

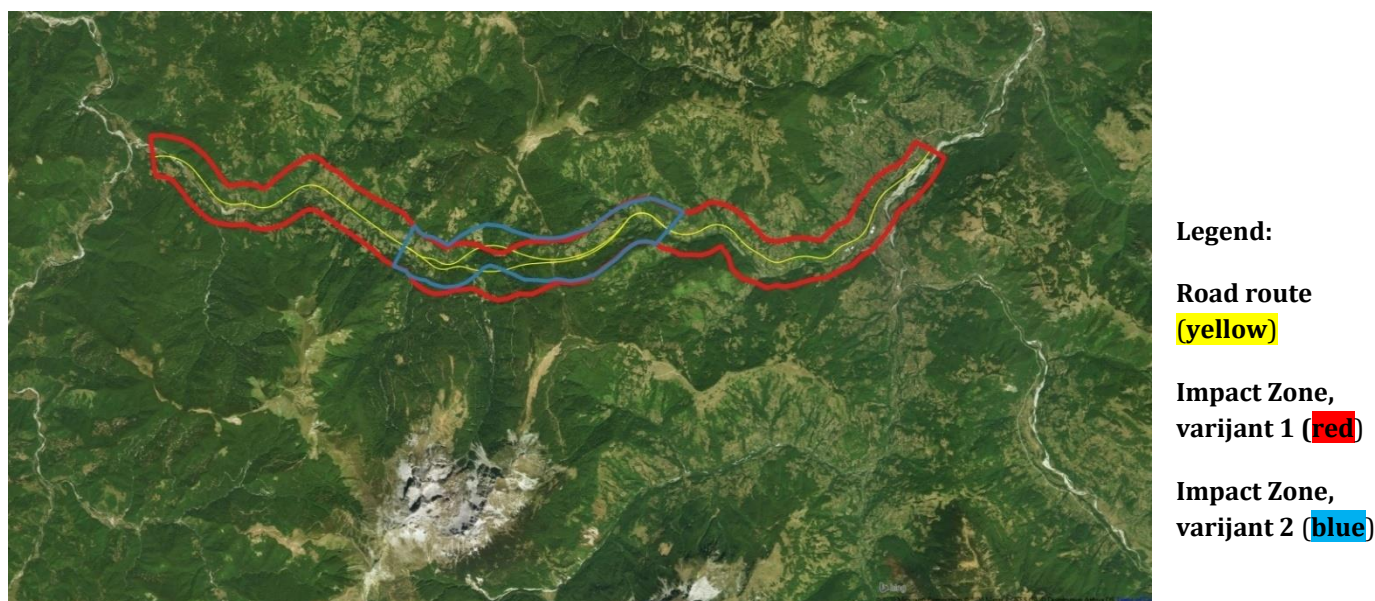
# Environmental impact assessment study for the construction of the Mateševsko-Andrijevica highway section

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## 1. INTRODUCTION

Field research of flora and habitats on the section of the Mateševsko-Andrijevica highway was performed in two seasons: autumn aspect September/October 2019 (8 days) and spring aspect May/June 2020 (5 days).

The field research included a complete research of flora and vegetation (habitats) on the section of the Mateševsko-Andrijevica highway (500 m to the left and right of the planned Project).



**Figure 1. Research area with impact zones**

Special attention is paid to the sites located near the border of the Regional Nature Park 'Komovi', which is also IPA (Important Plant Area) site: the valley of the river Drcka (in the area of Batala) and the area of Ljubaštica (before Trešnjevnik), and sites in the valley of Lim River Valley that represent the EMERALD and IPA areas (and potentially the NATURA 2000 area).

## 1.1 Research limitations

Lack of literature data.

## 1.2 Metodology

Flora and habitats have been recognized as a result of many years of experience with habitat mapping, as well as in accordance with the Catalog of Habitat Types of Montenegro of Importance for the EU (Milanović & al., 2020). Habitats were also described by the standard quadratic method along a linear transect (Topić & al, 2006) along the highway route with 87 (89) phytocenological relvés. After collection in the field, the plants were prepared and determined according to Flora Europaea 2-5 (Tutin & al., 1964–1980), Flora Europaea 1 (Tutin & al., 1993) and Conspectus florae Montenegrinae (Rohlena, 1942).

## 1.3 Processing of research results:

Data processing results in a Report containing:

- **floristic analysis** of the area along the route with GPS coordinates, determination of conservation status - protected and endangered plant species (Latin and English name, ie Latin and Montenegrin species name) and their national and international protection status (IUCN, Habitat Directive - Annex II, IV, Berne Convention, European Red List).
- **endemic taxa** along the route with GPS coordinates.
- **habitat description** (according to NATURA 2000, and EUNIS codes, Pal. Class.)  
With special reference to:
  - ✓ **part of the route** that includes (textual description of the location, estimated area and GPS coordinates),
  - ✓ **representativeness of habitats** - (A, B, C, and also whether the habitat is common and widespread in Montenegro or has a limited range),
  - ✓ **habitat coverage** - (in km<sup>2</sup>),
  - ✓ **habitat vulnerability** and the impact of the Project - (eg very sensitive, moderately sensitive, etc. and whether the project is directly or indirectly affected and what kind of impact),
  - ✓ **habitat sensitivity** to fragmentation - (eg already fragmented, extremely sensitive, weak sensitivity, so that the habitat will be re-established after construction works, etc.),
  - ✓ **importance** of the project area for the habitat;
- **tabular presentation** of floristic-vegetation component (habitat type) on transects along the route with the following data (locality, point number, date, GPS coordinates, habitat type - according to NATURA 2000, with codes: EUNIS, Palearctic Habitat Classification, EMERALD, floristic composition with abundance-cover of species from **1-5** (+ - up to 0,1%; **1** - 1-10%; **2** - 10-25%; **3** - 25-50%; **4** - 50-75%; **5** - 75-100%);

- **Project impacts** on habitats during road construction, road use, residual and cumulative impacts;
- **general measures and measures of minimization, avoidance and replantation** on sites whose habitats are under the direct or indirect impact of the Project;
- **mapping** of nationally and internationally significant habitat types in Q-GIS along the route - (according to NATURA 2000), within the zone 500 m to the left and right of the motorway corridor.

## 2. RESULTS

### 2.1 Status of protection of taxa (species and subspecies) at the national and / or international level ascertained on the route

In the investigated area (on the route Matešev - Andrijevica), 12 plant taxa (species and subspecies) protected at the national and/or international level were found. All identified protected species belong to the orchid family (*Orchidaceae*) and have national protection - protected Decisions on protection of certain plant and animal species ('Official Gazette of the Republic of Montenegro' 76/06) and international protection - are listed in Annex II of the CITES Convention.

Table 1. List of nationally and / or internationally protected taxa (species and subspecies)

| Family      | Species                                                                | National protection | IUCN Red List Category (Europe) | Endemic to Balkan | Habitats Directive Annexes | Bern Convention Annex I | CITES Annexes |
|-------------|------------------------------------------------------------------------|---------------------|---------------------------------|-------------------|----------------------------|-------------------------|---------------|
| Orchidaceae | <i>Anacamptis coriophora</i><br>Bug orchid                             | +                   | LC <sup>1</sup>                 | -                 | -                          | -                       | II            |
| Orchidaceae | <i>Anacamptis morio</i> subsp. <i>caucasica</i><br>Green-winged orchid | +                   | -                               | -                 | -                          | -                       | II            |
| Orchidaceae | <i>Anacamptis morio</i> subsp. <i>morio</i><br>Green-winged orchid     | +                   | NT <sup>2</sup>                 | -                 | -                          | -                       | II            |
| Orchidaceae | <i>Cephalanthera longifolia</i><br>Narrow-leaved helleborine           | +                   | LC <sup>1</sup>                 |                   | -                          | -                       | II            |

|              |                                                                                                               |   |                                              |     |   |   |    |
|--------------|---------------------------------------------------------------------------------------------------------------|---|----------------------------------------------|-----|---|---|----|
| Orchidaceae  | <b><i>Cephalanthera rubra</i></b><br>Red helleborine                                                          | + | LC <sup>1</sup>                              | -   | - | - | II |
| Orchidaceae  | <b><i>Dactylorhiza cordigera</i></b><br>ssp. <b><i>bosniaca</i></b><br>Bosnian Heart-flowered<br>Marsh-orchid | + | LC <sup>1</sup> for ssp.<br><i>cordigera</i> | Yes | - | - | II |
| Orchidaceae  | <b><i>Gymnadenia conopsea</i></b><br>Fragrant orchid                                                          | + | LC <sup>1</sup>                              | -   | - | - | II |
| Orchidaceae  | <b><i>Neottia ovata</i></b><br>Common Twayblade                                                               | + | LC <sup>1</sup>                              | -   | - | - | II |
| Orchidaceae  | <b><i>Neotinea tridentata</i></b><br>Three-toothed orchid                                                     | + | LC <sup>1</sup>                              | -   | - | - | II |
| Orchidaceae  | <b><i>Neotinea ustulata</i></b><br>Burnt orchid                                                               | + | LC <sup>1</sup>                              | -   | - | - | II |
| Orchidaceae  | <b><i>Traunsteinera globosa</i></b><br>Round headed orchid                                                    | + | LC <sup>1</sup>                              | -   | - | - | II |
| Tamaricaceae | <b><i>Myricaria germanica</i></b><br>German Tamarisk                                                          | + | -                                            | -   | - | - |    |

<sup>1</sup> LC - Least concern - it is unlikely to disappear in the near future

<sup>2</sup>NT - there is a danger of extinction in the near future

No taxa from Annexes II and IV of the Habitat Directive have been identified. *Anacamptis morio* subsp. *morio* is widespread in Montenegro.

## 2.2 Distribution of taxa (species and subspecies) protected at national and/or international level along the route of the road

***Anacamptis coriophora*** (L.) R. M. Bateman, Pridgeon & M. W. Chase

Distribution on the route of the road: 4245113N 1936110E (Vranještica); 4244008N 1945050E (Kralje).

***Anacamptis morio*** subsp. ***caucasica*** (K. Koch) H. Kretzschmar, Eccarius & H. Dietr.

Distribution on the route of the road: 4244043N 1939282E (Ljubaštica) - NEW FINDING FOR MONTENEGRO!

***Anacamptis morio*** (L.) R. M. Bateman, Pridgeon & M. W. Chase subsp. ***morio***

Distribution on the route of the road: 4244832N 1934639E (Mateševo); 4244563N 1934289E (Mateševo-Nesirenski potok stream); 4244914N 1934741E (Mateševo); 4245113N 1936110E (Vranještica); 4244144N 1938251E (Crnja).

***Cephalanthera rubra*** (L.) Rich.

Distribution on the route of the road: 4244218N 1946403E (Andrijevisa).

***Cephalanthera longifolia***(L.) R. M. Fritsch

Distribution on the route of the road: 4244835N 1934701E (RP "Komovi", Nesiren)

***Dactylorhiza cordigera*** subsp. ***bosniaca*** (Beck) Soó

Distribution on the route of the road: 4243446N 1939776E (Ljubaštica).

***Gymnadenia conopsea*** (L.) R. Br.

Distribution on the route of the road: 4245113N 1936110E (Vranještica); 4244340N 1944341E (Kralje).

***Neottia ovata*** (L.) Bluff & Fingerh.

Distribution on the route of the road: 4244832N 1934639E (Mateševo); 4244535N 1934321E (Mateševo-Nesirenski potok); 4243446N 1939776E (Ljubaštica); 4245113N 1936110E (Vranještica); 4245457N 1933648E (Mateševo - Adžića do).

***Neotinea tridentata*** (Scop.) R. M. Bateman, Pridgeon & M. W. Chase

Distribution on the route of the road: 4245113N 1936110E (Vranještica).

***Neotinea ustulata*** (L.) R. M. Bateman, Pridgeon & M. W. Chase

Distribution on the route of the road: 4244914N 1934741E (Mateševo); 4244542N 1935499E (above Đekić's houses).

***Traunsteinera globosa*** (L.) Rchb.

Distribution on the route of the road: 4245113N 1936110E (Vranještica).

***Myricaria germanica*** (L.) Desv. (Syn.: *Myricaria ernesti mayeri* Lakušić)

Distribution on the route of the road: 4244949N 1947456E (Andrijevisa- along the Lim River), 4243947N 1945133E (one specimen in the village of Kralje near Kraštica)

## 2.3 Endemic taxa (species and subspecies) found on road routes puta

In the territory of Montenegro, 372 endemic taxa of the Balkans (levels of species and subspecies) were found, of which 39 taxa were distributed only in Montenegro (Vuksanović et al. 2016). In the investigated area (on the route Mateševo - Andrijevića), 5 endemic plant taxa (species and subspecies) of the Balkan Peninsula were found.

Table 2. List of endemic taxa (species and subspecies)

| Familija        | Species/Subspecies                                                                          | National protection | IUCN Red List Category (Europe) | Endemic to Balkan | HD Annexes II, IV | CITES Annexes |
|-----------------|---------------------------------------------------------------------------------------------|---------------------|---------------------------------|-------------------|-------------------|---------------|
| Asteraceae      | <i>Cirsium appendiculatum</i><br>Thistle                                                    | -                   | -                               | Yes               | -                 |               |
| Orchidaceae     | <i>Dactylorhiza cordigera</i> subsp. <i>bosniaca</i><br>Bosnian Heart-flowered Marsh-orchid | +                   | LC for <i>cordigera</i>         | Yes               | -                 | II            |
| Asteraceae      | <i>Lactuca pancicii</i><br>Pancic's sow-thistle                                             | -                   | -                               | Yes               | -                 |               |
| Liliaceae       | <i>Lilium bosniacum</i><br>Bosnian Turk's-cap lily                                          | -                   | -                               | Yes               | -                 |               |
| Caryophyllaceae | <i>Silene sendtneri</i><br>Sedtner's bladder                                                | -                   | -                               | Yes               | -                 |               |

## 2.4 Distribution of endemic taxa (species and subspecies) found on the route of the road

### ***Cirsium appendiculatum*** Griseb.

Distribution on the route of the road: 4244702N 1937417E (Bare Kraljske)

Global range: Al Bu Cg Gr Mk Sr

### ***Dactylorhiza cordigera*** subsp. ***bosniaca*** (Beck) Soó

Distribution on the route of the road: 4243446N 1939776E (Ljubaštica)

Global range: Al Bu CG Ju

### ***Lactuca pancicii*** (Vis.) N. Kilian & Greuter

Distribution on the route of the road: 4244702N 1937417E (Bare Kraljske)

Global range: Al BH Bu Cg Gr Mk Sr

### ***Lilium bosniacum*** (Beck) R. M. Fritsch

Distribution on the route of the road: 4243533N 1939390E (Ljubaštica)

Global range: Ju BH Cg

### ***Silene sendtneri*** Boiss.

Distribution on the route of the road: 4244834N 1940372E (Trešnjevik); 4244411N 1941544E (Trešnjevik); 4245387N 1933704E (Mateševo-Adžića do); 4244891N 1934609E (Mateševo-Bare Kraljske); 4244937N 1934484E (Mateševo-Bare Kraljske); 4244832N 1934639E (Mateševo); 4244375N 1934302E (Mateševo-Nesirenski potok); 4244563N 1934289E (Mateševo-Nesirenski potok); 4244043N 1939282E (Ljubaštica); 4243473N 1939446E (Ljubaštica); 4245113N 1936110E (Vranještica); 4243520N 1939379E (Ljubaštica); 4244144N 1938251E (Crnja);

Global range: Al Bu CG Ct Gr Mk

**Interpreter of distribution abbreviations:** (Al-Abania; BH- Bosnia and Herzegovina; Bu-Bulgaria; Cg-Montenegro; Ct-Croatia; Gr-Greece; Ju-former Yugoslavia; Mk-Macedonia; Sr-Serbia)

## 2.5 Distribution of the Invasive alien plant species on the route of the road Mateševo – Andrijeva

Along the highway route Mateševo - Andrijeva, the presence of three invasive plant species was ascertained: *Robinia pseudaccacia*, *Reynoutria japonica* and *Erigeron canadensis*, while the species *Helianthus tuberosus* can be managed as a naturalized species and has no invasive character. The species *R. pseudaccacia* and *R. japonica* were found in a number of localities, while the species *E. canadensis* and *H. tuberosus* were found only along the Lim River in one locality. Here is an overview of the distribution of these species with the coordinates at which they occur and the area they occupy.



***Robinia pseudaccacia* L. (Black locust tree)**

4244914N 193137E, n.v./alt. 1040 m

Between Mateševu and Bare Kraljske, on both sides of the road at the edge of a beech forest, surface: cca 25 m<sup>2</sup>.

4244629N 1942331E, n.v./alt. 1054 m

Between Mateševu and Bare Kraljske, on the surface of cca 20 m<sup>2</sup>.

4244971N 1942330E, n.v./alt. 1107 m

Between Mateševu and Bare Kraljske, on both sides of the road at the edge of a beech and spruce forest, surface: cca 20 m<sup>2</sup>.

4244215N 1945040E, n.v./alt. 1107 m

Kralje - on both sides of the road at the edge of a beech and spruce forest, surface: cca 3 m<sup>2</sup>.

4244286N 1946769E, n.v./alt. 770 m

Andrijevića, along the river Kraštica, in the community with the dominance of *Salix eleagnos*, *S. purpurea*, *S. viminalis*, *S. amplexicaulis* and *Rubus ulmifolius*, surface: cca 25 m<sup>2</sup>.

4245138N 1947437E, n.v./alt. 776 m

Andrijevića, in the forest zone with *Quercus cerris* and species *Juglans regia*, *Pyrus communis*, *Prunus cerasifera*, surface: cca 150 m<sup>2</sup>.

4245181E 1947487E, n.v./alt. 770 m

Andrijevića - lokalitet Sitna Luka, iznad rijeke Lim, u zoni šumaraka sa *Quercus cerris* na Andrijevića - Sitna Luka locality, above the river Lim, in the forest zone with *Quercus cerris*, wet habitats with codominant presence of the following plant species appear at the above coordinates: *Robinia pseudaccacia*, *Alnus incana*, *Populus nigra*, *Salix alba*, *S. amplexicaulis*, *S. viminalis*, *Malus domestica*, *Prunus cerasifera*, *Ligustrum vulgare*, *Fraxinus excelsior*, *Corylus avellana* etc.

***Reynoutria japonica* Houtt. (Japanese knotweed)**

4244790N 1947417E, n.v./alt. 750 m

Andrijevića - locality: Lim river, on the surface of cca 2 m<sup>2</sup>.

4244836N 1935466E, n.v./alt. 1054 m

Between Mateševu and Bare Kraljske, on the surface of cca 3 m<sup>2</sup>.

4244210E 1939429E, n.v./alt. 1220 m

Between Mateševu and Bare Kraljske, on the surface of cca 6 m<sup>2</sup>.

4244999N 19 42 008E, n.v./alt. 1135 m

Below Trešnjevik - towards Andrijevića, on both sides of the road at the edge of a beech forest, surface: cca 25 m<sup>2</sup>.



4244970N1942285E, n.v./alt. 1109 m

Below Trešnjevik - towards Andrijevisa, on both sides of the road at the edge of a beech and spruce forest, surface: cca 6 m<sup>2</sup>.

4244227N1945 059E, n.v./alt. 870 m

Kralje, on both sides of the road at the edge of a beech and spruce forest, surface: cca 15 m<sup>2</sup>.

4245615N 1947981E, n.v./alt. 770 m

Andrijevisa, on the surface of cca 10 m<sup>2</sup>.

4244297N 1946444E, n.v./alt. 770 m

Andrijevisa, on the surface of cca 10 m<sup>2</sup>.

4244074N 1945461E, n.v./alt. 770 m

Andrijevisa, on the surface of cca 15 m<sup>2</sup>.

4244084N 1945149E, n.v./alt. 770 m

Andrijevisa, on abandoned orchards, on the surface of cca 50 m<sup>2</sup>.

***Erigeron canadensis* L.** (Canadian horseweed)

4244790N 1947417E, n.v./alt. 750 m

Andrijevisa - locality: Lim river, on the surface of cca 20 m<sup>2</sup>.

***Helianthus tuberosus* L.** (Sunchoke)

4244790N 1947417E, n.v./alt. 750 m

Andrijevisa - locality: Lim river, on the surface of cca 2 m<sup>2</sup>.

### 3. STUDY IMPACT ASSESSMENT AND MITIGATION MEASURES ON HABITATS AND PLANT SPECIES

#### 3.1 Study impact assessment - habitats and plant species

A number of potential sources of impact on habitats and plant species associated with the construction and operation of the proposed project were identified during the projects scoping study. These are listed below and discussed in more detail in the impact assessment section..

*Table 3. Initial Assessment of Potential Sources of Impact on habitats and plant species*

| Source of Impact | Receptors (core) | Potential Impacts and Key Sensitivities |
|------------------|------------------|-----------------------------------------|
|------------------|------------------|-----------------------------------------|

|                                                                                   |                                                                                                     |                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Direct Habitat Loss from Vegetation Clearance (Road corridor & working compounds) | Terrestrial and riparian habitats and plant species; birds; mammals; reptiles; Invertebrates.       | Loss of different habitat types, and habitat fragmentation along the route. The clearance of vegetation will remove habitat but more significantly increase fragmentation of existing corridors, this could lead to disturbance of potential loss of notable plant species.                                              |
| Water crossing construction                                                       | Riparian habitats and plant species; and associated bird; mammals; amphibians; fish; invertebrates; | Direct and indirect impact on the loss and fragmentation of riparian habitat types. Aquatic species are less likely to be affected by general terrestrial construction disturbance but may be affected by pollution and sedimentation during river crossings. Other species impacts will be as for terrestrial habitats. |
| Disposal of excess material on river banks                                        | Riparian habitats and plant species.                                                                | Direct endangerment of riparian habitats and plant species, nationally and internationally important.                                                                                                                                                                                                                    |
| Unplanned events, such as landslides, fires                                       | habitats and all species                                                                            | Potential effects on all receptors. Loss of habitat, disturbance effects.                                                                                                                                                                                                                                                |
| Cumulative effects                                                                | habitats and all species                                                                            | There is a potential for other developments to have an effect when assessed in combination with the Project. Increased disturbance or the need for wider infrastructure improvements to facilitate accesses etc. In addition, existing threats to notable habitats and species may be exacerbated.                       |

### 3.2 Existing habitats

In general, the projected route of the Mateševica-Andrijevica highway (variants 1 and 2) in the western part passes through the area belonging to the Tara river basin, continues through the Trešnjevik pass (variants 1 and 2), in the eastern part passes through the area belonging to the Lim river basin (variants 1 and 2) and ends in Andrijevica (along the river Lim in the direction of Berane). In the western part (Mateševica-Trešnjevik) the route of the road (variant 1) passes through the riparian habitats of the rivers Drcka, Vranještica, Ljubaštica and numerous streams, acidophilic forests and woodlands, hilly and mountain meadows. Most of the habitats are mosaically distributed. The area is exposed to anthropogenic influence, which is reflected in the felling of the forest, the regulation of the river flow (Drcka-Đekići), the flow of meadows and pastures. Representative forest stands

in Crnja and Ljubaštica (local population and concessionaires) were not spared from felling.

On Mateševo, the route is about 107 m away from the protected area of Regional Park 'Komovi'. The boundaries of the protected area include meadows, forests, woods, Nesirenski potok stream, Grba stream, Pecka river and Drcka river, mostly of **good ecological quality**. Riparian forests along the rivers Drcka, Crnja and Ljubaštica are of **high ecological value**, with an anthropogenic impact on Mateševo (Drcka), the mouth of the river Crnja and the mouth of Ljubaštica. Forests, hilly and mountain meadows stretch along the hamlets (Mateševo, Lazi Đekića, Vranještica, Bare Kraljske, Crnja). Hilly and mountain meadows are mowed and used for grazing, which contributes to the richness of flora, while forests are degraded by felling with frequent occurrence of shrubs overgrown with Common bracken (*Pteridium aquilinum*). The area is considered to be at a **moderate level of environmental sensitivity**. The exceptions are acidophilic beech forests on the Mateševske strane area, which are well preserved and have **good ecological values**.

In the area of Crnja, where variant 2 of the highway begins, forests have been degraded by felling, as well as in Han Drndarski. Above Han Drndarski, in the direction of the village of Krgovići, there are beech forests of better quality and **moderate ecological sensitivity**. Next to the houses are agricultural lands that have been modified by agricultural activities, whose ecological value is generally considered limited. Between the rivers Crnja and Ljubaštica, there is a mixed beech-spruce forest, which has been degraded by felling at the edges. In the direction of Ravni brijeg, which also belongs to the protected area of RP (Regional Park) Komovi forest, **high ecological values** have been preserved. At the same time, this is the part of the route in which RP Komovi enters the zone of influence and is about 300 m away from the route (variants 1 and 2). The impact zone of variant 1 also includes a representative alkaline fen, which is about 500 m away. Routes 1 and 2 continue through a tunnel through the hill Turlog (variant 1) and across Crni potok and Dragovo katunište (variant 2) through Trešnjevik. The route of the road (variants 1 and 2) exits from Trešnjevik to the area of Novovića potok. The riparian forests along the Novovića potok stream are of moderate ecological quality with a noticeable felling of the surrounding beech-spruce forests. Routes (variants 1 and 2) continue on the bridge over the mouth of Novovića potok stream into Rajovića river, which descends from the northwest side of the route, north of the village of Lanište. The road then passes through groves, which are degraded remains of turkey oak and beech forests, often with clearings overgrown with Common bracken (*Pteridium aquilinum*). Around the villages of Gnjili potok and Miravčina there are mountain meadows of good ecological quality, moderate ecological sensitivity. Along the Dubokalj stream, which flows into the Rajovića river, representative riverine forests have been developed.

The road then descends to the village of Kralje, where, in addition to mountain meadows, well-maintained orchards are developed. In the village of Kralje, along the river Kraštica, riparian vegetation has developed that is not representative (anthropogenic influence). The route of the road then rises and continues through the forests of **high ecological value**, within the boundaries of the EMERALD area. South of the route flows the river Kraštica, which also enters the EMERALD area and on which high-quality riparian forests have been developed. Along Kraštica river and the hamlets there are hilly meadows that are mowed and which are of **good ecological value**. Beech forests with fragments of oak-hornbeam forests (EMERALD area) have been developed in the vicinity of the village of

Peovac. The route then passes the Bandovića most bridge and descends over the existing regional road Berane-Andrijevića to the left bank of the river Lim in Andrijevića (EMERALD area). In the direction of the hamlet of Lugovi, representative riparian forests of *Alnetum* have been developed, and on the shores of Lim river, communities of gray willow and German tamarisk and herbaceous vegetation. The German tamarisk (*Myricaria germanica*) habitat on the river bank is a rare type of habitat in Montenegro, and in one location a representative communities of the habitat is only 60 m away from the route of the road. These riparian habitats have a **high ecological sensitivity**. In the vicinity of the scattered houses, there are mowed mountain meadows, orchards and fields. North of the route, above the regional road Berane-Andrijevića, there are turkey-oak forests, mountain meadows and orchards of the hamlets of Prisoja, Slatina and Guvna. Southeast of the route on the right bank of the Lim river, along the water, there are communities with gray willow, and above the bank there are mountain meadows and turkey oak forests. The route ends in the village of Sitna Luka with orchards, meadows and arable land.

The road crosses 5 main watercourses (Drcka, Vranještica, Ljubaštica, Rajovića rijeka, Lim) which together with the streams form a network of forest habitats. These habitats are further connected to larger forest areas and form important corridors for amphibians, reptiles, small mammals and invertebrates, and also serve as navigational aids for bats. The presence of large trees and shrubs provides conditions for shelters and nests of bats and birds, which is why forest habitats and their networking are estimated to be at a **high level of ecological sensitivity**. On the west side, within and around the EMERALD area, the project passes through areas of greater ecological importance. Turkey oak forests, the Kraštica River and the habitats around Lim, also form areas with significant diversity, and a range of opportunities to use meadows for fauna development, which is why they are considered to be at a **high level of environmental sensitivity**.

Habitat analyzes have identified 14 habitats of the NATURA 2000 network, which are of greater importance, as well as orchards that occur in the villages from Kralja to Sitna Luka. Habitats are described in the Table below and mapped in a Q-Gis with a buffer zone of 500 m on either side of the route.

A detailed description of the habitat is given in the Annex.

*Table 4. Natura 2000 habitat types identified in Project area*

| Habitats                                                                    | Eunis code           | Pal. Class.:                     | NATURA 2000 code, HD Annex |
|-----------------------------------------------------------------------------|----------------------|----------------------------------|----------------------------|
| Alpine rivers and the herbaceous vegetation along their banks               | C3.5, C3.551, C3.552 | 24.221, 24.2211, 24.222, 24.2222 | 3220, Annex I              |
| Alpine rivers and their ligneous vegetation with <i>Myricaria germanica</i> | F9.1, F9.11, F9.13   | 24.223, 44.111                   | 3230, Annex I              |

|                                                                                                                                                    |                                                                  |                                                      |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|---------------|
| Alpine rivers and their ligneous vegetation with <i>Salix eleagnos</i>                                                                             | F9.1, F9.11, F9.14                                               | 24.224                                               | 3240, Annex I |
| Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> ) (* important orchid sites)                 | E1.2, E1.22, E1.26, E1.27, E1.28                                 | 34.31, 34.32, 34.33, 34.34                           | 6210, Annex I |
| Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels                                                            | E5.4, E5.41, E5.43, E5.5, E5.51, E5.52, E5.57, E5.58             | 37.7, 37.71, 37.72, 37.8, 37.81, 37.82, 37.87, 37.88 | 6430, Annex I |
| Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )                                                               | E2.2, E2.22, E2.23                                               | 38.2, 38.22, 38.23                                   | 6510, Annex I |
| Mountain hay meadows                                                                                                                               | E2.3, E2.31                                                      | 38.3, 38.31                                          | 6520, Annex I |
| Alkaline fens                                                                                                                                      | D4.1                                                             | 54.2                                                 | 7230, Annex I |
| Siliceous rocky slopes with chasmophytic vegetation                                                                                                | H3.1                                                             | 62.2                                                 | 8220, Annex I |
| <i>Luzulo-Fagetum</i> beech forests                                                                                                                | G1.6, G1.61                                                      | 41.11, 41.112                                        | 9110, Annex I |
| *Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> ) | G1.1, G1.111, G1.12, G1.121, G1.2, G1.21, G1.211, G1.212, G1.213 | 44.13, 44.2, 44.21, 44.3, 44.31, 44.32, 44.33        | 91E0, Annex I |
| Illyrian oak-hornbeam forests ( <i>Erythronio-Carpinion</i> )                                                                                      | G1, A1A                                                          | 41.2A                                                | 91L0, Annex I |
| Pannonian-Balkan turkey oak - sessile oak forests                                                                                                  | G1.769                                                           | 41.769                                               | 91M0, Annex I |
| Acidophilous Picea forests of the montane to alpine level ( <i>Vaccinio-Piceetea</i> )                                                             | G3.1, G3.1B                                                      | 42.25                                                | 9410, Annex I |

### 3.3. Impact Assessment

#### 3.3.1 Assessment Criteria

The impact assessment has taken into account both the sensitivity of potential receptors to impacts and the magnitude of the potential impact arising. Sensitivity has been determined based on the following criteria:

- **High Sensitivity:** Habitats and species considered notable at an international or national level. This includes IUCN RDB uncommon species listed as Endangered (EN) or Critically Endangered (CR), habitats or species listed in Annex I, II and/or IV of the EU Habitats Directive and internationally recognised sites such as IUCN protected areas (I, II, III & IV); key biodiversity areas;
- **Medium Sensitivity:** Habitats and species considered notable at a local or regional level. This includes IUCN RDB species listed as Vulnerable (VU) or Near Threatened (NT), more common species and habitats from the annexes of Habitats Directive and areas of designated at a national level for nature conservation.
- **Low Sensitivity:** Habitats and species that are considered as IUCN as if Least Concern (LC) species are not listed in the key EU Directives and that are typically locally common.

The following criteria have therefore been used for the assessment of impacts. Impacts rates as “very high” and “high” are considered to be ‘significant impacts’:

*Table 5. Impact Assessment Criteria*

| Negligible impact                                                                    | Low impact                                                                       | Medium impact                                                                                                              | High impact                                                                                                                                     | Very High impact                                                                                       |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| The activity is not expected to result in observable impact on species or habitats.. | The activity may have limited impacts on species or habitats of low sensitivity. | No observable impacts are expected on species of high sensitivity.<br><br>Limited impacts may occur at an individual level | Limited impacts may occur at an individual level to species or habitats of high sensitivity.<br><br>Impacts may occur to species or habitats of | Impacts may occur to species or habitats of high sensitivity that are significant enough to reduce the |

|  |                                                                 |                                                                                                                   |                                                                                                                                    |                                                                                                           |
|--|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
|  | No observable impacts on species of medium or high sensitivity. | to species or habitats of medium sensitivity.<br><br>Impacts may occur to species or habitats of low sensitivity. | medium sensitivity that are significant enough to reduce the ability to sustain population levels of affected species or habitats. | ability to sustain the habitats, complex of habitats and/or the population levels of species of interest. |
|--|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|

### 3.3.2 General Impacts and Mitigation: Habitats

Impacts to receptors (habitats and species) of **High** or **Medium Sensitivity** are considered further below. Impacts to receptors of **Low Sensitivity** will be managed through the implementation of Good Industry Practice (GIP) mitigation. Where mitigation is proposed it has been applied in line with the mitigation hierarchy and is presented as follows:

- **Good International Practice:** generic mitigation to be adhered to throughout the enabling and construction period. This include as standard site supervision by an Ecological Clerk of Works (EcoW) throughout the scheme's construction period, and is included within the construction EMP – Environmental Management;
- **Bespoke Construction Mitigation:** This has been developed for particularly sensitive habitats and/or species by receptor type and will also be included and cross referenced in the Contractors SEMP along with habitat restoration methods;
- **Operational Mitigation:** This will include significant maintenance and monitoring required to ensure that the construction impacts are adequately mitigated and that the maintenance for the road is carried out appropriately.

The following generic impacts and sources of impact have been identified:

*Table 6. Generic Impacts and Sources*

| Direct Impacts                                                                                                                                                                                                               | Construction Sources                                                                                                                                                                                                                                                                             | Operational Sources                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Habitat loss; degradation and simplification</li> <li>• Habitat Fragmentation</li> <li>• Changes in water conditions (hydrological impacts)</li> <li>• Habitat pollution</li> </ul> | <ul style="list-style-type: none"> <li>• Working corridor vegetation clearance and topsoil removal</li> <li>• Construction activities including disturbance of soils &amp; pollution from construction, including river crossings</li> <li>• Compounds working camps construction and</li> </ul> | <ul style="list-style-type: none"> <li>• Increase in hunting or predation utilising the road for access</li> <li>• Spread of non-native invasive species along the road</li> <li>• Impacts upon habitats and species directly resulting from the road maintenance</li> </ul> |



|                                                                                                                                                            |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Direct mortality</li> <li>• Disturbance to species</li> <li>• Spread of non-native or invasive species</li> </ul> | <ul style="list-style-type: none"> <li>operation, including wastes and indirect pressure of workers presence</li> <li>• Vehicle mobilization, including transport of people and equipment within the works area</li> <li>• Water abstraction</li> <li>• Unplanned Event</li> </ul> | <ul style="list-style-type: none"> <li>• Increased disturbance due to increased accessibility</li> <li>• Visual, noise and air quality issues related to the operation of the road and associated areas</li> <li>• Impacts from habitat severance</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

For each of these potential generic impacts, the following table identifies potential construction sources of impact, proposed generic mitigation to avoid or reduce the impact and the potential for residual significant adverse effects to important ecological receptors. More detailed receptor-specific assessments - in this case habitats and plant species - are provided in the sections that follow.

*Table 7. Generic Habitat Impacts and Mitigation*

| <b>Impact</b>                                | <b>Effect</b>                                                                                                 | <b>Proposed Mitigation</b>                                                                                                                                                                                          | <b>Significance (post mitigation)</b> |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| Habitat loss; degradation and simplification | Vegetation clearance for the preparation of the working corridor, and supporting infrastructure (construction | Part of the area that will suffer permanent habitat losses is primarily located in areas of significant habitats (different types of representative pastures, forests and riparian habitats). Part of the area that | Moderate - High                       |

|                                                    |                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                |                |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|                                                    | <p>camps, laydown areas etc).</p> <p>Degradation from soil compaction and erosion, dust and temporary roads and access areas</p>                                                                                                                                                                 | <p>will suffer permanent habitat losses is primarily located in areas of limited ecological value (agricultural land and unrepresentative pastures). Land outside the area of direct impact of the project should not be disturbed, and if it is used for temporary works, it must be returned to its original or improved condition. Specific mitigation for notable habitats is included later.</p>          |                |
| Habitat Fragmentation                              | <p>Disorders in the continuity of habitats <i>per se</i> (physical disorders)</p>                                                                                                                                                                                                                | <p>Specific risk mitigation measures for notable habitats are discussed below.</p>                                                                                                                                                                                                                                                                                                                             | High           |
| Changes in surface & ground water conditions       | <p>Impacts to aquatic species (surface waters) and species dependent upon using shallow groundwater/ infiltration. Impact on habitats whose existence is conditioned by the groundwater level.</p>                                                                                               | <p>Construction works on rivers should primarily be carried out during dry periods in order to avoid negative impact. The measures defined in the project design should also aim to reduce the impact. The water will be treated before being released into the wild. It will not be allowed to dispose of excess material in the area of the Drcka river, Ljubaštica and Lima in the area of Andrijevica.</p> | High           |
| Habitat pollution; including deposition and runoff | <p>Nitrogen deposition from vehicles can affect sensitive habitats (woodland, alpine grasslands and riparian areas). Dust can impact on vegetation and affect productivity and/or change local soil PH levels. Pollution (including salt) from road run off and de-icing may affect habitats</p> | <p>GIP mitigation will ensure that there are no significant impacts from run off. For particularly sensitive areas near watercourses bespoke mitigation will be used to minimise the risk of significant effects. Effects from dust are expected to be limited to up to 50m from the source (25m with the application of GIP) and are unlikely to be significant.</p>                                          | Low - Moderate |

|                                         |                                                                                   |                                                                                                                                                                                                                                                                                                                           |     |
|-----------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                                         | and can create surface water films                                                |                                                                                                                                                                                                                                                                                                                           |     |
| Spread of non-native / invasive species | Spread of non-native invasive species can reduce the ecological value of an area. | The distribution of invasive plant species was determined by visiting the terrain, and the subsequent treatment of these species, which are not natural for the habitat, will prevent their spread. Post-construction monitoring will ensure that species from neighboring areas do not colonize these restored habitats. | Low |

### 3.3.3 General Impacts and Mitigation: Plant Species

The Project has the potential to impact on notable plant species. Although these will be reduced where practical through the application of construction good industrial practice (GIP), such impacts will include the following:

*Table 8. Generic Issues that may Affect Notable Plant Species*

| Issue                                 | Description                                                                                                                                                                                                  |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Habitat loss, conversion, degradation | Removing a layer of vegetation, or, habitat loss can have a negative impact on significant plant species. Based on the conducted field research, a number of protected plant species were found (mostly from |

|                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| and simplification                                 | the Orchid family; most of these species are found in meadow habitats in the Vranještica river zone), but these are not species that are not extremely rare. Also, a number of endemic species are found in the zone of riparian vegetation (eg <i>Lactuca pancicii</i> ) or on alpine meadows (eg <i>Silene sendtneri</i> ), but it is assumed that the interventions will not have a major negative impact on the total populations of these species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Fragmentation                                      | The construction and use of the road will affect the habitat fragmentation of some plant species. This could, in the first place, apply to species that are protected and rare as well as their habitats (eg <i>Myricaria germanica</i> - it is protected by national legislation as a species). Additional measures to reduce the impact on this species are necessary: direct - through maximum restraint of works in places where it is located, and, indirectly - prevention of disposal of construction materials or waste in the Lim River zone where it is present to avoid disturbing the physical parameters of coastal habitats of this species.                                                                                                                                                                                                                                                                                                                                                                                                      |
| Changes in water conditions (hydrological impacts) | The proposed scheme requires a limited number of water crossings. Appropriate pollution prevention measures will be put in place at each crossing and vegetation cover will be retained on the banks where possible to retain habitat and minimize soil exposure. Silt fences will be used to prevent silt from travelling downstream, and banks will be restored to pre-construction contours to the extent practical using temporary erosion control measures (such as straw bales, silt fence, etc.). In order to reduce the impact of outflows, good industrial practices should be used. Changes in water conditions (hydrological impact) will have a negative impact on coastal habitats (it has already been mentioned here that the most obvious example is the habitat / species <i>Myricaria germanica</i> ). Also, negative consequences of changes in water conditions would have on other ripar habitats ( <i>Salicetum eleagni</i> , <i>Alnetum incanae</i> , etc.). Additional measures are needed to reduce the impact on these habitat types. |
| Habitat pollution including deposition and runoff  | In order to reduce the impact of outflows, good industrial practices should be used. For particularly sensitive watercourses, the highest quality mitigation and monitoring measures will be used to ensure that there are no significant adverse effects. The impact of dust (with occasional wetting of the area and other mitigation measures) can be reduced to a distance of 25 m from the site, and is not expected to be significant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Spread of non-native or invasive species           | The distribution of invasive plant species was determined by visiting the terrain, and the subsequent treatment of these species, which are not natural for the habitat, will prevent their spread. Monitoring post-construction will ensure that newly restored areas are not inundated with non-native species from adjacent areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Overall, the Project proposes to adopt the mitigation hierarchy to avoid impacts to notable species through a sequential approach of impact avoidance, mitigation, restoration and

finally offsetting if no other approach is effective. The project has sought to avoid impacts to notable species from the outset through design of the route to avoid sensitive habitats. Wherever practical already degraded habitats (e.g. existing roads) are used or habitats of low biodiversity value (e.g. overgrazed pasture), and the use of tunnels will also avoid many impacts. Construction works will employ GIP (Good International Practice) to further prevent or reduce impacts wherever practical..

*Table 9. Generic Construction Mitigation (GIP) to Minimize Impacts to Notable Plant Species*

| Impact                                               | Mitigation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Impacts due to scarcity of data                      | Ahead of all works, sensitive habitats and notable species will be identified and mapped in 'pre-works surveys' (details below) by the EcoW. Bespoke mitigation will be applied in all areas where sensitive habitats and notable species are identified. This will allow suitable mitigation to be identified and the success of any remediation to be monitored. A monitoring report and hazard map will be prepared of sensitive locations by the EcoW and shared with workers so that sensitive areas can be avoided or bespoke mitigation implemented. The EcoW will ensure that habitat degradation is minimized and baseline data for the species <b>BAPs (Biodiversity Action Plans)</b> is obtained. Prior to any enabling works site survey, mapping and/or demarcation of non-native invasive species will also be required.                                                                                                                                                                                                                                             |
| General impacts from works and operation – avoidance | The works footprint will be reduced as far as possible e.g. through the use of a single vehicle track policies and use of low-impact vehicles where practical. Vehicles will be driven at designated speed limits. Off-road travel will be prohibited where practical. Laydown areas and compounds will be sited to avoid unnecessary clearance of vegetation. Natural breaks in vegetation will be used as preferred access routes where possible. The workforce will adhere to working corridors. All staff will be provided with environmental awareness training. The workforce will not deviate from approved clearance areas. Workforce hunting and fishing bans will be enforced and cutting of wood by workers will be prohibited. Fencing will be minimized (apart from where put in place for operations to reduce roadkill) to ensure that areas vital for wildlife are not isolated by workforce activities, unless this is for species protection measures. Temporary barriers will be used to prevent wildlife from accessing waste disposal areas and similar areas. |
| Habitat Restoration                                  | Any reseedling or replanting of selected areas to be restored will use locally collected seed mixes and saplings. A local source of indigenous saplings suitable for replanting programs will be identified in advance to facilitate restoration. All efforts will be made to minimise removal of mature/significant trees and maintain connectivity between areas of forest habitats. Soils will be removed as subsoil and top soil and these will be stored separately as per good working practice for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                  | subsequent restoration. Workforce will be educated on preventing bush fires and this will not be used as a land clearance method.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Woodland habitats                                                                | Mitigation will include limiting working areas within woodland habitats, avoiding the felling of mature trees wherever possible and restricting working hours to daytime preventing noise pollution during twilight (dusk and sunrise).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Riparian Habitats                                                                | Works in coastal areas should be kept to a minimum in order to preserve plant species of riparian habitats. Crossing points across rivers will be conducted where there is clear access to the banks and vegetation clearance is minimised. The EcoW will determine for which riparian works a site-specific method statement is required. Standard pollution control measures will be implemented in all sites (e.g. to prevent silt contamination water will be kept out of the works area using appropriate isolation techniques, such as coffer dams, silt fences and by-pass channels). Demarcation and offsets for camp and storage locations and field activities will be at least 50m from watercourses where practical. Erosion control using 'polders', pads of plants and geo-nets will be implemented. Where trees have to be removed to facilitate the crossing, these will be replanted with a similar species composition. |
| New Habitats                                                                     | New habitat features will include boulder piles, dead wood piles and brash, and creation of appropriate ponds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Habitat pollution                                                                | Standard pollution control measures will be implemented. The EcoW will determine when further monitoring (e.g. for turbidity) and/or bespoke mitigation are required. Dust emissions due to road travel will be minimized by regulating vehicle speed and watering roads (where required). Spill kits will be available and standard industry refuelling protocols will be followed, e.g. use of drip trays. Erosion control will be implemented as appropriate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Spread of Non-native or invasive species that are not natural for given habitats | Native plants that are locally sourced will be used for re-planting. A site wide ban will be placed on workers bringing vegetation or soil from outside the site area to prevent dispersion of non-native invasive species. Minimize topsoil movements. Wash down of all vehicles and equipment before entering the sensitive sites. Follow species specific mitigation regarding invasive species which includes demarcation and avoidance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Unplanned events                                                                 | Mitigation for unplanned events will include training of staff in: 1) the sensitivities of the habitats and species in the area via toolbox talks including health and safety recommendations regarding poisonous or otherwise dangerous plants or animals, provided by the EcoW 2) Prevention of accidents by adhering to good practice behaviour throughout the works 3) Delegating authority to a EcoW whose job it is to ensure compliance of the required mitigation 4) Training in immediate response to bush fire, spillages etc. 5) Emergency                                                                                                                                                                                                                                                                                                                                                                                     |

|  |                                                                                                                                                                                                            |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | numbers provided for EcoW should protected species be found on site in the absence of site supervision. The EcoW will be present at all times if works need to take place in particularly sensitive areas. |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Pre-works surveys** – Prior to works starting, along the proposed route of the road (two versions) a detailed identification and mapping of habitats and plant species was done by botanists. The collection of the mentioned data was done:

- during the adequate time period for conducting the study for habitats and plant species (autumn 2019 and spring / summer 2020);
- considering the application of observable and repeatable analyzes, which are in line with good practice guidelines;

This study can be summarized as follows:

The collection of detailed data on the basic condition before the start of the works enabled a precise mapping of the habitat and distribution of native and invasive plant species in order to:

- defining mitigation measures and objectives for neutralizing impacts,
- defining key performance indicators for monitoring purposes.

This procedure was carried out by adequately qualified biodiversity specialists - botanists in the above term.

Specific Impacts and Mitigation are addressed in the sections below.

### **3.3.4 Impact on habitats and species along the route**

#### **3.3.4.1 Impacts from Construction**

The proposed highway route passes through an area with different habitat types from Annex I of the Habitats Directive (Table 2). Thus, these are 14 habitat types from this Directive that are from a national and regional perspective of different importance and degree of sensitivity to the impact of the construction of the Project.

Impact on river habitats (eg disturbances in riverbeds and disturbances in the physical parameters of watercourses and/or disturbances in accidental environmental pollution during construction works) could lead to a significant threat to the ecological value of this area (especially riparian vegetation along watercourses). The risk of degradation - disproportionate habitat removal and consequently its fragmentation combined with the high sensitivity of the area - meant that failure to take risk reduction measures could have

a **high impact**. Therefore, a specific work methodology will be required for works on or near watercourses in order to minimize impacts.

### Habitat Loss and Fragmentation

The project is currently proposing the establishment of ..... !!!! temporary construction sites along the route of the road, two of which will be located ..... !!!!. Works on these sites include the removal of vegetation, which will have a direct impact on the habitats from the Habitat Directive.

During the construction works, there will be a risk of erosion and pouring of substances and materials into watercourses. No NATURA 2000 water habitats have been identified on the main watercourses of the highway route. However, any increase in the degree of turbidity and/or accumulation of sediments can affect the faunal component of these watercourses.

### Watercourse Pollution and Changes in River Bed Morphology

The Drcka i Lim rivers are at risk of pollution from a range of sources, including oil leaks or spills or uncontrolled waste disposal during the works. Dust generated from works (eg during vehicle movements, explosions for tunnel construction etc) may be blown into the watercourses, which may also suffer from run-off from earthworks during rainy periods. River bank excavations and construction of retaining walls here may cause high water turbidity and/or pollution from accidental releases of construction materials. Further impacts may occur through accidental infilling of watercourses including by erosion of riverbanks or uncontrolled or accidental unloading of soil materials.

### Invasive Species

Execution of works - removal of vegetation can create conditions for disturbance of ecological balance within fragile and/or unstabilized habitats - which can be suitable for creating conditions for faster spread of already established invasive plant species (*Reynoutria japonica*, *Robinia pseudoaccacia*, *Erigeron canadensis*), as well as introduction new invasive plant species. Here it is estimated that the highest negative impact of *Reynoutria japonica* in particular could be near watercourses, given the fact that this species along Kraštica river in the area of Kralje has already led to a significant expansion and suppression of indigenous riparian vegetation.

The impact of invasive plant species in sensitive habitats can be considered **moderate** for now, but trends in the spread (monitoring) of populations of invasive species in the future (the area of the river Kraštica in Kralje, as well as the area of Lima in Andrijevisa) should be monitored. In the area of the Kraštica river in Kralje, the impact of the Invasive species *R. japonica* could already be defined as high.

A special Annex on Invasive Plant Species provides a list of Invasive Plant Species with detailed data and coordinates on the distribution and area they occupy.

### 3.3.5 Impacts on Notable Habitats and Flora



### 3.3.5.1 Impacts from Construction

#### Habitat loss

Road construction will lead to the permanent loss of a number of natural and modified habitat types, and will contribute to habitat degradation and fragmentation. The impact will refer to the entire length of the road route where the physical removal of vegetation is planned, as well as around watercourses and for the needs of building bridges.

*Figure 1. Location of temporary construction sites along the route of the road*

A summary of the sensitive habitats that will be affected is shown in the table below. In general, about 60 ha of these habitats will be directly affected by the Project.

Highway construction will result in habitat fragmentation, and such effects will be more significant in sensitive habitats. Areas where habitat degradation and fragmentation can be expected, and where sensitive habitats are present, are shown in the table below. In general, the table gives a list of localities with habitat types and areas that will be permanently lost.

About 10 ha of acidophilic beech forests in the area of Mateševske Strana above the right bank of the Drcka River will be permanently lost as a result of the implementation of a project of a total of 967 ha of this type of habitat.

Also, the loss of riparian vegetation on bridge 1 on the river Drcka (habitat with *Salix eleagnos*) will be about 1.2 ha, and the loss of riparian habitat in the area of bridges 7 and 8 will amount to 2.6 ha.

In the area of the river Vranještica, a permanent loss of riparian habitats will be expressed on the area of 1.8 ha, while in the area of Ravni brijeg 17 ha of beech and spruce-beech forests and 2.5 ha of mountain meadows will be lost.

In the area of the river Ljubaštica, the permanent loss of mostly ripar habitats will be around 0.7 ha, while alkaline peat bogs will remain intact.

In the area of the bridges on the Rajovića river and the Dubokalj stream, a total of 1.8 ha of riparian habitats will be lost.

In the area of the hill between the villages of Kralje and Salevići, about 10 ha of habitats with oak forests of a total of 544 ha will be permanently lost.

In the area of the Lim River in Andrijeva, several habitat types will be endangered: habitat with willow *Salix eleagnos*; habitat with *Myricaria germanica*; habitat with *Calamagrostis pseudophragmites*; habitats of riparian vegetation of *Alnetum incanae* and galleries of *Alnetum glutinosae* s. l. (Lugovi-Sitna Luka). The total habitat area that will be affected by the project in this area is about 267 ha.

The overall impact related to the loss of these specific habitats during construction is considered as a **high impact**.

Table 10. Assessment of habitat loss in specific localities

| Location and Type of habitat                                                                                                                                                                                                                                             | Sensitivity | Magnitude of Fragmentation |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------|
| <b>1. Mateševske strane</b> , acidophile beech forests above right bank of the Drcka River. Total surface of the habitat on Mateševske strane is around 967 ha. Permanent loss due to implementation of the project is around 10 ha.                                     | High        | Middle (adverse)           |
| <b>2. Drcka Bridge</b> - River Drcka with willow scrub of <i>Salix eleagnos</i> , total surface of habitat is around 8.7 ha. Permanent loss due to implementation of the project (variant 1, bridge 1) is around 1.2 ha.                                                 | High        | Middle (adverse)           |
| <b>3. Drcka Bridges</b> - River Drcka, along with riparian vegetation, whereby the total surface of habitat is around 200 ha. Permanent loss due to implementation of the project (variant 1, bridge 7 and 8) is around 2.6 ha and (variant 2, bridge 9 D) around 0.4ha. | High        | Middle (adverse)           |
| <b>4. Vranještica</b> - Bridge Vranještica River covered with riparian vegetation whereby the total surface of the habitat is around 76 ha. Permanent loss due to implementation of the project is around 1.8 ha.                                                        | High        | Middle (adverse)           |
| <b>5. Ravni brijeg</b> covered with beech forest, mountain meadows and part of RP Komovi furthered around 300 m from Variant 1 and more than 400 m from Variant 2, total surface of the habitat is around 777 ha of forest and 2.7 ha of meadows. Permanent loss due     | High        | Middle (adverse)           |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------|
| to implementation of the project is around 17 ha of forests and 2.5 ha of meadows.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |                  |
| <b>6. Ljubaštica</b> - River Ljubaštica with riparian vegetation along the bank, total surface is approximately 21 ha. Permanent loss due to implementation of the project is around 0.7 ha.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Medium    | Minor (adverse)  |
| <b>7. Ljubaštica</b> - Alkaline fens characterized by low sedges and brown moss that form peat. Total surface of habitats is around 15 ha, at the distance of around 500 m from the project impact area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | No change | Negligible       |
| <b>8. Rajovića Bridge</b> - River Rajovića and mouth of Novovića spring, along with riparian vegetation. Total surface of habitats is around 118 ha and under impact caused by the project will be around 1.2 ha.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | High      | Middle (adverse) |
| <b>9. Dubokalj Bridge</b> - Dubokalj spring, along with riparian vegetation. Total surface of habitats In Project area is around 33 ha, under impact caused by the project is around 0.6 ha.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | High      | Middle (adverse) |
| <b>10. Hill between Kralje and Salevići</b> , habitat of oak forests. Total surface of habitat is around 544 ha; surface which will be under impact caused by the project is around 10 ha.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | High      | Middle (adverse) |
| <b>11. Lim River</b><br>- habitat with willow <i>Salix eleagnos</i> . The total habitat area is about 5 ha; the area that will be affected by the project is about 3.5 ha ;<br>- habitat with <i>Myricaria germanica</i> . The total habitat area is about 3 ha; the area that will be affected by the project is about 1ha ;<br>- habitat with <i>Calamagrostis pseudophragmites</i> ; The total habitat area is about 3 ha; the area that will be affected by the project is about 1 ha ;<br>-habitat of ripar vegetation <i>Alnetum incanae</i> and gallery <i>Alnetum glutinosae</i> s. l. (Lugovi-Sitna Luka) The total area of the habitat is about 17 ha; the area that will be affected by the project is about 10 ha . | High      | Major (adverse)  |

## Other Impacts

Construction works may also result in impacts from:

- loss of soil structure including erosion of the upper territorial horizon, leaching of construction sites and soil pollution from waste.
- degradation of the quality of surface or groundwater due to discharges from the areas where earthworks are being carried out or because of water pollution by substances used in the construction phase.
- changing the direction of surface run-off due to earthworks.

Generally, a certain area of the route will be affected. However, given the fact that these impacts are not large-scale, and that they can be partially reversed, that is, that they can be reduced by applying Good Industry Practice (GIP), it is considered that the impacts belong to the group of **medium-level impacts**.

In areas with particularly sensitive habitats (including Natura 2000 habitats) unmitigated effects would be regarded as **high impact**.

### 3.3.5.2 Impacts from Operations

Impacts on habitats during operation will be restricted to impacts from road run-off, dust etc. Such impacts are considered to be **low**.

## Impacts from Operations

Impacts on flora and vegetation resulting from the use of the project are primarily related to indirect effects of increased human activity, leading to habitat quality degradation, although such impacts are expected to be limited in terms of scale and intensity. In general, the use of the proposed project is expected to have a low impact on flora and habitats in the area of impact (as opposed to the faunal component of the ecosystem of the area where the road is being established).

### 3.3.6 Proposed measures to reduce the impact of the project

The previous sections include a number of general mitigation measures. Also, appropriate concrete measures to reduce the impact of the project on specific areas targeted are proposed, which include:

#### 3.3.6.1 Protected areas

No specific mitigation measures are proposed in the zone of protected areas on the motorway route:

- a) part of RP Komovi (Ravni brijeg)** which is located about 300 m from variant 1 and about 400 m from variant 2 of the projected highway route. The sensitivity of this area is defined as high and the magnitude of fragmentation in this area as **medium (unfavorable)**;
- b) part of the course and coastal area of the Lim River** in the area of Andrijević - Sitna Luka is located in the EMERALD zone of the protected area - with several habitat types from the Habitats Directive (3220, 3230, 3240, 91E0). The sensitivity

of this area is defined as high and the magnitude of fragmentation in this area as **high (unfavorable)**.

Appropriate concrete measures are proposed to reduce the impact of the Project implementation on certain specific areas - the area of the Lim River in the zone of Andrijevica and Sitna Luka - which include:

- exclusion of the possibility of disposal of surplus material in the coastal area, which could lead to a violation of the physical parameters of this area and, consequently, to the degradation of the present habitat types;
- disposal and concentration of surplus material during road construction should be foreseen in such a way that the consequences of such disposal do not disrupt the regime and flow of the Lim River in this locality.

### **3.3.6.2 Habitats**

#### **Impact reduction measures during construction works**

During construction works, in addition to ECoW guidelines, the contractor should be denied access to sensitive habitats, except when absolutely necessary. Good performance control measures should be specified in the contract with the contractor, and should include the rehabilitation of all areas where vegetation is damaged. Areas to be used temporarily, such as areas where disruptions have been caused by the construction of bridges, need to be rehabilitated.

Specific mitigation measures will be implemented to reduce the effect of habitat fragmentation on fauna. Specific measures will be defined for sensitive habitats (eg NATURA 2000).

With regard to the restoration of areas subject to temporary impact, land that has been exposed to disturbances should be restored to the extent that it does not endanger traffic safety and visibility. The banks of the rivers that will be most affected by the construction of new bridges should be restored to their original profile, with the help of mesh baskets and stone cladding, if necessary to prevent erosion. The use of "soft" engineering techniques should be emphasized. In planting trees, use two-year local seedlings of indigenous flora. Use seeds collected from indigenous plant species from the local area.

#### **Residual and cumulative impact**

All details of the measures to reduce the impact of construction works should be part of the Contractor's Biodiversity Management Plan. When these impact reduction measures are implemented (as described above), the project construction process will have only a number of residual environmental impacts, including:

- loss of part of different habitat types (with subsequent restoration);
- impact during construction works on streams, rivers and associated habitats.

During the execution of works, the environmental supervisor (ECoW) should be present on the construction site, and apply an adaptive approach to management, with

monitoring. If any of these impacts are more significant than the original assessment, additional mitigation measures should be implemented. Therefore, the significance of residual impacts is expected to be **low**.

### **Cumulative impact**

The ecology of some rivers in the Project area is already negatively affected by wastewater runoff from households, local industry, agriculture (most pronounced near the Lim River). Residual impacts are also expected, which will further worsen the quality of water in watercourses into which wastewater flows, which will have an additional impact on aquatic biodiversity.