the route heading south, crosses Brezhanska River enters from the west in the array of Mount Vartichovitsa (811.4) and heads to the south. The goal is finding a route west of the existing road Brezhani-

Mechkul-Senokos on the slopes of the surrounding mountain massifs. Situational is crossed the road Stara Kresna - Oshtava and the route goes west from mineral spring "Hladkata voda" and then running east and the other mineral spring - "Toplata voda". The route is developed west of Vlahi village crosses Vlahinska River east of over the valley and headed to the third mineral spring "Gradeshki mineralni bani" where passes from the east and after that along the ridge of "Padinata" headed to the Dolna Gradeshnitsa village. It is proposed tangential passing from the east side of the village, as the existing building development about E79 technically will not allow passaging of gauge of 25.5 meters. After bypassing the village, the route is included in the existing road E79.

The highest elevation of the passing is at 10,146 km and 670.11 meters.

The difficult terrain led to the designing of 6 tunnels respectively with lengths 3900 m; 305 m; 505 m; 565 m; 1 350 m and 4 300 m or the a total length of 10 925 meters.

The length of the projected number 8 bridges is 480 m; 480 m; 1320 m; 1 160 m; 240 m; 160 m; 480 meters and 1 320 meters for a total of 5 640 meters.

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

It is includes to the routes of "Speya" at D. Gradeshnitsa - after the border M4-M5.

- Green dotted line - alternative option (Votan), length 31.32 km

This alternative was developed as a sub-alternative of the first one, and on assignment of the Investors should study the possibility of passing east of Vlahi village.

The route of the II Alternative in situational and levelling respect is separated from the I Alternative at 15.4 km and after passing east of of the Vlahi village is included again in the route of the Alternative I like situation at km 27th.

Passes east of the buffer zone of Tisata and does not affect it;

The highest point of the passing is the same as in Alternative I and is at 10.146 km and has a height of 670.11 meters.

In order to overcome the complicated terrain the alternative includes 6 pieces tunnels with lengths 3 900; 305; 505; 2 850; 670 and 5 700 meters or a total length of 13 930 meters.

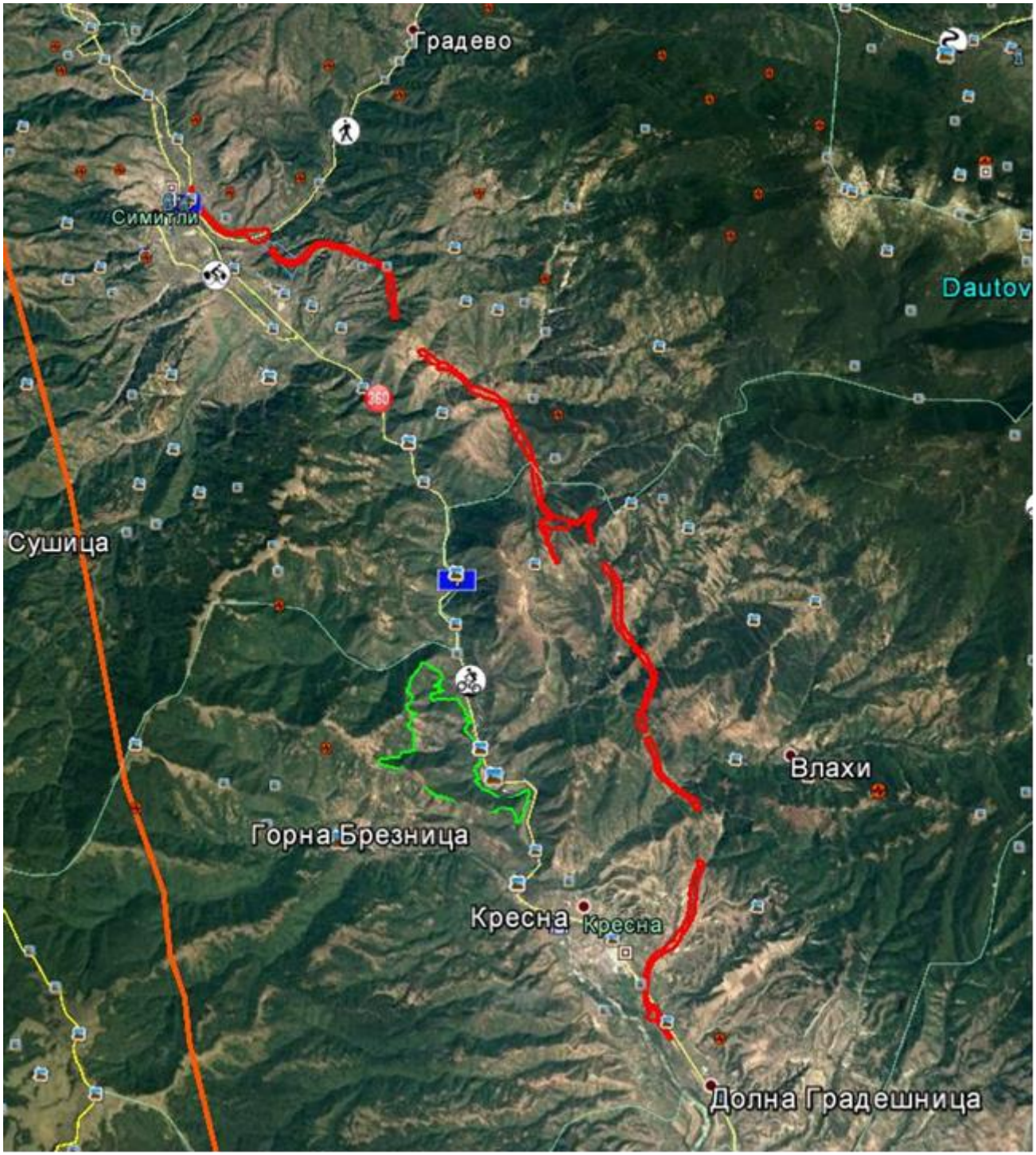
Designed bridges are 8 in number and with lengths respectively 480 m; 480 m; 1 320 m; 1 200 m; 440 m; 480 m; 480 m and 560 meters or a total length of 5 440 meters.

The total length of the facilities is 19 370 meters and the length of the route of 31 32 km these are 61.8% facilities.

## EAST ALTERNATIVE G 20 OUTSIDE THE KRESNA GORGE

In conjunction with consultations, carried out during 2016 on the Updated Terms of Reference on the scope and content of EIA, the RIA assigns the designer of the East Alternative G 10.50 to provide a technical solution for the project road designed so that both road lanes to be developed over a new terrain outside the Kresna Gorge for Vdesign=80 km/hour.

In December 2016 has been elaborated a project: "Pre-investment Study of Lot 3.2 of Struma Motorway - east alternative G20. The project envisages the right and the left lane to pass outside the Kresna Gorge.




The alternative includes a new route in a new property with the dimension G-20 with two lanes with two lines, providing both traffic directions (Sofia - Republic of Greece and the Republic of Greece - Sofia) at easterly direction around Brezhani, Stara Kresna and Oshtava villages for Vpr . = 80 km / h.

Dimension G 20

- Traffic lanes - 2 x 2 x 3,50 m
- Third line for slow-moving vehicles:
  *From km 376+500 to km 385+200 - 2 x 3.00 m.*
  *From km 392+500 to km 399+100 - 2 x 3.00 m.*
- Leading strips (concrete-asphalt mixture) - 2 x 0.25 m;
- Banquettes - 2 x 1.50 m;
- Middle dividing strip - 1 x 2.00 m

- Excavations;
- Protective facilities;
- Slopes.

Both lanes are completely on new terrain and follow its peculiarities. However, putting the two-way traffic to the east of Kresna Gorge will not solve the problem of traffic on the existing section of the E-79 through the Kresna Gorge, as there is no mechanism by which the use of the existing road is prohibited for use by light vehicles.

The levelling of the motorway corresponds to the following requirements:

- Observing the main technical parameters, corresponding to Vdesign;
- Providing smoothness and homogeneity of the route;
- Providing drainage of the road bed and the adjacent territories;
- Providing the necessary dimensions and heights at the intersection of agricultural and other roads of the national road network, railway lines;
- Providing permeability of maximum water quantities from the bridges at Rivers and water obstacles;
- Providing optimum balance of earth masses in excavations and embankments;
- Situation of levelling at the optimal height

The route begins at km 373 +300 (100 m past the intersection with the railroad for the Oranovo mine), to the left of the existing road and will be developed parallel to it up to km 373 +600, then to the south-east, parallel to Gradevska River between the neighbourhoods of the town of Simitli - Oranovo and Dalga mahala. At km 375+775 it crosses road II-19 „Simitli – Predela – Gotse Delchev“ in two levels, by arranging a road junction for connection of the motorway with the town of Bansko and vice versa. Following the intersection of Road II-19 it enters the slope and is needed a tunnel of L = 350 m, and afterwards a viaduct of L = 200 m.

The longitudinal inclinations, permitted in the road junction, tunnel and viaduct are 4%, then the inclination will be 5% and a third lane is needed, descending towards Sofia, and also the construction of emergency exits, if necessary.

From km 378 +000 the alternative runs to south-east, bypasses the village of Poleto, at km 379 + 500 it crosses the road Poleto - Brezhani and at km 380 +470 crosses and Rezena River.

Follows tunnel with length of 1 130 meters, which route underwent optimization and has a longitudinal slope 4.35%, as are improving the technical solutions for tunnels and viaducts around it.

In the section from 385 +500 to km 389 + 800 the alternative is developed to south direction, to the west from Rakitna village, parallel to the road Rakitna - Mechkul and around km 383 +900 crosses it, passes on the west from Mechkul village, continues to the south and to the east of Stara Kresna village, at km 387+670 it crosses the road Stara Kresna - Oshtava, passing through a tunnel underneath.

From km 390+000 to km 396+000 the alternative continues to develop in the south direction. From km 396+000 to km 399+800 the route runs in southwest direction near the existing road to he Vlahi village. At km 399 + 800 is included in the red alternative from 2015 (Detour of the town of Kresna). The alternative ends at km 401+247 identical with km 397+600 by investment proposal of Viaplan 2014.

In places where the road route passes in a tunnel for each lane is provided a separate tube, which in turn imposes their divergence from one another in order to provide the required distance between the pipes. In front of portals are designed sites that serve for building the servicing infrastructure

Because of the higher longitudinal gradients, which are located at the beginning and at end of the route in order to improve throughput and to ensure safety is provided third lane for slow-moving vehicles in both traffic directions in the following areas:

- from km 376+500 to km 385+200.
- from km 392+500 to km 399+100.

LARGE FACILTIES

- Tunnels

| from km | to km | length (m) |
|---|---|---|
| 381+080 | 382+630 | 1550 |
| 388+480 | 389+630 | 1150 |
| 393+910 | 394+120 | 210 |
| 396+030 | 397+350 | 1320 |
| ***TOTAL*** | | ***4230*** |

- Viaducts

| from km | to km | Length (m) |
|---|---|---|
| 375+885 | 376+015 | 130 |
| 376+350 | 376+600 | 250 |
| 378+915 | 379+750 | 835 |
| 379+940 | 380+080 | 140 |
| 380+145 | 380+550 | 405 |
| 380+760 | 381+030 | 270 |
| 383+520 | 383+980 | 460 |
| 386+030 | 386+750 | 720 |
| 387+480 | 387+680 | 200 |
| 387+850 | 388+020 | 170 |
| 391+580 | 391+860 | 280 |
| 392+250 | 392+510 | 260 |
| 393+290 | 393+510 | 220 |
| 394+530 | 394+620 | 90 |
| 395+040 | 395+690 | 650 |
| 398+820 | 398+910 | 90 |
| ***TOTAL*** | | ***5170*** |

SMALLER FACILITIES AND PASSAGEWAYS FOR ANIMALS

To conduct water from the gullies, drainage ditches and other low areas, to build small facilities - culverts are provided. After drawing up a detailed plan for the drainage of the motorway, is determined and the exact number and type of equipment that is needed to conduct the water quantities of trenches, ravines, to the most suitable sites for that purpose.

The selected facilities for animals were been checked for the design maximum dimensional water quantities that could pass with certainty by 1% through the reduced cross-section without allowing spreading water on dry trails.

For this purpose are provided facilities with the following openings:

- pipe culverts – ø 150 – 33 pcs.;
- pipe culverts – ø 150 - facilities for animals - 9 pcs.

Note: Pipe culverts that carry out the intended purpose of passageways for animals will conduct only water quantities from the motorway trench, generated in raining, snowing, etc. The water that will passes through the culvert will be small quantity and will not be constantly running, and during most of the year the facilities will be "dry" and will not create difficulties for the passing of the animals through.

- Rectangular culverts
  - ✓ Rectangular culvert 200/200 – 3 pcs.
  - ✓ Rectangular culvert 400/250 – 2 pcs.
  - ✓ Rectangular culvert 200/200, facilities for animals – 16 pcs.
  - ✓ Rectangular culvert 300/250, facilities for animals – 2 pcs.

***Notes:*** Rectangular culverts that carry out the intended purpose of inter passes for animals are modified to provide dry passageways of the animals and consequently the water quantity passing through the facility are sized so that there is no danger of flooding the dry path.

ROAD JUNCTIONS

The current project provides for two independent lanes, each providing movement in one direction.

This determines the need for cross connections between the two lanes along the existing roads and the arrangement of road junctions (or road connections in two levels) of the left lane.

- ✓ Road connection of the road Mechkul – Brezhani
- ✓ Road connection of the road Mechkul – Rakitna
- ✓ Road connection of the road Stara Kresna - Oshtava
- ✓ Road connection of the road Kresna - Vlahi village

ENGINEERING NETWORKS

In the implementation of the route of Struma Motorway, Lot 3.2 the following engineering networks will be affected:

- Gas pipelines;
- Power lines
  - HV 20 kv;
  - HV 110 kv;
- Water supply pipelines;
- Cables;
- Irrigation canals.

REHABILITATION OF MUNICIPAL ROADS

It is necessary to be rehabilitated the following municipal roads which represent and transverse connection between the Struma Motorway and the way in the Kresna Gorge:

- Road E 79 – Poleto - Brezhani;
- Road Mechkul – Brezhani;
- Road E79 – Stara Kresna – Oshtava;
- Road Kresna – Vlahi.

*The description of the est alternative G 20 and the level of detail of the data in the present Terms of Reference corresponds to the level of the study and design of the alternative.*

***In the EIA Report and Report on the Degree of Impact Assessment (RDIA), in the "Alternatives" section for the eastern Alternative G20, will present information about the expected effects on components and environmental factors, including loss of natural habitats and habitats of species.***

## 2.2. Alternatives for Lcation of the Investment Proposal

The alternative, evaluated in the EIA report are described in detail in section. 1.A of the present supplemented updated Terms of Reference for the scope and content of the EIA as follows:

### ALTERNATIVE WITH DIMENSION G20 - BLUE

The route starts south of the Krupnik road junction, with a length of 0.6 km and crosses the Struma River by bridge facility. In the Kresna Gorge, one lane follows the existing road E79 and the other lane is developed independently via tunnels and facilities in the western massif of the gorge. Upon the exit of the Kresna gorge passes east of the town of Kresna and ends at road junction Kresna.

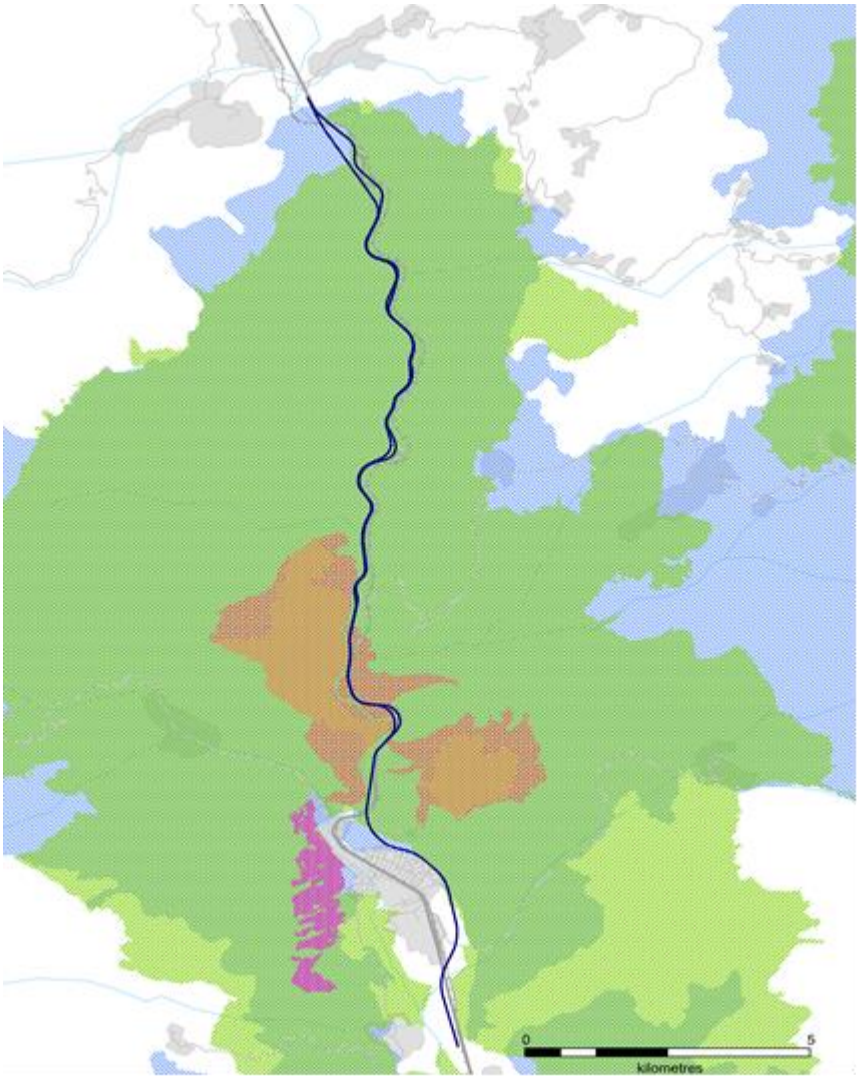
The purpose of developing of an alternative with dimension G20 - blue is to explore the possibilities of using the terrains occupied by the existing road E79, so minimum territories in the Kresna Gorge to be occupied.

In the section from km 378+600 to km 393+100 the two lanes are developed separately from one another, as they get closer or differ in situational and levelling aspect. Wherever possible, the existing road is followed and in the other road sections tunnels and viaducts are planned. In some cases support walls are envisaged toward the Struma River and the slopes.

The route is described in detail in Item 1.A. Description of the physical parameters of the investment proposal and required land areas – Alternative with dimension G20 – Blue

The route passes through two NATURA 2000 sites - habitat protection area (SCI) BG0000366 “Kresna-Ilindenci” and bird protection area (SPA) BG0002003 “Kresna”.

### ALTERNATIVE WITH DIMENSION G20 – RED

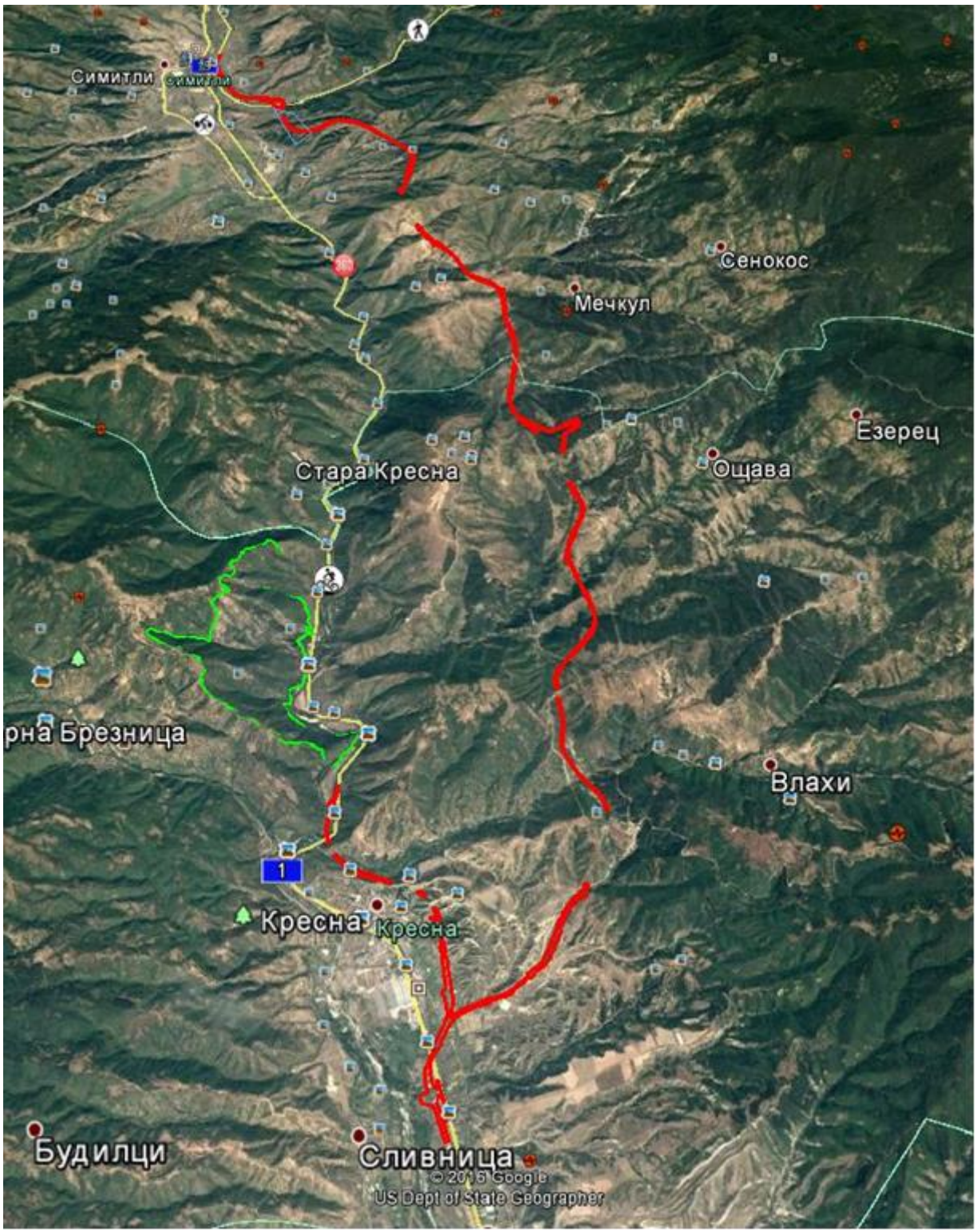



The design for developing an route through Kresna Gorge continued in 2015 aiming at design of an alternative route option to the route developed in 2014 (Alternative with dimension G20 – Blue). In this regard the potential for utilization of the territories occupied by the existing road E-79 was studied in order to minimize the lands in Kresna Gorge acquired by the project. Parallel to this, a design solution was sought for an alternative which is compliant to the environmental and human health criteria and is technically feasible, in line with the regulations on road construction, safety requirements and requirements to the maintenance of the road and its scope.

The route is described in detail in Item 1.A. Description of the physical parameters of the investment proposal and required land areas – Alternative with dimension G20 – red).

The route passes through two NATURA 2000 sites - habitat protection area (SCI) BG0000366 “Kresna-Ilindenci” and bird protection area (SPA) BG0002003 “Kresna”.

**EAST ALTERNATIVE G 10.50**




In 2016 Patproekt 2000 developed a new alternative for passing the Kresna Gorge - **East Alternative G10:50.**

The alternative was studied as two separate traffic lanes, one of which is developed along the existing route of road E79 and eastern bypass of town of Kresna and the other - two lanes on the east far from the Kresna Gorge. The location is described in detail in Item 1.A.

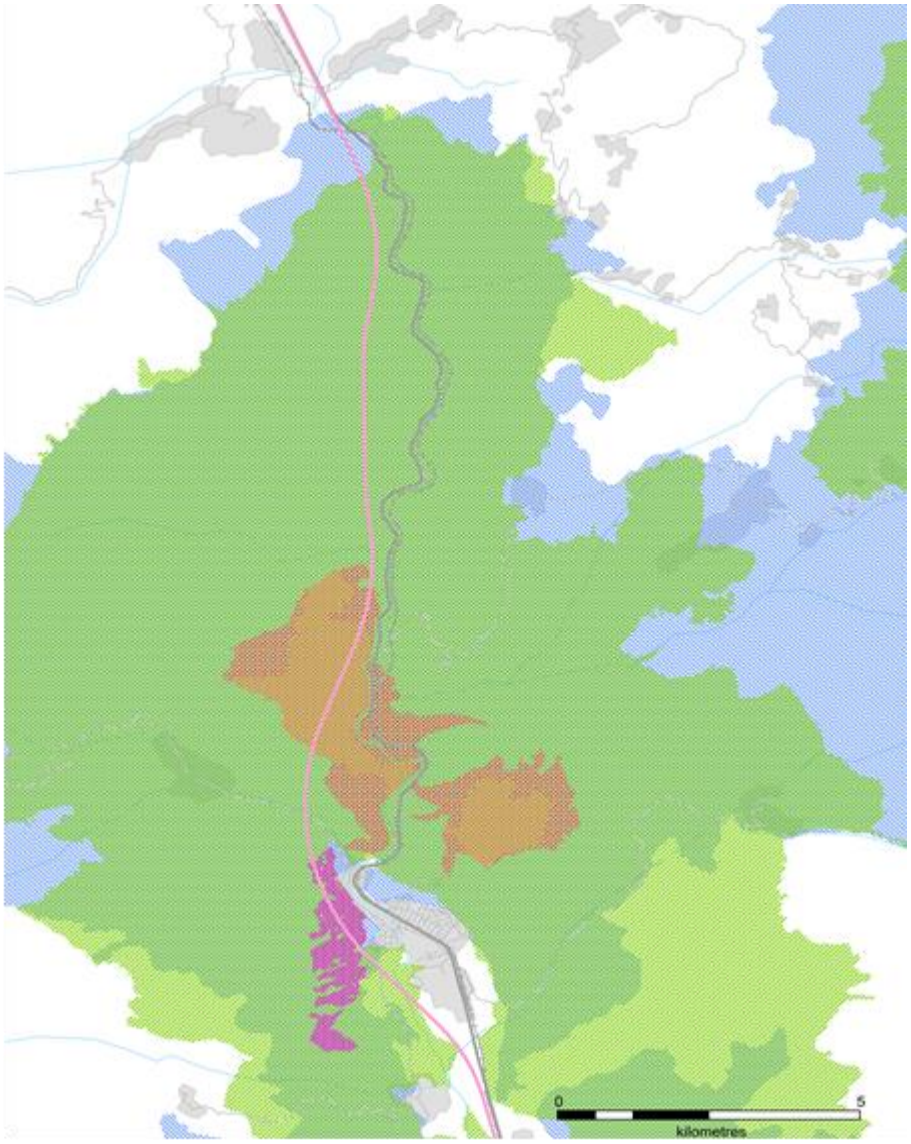
The project route is designed as two separate lanes with dimensions 10.50 for Vpr=80 km/h, which does not ensures motorway dimension and speed.

The right lane of the end of Lot 3.1 follows the existing road through the Kresna Gorge, as the both lanes are in the direction Sofia - Republic of Greece. Before the town of Kresna the route shall leave the existing road and on 2015 developed plan (**Alternative G20-red**) bypasses the town from the east, then makes connection to Lot 3.3. at Kresna road junction.

The left lane is being constructed on new terrain east direction bypassing villages Poleto, Brezhani, Rakitna, Oshtava and Stara Kresna with dimension 10.50 and two unidirectional lanes ensuring the destination Republic of Greece - Sofia.

Since the left lane passes completely on new terrain through a protected zone "Kresna-Ilindentsi" studies are made by the Contracting Authority on the affect on habitats, to assess in advance as far as the priority ones are affected In this variant the traffic in Kresna Gorge is reduced, although the existing road is used, because the vehicles are eliminated in one direction. In this variant the traffic in Kresna Gorge is reduced, although the existing road is used, because the vehicles are eliminated in one direction.

**LONG TUNNEL ALTERNATIVE, KRESNA TUNNEL**




The beginning of the section is immediately after the bridge of the Struma River, as the freeway use existing road and the route of the road would be shifted to the east, parallel to it.

The passing through Kresna tunnel is from km 379 + 267.015 + 394 to km 605.00/left pipe and from km 379 + 255 to km 394 +600/right tube. After the exit of the Kresna tunnel, the motorway intersects an existing third class road and Struma river as passes east of it near the end of town of Kresna, west of the existing road the section ends.

The existing road remains west of the motorway.

The route passes through two NATURA 2000 sites - habitat protection area (SCI) BG0000366 "Kresna-Ilindenci" and bird protection area (SPA) BG0002003 "Kresna".

One of the main disadvantages of this alternative is the necessity to continue to use the existing road E79 by the heavy goods vehicles carrying dangerous substances, which for security reasons should not use the long tunnel.

Furthermore, in item 2.1. *Project development...* are discussed and other problems associated with the implementation of the long tunnel Alternative, which have been identified in advance of the study and design of the facility.

This variant has been developed in conjunction with the EIA Decision № 1-1 / 2008, as in the design process are identified a number of factors for its implementation that make the project problematic.

**In the upcoming EIA Report and DIA Report for long tunnel the expected impacts based on information available will be compared with those in the realization of travel alternatives G20 (blue, red and eastern alternative) and eastern Alternative G 10.50.**

In the assessments will be discussed all issues identified in the design of the tunnel regarding the relevant components of the environment and human health.

## 2.3. Alternatives for technology

The proposed forexamination by the Contracting Authority design variants were prepared in line with an approved technology for construction of speed road, including and highway dimension with traffic category "very heavy". The technology of road construction is regulated in the Norms of road design and Technical specification for the respective dimension Г 10.50, G20 and A29, and Norms of tunnel design, 2014. The regulatory documents do not allow alternatives of the technologies.

## 2.4. Implementation of "zero" alternative

Struma motorway is recognized as a strategic project and is part of Trans-European Corridor No. IV, in the section Sofia-Kulata-Thessaloniki providing direct route through Bulgaria to the Aegean Sea. This is the busiest route through Bulgaria in north-south direction.

The route is part of the EU priority project 7 for developing the Trans-European transport network, including motorway axis: Igumenitsa/Patra-Athens-Sofia-Budapest.

The existing first class road E79 does not have the required technical characteristics for providing speed and accident-free traffic to the European transport network. The geographic conditions and the topography along the existing road – the Kresna Gorge – are reasons for a heavy traffic conditions, with landslips of the roadside slopes, including subsiding of the road into Struma river at high water and high waves. The vehicles move on the road with sequence of turns with small radius, limited visibility and just one track for traffic in each direction, no dividing strip between vehicles moving in opposite directions and without possibility for emergency stop.

**The road is with a high risk of traffic accidents, with high percentage of casualties, and with no alternative for the moment to detour the Sofia-Kulata destination.**

According to the information from the traffic police, for the period of January 2010 – June 2015, there were 366 road accidents in the area of Kresna Gorge of which 21 are with death casualties and 139 with injuries. In other words the average rate of accidents is 68, with 3.87 death casualties and 26 injuries every year. For comparison, the average annual number of death casualties from traffic accidents (for the period 2009-2013) is 152. Considering the total length of the first class national roads which is 2 975 km, about 0.051 death casualties per year per km occur.

Applying the same approach to the data for Kresna Gorge (3.87 death casualties per year in a road section of 19 km) the death rate per year per km is 0.204 or almost 4 times higher mortality.

Accepting the "zero" alternative will not only prolong the risk period for those using the road – both drivers and passengers, but also nullifies the funds and efforts invested so far in the construction of the entire remaining section of Struma Motorway. The road section in question is the last one pending construction and also the most risky one of the entire route from the perspective of road safety; it is also extremely sensitive from biodiversity point of view in the region.

Main principle in the Roads Act, stated in Art.2, para 2, is that the road network develops according to the transport and social needs of the public, the infrastructure of the settlements and the requirements of the laws and regulations, related to national security, environmental protection, human health and traffic safety.

## 3. Baseline Description of the environment in which the project will be realized, and Potential Impacts

*Brief presentation of the methodology for baseline description of the environmental components and factors and human health (preliminary identification of the sensitive receptors), which are likely to be significantly affected by the implementation of the investment proposal and potential impacts*

The study of the existing/initial/baseline conditions provides the basis for the assessment of the environmental components/factors. The description of the baseline conditions will be based on the review of the available information and literature sources as well as field surveys to establish the status of the environmental media in the area affected by the investment proposal (IP).

Subject to description and analysis is the *territory* affected by the IP in its integrity, including all additional or accompanying activities, their spatial distribution and timing, frequency and duration of the significant impacts which are likely to result from the IP. The baseline description of the environmental components, in addition to the general description of the typical features and conditions along the entire route, will also include description of the main activities for implementing of the IP aiming at determining of the *significance and sensitivity* of the receiving environment as per components (receptors).

For the impact assessment purposes, identification and quality evaluation of the affected receiver or the so-called receptor will be made. In the course of this evaluation the sensitivity/importance of each receptor will be determined; for this purpose a criteria for each environmental component/factor will be used. These criteria shall take into account the baseline specifics of the receptor with respect to: existing status of the receptor – geographic distribution and abundance, value (conservation status), etc.; capacity for recovery; resistance towards stress; period of recovery, etc. All these factors determine the sensitivity of the receptor.

The EIA Report will comprise identification of the impacts resulting from the implementation of the investment proposal in its integrity **for the phases of this implementation – during construction and operation as well as in case of emergency situations** considering the level of the development proposed by the Contracting Authority project development by alternatives. The specific laws and regulations on the design, construction and operation of roads, including motorways, does not regulate obligations anticipating of closure and decommissioning of roads and such phase respectively is not studied in the EIA documentation.

The identification of the expected impacts due to the implementation of the investment proposal will be based on the identified specific, physical and technological features of the investment proposal, the type and quantity of the expected pollutants, the natural resources used, as well as the results of the stakeholders consultations held. The potential cumulative impacts will be

evaluated considering the available and presented information on the other existing or planned activities in the area of the investment proposal.

The expected impacts will be assessed for the period of construction and operation, as well as in cases of emergency/contingency, aiming at drawing of general and specific conclusions regarding the expected potential impacts, including the level of impact.

*The assessment of the expected significant impacts on the components and factors of the environment and on human health will be accompanied by proposed measures to prevent and reduce the significant harmful impacts, both for the separate road section and for the entire route of the Lot 3.2 during construction, during operation and if needed – in the case of contingency/emergency situations.*

The EIA Report shall assess the proposed route project alternatives by the Contracting Authority for improving the route of Lot 3.2, as well as the "zero" alternative and an alternative for implementation will be selected.

Parallel to the EIA Report, DIA Report shall be prepared too as required by MOEW; the route project alternatives reviewed and assessed in both reports are the same.

The leader of the EIA expert team shall be responsible, in line with the legislation requirements, for the objectiveness of the final conclusion and the proposed mitigation measures, including for the conclusions and measures of the DIA Report.

### 3.1. Ambient Air and Climate factors

The proposed of the Contracting Authority design variant solutions for route of Lot 3.2 of Struma Motorway include passage through the gorge and bypass of Kresna Gorge. The beginning of design variant solutions of route of Lot 3.2 Struma Motorway starts of the end of the upcoming for implementation section of Lot 3.1 and ends with road junction Kresna and the beginning of Lot 3.3.

In the design solution of both alternatives through the Kresna Gorge (alternative G20-blue and alternative G20-red) is proposed implementation of short tunnels with distancing and approaching of both road lanes. The route starts south of the „Krupnik" road junction. In the Kresna gorge, one lane follows in its main part the existing Road E79 and the other develops on new terrain with tunnels and facilities in the western massif of the gorge. After exiting out of the Kresna Gorge the route passes east of town of Kresna and ends at the road junction „Kresna".

The design solution of eastern alternative G 10.50 is designed as two separate lanes with dimension 10.50 m. The right lane at the end of Lot 3.1 follows the existing road through the Kresna Gorge, and after exiting the gorge it leaves the existing road and the town of Kresna is bypassed from the east on a new terrain, ending at the beginning of the Lot 3.3. The left lane (eastern bypass of the gorge) passes on a new terrain alongside the Gradevska River between the neighborhoods of the town of Simitli - Oranovo and Dalga mahala, as developing eastwards around the villages Brezhani, Stara Kresna and Oshtava by consistently built tunnels, viaducts, supporting walls and reinforced embankment, ending again at the beginning of the Lot 3.3.

The developed conceptual design for a long two-pipe tunnel with a length of 15.4 km is located on the west side of E79 and below the Kresna Gorge. The passing of the route through Kresna tunnel is from km 379 + 267 to km 394+605 (left pipe) and from km 379 + 255 to km 394 +600 (right tube). After the exit of the Kresna tunnel, the motorway intersects an existing third class road and Struma River as passes east of it and southwest of the residential area of the town of Kresna.

**Existing climatic factors** within the scope of the proposed project variant solutions for route of Lot 3.2 Struma Motorway are determined by the condition of the Kresna Gorge, longitudinally crossed, which is characterized by a continental climate with considerable Mediterranean influence, penetrating the valley of the Struma River. The region of the route Lot 3.2 of Struma Motorway in its northern part falls partly in the most southern part of the climatic are Kyustendil-Blagoevgrad

from the transitional continental climate subregion of European continental climatic region, and in the southern part - in climatic region Petrich-Sandanski of Southern Bulgarian climate area of the Continental-Mediterranean climatic region.

**The Kyustendil-Blagoevgrad climatic area** covers the northern half of the Struma valley, and includes Kyustendil and Dupnitsa fields. The altitude of the area is between 400 and 800 meters. It is relatively well protected not only from the west and east, but also from the north, where between Rila, Vitosha and Stara Planina mountains are situated some low and medium high hills. For this reason the winter is considerably warmer than the winter in the nearby Sofiysko pole. The average temperature in January is between 1 and 0.5 °C, as the warmest remains the Blagoevgrad field. The quantity of winter precipitation in the area is between 110 and 145 mm, but the snow cover is too resistant covering a total of about 30-35 days. Despite the relatively mild winter, the characteristic feature of climatic conditions in this region are relatively late spring frosts. This is particularly well expressed in Kyustendil field where these frosts are also almost so late as and in the Sofia field. In the summer season the thermal conditions in the area are determined mainly by the relevant altitude, but also smaller cloudiness exerts influence (more prolonged sunshine) compared to northern regions. Therefore, here the summer is quite warm with average temperatures in July between 21 and 23 °C, as the maximum temperatures for this month are average between 34 and 36 °C. The quantity of summer precipitation is from 120 to 160 mm, i.e. almost as in spring. Therefore, there is no sharp outlined seasonal distinction between rainfall, which emphasizes the transitional nature to the mode of most southern areas. Their autumn amount averaged between 130 and 180 mm, which also highlights the region as a transitional.

**The Petrich-Sandanski Climatic Area** of the South Bulgarian Climatic Sub-region comprises the south part of the valley of Struma river and is surrounded on the east by Pirin mountain, on the west by Vlakhina, Maleshevska and Ograzhden mountains, and on the south by Belasitsa mountain. The area is protected to a great extent from the north by a whole group of mountain elevations. This southern location, the sheltering of the area from the cold coming from north and its relatively low altitude (average altitude between 100 and 300 m) set the conditions for a soft winter – the average temperature for January is about 2°C, and the number of days with snow cover is 15-20 on the average. The total winter precipitation is one of the highest for the lowlands part of Bulgaria - 160 to 210 mm on the average, despite the occurrence of foehn effect from Belasitza Mountain and occasional blurring of the fronts. Spring comes earliest in this lowland area in comparison to the others lowlands areas in Bulgaria –the average air temperature before the end of February keeps stable above 5°C. The relative proximity of the area, however, is sometimes the cause of quite late spring frosts. Nevertheless, here the spring is the warmest of all in the lowlands – the average temperature in April is already 13.5 – 14°C, and in May – between 18 and 18.5°C. The sum of the spring precipitation is about 140 mm – one of the lowest in the country for this season due to the quoted orthographic reasons. The summer in the area is the hottest in the whole country. In July the average temperature is about 25°C, the maximum temperatures often exceed 35°C, and in rare occasions they can reach even 40-42°C. The strong sun and the little cloudiness are causes for very frequent and prolonged droughts. For that reason the summer sum of precipitation is the lowest for the country (100 - 125 mm). The autumn, especially at the beginning, is very warm and dry. The period with stable diurnal temperature above 10°C lasts till the first decade of November.

The EIA Report will assess the potential impacts of the proposed by the Contracting Authority project variant solutions for route of Lot 3.2 of Struma Motorway, which may result in potential micro-climatic changes within the route scope (Kresna Gorge) as regards the quantities of emitted greenhouse gases which affect the **climatic conditions.**

The identification of the existing (baseline) condition of **quality of ambient air** in the area crossed by of the proposed project variant solutions the route of Lot 3.2 of Struma Motorway will be carried out using data from the available updated municipal Programs for reducing the levels of pollutants in the neighboring municipalities.

Sites (receptors) of pollutants emitted by the road traffic, which can be affected by the road section implementation, are the residential areas and/or areas of the settlements (receptors), located around of the proposed project alternative solutions of Lot 3.2 of Struma Motorway. The nearest residential areas (receptors), which are likely to be affected with regards the ambient air quality can be divided into: settlements before entering the gorge – neighborhoods Oranovo and Dalga mahala of town of Simitli, villages Cherniche, Krupnik and Poleto; - single inhabited buildings around the existing road (E-79) in Kresna Gorge; - residential areas after exiting the gorge in town of Kresna; - Settlements at the bypass of the gorge – villages Brezhani, Rakitna, Stara Kresna and Oshtava village.

The impacts of proposed project variant solutions of Lot 3.2 of Struma Motorway regarding the air pollution is determined by the location of the road lanes and their technical parameters (width, transverse/longitudinal gradients, etc.), as well as by the design solutions for overcoming the rough topography and the river (split road lanes, tunnels, slope cutting, viaducts, highway crossings and bridges, etc). The technical characteristics of the proposed variantss regarding these design elements are described in previous items.

**Potential impacts**

***During construction.***

During this period various activities causing mainly non-organized emissions are expected, namely: excavation works for preparation the road foundation and for dug into the slopes; excavations for the supporting walls and foundations of viaducts and bridges; excavations for shifting infrastructure items accompanying the road section; loading and transport of surplus spoil to disposal sites; unloading of the surplus spoil; loading and unloading of inert materials within temporary sites along the route; backfilling with gravel and felt when laying the road foundation; unloading, spreading and compacting the inert materials on the road.

The main emissions when transporting the inert materials will be along the existing used roads in the area, serving existing settlements or existing road (E79) in the area of the constructions.

These processes are sources of emissions of dust with varying grain size composition due to the use of machines for removal of the road surface, bulldozers, front loaders and manual works. In parallel emissions of the typical of ICEs exhaust gases (nitrogen oxides, carbon oxide, sulphur oxide, soot, VOC, PAC, POPs, etc.) will also occur.

Tunneling of the road sections is accompanied by blasting, resulting in emissions mainly of nitrogen oxides, carbon oxide, and fine particle matter in the area around the entries/exits of the tunnels. These pollutants will be emitted periodically during ventilation of the working sections and will depend on the quantities of explosives used. The tunnel works are also associated with loading activities and transport of surplus spoil to the location of their reuse or to the respective disposal site.

During the preparation, laying and evening of the asphalt surfaces, associated with melting of bitumen as well as the preparation of asphalt mixtures, their laying and machine evening mainly emissions of vapors of various hydrocarbons (including VOCs PAHs, POPs, dioxins, furans and PCBs) are expected.

The pollution of the ambient air during this phase will be short-term and local and it is unlikely to impact the quality of the ground air layer within the scope of the affected areas. The EIA Report will assess and compare the proposed project alternative solutions of Lot 3.2 of Struma Motorway in relation to the anticipated impacts on the sites (receptors) due to the pollutants emitted by the construction activities. The comparison of the proposed of the Contracting Authority design variant solutions for route of Lot 3.2 of Struma Motorway will be carried out for the near-ground concentrations of the main pollutants emitted by the blasting (nitrogen oxides and fine particle matter ($PM_{10}$)) within the affected areas (residential areas and/or buildings) around the entries/exits of the tunnels.

***Operation period***

The EIA Report will comprise an assessment of proposed project alternative solutions of Lot 3.2 of Struma Motorway with regard to the near ground concentrations of pollutants. Alternative

G20-blue, Alternative G20-red, East alternative G10.50 with eastern bypass of the gorge and East alternative G 20 and a long two-pipe tunnel.

The pollutants, for which the emissions due to the project implementation will be calculated, are as follows: NOx – nitrogenium oxides; VOCs – volatile organic compounds; NMVOCs – non methane volatile organic compounds; CH4 – methane; CO – carbon monoxide; CO2 – carbon diioxide; N2O – dinitrogenium oxide; SO2 – sulfur dioxide; NH3 – ammonia; Cd - cadmium; Pb – lead; PAH- polycyclic aromatic hydrocarbons; PAHs- Benzo (α) pyrene, Benso (β) fluoranthene + Benzo (κ) fluoranthene, indeno (1, 2, 3-cd) pyrene; Diox – dioxins and furans; $PM_{10}$ – particulate matter (soot) - equivalent of the quantity of soot collected by filter measurements when burning diesel fuel. The quantities emitted by the vehicles for the different pollutants will be determined according to the presented by the Contracting Authority traffic forecast by sections of of the proposed of the Contracting Authority design variant solutions for route of Lot 3.2 of Struma Motorway for the period 2020 – 2040.

The routes of the proposed project alternative solutions with dimension G20 (blue and red) does not cross residential areas and bypass the settlements. The left lane of eastern alternative G10.50 passes between the neighborhoods of the town of Simitli - Oranovo and Dalga mahala. The both lanes of eastern alternative G10.50 passes between the neighborhoods of the town of Simitli - Oranovo and Dalga mahala. The main effect from the project variants will be determined in the EIA Report; however it is expected at the nearby affected settlements and its significance will depend mainly on the presented by the Contracting Authority data on the traffic intensity as well as on the other static and dynamic factors in each section. The distribution of the near-ground concentrations of nitrogen oxides and $PM_{10}$ will be modelled and visualized on a suitable maps.

The nearest residential areas to the route (receptors) are as follows: - settlements in the section before entering the gorge – neighborhoods Oranovo and Dalga mahala of the town of Simitli , southern parts of Cherniche village, western parts of Poleto village, the eastern parts of Krupnik village; - single inhabited buildings serviced by the existing road (E-79) in Kresna Gorge; residential areas after exiting the gorge – northern and eastern parts of town of Kresna; - neighborhoods and residential areas of villages Brezhani, Rakitna, Stara Kresna and village of Oshtava.

The EIA Report will assess and compare the proposed by the Contracting Authority project alternative solutions of Lot 3.2 of Struma Motorway in relation to the anticipated impacts on the sites (receptors) due to the pollutants emitted by the road section - the indicated adjacent residential territories and/or zones of settlements. The comparison of the project alternative solutions of the route of Lot 3.2 of Struma Motorway will be carried out for the near ground concentrations of the emitted by the road sections main pollutants - nitrogen oxides and Particulate matter ($PM_{10}$) within the scope of the affected areas (residential areas and/or buildings).

The preferred and/or unfavorable alternative solutions for implementation of the investment proposal will be proposed based on the number of affected receptors and after forecasts for the potential impacts (exceeding of the limit values and/or norms for protection of human health) during construction and operation of Lot 3.2.

Proposed by the Contracting Authority project alternatives for the route will be compared in terms of the impact on the air quality and the quantity of greenhouse gases, and will be named the preferred alternative for implementation of the investment proposal.

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant negative effects.

### 3.2. Surface and ground waters

The area of the investment proposal falls is within the scope of Basin Directorate for water management of West-Aegean Region (WABD) with center in town of Blagoevgrad.

The impact assessment on the surface water and groundwater bodies is based on comparison of their baseline status, before the implementation of a given investment project and their status, which is possible to be changed during the phases of project construction and operation. This

comparison comprises assessment of the different wastewater emissions, the water quantities needed as well as the physical effects on the water bodies.

The initial (also quoted as baseline) condition of the water bodies, likely to be affected by the investment proposal, is determined using the available monitoring data on the ecological, chemical and quantitative status. In such cases of importance are also water supply and irrigation facilities, etc., as well as the water protection zones – mainly the zones for protection of the drinking water, water protection areas around the water obtaining facilities of mineral water deposits,and protected ares and zones under Natura 2000.

The water management, the identification of the water bodies, the control of their status, the environmental objectives and the measures, which are set in terms of achieving good status or keeping them in good status,are carried out, on the basisof the following documents that define integrated management water:

- adopted by Decision No. 1108 dated 29.12.2016 of the Council of Ministers ***River Basin Management Plan of the West-Aegean Region for the period 2016-2021 and the National Programme for its implementation*, as well as**
- adopted by Decision No. 1105 dated 29.12.2016 of the Council of Ministers ***Flood Risk Management Plan of the West-Aegean Region for the period 2016-2021 and the National Programme for its implementation*.**

Due to the update performed of some of the superficial and ground water bodies and information from the River Basin Management Plan of the West-Aegean Region for the period 2016-2021 will be provided, as well as the preliminary assessment of flood risk of the West-Aegean Region with a view to continuity due to the fact that the project works were carried out mainly during the previous planning period and that environmental development projects concern mainly for this period.

The baseline condition will be determined by using accessible archive and specialized sources relevant to the assessment, for example analyses of the environment impacts from the transport.

The Water Framework Directive 2000/60/EC (WFD) and the Water Act (WA) determine of special importance, inter alia, the observance of the regimes (prohibitions and restrictions) in water protection zones which can be identified as receptors of priority importance.

The water protection zones, are listed below, namely:

*Art. 119a. (New - SG, issue 65 of 2006) (1) The areas for protection of water are:*

*1. . (amend. - SG, issue 61 of 2010) The water bodies and the sanitary-protection zones, under Art. 119, para 4;*

*2. The areas with bathing waters;*

*3. The areas, where the water is sensitive to biogenic elements, including:*

*a) vulnerable areas;*

*b) sensitive areas;*

*4. The areas for protection of economically valuable species of fish and other water organisms;*

*5. The territories and areas declared for conservation of habitats and biological species, where the maintenance or the improvement of the status of the water is an important factor for their conservation.*

It should be noted that the proposed by the Contracting Authority various project alternatives of the investment proposal have different "information base", i.e. they are designed with varying degrees of provision of primary information, particularly in respect of water, absence of detailed engineering and geological and hydrogeological studies, as well as the absence of hydrological reports for dimensioning of bridging facilities.

Prior the realization of any of the selected variant should be obtained the corresponding permits for use of water - water abstraction and/or water site usage.

- **Surface water**

The investment proposal is located in the central part of the valley of Struma River. In this part of the valley of Struma river, affected by the various project alternatives proposed by the Contracting Authority - from town of Simitli till immediately after the end of town of Kresna are the Struma River and its left tributaries in this part of its river valley. Sequentially from north to south, these are the rivers - Gradevska, Brezhanska (also known as a Rezena), Ludata, Mechkulska (also known as Senokoska), Oshtavska (also known as Dyavolska) and Vlahinska river. According PRBM these rivers are separated to specific surface water bodies.

Regardless of the alternative, selected among the alternatives, proposed by the Contracting Authority, as a primary receptor (Zone of Impact) shall become the Struma River in this part of the river valley.

*Surface water bodies, comprised in the scope of the different alternatives of the investment proposal (according to PRBM 2016-2021):*

| **Code of the surface water body** | **Code of the type** | **Name of the type** | **Geographical description of the surface water body** | **History of the surface water body (PRBM 2010 - 2015г.)** |
|---|---|---|---|---|
| BG4ST500R1048 | R5 | Semi-mountain rivers type | Struma River from the confluence of Stara Reka River up to the confluence of the Sushichka River (presumably Oshtavski / Dyavolska River /) | Part of BG4ST500R048 |
| BG4ST500R1052 | R5 | Semi-mountain rivers type | . Gradevska River from confluence of of the Osenovska River up o confluence of the Struma River | Part of BG4ST500R052 |
| BG4ST500R053* | R14 | Sub-Mediterranean Rivers | . Sushichka River from its sources to confluence into the Struma River | BG4ST500R053 |
| BG4ST500R054 | R14 | Sub-Mediterranean Rivers | . Brezhanska River from its sources to confluence into the Struma River | BG4ST500R054 |
| BG4ST500R055 | R14 | Sub-Mediterranean Rivers | . Ludata River from its sources to confluence into the Struma River | BG4ST500R055 |
| BG4ST500R1056 | R3 | Mountain rivers type | . Oshtavska (Dyavolska) River from elevation 1510 m to confluence into the Struma River | Part of BG4ST500R056 |
| BG4ST500R057 | R5 | Semi-mountain rivers type | . Struma River from confluence of of the Oshtavska River to confluence into the Belishka (Shashka) River | BG4ST500R057 |
| BG4ST500R059 | R3 | Mountain rivers type | . Vlahinska River from confluence of of the Sinanishka River up o confluence of the Struma River | BG4ST500R059 |
| BG4ST500R060* | R14 | Sub-Mediterranean Rivers | . Breznishka River from its sources to confluence into the Struma River | BG4ST500R060 |

Notes: *- surface water bodies not directly related to the IP options, but in the immediate vicinity to it.

For the Struma river, the scope of the project alternatives of the investment proposal, proposed by the Contracting Authority, comprises two areas with considerable potential risk of flooding (ACPRF).

*Area with considerable potential risk of flooding (ACPRF) - Kresna*

| **Code of ACPRF** | **Name of the ACPRF** | **Populated area** | **Level of risk** |
|---|---|---|---|
| BG4_APSFR_ST_03 | . Struma River and tributaries at town of Kresna | Kresna | high |
| BG4_APSFR_ST_04 | . Struma River and tributaries from town of Simitli at the villages Cherniche | Town of Simitli<br>Krupnik village<br>Poleto village | high |

| | | | |
|---|---|---|---|
| | | Cherniche village | |

**Potential impacts**

***Construction period.***

Prior to starting construction activities, you need to obtain the appropriate permits for water use - water intake and/or the use of a water body for bridging, correction, waste water discharge and other similar activities, according to the requirements of the Water Act and the statutory by-laws/normative documents.

Impact can be expected on the morphological characteristics of surface water bodies in the areas of intersection (bridging) or correction of surface water from the facilities of the investment proposal - bridges, viaducts and culverts, retaining walls, affecting the riverbed. Minor and local impact is to be expected in terms of increase in suspended solids in the river water, when executing foundations in the riverbeds and in the preparation of coastal areas (clearing of trees, shrubs and herbaceous vegetation, also of rock varieties, unsuitable for the foundation - soils slimes etc.), discharge of drainage water in the construction of tunnel works, undesirable waste disposal in the river beds.

***Operation period***

During operation, emissions of harmful substances are to be expected mainly in cases of emergencies (mainly with liquid loads) or from excessive use of materials for winter road maintenance. Cases of accidents, particularly those with spills of liquefied substances and cargo are extremely rare and can not cause long-lasting impact on the condition of surface water bodies. Winter maintenance shall be performed according to approved expenditure norms, in compliance with the environment, therefore one could also assumed that the impact shall be local and short-lived. As such, we could mention Cl, $SO4^{2-}$, $Na^{+}$, $Mg^{2+}$ and others, from the de-icing substances used for de-icing of the roadway. The use of defrosting materials will be very limited, in view of the fact that the average winter temperature is about +2°C.

- **Grounddwaters**

The spread of the affected groundwater bodies and their characteristic type shall be determined mainly by the geo-lithological and structural characteristics of the area, through which the project alternatives, proposed by the Contracting Authority shall pass.

The groundwater bodies within the area of the proposed project alternatives l may be specified as receptors (areas of impact), affected by the implementation of the investment proposal.

Ground water bodies, impacted by the realization of the project alternatives, proposed by the Contracting Authority for the investment proposal, (PRBM, 2016-2021).

| Type of the surface water body | Name of the surface water body | Code of surface water body | Total area of the surface water body, km2 |
|---|---|---|---|
| Water bodies in alluvial deposits of the rivers | Quaternary pore water - Kresna-Sandanski | BG4G000000Q002 | 123.34 |
| | Pore waters in the cuaternary - Simitli | BG4G000000Q003 | 16.02 |
| Water bodies in the graben-shaped depression | Pore water in neogene - Sandanski | BG4G000000N012 | 632.33 |
| | Pore water in neogene - Simitli | BG4G000000N013 | 69.24 |
| Water bodies with fissure water | Fissure water in Vlahinsi-Ograzhdenski-Maleshevski-Osogovski metamorphites | BG4G001PtPz125 | 3089.90 |
| | Fissure water in Pirinski block | BG4G1PzC2Pg019 | 1118.71 |

Some project alternatives of investment proposal proposed by the Contracting authority is likely to affect the sanitary protection zones around mineral water deposits. The latter concerns mainly those which are public municipal property such as:

- Oshtava (hladka bania) — Blagoevgrad District, Municipality of Simitli, village Oshtava
- Oshtava (goreshtia izvor) — Blagoevgrad District, Municipality of Simitli, village Oshtava
- Gradeshka Banya — Blagoevgrad District, Municipality of Kresna, village Gorna Gradeshnitsa
- Breznitsa — Blagoevgrad District, Municipality of Kresna, village Gorna Breznitsa

**Potential impacts**

***Construction period.***

Impacts on the status of the groundwater bodies are likely mainly for the areas of substantial excavation works and more specifically the tunneling. These impacts are related to partial draining of the groundwater bodies along the road section with excavation works and the degree of impact depends on the specific hydro-geological characteristics (depth of the water levels, in particular) of the affected groundwater bodies. Due to the strongly uneven topography (draining respectively) crossed by the route of the IP the anticipated impact are insignificant.

The above, of course, does not apply to the "long tunnel" alternative where the impact on groundwater covers much greater length, respectively it shall affect much larger area than those ground water bodies within the range of the long tunnel.

***Operation period***

During operation impacts on the groundwater bodies settings are practically unlikely.

Similarly to the above comment, it should be noted that in the "long tunnel" alternative effects on the condition of the affected ground water bodies will be significant due to the constant drainage of water deriving from the development.

Proposed by the Contracting Authority design alternatives for the route will be compared in terms of impact on surface and groundwater, and will be named the preferred alternative for implementation of the investment proposal .

Will be offered achievable and verifiable mitigation measures for limiting or avoid significant negative effects.

## 3.3. Geological settings (Geology)

The baseline status of the geological settings is identified using the available geological information about the area crossed by the investment proposal – map sheets in scale 1:100 000 and explanation notes to them, engineering-geological reports from the performed surveys of the geological strata for the area of the road and road facilities foundations, topographic photos and other relative information available.

The investment proposal will cross the area of the Morava-Rhodope tectonic zone, and more specifically through parts of the Struma, Pirin-Pangeon, Ograzhden units, as well as parts of intra-orogenic Neogene-Quaternary basins - Simitli and Sandandski basins.

Receptors of the impacts on the subsurface and the geological settings during implementation of the investment proposal are the specific topographic areas in the zones of steep slopes cutting and tunneling.

In addition to the above mentioned main receptors, not less important, however, are the sections (disposal sites) for storage of earth spoil which is "not suitable" for construction. As "Not suitable" may be defined the earth spoil, formed during terrain preparation which is not suitable for reuse in embankments or for the construction of the earth base of the road surface (excavated earth spoil, which do not meet the design specifications for reuse in construction).

The presence of adverse geological phenomena is of special importance in the design construction and operation of project and the development of the transport network.

The area of the investment proposal includes granites, gneisses and andesite of Precambrian, Paleozoic, Mesozoic and Neozoic age, as well as sediments of Paleogene, Neogene and Quaternary age.

In brief, the description of these rock formations is as follows:

**Precambrian:**

Ograzhden supergroup:

Gneiss-migmatite complex — Maleshevska group PєC)

Rhodope supergroup:

Chepelare formation (tčPєD)

**Paleozoic:**

Krupnik pluton (krgPz2)

**Mesozoic:**

Upper Cretaceous:

North Pirin pluton (dgK2)

**Neozoic:**

Paleogene:

Formation of subalkaline dacites and trachiandesites (yPg3)

Paleogene sediments filling the Brezhany Graben — Paleogene includes 5 bottom-up situated formations therein in the following sequence: Kachovska, Goreshtishka, Rakitnishka, Lulevska and Dermirishka.

Neogene:

Kaliman formation (ka/1N1)

**Quaternary:**

Alluvial formations (aQh)

Regardless of the selection of proposed project alternatives by the Contractin Authority the presence of deposits of natural resources registered at the National Balance of Reserves & Resources of Bulgaria as well as areas with granted concessions for mining of natural resources, and affecting areas for prospecting and/or exploration of mineral resources should be consulted about.

The presence of negative geo-dynamic processes needs to be clarified for the different alternatives of investment proposal.

**Potential impacts**

***During construction.***

The impact on the geological environment is practically along the whole length of the route of the IP, regardless of which alternative should be selected for implementation of the investment proposal . It results from the performance of the excavation and backfilling works (earthworks) and largely affected is the geological strata in the area of tunneling. The impacts will occur during construction of the facilities and the road lane.

***Operation period***

Adverse impact may occur in case of incorrect design and poor construction of the facilities supporting and retaining facilities in the areas of slope cuttings that may result in development of landslides or landslips and impede the subsequent operation of the route.

The impact assessment of the geological settings in the EIA Report will be based on the available information about the geological characteristics of the area, on performed geological surveys - mainly the results of the engineering-geological reports, consultations with the competent authorities – the Ministry of Energy, Geozashtita – Pernik, affected mayoralties' lands, etc.

The recommendations regarding avoidance and minimization of the potential adverse impacts on the geological settings will be part of the conclusions.

Proposed by the Contracting Authority project alternatives for the route will be compared in terms of impact on geological settings , and will be named the preferred alternative for implementation of the investment proposal .

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant negative effects.

### 3.4. Soils

According to the geographical zoning of the soils in Bulgaria, the soils in the scope proposed by the Contracting Authority solutions alternative projets of the investment proposal are related to the Mediterranean Soil Subzone, the Struma-Mesta Province (South Bulgarian xerothermic region). The Cambisols, Distric-Eutric and Umbric Cambisols predominate among the zonal soil types while the Fluvisol and Delluviosols (or Colluviosols) predominate among the azonal types. The soil cover in the treeless areas with higher slopes and intensive erosion is represented by isolated soil areas - shallow soils; at some places the soil cover is missing completely and the base rock outcrops on the surface.

The soil types in the areas of implementation of the proposed by the Contracting Authority alternative solutions of the investment proposal alternatives are established as follows:

Order A. **Soils which are not related to the zonal climatic conditions**

**Type:** Fluvisols (FL, FAO, 1988).

These are formed by the recent River sediments, more or less are covered with vegetation and regularly are enriched with new sediments. They have only A horizon which covers the sandy sediment layers. The Fluvisols always develop in the River floodplain and the terrace above it; the groundwater level is shallow – from 1 to 3 m (the groundwater depth depends on the River regime); they are subject to periodical flooding and sedimentation of new eluvium. According to the mechanical composition they are gravelly-sandy to slightly clayey, quickly altering in a short distances depending on the grain size of the River sediments. The Fluvisols are loose, airy, well saturated by the close groundwater and easy to cultivate. Their high filtration capacity is a precondition for quick contamination mainly via the water pathwith dissolved fertilizers as well as deposition of pollutants from the transport, etc. In natural conditions wood and meadow hydrophytes grow on these soils namely: willows *(Salicaceae)*, alders *(Alnus glutinosa)*, and poplars *(Populaceae)*.

**Type:** Shallow soils (Leptosols, LP, FAO, 1988). These soils are not well developed; they have one horizon which lies directly on the hard rock. Conditions for their forming are the base rock resistance to weathering, the dry, warm to cool climate which limits the water content and the biological activity as well as the relatively young geomorphological surfaces.

**Subtype:** Lithosols (Lithic Leptosols LPq, FAO, 1988). Developed straight over the fractured and compact hard rock with underdeveloped A horizon. These are covered with poor and scattered grass vegetation.

**Subtype:** Rankers (Umbric Leptosols, LPu, FAO, 1988). Shallow Umbric and Gray Luvisols - eroded. Formed over thin Alluvium of siliceous rocks, only A horizon is present. Developed on steep slopes. Covered with forest or grass vegetation.

**Order C. Metamorphic soils with altered characteristics due to weathering and clay forming (Cambisols, CM, FAO, 1988)**

**Type:** Cambisols. Developed under moderate cool and relatively wet mountainous climate. The soil forming materials are result of the physical weathering of various siliceous rocks formed under deciduous and coniferous forests. These cover the mountain areas with altitude from 600 to 1700-1800 m above sea level. Developed under moderate wet mountainous climate. The most essential features of these Cambisols are: presence of horizon Bm from the type cambis, abundances of skeleton and rock fragments in the profile, relatively small depth of the profile and small thickness of the humus layer, they have acidic reaction and low humus reserves.

**Order F. Order F. Soils with clay accumulation or sesquioxcides and organic matter in the subsurface layers.**

**Type:** Luvisols (LV, FAO, 1988). This type includes the defined Gray Luvisols in Northern Bulgaria as well as the Umbric Luvisols in the Southern Bulgaria. The mechanical composition of the Luvisols is diverse. In the surface layer the soils are slightly to medium sandy-clayey with humus content of brownfield of up to 3-4%, decreasing to 1-2% in the arable land.

**Order H.** Organic soils (Histosols) and mineral anthropogenic soils.

**Type.** Anthropogenic soils (Anthrosols, AT, FAO,1988). Landscapes where natural components have been transformed as a result of various forms of human activity.

***Disturbed soils and lands***

Disturbed lands within the scope of the implemented proposal are found only along the existing road E79, crossing of national road network roads on alternative G10.50) and eastern alternative G 20 as well as along the forest and agricultural roads. The lands affected by the construction of the investment proposal, in their majority, belong to the forestry fund.

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***Degradation processes and phenomena***

Usually the excavation and backfilling operations create conditions for activation of erosion processes which can be avoided providing implementation of appropriate reinforcing activities. Construction activities can cause landslides as well as compaction of the adjacent areas. The recovery of these lands is subject to reclamation.

***Contaminated lands***

The lack of industrial pollutants in the region determines the soil as unaffected by contamination with harmful substances.

***Landuse***

The construction activities due to the investment proposal will affect agricultural lands and forest areas which will be subject to respective procedures for change of designation thereof. Information shall be provided in the EIAR about the territories and areas affected under the evaluated project alternatives.

The anticipated disturbance of the lands and soils shall be determined with more details during the EIA stage in terms of areas and affected lands by option subject to change in designation, according to the planned general characteristics and technical parameters of the linear part of the road and related facilities.

**Potential Impacts**

***Construction period.***

The main impacts on soils resulting from the implementation of the investment proposal are related to disturbance of the soil profile, changes in the physical and chemical, waterphysical and biological processes that take place in the soil substrate as well as local deterioration of the soil quality in the lands adjacent to the road section.

Following the implementation of the investment proposal, the utilized lands will be classified as **disturbed lands**, in accordance with the Method for Classification of Disturbed Soils (Instruction № РД-00-11/13.06.1994 of the Ministry of Agriculture and Forestry). Construction of the investment proposal will result in permanent soil disturbance where soils will be irreversibly lost as non-renewable natural resource.

The excavated humus layer is of importance in terms of its re-use in landscaping of the lands adjacent to the road. The storage of the excavated humus in a designated areas as well as its utilization shall be carried out in line with Art. 15, para 1and 2 of the *Soil Act* and Ordinance № 26 for *reclamation of disturbed areas*.

Temporary soil disturbance will occur in the sites designated for homeporting of construction vehicles and equipment, spoil disposal sites as well as in the areas for storage of construction materials and excavated humus. After completion of the construction activities these sites will be reclaimed.

Other expected impacts on lands and soils, such as compaction may happened as result of uncontrolled movement of construction and transport vehicles outside the construction corridor and the designated road accesses.

During construction, contamination of the adjacent lands with aerosols from the exhausts is expected to be insignificant and will not affect the quality of the lands considering the short duration of the construction activities.

Local soil contamination with fuel and lubricants is possible in case of accidents with the machinery.

***Operation period***

*Contamination with harmful substances.* During operation of the investment proposal contamination of the adjacent soils will occur due to exhaust gases from the road transport, potential fuel and lubricant spills, defrosting chemicals used for road maintenance in winter along with the surface runoff from the road lane.

During operation the investment proposal will be a linear source of contamination emitting:

– continuously, but with variable intensity, COx, NOx, $SO_2$ and other gases and aerosols which contain mainly Cd, soot and other compounds from the engines of the passing vehicles as well as from the tire wearing on the road lane and from the road surface;

– periodically (during the winter season) — Cl, $SO_4^{2-}$, $Na^+$, $Mg^{2+}$ , etc. from the defrosting substances used to prevent the icing of the road lane.

The gases and aerosols emitted from the road will reach the lands and soils adjacent to the road. The results from the modelling of the dispersion of pollutants prove that the land strip which is at a distance of 5 to 10 m from the roadside will be subject to contamination; the concentrations of the pollutants rapidly decreases with the distance (50, 100 m).

The pollution due to use of salt and lye during the winter maintenance of the road lane is also source of soil contamination in the areas adjacent to the road. These substances will cause small changes in the soil quality (except local pH changes) considering the limited quantities which are applied.

During operation of the investment proposal accidental spillages of lubricants, fuel and harmful substances can cause local but significant soil contamination.

In general, the expected adverse environmental effects due to soil contamination are:

- change (although local) in the physical and chemical, waterphysical and biological processes in the sections adjacent to the road;
- additional deterioration of the soil structure;
- deterioration in the quality of the agricultural production from the lands adjacent to the route of Lot 3.2.

*Contamination with waste*

Solid waste – waste from construction as well as municipal waste are important soil pollutants along the roads. In the context of soil contamination with waste, the areas designated for parking and homeporting of vehicles as well as the lands along the road are contaminated with municipal waste, in some places there are construction waste from construction and road works. In this respect the lands along the investment proposal will not be an exception.

*Erosion processes – induced erosion*

The resloping which is part of the Lot 3.2 construction is a precondition for causing induced erosion. The type of the terrain crossed by the route of the new road plans for excavation and backfilling operations and forming of steep slopes which may cause erosion.

The envisaged reclamation activities will prevent to great extent this phenomena, providing on-time implementation.

Proposed by the Contracting Authority design alternatives for the route will be compared in terms of impact on the soils and will be named the preferred alternative for implementation of the investment proposal .

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects

EIA Report will comprise assessment of the proposed by the Contracting Authority alternatives in relation to the balance of the affected lands,way of permanent landuse, category and ownership on the basis of preliminary information for the preparation of the parcel plans.

The expected permanent soil disturbance and impacts resulting from the new construction as well as the impacts of the traffic pollution on the soils adjacent to the road will be studied and assessed for the construction and operation stages of the investment proposal. Measures to mitigate the adverse impacts on the soils and lands due to the road shall also be proposed.

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects

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## 3.5 **Flora and Fauna Elements of the National Ecological Network (NEN)**

### Flora

The area of the investment proposal is located in the southwestern part of Bulgaria and includes Kresna Gorge between Krupnik village and the town of Kresna, western lower slopes of Pirin and Maleshevska Mountain. The first class road E-79 in its majority is situated in the valley of Struma River. The altitude along Kresna Gorge varies from 185 m to 280 m above sea level. Under East Alternative G10.50 and the East Alternative G20 the altitude varies between 300 and 740 m.

According to the geobothanical zoning of Bulgaria, the region is part of the Mediterranean sclerophyll forest area, Eastern Mediterranean province, Middle Struma district. It characterizes with xerothermic forest vegetation with predominating downy oak and white *oak (Quercus pubescens, Q.virgiliana)* majority of which is destroyed and currently only patches of forest with altered composition are left. Widely represented in the recent forest vegetation are the mixed forests of downy, oriental hornbeam *(Carpinus orientalis)* and flowering ash (*Fraxinus ornus)* with undergrowth of Mediterranean evergreen bushes. The destroyed forests are replaced with evergreen secondary vegetation of juniper *(Juniperus oxycedrus),* Jerusalem thorn *(Paliurus spina-cristi*) and turpentine tree *(Pistacia terebinthus).*

Typical representatives of Sub Mediterranean and Mediterranean forest vegetation such as downy oak, oriental hornbeam and Greek juniper *(Juniperus excelsa*) as well as coniferous plantations predominate at altitude of up to 600 m.

In the lower mountainous belt (from 600 to 1000 m), the natural oak and mixed forests are developed. The variety of species in these territories to a large extent is linked to the changes in altitude, the different exposition of the slope and the local hydroclimatic, soil and ecological conditions. Hungarian oak *(Quercus frainetto*), beech oak *(Q. dalechampii*), hop hornbeam (*Ostrya carpinifolia*) and plantations of Scot pine (Pinus sylvestris) and black pine (P. nigra) grow in the well drained and relatively drier sites. The forest vegetation in the more wet habitats is represented by European beech *(Fagus sylvatica*), field maple (Acer campestre), common hornbeam (*Carpinus betulus*), common alder (Alnus glutinosa), mountain ash *(Sorbus aucuparia*), checker tree (*Sorbus torminalis*), etc.

Some of the Mediterranean species possess the ability to form communities such as the *Juniperus oxycedrus* and *Platanus orientalis*. Despite the increased human activities these communities develop relatively well and expand their spatial distribution. The oriental plane (*Tertiary relict)* forms forest communities along Struma River and its tributaries and is typical in the Kresna Gorge.

Communities of willow and common alder (*Salix spp. u Alnus spp.)* predominate in the wet areas along the river.

The predominating mountainous terrain of the area determines the altitudinal zonation of the vegetation cover. In general the forest species are more common but the share of natural meadows and pastures as well as bush vegetation is also significant.

Description of the affected territories along project alternatives
In terms of flora the investment proposal falls within the floristic region valley of the Struma River. This area is rich in biodiversity and includes the distribution of 44% of the species in the Bulgarian flora. Only in this region are distributed 27 species of plants and 46 species in the area have conservation significance.
In theregion is common and endangered species Imanuelova cornflower *(Centaurea immanuelis-loewii Degen),* which is the subject of conservation in protected area "Kresna - Ilindentsi" and Balkan endemic.
During the preliminary investigation on the territory of the proposed by the Contracting Authority project routes the following flora ans communities were established

**Oak forests, dominated by downy oak (Quercus pubescens)**
Distributed over relatively large areas on steep rocky terrains. This habitat includes the xerothermic forests dominated by the downy oak (*Quercus pubescens*) developed in the areas with transitional Mediterranean, transitional-continental and euxeinos climates The composition of the community includes: Turkey oak (*Quercus cerris),* flowering ash *(Fraxinus ornus*), oriental hornbeam (Carpinus orientalis). The grass-bushy segment species are typical for the xerothermic oak forests and include many Mediterranean species such as: jasmine (*Jasminum fruticans*), Jerusalem thorn (Paliurus spina-christi), smoke bush (Cotinus coggygria), bulbous bluegrass (Poa bulbosa), orchard grass (*Dactylis glomerata*), southern crupina (*Crupina crupinastrum*), felty germander *(Teucrium polium*), clammy-clampion (*Viscaria vulgaris*), etc.
The habitat is established according to routes of all reviewed project alternative.

**Balkan-Pannonian-Turkey-sessile oak forests *(Quercus cerris, Quercus dalechampii*)**
This subtype includes xerothermal and mezoxerothermic oak forests in the hilly plains, foothills and lower mountains of southern Bulgaria — the southern slopes of the Stara planina and Sredna Gora, Thracian lowland and Tundzha plane, Eastern Rhodopes, Sakar, Strandja, Struma valley and Mesta River valley, low mountains south of the towns of Blagoevgrad and Kyustendil. These communities have diverse floristic composition and are mostly mixed, but often dominated by the beech oak (*Quercus frainetto*) or form mixed communities with Turkey oak (*Quercus cerris*), and at high altitudes, also with durmast *(Quercus dalechampii).* Thracian oak forests occupy the slopes with different exposure and hill ridges. Increasing the erosion of the driest and poorest areas, they are replaced by phytocenoses dominated by Acer monspessulanum, Carpinus orientalis, Quercus pubescens, and in the stage of ultimate degradation they represent the communities of Bothriochloa ischaemum (= *Dichanthium ischaemum*), Chrysopogon gryllus, Juniperus oxycedrus, Paliurus spina-christi. Thracian thermophilic mixed oak forests are provided with good lighting (canopy 0.6-0.7), which allows co-existence of many tree, shrub and grass species. Due to the influence of anthropogenic and natural soil erosion Oriental hornbeam (*Carpinus orientalis)* is often presented in these cenoses, which may form a second wood layer with about 3-4 m height. Bush layer often includes Colutea arborescens, Cornus sanguinea, Coronilla emerus subsp. emeroides, Cotinus coggygria, Crataegus monogyna, Juniperus oxycedrus, Lonicera etrusca, Paliurus spina-christi and rarely, in the southernmost areas Phillyrea latifolia. The herbaceous layer of mixed forests consists mainly of species typical for xerothermic oak forests, as Mediterranean elements are increasing in the south: Brachypodium sylvaticum, Dactylis glomerata, Poa nemoralis, Festuca heterophylla, Melica uniflora, Geum urbanum, Luzula spp., Clinopodium vulgare, Buglossoides purpurocaerulea, Fragaria spp., Veronica chamaedrys, Veronica officinalis, Lychnis coronaria, Aremonia agrimonoides, Silene viridiflora, Campanula spp., Euphorbia polychroma, Euphorbia amygdaloides, Scorzonera hispanica, Physospermum cornubiensis, Laser trilobum, Echniops spp., Helleborus odorus, Potentilla micrantha, Tanacetum corymbosum, Ajuga laxmanni, Galium pseudoaristatum,

Lathyrus spp., Peucedanum spp. Bupleurum praelatum, Viola spp., Viscaria vulgaris, Primula spp., Crocus flavus, Iris spp. Huetia cynapioides is formed due to its typical early-summer aspect in beech oak forests of the Struma valley.
The habitat is established along the routes of Alternatives G20 – blue and G20 – red and East Alternative G10.50 and eastern alternative G20).

***Salix alba and Populus alba River galleries***
River galleries developed in the planes and lowlands with the transitional-continental climate in Southern Bulgaria. It covers narrow strips along the of Struma River banks. It is developing on rich Alluvial (sediment) soils *(Fluvisols*). Typical are the periodical spring floodings with different duration. Main edificators are the white *(Populus alba*) and black poplars (*P. nigra*), white willow (Salix alba) and crack willow (S . fragilis). The black alder (*Alnus glutino*sa) also occurs, more rarely also the field elm (Ulmus minor), narrow-leafed ash (*Fraxinus oxycarpa*), oriental plane (Platanus orientalis) and English oak *(Quercus robur*). The presence of climbing plants is also typical — common hop *(Humulus lupulus*), clematis (*Clematis vitalba, C. viticella*), common ivy (Hedera helix), blackberry (*Rubus spp.),* silkvine *(Periploca graeca*), bindweed (Calystegia sepium), wild grape (*Vitis sylvestris*). The bush layer consists of: common dogwood (Cornus sanguinea), guelder-rose (*Viburnum opulus*), alder buckthorn (Frangula alnus). The habitat in most of the cases is anthropogenically loaded due to the creation of high-productive hybrid poplar cultures. A big variety of mobile species and anthropophytes, such as: ground elder (*Aegopodium podagraria*), birthwort (Aristolochia clematitis), lesser water-parsnip (Berula erecta), three-lobe beggarticks (Bidens tripartita), poverty brome (Bromus sterilis), greater celandine (*Chelidonium majus*), cleaver (Galium aparine), hogweed (Heracleum ternatum), lichwort (Parietaria officinalis), bittersweet nightshade *(Solanum dulcamara*), common nettle (*Urtica dioica*), etc. occur in the grass-bushy layer.
The habitat is established along the routes of Alternatives G20 – blue and G20 – red .

***Platanus orientalis forests***
This habitat includes River galleries, dominated by oriental plane (*Platanus orientalis*). The natural habitat distribution of the oriental plane is linked to the River valleys, and reaches altitude of up to 800-900 m above the sea level. The Alluvial-Delluvial soils are developed along the water courses and water sources with permanent and ephemeral waters; these are water saturated by groundwater of from the surface. The oriental plane dominates in the wood floor of the community but single species of black alder (*Alnus glutinosa),* common walnut (*Juglans regia*), white willow (*Salix alba*) etc. are also met. The communities found in proximity to the settlements – mainly on torrential cones and along the gullies with ephemeral water courses are in unfavourable condition. The communities close to the settlements are strongly affected by the human presence and often the ruderal species such as common nettle (Urtica dioica), danewort (Sambucus ebulus), lichwort (*Parietaria officinali*s), greater burdock (Arctium lappa), bulbous bluegrass (*Poa bulbosa*) etc., predominate in the grass floor.
The habitat is established along the routes of Alternatives G20 – blue and G20 – red and "long tunnel" alternative.

**Alluvial forest with black alder (*Alnus glutinosa*) and European ash (*Fraxinus excelsior*)**
Riparian forests of alder and European ash are patchily distributed along the Rivers in the foothills and lower mountain belt of most Bulgarian mountains at an altitude of about 300 to about 1000 m above sea level. They represent mixed gallery Riverside communities with black alder (*Alnus glutinosa)* as major dominant. European gray alder (*Alnus incana*), oriental plane (Platanus orientalis) and European ash (*Fraxinus excelsior*) dominate and co-dominate at certain sites. Various willow species, most often crack willow (*Salix fragilis*) and white willow *(S. Alba*) are also presented. This type of gallery forests are more common in the low mountain belt and rarely in the medium mountain belt. They develop on damp to wet, occasionally flooded, drained and aerated

soils (*Fluvisols*). The grass vegetation consists mostly of *Aegopodium podagraria, Carex remota, C. sylvatica, Circaea lutetiana, Cirsium appendiculatum, Equisetum spp., Filipendula ulmaria, Galium aparine, Impatiens noli-tangere, Lycopus europaeus, Lythrum salicaria, Myosotis scorpioides, Ranunculus repens, Rumex sanguineus, Scirpus sylvaticus, Stellaria media, S. nemorum, Urtica dioica*, etc.
The habitat is established in the floodplain terrace of Vlahinska River along the routes of Alternatives G20 – blue and G20 – red and EastAlternative G10.50 and eastern alternative G 20). It is dominated by black alder (*Alnus glutinosa*) with the presence of white willow (*Salix alba*), black poplar (*Populus nigra*), oriental plane (*Platanus orientalis),* walnut (*Juglans regia),* etc.

**Endemic forests of *Juniperus spp.***
The Greek juniper *(Juniperus excelsa*) and its phytocoenosis occur only in the areas with typical Mediterranean climate. In the valley of Struma River the Achilleo clypeolatae-Juniperetum excelsae association is developed in Kresna Gorge, in the most low parts of Vlahina River Oshtavska River and the protected area "Moravska". In northern direction groups or single Greek juniper trees can be seen up to the Mechkulska River, between the Stara Kresna and Krupnik stations. The most representative communities are found in "Tisata" Reserve and its former buffer area (re-categorized in protected locality). These are "pseudo - maquises" – evergreen sclerophyllous and deciduous bushes and low trees with many open spaces and rich grass vegetation. The communities with Greek juniper occur mainly at altitude 100 to 300-400 m. Along the tributaries of Struma River these species are met at a bit higher altitude but only on the southern slopes of the valleys. In the relatively lighter and wider valley of Vlahinska River they reach up to the village of Vlahi while along the narrow and relatively wet valley of Oshtavska River they occur at lower altitude. In Kresna Gorge the Greek juniper phytocoenosis cover mainly the eastern and southern slopes and lie over volcanic, often metamorphic rocks (*gneiss and amphibolite*). Other co-dominants in the wood and bush floor are the oriental hornbeam (Carpinus orientalis), flowering ash (Fraxinus ornus) and downy oak (*Quercus pubescens*). Less in number, although present in many coenosis are the terebinth (Pistacia terebinthus) and the almond-leaved pear (*Pyrus amygdaliformis*). The Jerusalem thorn (Paliurus spina-christi) and the prickly juniper (Juniperus oxycedrus) dominate in the bush floor. The distribution of the other species is quite limited; they are present only in certain areas. These are: wild asparagus (Asparagus acutifolius), scorpion senna (Coronilla emerus), jasmine (Jasminum fruticans), green olive tree (*Phillyrea latifolia*), briar (*Rosa glutinosa*). The bladder senna (Colutea arborescens) and white osyris (Osyris alba) occur relatively often but only in the lowermost parts. The grass floor is very well developed and characterizes with significant diversity. The thermophilic xerophytes of mainly southern and eastern origin predominate; they are present in dry and rocky areas. Typical is the presence of some species of Pontian-Steppe origin from Festuco- Brometea and Festucetalia valesiacae classes. These are: bluestem (Dichanthium ischaemum), bunchgrass (*Chrysopogon gryllus*), felty germander (*Teucrium polium*), milkvetch (Astragalus onobrychys subsp. chlorocarpus), field eringo (Eryngium campestre) and more rarely Cleistogenes serotina, statice grass (*Goniolimon tataricum),* Koeleria nitidula, salad burnet *(Sanguisorba minor*), feather grass (*Stipa capillata*), etc.
The habitat is established according to routes of all reviewed project alternatives.
For this reason, there are likely to be affected a significant part of the population of Greek juniper (Juniperus excelsa, respectively a major part of the habitat in the protected zone. Will be mapped polygons within the scope of the relevant alternatives to determine the exact area of influence or loss.

***Juniperus spp*. shrubs**
Mediterranean and sub-Mediterranean sclerophyllous evergreen shrubs predominated red juniper *(Juniperus oxycedrus*). They represent the final stage of degradation of xerothermic oak forests in Southern Bulgaria. They grow on heavily eroded umbric forest soils, rarely on rendzinas. The communities of Juniperus oxycedrus consist of individual trees or groups of downy oak (*Quercus pubescens*), Q. virgiliana *(Quercus virgiliana*), Oriental Hornbeam (*Carpinus orientalis*), flowering

ash (*Fraxinus ornus*), etc., representing residues of former forests. Grasslands and scrubland facies dominated by perennial bunchgrass (*Chrysopogon gryllus*), bluestem (*Dichanthium ischaemum*), Bulbous Meadow-grass *(Poa bulbosa*), membranacea Boiss (*Poa concinna*), Thymus atticus (*Thymus atticus*), Rhodax canus (*Rhodax canus),* milkvetch (*Astragalus onobrychis*), etc. is typical therein.
The habitat is established along the route of East Alternative G10.50 and eastern alternative G 20.

**Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)**
Xerothermic to mesothermal grass communities from Festucetalia valesiacae order. They are represented by continental and subcontinental pastures and meadow steppes as well as perennial grass communities on rocky slopes in the Submediterranean regions. Many of these communities are secondary – on the place of destroyed forests. Their species composition is extremely diverse. The phytocoenosis are dominated mainly by high tuff cereal plants and other perennial grass species from *Festucetalia valesiacae order — Chrysopogon gryllus, Dichanthium ischaemum, Stipa spp*., *Festuca valesiaca*. Their composition includes semi-shrubs as well as bushes and single trees, left from the primary forest vegetation. In many parts the coenosis are open. Often they form complexes with different types of petrophytic steppes and shallow degradated humus-carbonate soils or sandy-clayey screes on the slopes with the southern exposure, and in the most southern parts of Bulgaria – Sakar, Strandzha, the valley of Struma River etc. – complexes with the coenosis of Thero-Brachypodietea class, composed of Mediterranean cereal therophytes. Many Mediterranean species, including therophytes occur in Southern Bulgaria: *Aphanes arvensis, Euphorbia myrsinites, E. apios, Galium parisiense, Lotus aegaeus, Medicago disciformis, M. orbicularis, M. rigidula, Moenchia graeca, Neatostema apulum, Onobrychis caputgalli, Parentucellia latifolia, Trifolium cherleri, T. hirtum, T. incarnatum, T. strictum*. Typical is the presence of trees and bushes, such as *Crataegus monogyna, Paliurus spina-christi, Prunus spinosa*, while in Southern Bulgaria (Eastern Rhodope and the valley of Struma River*) Jasminum fruticans, Juniperus oxycedrus* also occur.
The habitat is established according to routes of all reviewed project alternatives.

**Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea.**
This habitat consists of xerothermic grasslands with domination of annual cereal plants such as *Aegilops geniculata, A. neglecta, Bromus intermedius, B. madritensis, Cynosurus echinatus, Lagurus ovatus, Psilurus incurvus, Trachynia distachya(= Brachypodium distachyon), Vulpia ciliata, V. Myuros* , etc. The soils under the phytocoenosis are dry, shallow and often eroded with outcropping gravely-rocky basis. The geological basement is diverse – they occur on siliceous and calcareous terrains. Typical is the ephemeral and the ephemeroid type plants which characterizes with maximum grass growth in spring (until the middle of May). The climate is transitional-Mediterranean and characterizes with dry and hot summer. The low to medium high perennial cereal grasses such as *Poa bulbosa, P. perconcinna, Cynodon dactylon, Dactylis glomerata subsp. perconcinna, Cynodon dactylon, Dactylis glomerata subsp. hispanica* , etc. The communities are also rich in annual plants (therophytes), reaching up to 70% of their floristic composition represented by the following *species Euphorbia, Silene,Bisserula, Plantago, Medicago, Hippocrepis, Nigella, Adonis, Linum, Papaver, Geranium, Trigonella, Trifolium (T. subterraneum, T. suffocatum, T. nigrescens),* etc. Typical is the presence of aromatic semi-shrubs from *Thymus genus and geophytes from Allium, Muscari, Ophrys, Romulea genus*, etc. The Submediterranean pseudo-steppe of cereal and annual plants often form complexes together with the xerothermic grass communities and the xerothermic oak forests, mainly with the downy oak.
The habitat is established according to routes of all reviewed project alternatives.

**Chasmophytic vegetation on silicate rock slopes**
The habitat is a sheer (over 70°) silicate rock slopes and walls in mountains and foothills (*alliances of Silenion lerchenfeldianae, Androsacetalia vandelii).* They are typical with their poor vegetation.

This vegetation varies largely depending on the exposure, altitude, geographical area in the country, and the degree of porosity of the rock.
The habitat is established along the route of Alternative G20 – blue and G20 – red.

**Potential Impacts**

**Construction period**

The main disturbance of the flora component will take place during preparation for the construction (preparatory works) of the route and the related facilities.
During construction of the Lot 3.2 the road the following potential impacts on the vegetation are expected:

- Loss of vegetation within the construction strip of the road;
- Forming conditions which imply changes in the habitats due to invasion of ruderal and weed species and change of the floristic composition;
- Processes of soil degradation as a result of compaction from the construction machinery outside the construction strip.

All project alternatives affect mostly forest areas. Affected are relatively small agricultural areas, under East Alternative G 10.50 – and in the road section of detour of Kresna town under Alternative G 20 – blue and G20 – red and eastern alternative G10.50 (right lane) where anthropogenic changes of different degree are observed in vegetation.
During construction the impacts on the habitats and ecosystems using air path will not be significant. The dust pollution in the ambient air and the deposition of dust on the vegetation will take place in the area of construction sites. The dust emissions emitted from the construction activities will not pose considerable threat for the habitats. Sources of air pollution will be the gases exhausted from the internal combustion engines used in construction: CO, NOx, hydrocarbons. The potential impact will be insignificant and temporary – until the completion of the construction works. Contamination may result from accidents – oil spills which will be local, temporary and insignificant in terms of spatial distribution.
In general in the territories subject to Lot 3.2 construction the expected effects on the vegetation are direct and long-term for all alternatives.

**Operation period**
*Impacts from dust and aerosols emitted from the vehicle traffic and the regime of road maintenance – sanding/salination*
Being a linear source of pollution and a busy road with intensive traffic, the Lot 3.2 route will have different adverse impact on the flora in the land strip adjacent to the road lane. The scope of this impact overlaps approximately with the vegetation strip along the road which will be affected during construction of the road; the impact there – loss of vegetation -–– shall be assessed according to the considered project alternatives.
It has to be mentioned that in Bulgaria there are no norms on the content of pollutants in the biomass. The sanitary norms for the content of harmful substances in the plants (vegetables) are set in Ordinance No. 5 of the Ministry of Health (MH), dated 1984.
The pollution due to the use of salt and lye during the winter maintenance of the road lane is also a source of soil contamination, hence contamination of the vegetation in the lands adjacent to the road. These substances will not cause noticeable changes in the vegetation quality considering the limited quantities which are applied.
*New habitats will be introduced along the road due to landscaping and biological stabilization of the immediate areas adjacent to the road, including the slopes and embankments*. The effects result from the landscaping activities. These projects aim at, with the help of the wood-grassy vegetation, harmonization of the area between the road and the surrounding landscape as well as biological stabilization of the road slopes. The plant species to be used shall be suitable for certain climatic and

edaphic conditions as well as to be gas-absorbing and gas-resistant. Furthermore, the selection of gas-absorbing and gas-resistant species to some extent is conditional since there are no species absolutely resistant to the harmful gases. Their resistance varies in the process of growing – usually young plants have low resistance which increases with maturity and decreases again with plants' aging.
Growing resistant and thriving vegetation groups and plantations requires maximum alignment of the species' ecological requirements and the environmental conditions. The selection of plant species should consider to a large extent the type of the local flora and should not allow introduction of invasive species.

The EIA report shall comprise characteristic of the flora for the investment proposal area where the project alternatives of the investmant proposal shall be implemented. Recent information shall be presented about the flora in the project routes area shall also be given the presence of many species with conservation status. The expected potential impacts on flora in the scope of the road shall be detailed and assessed for all proposed by the Contracting Authority project alternatives supported by field surveys to collect information on the current status of the vegetation and the presence of habitats and species, subject to protection. The unavoidable and permanent impacts on the vegetation that may be significant shall be identified for the construction and operational period of the investment proposal. Practical mitigation measures that can be controlled shall be proposed to protect the plant habitats and the plant species with high conservation status together with the protected species included in Annex 3 of the Biodiversity Act, that fall in the scope of project routes of the investment proposal.

**Fauna**
According to the zoo-geographical zoning of Bulgaria the areas in question where the alternative road routes options are developed falls within the Rila-Rhodope Region – Struma-Mesta subregion.
The fauna in the area characterizes with dominating Euro-Siberian and European species linked to the biomes of the boreal and nemo-real (Europena) faunistic complexes, however with the presence of the Mediterranean types too. This fauna belongs to the deciduous forests and is represented by many species, some of them widely spread. The Mediterranean influence is mostly noticeable in the lower and southern parts of the gorge. Typical inhabitants of the European deciduous forests are: European mole (*Talpa europaea*), fat and hazel dormouse (*Glis glis, Muscardinus avellanarius*), yellow necked mouse (*Sylvaemus flavicollis*), long-tailed field mouse (Sylvaemus sylvaticus), squirrel *(Scirius vulgaris*), beech marten *(Martes foina*), hare (*Lepus capensis)* and in the water courses otter *(Lutra lutra*). The large mammals are presented by wild boar (Sus scrofa), European roe deer (*Capreoluss capreoluus*) and wolf *(Canis lupus*). Bears (*Ursus arctos*) live in the higher parts of Pirin Mountain, in the zone of the dwarf mountain pine. The fish diversity in the mountainous parts of the Rivers is represented by the brown trout (*Salmo trutta fario*) and brook trout *(Salvelinus fontinalis*) while in the Struma River nase (*Chondrostoma nasus*), barbel (*Barbus cyclolepis*), European chub (*Leuciscus cephalus*) etc. commonly occur.

13 fish species, 10 amphibians, 21 reptiles (for 6 of them the northern boundary of the distribution passes along the gorge), 232 bird species of which 135 are nesting are found in the invertebrate fauna in Kresna Gorge and the adjacent mountain slopes of Pirin and Maleshevska mountain. There are totally 56 mammals of which 27 are small terrestrial mammals and 12 are large mammal species (*Carnivora* order and *Artiodactyla* order) and also 17 bat species (Beron, 2001.
The EIA report shall comprise characteristic of the animal world in the area of the investment proposal where the project alternatives of the investment proposal shall be implemented. Recent information shall be presented about the fauna in the project routes area shall also be given the presence of many species with conservation status. Will be specified and evaluated the expected impacts during construction and operation of all proposed by the Contracting Authority project alternatives for this purpose will be made field studies tailored to the active period of the animal species. Will be given special attention to the affected habitats for breeding / nesting, feeding

aggregations of individuals, lands near protected areas and wetlands - river valleys and places of bridging, the wildlife passaging functions of the territories. An assessment will be performed on the impact on species sensitivity to traffic identified in inspection reports "Monitoring, analysis and assessment of mortality of the animal species in the area of E-79 (I-1) passing through protected areasKresna and Kresna - Ilindentsi for 2013 - 2016." Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects.

**➽Fish (Pisces)**

Struma River in the region of Kresna Gorge distinguishes from adjacent sections by series of hydrological and morphological characteristics, but however, any specifics regarding the biodiversity of ichthyofauna is not found therein. Fish community characteristic of this River section is an integral element of the overall ichthyo-fauna of the Struma River in its Bulgarian sector (Stefanov, 2001; Vasilev Pehlivanov, 2002).

According to different reference sources for the section of the Struma River from the town of Simitli to the border a total of 13 species of native (indigenous) species of 5 families are reported: European eel *Anguilla anguilla*, spirlin *Alburnoides bipunctatus*, bleak *Alburnus alburnus*, asp *Aspius aspius*, barbel *Barbus cyclolepis*, Struma River nase *Chondrostoma vardarense*, gudgeon *Gobio gobio*, Eurasian minnow *Phoxinus phoxinus*, European bittering *Rhodeus amarus*, European chub *Squalius orpheus*, malamída *Vimba melanops*, Barbatula bureschi *Barbatula bureschi*, Bulgarian spined loach *Cobitis strumicae*, wels catfish *Silurus glanis*, European perch *Perca fluviatilis*. One of them, the European eel, can be considered extinct by the Bulgarian section of the River as a result of the construction of the Greek dam "Kerkini" which is an insurmountable barrier to the migrations of species to the upper River sections. This part of the River contains also some species that are alien for Bulgarian or regional ichthyo-fauna or indigenous species that are introduced deliberately (as recreational fishing sites) or occasionally — Carp *Cyprinus carpio*, silver Prussian *carp Carassius gibelio*, common roach Rutilus rutius, pumpkinseed *Lepomis gibbosus*, stone moroko *Pseudorasbora parva*.

Table № 3.5-1. Species composition and conservation status of fish found in the Kresna Gorge (confirmed species are marked with *).

| Family<br>Type | BDA<br>Application | RB<br>Категория | 92/43<br>Annex | IUCN | WB<br>Application |
|---|---|---|---|---|---|
| Cyprinidae | | | | | |
| Alburnoides bipunctatus* | | | | | III |
| Alburnus alburnus* | | | | | |
| Aspius aspius | 2 | VU | II | DD | III |
| Barbus cyclolepis* | 2, 4 | | V | | |
| Chondrostoma vardarense* | | | | NT | III |
| Gobio gobio | | | | | |
| Phoxinus phoxinus* | | | | | |
| Rhodeus amarus* | 2 | | II | LC | III |
| Squalius orpheus * | | | | | |
| Vimba melanops* | | VU | | DD | |
| Balitoridae | | | | | |
| Barbatula bureschi* | | VU | | LC | III |
| Cobitidae | | | | | |
| Cobitis strumicae* | 2 | | II | | |

| | | | | | |
|---|---|---|---|---|---|
| Siluridae | | | | | |
| Silurus glanis* | | | | | III |
| Percidae | | | | | |
| Perca fluviatilis | | | | | |
| Anguillidae | | | | | |
| Anguilla anguilla | Disappeared into the Bulgarian section of the Danube. Struma River | | | | |

BPA - Biological Diversity Act, Bulgaira's Red Book - Red Book of the Republic of Bulgaria (2015), 92/43 - Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), IUCN - Red List IUCN, BC - Berne Convention for the protection of wild fauna and flora and natural habitats..Red book categories: VU_vulnerable species, Red List IUCN categories: DD – Data Deficiency, LC – Lest Concern, NT – Near Threatened.

**Potential Impacts**

*Construction period*

Direct and indirect impacts on the ichthyo-fauna mostly in Struma and Vlahinska River may be expected during the construction. Most of the expected impacts are temporary and reversible after completion of the construction. The main impacts are expected in building the foundations of bridges in River beds and shore-recuperative facilities. These impacts will be related to seizure of River sediments, excavation works into the Riverbed, building and strengthening of embankments, temporarily diverting the River flow, temporary increase in the turbidity of the water due to the mobilization of sediments.

*Direct destruction of individuals*

Destruction of fish eggs is possible in carrying out construction activities in the Riverbed during the fish breeding period;

*Loss of habitat/direct destruction of habitats*

Expected impact in places where building foundations of bridges and retaining walls are built directly in the Riverbed. It is both areas of the common habitat and the spawning areas to be reduced;

*Deterioration of habitats*

It concerns the seizure of River sediment and mobilization of sediments during construction activities in the Riverbed. It may result in temporarily banishing of species from the affected River section (until termination of the impact) and deterioration of breeding conditions due to damaging the spawning areas. Influence also downstream outside the area of construction is possible.

*Fragmentation of habitats, incl. disruption of wildlife corridors*

The expected temporary impact is related to the construction of facilities for diversion of River flow in the areas of construction in the Riverbed.

*Operation period*

*Permanent impacts*

Habitat loss in places where building foundations of bridges and retaining walls are built in the Riverbed. Reducing the surface area of the habitats is equal to the cross sectional area of the respective facilities.

*Temporary (casual) effects*

These may occur in case of emergencies of vehicles on the road and direct ingress of contaminants in the water.

The EIA report shall specify and evaluate the expected impacts on fish species and their habitats within the scope of shore-recuperations of Struma and its tributaries and Vlahinska Rivers in the

different alternatives during the construction of facilities and operation of the Lot 3.2. Available information shall to that end be collected and analysed and field studies shall be carried out in order to identify the presence of potentially affected species and habitats.
Will be offered achievable and verifiable mitigation measures for limiting or avoid significant negative effects on fish species.

**➧Amphibians (Amphibia)**
24 species of Amphibians (Amphibia) are found in Bulgaria. They are divided into two orders — Ambystomatidae (Caudata order) and frogs and toads (Anura order. The road route according to the project alternatives passes through different habitats — Struma River, side mountain tributaries of Struma River with sand and gravel bottom and adjacent wooded and grassy slopes of the mountains, slopes with grass and shrubs, small farmland areas representing potential habitat of amphibians. In the region of Kresna Gorge I (incl. Mountain slopes up to 1000 meters altitude) are found a total of 11 amphibian species from the two genus (Table № 3.5-2).

Table № 3.5-2. Species composition and conservation status of the amphibians found in the Kresna Gorge

| Species | BDA | Directive. 92/43 | Bern Convention. | IUCN |
|---|---|---|---|---|
| Salamandra salamandra | III | | III | LC |
| Lissotriton vulgaris | III | | III | LC |
| Triturus karelinii | II, III | II, IV | II | LC |
| Bombina variegata | II, III | II, IV | II | LC |
| Pelobates syriacus | III | IV | II | LC |
| Bufo bufo | III | | III | LC |
| Bufotes viridis | III | IV | II | LC |
| Hyla arborea | III | IV | II | LC |
| Pelophylax ridibundus | IV | V | III | LC |
| Rana dalmatina | | IV | II | LC |
| Rana graeca | III | IV | III | LC |

BDA (Biological Diversity Act) - number of the Application.
Directive 92/43 (Council Directive 92/43 / EEC) - the number of Application.
Bern. (Bern Convention on the Conservation of European Wildlife and Natural Habitats) - Number Application.
IUCN (Red List of Threatened Species to IUCN) - abbreviation of category.

**➧Reptiles (Reptilia)**
From Class Reptiles (Reptilia) in Bulgaria have established a total of 38 species 2 genus - turtles (order. Testudines) and squamous (genus Squamata with two sub-genus - Lizards (Sauria) and snakes (Serpentes)). Kresna Gorge is one of the richest herpetofauna regions of Bulgaria. It forms a narrow rocky gorge with transition-Mediterranean, and in the south end also mezo-Mediterranean vegetation. The gorge is the northern boundary of distribution of some reptile species. Furthermore, something like a funnel is formed, particularly in the northern end of the gorge, species are distributed in the narrow hallway on the lowest close parts. In the region of Kresna Gorge (incl. Mountain slopes up to 1000 m asl) are found 21 species of amphibians from the both genus (Table № 3.5-3).

Table № 3.5-3. Species composition and conservation status of reptiles in the region of Kresna Gorge.

| Species | BDA | RB | Directive. 92/43 | Bern Convention. | IUCN |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Emys orbicularis | II, III | | II, IV | II | LR/NT |
| Testudo graeca | II, III | EN | II, IV | II | VU |
| Testudo hermanni | II, III | EN | II, IV | II | NT |
| Mediodactylus kotschyi | III | | IV | II | LC |
| Anguis fragilis | III | | | III | |
| Lacerta trilineata | III | | IV | II | LC |
| Lacerta viridis | III | | IV | II | LC |
| Podarcis erhardii | III | | IV | II | LC |
| Podarcis muralis | III | | IV | II | LC |
| Xerotyphlops vermicularis | III | | | III | |
| Coronella austriaca | III | | IV | II | |
| Dolichophis caspius | III | | IV | II | |
| Elaphe quatuorlineata | II, III | EN | II, IV | II | NT |
| Platyceps najadum | III | | IV | II | LC |
| Telescopus fallax | III | VU | IV | II | LC |
| Zamenis longissimus | III | | IV | II | LC |
| Zamenis situla | II, III | EN | II, IV | II | LC |
| Malpolon insignitus | III | | | III | |
| Natrix natrix | | | | III | LR/NT |
| Natrix tessellata | III | | IV | II | LC |
| Vipera ammodytes | III | | IV | II | LC |

BDA (Biological Diversity Act) - number of the Application.
Red (Red Book of Bulgaria, ed. 2015). - Abbreviation of category.
Dir. 92/43 (Council Directive 92/43 / EEC) - the number of Application.
Bern. (Bern Convention on the Conservation of European Wildlife and Natural Habitats) - number of the Application.
IUCN (Red List of Threatened Species to IUCN) - abbreviation of category.

**Potential impacts on herpetofauna**

*Construction period*

*Loss of habitat/direct destruction of habitats*

The implementation of variant solutions for the road may lead to expected loss of appropriate habitats of amphibians and reptiles within the scope of project routes.

– *Deterioration of habitats*

Deterioration of habitats may occur beyond the area of direct destruction.

– *Fragmentation of habitats, incl. disruption of wildlife corridors*

Construction of the road will lead to fragmentation of habitats over the entire length of the route. Fragmentation may be mitigated through the application of appropriate measures — construction of sufficient number of passes. All water courses (rivers and gorges, incl. coastal strips), crossed by project routes may be considered as potential wildlife passages for amphibians and reptiles. During construction the wildlife passages will be interrupted, but as far as project provides construction of bridges, viaducts and culverts, it may be assumed that wildlife-passage function of Rivers and gullies will recover naturally after completion of the construction works.

– *Disturbance*

The species found are probably less sensitive to possible sources of disturbance (noise, light pollution, human presence, etc.). Some disturbance may be expected during construction.

– *Loss of specimens*

Possible destruction of specimens may occur during construction, but it will be temporary and the number of possible victims may not be predicted. Will carry out preliminary catching and displacement of the specimens in site clearance and preparation for the construction.

*Operation period*
*– Loss of specimens*
In general amphibians and reptiles are highly sensitive to this type of impact because of its poor mobility and characteristic of many types of mass seasonal migrations. In all alternatives, where project routes intersect optimal habitat (or located close to water bodies, even if the latter are beyond the scope of the road) systematic crushing of amphibians and reptiles may be expected.
*– Fragmentation of populations*
During operation, the road will be a virtually insurmountable barrier for amphibians and reptiles, which will lead to fragmentation of their populations.
In the EIA report will be specified and evaluated the expected impacts on species of amphibians and reptiles and their habitats within the scope of the various options decisions during construction and operation. For this puspose will be gathered and analyzed information available and will be carried out field studies to identify the presence of potentially affected species and habitats.
Will be offered achievable and verifiable mitigation measures for limiting or avoid significant adversary effects on species of amphibians and reptiles.

**➸ Birds (Aves)**
From an ornithological aspect, the significance of the place is determined by the rich diversity of nesting birds (135 species), but mostly the diversity of migratory (156 species) and wintering (100 species) birds.
The ornithofauna in the area of the investment proposal is typical for the lower parts of the mountains in this countryside. During the autumn-winter seasons, birds from the higher areas of the surrounding mountains or from the northern latitudes use this area for wintering or just cross it during their seasonal migration. Here exist: 1/ species inhabiting deciduous forests; 2/ species inhabiting coniferous forests, including also coniferous forest crops; 3/ species inhabiting xerophytic or mesophytic shrub communities; 4/ species inhabiting open areas without or with negligible amount of trees,fields, vineyards, yards; 5/ species inhabiting open dry grassy habitats, fields and arable lands; 6/ species inhabiting rocky and stony land; 6/ species inhabiting Rivers or gravelly and sandy shores and islands; 7/ species inhabiting settlements. The species variety has changed following the long term decrease of the forested areas.
. Here many species of diurnal birds of prey and Mediterranean bird species, most of them in relatively high numbers, are nesting. Some of them have high conservation value in European and national aspect — Eurasian griffon (*Gyps fulvus*), Levant sparrowhawk (*Accipiter brevipes*), Golden eagle (*Aquila chrysaetos*), Peregrine falcon (*Falco peregrinus*), European honey-buzzard (*Pernis apivorus*), Short-toed snake-eagle (Circaetus gallicus), Olive-tree warbler (Hippolais olivetorum), Masked shrike (*Lanius nubicus*),and others, and some mainly in national aspect — Blue rock thrush (*Monticola solitarius*), Eastern Orphean Warbler *(Sylvia crassirostris)*, Subalpine Warbler (Sylvia cantillans), Sardinian warbler (Sylvia melanocephala), Western rock nuthatch (*Sitta neumayer*) and others. Other important bird species regularly nesting in the gorge are as follows: Eurasian Eagle-Owl (*Bubo bubo*), European nightjar (*Caprimulgus europaeus*), Red-backed shrike *(Lanius collurio*), Ortolan bunting (*Emberiza hortulana)*, Wood lark (*Lullula arborea*), Middle spotted woodpecker (*Dendrcocopos medius*), Grey-headed woodpecker (*Picus canus)*, Rock partridge (*Alectoris graeca*), Rock sparrow (*Petronia petronia)* and others..
A project for reintroduction of Eurasian griffon (FWFF project) is in process of implementation in the Kresna Gorge.. The cases of visits to the region also of other important species of diurnal birds of pray became more frequent by organizing the feeding grounds for vultures.
Kresna Gorge is part of the migration route Via Aristotelis; this route is of importance for the migrating birds – mainly raptor and songbirds species as well as for the migration of the waterfowl birds. Great Crested Grebe (*Podiceps cristatus*), Little Grebe (*Tachibaptus ruficollis*), Great

Cormorant (*Phalacrocorax carbo*), Pygmy cormorant (*Phalacrocorax pygmaeus*), Grey Heron (*Ardea cinerea*), Purple heron (*Ardea purpurea*), Little egret (*Egretta garzetta*), Great egret (*Egretta alba*), night heron (*Nycticorax nycticorax*), Eurasian bittern (*Botaurus stellaris*), Little bittern (Ixobrychus minutus), Black stork (Ciconia nigra), Whooper Swan (Cygnus cygnus), Mute swan (*Cygnus olor*), Greylag Goose (*Anser albifrons*), Domestic Mallard (*Anas platyrhynchos*), Garganey (*Anas querquedula*), Common teal (*Anas crecca*), Ferruginous duck *(Aythya nyroca),* etc.; migrating raptors: Greater spotted eagle (*Aquila calnga*), Imperial eagle (*Aquila heliaca*), Western marsh-harrier (*Circus aeruginosus*), Northern harrier (*Circus cyaneus)*, Montagu's harrier (C*ircus pygargu*s), Pallid harrier (*Circus macrourus*), Common buzzard (*Buteo buteo*), Lanner falcon *(Falco biarmicus*), Eleonora's falcon (*Falco eleonorae*), Red-footed falcon (*Falco vespertinus*), Booted eagle (*Hieraaetus pennatus*), Black kite (*Milvus migrans*), Red kite (*Milvus milvus*) and others.

Table 3.5-4 Species composition and abundance of birds, seen during the field studies in 2012 and 2016 in the Kresna Gorge.

| No. | Type | Family | | No. | Type | Family |
|---|---|---|---|---|---|---|
| 1 | Phalacrocorax carbo | Phalacrocoracidae | | 31 | Lanius minor | Laniidae |
| 2 | Ardea cinerea | Ardeidae | | 32 | Cinclus cinclus | Cinclidae |
| 3 | Ardea purpurea | Ardeidae | | 33 | Troglodytes troglodytes | Troglodytidae |
| 4 | Egretta garzetta | Ardeidae | | 34 | Erithacus rubecula | Muscicapidae |
| 5 | Accipiter nisus | Accipitridae | | 35 | Luscinia megarhynchos | Muscicapidae |
| 6 | Aquila chrysaetos | Accipitridae | | 36 | Phoenicurus ochruros | Muscicapidae |
| 7 | Buteo buteo | Accipitridae | | 37 | Turdus merula | Turdidae |
| 8 | Circaetus gallicus | Accipitridae | | 38 | Acrocephalus arundinaceus | Acrocephalidae |
| 9 | Gyps fulvus | Accipitridae | | 39 | Hippolais pallida | Acrocephalidae |
| 10 | Pandion haliaetus | Pandionidae | | 40 | Sylvia communis | Sylviidae |
| 11 | Falco tinnunculus | Falconidae | | 41 | Phylloscopus collybita | Phylloscopidae |
| 12 | Gallinula chloropus | Rallidae | | 42 | Parus caeruleus | Paridae |
| 13 | Actitis hypoleucos | Scolopacidae | | 43 | Parus lugubris | Paridae |
| 14 | Streptopelia decaocto | Columbidae | | 44 | Parus major | Paridae |
| 15 | Streptopelia turtur | Columbidae | | 45 | Carduelis carduelis | Fringillidae |
| 16 | Cuculus canorus | Cuculidae | | 46 | Carduelis chloris | Fringillidae |
| 17 | Alcedo atthis | Alcedinidae | | 47 | Coccothraustes coccothraustes | Fringillidae |
| 18 | Merops apiaster | Meropidae | | 48 | Fringilla coelebs | Fringillidae |
| 19 | Upupa epops | Upupidae | | 49 | Emberiza calandra | Emberizidae |
| 20 | Dendrocopos syriacus | Picidae | | 50 | Emberiza cia | Emberizidae |
| 21 | Picus viridis | Picidae | | 51 | Emberiza cirlus | Emberizidae |
| 22 | Galerida cristata | Alaudidae | | 52 | Emberiza hortulana | Emberizidae |
| 23 | Delichon urbicum | Hirundinidae | | 53 | Passer domesticus | Passeridae |
| 24 | Hirundo daurica | Hirundinidae | | 54 | Passer montanus | Passeridae |
| 25 | Hirundo rustica | Hirundinidae | | 55 | Sturnus vulgaris | Sturnidae |
| 26 | Ptyonoprogne rupestris | Hirundinidae | | 56 | Oriolus oriolus | Oriolidae |
| 27 | Motacilla alba | Motacillidae | | 57 | Corvus corax | Corvidae |
| 28 | Motacilla cinerea | Motacillidae | | 58 | Corvus corone | Corvidae |

| No. | Type | Family | | No. | Type | Family |
|---|---|---|---|---|---|---|
| 29 | Motacilla flava | Motacillidae | | 59 | Garrulus glandarius | Corvidae |
| 30 | Lanius collurio | Laniidae | | 60 | Pica pica | Corvidae |

Many of the species, occurring in the scope of the investment proposal shall be subject to protection under the BDA (included in Appendix 3) and subject to protection under Directive 2009/147 / EC on the conservation of wild birds.

***Potential impacts***

*Construction period*

*- Los habitats/direct extermination of habitats*

In the implementation of alternative solutions for the road shall be expected permanent loss of suitable habitats for the birds in the range of the route.

*- Fragmentation of habitats*

The fragmentation of habitats shall be most pronounced in the construction of the so called linear infrastructure - Motorway, roads, ski slopes, channels and others. With birds - the fragmentation of habitats shall be not pronounced at the same extent as in the slow-moving animals, such as reptiles and amphibians. The construction works on the road could lead to direct, permanent and irreversible destruction of the existing habitats of birds at the site of the route, easement and the construction polygons, as it provides a complete change of habitats due to construction works.

*- Disturbance*

Expulsions of birds due to increased human presence shall be expected with the birds of prey at a distance of about 300 m from the motorway route. The scope of alternative G 10.50 and Eastern alternative G20 within the project route of the road has not been subject to increased human pressure..

*Operation period*

*- Aggravation of the quality of neighboring habitats*

Aggravation of the quality of neighboring habitats because of their disturbance (noise and light pollution) is possible in the forest and open areas (pastures and meadows.

*- Mortality*

In a collision with vehicles, where project routes intersect with the optimum habitat of birds. The implementation of mitigation measures shall be necessary.

In the EIA report will be specified and evaluated the expected impacts on bird species and their habitats within the scope of the various options decisions during construction and operation. For this purpose will be gathered and analyzed information available and will be carried out field studies to identify the presence of potentially affected species and habitats.

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary impacts on bird species.

**➨ Mammals (Mammalia**)

According to literature data in the region of the Kresna gorge a total of 33 types of mammals have been established /excluding bats/ - Table No. 3.5-2: Mole (*Talpa europaea*), hedgehog (*Erinaceus concolor*), Mediterranean water shrew (*Neomys anomalus),* bicolored shrew (*Crocidura leucodon*), lesser white-toothed shrew (*Crocidura suaveolens*), Wild rabbit (*Lepus europaeus*), Squirrel (*Sciurus vulgaris*), dormouse (*Glis glis*), forest dormouse (*Dryomys nitedula),* rice mice ( *Micromys minutus*),rock mice (*Sylvaemus mystacinus*), Yellow-necked mice *(Sylvaemus flavicollis*), long tailed field mouse (*Sylvaemus sylvaticus*), Field mice ( *Apodemus agrarius*),black rat (*Rattus rattus*), grey rat *(Rattus norvegicus*), house mice (*Mus musculus*), Mediterranean house mice (*Mus macedonicus*), water rat (*Arvicola terrestris*), plain vole (*Microtus arvalis*), Microtus rossiaemerridionalis, Lesser mole rat *(Nannospalax leucodon*), European wolf (*Canis lupus*),

jackal (*Canis aureus*), fox *(Vulpes vulpes*), brock (*Meles meles*),weasel (*Mustela nivalis*), foumart *(Mustela putorius*), beech marten *(Martes foina*),otter (*Lutra lutra*), Wild cat *(Felis sylvestris*), Wild boar *(Sus scrofa*), Roe deer (*Capreolus capreolus*).
Almost all of them are represented with local reproducing populations. The important species from a conservation point of view are the wolf, the otter and the wild cat. Two species have been included in Appendix 2 of the Biological Diversity Act, 4 species - in Appendix 3 of the BDA and 3 species have been included in the Red Book of Bulgaria /2011/.

Table No. 3.5-5: Types of mammals, to be encountered in the area of the IP and their nature-conservation status.

| No. | TYPE | The Red Book of Bulgaria (RB) | BDA | | No. | TYPE | The Red Book of Bulgaria (RB) | BDA |
|---|---|---|---|---|---|---|---|---|
| 1 | Talpa europaea | | | | 18 | Mus macedonicus | | |
| 2 | Erinaceus concolor | | 3 | | 19 | Arvicola terrestris | | |
| 3 | Neomys anomalus | | | | 20 | Microtus arvalis | | |
| 4 | Crocidura leucodon | | | | 21 | Microtus rossiaemerridionalis | | |
| 5 | Crocidura suaveolens | | | | 22 | Nannospalax leucodon | | |
| 6 | Lepus europaeus | | | | 23 | Canis lupus | VU | 2 |
| 3 | Sciurus vulgaris | | | | 24 | Canis aureus | | |
| 8 | Glis glis | | | | 25 | Vulpes vulpes | | |
| 9 | Dryomys nitedula | | | | 26 | Meles meles | | |
| 10 | Micromys minutus | | | | 27 | Mustela nivalis | | 3 |
| 11 | Sylvaemus mystacinus | | | | 28 | Mustela putorius | | |
| 12 | Sylvaemus flavicollis | | | | 29 | Martes foina | | |
| 13 | Sylvaemus sylvaticus | | | | 30 | Lutra lutra | VU | 2, 3 |
| 14 | Apodemus agrarius | | | | 31 | Felis sylvestris | EN | 3 |
| 15 | Rattus rattus | | | | 32 | Sus scrofa | | |
| 16 | Rattus norvegicus | | | | 33 | Capreolus capreolus | | |
| 17 | Mus musculus | | | | | | | |

Talpa europaea - species, established in the explorations of the territory;
*Crocidura leucodon* - species established in the studies of mortality;
BDA - the Biological diversity Act (BDA)
RB – The Red Book of Bulgaria, Category of endangered species: EN „endangered", VU „vulnerable".

**Expected impacts**

*Construction period*

*- direct loss of habitats*

During construction, the vegetation, respectively - habitats of the species of terrestrial mammals within the route and in its scope, as well as in the areas, intended for construction sites will be destroyed. Mostly deciduous forests and grassy places will be affected, as the latter include various ruderal, headlands and / or trodden places. In reality, will be affected the habitats of all mammalian species, whose area falls under the investment proposal. The impact shall be insignificant for the widely spread species of numerous populations. Also the habitats of species protected by law may be affected.

*- Fragmentation of habitats*

When the territory (polygon), occupied by a habitat of a given species is affected, so that the remaining part / parts of the same are insufficient to maintain / preserve the characteristics of the habitat for that species. Many of the species require a certain size of polygons with potential habitats to be used from the respective type, whereas this size shall be species specific.

*- Disruption of bio-corridors*

During the construction, it is possible to have temporary disruption of bio- corridors of all types of terrestrial mammals, occurring within the scope of the alternative solutions. The impact shall be localized only in the site of the route's construction. For greater part of the larger and more mobile species, it will be only during the day, when the construction activities are in process. No impact is to be expected in the night, when the majority of mammals are active. Therefore, the interruption; of the biological passageways in the time of construction works shall be insignificant.

- *Disturbance* during the construction shall be driven from the presence and noise, emitted by the transport equipment and the people in the construction places on the road. Higher sensitivity to such impacts shall have larger species, which shall seek refuge farther from the site of construction. No impact is expected in the night, when the majority of mammals are active.

*- mortality of single individuals*

During the construction, mortality of individuals from the small and slow-moving species will also be possible. More significant potential impact is possible if the beginning of construction works coincides with the breeding period of species

*During the operation period*

*- direct destruction of habitats*

During the operation the vegetation, respectively the habitats of species within the range of the road shall remain permanently confiscated. The areas within the scope may be occupied for settlement of some species - e.g. rodents. With the proper reclaiming, the territories, occupied by construction sites, will also be populated. Thus, the affected area shall be less, respectively, the direct impact on the habitats of terrestrial mammals occurring in the range of the road shall be mitigated.

*- Disruption of bio-corridors*

During the operation the route will generally disrupt bio- corridors of all types of terrestrial mammals, occurring within the scope of the route of the road. The overpasses, underpasses and culverts, provided in the project shall play a role of defragmentation facilities.

*- Disturbance*

The disturbance during the operation will be caused by the traffic on the road. Higher sensitivity to such impacts shall have larger species, which shall seek refuge farther from the route.

*- mortality of single individuals*

During the construction, mortality of individuals from the small and slow-moving species will also be possible. The implementation of mitigation measures shall be necessary.

In the EIA report will be specified and evaluated the expected impacts on the mammal species and their habitats within the scope of the various alternatives solutions during construction and operation periods. For this purpose will be gathered and analyzed information available and will be carried out field studies to identify the presence of potentially affected species and habitats.

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects on the on mammal species.

➧ *Bats (Chiroptera)*

According to the zoogeographical zoning, used by Benda et al (2003) when analysing the species composition of bats in Bulgaria and their territorial distribution, the alternative versions of the route of the road, passing through the South Western Mediterranean region of Struma valley.

The summarized analysis of all available data so far allows us to consider that in the area of the project routes are found 22 species of bats. The Kresna Gorge shall be characterized by high species richness, as compared to the diversity of bat community in the karst areas. Established migrations of species of mountain type of distribution, inhabiting the adjacent slopes of Pirin - (V. murinus), (B. barbastellus). The main part of the summer and winter refuges and the hunting areas are located up to 100 m above the River terrace.

The presence of bats, including the 12 bat species, subject to protection in the "Kresna-Ilindentsi" Protection Zone of affected territories is possible because they are part of their potential habitats in the different stages of their life cycle - daily (hunting) or seasonal migrations, as and their feeding habitats. No underground shelters shall be impacted. Nearest deposit of Lesser horseshoe bat (Rhinolophus hipposideros) i.e. the railway canton in the region of Kresnensko hanche on the left bank of the Struma River.

Table No. 3.5-6. Species composition and conservation status of the bats

| Type | the Dir River. 92/43/ EC Bats | The Red Book of Bulgaria (RBB) | IUCN | Bern. Bats | Bonn. Bats | BDA Bats |
|---|---|---|---|---|---|---|
| Rhinolophus ferrumequinum | II, IV | | LC | II | II | 2, 3 |
| Rh. Hipposideros | II, IV | | LC | II | II | 2, 3 |
| Rh. euryale | II, IV | VU | NT | II | II | 2, 3 |
| Rh. mehelyi | II, IV | VU | VU | II | II | 2, 3 |
| Rh. blasii | II, IV | VU | LC | III | II | 2, 3 |
| Myotis mystacinus | IV | | LC | II | II | 3 |
| Myotis myotis | II, IV | | LC | II | II | 2, 3 |
| Myotis blythii | II, IV | | LC | II | II | 2, 3 |
| Myotis capaccinii | II, IV | VU | VU | II | II | 2, 3 |
| Myotis natterer | IV | | LC | II | II | 3 |
| Myotis emarginatus | II, IV | VU | LC | II | II | 2, 3 |
| Myotis bechsteinii | II, IV | VU | NT | II | II | 2, 3 |
| Pipistrellus pipistrellus | IV | | LC | III | II | 3 |
| Pipistrellus pygmaeus | IV | | LC | II | II | 3 |
| Pipistrellus nathusii | IV | | LC | II | II | 3 |
| Hypsugo savii | IV | | LC | II | II | 3 |
| Eptesicus serotinus | IV | | LC | II | II | 3 |
| Nyctalus noctula | IV | | LC | II | II | 3 |
| Nyctalus leisleri | IV | VU | LC | II | II | 3 |
| Vespertilio murinus | IV | | LC | II | II | 3 |
| Miniopterus schreibersii | II, IV | VU | NT | II | II | 2, 3 |
| Plecotus austriacus | IV | | LC | II | II | 3 |
| Barbastella barbastellus | II, IV | VU | NT | II | II | 2, 3 |
| Tadarida teniotis | IV | | LC | II | II | 3 |

Directive92/43/EEC – Directive on the conservation of natural habitats

RB – Red Book of Bulgaria, Category of the threat VU - „vulnerable”;

IUCN – European list - category of the threat NT - „nearly threatened", VU - „vulnerable", LC „low concern";
Bern. - The Bern Convention;
Bonn. - The Bonn Convention;
BDA - the Biologicaldiversity Act (BDA)

**Potential impacts:**
*Construction period*
- *Loss of habitats/direct destruction of habitats*
The removal of shrub and forest vegetation from the route, as well as the construction itself will lead to permanent change the natural characteristics of the potentially hunting habitat of bats.
- *Deterioration of habitats quality*
Deterioration of the habitats quality outside the zone of direct destruction is not expected.
- *Fragmentation of habitats, including disruption of bio-corridors*
Construction activities themselves do not lead to fragmenting or barrier effect for the bats populations.
- *Disturbance*
In the realization of project alternatives G20, is expected a disturbance of the nearest locality of lesser horseshoe bat (Rhinolophus hipposideros) at the railway canton in the area of Kresnensko hanche on the left bank of the Struma River.
- *Destruction of specimens*
During the terrain preparation for construction and the removal of trees is possible mortality of individuals in forest habitats if the activities were carried out during the breeding period (April to July) and in the hibernation period (November - March).

Operation period
- *Destruction of specimens*
During operation it is possible incidental mortality of migrating and hunting individuals as a result of collisions with vehicles;
- *Fragmentation of populations*
Possible fragmentating effect on hunting territories.
In the EIA report will be specified and evaluated the expected impacts on the bats species and their habitats within the scope of the various alternatives solutions during construction and operation periods.
For this purpose will be gathered and analyzed information available and will be carried out field studies to identify the presence of potentially affected species and habitats.
Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects on the on bat species.

- *Invertebrates (Invertebrata*)
In Bulgaria until now 29 000 invertebrates species are reported (total number of animal species is around 29 850) among which a considerable part are the insects – more than 20 500 species. Most of the available information is for the most studied regions such as the mountains of Rila, Rhodope, Vitosha, Stara planina as well as Struma Valley, some areas of Southeastern Bulgaria and Dobrudzha. For the assessment of the invertebrates' biodiversity in depending to the territory, the potentially areas affected of LOT 3.2 of Struma Motorway by examined alternatives, the representative groups of invertebrates are selected in view of the biomass in the food chain and presence in the international and national legislation on biodiversity conservation - lesser searcher beetles (Calosoma inquisitor), daily butterflies, grasshoppers (*Orthoptera*), dragonflies (*Odonata*), mollusks. Most of these species are subject to protection in the national ecological network Natura 2000: green snake tail (Ophiogomphus cecilia), stag beetle (*Lucanus cervus*), great Capricorn beetle *(Cerambyx cerdo*), Morimus funereus, hermit beetle (Osmoderma eremita) (also included as vulnerable species in Bern Convention – Annex II, IUCN as well as the Red Data Book of

Bulgaria), Jersey tiger (*Euplagia quadripunctaria*), large copper (*Lycaena dispar*), large longicorn (*Rosalia alpina*), dragonfly (*Cordulegaster heros*), common paracaloptenus (*Paracaloptenus caloptenoides*), thick shelled River mussel (*Unio crassus*), stone crayfish (*Austropotamobius torrentium*) etc.
The realization of the investment proposal on all project alternatives affects the potentially habitats of aquatic invertebrates that can be influenced in activities in River beds for building bridges. Potential habitats of aquatic molluscs (*Mollusca*) and crustaceans (*Crustacea*) have been found in intersection places of the Struma River and its tributaries.
The River valleys and small ravines with tree and shrub vegetation can be considered as areas with increased species richness of invertebrates, uncultivated agricultural land - grasslands and forest areas, which can also be considered as areas with relatively increased species richness of invertebrates compared with the cultivated areas.

**Potential impacts:**

Construction period

- *Loss of habitats/direct destruction of habitats*

The removal of grass, shrub and forest vegetation from the route, as well as construction itself will lead to permanent change the natural characteristics of the potentially habitat of invertebrates.

- *Deterioration of habitats quality*

During the construction of bridge facilities is expected temporary deterioration of the quality of potential habitat for aquatic invertebrates due to excavation activities in the River bed and water turbidity. The natural hydrological regime of the Rivers will not be changed, and the habitat restoration will occur promptly after completion of construction activities. Contamination of water bodies through which the route passes is possible in emergency situations or direct discharges of the surface water in drainage of the route of the road..

- *Fragmentation of habitats, including disruption of bio-corridors*

Construction activities themselves do not lead to fragmenting or barrier effect for the invertebrates populations. The impact is temporary.

- *Disturbance*

Invertebrates are less sensitive to this factor and an impact outside the area of direct destruction of habitat is not expected in practice.

- *Destruction of specimens*

It is possible destruction of single individuals as a result of excavation works in the River beds, but they will not lead to changes in population parameters of the species. During the terrain preparation for construction and the removal of trees is possible mortality of individuals in forest habitats, mainly from beetles (*Coleoptera*).

*Operation period*

- *Destruction of specimens*

During the operation of the road would mortality of individuals, mostly representatives of butterflies (*Lepidoptera*) and beetles (*Coleoptera*) as a result of collisions with motor vehicles.

- *Fragmentation of populations*

Not expected fragmentation of flying and aquatic invertebrates, as the route of the road does not prevent their movement.

In the EIA report will be specified and evaluated the expected impacts on the invertebrates species and their habitats within the scope of the various alternatives solutions during construction and operation periods.
For this purpose will be gathered and analyzed information available and will be carried out field studies to identify the presence of potentially affected species and habitats.
Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant negative effects on the on invertebrates species.

**Elements of the National Ecological Network (NEN)**

***Protected territories***

The protected territories as per the Protected Territory Act situated in immediate vicinity to project alternatives of the route of LOT 3.2 of Struma Motorway are as follows:

Protected area "Kresna Gorge", designated as buffer area of Tisata Reserve by the means of Order No. 130/22.02.1985 of the Chairman of CPNE (SG, issue 24/1985), amended by Order No.844/31 October 1991 (SG, issue 24/1985 ) of the Minister of Environment and re-classified into protected area by Order No. РД - 56/30 January 2008 (SG, issue 29/2008) of the Minister of Environment and Water.

Tisata" Reserve is designated with Decree № 6663/05.12.1949 of the Ministry of Forests, Order No. 440/09.12.1977 (SG issue 6/20.01.1978) of CPNE and Order No. 844/31.10.1991 (SG issue 93/12.11.1991) of MOE for changes in the area.

Protected area „Moravska", designated as natural landmark by the means of Order No. 133/22.02.1985 of CPNE (SG issue 26/1985), with category changed to protected area by the Order No. 727/28.09.1991 of MOE (SG issue 87 of 1991).

Natural landmark "Momina Skala" announced by Order No. 468 / 30.12.1977 of the Chairman of the EPC Council of Ministers (promulgated. SG, issue 6/1978).

Protected area "Natural habitat of the plane - Buyna", announced as a natural landmark by Decree No. 1427 / 13.05.1974 of Ministry of Forests and Environmental Protection (prom. SG. 44/1974 years) and categorized in a protected area by Order No. РД - 647 / 25.05.2003 of the MoEW (prom. SG. 60/2003).).

The project alternatives for the route of the Lot 3.2 Struma Motorway" - eastern alternative with gauge G 10.50, eastern alternative with gauge G 20 and a long tunnel option does not affect the protected areas.

For project developments to track Lot 3.2 of the 2014 and 2015 alternatives through the Kresna Gorge to gauge G20 (blue and red version) accompanied by a map material m. In November 2016 with a situation of blue and red version in sections along reserve "Tisata" and Protected "Kresna Gorge", as a the project runs entirely within the scope of the existing road 79, according to geodesic survey in 2016 and the removal of obvious factual error.

The project routes do not affect protected areas, according given situation, Application № 7.

**Protected sites from Natura 2000 ecological network**

The project alternatives of the Lot 3.2 – eastern alternattive with dimension G10.50 blue and red alternative with dimension G20 and long tunnel alternative have impact on:

Protected sites as per Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora: BG0000366 „Kresna-Ilindentsi"

Protected site as per Directive 2009/147/EC on the conservation of the wild birds: BG0002003 „Kresna"

Following MoEW's instructions letter Ref. No. OBOC-85/13.05.2015) a Report on the degree of the impact on the natural habitats and habitats of the species subject to protection in the protected areas, which is an integral part of the EIA report.

Proposed by the Contracting Authority project alternatives for the route will be compared in terms of impact on biodiversity, and will be named the preferred alternative for implementation of the investment proposal .

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects.

In the EIA will be carried out analyzes and assessments, and will be reflected the impacts of the IP on species listed in Annex 3 of the Biological Diversity Act, and will be proposed mitigating measures for their protection.

**3.6. Waste**

The investment proposal will be implemented on the territory of the municipalities of Simitli and Kresna, Blagoevgrad District.

The generated waste on the territories of these municipalities is passed for treatment to the Regional Waste Management Systems (RWMS), following the waste management hierarchy which is aiming to prevent, reduce and limit the waste harmful impact on human health and the environment.
Regional Waste Management Systems, accepting municipal waste for further treatment within the scope of the investment proposal are listed in the table below:

| No. | Name of the RWMS | Municipalities in the scope of the RWMS |
|---|---|---|
| 1 | Blagoevgrad | Simitli |
| 2 | Sandanski | Kresna |

No non-designated dumping sites affecting adversely the environment and human health were observed during the field surveys of the territory intended for the implementation of the investment proposal.
The impact areas (receptors) which can be affected by the waste generated during construction and from the road traffic in implementation of Lot 3.2 are: surface water, groundwater, soils and habitats .

**Potential impacts**
The implementation of the investment proposal comprises two stages when generation of waste is expected - during construction activities and during operation of the project alternatives of Lot 3.2 of the Struma Motorway.

**Construction period**
During construction activities of the route and the facilities of the Lot 3.2 different types of waste will be generated, mainly during preparation of the construction sites, as well as from excavation, construction of the road structure, construction of bridge and road facilities (tunnels, viaducts, overpasses, underpasses, culverts), reconstruction of the engineering network, crossings of railroads, sites for storage of construction materials, temporary construction sites, road junctions, sites for homeporting of the construction equipment as well as temporary camps for the workers.
A large scaled tunnel construction is ahead that will result in generation of considerable amounts of earth and rock spoil with various strength parameters which not always will allow reuse in the construction.
The various wastes which will be generated during the construction of the road are grouped as follows: construction waste, municipal waste and hazardous waste.
The construction waste generated during excavation, backfilling, maintenance, formworks, reinforcement concrete and concrete-asphalt activities as well as the remaining construction activities carried out within the construction site is as follows: excavated excess earth and rock spoils; excavated earth and rock masses which do not fulfil the project specifications for use in construction ; concrete; metal waste; lumber; asphalt mixtures. During the initial construction stage, waste from the trees and shrubs will be generated from the clearance of vegetation during preparation of the route.
The municipal waste will generate at the construction sites, in the temporary camps and sites for homeporting of the transport machinery, construction machinery as well as from the living activities of the workers involved in the construction.
Hazardous waste includes mainly spent batteries and lubricants from the construction machinery in case emergency replacement is needed as well as packages, containing remains of hazardous substances or packages contaminated with hazardous substances.
*Potential impacts during construction:* During construction activities, construction waste has priority in terms of quantity compared to the municipal and hazardous waste.
The effects from the waste, when generating and during the preliminary storage in the place of forming, on human health and the environmental components is assessed as insignificant and temporary, with limited spatial distribution and without potential for cumulating.

It will be necessary to storage the generated earth and rock spoil from the tunnels in designated sites, where probably they will remain for quite a long time, especially the quantities which do not fulfill the project specifications for reuse (excavated material unsuitable for backfilling). The disposal sites for permanent storage are with limited spatial distribution and no cumulating of the effects is expected due to the nature of the material. The latter is true in case soils and rock material are not contaminated.
The impact of the generated hazardous waste on human health and environment in case of accidents with the construction machinery such as spillages/leakages of petrol products characterizes as insignificant and periodical, limited in terms of territory and without cumulative effects.

**Operation period**
During operation of the road lane and the facilities of Lot 3.2 different type of waste will generate from the traffic using the road and road maintenance and repair. The various wastes which will be generated during the operation of the road are grouped as follows: municipal waste, non-hazardous and hazardous waste and construction waste from the maintanance works.
The municipal waste from uncontrolled disposal at and along the road, including in the resting areas; these are generated by the drivers of the vehicles and passengers.
The non-hazardous and hazardous waste generated during regular operation of Lot 3.2 of the Struma Motorway are namely: units and parts from the vehicle;, ripped tires; waste from cleaning of the roadside ditches and dividing strip; waste from different spillages/leakages and cleaning of the road lane after accidents, accidents and car accidents involving use of adsorbents.
The non-hazardous and hazardous waste, generated during accidents and car accidents or emergencies with vehicles, carrying hazardous substances and hazardous waste vary in type depending on the type of the transported materials.
The construction waste generated during maintenance of the road lane is mainly pieces of asphalt cover, waste concrete and metal waste.
*Potential impacts during operation*:
During operation of the Lot 3.2 expected is the generation of small quantities of mainly municipal waste, which will be disposed on and along the road. The impact from waste during the regular operation of the Lot 3.2 on human health and the environmental components and factor characterizes as insignificant and permanent limited in terms of spatial distribution and without cumulative effect. The impact from the waste generated from car accidents and accidents with the vehicles transporting hazardous loads on human health and environmental components is characterized as insignificant and periodic, with not large territorial scope and without cumulative effect.
The EIA Report will comprise description of the various waste types which will generate during construction and operation of the road in line with the codes and classification of Annex 1, pursuant to Art. 5, para 1 of *Ordinance No. 2 from 23.07.2014 on the waste classification*, of Ministry of Environment and Water and Ministry of Health, as well as the expected quantities of the waste for the three stages of the investment proposal will also be included. The EIA Report will also comprise the impact assessment of the waste on environment and human health as well as the impacts from accidents and non-routine events.
Proposed by the Contracting Authority project alternatives will be assessed and compared in the EIA Report in terms of the waste generated by the realization of the road and the anticipated impacts on the receptors.
In the EIA report will be taken into account and reflected tailored recommendations to the competent environmental authority (letter ref. No. EIA-85 / 13.01.2017) from consultations on the updated terms of reference for the scope and content of EIA.
Proposed by the Contracting Authority project alternatives for the route will be compared in terms of impact on waste generating , and will be named the preferred alternative for implementation of the investment proposal .
Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant negative effects.

3.7. **Hazardous substances**

During the field surveys along the route alternatives, no industrial zones and warehouses for storage of hazardous waste and pesticides were observed in close proximity - 310 m, to the investment proposal. At 310 m there are no industrial facilities using hazardous substances or storing methyl bromide (CH3B) as well as ozone depleting substances as per the Regulation for establishing of measures for implementation Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer (Decree of the Council of Ministers No. 326 dated 28.12.2010).

The areas of impact (receptors) of the hazardous substances used in the construction and generated by the road traffic which is likely to be affected by the implementation of the road are: surface water, groundwater and soils.

**Potential impacts**

The implementation of the investment proposal includes two project stages during which generation of the hazardous substances due to accidents and non-routine events – during construction activities and during road operation.

Construction period

Hazardous substances are used during construction by the construction and transport machinery such as petrol oils and fuels – petrol, diesel, LPG, natural gas.

During the construction of the road route and road facilities and reconstruction of facilities of other organizations it is not planned storage of hazardous substances on the construction site, as well as is not planned the usage of hazardous chemical substances and products subject to prohibition. It is not envisaged to use raw materials and products which fall under the provisions of the Regulation on the order and means for limiting the production, use and sale of certain hazardous chemical substances, mixtures and products included in Annex XVII of the Regulation (EC) No. 1907/2006 (REACH), adopted with Decree of the Council of Ministers ПМС No. 376 dated 30.12.2011. Organic solvents which are in scope of Directive 1999/13/EC on the limitation of emissions of volatile organic compounds will also not be used.

*Potential impacts during construction:* No impacts are anticipated – it is not planned to store hazardous substances within the construction sites.

Operation period

During operation of the road and road facilities different types of hazardous substances and mixtures will be transported. Hazardous waste will be generated in case of accidents with the vehicles transporting hazardous substances. The accidents with vehicles, transporting hazardous substances are with small probability of occurrence and unpredictable in terms of timing, location and pollution intensity. The impact from the generated waste due to leakages and spills from transported hazardous waste are described in section 3.6.

During operation of the rout of Lot 3.2 no activities involving hazardous chemical substances will be carried out.

Classification of the petrol oils and fuels used during road construction and their toxicology characterisic will be included in the EIA Report.

Proposed by the Contracting Authority project alternatives for the route will be compared in terms of impact on use of hazardous chemical substances , and will be indicated the preferred alternative for implementation of the investment proposal .

Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects.

**3.8. Risky Energy Sources**

**Noise**

The investment proposal is about construction of LOT 3.2 of Struma Motorway through Kresna Gorge and examines proposed by the Contracting Authority project alternatives for the route.
Currently, the noise source in the area of the future road is the transport flow along road I-1(E-79), which determines the noise background in the section of the gorge. Noise characteristics will be determined based on data for traffic load data provided by the Contracting Authority.
The existing (initial) status of the acoustic environment in the vicinity of the route of the future road at this stage is determined on the basis of the field surveys and information materials, presented by the Contracting Authority.

**Potential impacts**
The limit values for the noise levels in different territories and development areas in urban territories are regulated in Regulation 6/2006 on the parameters for environmental noise and are as follows: for residential areas, subject to impacts from intensive vehicle traffic – day – 60 dBA, evening – 55 dBA, night – 50 dBA; for areas for scientific and research activities (areas for education) - day – 45 dBA, evening – 40 dBA, night – 35 dBA; industrial and storage areas – 70 dBA for day, evening and night.
The routes of the proposed by the Contracting Authority considered alternatives are located at different distances from the nearby settlements in the area - Simitli town, villages Poleto, Mechkul and Oshtava and Kresna town. The areas with regulated noise regime on their territories, in closest proximity to the routes of the alternatives of the future road are: residential, for educational purposes, industrial and storage activity

**Construction period**
The areas with regulated noise regime, located near the construction sites will be affected in different extent by noise generated from the road-construction equipment, depending on the distance between them.
The noise level that reaches these areas will be determined and assessed in the EIA report as required by Bulgarian legislation - Regulation No. 6 on the parameters for environmental noise. The impacts due to the noise from transport used during construction will be assessed on the basis of information provided on routes, number of courses and the schedule of movement. During construction of the alternatives G 20 (blue and red) it is not planned to detour the main traffic flow along detour roads. The traffic will use one lane and the construction activities will be carried out in the other lane and vice versa.
During construction of the left lane of east alternative G 10.50 is not planned diversion of the main traffic flow at existing E79 road through the gorge.
After construction of the left lane will be conducted rehabilitation of the existing road E79 through the gorge, the traffic in both directions will be passed in already built the left lane.

Operation period
The EIAR will determine the noise characteristic of the traffic flow along the route of the future road. For the various alternatives the anticipated noise levels at the receptors identified above (areas with regulated noise regime) will be determined, considering their location, local relief and the proposed technical solution of the project (tunnels, viaducts).
The resulting levels will be assessed according to the limit values for noise levels regulated in *Ordinance No. 6 on the parameters for environmental noise*. The proposed by the Contracting Authorithy route alternatives will be compared in terms of the noise impacts on the receptors and a preferred alternative will be proposed.

**Vibrations**
**During the construction period**
The construction activity is not a source of vibrations in the environment. The vibrations, emitted during the operation of some of the machines and equipment, are a factor of the working environment and concern only the respective staff.

**During operation period**
The transport flow along the road is not a source of vibration in the environment. In line with the engineering design the construction of the road lane (soil base and surface cover) provides quick attenuation of the vibrations in the ground. On this ground, vibrations during road operation as a factor of environment are not assessed in the EIAR

**Radiation**
Construction period
The lit construction sites are a source of light radiation. The light pollution may cause harmful impacts on the living environment and alter the biological cycle.
Potential impact: This impact is local and will affect very limited area in the vicinity of the construction site. The impact has a medium term of duration and is reversible.

Operation period
During operation, the traffic along the road is a source of light radiation. The excessive growth in the lighting during the night time changes the natural environment of the nocturnal animal species. Many of the animal species are disoriented due to the night lighting. The impact is continuous when there is traffic.

The construction activities and the traffic are not a source of other types of radiation during construction and operation of the road.
Proposed by the Contracting Authority project alternatives for the route will be compared in terms of impact of he Risky Energy Sources and will be named the preferred alternative for implementation of the investment proposal .
Will be offered achievable and verifiable mitigation measures for limiting or avoiding significant adversary effects.

**3.9. Landscape**
The existing road I-1 (E79), as well as the developed project alternatives for the route are located in the valley of the Struma River - the Kresna Gorge. All alternatives of the Lot 3.2 start from end of Lot 3.1. Alternatives G20 - blue and G20 - red going into the Kresna Gorge and ending at the road junction “Kresna” with a bypass the Kresna town in eastern direction. The East Alternative G 10.50 and the easten alternative G 20 is far on the east from the gorge and are develop in the lower slopes of Pirin Mountain. The route of alternative "long tunnel", after the bridge over the Struma River goes into Malashevska Mountain. The passing through 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 - 15.378 km. After the exit of the Kresna tunnel, the route of Lot 3.2 intersects an existing third class road and Struma River, passing to the east of it and ends at road junction Kresna.
According the Landscape country zoning, Lot 3.2 of Struma Motorway and the considered project alternatives for the route, fall within the South- Bulgarian mountain-valley zonal region, Pirin subregion.
In view of the landscape classification in Bulgaria, the region of the implemented investment proposal is referred to:
**Class**: Mountainous landscape
**Type**: Landscape of the Submediterranean low mountainous forests
**Subtype**: landscapes with low mountains xerothermic forests

Depending on the overwhelming participation of natural and anthropogenic components, the landscapes are divided into the following groups:
**Natural landscapes**. Landscapes in which the native natural components are dominated. This group includes forest landscapes with intact biotic components and root vegetation as well as preserved to a large extent River landscape of the Struma River.

**Forest landscapes.** Presented by deciduous and coniferous forests, as with the highest prevalence is a subtype - broad-leaved low-stemmed. They form a habitats of plant and animal species and are important for visual perception.
**Aquatic landscapes** - fluvial. The route of the existing road E79 and the proposed alternatives G20 blue and red are developed in the River terrace of Struma River.
**Meadow landscapes** - take a limited place in a scope of the routes. These are the grasslands of the land fund of herbaceous vegetation and shaped opened landscape structures.
**Agrarian landscapes** are those used for agricultural activities and formed under its influence. They formed anthropogenic landscape structure which affects the aesthetic landscape appearance of the territory. They occur in a short section of road route after Kresna.
**Anthropogenic landscapes**. Landscapes in which the natural components have been transformed as a result of various forms of human activity. This group includes landscapes with different variations of their components due to economic, constructional and cultural activity that violates the natural relationships between abiotic and biotic components of ecosystems. Within anthropogenic landscapes are distinguished: urban landscapes in populated areas, industrial landscapes, communication, agrarian landscapes, etc., where the individual components of the landscape have been modified to a different extent.

**Potential impacts:**
Construction period
Activities on the implementation of the road and its objects will be associated with two phases of changes in the landscape.
During construction process - the performing of significant excavation and backfilling operations (negative and positive forms) for the construction of new routes, including the use of construction machinery and transport for carrying out the construction works will affect temporarily the general status of the landscape.
The second phase will be associated with the operation of the IP including new technogenic landscape elements - road junctions, new bridges, overpasses, underpasses, highway crossings, tunnels. This phase is characterized with continuous change in the environmental conditions as well as visual changes in the landscape status as a result of the constructed road. The technogenic structures will stand out against the surrounding landscape background and will replicate and enhance the urban environment.
Activities that will have an impact on the physical features of the landscape in the IP area, regardless of which version they are:

- The preparations for construction, upon which the vegetation and the humus layer - the surface soil layer will be removed;
- Construction of a road and its facilities - excavations and embankments;
- Blasting activities in the construction of tunnels and route widenings into the adjacent slopes;
- Traffic from the construction itself;
- Formation of transport-communication type landscape in the process of construction;
- Reclamation .

The construction of the IP will lead to changes in the existing landscape as a result of the new objects construction. These include interference in the organization of the territories, related to loss of agricultural lands and forest territories. In the same scope the construction will be related with removal of the existing humus layer; the latter is the unique accumulator and distributor of the energy in the soils, and is necessary for the normal exchange and circulation of substances in nature.
Landscape types will be changed in sections where blasting operations are conducted, for the construction of tunnels through the mountainous terrain. The impacts on landscape characteristics caused by blasting will be as a result of dust emitted in blasting activities, the noise and vibration that would be felt by people living in nearby areas. The impact will be direct, negative, temporarily,

short-lasting (only during construction period), local (only in some separate places along the Lot 3.2). Cumulative and secondary impacts are not expected. The impact will be of a low degree.
During the construction of bridges, highway crossings and other above- ground facilities associated with the investment proposal, the typology of the landscape will be permanently changed. The landscapes will be transformed into transport-communication type - formed in the process of construction and operation of the transport objects. The impact will be directly due to the specifics of the construction work - removal of new terrains that changes the structure and functioning of the landscapes. This impact will be temporary and short-lasting because disturbed terrains, as a result of the construction work will be reclaimed.
During performing construction activities is expected to have a minor contamination of landscape components by dust (excavation and backfilling operations, withdrawal of humus layer and removing the vegetation provided by the project) soot from construction and servicing equipment. The expected impact of the pollutants on the landscape will be the result of the use of heavy road construction equipment and facilities for carrying out of construction activities (noise, dust, aerosols).
The process of construction of objects of the investment proposal will be associated with a temporary change in the overall condition of the environment, as the horizontal and vertical structures of the landscape will not be changed. In landscape dominants changes are not expected. Impacts during construction period will be direct, short-lasting and negative. Expected violations will have local character, they will only be along the route of the investment proposal and will not cause a general degradation of the landscapes.

Operation period
The changes in the landscape in the period of the operation of the IP are related mainly to the introduced new technogenic landscape elements – new road junctions, viaducts tunnels, support walls, bridges, vertical signalization etc.
This phase is characterized with continuous change in the environmental conditions as well as visual changes in the landscape status due to the implementation of the IP. The technogenic structures will stand out against the surrounding landscape background and will replicate and enhance the urban environment.
The operation of the IP will be related to the visual perception of the road by the traffic participants and the related facilities for traffic management as well as to the migration of pollutants into the landscape.
The landscaping in the area adjacent to the road lane will be subject to a project which includes landscaping and planting activities.
Proposed by the Contracting Authority design alternatives for the route will be compared in terms of impact on the landscape, and will be named the preferred alternative for implementation of the investment proposal .
Will be offered achievable and verifiable mitigation measures for limiting or avoid significant negative effects.

**3.10. Cultural heritage**

The analysis of the investment proposal for improving of the route of Lot 3.2 of Struma Motorway shall be carried out with the means of collection and processing of the existing information for the objects of the cultural heritage in the road section Krupnik-Kresna. The baseline in relation to the cultural heritage objects will be determined using different information sources - the computer system “Archaeological Map of Bulgaria”, registers of the National Institute for Immovable Cultural Heritage, specialized publications, analyses of topographic maps and orthophoto images.
The nature of the investment initiative suggests that its implementation may threaten mainly archaeological cultural values. This section of the motorway crosses a region with high concentration of archaeological sites. In proximity to the project routes of Lot 3.2 of Struma Motorway are located the following known archaeological objects.
In the lands of Poleto Village, Simitli Municipality
- old road in Luzhova mahala locality;

In the lands of Gorna Breznitsa Village, Kresna Municipality
- Antique settlement near Breznishka River, next to the bridge to Kresna town;
In the lands of Stara Kresna Village, Kresna Municipality
- Prehistoric settlement in the Raets locality;
In the lands of Kresna Town, Kresna Municipality
- Antique settlement in Melo locality;
- Late-Antique settlement in Novo selo locality;
- Settlement from the late Bronze and Roman Ages in Gorni ushi locality;
- Fortified settlement from the Late Iron Age in Ushite locality
- Late-Antique and Byzantine fortress;
- Old road;

There is a fair chance for registering of unknown archaeological sites to the east and south-east of Kresna Town where the route passes on completely new route.

Receptors and area of impact: According to the scientific and cultural region the immovable cultural values are: archaeological, historical, architectural and construction, artistic, urban, cultural landscape, park and garden art, ethnographic, cultural routes. In compliance with the definition of Art. 47 of the Cultural Heritage Act (CHA) the archaeological immovable cultural values are material traces of human activities, inseparable from the environment in which they are created and identified by archaeological research. The variety of human activities and the vast chronological span, in which they exist, provide for an exceptional diversity of this type of objects.

The concentration of cultural heritage sites on the territory of Bulgaria is exceptionally high. The reference to the registers of the National Institute of Immovable Cultural Heritage (NIICH) proves that there are a couple of ten thousands announced and registered cultural sites on the territory of Bulgaria. These objects are made public after long years of research by the specialists from NIICH, National Archaelogical Institute and Museum at the Bulgarian Academy of Sciences (NAIM – BAS), regional historical museums and other cultural institutions as well as thanks to the activities of local history researchers. However, these studies were not focused and under no circumstances resulted in registration of all objects of cultural heritage which exist. This statement refers mainly to the archaeological monuments; locating some of them is possible only after execution of specific studies. These objects are most vulnerable and directly threatened by the execution of any activities utilizing destructive methods.

This is the reason why it is extremely important as early as the design project phase (before the construction works) to locate the boundaries of all archaeological sites in the scope of selected for the implementation alternative of the Lot 3.2 of Struma Motorway, as this can be done via execution of preliminary archaeological surveys of the territory of the investment proposal (searches for archaeological sites) in line with provisions of Art. 161 of the CHA.

**Potential impacts**

Construction period

The adverse impacts on the cultural heritage objects may occur during the construction works within the boundaries of the planned road or within the temporary working corridor. The most seriously endangered are the archaeological cultural items which are difficult for identification due to their nature.

In the last 20 years a scientifically justified methodology for investigation of archaeological sites threatened by infrastructure projects has been developed using Bulgarian and international experience. The strict and timely execution of the surveys envisaged in this methodology will to a large extent allow avoiding the risks from loss of integrity of the cultural values on the one hand as well as further delays and increased construction costs of other. The phases for implementation of this methodology are regulated in the specialized legislation.

Operation period

The operation of Lot 3.2 of Struma Motorway imposes no direct threat for the cultural values. The environmental pollution must be mentioned firstly as "indirect" impact on the cultural heritage objects. Of special importance is the quality of the ambient air. Among the typical air emissions

from the traffic most important in relation to the cultural heritage are the compounds containing sulphur.
The change of cultural and traditional landscape is another indirect effect which is due to the construction of Lot 3.2 of Struma Motorway.
The construction of Lot 3.2 of Struma Motorway provides for easy access to more representative cultural sites, situated in the vicinity of the motorway. However, a suitable marking of the approaches to these sites will be required.
The above listed potential adverse impacts on the objects of the cultural heritage will be analyzed in the EIAR. The baseline information on the known archaeological sites will become a basis for assessment of the risk from loss of integrity or compromising for each of them. On this basis will be proposed measures for their protection, as well as in which stage of the investment proposal these measures shall be applied.

**3.11. Health and hygiene aspects**

Safety of the workers involved and the population living in the area of the investment proposal is one of the essential elements during project's implementation namely during construction and operation of the planned Struma Motorway in the region of Kresna Gorge.
The investment proposal will be implemented in an area with complicated location what concerns the type of the activities and the complex topographic and geographic conditions in relation to the nearby settlements.
Where possible the existing road is used while in other sections tunnels and viaducts are planned. Support walls shall be envisaged as well, where required.
All of the proposed by the Contracting Authority project alternative solutions developed in the current investment proposal for Lot 3.2 will be studied and assessed in terms of health and ecological aspects in the EIAR.
The EIAR will comprise, from health point of view, the technical parameters, efficiency road drainage, safety of the planned junctions for crossing the national road network and the railways etc. To ensure conflict-free crossings road junctions in various project alternatives are planned in the investment proposal.
From healthcare positions in the EIA Report will be given a positive assessment of the designed three tunnels east of the town of Kresna alternatives for G20 blue and red variant G10.50 that are of high value in securing the population in difficult geographical and landscape area.
The proposed project solutions offer technical and technological solution such as tunnels with given length, splitting of the road lanes, possibilities for timely and conflict-free traffic management in case of car accidents and natural disasters, etc..
The tunnels in alternatives G 20 and G 10.50 have a short length and does not require construction of a ventilation system. Will be presented an estimate of the purpose of viaducts and road junctions to ensure a conflict-free traffic
In this EIA report will also comment on the appropriateness of all design alternatives from healthcare positions.
Under east alternative G 10.50 forecasted can be assumed that in "de-centralization" of the traffic flow the significant air pollution will be reduced, as well as the noise pollution in the area during the construction and operation of the existing road E79 and of the unidirectional variant that is remote east of the gorge.
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The EIAR will comprise, from health point of view, the technical parameters, efficiency road drainage, safety of the planned junctions for crossing the national road network and the railways etc. To ensure conflict-free crossings two junctions are planned in the investment proposal.
The designed east of Kresna town three tunnels that are of high value in providing the population in the hard in terms of geography landscape area, from a health point of view will be evaluated with a positive assessment in the EIAR.
The current prject proposes technical and technological solution such as tunnels with given length, splitting of the road lanes, possibilities for timely and conflict-free traffic management in case of car accidents and natural disasters, etc.

The tunnels in the G20 and G10.50 have a short length and does not require construction of a ventilation system. Assessment of the viaducts and the road junctions which ensure conflict-free traffic.
The EIAR will include the appropriateness of the other alternative options from health perspective.
The proposed variants, including the Alternative G10:50 (East alternative) should be assessed.
Under this alternative G 10.50 forecasted can be assumed that in "de-centralization" of the traffic flow the significant air pollution will be reduced, as well as the noise pollution in the area during the construction and operation of the existing road E79 and of the unidirectional variant that is remote east of the gorge.
The parameters of the air environment such as noise, vibration and lighting, must comply with the relevant statutory criteria in regard of hygienic point of view, regardless of the length and number of the tunnel facilities. The factors described, especially in very long tunnels are vulnerable and should also not to be underestimated the possible emergency situations in them as preconditions for serious accidents of motor vehicles and damage the health of passengers.
From health-hygienic point of view, the use of tunnels with a length of many kilometers automobile transport is unacceptable compared to electrified railway transportation.
The report will comprise as well the impacts on the sanitary-hygienic conditions in the nearby settlements and other objects, subject to health protection such as air pollution with dust fractions, pollution with contamination harmful gas emissions, noise pollution, as the expectation from health point of view is that the above mentioned hazards will be compliant with the safety norms; the cumulative effect with continuous type of pollution in the area of Struma Motorway will be prognosticated.
The description of the status of the components and the environmental factors in the area of the investment proposal for the studied route section of the route of Lot 3.2 of Struma Motorway shall include comprehensive information about the presence of sources of potable water, mineral water and the sanitary-protection zones around them. The location of objects which are subject to health protection shall be assessed in terms of cumulative and hygienic aspects of the sanitary protection.
The identification of the impact sensitive receptors during implementation of the investment proposal forms the basis of the preventive activities for the population and the route workers aiming at impacts mitigation and shall be included in the EIAR.

**Potential impacts**

In view of the characteristics of the different factors with regards to their impact on the health of population and workers, these will be be classified and studied according to the communal and hygienic requirements as follows:
Chemical factor;
Physical factor;
Psycho–sensor factors;
Social factors.

During construction period
The EIARwill comprise all health risk factor in the working environment as per type of NOx-es typical for the respective activities. The health assessment wil be compliant with the requirement of Regulation No. 13/2003 on the protection of the workers from risks from exposure to chemical agents during working (prom. SG, issue 8 dated 2004, amended SG, issue 71 dated 2006, amended SG, issue 67 dated 2007).
The main risk factors with regards to the occupational health during implementation of the investment proposal are: dust, toxic harms, noise, general local vibrations, unfavorable microclimate, and physical exertion.
The implementation of the investment proposal is not related with the impacts comprising harmful radiation.
Among the chemical risk factors, presented as chemical compositions, most important are: polycyclic aromatic hydrocarbons (PAHs), heavy metals, carbon and nitrogen oxides, sulfur dioxide, tars, explosives etc.

During construction, the population of Kresna Town will be temporarily exposed to noise and air impacts in the areas close to the entrances of the tunnels and viaducts, in the eastern periphery of the town. This could happen only under certain atmospheric conditions – eastern wind. The health assessment will consider the results of the forecasts factor "Noise" and component "Ambient air". During construction, the population of the residential area of Simitli town will also be temporarily exposed to noise and dust in the implementation of East Alternative G10.50 and east alternative G 20 and a long tunnel alternative.

Operation period

These characteristics shall be analyzed with regards the health and hygiene aspects; assessment of the potential adverse impact on the population in the adjacent settlements will also be included

The routes of the proposed project variant solutions with dimension G20 (blue and red) pass through undeveloped territories far from existing settlements. The left lane of east variant G10.50 passes between the neighborhoods of the town of Simitli - Oranovo and Dalga mahala. Both lanes of eastern alternative passes between the neighborhoods of the town of Simitli - Oranovo and Dalga mahala.

During the operation of the investment proposal impacts due to air pollution with particulate matter, exhaust pollution and noise pollution are expected.

Noise is the heaviest environmental pollutant around roads and motorways, which is why its generation and distribution is subject to further studies, depending on a number of additional factors - topography, surrounding areas, traffic intensity, type of the road surface, behavior of the drivers etc.

Other important source of impacts are the harmful air emissions during the operation of the Lot 3.2 of the Struma Motorway. The EIAR shall assess the impact on sanitary hygienic conditions in the surrounding settlements and others objects, subject to health protection in terms of ambient air pollution with dust and harmful gas emissions. Modeling of dispersion of pollutants from vehicles along the proposed designed route alternatives shall be carried out.

The route of Lot 3.2 during operation will rapidly improve the the ambient air quality in the settlements and surrounding area, especially in Kresna Town by shifting the existing traffic (including the heavy transit transport flow) outside of the residential areas, and and outside them will allow higher average speed of the passing vehicles and thermally stable working regime of the engines which will decrease the quantities of the emitted harmful substances. Eventually this will improve the hygienic parameters of the ambient air in the residential areas, reduce the noise emissions and remove the preconditions for accidents with vehicles and their cargos on the territory of the Kresna town.

The assessment conclusion will be in line with the requirements of the preventive medicine and will be based on:

Hygienic characteristic of the physical, chemical and mechanical agents used during operation;

Health and hygienic analysis of the potential paths of impacts on the investment proposal on the health of workers and population as well as on the environment;

Identification of the risk factors for the health of the employed in the project;

Possibilities for combined, complex, cumulative and remote impact on the identified factors;

Assessment of the risk for the health, protection measures, actions in case of emergency situations.

In the EIA Report will be taken into account and reflected tailored recommendations of Ministry of Health (letter ref. No. 12-00-2 / 13.01.2017) from consultations on the updated terms of reference for the scope and content of EIA.

## 4. Significance of the Anticipated Environmental Impacts and Identification of Unavoidable and Permanent Environmental Impacts which have Potential to be Significant during Construction and Operation of the Investment Proposal and shall be Assessed in Details in the EIA Report, including in cases under art. 99b in conjunction with Art. 109, para. 4 of EPA

### 4.1. Evaluation of the extent/magnitude and significance of impacts for the investment proposal

The significance of an impact is usually expressed with quantitative and qualitative parameters compared with local, national and international standards. Rates/parameters are not applicable to some impacts. In such cases the assessment is qualitative and is based on the expert experience and the good practice. In cases of emergencies (accidents, natural disasters, incidents) the impacts are studied in the context of probability of the respective event and its consequences.

In general the criteria for extent/size/magnitude of the impact are:

In spatial, depending on the physical scope of the impact;

temporal, for example duration of recovery or of impact, project schedule; or

qualitative or quantitative, when the parameters describing the condition of the respective component/factor in relation to the sensitivity of the receptors are applicable.

Evaluation of the impact significance on receptors/foster environment shall be carried out considering sensitivity/value of the receptor or the resource and magnitude of the impact; it is summarized in the following matrix:

Figure No. 4-1. Example of matrix for evaluation

| Rate/Size/Magnitute of Impact | | Sensitivity of the receptor/Value of the receptor or resource | | | | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| | | Very low | Low | Medium | High | Very high |
| 1 | Very low | | | | | |
| 2 | Low | | | | | |
| 3 | Medium | | | | | |
| 4 | High | | | | | |
| 5 | Very high | | | | | |

The impact significance evaluated using the matrix on Figure № 4-1 above does not account for adoption of mitigation measures. Three general significance groups are outlined in the matrix:

impacts with high significance (unacceptably high), marked in red;

impacts with moderate significance (impacts which are acceptable under certain conditions which are to be confirmed), marked in yellow;

impacts of low significance, which do not exclude the need to propose/envisage mitigation measures, marked in green.

However strict distinction between these groups is not possible and in many cases the final evaluation of the impact significance is somewhere in-between them.

In some cases, where appropriate, the environmental risk will also be determined depending on the impact significance and the probability of occurrence. Similar to the significance, the risk is grouped in three units:

significant, unacceptable risk for environment;

acceptable risk, for which mitigation measures and control of impacts need to be envisaged;

low risk, of which no mitigating measures are necessary.

Various criteria of the route alternatives have been studied in order to further detail the environmental impact assessment using the experience gained from other infrastructure (road)

projects, their construction and operation; this helps to structure the results of the preliminary impact identification and impact assessment of the environmental components and factors.
The table below comprises in a structured form the results of the preliminary impact identification and impact assessment of the environmental components and factors due to the implementation (construction and operation) of the investment proposal under normal conditions as well as in emergency cases and the identified potential receptors of these impacts ape substantiated.

**Table No. 4-1**

**Potential impacts due to the implementation of the investment proposal, which is subject to detailed study in the EIA Report**

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| Atmospheric air and Climate | | |
| Construction | | |
| | Dust generation during ground preparation, excavations, construction of support walls, foundation of viaducts and bridge facilities, from traffic of the construction machines, loading and unloading operations of inert materials and storage of materials at the site | Residential territories and/or part of the settlements along the route.<br>Ecosystems along the route |
| | Ambient air pollution during tunneling when blasting (nitrogen oxides, carbon dioxide and particulate matter) | Residential territories and/or part of the settlements situated near the tunnel entrances/exits.<br>Ecosystems along the route |
| | Ambient air pollution during operation of the construction machines (waste gasses typical for the combustion process: nitrogen oxides, carbon oxide Sulphur oxide, soot, VOC, PAHs, POP), equipment and facilities (e.g. facility for asphalt production emitting mainly steams of different hydrocarbons incl. VOM, PAHs, POP, dioxins, furans and PCBs) | Residential territories and/or part of the settlements along the route. Ecosystems along the route |
| Operation | | |
| | Ambient air pollution due to the traffic which have the potential to affect people in the residential territories and/or zones along the route as well as sensitive receptors of the nature in view of the already established critical rate of pollution and/or existing topographic conditions and/or wind directions, which further contribute for amplification of the adverse impacts. | Residential territories and/or part of the settlements with certain air quality, situated along the route.<br>Ecosystems along the route. |
| | Positive impact on living standards for the local population and on climate change / reduced emission of green gasses due to the elimination of traffic congestion after the construction of new infrastructure and therefore generally more regular traffic and the related reduction in transport | Residential territories and/or part of the settlements along the route.<br>Ecosystems along the route |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| | emissions | |
| Surface and ground waters | | |
| Construction works/Civil Engineering | | |
| | Effects on the Riverbeds during construction phase (temporary changes, impacts on the hydraulic characteristics etc., vegetation clearance along the River banks) mainly related to the bridges and viaducts construction.<br>Temporary impacts on the morphology of the Rivers and water courses;<br>Use of faulty construction machinery – pollution of surface water with hydrocarbons. | The surface water bodies tangent or crossed by the route.<br>Groundwater bodies which outcrop on the surface.<br>Water protection zones |
| | Drainage of ground waters in the excavation works of tunnels and in their further operation | Groundwater bodies, comprised in the scope of tunnel works |
| | Deployment of construction sites for the construction of the route and the involved facilities | The surface water bodies tangent or crossed by the route.Groundwater bodies, which have access to the earth surface |
| | Draining activities, comprising:<br>providing of temporary access/construction roads in the surroundings of the site intended for bridge construction;<br>temporary situation and operation of pumps for pumping out of water. | The surface water bodies tangent or crossed by the route. |
| Operation | | |
| | Protection from flooding | Surface waters<br>Ecosystems<br>Settlements |
| Forest areas | | |
| Construction works/Civil Engineering | | |
| | Destabilization of the geological base in relation to big construction sites, for example at the construction place of tunnels and bridges. | Ground base<br>Specific sections of topography |
| Operation | | |
| | Violated norms for construction of retaining and strengthening facilities in the areas of slope hacking resulting in development of landslides and rockfalls | Ground base<br>Specific sections of topography |
| Land and soils | | |
| Construction works/Civil Engineering | | |
| | Loss of soil – loss of agricultural land and forest territories with the resulting changes | Forest areas<br>Agricultural lands |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| | in land use | |
| | Soil disturbance – disturbance of the soil profile, changes in the physical and chemical, waterphysical and biological processes that take place in the soil substrate, local deterioration of the soil quality in the lands adjacent to the road section.<br>Soil compaction – temporary presence and use of the sites/soils by construction and transport machinery (construction sites of the Contractor, access for the transport, traffic detours) as well as temporary storage of construction material, construction waste, the surface soil layer, excavated earth spoil regardless whether it will be reused or not, etc., as well as additional impacts | Soil |
| | Induced erosion | Soil |
| | Bridging of water courses | Alluvial soil |
| | Soil contamination – impacts on soil quality:<br>- contamination of the adjacent lands with aerosols and exhaust gasses;<br>- local soil contamination with fuels and lubricants resulting from accidents with the machinery.. | Soil |
| Operation | | |
| | Contamination with harmful substances<br>- continuous, but with variable intensity, COx, NOx, SO2 and other gasses and aerosols which contain mainly Cd, soot and other compounds from the engines of the passing vehicles as well as from the wearing of the tires on the road lane and the road surface<br>- periodically (during the winter season) - Cl, SO42-, Na+, Mg2+ etc. from the defrosting substances used to prevent the icing of the road lane;. | Soil |
| | Soil erosion /slopes, embankments/ resulting from outstanding or poor reclamation measures | Soil |
| | Contamination with waste from:<br>construction/repair from construction and maintenance road works;<br>municipal waste at the resting sites of the road and in the roadside areas. | Soil |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| | Accidents and emergency releases of pollutants in the soils, for example from car accidents; | Soil |
| Biodiversity | | |
| Construction works/Civil Engineering | | |
| | Habitats disturbance<br>- Irreversible loss of the habitats of plants and animals found within the scope of the route<br>- Invasion of ruderal and weed species in the destroyed natural coenosis and changes in floristic composition, development of degradation processes | Semi-natural and natural phytocoenosis (forests, meadows, pastures)<br>Agrocoenosis |
| | Habitats fragmentation (including nesting, feeding and breeding), following the preparation of the route, facilities and the construction sites.. | Habitats of plant and animal species |
| | Disturbance<br>chasing animals away due to the increased human presence | Animal species |
| | Bridging facilities:<br>Chasing away from the area of construction of the facility;<br>loss of eggs;<br>water pollution;<br>habitat disturbance. | Ichthyofauna, bottom fauna<br>Amphibians<br>Otter |
| Operation | | |
| | Irreversible loss of terrestrial and aquatic habitats /wet zones within the footprint of the route | Animal and plant habitats |
| | Permanent habitat fragmentation. Disturbance of the local and seasonal migration corridors – barrier effect. | Animal and plant habitats and animal species |
| | Deterioration of the quality of the neighboring habitats due to nuisance (noise and light pollution) | Animal species |
| | Impacts from dust and aerosols emitted from the vehicle traffic and the regime of road maintenance – sanding and salination | Plant habitats and animal species |
| | Introducing of new habitats in the roadside areas resulting from landsaping and biological stabilization of the roadside areas, slopes and embankments. | Plant habitats |
| | Mortality resulting from the crashes of animal species with vehicles. | Animal species, mainly amphibians, reptiles and small mammals |
| Landscape | | |
| Construction works/Civil Engineering | | |
| | Changes in the natural topography within | Existing agro- and forest |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| | the construction corridor; mechanical destruction of the geological strata due to excavation and backfilling when building new routes, junctions, tunnels, support walls, viaducts, bridges, disturbance of vegetation cover, visual impacts resulting from the construction machinery used, new negative land forms from the excavations and embankments, disposal sites for storage of humus, earth spoil and construction materials. | landscape.<br>Vegetarian cover<br>Geological medium<br>Impaired visibility |
| Operation | | |
| | Impacts on landscape through structural changes due to the road construction.;<br>New technological elements of the landscape (new road junctions, tunnels, viaducts and bridges, traffic signs);<br>Visual perception of the road by the participants in the traffic and the related facilities for traffic management.<br>Influence upon the natural beauty of landscapes. | Existing landscape<br>Vegetarian cover<br>Geological medium<br>Altered visibility |
| Cultural and historical heritage | | |
| Construction works/Civil Engineering | | |
| | Destroying or partial disruption of the integrity of archaeological cultural heritage of value during excavation works | Territories or protected zone of archaeological sites within the limits of the projected route or those of the temporary work corridor |
| | Peripheral impact on the territory of archaeological cultural heritage of value in the excavation works | Territories or protected zone of archaeological sites within the limits of the projected road or those of the temporary work corridor |
| | Hazard for individual archaeological structures or artefacts within the limits of the projected road route or those of the temporary work corridor | Territories or protected zone of archaeological sites within the limits of the projected road or those of the temporary work corridor |
| | Compromising of the cultural landscape of significant monuments of culture | Border areas of cultural values crossed by Struma Motorway Lot 3.2. |
| Operation | | |
| | Change of the cultural and traditional landscape resulting from construction of Lot 3.2 of Struma Motorway | Border areas of cultural values crossed by Struma Motorway Lot 3.2. |
| | Endangering cultural property of value, as a result of the negative impact of greenhouse gas emissions of traffic | Border areas of cultural values crossed by Struma Motorway Lot 3.2. |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| Health and hygienic aspects | . | |
| Construction works/Civil Engineering | | |
| | Psychiatric and sensor factors: noise / vibration and other discomfort due to the transportation of materials, loading and unloading activities, construction works, diesel generators, fuel spills for construction vehicles | The workers on the construction site of road route |
| | Exposure to physical, chemical and mechanical agents, health risk factors in the work environment under normal and emergency modes | The workers on the construction site of the road track |
| Operation | | |
| | Positive impact - by improving the hygiene parameters of atmospheric air of nearby residential areas, reducing the noise emissions, the preconditions for accidents, involving vehicles and their loads on the territory of the city. Kresna. | Sanitary and hygienic conditions of the nearby residential areas and other sites, subject to health protection |
| | Contamination of air with particulate matter /dust particles/, contamination with harmful emissions from the traffic of vehicles | Sanitary and hygienic conditions of the nearby residential areas and other sites, subject to health protection. Favourable conditions shall be created for the limitation of contamination of agricultural areas and vegetable production |
| | Noise levels during the operation of traffic | Population of the relatively close residential areas and other sites, subject to health protection |
| | Road / Traffic accidents | Traffic participants |
| Noise | . | |
| Construction works/Civil Engineering | | |
| | Noise pollution of road construction machinery and noise, generated from the service transportation of construction activity. | Areas and zones with standardized noise mode, closest to construction sites of the road section of the future road (the town of Simitli, Poleto village, village of Mechkul, village of Oshtava, the town of Kresna).<br>Areas and zones with standardized noise mode around the road section of traffic of the transportation, servicing the construction. |

| Environmental components & factors | Potential significant impacts resulting from the activities of the investment proposal | Receptors |
|---|---|---|
| | | Fauna. |
| Operation | | |
| | Noise load of the transport stream along the route of Lot 3.2 | Territories and zones of standardized noise mode, closest, closest to the route section of the future road (the town of Simitli, Cherniche village, Poleto village, village of Mechkul, village of Oshtava, the town of Kresna).<br>Fauna |
| Waste | | |
| Construction works/Civil Engineering | | |
| | Generating, treatment and disposal/neutralization of waste (hazardous and non-hazardous) in the construction activities | Soil<br>Surface and groundwaters<br>Habitats |
| | Accidents and incidents with the construction and assembly road handling equipment, spills / leaks of petroleum products | Soil<br>Surface and groundwaters<br>Habitats |
| Operation | | |
| | Generation and treatment of waste under normal operation and maintenance of the track of Lot 3.2 | Soil<br>Surface and groundwaters |
| | Accidents with road and transportation vehicles, spills / leaks from tanks and trucks, carrying liquid or hydrated materials or dangerous goods | Soil<br>Surface and groundwaters<br>Habitats |

**The Environmental Impact Assessment Report (EIAR) shall identify the inevitable and lasting environmental impacts from the construction and operation of the investment proposal, which can be significant and should be examined in detail.**

Based on the results of assays and assessments of the likely significant environmental impacts, resulting from the construction and operation of the investment proposal in the Environmental Impact Assessment Report (EIAR), measures shall be recommended for the prevention and reduction of adverse effects from the project on the environment and human health.

4.2. **Characteristics of the impacts (types, range, probability, duration, frequency and reversibility of the impact), while determining the inevitable and lasting environmental impacts of implementation of the investment proposal, which must be examined in detail in the report**

**Impact estimation:** The impacts, expected in the realization of the investment proposal shall be diverse and may be defined differently. The Environmental Impact Assessment Report (EIAR) shall provide an assessment of the expected impacts on people and the environment from the construction and operation in normal and emergency situations, by considering the characteristics of impacts. Of the project, the expected impacts shall be evaluated as:

Impact type: direct, indirect, reversible (for a certain period of time) and irreversible (permanent); as a result of routine activity or incidents;

Scope of the project: local, regional, national or trans-boundary;

Duration of impact short-term, middle-term, long-term;

Frequency of impact: periodical, intermittent;
Consequence of impact: positive, negative;
Rate of impact: insignificant (low rate); moderate (medium rate); significant (high rate).

In addition to the above effects, the Environmental Impact Assessment Report (EIAR) shall identify and assess potential cumulative impacts. They can be caused by different types of activities and interaction:

cumulative - the overall effect of different impacts on a particular receptor;

in the interaction - different impacts interact with each other to obtain new impacts;

With additional effect (synergistic) - the effect of impacts of the proposed development and other existing or planned projects in close proximity;

in time - series of impacts that occur at different times and which are not individually significant, yet put together for the relevant period, they may be significant.

For the purpose of determining the environmental impacts of the implementation of the investment proposal, which must be examined in detail in the Environmental Impact Assessment Report (EIAR), a matrix has been constructed for qualitative evaluation and characterization of the identified potential impacts from the implementation of the project alternatives for the road.

| Environmental component/factors | | CHARACTERISTICS OF THE INFLUENCES | | | | | | | | | | | | | | | LEVEL OF SIGNIFICANCE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Positive | Positive | Direct | Indirect | Reversible | Irreversible | Short-term | Long-term | Periodical | Continuously | Local | Large scaled | Synergy/cumulative effect | Routine | Due to accidents | Unavoidable | Low | Average | High |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 3 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Ambient Air & Climate | Construction works | | x | x | | x | | x | | x | | x | | | x | x | x | x | | |
| | Operation | | x | x | | | x | | x | | x | x | | | x | x | x | x | | |
| Surface waters | Construction works/ | | x | x | | | x | | x | | x | x | | | x | x | | x | | |
| | Operation | | | | | | | | | | | | | | | x | | x | | |
| Grounddwaters | Construction works | | x | x | | | x | | x | | x | x | | | x | x | | x | | |
| | Operation | | | | | | | | | | | | | | | x | | x | | |
| Geological settings | Construction works | | x | x | | | x | | x | | x | x | | | x | | | x | | |
| | Operation | | | | | | | | | | | | | | | | | | | |
| Soil | Construction works/ | | x | x | | | x | x | | x | | x | | | x | x | x | | x | |
| | Operation | | x | | x | | x | | x | | x | x | | | x | x | x | x | | |
| Noise | Construction works/ | | x | x | | x | | x | | x | | x | | | x | | x | | x | |
| | Operation | | x | x | | x | | | x | | x | x | | | x | | x | x* | | |
| Landscape | Construction works/ | | x | x | | | x | x | | | | x | | | x | | x | | x | |
| | Operation | | x | x | | | x | | x | | | x | | | | | x | x | | |
| Flora | Construction works/ | | x | x | | | x | x | | | | x | | | x | | x | | x | |
| | Operation | | x | | x | | x | | x | | | x | | | x | | x | x | | |
| Fauna | Construction works/ | | x | x | | | x | x | | | | x | | | x | | x | | x | |
| | Operation | | x | | x | | | | x | | | x | | | x | | x | x | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health and hygienic aspects | Construction works/ | | x | x | | x | | x | | x | | x | | | | x | | x | | |
| | Operation | x | | | x | | | | x | x | | | | | x | | | x | | |
| Cultural heritage | Construction works/ | | x | x | | | x | x | | | | x | | | | | x | | x | |
| | Operation | x | | | | | | | | | | | | | | | | | | |
| Waste | Construction works/ | | x | x | | x | | x | | | x | x | | | x | x | x | x | | |
| | Operation | | x | x | | x | | | x | | x | x | | | x | x | | x | | |

*Following the implementation of the noise-protection measures

## 5. Limits of study with respect to the EIA

The territorial scope of the study includes a corridor from 620 meters, following the trail of the proposed design alternatives of the project, the possibility when finalizing the route (on selected within the EIA procedure alternative for implementation) to obtain partial shift originally intended mark..

According to the type of the site, its borders and scale, and the requirements of the Ministry, in letter of ref. No. EIA - 85/13 May 2015, the limits of impact shall include:

The territory, comprised in the scope of project alternatives, proposed by the Contracting Authority;

Populated areas in close proximity to project alternatives, crossed by the road, and the presence of other objects, subject to health protection;

The territories, reach by noise and abnormal emissions from transportation;

Water sites and sanitary-protection areas;

Short characteristic of the geological settings

Protected territories. Plant and animal life;

Other sites, on which construction and operation of the proposed investment proposal may affect or lead up to cumulative effect (an existing railway line and its modernization, Lot 3.1 and Lot 3.3. of the Struma Motorway, the presence of natural deposits, etc.);

Other territories, depending on the received observations under the updated Terms of Reference on the scope and content of EIA.

## 6. Structure of the environmental impact assessment report, incorporating a description of the expected contents of the comprised items/paragraphs

Structure of the Environmental Impact Assessment Report (EIAR), according to Art. 96, Para. 1 of the Environmental Protection Act, as follows:

**I. General information**

1. Project Name
2. Employer of the Project
3. Requirement for and objective of the investment proposal
4. Flora & Fauna
5. Location of the investment proposal - physical characteristics, range, distance of protected sites and other elements of the NEN
6. Stages of project execution
7. Connection to other existing activities, approved by a territory plan or other planning
8. Natural or legal entities, influenced by the investment proposal
9. Necessary permits, related to the investment proposal

**II. Annotation of the investment proposal for construction purposes, activities and technologies**

1. Specification of the project proposal
2. Used resources and materials, natural resources and energy resources

**III. Explored alternatives for location and / or alternatives for technologies and grounds for the choice of the study, given the impact on the environment, including the "zero" alternative**

1. Development of the investment proposal
2. Alternatives /variants/ for the location of the investment proposal
3. Technological alternatives
4. „Zero" alternative

**IV. Description and analysis of components and environmental factors and of material and cultural heritage that shall be affected to a great extent by the investment proposal and the interaction between them**

1. Atmospheric air and climatic factors

1.1. A brief description and analysis of climatic and meteorological factors relevant to the specific impact and air quality

1.2. Present data of the contamination of atmospheric air in the region of the site. Lands and Soils

2. Surface and ground waters

2.1. A brief description of hydrological and hydro geological conditions and factors of water resources on the territory of the project proposal

2.2. Sources of domestic and potable water supply, as well as process water supply for the requirements of the investment proposal. Necessary quantities.

3. The bowels of the earth (Geology)

3.1. Presence of sanitary-protection zones.

4. Land and soils

4.1. Specification of the condition of soils. Land discontinuity. Impact assessment Degradation processes

5. Plant and animal life;

5.1. General description of the vegetation species within the scope of the investment proposal

5.2. General features of the animal species within the scope of the investment proposal

5.3. Protected zones

6. Waste

7. Hazardous substances

8. Energy sources, involving risk

8.1. Noise specification of the area, where the investment proposal shall be implemented

9. Landscape

9.1. Measure to limit the erosion within the scope of the investment objects.

10. Cultural heritage - the presence of monuments and architecture within the investment proposal

**V. Description, analysis and assessment of the likely significant effects on the population and environment as a result of the realization of the investment proposal, the use of natural resources, emissions of harmful substances during normal operation and in emergency situations, generation of waste and creating discomfort**

1. Atmospheric air and climatic factors

1.1. Sources of air pollution, related to the implementation of the investment proposal - during construction and during operation.

1.2. Assessing the impact on atmospheric air and climatic factors, according to the current norms and standards, effective in the country.

2. Surface and ground waters

2.1. Sources of water supply. CO3 presence.

2.2. Type and quantities of the expected waste generated during construction and operation of the investment proposal.

2.3. Impact estimation.

3. The bowels of the earth (Geology)

3.1. Evaluation of the possible changes in the geological environment, resulting from the implementation of the investment proposal

4. Land and soils

4.1. Transport scheme of waste transportation. Change of projected use and land use, related to the implementation of the investment proposal
4.2. Hazardous substances Activities for limiting erosion in the range of investment sites. Assessment of provided re-cultivating activities.
5. Plant and animal life;
5.1. Anticipated noise emission loads on environmental media during construction and operation of the investment proposal.
5.2. Description and analysis of the impacts of the investment proposal upon animal life.
5.3 Protected zones
6. Waste
6.1. Expected type and quantity of waste, generated during the construction and operation of the investment proposal. Classification of waste
6.2. Collection, transportation, using and storage of waste
6.3. Transportation diagram for the transportation of waste. Required sites for the storage of waste
7. Hazardous substances
7.1. Types of hazardous waste in the construction works of the investment proposal. Assessment of the health-hygienic aspects of the environment and the risk for human health
8. Energy sources, involving risk
8.1. Projected noise pollution of the environment during the construction and operation of the investment proposal.
8.2 Estimate of the expected noise impact
8.3. Vibration
8.4. Radiation
9. Landscape
9.1. Estimation of the expected landscape changes
10. Cultural and historical heritage
11. Estimation of the health and hygiene aspects of environment and the risk to human health
11.1. Where possible, reference shall be made to the properties of the Long Dual Tunnel regardless to whether it is discarded at the preliminary environmental analysis (referenced at I.), or not.
11.2. Identifying risk factors of the environment and operating environment, taking into account the type and conditions of their harmful effects
11.3. Estimation of the health risk in the time of construction and operation of the investment proposal and measures of health protection
12. Cumulative effect

**VI. Information, regarding used methodology for prognosis and assessment of the impacts upon the environment. Project materials, statutory documents, other sources**

**VII. Description of measures, provided to prevent, reduce and where possible - offset any significant adverse environmental impacts. Plan implementation of measures**

**VIII. The views and opinions of the public stakeholders, the competent authorities to decide on the EIA and other specialized agencies, resulting from the consultations**

**IX. Description of difficulties**

**X. Comparative Table for selection of alternatives for implementation**

**XI. Conclusions in accordance with Art. 83, Para.5 of the EIA;**

**XII. Non-Technical Summary**

**7. Consultations held with interested agencies and organizations and the affected community from the realization of the investment proposal**

For the investment proposal in MOEW has been submitted documentation pursuant to Art. 4 para. 1 of the Ordinance on the terms and conditions for EIA. The affected municipalities and mayoralties have notified under Art. 4 para. 2.

Pursuant to the requirements of Art. 95, para. 1 of the EPA, the Contracting Authority has determined the natural and legal persons which has consulted to determine the scope and content of the EIA report (Application № 9):

Copies of the comments received from the consultations on assignment for the scope and content of the EIA (about consultations) are presented in Application № 9 as their way of coverage in the amended Assignment described in Application No.10 - Information for consultation with interested bodies and organizations and the public concerned by the implementation of the investment proposal.

**8. List of necessary appendices, lists and others**

The Environmental Impact Assessment Report (EIAR) will also comprise enclosed: maps, situations, layout plans, photo materials, written observations of the consultations carried out, certificates of competence of the experts and of the leader of the group, written statements of the experts under Art. 11, Para. 3 of the Ordinance on the conditions and procedures for conducting EIA and others.

Additionally, in compliance with Art.12, para 1 and para 2 of the Regulation on the conditions and order for the performance of EIA the following shall be appended as well:

List of the information sources used by the authors in the EIA Report

Reference to the consultations, carried out and the grounds for accepted and unaccepted comments and recommendations (according to Art. 9, para. 5 of the Ordinance on the conditions and procedures for conducting EIA);

non-technical summary, in the preparation of which the definition under p. 27 § 1 of the Supplementary Provisions of the EPA shall be taken into consideration.

As a separate Appendix to the Environmental Impact Assessment (EIA), a report shall be prepared to assess the degree of impact of the investment proposal on protected areas:

According to the instructions of the MOEW in letter of Ref. No. EIA-85/13 May 2015, the assessment shall comply with the requirements of Art. 23, Para. 2 of the Ordinance on the Environment and also the requirements of MOEW shall be complied with, according to the available information and the project documentation on the site.

**9. Stages, phases and time periods/deadlines for the drafting of the Environmental** Impact Assessment Report (EIAR)

9.1. Preparing Information for the consultations / Terms of Reference on the scope and content of EIA, according to the requirements of Art. 10, Para 1 and in view of Art. 9, Para. 1 and Para. 4 of the Ordinance on the terms and conditions for the EIA.

9.2. Execution of consultations with the specialized organizations and representatives of the affected public, including NGO on the initially proposed updated Assignment for the scope and content of the EIA and addressing of the statements in the Assessment.

9.3. The elaboration of updated Terms of Reference on the scope and content of the EIA, including information, received during the consultations under Art. 9.

9.4. The updated Terms of Reference shall be discussed by the Contracting Authority in consultations with the competent Environmental Authority (MOEW) and the Ministry of Health pursuant to Art. 10, Para. 5 and Para. 7 of the Ordinance on the conditions and procedures for conducting EPA, following which, the Terms of Reference shall be finalized with respect to the scope and content of EPA.

9.5 Preparation of EIA Report and all necessary appendices, including the AIA Report within a term, specified by the Employer.
9.6. Presentation of the Environmental Impact Assessment Report (EIAR) with all appendices thereto to the Contracting Authority for initial review and then to the competent environmental authority for Quality Assessment.
9.7. Submitting the Environmental Impact Assessment Report (EIAR) with all appendices thereto to the designated competent authority, concerned municipalities, town halls/Mayor's offices, organizing meetings for public discussion, public debates of the Environmental Impact Assessment Report (EIAR).
9.8. Submission of the EIA Report and all appendices to the affected municipalities and mayoralties specified by the competent authority, organizing of public hearings, execution of public hearings of the EIA Report.
9.9. A meeting of the Supreme Expert Environmental Council of the Ministry for review of the documentation on EIA.
9.10. Pronouncement of an EIA decision by the Minister of Environment and Water.

**10. Other conditions or requirements**

Subject to the EIA procedure shall be the proposed by the Contracting Authority project alternatives for the road track of Lot 3.2 of the "Struma" Motor Highway, detailed in Item 1.A of the updated Terms of Reference, and also the ancillary facilities and activities, related to the construction works and operations.
The drafting of the documentation on EIA and the subsequent stages of the procedure must be adequately consistent with the specifics of the design and the construction of linear objects, as well as the available data, as of the relevant point in time, for the design of (degree of detail required of the projects) of individual options Lot 3.2 Struma Motorway" and provided by the Contracting Authority information including data consulted by the Contracting Authority.

List of Appendices

Appendix No. 1 Letter of the MOEW, Ref.. No. EIA-85/13 May 2015.

Appendix No. 2 Situation of the projected road route, alternative G20-blue, upon topographic map in scale m 1:25000.

Appendix No. 3 Situation of the projected road route, alternative G20-red, upon topographic map in scale m 1:25000.

Appendix No. 4 Situation of the project route, alternative G 10.50 (East alternative), upon topographic map in scale m 1:25000 (three parts).

Appendix No. 5 Situation of the project route, long tunnel alternative, on ortho-photographic map in scale M 1:5000 (three parts).

Appendix No. 6 Situation of the project route east alternative G 20 on the topographic map in scale 1: 25000 (three parts).

Appendix No. 7 Situation of blue and red alternative in sections along the reserve "Tisata" and protected area "Kresna Gorge"

Appendix No. 8 Legislative framework, sources of information and methodology of prognosis and assessment.

Appendix No. 9 Opinions on consultations with interested agencies and organizations and the affected community from the realization of the investment proposal

Appendix No. 10 Information for consultations with interested agencies and organizations and the affected community from implementation of the investment proposal.