# EIA REPORT

**on**

**INVESTMENT PROPOSAL:**

## GRAVEL AND SAND EXTRACTION FROM ALLUVIAL SEDIMENTS IN THE BED OF THE DANUBE RIVER, MISHKA SECTION (462.0 KM. – 459.4 KM.), IN THE AREA OF BABOVO VILLAGE, SLIVO POLE MUNICIPALITY, ROUSSE REGION


**Assignor: Gravel and Sand Pits Bulgaria EAD**

**2015**

# Contents

## CONTACT DETAILS:

- **Assignor:**

  Gravel and Sand Pits Bulgaria EAD, UIC: 110055220

- **Seat and registered office:**

  SofIa 1528, Iskar District, 6, Poruchik Nedelcho Bonchev Street

- **Director:**

  Alexander Nakov Chakmakov

- **Phone, fax or e-mail:**

  phone: 02/970 00 70, fax: 02/970 00 72, e-mail: vladimir.dimitrov@titan.bg

## BASIS FOR DEVELOPMENT OF EIA REPORT

This EIA Report has been drafted in relation to investment proposal for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region. Investment proposal assignor is the company Gravel and Sand Pits Bulgaria EAD.

In accordance with current regulations, the Contracting Authority informed the Minister of Environment and Water for the investment proposal. The Ministry replied with letter ref OVOS-49 on 14.10. 2013 (Annex № 1) to inform that:

**1)** The investment proposal falls within the scope of Annex No 2 to Art. 93, para. 1 pt. 1 of the Environmental Protection Act, pt. 2 - Infrastructure investment proposals, letter "c" - extraction of inert materials from rivers, lakes or sea through dredging and is subject to procedure for evaluation of the need for preparation of EIA Report thereof;

**2)** IP does not fall within a protected area as defined in the PAA, but is adjacent to protected area "Kalimok Brushlen." Mishka Section (km 462.0 to km 459.4) falls within two protected areas - Natura 2000 sites under the Biological Diversity Act: PA "Complex Kalimok" BG0002030 for the conservation of wild birds and PA "Kalimok Brushlen" with code BG0000377 for the conservation of natural habitats and of wild fauna and flora. According to Art. 31, para. 1 BDA and pursuant to Art. 2 para. 1 pt. 1 of the Ordinance on conditions and procedures for assessing the compatibility of plans, programs, projects and investment proposals with the object and purpose of conservation of protected areas (CA Ordinance) the investment proposal will be assessed for compatibility (CA) with the object and purpose of conservation of protected areas, which procedure will be conducted through the EIA procedure, according to Art. 31, para. 4 BDA.

**3)** IP falls within the scope of it. 14 of Appendix I of the EIA Convention and the same implies a significant environmental impact on the territory of another country.

The contracting authority submitted to the Ministry the information requested by letter with ref. nr OVOS-49 of 14.10.2013, including notification pursuant to Art. 3 of the EIA Convention. In response and by Resolution No 3-PR/2014 on the need for preparation of EIR (Appendix No 1) the competent authority ordered preparation of EIA Report on investment proposal for gravel and sand extraction from alluvial sediments in the bed of the Danube

river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region, which is likely to have a significant negative impact on natural habitats, populations and habitats of species subject to conservation in protected areas.

By letter ref. OVOS-74 /01.04.2014 (Appendix No 1) the competent authority provided further guidance on the next steps of the procedure under Chapter VI EPA, as well as on the requirements of the EIA Convention. By letter 6187/RP/ 23.01.2014 the Ministry of Environment and Climate Change of Romania expressed their interest in participating.

After the development and submission for consideration of the terms of reference for the scope and content of the EIA report, consistent with the requirements of Art. 10, para. 3 of the Ordinance on the conditions and procedures for the evaluation of environmental impact /letter ref nr EIA-74/05.08.2014, the competent authority approved the terms of reference and providedadditional instructions on the content of the EIA report (Opinion with ref. No OVOS-74 / 05.08.2014, Appendix No 1**.**

In accordance with Art. 3, para. 5 of the EIA Convention, the Ministry has provided the Ministry of Environment and Climate Change of Romania the terms of reference translated in English. By letter ref. No 4072 / AK / 26.8.2014, (Appendix No 1) the Romanian state gave additional instructions to be reflected in revised terms of reference and EIA and CA reports.

This EIA Report was drafted on the basis of Terms of Reference revised in compliance with the instructions of the competent authority (a separate annex to the EIA Report) and opinion ref. No EIA-61 / 01.12.2015 of the MoEW (Appendix No 1).

The assessment report on the degree of impact of the investment plan on BG 0000377 "Kalimok Brushlen" under Directive 92/43 EEC on the conservation of natural habitats and of wild fauna and flora, BG 00002030 "Complex Kalimok" under Directive 2009/147 / EC for conservation of wild birds, ROSPA0090 Ostrovu Lung-Gostinu for the conservation of wild birds, and ROSCI0088 "Gura Vedei - Șaica -Slobozia" for conservation of natural habitats has been developed by a team of experts in compliance with the requirements of Art . 31, para. 20 of the Biodiversity Act and Art. 9, para. 1 of the CA Ordinance, with expertise in the following areas: Phytocoenology, Hydrobiology and Ornithology. (Separate annex to the EIA Report**).**

The EIA Report was drawn up by a team of experts who meet the requirements set out in Art. 83 EPA and Art. 11, para. 3 of the Ordinance on the conditions and procedures for EIA. Pursuant to Art. 12 para. 1 pt. 4 and 5 of the abovementioned Ordinance in this report are presented:

- a list of experts and the team leader responsible for drawing up the EIA Report with their respective signatures**;**
- written independence statements of experts (Appendix No 3)**;**
- copies of diplomas of experts with Master's Degree (Application No 3).

## I. Annotation of the investment proposal

The main purpose of the investment proposal is extraction, transportation and unloading of alluvial materials (sand and gravel) from the bed of the Danube River, Mishka section (462.0 km. – 459.4 km.) to the north of the village of Ryahovo and the village of Babovo, to the north and north-west of Mishka Island (Golyam Mishka – 1 and Malak Mishka-2) and to the south of Mishka-3.

As a result of the studies performed, the identified reserves have been approved by the Executive Agency for Exploration and Maintenance of the Danube (EAEMD) for the extraction of alluvial deposits from the bed of the Danube.

The approved project area complies with the following conditions:

- area of the site is in the Bulgarian part of the river;
- area of the site is at the required distance from the fairway;
- observance of the required distance of the working area from the Bulgarian coast in order to exclude the likelihood of its overbreaking and eroding caused by the extraction.

Extraction area is 433 626 m².

## 1. Location of the project - map of the area

The extraction site spreads from km 462.0 to km 459.4 of the Danube, to the north of the village of Ryahovo and the village of Babovo, to the north and north-west of Mishka Island (Golyam Mishka – 1 and Malak Mishka-2) and to the south of Mishka-3. The total area of the site (0,433 $km^2$) is 2.6 km long and 300 meters wide in the southwest and up to 100 m wide in the northeast.

**The extraction area is located within the Bulgarian part of the river, at the mandatory distance of the river's mainstream (327 m in the southwest and 194 m in the northeast.).**

**The extraction area is 418 meters away from the Romanian border and 836 meters away from the Romanian coast in the southwest and from 50 m to 310 m in the northeast respectively. Appendix 2 gives a layout of the area of extraction with scale 1:15000**.

Fig I.1.-1 is a satellite image of the Danube showing the area of the future extraction site.

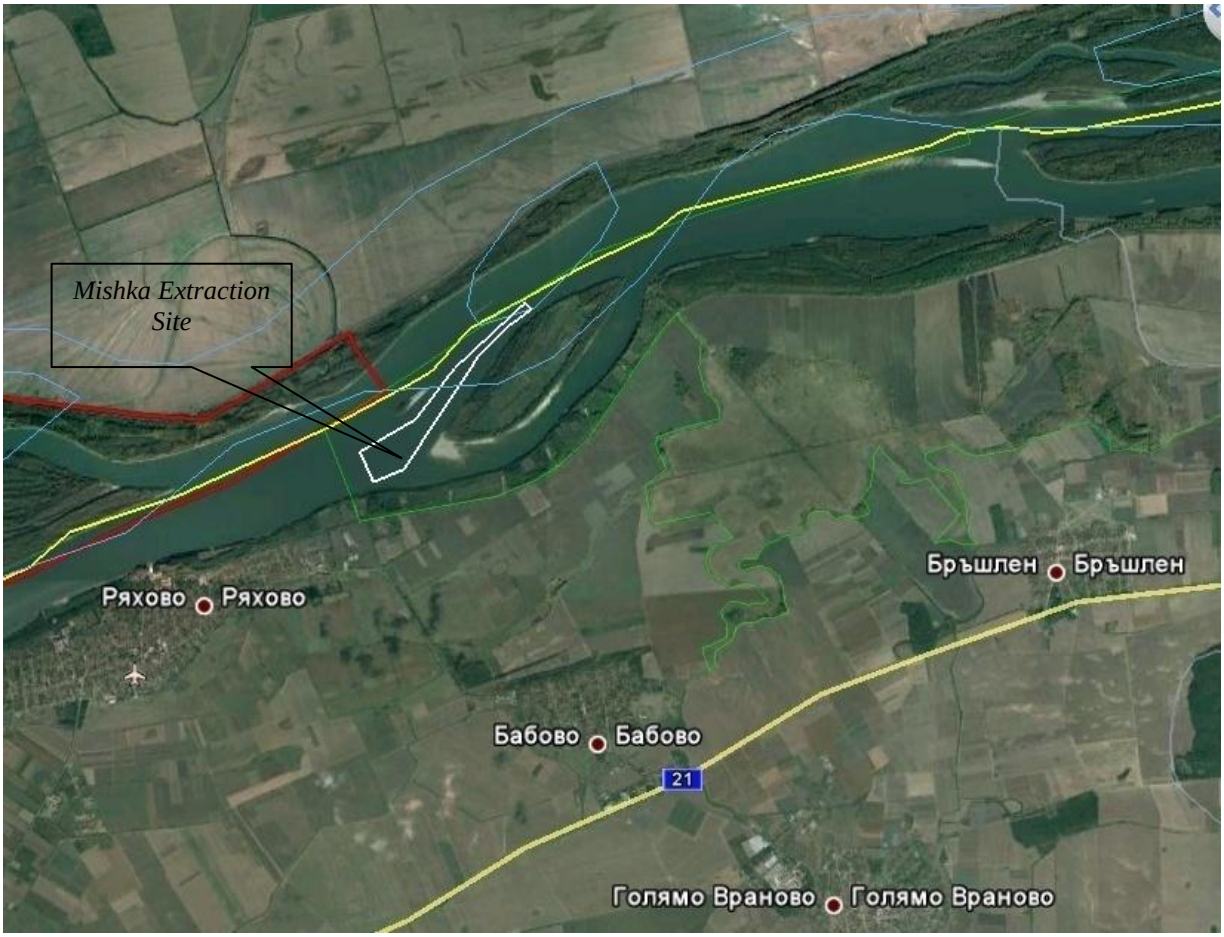



***Fig. I.1.-1: Satellite image showing the future extraction site***

The nearest settlement, Ryahovo Village is located at 1 km to the southwest, and the village of Babovo at 2 km to the southeast. The distance along the river to the bridge of the Danube River in the town of Ruse is 29.5 kilometers.

The territory of the investment proposal does not fall within any protected territory within the meaning of the Protected Areas Act. It is, however, adjacent to the area Kalimok Brashlen protected by virtue of Order RD-451 of the Minister of Environment and Waters.

The extraction area falls within protected area BG 00002030 "Complex Kalimok" - under Directive 2009/147 / EO on the conservation of wild birds and PA 0000377 "Kalimok - Brushlen" - under Directive 92/43 on the conservation of natural habitats and of wild fauna and fauna in "Natura 2000" under the Biological Diversity Act.

***Table I.1.-1: Geographical coordinates WGS-84 of the border points of Mishka area***

| **Mishka Section** | | |
|---|---|---|
| **No** | **Breadth, B** | **Length, L** |
| **1** | 44º00´13.1 | 26º16´28.8 |
| **2** | 44º00´23.5 | 26º16´22.5 |
| **3** | 44º00´34.5 | 26º16´48.8 |
| **4** | 44º00´52.4 | 26º17´07.2 |
| **5** | 44º01´14.1 | 26º17´40.7 |
| **6** | 44º01´11.8 | 26º17´43.1 |

| Mishka Section | | |
|---|---|---|
| **No** | **Breadth, B** | **Length, L** |
| **7** | 44º01´05.8 | 26º17´31.9 |
| **8** | 44º00´56.4 | 26º17´18.8 |
| **9** | 44º00´17.4 | 26º16´43.2 |

***Table I.1.-2 Geographical coordinates of the border points of Mishka extraction site in the WGS-84 and STEREO 70 system***

| No | N WGS-84 | E WGS-84 | N S-70 | E S-70 |
|---|---|---|---|---|
| **1** | 44.003639 | 26.274667 | 278988.257 | 602221.405 |
| **2** | 44.006528 | 26.272917 | 279307.021 | 602076.043 |
| **3** | 44.009583 | 26.280222 | 279655.628 | 602656.466 |
| **4** | 44.014444 | 26.285333 | 280202.145 | 603057.741 |
| **5** | 44.020583 | 26.294639 | 280896.020 | 603792.998 |
| **6** | 44.019944 | 26.295306 | 280825.880 | 603847.602 |
| **7** | 44.018278 | 26.292194 | 280636.819 | 603601.059 |
| **8** | 44.015667 | 26.288556 | 280342.110 | 603313.996 |
| **9** | 44.004833 | 26.278667 | 279125.947 | 602540.083 |

The wharf owned by the company and used for loading and unloading of sand and gravel extracted from the river is located in the Eastern Industrial Zone of the town of Rousse and is 4,558 $m^2$ (fig. I.1-2).


***Fig. I.1.-2: Satellite image of the location of the wharf owned by Assignor***

Appendix No 2 is a layout with coordinate list of the wharf located in the Eastern Industrial Zone of Rousse.

## 2. 2. Current status of the territory

***Extraction area***

The mainstream of the Danube falling within Bulgarian territory has been the subject of systematic exploration work in the past. This also applies to the area of the site subject of this investment proposal. Immediately to the west of it is section "Ryahovo", which has also been extensively studied and significant volumes of dynamic reserves of sand and gravel have been found there.

The Danube is the main drainage artery of the rivers in Northern Bulgaria. Water levels in it vary widely depending on the existing physical and geographical conditions of the large catchment area. The water supply system "Iron Gate - 2" located outside Bulgarian territory is also a factor. The river is the deepest in April, May and early June. Low water is most common during the period from September to November with a minimum in October.

The studied Mishka area in the bed of the Danube River is composed of alluvial deposits represented by sandy gravel aggregate with layers and lenses of sands. Geological, geomorphological and geometric parameters of the alluvial deposits are defined on the basis of complex geophysical work, and the results of geological - exploration work on adjacent areas explored in the past. The section is a natural continuation of the "Ryahovo" section studied in 1964, which allows for analogy in the lithological characteristics. The foundation reveals blockages and loam-sandy clays, which are mostly found near the shoreline.

The useful layer contains small to medium gravel with sandy filler and thin sand strata. Discontinuous layer of sand is expected to be revealed over the rubble.

The sand content in the region is expected to be from 30% to 60%, averaging about 45%. The sand is mostly coarse, dominated by fractions over 0.3 mm. It is made of quartz and feldspar grains with low clay content.

The content of gravel varies from 40 to 70%, averaging at 55%. Gravel size varies from 5 to 40 mm, predominantly from 5 to 20 mm, which is about 70%. The fractions less than 40 mm are less than 10%. Gravel fragments are oval, well rounded and are made of quartz diorite, amphibolites, limestone, marble and other metamorphic, sedimentary and igneous rocks.

Gravel stratum thickness – up to 11.5 m, an average of 6.0 m.

Applied for and approved extraction area is located north - northwest of Mishka Island in Bulgarian territorial waters (from 462.0 to 459.4 km). It is delineated by points marked from number 1 to number 7 with geographical coordinates in WGS-84 system, according to the attached register in the decision of the Executive Agency "Exploration and Maintenance of the Danube" - the Ministry of Transport, reflected in letter VIII-5-132/04.02.2013 (Appendix No 2). The site has been approved by the Ministry of Defence by letter Reg. No 11-00-445/18.06.2007 (Appendix No 2).

Given the newly formed island tentatively called "Mouse-3" in 2013 a new survey with GPS Sistem 900 in RTK mode was made with subsequent data processing - leveling measurements and coordinate system transformation in 1970 coordinate system. The island was surveyed from all sides with a boat. Movement on the island itself is impossible because of dense vegetation - willows and 3-4 years old shrubs. The island is accessible on foot only in a few spots and mainly on the east end, where a sand spit has been formed. The extraction area has been adjusted within the authorized perimeter and 100 meters away from Mishka-3

Island. The east end is also 100 meters away from Mishka Island ("Golyam Mishka-1" and Malak Mishka-2) (Appendix No 2).

The new area of the extraction site is 433,626 m2 . It is delineated by points from number 1 to number 9 with geographical coordinates in WGS-84 system with scale 1:12000 (Appendix No 2).

According to the Executive Agency for Exploration and Maintenance of the Danube (http://appd-bg.org/site/page.php?51), for the area of Mishka Island there are a number of issued and existing permits for extraction of inert materials presented in table I.2.-1.

***Table I.2.-1: Permits issued for plans, programs and investment proposals for extraction of inert materials from the Danube River***

**Water body The Danube** **Code: BG1DU000R001** Last update: **09.12.2014**

| number | Holder of permit | Number and date of issue | Geographic description | | | area | Geographical coordinates of the pit in WGS_84-BL coordinate system | | | Permitted annual amount of extraction | Expiration date of permit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Populated location, municipality, region, UCATTU | River km | | | | | | | |
| | | | | From | To | decares | Point no | latitude | longitude | $m^3x10^3$/annually | |
| 3 | Dragazhen OOD | PBO-3/08.08.2011 | The village of Sandrovo, Rousse Municipality, Rousse Region, 65348 | 480,0 | 478,0 | 293 | 1 | 43°56' 25.1" | 26°05'07.0" | Within the renewable stock | 31.12.2015 |
| | | | | | | | 2 | 43°56'41.7" | 26°05'44.0" | | |
| | | | | | | | 3 | 43°57'04.4" | 26°06'08.7" | | |
| | | | | | | | 4 | 43°56'59.2" | 26°06'15.1" | | |
| | | | | | | | 5 | 43°56'39.5" | 26°05'46.2" | | |
| | | | | | | | 6 | 43°56'19.2" | 26°05'15.3" | | |
| 16 | Inert OOD | PBO-16/08.08.2011<br>Term prolonged with resolution no 71/03.10.2011 | The village of Pozharevo, Tutrakan Municipality, Silistra Region, 57090 | 426,0 | 422,5 | 735 | 1 | 44°03'33.2" | 26°41'30.4" | Within the renewable stock | 31.12.2015 |
| | | | | | | | 2 | 44°03'38.8" | 26°41'27.9" | | |
| | | | | | | | 3 | 44°04'16.6" | 26°43'38.9" | | |
| | | | | | | | 4 | 44°04'17.9" | 26°43'54.1" | | |
| | | | | | | | 5 | 44°04'09.9" | 26°43'54.7" | | |
| | | | | | | | 6 | 44°04'08.9" | 26°43'42.5" | | |
| | | | | | | | 7 | 44°03'49.7" | 26°42'44.9" | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | ET Poli – Kamen Chakalov | PBO-18/08.08.2011 | The village of Mechka, Ivanovo Municipality, Rousse Region, 47977 | 521,0 | 519,3 | 283 | 1 | 43°41'38.3" | 25°44'36.5" | 33 | 31.12.2015 |
| | | | | | | | 2 | 43°41'44.1" | 25°44'31.9" | | |
| | | | | | | | 3 | 43°42'10.9" | 25°45'37.0" | | |
| | | | | | | | 4 | 43°42'07.2" | 25°45'39.8" | | |
| 19 | ET Poli – Kamen Chakalov | PBO-19/08.08.2011 | The town of Rousse, Rousse Municipality, Rousse Region 63427 | 503,5 | 502,7 | 79 | 1 | 43°47'27.1" | 25°54'10.3" | 100 | 31.12.2015 |
| | | | | | | | 2 | 43°47'50.3" | 25°54'24.9" | | |
| | | | | | | | 3 | 43°47'49.0" | 25°54'29.0" | | |
| | | | | | | | 4 | 43°47'25.7" | 25°54'14.2" | | |
| 25 | ET Milen Velikov | PBO-24/11.10.2011<br>Amended by virtue of resolution 171/22.10.2013. | The town of Rousse, Rousse Municipality, Rousse Region, 63427 | 501,4 | 501,0 | 70 | 1 | 43°48'30.6" | 25°54'44.2" | 7 | 31.12.2015 |
| | | | | | | | 2 | 43°48'41.1" | 25°54'51.9" | | |
| | | | | | | | 3 | 43°48'39.6" | 25°54'59.5" | | |
| | | | | | | | 4 | 43°48'28.4" | 25°54'52.1" | | |
| 26 | ET Minko Stilyanov – Detelina Rousse | PBO-25/19.12.2011 | The village of Batin, Borovo Municipality, Rousse Region, 02854 | 525,1 | 523,0 | 103 | 1 | 43°40'28.4" | 25°41'20.9" | 22 | 31.12.2015 |
| | | | | | | | 2 | 43°40'54.0" | 25°42'46.5" | | |
| | | | | | | | 3 | 43°40'52.4" | 25°42'47.2" | | |
| | | | | | | | 4 | 43°40'27.0" | 25°41'22.0" | | |
| 27 | Danube dredging fleet ad - Rousse | PBO-26/27.01.2012 | The village of Ryahovo, Slivo pole Municipality, Rousse Region, 63668 | 468,0 | 464,0 | 753 | 1 | 43°59'06.2" | 26°12'07.5" | Within the renewable stock | 31.12.2015 |
| | | | | | | | 2 | 43°59'56.2" | 26°14'42.4" | | |
| | | | | | | | 3 | 43°59'50.0" | 26°14'45.1" | | |
| | | | | | | | 4 | 43°59'00.1" | 26°12'10.5" | | |
| 30 | Gravel and Sand Pits | PBO- | 1528 Sofia, Iskar District, 6, Poruchik | 510,5 | 508,0 | 682 | 1 | 43°45’05.93” | 25°49’52.61” | 600 | 31.12.2015 |
| | | | | | | | 2 | 43°45’24.09” | 25°50’48.97” | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bulgaria EAD | 29/19.08.2013 | Nedelcho Bonchev Street | | | | 3 | 43°45’43.08” | 25°51’23.97” | | |
| | | | | | | | 4 | 43°45’38.68” | 25°51’29.25” | | |
| | | | | | | | 5 | 43°45’16.20” | 25°50’55.16” | | |
| | | | | | | | 6 | 43°44’57.60” | 25°49’57.26” | | |
| 31 | Danube dredging fleet AD - Rousse | PBO-30/13.12.2013 | The town of Rousse, Rousse Municipality, Rousse Region, 63427 | 461,5 | 491,0 | 194 | 1 | 43°52'13.3' | 25°58'54.0" | 60 | 31.12.2015 |
| | | | | | | | 2 | 43°52'18.5" | 25°58'48.5" | | |
| | | | | | | | 3 | 43°52'38.5" | 25°59'22.4" | | |
| | | | | | | | 4 | 43°52'33.3" | 25°59'27.9" | | |

Information Statement no ZDOID-28 / 04.15.2013 issued by MoEW upon request of the Assignor identifies the following plans, programs and investment proposals covering the territory of protected areas "Kalimok - Brushlen" BG0000377 under the Habitats Directive, "Kalimok Complex " BG0002030 under the Birds Directive and ROSPA0090 Ostrovu Lung-Gostinu under the Birds Directive:

***Table I.2.-2: plans, programs and investment proposals covering the territory of protected areas***

| Consecutive nr | plans, programs and investment proposals covering the territory of protected areas |
|---|---|
| **1** | Forestry and hunting plan (FP and HP) - Forest Management Project (FMP) of "Danube" State Hunting Farm (SHF) - approved by the Ministry with Resolution No 45-OC/2012 |
| **2** | Development of Argesh River and Dambovitsa River for navigation and other purposes |

According to available records on requests for access to information nr. AO 2288 / 16.04.2013, and nr 4009 / 20.08. 2013, of RIEW - Rousse (Appendix No 2) and opinion ref. nr OVOS-61 / 01.12.2015 of the MoEW, the following investment proposals, plans and programs, proceeded by RIEW - Rousse may have a cumulative effect on PA "Complex Kalimok" BG0002030 and "Kalimok Brushlen" BG0000377:

***Table I.2.-3: Plans, programs and investment projects on the territory of protected areas, proceeded by RIEW Ruse***

| Consecutive number | Plans, programs and investment projects on the territory of protected areas |
|---|---|
| **1** | Extraction of inert materials from the river bed of the Danube from km437.000 to km435.000 near Radetsky Island on an area of 700 decares – Not implemented |
| **2** | Extraction of inert materials from the river bed of the Danube from km478.000 to km476.500 near Aleko Island on an area of 300 decares – Not implemented |
| **3** | Extraction of inert materials from the river bed of the Danube from km 501,400 to km 502,000 on the grounds of the town of Rousse on an area of 40 decares – Not implemented |
| **4** | Extraction of alluvium deposits from the river bed of the Danube from km 468,00 to km 464,000 on an area of 75,2647 decares – implemented |
| **5** | Extraction of alluvium deposits from the river bed of the Danube from km 407,000 to km 401,500 on an area of 901,405 decares – implemented<br>* restriction for extraction works from km 407.000 to km 405.500 and from km 404.600 to km 403.000 |
| **6** | Extraction of inert materials from the river bed of the Danube from km 491.000 to km 490.500 - Procedure studiying the need of EIA preparation |

| Consecutive number | Plans, programs and investment projects on the territory of protected areas |
|---|---|
| **7** | Establishment of site for temporary storage of inert materials on plot of land 000358, the town of Marten on an area of 2,235 decares |
| **8** | Restoration of the river bank at the cemetery in Ryahovo, plots no 63668.142.25 and 63668.142.26 the village of Ryahovo, area of 1,733 decares |
| **9** | Construction of a marina with a pier for 20 yachts on plot nr 124003, the village of Popina on an area of 7,375 decares |
| **10** | Forestry program for plot no 047005 on the land of the village of Brushlen, Slivo pole Municipality |
| **11** | Construction of drip irrigation system with water supply by building three tube wells with a depth of 50 to 100 meters and 40 l / sec flow rate on plot of land No 023 001, 023 002, 023 003, 023 004, 023 006, 023 217, 023 218, 023 219, 023 220 on the land of Tsar Samuil, Tutrakan Municipality. The investment proposal is in the process of EIA requirement assessment |
| **12** | Construction of water supply branches in the villages Ryahovo, Babovo, Brashlen, Golyamo Vranovo, Slivo pole Municipality |
| **13** | Establishment of a site for the collection, storage and pre-treatment of waste from X-rays, paper and cardboard in the village Ryahovo, Slivo pole Municipality |
| **14** | Repair, reconstruction and improvement of the surrounding areas of the church "St. George" in the village Ryahovo, Slivo pole Municipality |
| **15** | Construction of aerial cable distribution network for electronic communications in the villages Babovo, Golyamo Vranovo and the town Slivo pole, Slivo pole Municipality |
| **16** | Construction of urban waste water treatment plant (WWTP) and completion of the sewerage network of the town of Tutrakan |
| **17** | Creation of new plantations of perennials (plum trees) on an area of 21,334 decares and installation of drip irrigation system in the village Nova Cherna, Tutrakan Municipality |
| **18** | Extraction of alluvial deposits with floating and / or moored vessels on the Danube in the stretch from km 464.000 to km 462.300 within an area of 747,600 square meters - issued Decision No RU-64-PR/2015 of RIEW Ruse requiring EIA preparation |

According to letter ref. ZDOI-254/05.11.2010 (Appendix No 2) and issue No 378/04.07.2014, (Appendix No 1) of the Danube Water Management Directorate with headquarters in the town of Pleven the following sources for drinking water supply to the population exist on the territory of Bulgaria:

***Table I.2.-4: Sources of drinking water to the population within the project area***

| Karst water in the Rousse formation (BG1G0000K1b041): |
|---|

| |
|---|
| „TK1-ViK Rousse PS „Brashlen” |
| „TK1- ViK Rousse – Golyamo Vranovo” |
| „TK2- ViK Rousse - Golyamo Vranovo ” |
| Porous aquifer in Quaternary deposits - Brashlyanska Valley (BG1G0000Qal010) |
| „Ranney well– 1 ViK Silistra – Tutrakan” |
| „Ranney well – 2 ViK Silistra – Tutrakan ” |
| „Ranney well – 2 ViK Silistra – Tutrakan ” |
| „SW1 – ViK – Rousse PS „Brashlyan” |
| P1 „ViK – Razgrad – Ryahovo ” |
| P3 „ViK – Razgrad – Ryahovo ” |
| P4 „ViK – Razgrad – Ryahovo ” |
| P5 „ViK – Razgrad – Ryahovo ” |
| P6 „ViK – Razgrad – Ryahovo ” |
| P7 „ViK – Razgrad – Ryahovo ” |

The closest Ranney well is 150,0 m away. The plot is located outside zone I of KBS.

Mineral springs have not been detected within the area of the investment proposal.

***Wharf***

The wharf (licensed and operating port for handling of general and bulk cargo) owned by the company and used for loading and unloading of sand and gravel extracted from the river is located in the eastern industrial zone of the town of Rousse (fig. I.2. – 1). The reconstruction of the existing wharf into cargo and storage port was approved by RIEW Rousse with statement no 1756/31.05.2011 (Appendix No 2).

According to information provided by RIEW Rousse in answer to a request for access to public information no AO 4217 / 03.09.2014, companies operating within the Eastern Industrial Zone - Rousse, which in combination with the investment proposal for the extraction of sand and gravel from alluvial sediments from the bed of the Danube area, Mishka section (from km 462.0 to km 459.4) can create a cumulative impact, are the following:

***Table I.2.-5:***

| No | Company | Nature of business |
|---|---|---|
| **1** | "District Heating Plant Russe" EAD - "TPP - Ruse East" | Combustion plant for production of heat and electricity |
| **2** | Ashpond "District Heating Plant Russe" EAD | Depot receiving more than 10 tons of waste a day |
| **3** | „Unistroymat” OOD | concrete plant |

| No | Company | Nature of business |
|---|---|---|
| **4** | „Dunav" AD | concrete plant |
| **5** | „Beton-05" OOD | concrete plant |
| **6** | "Danube dredging fleet" AD | Aggregate extraction and crushing and sorting plant |
| **7** | „Trud" AD | Installation for the manufacture of ceramic products by firing |
| **8** | „Bilbobul" OOD | Ferrous metal foundries |
| **9** | „Piroliza BG" OOD | Installation for the disposal of tires |
| **10** | „ Pressure Pipes"AD | Production of reinforced concrete pipes |
| **11** | „Gorainvest" AD | Logging, wood processing and timber trade (Sawmilling and planing of wood) |
| **12** | „Ruvitex Industry" AD | Production of polyvinylchloride coated products by the method of extrusion coating |

## 3. Description of the project - capacity, location of individual elements

The Investment Proposal includes extraction, transportation and unloading of alluvial sediments (sand and gravel) from the Danube.

Extraction of alluvial materials (sand and gravel) from the Danube River will be done by using floating multi-bucket dredger. The material from the buckets is then transferred to a drying sieve and via a rubber conveyor belt to self-propelled barges for transport to a wharf owned by the company for unloading. Unloading on the wharf will be done by using grabbing jib crane with a lifting capacity of 15 tons. The material will be collected by the barge and dumped on longitudinal pile, parallel to the crane runway.

The material will be then loaded using front loader and will be dispatched with road transport vehicles.

The area of extraction of sand and gravel from the bed of the Danube is 0.433 km2 , 2.6 km long and 300 m wide in the southwest part and up to 100 m in the northeast part. Reserves (222) amount to 2 475 047 m3, 1 812 869 m3 of which are extractable reserves (222). The extraction area will be divided into 10 tracts. The capacity of extracted material will reach 345,000 m3 / year. Extraction per day - 1500 m3 for 230 work days a year (9 months, 6 days per week).

During extraction of the material in depth, slopes in proportion of 1:2.75 will be formed in order to secure the stability of the riverbed (in the relevant tract) for the performance of extraction and technical works. Shaping of the slopes with increasing depth will lead to reduced intake area with 317,613 m3 of extractable materials. Depending on the water position and during nesting season, extraction works may take place in different tracts of the developed area.

**Technology for the extraction of alluvial deposits**

The technology for extraction of gravel and sand from the Danube is based on the use of floating multi bucket dredger type KS 250, which has no alternative under the given conditions, i.e. 150 mm boulders.

Main technical data of the dredger:

- Maximum operating depth of the dredger for sediment extraction – 12 m
- Total number of scraper buckets – 32
- Bucket volume –250 l each
- Rated speed of movement of the chain of buckets – 26 buckets/min.

Installed capacity:

- Diesel engine - 500 kW
- Generator - 620 kVA

Main engine power:

- Bucket chain operation - 2 x 90 kW
- drying sieve - 2 x 30 kW
- rubber belt conveyor -11 kW
- pulley chain of buckets - 2 x 15 kW.

Total installed power: 281 kW.

The facility is constructed on a support pontoon system, consisting of two longitudinal, one transverse and one intermediate pontoon.

Dimensions

Length - 39 m, overall width - 9.5 m.

Management of all processes and control mechanisms is carried out in the operator's cabin, located on the middle platform overlooking the chain of buckets.

The dredger will be positioned on the extraction site with the help of a self-propelled barge that will tow the dredger to the required location. This operation will take place twice a year: at the start of extraction works and at the end of the season in order to put away the dredger for the winter. Movement of the dredger within the specified tract is done through a system of stern and side anchors located at the top to the left and right of the axis of the dredger. Movement is achieved by rolling anchor ropes on one side and releasing the ones on the other.

The specific extraction process is carried out via removal of sediment material from the bottom of the river by scraper (250-liter) buckets. Maximum operating depth of the dredger for sediment extraction is 12 m.

Unloading of alluvial materials extracted by the buckets will be done directly on the drying sieve of the dredger. Drained water will be returned in the river and dried alluvial materials will be transferred to the self-propelled barges via rubber belt conveyors. Barges transport the raw materials to the wharf located in the East Industrial Zone of Rousse. In the process of loading of extracted ballast in the barge the solid phase is precipitated at the

bottom of the barge and the water remains above it. When the amount of useful material increases, the water level rises and reaches the holes in the barge walls from where excess water flows back into the river. There are drainage pipes at the bottom of the barge that drain the remaining water for maximum drying of the material. Drainage water will be pumped back into the river by pumps with maximum flow rate of 260 m3 / h.

- The barge is divided into two separate holds with freight volumes V1 = 680 m3 and V2 = 627 m3 and a total carrying capacity of 1,000 t.

Installed capacity:

- 820hp Diesel engine.

The vessels (dredger and barges) have fire installations, drying plants, sanitation (process water and overboard water - water to wash the ship) and installations for the treatment of domestic and human waste waters.

Waste generated during operation will be levied on vessels and transported to the quay for further treatment.

**Extraction of alluvial deposits from each tract**

Extraction works in each individual tract will be done upstream from km 459.4 towards km 462.0. Extraction area is divided into tracts for extraction of inert materials. Each tract will be marked with floating buoys anchored along the contour of the specified tract. Extraction works will start from tract 1 and track 2 located adjacent to one another along the riverbed on the northern border of the extraction site. The lower edge of the stope coincides with the natural slope thus complying with the requirement for exclusive extraction within the borders of the approved extraction site. The stratus containing sediment material will be mined at full depth in order to use the extraction equipment at its full capacity. Extraction works in each individual tract will be done from east to west (upstream).

This manner of extraction of alluvial deposits guarantees:

1. Effective extraction regardless of the water level – if the water level is low a tract with greater thickness of the alluvial deposit stratum will be worked, and if the water level is high, a tract with lower thickness respectively. This does not exclude the possibility to mine the stratum at the planned depth provided that the working depth of the dredge and water levels permit.
2. the smallest possible number of changes in the position of anchors.
3. the smallest possible volume of unextracted deposits, respectively minimum operational losses.

**Transportation of extracted material**

The transport corridor for transportation of sand and gravel extracted from the Mishka section to the wharf site owned by the company is the Danube River. The site is located in the Eastern Industrial Zone of the town of Rousse. Transportation of raw material will be done by using three special self-propelled barges for loos, each of them with useful capacity of 1 000 tonnes. Transportation of raw material will be carried out by three specialized self-propelled barges with bulk capacity of 1000 t. The payload of a barge is actually an average 900 t due to the presence of about 10% "dead load" - material on the bottom of the barge that cannot be scraped up by the jib crane. Each barge will make 1 course a day or a total of 3 barges loaded with raw material will arrive at the wharf for unloading per day.

Transportation step by step: maneuvering and berthing of the barge to the loading side of the dredge, regular change of position for even distribution of the material along the transport vessel until it is fully loaded, travelling to the wharf, mooring on the quay, unloading of material ashore by a grab crane, and the barge sailing empty back to the dredge for subsequent loading.

**Unloading of Material on the Wharf**

Implementation of the investment plan will involve changing of the existing infrastructure of the wharf located in the Eastern Industrial Zone of the town of Rousse (*fig. I.3.-1*).

***Fig. I.3.-1: Wharf***

Existing buildings on the wharf will be demolished and site for unloading of material and buffer depot for temporary storage of 17,000 tons of alluvial materials will be prepared.

Caravans along the south fence will meet the housing and administration needs by providing a checkpoint, administration office, changing room with showers and toilets, accommodation for eating with kitchenette, water purification installation and transformer substation/1x650. Appendix No 2 is a schematic of existing and newly constructed buildings and facilities on the wharf.

The site is to be equipped with a small treatment plant type ACO Clara 5-10 with hydraulic load of 0.75 to 1.05 m3 per day. Inflow and outflow of the plant is controlled by gravity.

Purified water will be discharged in the Danube owing to the certified parameters of the plant allowing a high degree of water purification.

Works on site will be performed in shifts with additional lighting provided for night time.

In order to optimize the workflow and, in particular, the unloading of sediment material from barges one of the existing 5-ton jib cranes will be dismantled and a 15-ton electricity-powered grabbing jib crane will be mounted..

The adopted flow sheet provides for the grapple crane to unload excavated rubble directly on dumper trucks. In rare cases, only in the absence of a regular supply of dumper trucks, the crane will unload the rubble on a pile along the crane runway. This ensures independence of the unloading process from the transportation of the raw material by dumper trucks to a sorting and treatment site, and full utilization of the production capacity of the crane.

The purpose of the buffer depot is to provide certain quantities of raw material during short stays of extraction, transport and unloading facilities.

The material loaded on dumper trucks will be covered with tents and transported to an industrial site owned by the company and equipped with a sorting and treatment installation for processing of alluvial materials from the Danube River and concrete unit on plot with identification No 63427.8.1076 from neighbourhood No 1 located at a distance of nearly 1 km from the wharf. Fig. I.3.-2 shows the location of the sorting and treatment installation and the wharf and the most likely route for raw material transportation.

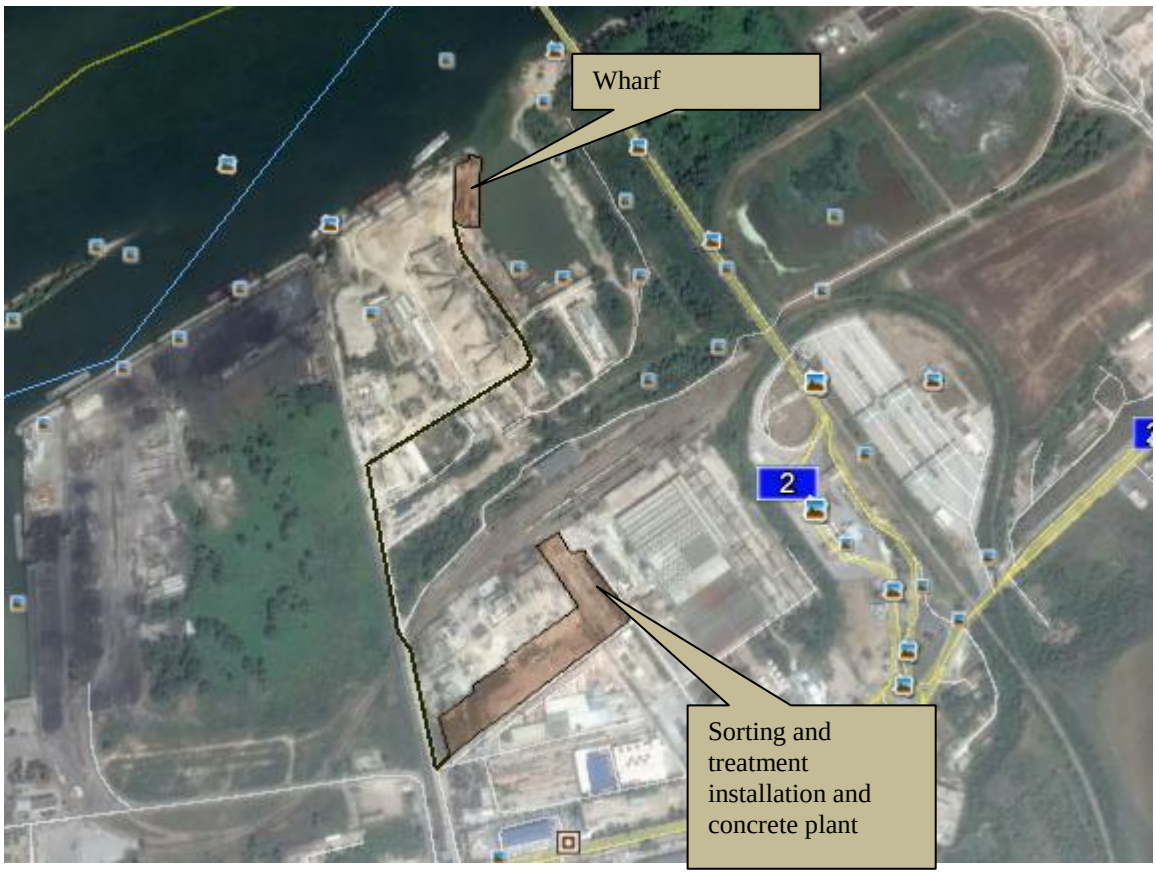



***Fig. I.3.-2: Location of wharf and sorting and treatment plant***

——— most likely route for raw material transportation

Plot of land no 63427.8.1076 of neighbourhood 1 as per the plan of the town of Rousse, Eastern Industrial Zone is outside the scope of the current Investment Proposal.

Alternatively, extracted material will be dispatched with covered road transport vehicles to the market for processing by other entities or for direct utilization.

**Mode of operation, mining and transportation equipment**

- 230 working days a year;

- 7 days a week
- including 6 days of mining and 1 day for repairs and maintenance;
- 8 working months;
- 12 working hours a day.

Preliminary project estimates on mining productivity reach 300,000 cubic meters a year or 1,500 cubic meters a day.

Sample forecast schedule for annual operation of the site

***Table I.3.-1:***

| Month | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Non working months due to low temperatures and high water level | | | | | | | | | | | | |
| Non working months during the breeding season of sturgeon and birds | | | | | | | | | | | | |
| Working months | | | | | | | | | | | | |

This schedule may be changed depending on weather conditions, high water of the river and the technical capabilities of extraction equipment.

**Human resources**

- work shift foremen – 2
- workers required for the dredge – 12
- workers required for barges – 9
- workers required for the grabbing crane – 2
- people necessary for the dispatch office – 4
- people required for wheel loaders – 4
- people required for the dumpers – 8

The total number of people employed in the activity amounts to 41 people.

**Methods of exploitation**

The technology of process implementation during the extraction of sand and gravel is directly related to certain characteristics of alluvial materials subject to extraction. These are naturally deposited and thickened, but uncombined materials relating to a category of heavy soils of the earth extracted directly from their location using floating dredges.

Extracted raw materials is transported by specialized self-propelled barges for loos with useful capacity of 1 000 tons each. Unloading of raw material from the barges to the coast is done by a jib crane with grabs.

## 4. Description of infrastructure

**Water Supply**

- *Mishka Section*

The investment proposal does not provide for the construction of water intake facilities from either surface or groundwater.

The extraction will be carried out by dredging and transport - with barges.

- *Wharf, unloading site*

The investment proposal does not provide for the construction of water intake facilities from either surface or groundwater.

Construction of additional water supply system to the site is not envisaged.

***The following will be used for the implementation of the investment proposal:***

*Drinking water*

- *Mishka area*

Drinking water for the workers on the dredger and barges will be provided from an external source by the company carrying out the extraction and transport.

- *Wharf, unloading platform*

The ten workers on site will receive supplies of bottled water.

*Water for production and technological needs*

According to the adopted plan for the extraction, transportation and storage of extracted material, such water will not be necessary.

*Water for Domestic Use*

- *Mishka Area*

Water quantities required for domestic use will be stored in special tanks on the dredger and transport barges respectively. The tanks will be filled up at certain areas according to the arrangements of the company owner of the dredger and barges.

- *Wharf, unloading platform*

Necessary water quantities during operation for staffing of 10 people will be about 0.5 $m^3$ per working day. Personnel's personal hygiene needs will be met at the housing and administration section of the site. Water will be supplied via the urban water supply system on the base of a contract with the water operator.

**Sewage**

*Wastewater flows that will be generated during implementation of the investment proposal*

*Industrial wastewater*

The planned extraction technology, mode of transport and handling will not lead to formation of industrial waste water.

*Domestic Wastewater*

- *Mishka Section*

Domestic wastewater will be generated on the dredger and transport barges hired from an outside company.

According to the IP, the crew of the dredge will consist of 6 people, and that of the barge - of 3 people. Extracted raw material will be transported by three barges.

*According to expert estimates the total volume of domestic wastewater will amount to about 0,75 $m^3$ per working day.*

Article 10.03, item 1 of Chapter 9 of the Navigation Rules on the Danube (adopted by virtue of Council of Ministers Decree No 83 of 05.04.2013 and promulgated in SG 35/2013)" prohibits the discharge, issuance or release from ships navigating the Danube of waste formed in the process of operation of the ship and containing waste oils or lubricants, as well as household waste, treatment waste, waste stream or other specific waste.

Article 10.03, item 3 states that household streaming waste mixtures can be discharged or released into the waters of the Danube only in accordance with "Recommendations on the organization of the collection of waste from ships sailing the Danube," of the Danube Commission.

Article 10.04, item 3 requires the commander to ensure collection on board and separate disposal at the receiving facility of treatment waste and waste streams.

- *Wharf*

*Household waste generated by construction workers*

The investment proposal does not provide for generation of domestic wastewater during reconstruction of the wharf. Chemical toilets maintained by a specialized company will be provided on site.

*Household waste generated by production workers*

Certain quantities of household and sanitary sewage and wastewater will be generated in the administrative premises and kitchen. Taking into account the number of workers on site – 10, the amount of wastewater will not exceed 0.5 m3 per working day.

The site is to be equipped with a small treatment plant type ACO Clara 5-10 with capacity from 0.75 to 1.05 m3/day. Inflow and outflow of the plant is controlled by gravity.

Purified water will be discharged in the Danube owing to the certified parameters of the plant allowing a high degree of water purification.

***Implementation of the project requires issuance of authorization under the Water Act for extraction of alluvial sediments, and authorization for discharge of treated fecal waste into the Danube.***

*3) Storm water*

- *Mishka Section*

The extraction area is located in the bed of the Danube; therefore storm water streams will not be formed.

- *Wharf and unloading site*

As the site is situated on the river bank storm water streams will drain away in the surrounding land and the river.

**Construction of new or modification of existing road infrastructure**

The transport corridor for transportation of sand and gravel extracted from the Mishka section to the wharf owned by the company is the Danube River.

The material from the longitudinal pile will be loaded onto four 27-ton dumpers by a front loader. The loaded material will be transported with road vehicles.

The investment plan does not envisage changes in the existing road infrastructure in the area or construction of new infrastructure. The wharf is located approximately 1000 meters from the crushing and sorting plant in the Eastern Industrial Zone of the city Rouss, the two of them connected by an existing road network (see *fig. I.3.-2*).

**Power Supply**

The site for unloading and realization of extracted materials will be powered with electricity from existing technical communications.

## 5. Main raw materials, natural resources and energy resources needed and used in the construction and operation of the facility

River sediments, sand and gravel, are a useful natural resource that is the nature or subject matter of the proposed activity. The estimated dynamic reserves of alluvial materials in the outline of the approved area subject of the investment proposal for extraction of sand and gravel in the Danube River are about 2,475,047 cubic meters.

The investment proposal does not provide for the construction of water intake facilities from either surface or groundwater. The extraction will be carried out by dredging and transport - with barges.

The following will be used for the implementation of the investment proposal:

**Drinking water**

Mishka area

Drinking water for the workers on the dredger and barges will be provided from an external source by the company carrying out the extraction and transport.

Wharf, unloading platform

The ten workers on site will receive supplies of bottled water.

**Water for production and technological needs**

According to the adopted plan for the extraction, transportation and storage of extracted material, such water will not be necessary.

***Water for Domestic Use***

*Mishka Area*

Water quantities required for domestic use will be stored in special tanks on the dredger and transport barges respectively. The tanks will be filled up at certain areas according to the arrangements of the company owner of the dredger and barges.

*Wharf, unloading platform*

Necessary water quantities during operation for staffing of 10 people will be about 0.5 $m^3$ per working day. Personnel's personal hygiene needs will be met at the housing and administration section of the site. Water will be supplied via the urban water supply system on the base of a contract with the water operator.

Other natural resources or raw materials will not be used during exploitation of the deposits.

Energy sources are:

- Diesel fuel for extraction, transportation and storage of bulk material - 908 tonnes per year.
- oils - 24 tons per year.
- Electricity for the unloading site on the wharf – 390,000 kWh.

### 6. Social and economic impact of implementation of the project

The investment proposal for the extraction of sand and gravel from alluvial sediments from the bed of the Danube, Mishka section (from km 462.0 to km 459.4) in the area of Babovo, Municipality Slivo Pole is dictated by the demand for this type of building materials . Implementation of IP:

- will achieve development of production functions by utilizing the available natural resources;
- will create additional employment opportunities, which will improve the economic opportunities of the region.

## II. Alternative locations and/or technologies, and the reasons for their choice, considering the impact on the environment, including the "zero alternative"

### 1. Location Alternatives

Alternative location options are few, since the displacement of the work site to another area of the riverbed should be consistent with the requirements of navigation on the river, and the requirement to minimize possible impacts on protected areas.

Extraction of alluvial sediments by dredging is carried out periodically in the critical sections to maintain shipping (navigation) conditions in the Lower Danube. The proposed investment project falls exactly in this area where passage of vessels is impossible due to accumulation of bottom sediments.

Commercial extraction of alluvial deposits is always preceded by geological studies of the area required to prove the presence of alluvial deposits. The riverbed of the Danube from the village Mechka to the village Ryahovo was subject to study in 1964 by PIES "Energoproekt" at the request of the Ministry of Constructions.

Five sections were studied:

- Stalpishte section – from 520 to 511 km
- Luylyak section – from 507 to 502 km
- Rousse section – from 499 to 498 km
- Marten section – from 480 to 471 km

- Ryahovo section – from 467 to 461 km

Stocks in the studied areas are given as follows: 1,685,320 m3 in Stalpishte section, 674,700 m3 inMarten section and 3,856,492 m3 in Ryahovo section-. All reserves are calculated as category C1 dynamic reserves. Exploited were also river sediments near areas:

- Luylyak section – from 507 to 502 km,
- Marten section from 581 to 570 km (the deposit area is excluded),
- Rousse section from 499 to 498 km and
- Stalpishte section from 520 to 510 km (the deposit areas are excluded) proved to be futile.

Applied for and approved extraction area is 593,593 m2, located north - northwest of Mishka Island in Bulgarian territorial waters (from 462.0 to 459.4 km). It is delineated by points number 1 to 7 with geographical coordinates in WGS-84 system, according to the attached register in the decision of the Executive Agency "Exploration and Maintenance of the Danube" - the Ministry of Transport, reflected in letter No II -2-1059 / 05.11 .2007 (Annex No 1.2-2). There are also the coordinates of the field as per the Romanian measurement system.

The site has been approved by the Ministry of Defence by letter Reg. No 11-00-445/18.06.2007. The same does not affect existing protected areas under the Protected Areas Act (SG. 133/98, last. amend. and suppl. SG. 103/2009 amend. SG 98 of 28 November 2014. amend. SG 61 of 11 August 2015).

Key factors in determining the upper sections were:

- The area for extraction to be in Bulgarian territorial waters;
- remoteness from the fairway and works in the riverbed not impeding river traffic;
- distance from the riverbank to be sufficient to exclude erosive action caused by extraction works;
- Minor change of hydraulic and hydro-morphological conditions in the river due to the deepening of the river bed in the area of extraction.

**Wharf**

The wharf site for unloading of extracted alluvial sediment deposits is located in the eastern industrial zone of Rousse - owned by the company. The area is 4558 m2. It is delineated by points 1 to 14 (*Appendix No 2*). The wharf is port for handling of general and bulk cargo licensed by the Ministry of Transport.

## 2. Technological alternatives

The process of extraction of river bottom sediments near Mishka Island will employ a floating bucket dredge type KS - 250, which has no alternative under the given conditions, i.e. 150 mm boulders. The dredge is equipped with endless multi bucket chain of buckets with capacity of 250 liters. The specific extraction process is carried out via removal of sediment material from the bottom of the river by scraper (250-liter) buckets.

Extraction of alluvial materials (sand and gravel) from the Danube River will be done by using floating multi-bucket dredger, after which the material will be transferred to a drying sieve and via a rubber conveyor belt to self-propelled barges for transportation to the wharf.

Material will be unloaded on the wharf by a 15-ton grabbing jib crane on a longitudinal pile, parallel to the crane runway. Completely drained materials will be loaded on dumper trucks by front loaders and transported to a nearby sorting and treatment installation for primary processing.

There is no other technological alternative for this section of the river.

## 3. „Zero Alternative"

"Zero alternative" is a description of the current situation and its consequences in cases where the investment plans offered, cannot be carried out. In this case, zero alternative would mean preservation of the current situation and parameters of the components of the environment.

The investment proposal envisages the extraction of sand and gravel through advanced technological solutions for mining on a relatively small area of the water body – the Danube. All legal requirements for environmental protection will be fulfilled. Slight impacts on components and environmental factors are expected; however, the health of the population of the nearby villages and health of workers will not be jeopardized. No mining waste or emissions of hazardous and noxious substances will be released.

Failure of the investment proposal for extraction of alluvial materials from the bed of the Danube off Mishka Island is expected to maintain the current environmental status of species and habitats in the potentially affected area, as well as the existing impacts associated with shipping, fishing, poaching, water pollution and other factors.

Such an alternative will not have a positive impact on the target fauna, given the strong degradation occurring due to accumulation of organics and silting of the riverbed. Self-purification of this stretch of the Danube is not expected. This means that the worst environmental conditions for hydrobionts will remain. Implementation of the investment proposal and extraction of alluvial bottom sediments from the river bed is likely to improve the environmental conditions and suitable habitats for breeding of demersal species as well as to normalize hydrocenoses.

These circumstances give no reason for application of "zero alternative" to this investment plan.

Furthermore, the "zero alternative" prevents the use of a natural resource that has proven itself in time as guaranteed and sustainable resource thanks to sustainable sediment flow of the Danube. Moreover, the "zero" alternative hampers the improvement of navigation conditions for the commercial, tourist and other shipping in the Danube area. The region of Rousse has no geological preconditions for the development of similar investment proposals with similar parameters in smaller internal rivers.

Disadvantages of "zero" alternative can be reduced to:

- Failure to provide employment in the region - about 41 jobs during continuous operation for more than 12 years.
- Absence of payments for authorized use of the water body for the planned extraction of river sediments including direct and indirect taxes and social security contributions, which would be charged on the implementation of the investment plan.

## III. Description and analysis of components and environmental factors that will be significantly affected by the investment proposal, as well as the interaction between them

### 1. Air

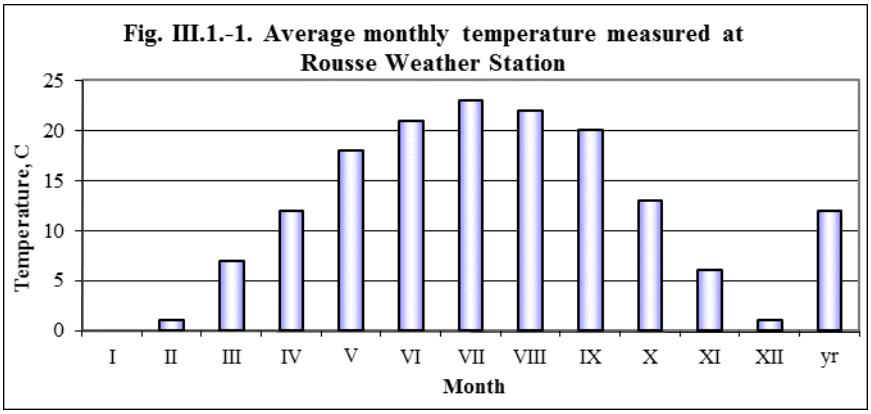
#### 1.1. A brief description of climate and weather factors, temperature, wind, precipitation, fog

The area of Rousse falls within the temperate continental climatic zone, which is a continuation of the Central European temperate continental climate zone. The climate is formed under the influence of different moist oceanic air masses transformed by local topography, and by northeast continental air masses during the cold months. The Danube has a great effect on the local climate. Cold Arctic air masses coming from the north and tropical air masses from the south have a lesser effect on the climate.

**Temperature**

Winters are characteristically cold (lowest observed temperature was -27.7°C in January), and summers are hot (highest observed temperature was +44.0°C in July). Diurnal temperature range varies from 6.0°C in December to 12.6°C in August. The annual average temperature is 12.0°C. Variations in average monthly temperatures are shown in fig. III.1.-1.

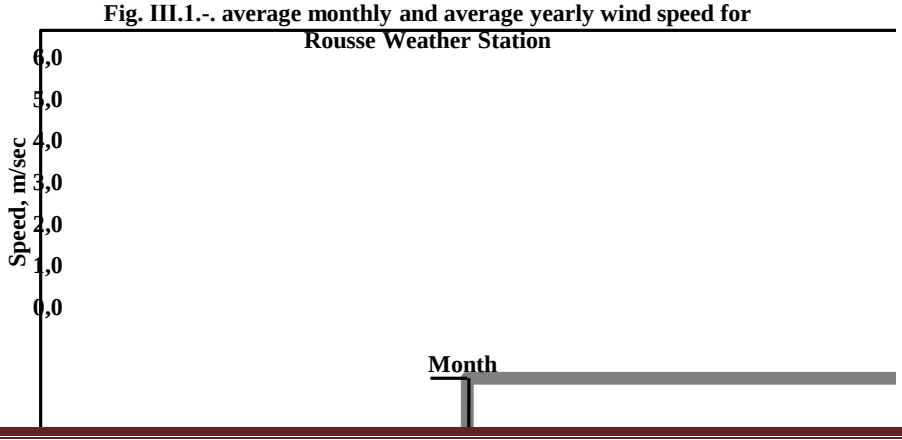
**Fig. III.1.-1. Average monthly temperature measured at Rousse Weather Station**




**Wind**

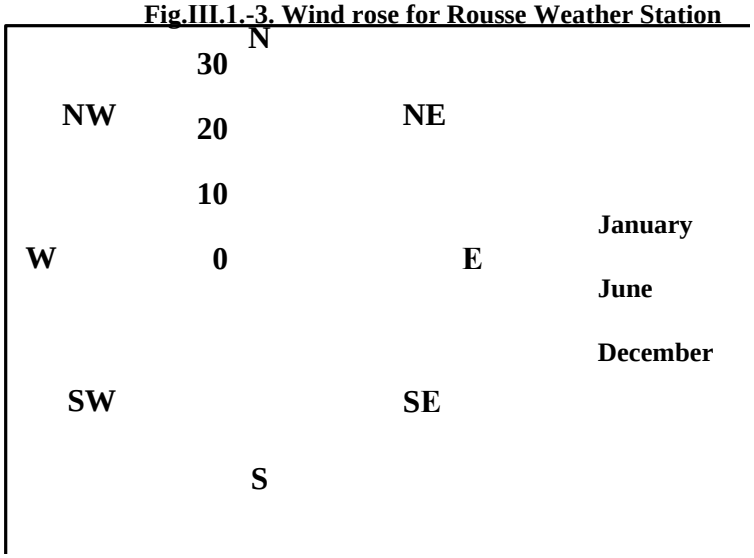
The average wind speed as per data collected by Rousse Weather Station is 4.6 m/s. It is highest in March and April (5.3 m/s) and lowest in September and November (around 3.9 m/ s). The share of windless periods is 24.4%.

**Fig. III.1.-. average monthly and average yearly wind speed for Rousse Weather Station**



**Wind Rose**

**Fig.III.1.-3. Wind rose for Rousse Weather Station**




The wind rose for Rousse Weather Station presented in Fig. III.1.-3 shows that the main wind direction during most of the year is from northeast (about 23% of cases, mainly in the winter months) and southwest (about 23% of cases, mainly during the summer months). Winds blowing from the north and south are significantly lower in frequency and cover about 5% of cases. The main reason for the cited wind direction is the course of the Danube near the city, which coincides in direction (from southwest to northeast).

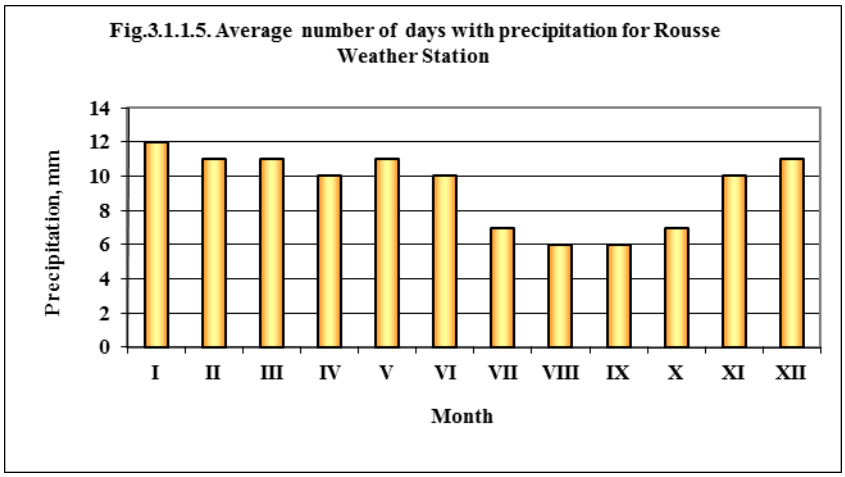
**Precipitation**

The amount of average monthly precipitation as per data collected by Rousse Weather Station is presented in Fig. III.1.4. The lowest amount of precipitation falls in January and February (about 25 mm) and the highest between May and July (up to 51 mm). The average annual precipitation is about 450 mm. In some years, these values range from 340 to 780 mm.

**Fig.III.1.-4. Average monthly precipitation for Rousse Weather St**

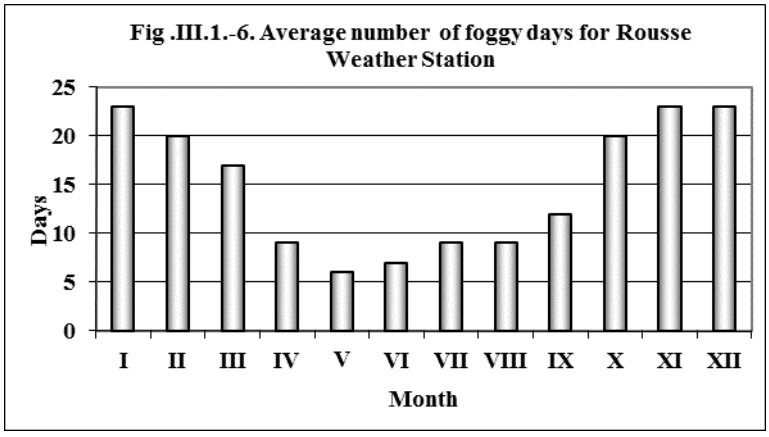

The average number of days with precipitation by month is shown in Fig. III.1.-5. The annual number of days with precipitation reaches 112, which is about 30% of the days in the calendar year. Both the amount of precipitation and the number of wet days is directly related to ambient air quality (AAQ) in the area, particularly with regard to particulate matter (PM). Precipitation partially dissolves gaseous pollutants and causes co-precipitation of particulate

pollutants. Wet roads slow the process of PM suspension into the air until their drying-out. It is a known fact that days with precipitation exhibit a significant reduction in the concentrations of PM in ambient air of settlements. The opposite process occurs when road surfaces are dry. Poorly maintained infrastructure (sidewalks, lawns, illegal parking lots, etc.) leads to rainfalls washing down a significant amount of soil on the roadway forming unwanted depositions. After drying out such depositions are suspended in the air by traffic and this often leads to excessive pollution.




**Fog**

Fig. III.1.-6 presents data on the average number of days with fog as per data collected by Rousse Weather Station. These data include all cases of fog, including mist and fog lasting more than one day. Thick fog lasting more than one day is most often formed in December (average 11.4 days) and January (average 10.8 days). Fog is produced by inversion conditions (highly resistant atmosphere). The wind speed is low and rarely exceeds 1 m / sec. The lack of turbulence worsens pollutant dissipation and creates conditions for higher accumulation of pollutants. Fog lasting more than one day increases such tendencies.




## 1.2. Ambient Air Quality

Recent data on air quality in the region of Rousse may be obtained from the 2011-2013 Environmental Condition Report of RIEW Ruse.

Data coming from real-time automatic air quality control systems in Ruse show no significant change in air quality in comparison to 2012. The levels of primary pollutants sulphur and nitrogen oxides, carbon monoxide, benzene, and ozone remain low. The number of registered PM10 exceedances in Rousse in 2013 is higher by 14% than that in 2012, and the annual concentration is higher than normal - 46.62 mkg/m3.

Implementation of this investment plan is not expected to significantly affect air quality in the city of Rousse. Expected emissions from the diesel-fuelled dredger and barges would be minor and separated by a considerable distance from the central urban area of the city of Ruse. Similar assumption can be made for emissions from diesel engines of the four dump trucks and the front loader operating on the wharf.

Construction works (demolition of existing buildings on the wharf) are expected to increase generation of construction dust. They are to be finished within one month.

## 2. Surface and groundwater

### 2.1. Surface water (hydrographical network)

Implementation of the project will affect the municipalities of Rousse and Slivo pole, as the section selected for extraction, unloading and storage of sand and gravel is located near them.

Mishka Section approved for the extraction of aggregates / sand and gravel / is located in the river bed of the Danube to the north-northwest of Mishka Island from km 459.4 to km 462.0. Fairway and the main river route pass to the north of the island and the future extraction site respectively, along the deeper Romanian armlet. The area of Mishka site for gravel and sand extraction from alluvial sediments in the bed of the Danube river is 433,626 m2, 2.6 km long and 300 m wide in the southwest part and up to 100 m in the northeast part. Right across Mishka section on the Bulgarian coast is situated Ryahovo port, which is currently not operating. Distance downriver from the extraction area to the bridge over the Danube in Rousse is 29.5 km.

The extraction area is located within the Bulgarian part of the river, at the mandatory distance of the river's mainstream (327 m in the southwest and 194 m in the northeast.).The nearest settlements are the villages Ryahovo and Babovo, Slivo pole Municipality.

The extraction area subject to the investment project for extraction of sand and gravel from the bed of the Danube is managed by the Danube Water Management Directorate with headquarters in the town of Pleven.

The Danube flows adjacent to the unloading platform and Mishka extraction site is located within the water body. According to the designation of surface water bodies by the Danube Water Management Directorate, the Danube between Novo Selo and Silistra is designated as water body code BG1DU000R001, name Danube RWB01 and length 650.65 km.

The Danube is the only major European river that flows from west to east. The Danube originates in the Black Forest of Germany, then flows for 2,852 km. and empties into the Black Sea via the Danube Delta (4300 km2) in Romania and Ukraine. The Danube's length, unlike that of most rivers, is measured from the mouth, specifically the old lighthouse in Sulina, not the source. That is why river length does not include the main branch of the delta and the river Breg, the source of the Danube. Catchment area of the river has an area of 802,266 km ².

Danube tributaries on the territory of Bulgaria are relatively small. Most of them originate from the Fore Balkan and Stara Planina. An exception is the largest tributary Iskar, which springs from the Rila and crosses the Balkan Mountains.

## 2.2. Ground waters - hydrogeological conditions and factors influencing formation of ground water

Groundwater is the water found underground in the cracks and spaces in soil, sand and rock. Ordinance No 1 of 10.10.2007 for the study, use and protection of groundwater classified groundwater bodies in the following manner:

- According to the structure of aquifers - single, layered and heterogeneous;
- according to the hydraulic characteristics of the aquifer – confined, unconfined, mixed;
- according to the filtration properties - homogeneous, heterogeneous and particularly heterogeneous.

***Hydrological conditions and factors influencing the formation of groundwater***

Groundwater in Bulgaria are widely spread and play an important role for the formation of the natural environment and as an important water resource for meeting the needs of people and the economy as a whole. Groundwater in Bulgaria have their own pools, where the processes of quantitative accumulation, movement and formation of hydrochemical properties take place.

Factors that determine the conditions for the formation of groundwater, their dynamics and their regime are many, but the most important are:

1) Physical and geographic - relief, climate, hydrology, hydrography;

2) Geology - geological structure, lithological composition of the rocks and tectonic blocks.

According to the hydrogeological division of Bulgaria (Antonov Hr., D. Danchev, 1980) the Bulgarian territory situated against Mishka extraction area falls within the Moesian hydrogeological region.

The diversity of rocks of different lithological composition and structural position determines the formation of different types of groundwater.

*Natural and operational resources*

According to the nomenclature of the Danube Water Management Directorate and MoEW for the water bodies in the area in which the investment proposal is situated / letter ref. ZDOI-254 / 05.11.2010 of DWMD Pleven (Appendix No 2) the following groundwater bodies have been identified:

***1. Name of groundwater body (GWB), in the area of which the investment proposal falls (wharf unloading platform - letter no 378 / 04.07.2013 DWMD) - Porous aquifer in Quaternary deposits - Brashlyanska Valley;***

***Code:****BG1G0000Qal010*;

***water body area - 217 km2***;

***GIS layer*** *1*;

***Type of containing collector:****porous*;

***type -** unconfined*;

***Lithological structure of the aquifer - gravels and sands and sandy clays***;

***Characteristics of layers covering GWB recharge area: sandy clay loam and clay;***

***Average thickness - 9 m**;*

***Average water conductivity, m2 / day:** 1250;*

***Average rate of filtration, m/day:** 139;*

***GWB recharge area, km$^2$:** 217;*

***Average modulus of groundwater flow, l/sec/km$^2$:** 4,0;*

***Natural resources of GWB, l/sec:** 870;*

***Directions and degree of exchange with surface water:** directly with the Danube;*

***Total water abstraction from GWB, l/sec:** 1158,0;*

***Impact of human activity on the chemical state of GWB:** 0;*

***Protective effect of coating layers:**favourable:0%, average: 10%, poor: 90%*

***Identified aquatic or terrestrial ecosystems or surface water bodies, to which GWB is connected:***

*-PA "Kalimok Brashlen";*

***2. Name of groundwater body (GWB):** karst waters in the Rousse formation;*

***Code::** BG1G0000K1b041;*

***water body area, km$^2$:** 6592;*

***GIS layer** 5;*

***Type of containing collector:** karst;*

***Type of GWB:** unconfined;*

***Lithological structure of the aquifer:** intensely fissured and karstified carbonate sediments;*

***Characteristics of layers covering GWB recharge area:** loess, alluvial deposits and Pliocene clays, sands and limestones ;*

***Average thickness, m:** 160;*

***Average water conductivity, m2 / day:** 500;*

***Average rate of filtration, m/day:** 3;*

***GWB recharge area, km$^2$:** 3723;*

***Average modulus of groundwater flow, l/sec/km$^2$:** 3,0;*

***Natural resources of GWB, l/sec:** 8240;*

***Directions and degree of exchange with surface water:** difficult;*

***Total water abstraction from GWB, l/sec:** 789,0;*

***Impact of human activity on the chemical state of GWB:*** *NO3, PO4;*

***Protective effect of coating layers:****favourable:0%, average:70%, poor:0%;*

***Identified aquatic or terrestrial ecosystems or surface water bodies, to which GWB is connected:***

*- Srebarna Natural Reserve: Wetland, enormous wealth of avifauna;*

*- PA "Kalimok Brashlen";*

*- PA "Garvanski blata" in v. Raven: natural habitat of rare waterfowl and plant species.*

*Transboundary water bodies agreed with Romania*

***3. Name of groundwater body (GWB):*** *Malmian-Valanginian Karst Water;*

***Code:*** *BG1G0000J3K051;*

***Area, km$^2$:*** *13033;*

***GIS layer*** *6;*

***Type of containing collector****: karst;*

***GWB type:*** *confined;*

***Lithological structure of the aquifer:*** *unevenly karstified and fissured limestone with dolomites and dolomitized limestone, siltstones, sandy marl;*

***Characteristics of layers covering GWB recharge area:*** *loess deposits in the open parts;*

***Average thickness, m:*** *810;*

***Average water conductivity, m2 / day:*** *2430;*

***Average rate of filtration, m/day:*** *3;*

***GWB recharge area, km2:*** *120;*

***Average modulus of groundwater flow, l/sec/km$^2$:*** *2,0;*

***Natural resources of GWB, l/sec:****15779;*

***Directions and degree of exchange with surface water:*** *difficult;*

***Total water abstraction from GWB, l/sec:*** *871,0;*

***Impact of human activity on the chemical state of GWB:*** *0;*

***Protective effect of coating layers:****: favourable:95%, average: 5%, poor:0%;*

***Identified aquatic or terrestrial ecosystems or surface water bodies, to which GWB is connected:*** *-*

***4. Name of the groundwater body (GWB,) coordinated with Romania, that is outside of the Investment Proposal area:*** *karst and porous waters in Neogen – Sarmat – Dobrudzha;*

***Code:*** *BG1G000000N049;*

***Area, km$^2$:*** *3308;*

***GIS layer*** *3;*

***Type of containing collector:*** *karst;*

***GWB type:*** *unconfined;*

***Lithological structure of the aquifer:*** *limestone, sands, sandstones and clays;*

***Characteristics of layers covering GWB recharge area:*** *лъос, льосовидни глини и глини;*

***Average thickness of GWB, m:40,0-60,0****;*

***Average water conductivity, m2/day:*** *200-250;*

***Average coefficient of filtration, m /day:*** *10-20 (до 40);*

***GWB recharge area, km2:*** *3308;*

***Average modulus of groundwater discharge, l/sec/km2:*** *2,0;*

***Natural GWB resources, l / sec:*** *1310;*

***Direction and degree of exchange with surface water: one direction****;*

***Total GWB water abstraction, l / sec:*** *391;*

***Impact of human activity on the chemical status of GWB:*** *0;*

***Protective effect of coating layers:****favourable:0%, average:50%, poor: 50%*

***Identified aquatic or terrestrial ecosystems or surface water bodies, to which GWB is connected****:-*

### 2.3. Quantitative and qualitative characteristics of water resources at the site and category of the receiving water bodies

*Surface waters monitoring network*

Water monitoring is performed on the basis of Order issued by the Minister of EW, in accordance with the new programs for control and operational monitoring developed in accordance with Art. 8 WFD. Water Monitoring System is to assess the quantitative and qualitative characteristics of water including wastewater, timely establishment of negative processes, forecasting their development, prevention and mitigation of negative impact and determining the degree of effectiveness of the currently implemented measures for use and protection of water.

#### 2.3.1. Quantitative and qualitative characteristics of surface water resources on the territory and category of receiving water bodies

*Quantitative Characteristics*

- Precipitation

The area of implementation of the Investment Proposal falls within the temperate continental climatic zone, which is a continuation of the Central European temperate continental climate zone.

It is characterized by cold winters / lowest observed temperature was -27 ° C / and dry, warm summer / highest observed temperature was + 42,2 ° /. The Danubian terrace is open to northeasterly winds.

The area is relatively dry, the average annual rainfall is 562 mm and the average annual number of days with precipitation is 138.9 days. The snow cover is about 14 cm thick, and the average annual number of days with snow cover is 48.4. Rainfall regime poses a number of problems associated with surface drainage, especially due to high groundwater.

- River runoff

The total river runoff of the Danube, measured at Tulcea is 6500 m³ / s, which corresponds to a specific flow of 8,1 l · s-1 · km-2 - the result of rainfall throughout the catchment area ranging from 2000-3000 mm in alpine areas to up to 600 mm in Moravia, average value about 800 mm. Various tributaries of the Danube have different hydrological regime – rain-fed oceanic in western Bavaria, mountain snow-fed and rain-fed in Austria, lowland snow-fed and rain-fed in Hungary, lowland snow-fed in Romania.

The complex snow-fed and rain-fed hydrological regime of the Danube reflects these diverse influences. Up to Ulm the river is influenced by the ocean with the maximum high water in winter. Then the Alpine tributaries such as Lech, Isar, Inn, and Enns turn the Danube itself into an eighty per cent alpine river, sensitive to winter water retention and deep melting snow. Thus, at Linz the minimum runoff is in December, and the maximum - in May or June with average value of 1710 m³ / s. The influence of melting snow is noticeable by Vienna (average flow of 2237 m³ / s), with a peak in June further reinforced by the summer rains, typical for Central Europe. These rains could cause catastrophic flooding eg. the Danube runoff exceeding five times its normal rate and reaching 8,000 m³ / s in June 1965 and in 1970 and 9000 m³ / s in July 1899.

In Budapest lowland snowmelt holds the high water at its maximum during May-June The confluence of the waters of the Sava and Tisa shifts high water earlier in April-May, and the lowest level is in June-September, for example, in Giurgiu, where runoff reaches 5900 m³ / s. Under the Iron Gate the Danube River becomes sensitive to climatic regime close to that of the steppes, which leads to very low summer discharges.

The Danube is the main drainage artery of the rivers in Northern Bulgaria. Water levels in it vary widely depending on the existing physical and geographical conditions of the large catchment area. The water supply system "Iron Gate - 2" located outside Bulgarian territory is also a factor. The river is the deepest in April, May and early June. Low water is most common during the period from September to November with a minimum in October.

Systematic measurements of the runoff regime of the Danube are conducted at Rousse station, which is suitable for characterization of the river flow near the IP site.

The main hydrographic elements of the Danube at Rousse Station are the following:

- catchment area: 669 990 $km^2$;
- river length: 2 857 km;
- distance to the mouth: 495,6 km;
- average runoff modulus: 9,17 l/s $km^2$;
- average annual runoff: 6145 $m^3$/s;
- minimum runoff: 1 420 $m^3$/s;
- maximum runoff: 15 600 $m^3$/s;

- Average maximum runoff: 11 280 $m^3$/s;
- modulus of the average maximum runoff: 16,84 l/s $km^2$.

The distribution of monthly and annual runoff of the Danube at Rousse is presented in Table III.2.3.1.-1 (data from "Hydrological Studies of the Danube River in the Bulgarian section" BAS, GUHM, IHM, Sofia 1981). As shown, water levels formed in the watershed of the river are stable due to the large catchment area and the presence of constant feeding from tributaries, snowmelt and groundwater. Along with this, though not as contrast, are exhibited maximum spring and summer - autumn minimum runoff.

***Table III.2.3.1.-1: Monthly distribution of the average runoff, m3 / sec of the Danube at Rousse***

| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Qav | 5178 | 5293 | 7109 | 8458 | 8859 | 7899 | 6534 | 5145 | 4499 | 4329 | 4928 | 5466 | 6145 |
| % | 7,15 | 6,66 | 9,82 | 11,3 | 12,23 | 10,56 | 9,04 | 7,11 | 6,01 | 5,98 | 6,59 | 7,55 | 100 |

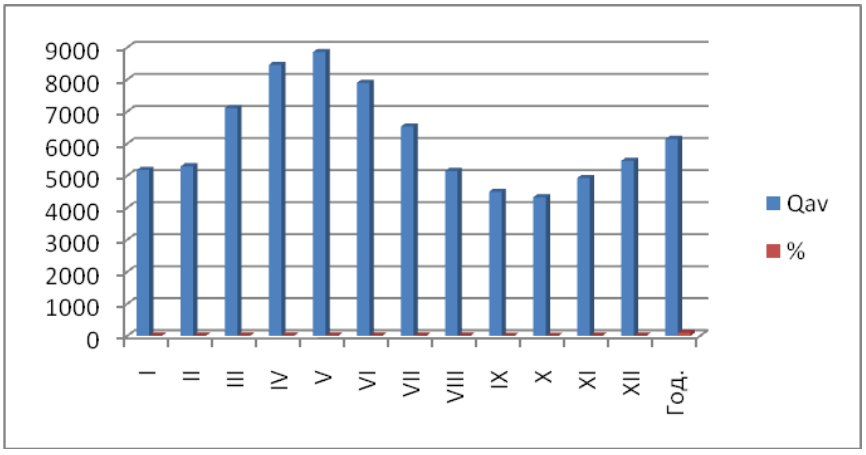



***Fig. III.2.3.1.-1: Monthly distribution of the average runoff, m3 / sec of the Danube at Rousse***

In monthly aspect, greater runoff is formed in April, May and June. In September and October minimum runoff is formed.

Duration of the flow of the Danube has different values. Runoff values of 13 000 $m^3$/s are less likely, while runoff of 8000 $m^3$/s occurs relatively often - once every four years.

***Table III.2.3.1.-2: Flow duration of the Danube at Rousse***

| Duration, % | 0,08 | 1 | 2,35 | 4,15 | 6,46 | 9,76 | 16,24 | 25,37 |
|---|---|---|---|---|---|---|---|---|
| Amount in thousand $m^3$/s | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
| Duration, % | 36,35 | 48,5 | 61,77 | 75,86 | 89,36 | 98,68 | | |
| Amount in thousand $m^3$/s | 7 | 6 | 5 | 4 | 3 | 2 | | |

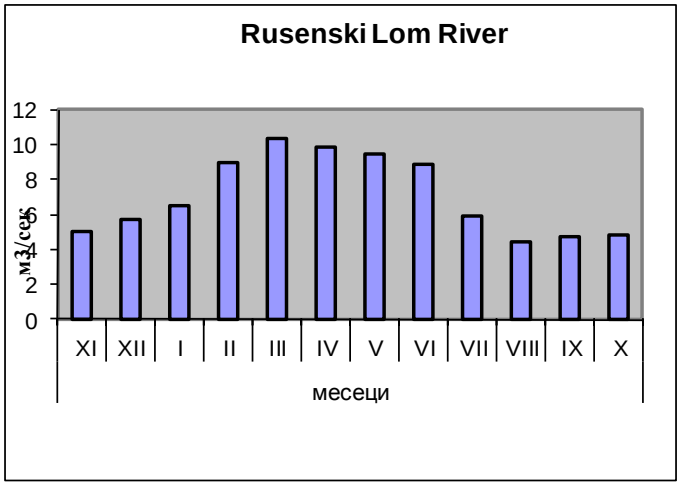
The average water temperature measured at Rousse station is 12,5 ° C. Maximum values of 25° C to 27,5° C have been measured in June, July and August, and the minimum 0 ° C - in December, January, February and March. Information about the quality of the Danube waters is periodically published on the website of the Executive Environment Agency in Sofia in the form of quarterly bulletins on the state of water and the annual report on the state of environment in Bulgaria.

The two main tributaries of the Rusenski Lom River are Cherni Lom and Beli Lom.

The runoff regime is temperate continental, characterized by prolonged high water period (from mid February - March to end of June) when about 60% of the water runs off and summer - autumn low water period (July-November). Peak runoff is usually in March. Rusenski Lom is snow-fed and rain-fed.

Fig. III.2.3.1.-2 shows the average monthly runoff of the river Rusenski Lom at station 31850.

***Fig. III.2.3.1.-2:*** **Average monthly runoff at the mouth, m³/s**




*Emission condition of water bodies*

Water quality is the most significant indicator of the impact of human activity on the natural aquatic environment. The main sources of water pollution giving rise to related issues are agriculture, industry, transport and settlements. Many of these contaminants are constantly discharged into surface and groundwater. Pollutants, mainly organic, decompose under the influence of natural self-purification processes to a certain extent, but some substances cannot be decomposed by natural processes, which requires their elimination or reduction to acceptable environmental limits.

Status of water bodies is subject to the following major categories of loads:

- Significant point sources of pollution of surface waters;
- Significant diffuse sources of pollution of surface waters;
- Significant surface water abstraction;

- Other impacts on surface water - morphological changes and runoff control.

*Issued of point sources of pollution*

Point sources of water pollution are discharges of urban sewage of settlements with over 2000 residents discharging sewage without the required treatment, discharges from urban wastewater treatment, waste water discharges of industrial waste water by industrial sites.

There are no operating industrial enterprises on the territory of the municipality of Slivo pole, with the exception of three large pig farms. There are several small manufacturing workshops of local importance operating in the town Slivo pole and in a number of villages. However, their runoff from industrial activity and pollution load are insignificant. Wastewater that is generated from industrial and communal activities is discharged into the subsurface through septic tanks and absorption wells.

Wastewater formed by pig farm Svinekompleks – Golyamo Vranovo – Invest AD in the village of Golyamo Vranovo, pig farm Svinekompleks – Yudelnik OOD in the village Yudelnik and Pig Farm Svinekompleks Brashlen in the village Brashlen is discharged in the Danube. All three sites have wastewater treatment plants (WWTP) with mechanical treatment only. The facilities are very outdated and do not meet the treatment efficiency requirements. Wastewater is polluted by BOD5, suspended solids, nitrogen and phosphorus. Pollution generated by pigfarms is significant and classed grade 1 in terms of pollution of the Bulgarian section of the Danube.

Table *III.2.3.1.-3* shows the main point sources of pollution of the Danube and its tributaries in Slivo pole Municipality and Rousse Municipality.

***Table III.2.3.1.-3: Point sources of pollution of the Danube***

| ***Code of water body and river name*** | ***Water body length in km*** | ***Point source of pollution*** | ***Water body*** |
|---|---|---|---|
| *BG1DU000R001 The Danube from Novo selo to Silistra* | *650.65* | *"SELVEN-STEFAN STANCHEV" SOLE TRADER, Slaughterhouse at Ryahovo.* | *Gully in the Uratlak area* |
| | | *Svinekompleks – Golyamo Vranovo – Invest AD in Golyamo Vranovo* | *The Danube* |
| | | *Svinekompleks – Yudelnik OOD in Yudelnik* | *The Danube* |
| | | *" Svinekompleks Brashlen " in Brashlen* | *The Danube* |
| | | *ST "Valentin Penev" –dairy farm in Babovo* | *The Danube* |
| | | *GW of Rousse -stream 1* | *The Danube* |
| | | *GW of Rousse -stream 2* | *The Danube* |
| | | *GW of Rousse -stream 3* | *The Danube* |
| | | *GW of Rousse -stream 4* | *The Danube* |
| | | *GW of Rousse -stream 5* | *The Danube* |
| | | *GW of Rousse -stream 6* | *The Danube* |
| | | *GW of Rousse -stream 7* | *The Danube* |
| | | *GW of Rousse -stream 8* | *The Danube* |
| | | *Combustion plant for energy production – stream 1, Rousse* | *The Danube* |
| | | *Combustion plant for energy production – stream 2, Rousse* | *The Danube* |
| | | *Production and trade with wine and spirits* | *The Danube* |
| | | *Production of sugar, molasses and other products* | *The Danube* |
| | | *Port complex "Rousse - West" -stream 1* | *The Danube* |
| | | *Port complex "Rousse - West" -stream 2* | *The Danube* |
| | | *Port complex "Rousse - West" -stream 3* | *The Danube* |

| | | | |
|---|---|---|---|
| | | *Port complex "Rousse - West" -stream 4* | *The Danube* |
| | | *Loading and unloading of goods for export – stream 1* | *The Danube* |
| | | *Loading and unloading of goods for export – stream 2* | *The Danube* |
| | | *Port complex "Rousse - East -stream 1* | *The Danube* |
| | | *Biodisesel production plant, Rousse* | *Collector of " Heavy Machinery "* |
| | | *Ashpond of "HPP Ruse" AD* | *The Danube* |
| *BG1RL120R013 Rusenksi Lom River* | *107,890* | *Enterprise for production, processing and canning of mushrooms – production site, the village Krasen* | *Rusenski Lom* |
| | | *Enterprise for production, processing and canning of mushrooms - mushroom tinning plant, stream 1* | *Rusenski Lom* |
| | | *Enterprise for production, processing and canning of mushrooms - mushroom tinning plant, stream 2* | *Rusenski Lom* |
| | | *GW of Rousse -stream 1* | *Rusenski Lom* |
| | | *GW of Rousse -stream 2* | *Rusenski Lom* |
| | | *GW of Rousse -stream 3* | *Rusenski Lom* |
| | | *GW of Rousse -stream 4* | *Rusenski Lom* |
| | | *GW of Rousse -stream 5* | *Rusenski Lom* |
| | | *GW of Rousse -stream 6* | *Rusenski Lom* |
| | | *Wastewater treatment plant for chemically contaminated wastewater of metal pipes & metalworking enterprise* | *Rusenski Lom* |
| | | *Wastewater treatment plant for chemically contaminated wastewater of "Zhiti" AD, Rousse* | *Rusenski Lom* |
| *BG1DJ100R006 No name* | *7,795* | *Factory for processing of fruits and vegetables, the village Yuper* | *gully* |
| | | *Dairy company, the village Yuper, Kubrat Municipality* | *gully* |
| | | *Intensive rearing of poultry, Sredna kula residential complex, Rousse* | *gully, Batmish area in the neighbourhood Obraztsov chiflik, Rousse* |
| | | *Intensive rearing of poultry, the village Chervena voda* | *gully* |

*<u>Problems posed by diffuse sources of pollution</u>*

Sources of diffuse pollution of surface waters are settlements without WWTP and without sewage, industrial areas without sewage, landfills for municipal, construction and industrial waste, including land use.

Biogenic substances, pesticides and heavy metals are the substances of concern here.

Problems arising from diffuse load of surface waters with nitrogen is mainly influenced by the inflow of groundwater (solutes), and phosphorus load is caused mainly by erosion (imported quantities of solids).

Other contaminants of concern are past pollution and / or hazardous contamination of soil (including landfill accidents) caused by abandoned mining technical equipment or significant dry or wet deposition from the atmosphere.

***Table III.2.3.1.-4: Pollution of surface water from diffuse sources***

| **Water body code and river name** | **Water body length, km** | **arable agricultural land % of water body area** | **Settlement with more than 2 000 residents** | **Sewage network not corresponding to the number of residents in %** | **sensitive zone or catchment sensitive zone** | **existing municipal depot, decares** | **industrial areas** |
|---|---|---|---|---|---|---|---|
| *BG1RL120R013*<br>*Rusenski Lom* | *1078,890* | *48,23* | *Shtraklevo village, Municipality Ivanovo* | *100* | *yes* | - | - |
| *BG1DJ100R006*<br>*No name* | *7,795* | *70,42* | *Marten, Rousse Municipality* | *90* | *yes* | - | **Intensive pig rearing plant,*<br>*"Svinekompleks Nikolovo" AD-lagoon;*<br>** Intensive poultry rearing plant,*<br>*Sredna kula residential complex, Rousse, "Biser Oliva -98" ;* |
| | | | *Nikolovo village, Rousse Municipality* | *100* | *yes* | - | ** Intensive pig rearing plant,*<br>*"Svinekompleks Samuil" AD,*<br>*Brashlen;* |
| | | | *Nova Cherna village,*<br>*Tutrakan Municipality* | *100* | *yes* | - | ** Intensive pig rearing plant,*<br>*Svinekompleks – Yudelnik OOD in Yudelnik - lagoon;* |
| | | | *Ryahovo, Slivo pole Municipality* | *100* | *yes* | - | ** Intensive pig rearing plant,*<br>*" Svinekompleks*<br>*Brashlen" AD,*<br>*Brashlen -lagoon;* |
| | | | *Slivo pole* | *100* | *yes* | *9* | ** Intensive pig rearing plant,*<br>*" Svinekompleks*<br>*Golyamo Vranovo - invest AD,*<br>*Golyamo Vranovo - lagoon;* |
| | | | *Rousse* | *7* | *yes* | - | ** Intensive poultry rearing plant, Chervena voda village, Biser Oliva- 98"* |

Judging by the way of use of land adjacent to surface water bodies it can be assumed that diffuse pressure exists if the structure of the land meets the following conditions: *the share of arable land is greater than 40%; share of root crops, including maize is greater than 20%; share of specific crops (grapes, fruits, vegetables, sunflowers, tobacco, rice, etc.) is greater by 5% by arable land; share of urban areas greater than 15%.*

Land use in % of the area of the water body BG1DU000R001 the Danube from the border at Novo Selo to the border at Silistra, the water body BG1RL120R013 Rusenski Lom and water body BG1DJ100R006 No name is presented in table *III.2.3.1.-5.*

***Table III.2.3.1.-5: Pollution from diffuse sources overview of land use***

| *Water body code and river name* | *Review of land use calculated in % of the area of the water body* | | | | | | |
|---|---|---|---|---|---|---|---|
| | *anthropogenic objects* | | | *agricultural lands* | | *forests* | *others* |
| | *Settlements* | *transport and infrastructure* | *quarries, landfills and construction sites* | *Arable land* | *perennials* | | |
| | | | | | | | |
| *BG1DU000R001 the Danube from the border at Novo Selo to the border at Silistra* | *5,47* | *1,10* | *0,11* | *61,69* | *3,00* | *15,39* | *13,22* |
| *Rousse Lom valley* | | | | | | | |
| *BG1RL120R013 Rousse Lom River* | *6,51* | *1,88* | *0,00* | *48,23* | *3,31* | *19,90* | *20,18* |
| *Danubian Dobrudzha rivers valley* | | | | | | | |
| *BG1DJ100R006 "No name"* | *5,59* | *2,89* | *0,04* | *70,42* | *0,76* | *10,48* | *9,83* |

Agricultural lands occupy 75% of the total area of Slivo pole Municipality and Rousse Municipality, which is a significant amount. Distribution of agricultural lands is the following - fields 90%, permanent crops 2%, forests and farmland 2%, meadows 1% and pastures 5%

A major share of the assortment structure of agricultural production is taken by wheat, feed and industrial crops.

*Problems due to hydro-morphological changes*

As hydro-morphological changes are summarized abstraction of surface water, flow regulation, morphological alterations:

- *problems arising out of water abstraction for drinking, industrial, agricultural, hydropower and other needs;*

- *runoff control issues*

These are problems arising out of construction of hydro power plants, construction of dams, dikes for flood protection, sluices and spillways. Impacts related to hydro-morphological changes significantly affect aquatic organisms as the latter are not able to overcome these barriers;

- *morphological changes*

Disruption of the natural length of rivers, physical changes of the bed, infrastructure development (roads, bridges), engineering and excavation works cause important and significant impacts related to harmful substances loading. Often they deprive aquatic organisms of their habitat and access to nutrients and thus of their ability to survive.

Hydro-morphological changes lead to changes in habitats of species, water pollution with substances of concern, increasing the concentration of biogenic and organic substances

in the water and others. All biological quality elements vary in accordance with the requirements of their habitat and processes related to the hydromorphological quality elements and flow dynamics and have a strong influence on the basic composition of communities of flora and fauna. Of particular importance is the impact of these elements on the substrate, the decomposition of organic matter and the degree of interaction with the riparian zone. Many catchments are associated with damming facilities and the problem of runoff control. Runoff control addresses the main issues of permeability of the riverbed. Lack of permeability affects the water body upstream and downstream. Signs of morphological changes are straightening of the riverbed, correction of river beds, barrages, hydro dams and extraction of inert materials, erosion, riparian vegetation, land use, etc.

If the share of hydro-morphological changes is:

- below 20% for the entire water body, it can be assumed that there are no permanent hydromorphological disturbances of the water body as a whole - very good condition;
- 21 –40 % -good;
- 41 –60 % -moderate;
- 61 –80 % -poor;
- 81 –100 % -very poor.

As per the Plan, the Danube in the Bulgarian section from Novo Selo to Silistra is defined as a *large sandy river with code* BG1DU000R001.

PRBM defines the Danube as heavily modified water body due to gravel extraction, corrections and shipping.

Load of Danube from water abstraction for industrial water through river catchments is 5,157,757 thousand cubic metres per year.

The load from water abstraction for irrigation through river catchments is 36,060,000 thousand cubic metres per year.

As shown, the used water quantities for major water intakes are very low compared to the flow of the river, even compared to the minimum runoff rate.

***Table III.2.3.1.-5: Assessment of hydro-morphological changes in surface water***

| *Water body code* | *Water body description* | *HMWB/AWB* | *Hydro-morphological status / potential* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | *Overall assessment* | *hydrological regime* | *morphological condition* | *Runoff control* | *issues* | *reason* |
| *BG1DU000R001* | *The Danube in Bulgaria*<br>*The section from the* | *HMWB* | *moderate* | *Very good* | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *confluence of the Timok to Silistra* | | | | *moderate* | | *modification of morphological conditions* | *correction of the river by construction of river dikes and extraction of inert materials from the river bed* |
| | | | | | | *Very good* | | |
| *BG1RL120R013* | *Rusenski Lom and Cherni Lom from the mouth to Tabachka village* | *HMWB* | *Very poor* | *good* | | | | *water abstraction for irrigation through pump* |
| | | | | | *Very poor* | | *modification of morphological conditions* | *correction of the entire river by dikes and straightening of the river bed* |
| | | | | | | *good* | | |
| *BG1DJ100R006* | *No name* | *no* | *moderate* | *moderate* | | | *dried up portions above the lake* | *Naturally drying up sections* |
| | | | | | *good* | | | |
| | | | | | | *good* | | |

The loads resulting from human activities that could pose a risk to water bodies in regard to compliance and observance of environmental objectives laid down in Art. 4 WFD are defined as significant loads.

Based on the risk assessment water bodies are classified in the following categories:

**- *Water bodies at risk* –** water bodies that will clearly not achieve the environmental objectives of the WFD with no need for further characterization or additional monitoring data;

**- *Water bodies that may be at risk*** – water bodies that are likely to fail in meeting the environmental objectives of the WFD, but final assessment cannot be made due to insufficient data. Additional monitoring data for final evaluation is required;

**- *Water bodies which are not at risk*** – water bodies that will clearly achieve the environmental objectives of the WFD with no need for further characterization or additional monitoring data.

*Qualitative characteristics of surface waters*

The Water Framework Directive introduces a new approach to water management by introducing environmental standards and quality objectives for securing the functioning of aquatic ecosystems.

WFD requires the assessment of "ecological status" and "chemical status" of surface water. The lower of the two assessments determines the assessment of the overall condition of the water body.

***Environmental condition***

As defined under the Water Framework Directive the following groups of components are reviewed for the purpose of assessment of the ecological status: biological, hydromorphological and physico-chemical elements. The biological elements are paramount as they are strongly influenced by different types of anthropogenic pressures on aquatic ecosystems.

| | |
|---|---|
| **hydromorphological indicators** | **hydrological regime**<br>**morphological conditions**<br>**continuity of the river** |
| **biological indicators** | **bottom invertebrates**<br>**phytobenthos**<br>**macrophytes**<br>**phytoplankton**<br>**fish** |
| **chemical indicators** | **common indicators**<br>**biogenic substances**<br>**specific substances** |

In assessing the overall state WFD uses the rule "one out-all out", which means that the overall state of the eco system is determined by the element that is in the worst condition. In some of the water bodies on the basis of an expert assessment is given more weight to the most representative biological quality elements of the type and category of water body.

***Ecological status of surface water bodies*** is classed in five classes: very good, good, moderate, poor and very poor, which are represented by colors shown in the table:

| *ENVIRONMENTAL CONDITION* | | | | |
|---|---|---|---|---|
| *very good* | *good* | *moderate* | *poor* | *very poor* |

- For a "very good" condition, the evaluation includes hydro-morphological elements that should also have a "very good" status.

- For a "good" and "very good" condition are taken into account the physico-chemical quality elements, which should also have a "good" and "very good" status.
- For the other classes – moderate, bad and very bad – the required physico-chemical elements must have values corresponding to the environmental condition.
- water bodies classified as heavily modified and artificial have also their environmental potential determined (good and higher, moderate, poor, very poor).

***Chemical status***

| ***Chemical status*** | |
|---|---|
| ***Good*** | ***Poor*** |

Chemical status of surface water bodies is classed as good and poor and is depicted on maps with blue and red colour.

In assessing the chemical status of surface water bodies are considered so-called priority substances. They are matched with the predicted values for environmental quality in the draft Directive on Environmental Standards.

"Good chemical status" is the state in which the average annual value (AAV) of pollutants does not exceed the quality standards of the environment (EQS). The bodies in which all priority substances meet the chemical quality standards are in good condition and the water bodies in which the results are above the respective specified values are in poor condition.

Water bodies for which pollution sources are not identified are deemed to be in good condition based on expert judgment.

***Condition of the portion of the water body covered by the investment proposal***

*Environmental condition of the Danube in the Bulgarian-Romanian border region*

The Danube River is the subject of strict monitoring. A number of monitoring programs have been developed for this purpose, including:

- TransNational Monitoring Network (TNMN) - generates monthly data on PC, priority and specific substances.
- The national monitoring programs of both countries.
- JDS (Joint Danube Survey) of ICPDR – conducted every six years - a complex study.

The evaluation, shown in Fig. III.2.3.1.-3 (Plamen Lenov, chief expert EEA-Regional Laboratory - Veliko Tarnovo – Assessment of the Ecological Status of Surface Waters in the Bulgarian-Romanian Border Region of the Danube) uses data from "Final Scientific Report JDS-2."

Ecological status assessment is made on biological quality elements – phytoplankton, phytobentos, bottom invertebrates and fish. Each is evaluated in five grades. The overall status is also assessed in five classes with the worst one taken as final. The remaining groups of supporting elements (physico-chemical and hydromorphological) are taken into account only if a very good condition is being assessed. Such sectors are not observed in the studied border region.

Data collected from 19 stations was analyzed.

The findings are the following:

- a total of 7 stations show abnormal environmental status, 6 of them are in poor and one in very poor environmental condition;
- lower status is mainly due to BQE assessment of fish and phytobenthos;
- lower indices of fish in the lower reaches of the Danube speak clearly for organic pollution;
- in the case of low phytobenthos status the reasons are impact influence of biogenic elements and changed features of the watercourse.

***At the stations before Rousse and after Rousse / Giurgiu the ecological status is defined as moderate.***

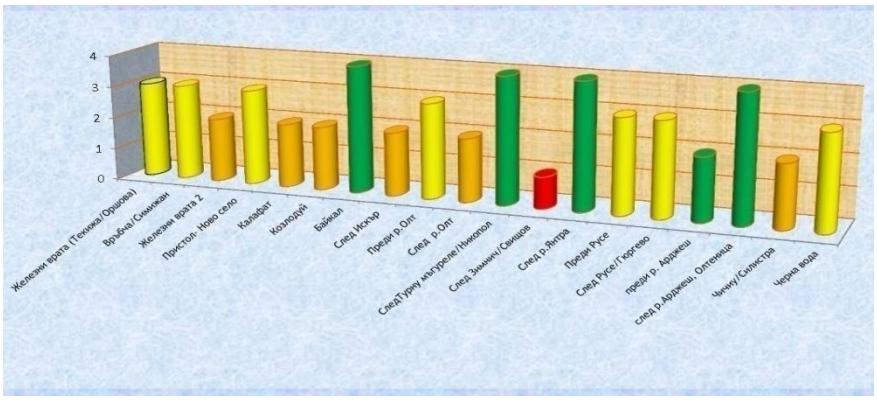



***Fig. III.2.3.1.-3: Environmental condition of the Danube River in the border region***

The most current document relating to the assessment of the state of surface water is the River Basin Management Plan - RBMP for the Danube region – on the website of the Danube Water Management Directorate with HQ in Pleven.

Current information about physical and chemical elements of quality and their interpretation in accordance with the requirements of the Water Framework Directive is the reason why the the ecological status of the Danube is described as "moderate" and the chemical - as "poor" in the River Basin Management Plan.

*Status of surface water bodies categorized as rivers*

***Table III.2.3.1.-6:***

| Water body code | Name of river | Code of type | description | Length in km | HMWB | environmental condition potential | chemical condition |
|---|---|---|---|---|---|---|---|
| ***BG1DU000R001*** | ***The Danube*** | ***BGTR6*** | ***The Danube from Novo selo to Silistra*** | ***650,650*** | ***yes*** | ***moderate*** | ***poor*** |

The reason for moderate environmental condition is the impact of both point and diffuse sources of pollution.

Along the Danube River, the main point sources are: discharges of sewage networks of settlements without WWTP, discharges of waste water from industrial sites with issued integrated permit, discharges of waste water from industrial facilities not subject to regulation by an IPPC permit.

Diffuse sources along the Danube are dominated by arable land - about 62% and settlements - 5.5% of the territory of the valley.

The above conclusions are coordinated with the International Management Plan for the Danube basin - website of the ICPDR - International Commission for the Protection of the Danube River. According to this document, the Bulgarian-Romanian section of the Danube is characterized as follows: in relation to pollution by organic substances - "possibly at risk"; as regards pollution by harmful substances and nutrients, as well as hydro-morphological changes - "at risk".

As hydromorphological changes are presented: interruption of the river bed and habitats, wet lands and flooded terraces; hydrological changes from water abstraction, impoundment, diversion of water; violation of the sediment balance including by dredging. Dredging is assessed as widespread in the basin of the Danube. Extraction of river sediments is carried out mainly with a view to ensuring the necessary depth for navigation purposes, flood protection, maintenance of dammed water volumes and control of tidal waves. In this connection, the main users are: water transport, mining and construction industry, energy producers, the authorities in flood protection.

*Risk to ecological status of surface water categorized as rivers*

***Table III.2.3.1.-7:***

| Water body code | River name | Description | Environmental risk | Organic pollutants | Nutrients |
|---|---|---|---|---|---|
| ***BG1DU000R001*** | ***The Danube*** | ***The Danube from Novo selo to Silistra*** | ***At risk*** | ***At risk*** | ***At risk*** |

*Risk to chemical status of surface water categorized as rivers*

***Table III.2.3.1.-8:***

| Water body code | River name | Description | Risk to chemical status | |
|---|---|---|---|---|
| | | | Chemical risk | hazardous and specific substances |
| ***BG1DU000R001*** | ***The Danube*** | ***The Danube from Novo selo to Silistra*** | ***At risk*** | ***At risk*** |

*Risk assessment for surface water bodies categorized as rivers which are at risk of not achieving the objectives set for environmental protection*

***Table III.2.3.1.-9:***

| Water body code | River name | Description | Risk assessment | Risk to chemical status | Risk to ecological status |
|---|---|---|---|---|---|
| | | | | Chemical risk | Ecological risk |
| ***BG1DU000R001*** | ***The Danube*** | ***The Danube from Novo selo to Silistra*** | ***At risk*** | ***At risk*** | ***At risk*** |

Based on the above facts it can be concluded that the characteristics of the surface waters of the Danube, near the project sites are defined by the following important factors: the intensity of river runoff and its seasonal and multi-annual runoff resistance; the impact of domestic, industrial and agricultural sources of pollution in the watershed of the Danube basin, and the Bulgarian section of the river; abstraction, impoundment, corrections of rivers, construction of protective dams, gravel extraction and others.

*Specific environmental objective for surface water body code BG1DU000R001 is "Preventing deterioration of ecological potential and achievement of good status by 2021. Prevention of deterioration of the chemical status and achievement of good status by 2027." The water body is excepted from achieving certain environmental objectives due to significant anthropogenic impact.*

*Assessment of water quality in the region encompassing the area of implementation of the investment proposal, based on monitoring carried out in 2013 by RL Rousse with the EEA.*

The Danube / Lower Danube / - two stations are monitored on the territory of RIEW Rousse – one before Rousse and another at the port of Silistra / right and left coast and midst / that are part of the international trans-national monitoring network for the Danube / TNMN /.

*Assessment based on physiochemical parameters, specific pollutants and priority substances*

The assessment is based on a comparative analysis of the measured and averaged results of the analysis of indicators conducted within the last year.

*Danube valley*

In 2013, water quality in the river near RIEW Ruse was monitored 12 times at the above described stations. The assessment of physicochemical indicators supporting BQE has been carried out in compliance with the requirements of Ordinance N-4 / 14.09.2012 on the characterization of surface water for type R7, ie large Danube tributaries instead of R6 - major rivers, because the Ordinance has no reference values for very good, good and moderate status of the Lower Danube as a major river.

The analysis conducted by RL EEA Rousse shows that there are no exceedances of the threshold values of physiochemical parameters, specific pollutants and priority substances for type R7. Analyses of certain substances, such as polychlorinated biphenyls, mercury, DDT and aldrin are conducted by applying methods in which the limit of quantification is equal to EQS or higher (eg. Mercury). This is a problem that urgently requires attention in order for the results of the analyzes to be used in assessing the condition.

BQE of the Danube are not processed. No sampling is conducted due to lack of methods and reference values required for assessment.

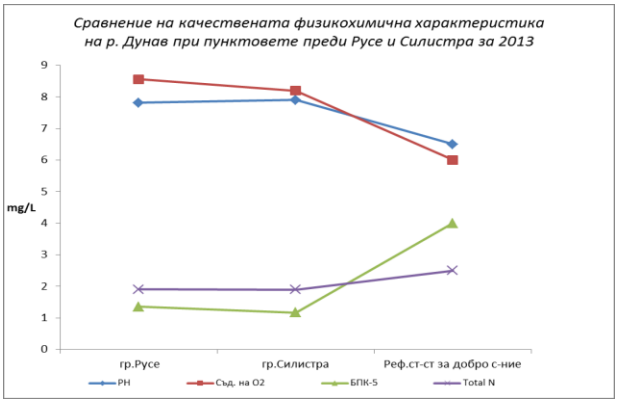



***Fig. III.2.3.1.-4: Comparison of quality physical and chemical characteristics of the Danube at the stations before Rousse and Silistra for 2013.***

***Groundwater Monitoring Network***

### 2.3.2. Quantitative and qualitative characteristics of groundwater

*Quantitative Characteristics*

| **Quantitative Status** | |
|---|---|
| **Good** | **Bad** |

Annex V, Paragraph 2.1.1. WFD states that to achieve good groundwater quantitative status, the available groundwater resource (i.e. the long-term average rate of overall groundwater recharge to the body less the long term annual rate of flow required to achieve the ecological quality objectives for associated surface waters) is not exceeded by the long-term annual average rate of abstraction.

Parameter for determining risk for the quantitative status is groundwater level or composition of water balance. Abstraction over 50% of the inflow puts the groundwater "at risk".

*Underground water quantitative status evaluation*

***Table III.2.3.2.-1:***

| *Water body code* | *Water body name* | *Natural resources For WB, $Q_{nat}$* | *Abstraction, m / sec* | | | *Free water quantity Qfree* | *Status* |
|---|---|---|---|---|---|---|---|
| | | | *allowed annual abstraction* | *Wells for personal needs* | *Total abstraction* | | |
| *BG1G0000Qal010* | *Porous aquifer in Quaternary deposits - Brashlyanska Valley* | *870* | *1103* | *55* | *1158* | *-288* | *bad* |
| *BG1G0000K1b041* | *Karst water in the Rousse formation* | *8240* | *781* | *8* | *789* | *7451.* | *good* |
| *BG1G0000J3K051* | *Malmian-Valanginian Karst Water* | *15779* | *871* | *0* | *871* | *14908* | *good* |
| *BG1G000000N049** | *karst and porous waters in Neogen – Sarmat – Dobrudzha* | *2330* | *391* | *0* | *391* | *1939* | *good* |

** agreed with Romania, outside the area of the investment proposal.*

*Qualitative status*

*Pressures and impact from human activity on the groundwater status*

Groundwater quality is determined by the anthropogenic impact, which is expressed in different types of pollution from point and diffuse sources.

- *Point sources of pollution*

As such are considered unregulated (rural) dumps, municipal dumps, pesticide warehouses, leaks of contaminated sites, depots of industrial and hazardous waste, locations of old pollutants, old landfills, closed industrial sites, BB cubes for collection, disposal, decontamination and safe storage of obsolete and unusable pesticides available in the country. To determine the risk of each point source it is juxtaposed to a total potential load surface of the body of groundwater equal to a radius of influence of about 1 km. It is assumed that there is a risk of not reaching the goals when the amount of the active surfaces exceeds 30% of the exposed surfaces of the respective water body. Point source pollution increases the content of biogenic substances in groundwater.

- *Diffuse sources of pollution*

Diffuse sources of pollution include land use (arable land and permanent crops) settlements without sewerage system, urban areas.

Significant problems of this kind of impact on groundwater are increasing levels of nitrates, phosphates, sulphates, chromium, iron and manganese. Nitrate is a leading parameter for diffusion imported in groundwater. When the proportion of arable land and urban areas exceeds 75% of the exposed surface of the GWB, the body is 'at risk'**.**

*Monitoring of the chemical status of groundwater*

The criteria for assessment of the chemical status of groundwater are:

1. groundwater quality standard - Ordinance No 9 on the quality of water intended for drinking purposes and Directive 2000/60/EC, Annex 1 to Ordinance 1/2007 on the study, use and protection of groundwater;

2. The threshold values determined according to Guidance Document No 18 to Directive 2006/118 / EC and methodology developed by project activity for determination of thresholds of contamination of groundwater and the development of a qualification system for chemical status of groundwater;

3. degree of interaction between surface water and groundwater;

4. A groundwater body is in good chemical status when the relevant monitoring demonstrates that the conditions of Table 2.3.2 of Annex V to Directive 2000/60 / EC are fulfilled: the chemical composition of groundwater is such that the concentration of pollutants shows no attraction of salty or polluted water; the concentrations established as the standard for quality are not exceeded; failure to achieve the objectives of environmental protection and significant damage to terrestrial ecosystems which depend directly on the groundwater body is not expected.

5. Concentrations Trend.

Methodology for assessing the chemical status of groundwater is as follows:

1. Assessment on the most stringent threshold values determined for use of groundwater as drinking water (Ordinance No 9), since 90% of groundwater bodies are used for drinking water supply.

2. Processing of monitoring information from three types of monitoring points.

- Type 1 – current MP of the groundwater monitoring network, which is administered by the EEA for the period 2004-2009;

- Type 2 – MP dropped from the groundwater monitoring network for which there are representative data for the period 1998 -2009;

- Type 3 – MP of water users with permits for water abstraction (self-monitoring) for 2004-2008.

3. Assessment of the chemical status of a single monitoring point, based on the status established as per individual indicators under the following conditions:

- in the event that all indicators show that status is "good", MP is deemed to have "good" status.

- in the event that one or more indicators are bad, MP is deemed to have bad status.

4. Assessment of the chemical status of GWB as a whole was accomplished by comparing the so-called relevant values (RV) and the threshold value (TV) of individual chemical status indicators. If all indicators show that status is "good", GWB is deemed to have "good" status. If one or more indicators of the status are "bad," GWB is deemed to have "bad" status. In this case a careful hydrological analysis is conducted of the MP responsible for the bad status. If it is determined that these MP are not representative enough, they are excluded from the general assessment of the state of GWB as a whole

General assessment of the chemical state of the GWB in general was carried out by comparing the so-called relevant values (RV) and the threshold value (TV) of separate chemical status indicators.

The relevant values are defined as follows:

1. One MP in GWB – PV is considered equal to FV of the indicator;

2. Two MPs in GWB – PV is considered equal to the arithmetic mean between FV of the indicators of both MPs.

3. Three or more MPs – PV is considered equal to the median of FV of the indicators of all MPs.

Applying the median (instead of the arithmetic mean) when there are more than two MPs improves the reliability of the assessment of the state of GWB because of the application of a statistical procedure. Thus unrealistic assessments such as GWB in "good" condition with predominant number of MPs in "bad" condition " and vice versa are avoided.

The final assessment of the chemical status of GWB is made based on the status determined by individual indicators:

- in the event that all indicators show that status is "good", GWB is deemed to have "good" status.

- in the event that one or more indicators are bad, GWB is deemed to have bad status. In this case a careful hydrological analysis is conducted of the MP responsible for the bad status. If it is determined that these MP are not representative enough, they are excluded from the general assessment of the state of GWB as a whole.

The table below gives an assessment of the state of GWB as per RBMP of WMD.

***Table. III.2.3.2.-2: Assessment of the chemical status of the groundwater body by 01.01.2009***

| code | name | Risk assessment | status | deviations | Source of pollution |
|---|---|---|---|---|---|
| **BG1G0000Qal010** | **Porous aquifer in Quaternary deposits - Brashlyanska Valley** | **risk** | **good** | - | - |
| **BG1G0000K1b041** | **Karst water in the Rousse formation** | **No risk** | **bad** | **NO3, PO4** | **diffuse** |
| **BG1G0000J3K051** | **Malmian-Valanginian Karst Water** | **No risk** | **good** | - | - |
| **BG1G000000N049** | **karst and porous waters in Neogen – Sarmat – Dobrudzha** | **No risk** | **good** | - | - |

.

## *Table III.2.3.2.-3: Risk assessment per point and diffuse sources of pollution of GWB – 2009*

| groundwater bodies | | | Point sources | | | | | | | status | Diffuse sources | | | | | | status |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| code | name | area, km² | Open city dumps, number | Depots, number | BB cubes, number | Old pesticide warehouses, number | Production sites, number | area, km² | % | | Settlements without sewage system, number | area, km² | emissions, % | Land use, % | | | |
| BG1G0000Qal010 | Porous aquifer in Quaternary deposits Brashlyanska Valley | 217 | 8 | 2 | 0 | 0 | 7 | 53,38 | 25% | good | 14 | 31,49 | 21% | 80 | 10 | 10 | bad |
| BG1G0000K1b041 | Karst water in the Rousse formation | 6592 | 104 | 8 | 4 | 10 | 11 | 430,18 | 7% | good | 125 | 142,51 | 4% | 65 | 10 | 25 | good |
| BG1G0000J3K051 | Malmian-Valanginian Karst Water | 1303 | 105 | 1 | 0 | 1 | 13 | 376,8 | 29% | good | 31 | 37,0 | 5% | 62 | 17 | 31 | good |
| BG1G000000N049 | karst and porous waters in Neogen – Sarmat – Dobrudzha | 3308 | 5 | 0 | 2 | 15 | 4 | 81,64 | 2% | good | 35 | 36,61 | 4% | 70 | 15 | 15 | good |

## *Table III.2.3.2-4: Measures for groundwater bodies with bad chemical status WMD*

| code | name | Significant impact on GWB from point sources of pollution | | | | | Significant impact on GWB from diffuse sources of pollution | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Risk assessment | Type of load | Basic measures | Supplementary measures | Document | Risk assessment | parameters (concentrations above QS ) in 2006 | status | Current parameters (concentrations above QS ) | Type of pollution/load | Type of pollutant | Basic measures | Supplementary measures | Document |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BG1G0000Qal010** | **Porous aquifer in Quaternary deposits - Brashlyanska Valley** | **No risk** | | | | | **risk** | **NO3** | **good** | | **Land use** | | **1. good agricultural practices;** | **Monitoring and control** | **FP Law; Ordinance No 1 and Ordinance No 2; Nitrate Directive** |
| **BG1G0000K1B041** | **Karst water in the Rousse formation** | **No risk** | | | | | **No risk** | | **bad** | **NO3, PO4** | **Land use in settlements without sewage system** | **Organic and biogenic waste; nitrogen** | **1. good agricultural practices;** | **Monitoring and control** | **Ordinance No 1 and Ordinance No 2; Nitrate Directive** |
| | | | | | | | | | | | | | **2. construction of wastewater treatment plants;** | **control** | **PS Directive; Ordinance No 7 OPOE Law** |
| | | | | | | | | | | | | | **3.construction of sewage system in settlements** | **control** | |

## *Table III.2.3.2-5: Environmental objectives for groundwater bodies in poor chemical status Danube basin WATER MANAGEMENT*

| **code** | **name** | **Significant impact on GWB from point sources of pollution** | | | **Significant impact on GWB from diffuse sources of pollution** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Risk assessment** | **Type of load** | **environmental goals** | **Risk assessment** | **parameters (concentrations above QS ) in 2006** | **status** | **Current parameters (concentrations above QS )** | **Type of pollution/load** | **Type of pollutant** | **environmental goals** |
| **BG1G0000Qal010** | **Porous aquifer in Quaternary deposits - Brashlyanska Valley** | **No risk** | | | **risk** | **NO3;** | **good** | | **Land use** | | **Maintaining good status** |

***Table III.2.3.2.-6: Measures for groundwater bodies with bad status due to water abstraction Danube basin WATER MANAGEMENT***

| code | name | Significant impact on volume | | | | | |
|---|---|---|---|---|---|---|---|
| | | Risk assessment 2006 | Risk assessment | Type of load | Basic measures | Supplementary measures | document |
| BG1G0000Qal010 | Porous aquifer in Quaternary deposi - Brashlyanska Valley | risk | bad | Water abstraction | Restriction of water abstraction | Control of issued permits and withdrawal of permits | PV Directive; Ordinance No 1 |

According to letter with ref. ZDOI 254/05.11.2010 of the Danube Water Management Directorate with HQ in Pleven (Appendix No 2) transboundary groundwater bodies coordinated with the Republic of Romania are "Malmian-Valanginian Karst Water" (BG1G0000J3K051) and "Karst and Porous Waters in Neogen – Sarmat – Dobrudzha" (BG1G0000N1049), the latter falling outside the project area.

The location of transboundary water bodies is shown on the map of transboundary water bodies *(Appendix No 2).*

*Characterization of groundwater bodies in the area of the investment plan.*

**Mishka Section**

According to the hydrogeological division of Bulgaria (Antonov Hr., D. Danchev, 1980) the Bulgarian territory situated against Mishka extraction area falls within the Moesian hydrogeological region.

The diversity of rocks of different lithological composition and structural position determines the formation of different types of groundwater.

***Alluvial Aquifer***

Alluvial deposits of the river are widely available in the Moesian region. They are accumulated in old meanders of the Danube and form the Danube lowlands.

The reviewed part of the Bulgarian coast falls within Brashlyanska Valley. The latter is an elongated strip along the Danube between the towns of Rousse and Tutrakan. It is layered, with three terraces having different hypsometric position to the river. Alluvial deposits of the three terraces are interconnected, laying from the highest to the lowest part to the bed of the Danube to which they are hydraulically connected. At the base of the alluvium lay Lower Cretaceous limestone karst aquifers.

In the area between the village Tsar Samuil and the village Nova Cherna the gravel deposits lay on Albean waterproof marl.

A porous unconfined aquifer has been formed among gravel and sand deposits. According to the characterization of groundwater bodies in Bulgaria the aquifer is referred to as " Porous aquifer - Brashlyanska Valley " (BG1G0000Qal010). Aquifer is characterized by good filtration properties. The water conductivity ranges from 500 to 2000 $m^2$/d. Groundwater levels are ranging from 0.0 to 8.0 m for the low terrace, from 6.0 to 10.0 m for the middle terrace and from 15.0 to 18.0 m for the high terrace. The formed underground flow is directed towards the Danube, which is the drainage artery for all aquifers in the region.

Groundwater is fed by precipitation filtering through the upper layers, high water levels and water from the underground flow of the Lower Cretaceous aquifer. Drainage of underground alluvial stream is carried by the Danube.

Groundwater is fresh with total mineralization of 0.28 to 0.82 g/l, with intensive water exchange. The total hardness is between 4,4-8,6 mg/equq, i.e. the water is medium to hard. Macrochemical analysis shows that the composition of groundwater is mainly hydrocarbonate-calcium-magnesium.

Contemporary alluvial deposits on the nearby Mishka Island are infiltrated by water from the Danube. Their levels and chemical composition are directly dependent on river water.

***Groundwater in Lower Cretaceous sediments***

Lower Cretaceous sediments in the Bulgarian region situated opposite Mishka section are fully developed carbonate facies. They are represented by alternating diverse, porcelain-like, micrite, biodetrite, oolite limestones associating with different clay, sand, organogenic, chalk-like and other types of Urgonian limestones. Lithostratigraphically these fall under the Rousse group with mainly Baremian-Aptean chronostratigraphic volume. It overlaps in areas with Albian glauconite sandy marls, with Late Cretaceous, Paleogene and Neogene sediments to the east and with Quaternary deposits all over. Surface Baremian-Aptian sediments reveal widely in the valleys of the river Rusenski Lom, and in some places at the base of the right bank of the Danube near Rousse. Obviously they form the pre-Quaternary base of a part of the bed of the Danube and the Danube lowlands and overlap with contemporary alluvial sands and gravels.

According to data from structural and hydrogeological drilling the thickness of Baremian - Aptian sediments varies from 30-40 m to 90-100 m and more than 600 m in the area of Rousse - Giurgiu.

Lower Cretaceous sediments in the area under consideration participate in the formation of the unified superstructure of the Moesian plate, which gradually sinks to the north-northwest. A characteristic feature of Baremian-Aptian carbonate complex is its intense fracturing, its extreme cavernosity (in places even honeycomb-like) and karst morphography, especially in the Pobrezhie. Within the fissured karstified limestone an unconfined underground stream was formed with a common water level.

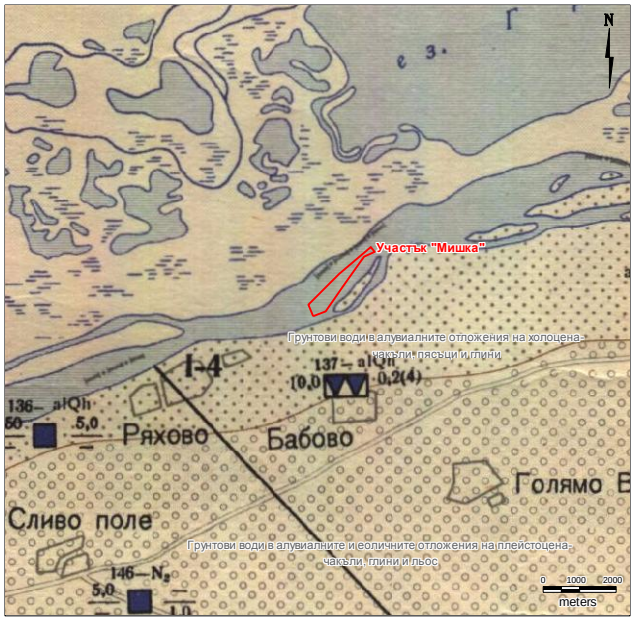
The Danube River Basin Management Plan published on the website of the Danube Water Management Directorate, Pleven, 2010, designates the water body as „karst waters in the Rousse formation ” (BG1G0000K1b041).

Groundwater is mainly fed by precipitations, much of them infiltrating directly into the fissures of limestone or indirectly through the alluvial sediments and partly Neogene. Karst water is drained mainly into the Danube with the front being from the mouth of the river Yantra the Oltina Lake situated on the territory of Romania.

Filtration characteristic of Baremian-Aptian sediments in the central and eastern parts is extremely diverse. The filtration ratio ranges from 0.03 to 0.50 m/d to 20 m/d, the conductivity from 1-2 $m^2$/d to over 5000 $m^2$/d, but mostly 100-600 $m^2$/d and an average of about 450 -500 $m^2$/d. Transmissivity varies from 1.105 $m^2$/d to 2.107 $m^2$/d, active porosity, characterizing water release ranges from 0.05 to 0.22, and the relative flow rates from individual wells - from 0,1 l/s m up to over 100 l/s m. The dynamic cost varies from 10-15 l/s m to 50-55 l/s m per 1 km length of the Danube for the entire stretch from the mouth of the Rusenski Lom to the Bulgarian-Romanian border, and the average modulus of groundwater flow varies from 1.7 - 2.3 l/s $km^2$ in the central part to over 5-10 l/s $km^2$ in Pobrezhie that characterizes the sediment as moderately to highly water-bearing.

Groundwater is of the infiltration genetic cycle, almost exclusively hydrocarbonate, calcium-magnesium to hydrocarbonate, magnesium-calcium, and chemically neutral (pH 7-8). Their mineralization varies from 0.6 g/l to 0.8 g/l. Their average annual temperature is 12-14°C with amplitude change of ± 2-3°C, i.e. these are mostly fresh, cold waters. With increasing depth and pressure their water exchange processes slow down and their content of sodium ions, alkalinity (up to 9.0 - 9.5) and temperature (up to 18-20°C) rise. In some parts, the water contains mostly minor amounts of ammonia, nitrites, nitrates or is of higher temperature and is suitable for drinking after chlorination and mixing with clean water. According to the bulletin of the EEA in 2012 the values for nitrates and phosphates established for this groundwater body exceed the standards for groundwater quality.

***Hydrogeological map of Mishka Section***




## Wharf

The wharf is situated on the Bulgarian bank of the Danube in the Eastern Industrial Zone of Rousse. Its geological structure is formed by Quaternary deposits and Lower Cretaceous sediments.

According to the hydrogeological division of Bulgaria (Antonov Hr., D. Danchev, 1980) the wharf falls within the Moesian hydrogeological region.

Depending on the lithologic and geologic composition of the host rocks there is:

### *Danube Alluvial Aquifer*

Alluvial deposits of the river are widely available in the Moesian region. They are accumulated in old meanders of the Danube and form the Danube lowlands.

The reviewed part of the Bulgarian coast falls within Brashlyanska Valley. The latter is an elongated strip along the Danube between the towns of Rousse and Tutrakan. It is layered, with three terraces having different hypsometric position to the river. Alluvial deposits of the three terraces are interconnected, laying from the highest to the lowest part to the bed of the Danube to which they are hydraulically connected. At the base of the alluvium lay Lower Cretaceous limestone karst aquifers.

In the area between the village Tsar Samuil and the village Nova Cherna the gravel deposits lay on Albean waterproof marl.

A porous unconfined aquifer has been formed among gravel and sand deposits. According to the characterization of groundwater bodies in Bulgaria the aquifer is referred to as " Porous aquifer - Brashlyanska Valley " (BG1G0000Qal010). Aquifer is characterized by good filtration properties. The water conductivity ranges from 500 to 2000 $m^2$/d. Groundwater levels are ranging from 0.0 to 8.0 m for the low terrace, from 6.0 to 10.0 m for the middle terrace and from 15.0 to 18.0 m for the high terrace. The formed underground flow is directed towards the Danube, which is the drainage artery for all aquifers in the region.

Groundwater is fed by precipitation filtering through the upper layers, high water levels and water from the underground flow of the Lower Cretaceous aquifer. Drainage of underground alluvial stream is carried by the Danube.

Groundwater is fresh with total mineralization of 0.28 to 0.82 g/l, with intensive water exchange. The total hardness is between 4,4-8,6 mg/equq, i.e. the water is medium to hard. Macrochemical analysis shows that the composition of groundwater is mainly hydrocarbonate-calcium-magnesium.

***Groundwater in Lower Cretaceous sediments***

Lower Cretaceous sediments in the Bulgarian region situated opposite Mishka section are fully developed carbonate facies. They are represented by alternating diverse, porcelain-like, micrite, biodetrite, oolite limestones associating with different clay, sand, organogenic, chalk-like and other types of Urgonian limestones. Lithostratigraphically these fall under the Rousse group with mainly Baremian-Aptean chronostratigraphic volume. It overlaps in areas with Albian glauconite sandy marls, with Late Cretaceous, Paleogene and Neogene sediments to the east and with Quaternary deposits all over. Surface Baremian-Aptian sediments reveal widely in the valleys of the river Rusenski Lom, and in some places at the base of the right bank of the Danube near Rousse. Obviously they form the pre-Quaternary base of a part of the bed of the Danube and the Danube lowlands and overlap with contemporary alluvial sands and gravels.

According to data from structural and hydrogeological drilling the thickness of Baremian - Aptian sediments varies from 30-40 m to 90-100 m and more than 600 m in the area of Rousse - Giurgiu. Lower Cretaceous sediments in the area under consideration participate in the formation of the unified superstructure of the Moesian plate, which gradually sinks to the north-northwest. A characteristic feature of Baremian-Aptian carbonate complex is its intense fracturing, its extreme cavernosity (in places even honeycomb-like) and karst morphography, especially in the Pobrezhie. Within the fissured karstified limestone an unconfined underground stream was formed with a common water level.

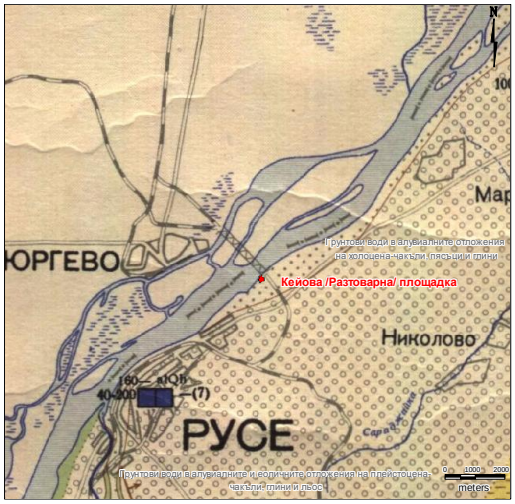
The Danube River Basin Management Plan published on the website of the Danube Water Management Directorate, Pleven, 2010, designates the water body as „karst waters in the Rousse formation ” (BG1G0000K1b041). Groundwater is mainly fed by precipitations, much of them infiltrating directly into the fissures of limestone or indirectly through the alluvial sediments and partly Neogene. Karst water is drained mainly into the Danube with the front being from the mouth of the river Yantra the Oltina Lake situated on the territory of Romania.

Filtration characteristic of Baremian-Aptian sediments in the central and eastern parts is extremely diverse. The filtration ratio ranges from 0.03 to 0.50 m/d to 20 m/d, the conductivity from 1-2 $m^2$/d to over 5000 $m^2$/d, but mostly 100-600 $m^2$/d and an average of about 450 -500 $m^2$/d. Transmissivity varies from 1.105 $m^2$/d to 2.107 $m^2$/d, active porosity, characterizing water release ranges from 0.05 to 0.22, and the relative flow rates from individual wells - from 0,1 l/s m up to over 100 l/s m. The dynamic cost varies from 10-15 l/s m to 50-55 l/s m per 1 km length of the Danube for the entire stretch from the mouth of the Rusenski Lom to the Bulgarian-Romanian border, and the average modulus of groundwater flow varies from 1.7 - 2.3 l/s $km^2$ in the central part to over 5-10 l/s $km^2$ in Pobrezhie that characterizes the sediment as moderately to highly water-bearing.

Groundwater is of the infiltration genetic cycle, almost exclusively hydrocarbonate, calcium-magnesium to hydrocarbonate, magnesium-calcium, and chemically neutral (pH 7-

8). Their mineralization varies from 0.6 g/l to 0.8 g/l. Their average annual temperature is 12-14°C with amplitude change of ± 2-3°C, i.e. these are mostly fresh, cold waters. With increasing depth and pressure their water exchange processes slow down and their content of sodium ions, alkalinity (up to 9.0 - 9.5) and temperature (up to 18-20°C) rise. In some parts, the water contains mostly minor amounts of ammonia, nitrites, nitrates or is of higher temperature and is suitable for drinking after chlorination and mixing with clean water. According to the bulletin of the EEA in 2012 the values for nitrates and phosphates established for this groundwater body exceed the standards for groundwater quality.

***Hydrogeological map of Wharf***




**<u>Sources of water supply to the population, total water use and own needs</u>**

According to letter ref. ZDOI-254/05.11.2010 (Appendix No 2) and issue No 378/04.07.2014, (Appendix No 1) of the Danube Water Management Directorate with headquarters in the town of Pleven the following sources for drinking water supply to the population exist on the territory of Bulgaria:

Table I.2.-4: Sources of drinking water to the population within the project area

Karst water in the Rousse formation (BG1G0000K1b041):

„TK1-ViK Rousse PS „Brashlen”

„TK1- ViK Rousse – Golyamo Vranovo”

„TK2- ViK Rousse - Golyamo Vranovo ”

Porous aquifer in Quaternary deposits - Brashlyanska Valley (BG1G0000Qal010)

„Ranney well– 1 ViK Silistra – Tutrakan”

„Ranney well – 2 ViK Silistra – Tutrakan ”

„Ranney well – 2 ViK Silistra – Tutrakan ”

„SW1 – ViK – Rousse PS „Brashlyan”

P1 „ViK – Razgrad – Ryahovo”

P3 „ViK – Razgrad – Ryahovo ”

P4 „ViK – Razgrad – Ryahovo ”

P5 „ViK – Razgrad – Ryahovo ”

P6 „ViK – Razgrad – Ryahovo ”

P7 „ViK – Razgrad – Ryahovo ”

Mineral springs have not been detected within the area of the investment proposal.

Sources for drinking water supply to the population situated closest to the IP sites are the following:

- *Mishka section*

There are six Ranney wells situated opposite the extraction site property of WS Dunav, ViK Razgrad – Ryahovo.

The closest Ranney well is 150,0 m away. The plot is located outside zone I of KBS.

- *Wharf, unloading site*

*The site is remote enough from the water intake facilities for drinking water supply to the population.*

*Water sources of the population within the boundaries of the settlements along the Bulgarian coast opposite the extraction area are also the pipes and wells within with the village Babovo. They will not be affected by implementation of the investment proposal, as the actions outlined in the latest and planned for implementation in the riverbed will not affect the qualitative and quantitative composition of aquifers.*

*Areas of water protection according to Article 119 WA, which fall within the area of the investment proposal*

- Areas for protection of drinking water from groundwater bodies according to Art. 119a para. 1 it. 1 WA - area with code BG1DGW0000Qal010, covering groundwater body BG1G0000QAL010. The condition of the area is poor. The environmental objective of the area for protection of drinking water is: "Reducing the need for water treatment prior to water use and ensuring planned intake by facilities by 2015.”

***Table III.2.3.2.-6: Status of areas for protection of drinking water from groundwater bodies on DWMD territory by 2009.***

| Protected area code | GWB code | status |
|---|---|---|
| BG1DGW0000Qal010* | BG1G0000Qal010* | bad |
| BG1DGW0000K1b041 | BG1G0000K1b041 | bad |
| BG1DGW0000J3K051 | BG1G0000J3K051 | good |
| BG1DGW000000N049 | BG1G000000N049 | good |

* protection zone and code of body of water that falls within the investment plan area

- Zones for protection of drinking water and sanitary protection zones according to Art. 119, para. 1 it. 1 WA (water bodies and sanitary protection zones under Art. 119, para. 4). The investment proposal does not fall within any sanitary protection zones defined under Ordinance No 3 of 16 October 2000 on the terms and conditions for surveying, approval and operation of sanitary zones near water sources and facilities for drinking water and sources of mineral water used for therapeutic, drinking and hygiene purposes;

- Zones of water protection, according to Art. 119a para. 1, it. 5 WA - protected areas and zones designated for protection of habitats and species where the maintenance or improvement of water status is an important factor in their protection (protected areas part of the NATURA 2000 network): Mishka section (km 462.0 to km 459.4) designated for extraction of sand and gravel from alluvial deposits in the bed of the Danube falls into the following zones: protected area for conservation of natural habitats and of wild flora and fauna named Kalimok Brashlen code BG000377, and protected area for conservation of wild birds named Complex Kalimok code BG0002030.

## 3. Land and Soil. Geological Base

### 3.1. Characteristics and condition of the soil in the area of the site and neighboring lands

According to the generalized classification of soils in Bulgaria (as per FAO), the soils in the project area can be characterized as follows:

Orders - E - soils with appreciable accumulation of surface saturated with bases of organic matter.

Types: Chernozems, CH.

Subtype: gleyic, CHg.

Chernozems are known as calcium-humus soils widespread in continental and temperate regions of Europe, Asia and North America. They were classified as a separate soil type for the first time by the Russian soil scientist V. Dokuchaev in 1883. He called them "the king of soils, the major riches of Russia."

Wide variety of soils in our country is due largely to chernozems. They are distributed in North Bulgaria, where they occupy almost entirely the lower forest belt of the western and central part of the Danube (Moesian) Hilly Plain, southern Dobruja plateau and part of Ludogorie. These lands cover about 20% of the total area of the country. Chernozems are formed on loess, loess sediments, clays, marls and limestones in the presence of grassland-steppe and forest-steppe vegetation. The most favourable conditions for their development and formation are present in areas with forb and cereal grasses. These conditions and alternating wet and dry periods during the year support humification, saturation of humus with calcium and leaching of carbonates.

Carbonates accumulate at different depths and range from 0 to 20%, as a result of which chernozems are divided into four subtypes: carbonate (brown), simple (leached), lessived (degraded) and gleyic (meadow). Depending on the thickness of the humus horizon or humus content chernozems are divided into the following types: weak (with humus horizon to 40 cm), average (40-80 cm) and strong (over 80 cm).

### 3.2. Geological structure in the area of the site

The below cartogram of Bulgaria with scale of 1:100000 (Fig. III.3.2.-1) shows that the project area falls within the Gryaka and Vetovo map sheets.

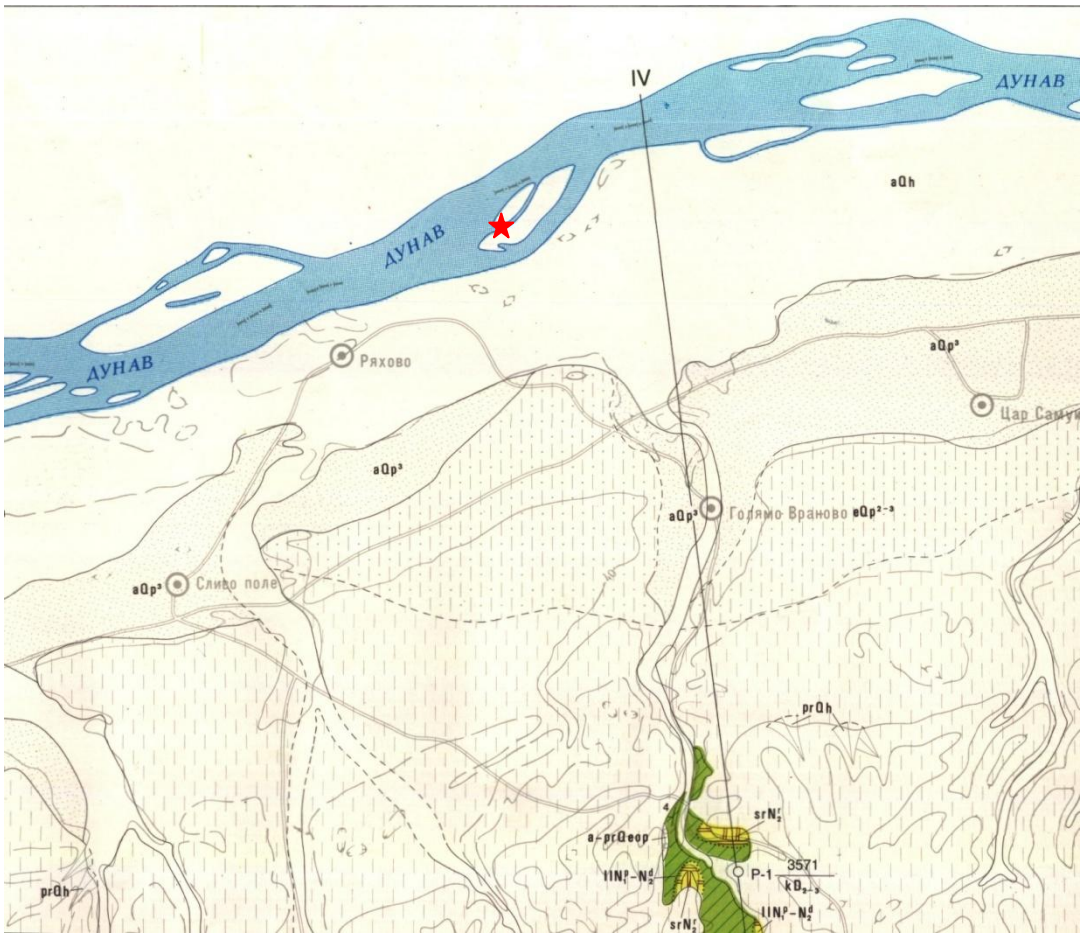



***Fig. III.3.2.-1: geological map with scale of 1:100 000***

★ ***- location of site***

Stratigraphy of the area is as follows:

THE CRETACEOUS

Cretaceous system is widely developed and is divided into two groups- Razgrad, Rousse and an informal litho-stratigraphic unit – greensand-marl-sandstone formation. Along the coastal strip of the Danube River the study area revealed deposits of the Rousse group.

Rousse group


Porcelain-like, oolithic and organogenic limestones – Hauterivian and Early Aptean Age

The name was introduced by Bonchev (1957) as "Rousse limestones." The rank was determined by Nikolov (1969), and the lectostratotype at the village of Basarbovo, Rousse Region was designated by Nikolov, Ruskova (1987).

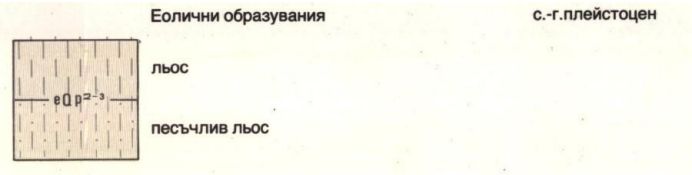
The lower limit of the Kaspichan Group is lithologically sharp (P-1 Chereshovo). The limit of Razgrad Group is normal with wedged lateral contacts (C-1, C-2 and C-4 Kubrat). The upper border is merging with greensand-marl-sandstone and sand and kaolin formation. Such is its nature with the Neogen group and Quaternary formations.

Rousse formation consists of irregularly changing strong, solid, light brown to white porcelain and porcelain-like limestone, oolithic limestone and thick layers of organogenic limestone, composed of recrystallized corals, bryozoa, requiennii and others. In most cases, limestones are cracked, cavernous, with calcite precipitations.

The thickness of the Rouse formation reaches up to 490 m (P-1 Chereshovo). Its stratigraphic range, according to Nikolov and Ruskova (1987), is Hauterivian-Aptean.

QUATERNARY PERIOD

AEOLIAN FORMATIONS




loess and sandy loess Middle-Upper Pleistocene

Loess is a widely spread Aeolian formation. It is a gradual transition over Lower Pleistocene clays.

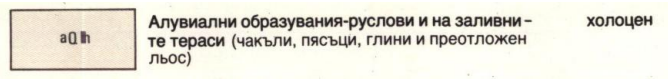
Loess is a pale yellow, friable, light, porous, slightly coherent clay aleurolitic rock. It is calcareous and stands as angular grains, crusts or concretions of different shapes and sizes - "Loesskindchen" (“little loess kids”). Loess stands in either steep or vertical faces. Loess becomes gravy when saturated with water and forms steppe minor depressions.

From north to south, the clay component is gradually increasing, and the aleurolitic and sand component decreasing respectively. Based on the ratio of sand, clay, and aleurolite there is true loess and sandy loess.

Sandy loess forms a narrow strip along the Pobrezhie which southern boundary follows approximately the line of villages of Nova Cherna, Malko Vranovo and Borisovo. To the south of this line there is true loess. Soil horizons buried in loess are rich in humus, dark brown, loose soils or weathered clay horizons. There are five buried soils in the north coming to only two in the south.

The thickness of the loess complex increases from 10 m in the south to 40 m in the north along the Danube between the villages of Nova Cherna and Slivo pole. We have adopted that the loess is Aeolian in origin. The main source of material has been probably formed by Danubian floods. The age of the loess complex is still undetermined, but may be taken to be Middle-Upper Pleistocene.

Alluvial formations




Mainstream and Floodplain Alluvium (gravel, sand, clay and redeposited loess) – Holocene

Pleistocene alluvium is found on the Danubian terraces in the Pobrezhie. Terrace deposits are formed primarily on the karstified and denuded limestone of Rousse Group and probably on sediments of the greensand-marl-sandstone formation in the vicinity of the town of Rousse. They consist of well smoothed gravel fragments of different size mixed with medium and coarse sand. Sediments on fluvial terraces are covered by alluvial red Aeolian clays and loess complex. With the exception of the first fluvial terrace, the other can be found

only by drilling.

Thickness is limited within 3 to 14 m for the separate terraces. The first fluvial terrace is the most widely developed. It is composed of alluvial materials that can be found in separate sections near the village of Marten, Slivo pole, Babovo and Golyamo Vranovo. Porcelain-like limestone of the Rousse Group near the last village is covered by sands and gravels with thickness of 7 m. Sands are medium to coarse, grey-yellowish, among which appear streaks and lenses of gravel. Fragments are well smoothed with a size of 0.4 cm to 12 cm. Limestone, milky quartz, flint and rarely sandstone is present. The aforementioned materials are covered by 2-3 m of redeposited loess and loess sands.

### 3.3. Seismic Activity

According to the seismic zoning map of Bulgaria, SG 102/2005, the area under consideration is characterized by seismic intensity of the VIIIth degree on the Medvedev–Sponheuer–Karnik scale and seismic coefficient of 0.27.

### 3.4. Natural resources

There are no registered natural resources in the area of implementation of the investment proposal.

## 4. Flora and Fauna

### 4.1. Flora

According to geobotanical zoning (in Bondev, 1997) the project area falls within the Rousse region of the Danube district of the Lower Danube province of the European deciduous forest biome, and according to forest vegetation zoning of Bulgaria within the Moesian plant forest area (floodplain and riparian forests at an altitude of 0-600 m.).

According to the floristic zoning adopted in Flora of Bulgaria (vol. I – X, 1962-1995) the section of the Danube River (from km 462.0 to km 459.4) where extraction of sand and gravel will take place is the northern boundary of North-eastern Bulgaria floristic region. The area covers the territory between the lower reaches of the river Yantra and Tutrakan. It is characterised by residual forests dominated by oak species such as Turkey oak (Quercus cerris), pubescent oak (Quercus pubescens), Oriental Hornbeam (Carpinus orientalis), Field Elm (Ulmus minor), large-leaved lime (Tilia grandiflora), Silver Lime (Tilia tomentosa) and others. Eurasian smoketree (Cotinus coggygria) is the predominant representative of shrubs. Typical steppe elements for the area are feather grass (Stipa lessingiana), Montpellierian Camphor-fume (Camphorosma monspeliaca), Danubian Clustered Broom, Crimean salvia (Salvia scabiosifolia) and others. Kovachev broom (Chamaecytisus kovacevii) is an endemic plant found in the westernmost part of the region.

Significant areas along the Danube and the Danube islands are occupied by Riparian flooded forests dominated by white willows (Salix alba), almond willow (Salix triandra), black poplar (Populus nigra), white poplar (Populus alba), white elm (Ulmus laevis), black alder (Alnus glutinosa), Desert Ash (Fraxinus oxycarpa), shrubs (Amorpha fruticosa) and blackberry (Rubus caesius var.aquaticus).

Waterlogged areas along the Danube have formed forest communities dominated by white willow (Salix alba), white poplar (Populus alba L.) and black poplar (Populus nigra L.).

In many places, including the islands were created cultures of black locust (Robinia pseudoacacia) and Euro-American poplar hybrids (Populus x euroamericana).

Wetlands along the river are overgrown with pond and marsh vegetation dominated by reed (Phragmites australis (Cav.) Trin ex Stend.), Fernleaf cattail (Typha angustifolia L.) and bulrush (Schoenoplectus lacustris L.).

**The area of the offered investment proposal is a section of the bed of the Danube River that is public state property falling within Mishka section (from км 462.0 to км 459.4), to the north of the village of Ryahovo and the village of Babovo, to the north and north-west of Mishka Island (Golyam Mishka – 1 and Malak Mishka-2) and to the south of Mishka-3**.

The area of Mishka Island and Malak Mishka is covered by woods property of the State within the protected area "Kalimok Brushlen" proclaimed by Order No RD - 451 / 04.07.2001 of the Minister of Environment and water (SG 68/2001). Mishka Island is part of the protected area "Kalimok Brushlen" as its territory is occupied mainly by local tree species such as white willow and black poplar.

The forests covering Mishka Island and Malak Mishka fall within the area of activity of "Severnotsentralno darzhavno predpriatie" DP - Gabrovo, State Hunting Farm "Dunav" - Rousse. They are arranged by department, 229 subsections a, o, c, d, e, f, g, h and k, l, m, n, o, n, p, 1, according to the 2012 Forest Map and Forest Plan of SHF "Dunav". Part of subsections, namely "a", "b", "c", "d", "o", "p", "q" represent seed plantations of natural origin, mainly from white willow and rare field elm, black poplar and white poplar. The age of plants varies from 10 to 60 years. Subsections "e", "f", "g", "h", "i", "k", "l", "n" represent forests planted with forest tree species such as white willow, poplar - branches " 1-214" and "1-37/61" narrow-leafed ash, field elm, black poplar and white poplar; subsection "m" is formed as a "clearing" and subsection "1" is formed as "backwater" (according to letter with issue number GF-88/19.05.2014 of the Regional Directorate of Forestry - Rousse enclosed as Annex); age of the plantation is 1 to 2 years.

Implementation of the project will not affect parts of the island formations, and will not envisage activities on Mishka Island itself related to destruction of areas occupied by deciduous trees.

**Phytoplankton**

The results of the research program on the Danube conducted at the beginning of the century indicate a total of 261 species of phytoplankton along the entire river. The number of species of phytoplankton increases in the middle and lower reaches of the Danube, which is at the expense of the Chlorococcales family and probably due to eutrophication processes (Joint Danube Survey, 2002).

The number of phytoplankton algae species identified in the seventies of the last century in different sections of the Danube is 91 (Naydenov 1966) to 186 (Says, 1978). Diatoms prevail in the phytoplankton with pronounced autumn maximum, and less pronounced minimum in summer. The damming of the "Iron Gate" lake saw intensive development of phytoplankton in summer.

Diversity of phytoplankton and phytobenthos species and their quantity in the river bed depends on the concentrations of nutrients in the water, the flow velocity, the type of sediment, temperature and solar radiation.

**Phytobenthos**

The expedition to study the water quality of the Danube organized by the International Commission for the Protection of the Danube River (ICPDR) registered 340 species of

phytobenthos organisms (Joint Danube Survey, 2002). The most numerous among them are diatoms (Bacillariophyceae) - 264 species. The largest number of species is from the Navicula, Nitzchia, Achnanthes, Amphora, Cocconeis, Cymbella, Diatoma, Fragilaria, Gomphonema, Gyrosigma, Surirella genera. The number of phytobenthos organisms decreases after Kozloduy (685 km) due to a change in the type of substrate. The highest number of algae is in the rocky and hard bottom areas and the lowest in sandy and muddy areas. In the delta their number is minimal. The number and abundance of species in the phytobenthos depends mainly on substances dissolved in water, and their ratios determine the diatom biotic index (DBI), which is an indicator of water quality.

### 4.2. Fauna

Terrestrial fauna of Bulgaria from zoogeographic point of view belongs to the Paleoarctic zoological area of the Holarctic kingdom. A significant part of the country falls within the Euro-Siberian zoogeographical subregion, but also borders on the Mediterranean zoogeographic subregion. This is the main reason why there are two zoogeographical complexes on the territory of Bulgaria: northern (Euro-Siberian), formed by cold resistant species and southern (Mediterranean), including many thermophilic species.

According to the zoogeographic division of Bulgaria (Georgiev 1982) the territory of the investment project falls within the Danube region. Most wildlife species here are Euro-Siberian and European. Prevalent species among the others are of Holarctic and Palaearctic distribution. Endemic fauna is almost non-existent, only subterranean fauna is represented by 2 Balkan and 4 Bulgarian endemics.

**The composition of species of vertebrates in the area includes the following:**

***Mammals***

Their composition in the area around Mishka Island was established with the conducting of a survey in the summer and autumn of 2014. Traces, holes, underground shelters, tracks and droppings were studied. Bats were recorded with an ultrasonic detector and the recordings analyzed with appropriate software. A survey with local hunters was made regarding larger mammals, predators and hunting objects. The results of surveys on the Danube program and the preparation of management plan Kalimok Brashlen, while these studies are used and traps. Faunistic research on the Romanian coast and islands from km. 838 to km. 383 (Murariu, 2005) reported 45 species of mammals belonging to 32 genera, 17 families and 6 orders. The majority live along the banks of the Danube. Bats registered near the Danube make longer migrations between their wintering and summer habitats. Crossing between the coast and the land is only possible during low water and ice, which is why the number of mammals inhabiting the areas adjacent to the river and the Danube islands is very limited. Only aquatic species such as the otter (Lutra lutra), water vole (Arvicola amphibius), as well as wild boar (Sus scrofa), roe deer (Capreolus capreolus) and jackals (Canis aureus) inhabit the area. Parts of the Danube islands that remain dry during high water, poplar forests, farmland and reeds are the home of the Common Vole (Microtus arvalis), Striped Field Mouse (Apodemus agrarius), Long-Tailed Field Mouse (Sylvaemus sylvaticus ), yellow necked mouse (Apodemus flavicollis) and Ural field mouse (Apodemus uralensis) (Murariu, 2005). The shores of the Danube and adjacent lands provide favorable habitat for the Eurasian pygmy shrew *(Sorex minutus),* the common shrew (*Sorex araneus*) and coypu (*Myocastor coypus*). The latter was introduced into Europe from South America for the production of fur and meat. It inhabits marshes along the Danube where individuals escaped from farms or released by their owners have settled. There are low-numbered populations isolated from one another.

Bats have been registered as 15 species belonging to two families: *Rhinolophus hipposideros, Rhinolophus mehelyi, Myotis myotis, Myotis daubentonii, Myotis emarginatus, Plecotus auritus, Vespertilio murinu, Nyctalus noctula, Nyctalus lasiopterus, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Pipistrellus nathusii, Pipistrellus kuhlii,* and *Miniopterus schreibersii.* All registered bats are protected by law in the two neighboring countries, and one species (*Rhinolophus hipposideros)* is subject to protection in PA BG 0000377 „Kalimok-Brashlen". Five of the species registered in the Danube region, namely *Rhinolophus mehelyi, Rhinolophus hipposideros, Myotis emarginatus, Myotis myotis* and *Miniopterus schreibersi* are subject to protection in PA ROSCI0088 Gura Vedei - Şaica –Slobozia part of Natura 2000 network.

Lands adjacent to the Danube are inhabited by *Lepus europaeus, Spermophilus citellus, Microtus arvalis, Microtus rossiaemeridionalis, Microtus (Pitymys) subterraneus, Apodemus agrarius, Apodemus sylvaticus, Apodemus flavicollis, Apodemus uralensis, Micromys minutus* and *Spalax leucodon.*

Floodplain forests along the Danube are suitable habitats for *Dryomys nitedula*, *Myoxus (Glis) glis* and *Sciurus vulgaris*. Romanian Islands Mocanu and Albina are inhabited by *Muscardinus avellanarius* (Murariu, 2005), which is also found in habitats of the afore mentioned three species.

Areas adjacent to the Danube are suitable habitats for two species included on the ist of invasive and potentially invasive for Bulgaria animal species prepared by the EEA, which populations are small at present; however, a detailed research is required to establish their actual numbers. These species are:

- muskrat (Ondatra zibethicus) - inhabits habitats similar to those of the water rat (water vole) (*Arvicola amphibius*). The muskrat avoids the Danube by digging holes in the dikes along the canals and ponds and looks for food in the marshlands. The Danube is important for the interconnectivity of its habitats and offers opportunities for its displacement to new locations. The muskrat was introduced in Bulgaria from North America in 1955, and since then has spread in Romania. Excessive increase in its numbers near the Danube could pose a threat to the habitats of other species;
- brown rat (*Rattus norvegicus*) – It was brought to Europe in the 17th century by commercial ships from Eastern Asia and Northern China. It is found everywhere. It inhabits mostly residential and commercial buildings. In recent years it has developed a tendency to displace the black rat and resettle in nature. Although it inhabits mostly dry places in Romania it has been caught in trappings set in typical habitats of the water vole (Murariu, 2005).

The settlements are inhabited by *Mus musculus, Rattus norvegicus* and *Rattus rattus.*

Predatory species registered in the lands adjacent to the Danube are *Canis aureus*, *Vulpes vulpes*, *Meles meles*, *Lutra lutra*, *Mustela nivalis*, *Mustela putorius* and *Felis silvestris.* The Romanian territory is in the area of natural distribution of *Mustela erminea*. Predators occupy different niches, with the riverbanks and islands inhabited by *Lutra lutra,* young floodplain forests by *Canis aureus,* and alluvial deposits by *Meles meles*. Utilization of agricultural land has chased the wolf (Canis lupus) away in places hard to reach.

Larger hunted species include *Sus scrofa* and *Capreolus capreolus,* which inhabit the islands closest to Mishka section.

***Birds***

242 species of birds inhabit the valley of the Danube, Danube islands and territories south of the Bulgarian coast are identified (MEW, 2006).

The biggest group is that of waterfowl species, 71 in number. Areas overgrown with reeds, reed and cattail are inhabited by the Ferruginous Duck (Aythya nyroca), Black-Crowned Night Heron (Nycticorax nycticorax), Little Egret (Egretta garzetta), Squacco Heron (Ardeola ralloides), great bittern (Botaurus stellaris), Eurasian Spoonbill (Platalea leucorodia), Black-Winged Stilt, Common Tern (Sterna hirundo), Whiskered Tern (Chlidonias hybridus) and Black Tern (Chlidonias niger), Pygmy Cormorant (Phalacrocorax pygmeus), Greylag Goose (Anser anser), Red-breasted Goose (Branta ruficollis), White-Fronted Goose (Anser albifrons) and others. Some of the birds are nesting; others like geese are migratory and only come for the winter.

Shrubs, sparse woods and agrolandscapes are inhabited by small songbirds followed by birds of prey. The area is one of the few places in Bulgaria inhabited by Sea Eagle (Haliaeetus albicilla). Significant numbers of white storks (Ciconia ciconia) and Glossy Ibis (Plegadis falcinellus) gather in the area during migration periods.

***Reptiles***

The number of established species is 11. The majority of them inhabit the territory south of the banks of the Danube. The river and the river islands are inhabited by 3 species - Dice Snake (Natrix tessellata), Grass Snake (Natrix natrix) and European pond turtle (Emys orbicularis). Existing conditions in the area favour the dispersal of the invasive alien species red-eared slider (Trachemys scripta elegans), but threats at this stage have not been established.

***Amphibians***

Water areas, wetlands and swampy areas provide conditions for greater abundance of amphibians. Of the 17 known species of Bulgaria 12 are only found in the Danube River basin. The wetlands, estuaries of the tributaries of the river, irrigation and drainage channels with clear water and abundant vegetation and the islands in the river are inhabited by the Danube crested newt (Triturus dobrogicus) and smooth newt (Lissotriton vulgaris). The Danube crested newt is included in the Red book of Bulgaria.

Frog species are represented by the edible frog (Rana kl. Esculenta), fire-bellied toad (Bombina bombina), common toad (Bufo bufo), green toad (Pseudepidalea viridis), European tree frog (Hyla arborea), Agile Frog, (Rana dalmatina), common spadefoot (Pelobates fuscus), eastern spadefoot (Pelobates syriacus) and Marsh Frog (Pelophylax ridibundus).

***Ichthyofauna***

83 Ichthyospecies inhabit the Danube, and 65 of them are found in the Bulgarian section (Busnita, 1967). Publications by Bulgarian ichthyologists have documented 58 species without the acclimatized ones. The majority of species inhabit the lower reaches of the river.

Objective indicator of the status of fish populations is the amount of harvested fish. According to NAFA the last few years witness a trend of stability of fish catches in the Bulgarian section of the Danube with an upward trend until 2011 and then decline. Total amount caught in 2012 was 111.1 tons, 102.7 tons of which were of freshwater fish, 2.9 tons of migratory fish and shad, and 5.5 tons of other fish (NAFA, 2012).

Harvested fish is of the following species: shad, Danube herring (Alosa pontica), Northern Pike (Esox lucius), roach (Rutilus rutilus), chub (Leuciscus cephalus), Orfe (Leuciscus idus), common rudd (Scardinius erythrophthalmus), asp (Aspius aspius), Danube bleak (Chalcalburnus chalcoides), bleak (Alburnus alburnus), common bream (Abramis brama), bream (Abramis sp.), vimba bream (Vimba vimba), sichel (Pelecus cultratus), common nase (Chondrostoma nasus), common barbel (Barbus barbus), Maritsa barbel (Barbus cyclolepis), common carp (Cyprinus carpio), carp (Carassius auratus), crucian carp (Carassius carassius), silver carp (Hypophthalmichthys molitrix), bighead carp (Aristhichthys nobilis), grass carp (Ctenopharingodon idella), wels catfish (Sillurus glanis), Burbot (Lota lota), zander (Sander lucioperca) and perch (Perca fluviatilis). The majority of the species caught are representatives of the carp family (Cyprinidae). Three types of silver carp (Hypophthalmichthys molitrix), bighead carp (Aristhichthys nobilis) and grass carp (Ctenopharingodon idella) are introduced species object of industrial fisheries. They cannot reproduce naturally in European rivers.

Studies on the presence and abundance of sturgeons in the Danube and Black Sea have been carried out jointly by the Institute of Zoology of the Bulgarian Academy of Sciences, the Institute of Fisheries - Varna; Faculty of Biology of Sofia University and the Institute of Zoology of Bratislava. Over the past 10 or more years there have been no records of bastard sturgeon (Acipenser nudiventris) or European sea sturgeon (Acipenser sturio) caught in the Bulgarian section of the Danube, and these species are considered extinct. Starry sturgeon (Acipenser stellatus) is also a rare catch in this section of the Danube and is also among the species threatened with extinction. European sea sturgeon (Acipenser sturio) has been entering the Danube Delta and reaching the Bulgarian sector (Drenski, 1951) until the beginning of the XXth century. It has not been caught since 1963 and according to all ichthyologists engaged in research on sturgeon, it has already disappeared from the upper and middle Danube, and probably from the Black Sea region. The presence of bastard sturgeon in the Bulgarian stretch of the Danube needs scientific confirmation.

Sturgeon species found in catches in the Danube are Starry sturgeon (Acipenser stellatus), Russian sturgeon (Acipenser gueldenstaedti), beluga (Huso huso) and sterlet (Acipenser ruthenus). The number of these species depends on the state of their breeding grounds, the physicochemical characteristics of the waters of the Danube, fishing regime and number of fish caught, and food availability.

Bastard sturgeon (Acipenser nudiventris), European sea sturgeon (Acipenser sturio) starry sturgeon (Acipenser stellatus) and Russian sturgeon (Acipenser gueldenstaedti) spawn in deep areas with swift current and rocky and hard bottom. The extraction of sand and gravel subject to the investment project is not associated with destruction of spawning sites of either species as raw material will be extracted from an area with sandy silt deposits unsuitable for spawning of sturgeon species. Depths measured during preparation of the report on the geological, geomorphological and geometrical parameters of alluvial deposits along the Danube in the "Mishka-Vetovo" section (km 462.0 - km 459.5) were 2.20 to 4.30 m with a maximum depth of 6.30 m and river flow speed of 6 km per hour making the area undesirable to these species.

The beluga (Huso huso) spawns in the spring on rocky and gravelly bottoms in the deep water. The beluga spawns every 4 to 6 years and feeds mainly on fish. In contrast to the migratory species the sterlet (Acipenser ruthenus) is a local, non-migratory freshwater species. It spawns in April to June on rocky and sandy bottoms.

Geological exploration of the "Mishka-Vetovo" section (km 462.0 - km 459.5) revealed presence of alluvial deposits, represented by gravel aggregate with layers and lenses of sand. Gravel content is in the range from 25% to 70%, about 50% average with fragments the size of 5 mm to 40 mm, the ones 5-20 mm in size predominating.

Data from the geological and hydrological studies reveals that neither the beluga nor the starlet favours the studied section of the Danube as spawning ground, therefore extraction of dynamic reserves of alluvial deposits from this stretch of the Danube will not influence the population density of either species.

Food availability in the river is of any significance only for the young of the migratory species for the period until their entering the Black Sea, where they grow up and return in the Danube only to spawn.

**Invertebrates**

***Zoobenthos***

In connection with the need to collect data on the composition and species composition of zoobenthos for the preparation of the EIS, the team working on the report commissioned a study of the area of the Danube that is object of extraction of alluvial deposits. Samples taken from said area of the Danube showed an extremely poor demersal community. Samples were taken from three different sections of the extraction area:– st. 1 extraction area, st. 2 the coastal area of Mishka Island and st. 3 the coastal area below the village of Ryahovo.


***Fig. III.4.2.-1: . Situation of studied stations***

Station 1 - within the future extraction site (extraction area is marked in purple); station 2 - the coastal area of Mishka Island; station 3 - the coastal area below the village of Ryahovo.

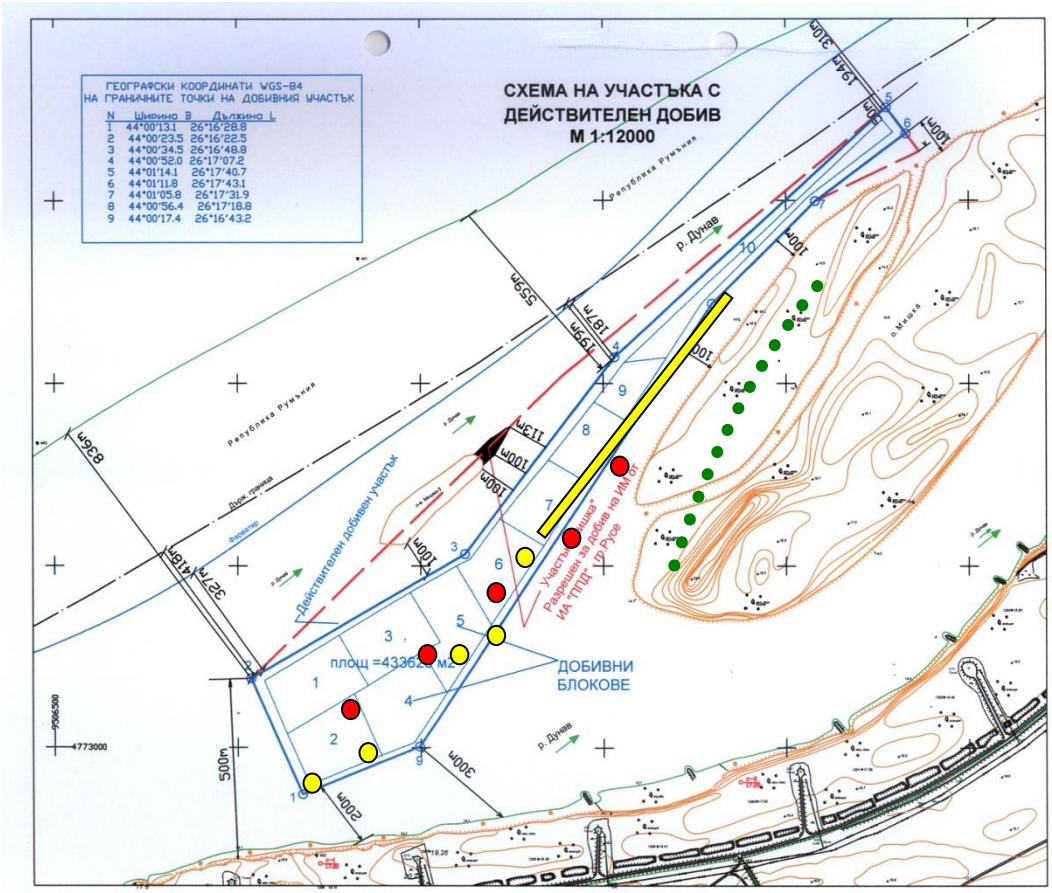



***Fig. III.4.2.-1: Detailed map of sampling within the area of the future extraction site***

(st.1) immediate coastal area, red dots show the main places of sampling by dredging; yellow dots mark diving spots; the yellow line marks the area where continues underwater study was performed by divers; the green dotted line shows the sampling area on Mishka Island (st.2).

Station 1: Two collections of samples conducted in the first section revealed only 7 taxa (species), of which only the Asian clam (Corbicula fluminea) and the river nerite (Teodoxus fluviatilis) is of greater importance due to massive development. The first species is one of the most rapidly expanding and growing in large abundances invasive species on the Danube (Hubenov et al., 2013). Shells of zebra mussel (Dreissena polymorpha), Ponto-Caspian species, one of the most aggressive aquatic invasive species in the world (Van der Velde et al. 2010) were also found.

The coastal area of the Mishka Island (section 2) is also very poor in bottom invertebrate species. The study revealed eight taxa, including three species of molluscs, 4 species of insect larvae and the amphipod Dikerogammarus villosus. The last species is Ponto-Caspian, quickly invading a number of bodies of freshwater in Europe (Devin et al., 2001; Casellato et al, 2006, etc.) by spreading along the so-called "Southern Corridor" (Rhine-Main-Danube). Two other invasive species (Corbicula fluminea) and (Dreissena polymorpha) have also been registered.

The coastal zone under the village of Ryahovo (section 3) outside the concession area was found to host 18 different taxa (species) as well as traces - shells, chitin carapace residues, etc. of 6 other taxa. Among them are the striped nerite (Theodoxus transversalis) and thick shelled river mussel (Unio crassus), which are endangered species according to IUCN Red List and listed in App. 2 and App. 3 of the BDA, and Danube crayfish (Astacus

leptodactylus), included in App. 4 of the BDA. Identified taxa are distributed as follows: five species of mussels, seven species of mussels, four taxa of shellfish, and eight taxa of insects.

Analysis of species composition of bottom invertebrates shows that very few taxa occur in the area of the future extraction site and the coastal areas of Mishka Island (st.1, 2), mainly eurobiontic invasive species. The main reason is probably the lack of suitable bottom substrate - river sediments are composed mostly of sand, which in combination with a strong current has a depressing effect on benthic representatives. Contrary to this situation, only 3 km upstream, below the village Ryahovo bottom communities are very rich, including rare and protected species.

*Estimate quantity of bottom invertebrate fauna*

*Station 1 (extraction site)*

Density (individuals per square metre) of bottom invertebrates inhabiting the area of the future extraction site (station 1) is extremely low. The results show that it varies between 2 ind. / m2 (August) and 28 ind. / m2 (September) of mainly C. fluminea (August) and T. fluviatilis (September). With respect to sampling malacofauna, the results are even lower: between 2 ind. / m2 (August) and 5 ind. / m2 (September) mainly of C. fluminea. C. fluminea is ecologically plastic and normally found on sandy bottoms, ie potentially the only species that can survive the conditions that bottom ecosystems in the area of the future extraction site offer.

Both types of samples (collected by dredging and scuba equipment) reveal mainly mature C. fluminea, indicating that stable population does not develop and probably the individuals found in the extraction site area originate from upper river sections. This statement is supported by the extremely large number of empty shells found in the section: 161 empty single shells / 1m2 (August) and only 2 live individuals/1 m2 were found by using a rectangular dredge.

*Station 2, Mishka Island coastal area*

The density of benthic fauna in the coastal areas of Mishka Island (up to 1.5m depth) is relatively low in both periods studied - 8 ind. /m2 in August and 9 ind. / m2 in September. Again, C. fluminea has the highest number (up to 5 ind. / m2, September) followed by D. villosus (up to 3 ind./m2, August). As in the main study area (st.1), here the number of remains of dead organisms - shells is several times larger than those found alive: in August 65 shells per sq.m. were found, in September - 18 shells per sq.m., mainly of C. fluminea and single shells of most of the common species of mussels and snails. This fact confirms the assumption for unstable, poor community. The conclusion that there are no good trophic resources can be made for this station as well.

*Station 3, the coastal area of the Danube River near the village Ryahovo*

The station located in the village of Ryahovo is characterized by a much greater density of bottom communities than the surveyed areas at the Mishka Island. Here between 678 ind. / m2 (August) and 87 ind. / m2 (September) of macrozoobenthos organisms were found. Compared to them, the remnants of dead organisms - shells are much less than those found near Mishka Island: between 53 ind. / m2 (August) and 3 ind. / m2 (September). The largest number of individuals per square metre belong to Fagotia esperi (numbering up to 266 ind. / m2, August); Teodoxus danubialis (107 ind. / m2, August); Amphimelania holandri (89 ind. / m2, August); Teodoxus fluviatilis (79 ind. / m2, August). Other taxa: crustaceans D. villosus (38 ind. / m2, August) and Corophiumsp. (28 ind. / m2, August) are also large in

number. Unlike in the previous areas of study here C. fluminalis has a relatively small share of 29 ind. / m2, August.

***Zooplankton***

More serious studies of zooplankton in the Bulgarian section of the Danube were made after 1958. Studies on the effects of hydraulic structures on the Danube, quality and quantity of zooplankton were made in the seventies of the last century (Naydenov 1963; Naydenov, 1968; Naydenov, 1975). Rotifiers are a dominant species throughout the year. Predominant species are Brachionus calyciflorus, B.Urceolaris, Keratella quadrata, Asplanchna priodonta. Second in number are copepods, which are found in greater quantity in the summer months and after construction of the "Iron Gate" dam they reach 84% of the total planktonic composition.

Between 1971 and 1973, over 70% of the zooplankton was produced in the spring and summer months. Following regulation of river flows, the reported reduction in average zooplankton abundance was 6-9 times, and in zooplankton biomass from 5.7 to 7.3 times. In the ten years of our century no major change in the relative share of the different groups constituting the planktonic fauna was observed. The number of registered species is 120, of which 79 rotifers, 27 cladocera and 14 copepods.

## 5. Protected natural areas. Protected zones

### 5.1. Protected Areas

The Mishka Section (462.0 km. – 459.4 km.) within the area of the village of Babovo, Slivo pole Municipality, Rousse Region where extraction of alluvium from the bed of the Danube will take place falls outside protected territories within the meaning of the Protected Areas Act, but is adjacent to PA “Kalimok-Brashlen”.

- **PA “Kalimok-Brashlen”**

Kalimok Brashlen is an area protected by virtue of Order RD-451 of 4 July 2001 of the Ministry of Environment and Waters, SG 68/2001 and approved by virtue of Order RD-886 of 7 December 2007 of the Ministry of Environment and Waters, SG 17 of 19 February 2008. The area covers 5771,6 ha.

The protected area is located along the former Tutrakan floodplain, between Babovo and Tutrakan, within the municipality of Slivo pole and Tutrakan and includes all Bulgarian Danube islands in this part of the Danube: Mishka, Malak Brashlen, Pyasachnik, Bezimenen, Kalimok and Radetzky. The protected area was established to preserve the diversity of ecosystems and landscapes characteristic of the region and habitats of rare and endangered plant and animal species.

In 2007 the protected area became part of the protected area "Kalimok - Brushlen" BG 0000377 under the Habitats Directive which overlaps with a protected area under the Birds Directive. The protected area constitutes 79 per cent of the protected area under the Habitats Directive.

The specific physical and geographic conditions in the protected area "Kalimok Brushlen" determine a wide variety of floral elements. A total of seven species divided into 26 groups of geoelements has been established. Of these elements the Circumborreal elements prevail (51%), followed by those of European (20%) and cosmopolitan (12%) type.

The relatively high participation of elements of the cosmopolitan type is due to the high degree of anthropogenic influence and the interzonal character of the prevailing habitat

types. For the same reasons, the endemic component is underrepresented – there is only 1 Balkan and 2 subBalkan endemic taxa.

***Table III.5.1.-1: Plant species subject to conservation in protected area "Kalimok Brushlen"***

| Latin name | Bulgarian name | Category |
|---|---|---|
| *Nymphaea alba* L. | Бяла водна лилия | Endangered |
| *Nuphar lutea* (L.) Sibth. et Sm. | Бърдуче | Endangered |
| *Euphorbia lucida* Waldst. et Kit. | Лъскаволистна млечка | Endangered |
| *Utricularia australis* Br. | Южна мехурка | Endangered |
| *Leucojum aestivum* L. | Блатно кокиче | Endangered |
| *Marsilea quadrifolia* L. | Разковниче | Rare |
| *Trapa natans* L. | Дяволски орех, джулюн | Rare |
| *Nymphoides peltata (S. G.Gmel.) O. Kuntze* | Щитолистни какички | Rare |
| *Utricularia vulgaris L.* | Обикновена мехурка | Rare |
| *Senecio paludosus L.* | Блатен спореж | Rare |
| *Lemna gibba L.* | Гърбава водна леща | Rare |
| *Salvinia natans (L.) All.* | Плаваща лейка | |
| *Dichostylis michelianus (L.)Ness.* | Михелов дихостилис | |
| *Armoracia macrocarpa (Waldst.et Kit.)* | Едроплоден хрян | |
| *Rorippa lippizensis (Wulf) Rchb* | Липизенски пореч | Balkan endemic species |
| *Galium rubioides L.* | Брошово еньовче | Endangered |

Fauna is well represented on the territory of the protected area. There are 500 species of invertebrates, 67 fish species, 10 amphibian species, one species of reptiles, 207 species of birds and 46 species of mammals. Given the habitat, fauna is divided into two completely independent ecologic complexes - terrestrial (land) and Aquatic (water).

***Table III.5.1.-2: invertebrate taxa of conservation significance in protected area "Kalimok Brushlen"***

| Species | Biodiversity Act | Berne Convention | IUSN | Directive 92/43/EEC |
|---|---|---|---|---|
| *Hirudo medicinalis* | + | + | + | - |

| | | | | |
|---|---|---|---|---|
| *Unio crassus* | + | - | - | + |
| *Helix pomatia* | - | + | - | - |
| *Coenagrion mercuriale* | - | + | + | + |
| *Gomphus flavipes* | - | + | - | - |
| *Lycaena dispar* | - | + | + | + |
| *Formica rufa L.* | + | - | + | - |

Batrachofauna is represented by: Danube crested newt, common newt, the marsh frog and European water frog, agile frog, European tree frog, two kinds of toads, with the brown being relatively rare, European fire-bellied toad and spadefoot toads.

The herpethofauna is represented by one species, the European pond turtle.

Six species of bats were registered on the territory. Other species of mammals also indicated for the territory are *Spermophilus citellus*, *Glis glis*, *Dryomis nitedula*, *Capreolus capreolus* and *Cervus elaphus*.

***Table III.5.1.-3: Taxonomic groups and numbers in protected area "Kalimok Brushlen"***

| Group | number | Red Book | BA Appendix 2,3 | BERN | IUCN Red list | BONN | CITES | Conv. 92/43 | Conv. 2009/147 |
|---|---|---|---|---|---|---|---|---|---|
| invertebrates | 500* | | 2 | 5 | 2 | | | 4 | |
| fish | 67 ** | 9 | | 26 | 31 | | 6 | 14 | |
| amphibians | 10 | 1 | 8 | 10 | 2 | | | 2 | |
| reptiles | 11 | 1 | 4 | 11 | 1 | | | 2 | |
| birds | 207*** | 55 | 180 | 199 | 8 | 122 | 30 | | 84 |
| mammals | | 5 | 15 | 27 | 10 | 6 | 2 | 13 | |
| **TOTAL** | **795** | **71** | **209** | **278** | **54** | **128** | **38** | **35** | **84** |

**Totals for the number of species as per taxonomic groups within protected area "Kalimok - Brushlen" and their conservation status**

** The estimated total number of species of invertebrates is around 1600.*

*** as per data from the protected area the number of fish is 55*

**** ** as per data from the protected area the number of birds is 242*

- The following activities are prohibited with a view to safeguarding biodiversity:
- activities related to or leading to drainage or disturbance of the water regime of the existing wetlands designated as such by their long term use under the land division plans of the respective areas;
- conversion of grasslands from state and municipal land into arable land;

- reduction of forested areas;
- reduction of forests by changing land use;
- reduce of natural forest areas owned by the state and municipalities;
- felling in breeding colonies of endangered species;
- felling during the period from March to July (inclusive) at a distance less than 300 meters from the breeding colonies of endangered species;
- regulation of game resources in the period, from March to July /incl/.
- open-pit mining.

The extraction site is located about 100 meters to the north of Mishka 3 Island. Implementation of the project does not provide activities within the protected area or activities in conflict with its protection regime.

**Protected areas designated under the Law on Environmental Protection of the Republic of Romania (LEGE nr.137 din 29 decembrie 1995)**.

- **Parcul Natural Comana**

The park was declared as a protected area by Government Decision HG №. 2151/2004 on the basis of scientific and technical documentation collected in 1954 by the Romanian Academy of Sciences. The Park is located in the southern part of Romania in the county of Giurgiu and occupies an area of 24.963 hectares. The park covers NATURA 2000 areas (SPA, SCI), wetlands, representing Ramsar sites and nature reserves, characterized by a wide variety of flora and fauna consisting mainly of forests, agricultural ecosystems, meadows, rivers, lakes, canals and deltas of rivers. The park is inhabited by 157 species of birds, 20,000 water birds, many of them migratory. There are also many species of fish, including the endemic *Petroleuciscus borysthenicus* and the internationally endangered *Umbra krameri*. The river Neajlov and its micro delta are optimal habitats for *Lutra lutra*, *Martes martes*, *Putorius putorius*, *Canis aureus, Felis silvestri* and *Meles meles*. Of 1300 plant species that occur on the territory of the park, 72 are threatened at the national level, and species such as Marsilea quadrifolia are protected in Europe. The park is important for water purification, flood protection, shoreline stabilization, groundwater recharge and maintenance of the currents. Around 10,000 people living in the park, directly benefit from the conditions in it - fish, hunt and develop traditional agriculture. The historical significance of the forest reserve dates back to 1462 when Vlad Tepes, also known as "Dracula" built Komanska Monastery.

Natural Park "Comana" includes the following protected areas under Annex 1 of Law No 5/6.03.2000 (LEGE nr. 5 din 6 martie 2000 privind aprobarea Planului de amenajare a teritoriului naţional - Secţiunea a III-a - zone protejate).

- **Pădurea Oloaga–Grădinari:** Research Reserve, located in the municipality of Comana on an area of 248 ha. It was declared to protect the natural habitat of butcher's-broom (Ruscus aculeatus).
- **Pădurea Padina Tătarului;** Research Reserve, located in the municipality of Comana with area of 230 ha. It was declared to protect the natural habitat of Romanian wild peony (Paeonia peregrina var. romanica).

The regime of conservation of protected areas in Romania is defined by Ordinance No 236/24.11.2000 on the regime of protected natural areas, conservation of natural habitats and

wild fauna and flora (ORDONANTA DE URGENTA Nr. 236 din 24 noiembrie 2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei si faunei salbatice, PUBLICAT IN: MONITORUL OFICIAL NR. 625 din 4 decembrie 2000) and Law No 462/ 8.07. 2001 for the implementation of Ordinance No 236 / 24.11.2000 of the Government on the regime of protected natural areas, conservation of natural habitats and wild fauna and flora (LEGE Nr. 462 din 18 iulie 2001 pentru aprobarea Ordonantei de urgenta a Guvernului nr. 236/2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei si faunei salbatice, PUBLICAT IN: MONITORUL OFICIAL NR. 433 din 2 august 2001). All of the above mentioned protected areas within Romania are situated more than 9 km away from the planned extraction site and impacts associated with violation of the regime of conservation and damage to the object of protection are not expected.

### 5.2. Natura 2000 sites– conservation objectives

The extraction area falls within two areas protected under the Biodiversity Act:

- BG0000377 "Kalimok- Brashlen";
- BG0002030 " Complex Kalimok ".

Both protected areas are situated in the Bulgarian section of the Danube.

The field of dynamic river sediments, which will be the subject of development is close to two other protected areas, which are located in the Romanian section of the Danube:

- ROSPA0090 Ostrovul Lung-Gostin - protected under Directive 2009/147 / EC on the Conservation of Wild Birds;
- ROSCI0088 Gura Vedei - Şaica –Slobozia under Directive 92/43 on the Conservation of Natural Habitats.

#### 5.2.1. Protected areas under Directive 92/43 / EEC on habitats

- **PA „Kalimok-Brashlen " BG 0000377**

It is a protected area under the Habitats Directive which overlaps with a protected area under the Birds Directive. Approved by Council of Ministers Decision No 122/02.03.2007, Publ. SG 21 / 2007 and EC Resolution of 12.12.2008 with area of 7550.18 ha. According to the afore cited decision the territory does not include settlements, territories with master or detailed development plan by the date of the order of the Minister of Environment and Water for the announcement of the protected area, concession areas for mining, or territories of overriding public interest under the Biological Diversity Act.

Subject to conservation in the protected area are 9 types of natural habitats.

***Table III.5.2.1.-1: Natural habitats subject to conservation in the protected area***

| CODE | *Pr.* | *NAME* | *% cover* | *repr.* | *Rel. area* | *Nat.st..* | *Gen. assess.* |
|---|---|---|---|---|---|---|---|
| **91E0** | * | Alluvial forests with Alnus glutinosa and Fraxi-nus excelsior (Alno-Pandion, Alnion incanae, Salicion albae | 3.48 | A | B | A | A |
| **1530** | * | Pannonian salt steppes and salt marshes | 2.45 | A | C | A | A |
| **3130** | | Oligotrophic to mesotrophic standing waters with vegetation of Littorelletea uniflorae and / or Isoeto-Nanojuncetea | 0.3 | A | C | B | A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **3140** | | Hard oligo-mesotrophic waters with benthic vegetation of Chara spp | 0.01 | A | B | A | A |
| **3150** | | Natural euthrophic lakes with Magnopotamion or Hydrocharition-type vegetation | 3.38 | A | B | A | A |
| **3270** | | Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation | 0.45 | A | C | B | B |
| **6430** | | Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels | 1.72 | A | C | B | B |
| **6440** | | Alluvial meadows of river valleys of the Cnidion dubii | 0.01 | A | C | B | B |
| **91F0** | | Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris) | 0.054 | A | C | A | A |

*Legend: Habitats marked with an asterisk have priority under Directive 92/43 / EEC.*

Target species subject to protection in the protected area include 15 species of fish, 1 species of amphibians, 3 species of reptiles, 10 species of mammals, including five species of bats, three species of invertebrates and one protected plant species.

***Table III.5.2.1.-2: Fish included in Annex II of Directive 92/43/EEC***

| Code | Latin name of the species | Bulgarian name |
|---|---|---|
| **1146** | *Sabanejewia balcanica* | Балкански щипок |
| **1124** | *Romanogobio albipinnatus* | Белопера кротушка |
| **2555** | *Gymnocephalus baloni* | Високотел бибан |
| **1145** | *Misgurnus fossilis* | Виюн |
| **2533** | *Cobitis elongata* | Голям щипок |
| **1159** | *Zingel zingel* | Голяма вретенарка |
| **1134** | *Rhodeus sericeus amarus* | Европейска Горчивка |
| **1157** | *Gymnocephalus schraetzer* | Ивичест бибан |
| **4125** | *Alosa immaculata* | Карагьоз (Дунавска скумрия) |
| **1160** | *Zingel streber* | Малка вретенарка |
| **1149** | *Cobitis taenia* | Обикновен щипок |
| **1130** | *Aspius aspius* | Распер |
| **2522** | *Pelecus cultratus* | Сабица |
| **1141** | *Chalcalburnus chalcoides* | Уклей, Брияна |
| **2484** | *Eudontomyzon mariae* | Украинска минога |

***Table III.5.2.1.-3: Amphibians and reptiles included in Annex II to Directive 92/43 / EEC***

| Code | Latin name of the species | Bulgarian name |
|---|---|---|
| 1188 | *Bombina bombina* | Червенокоремна бумка |
| 5194(1279) | *Elaphe sauromates* | Пъстър смок |

| | | |
|---|---|---|
| 1220 | *Emys orbicularis* | Обикновена блатна костенурка |
| 1219 | *Testudo graeca ibera* | Шипобедрена костенурка |

***Table III.5.2.1.-4: Mammals listed in Annex II to Directive 92/43 / EEC***

| Code | Latin name of the species | Bulgarian name |
|---|---|---|
| 1355 | *Lutra lutra* | Видра |
| 2609 | *Mesocricetus newtoni* | Добруджански (среден) хомяк |
| 1335 | *Spermophilus citellus* | Европейски лалугер |
| 2635 | *Vormela peregusna* | Пъстър пор |
| 2633 | *Mustela eversmannii* | Степен пор |

***Table III.5.2.1.-5: Bats***

| Code | Latin name of the species | Bulgarian name |
|---|---|---|
| 1310 | *Miniopterus schreibersi* | Дългокрил прилеп |
| 1316 | *Myotis capaccinii* | Дългопръст нощник |
| 1303 | *Rhinolophus hipposideros* | Малък подковонос |
| 1306 | *Rhinolophus blasii* | Средиземноморски подковонос |
| 1305 | *Rhinolophus euryale* | Южен подковонос |

***Table III.5.2.1.-6: Invertebrates listed in Annex II to Directive 92/43 / EEC***

| Code | Latin name of the species | Bulgarian name |
|---|---|---|
| 1087 | *Rosalia alpina* | Алпийска розалия |
| 1083 | *Lucanus cervus* | Бръмбар рогач |
| 1060 | *Lycaena dispar* | Лицена |

**Prohibitions and protection regime in the protected area**

The protected area has no protection regime; its standard data form, however, includes the following prohibitions:

- ban on felling with intensity below 5% in habitat type 91F0. In natural forests it is acceptable and normal for dead wood to form up to 5% of the fund. If dead wood is within 5% of the fund, sanitation harvesting is not allowed. In the cases of sanitation harvesting at least 15 $m^3$ of dead and dried wood should be left for each harvested hectare.
- Prohibition of all types of thinning in habitat type 91F0.
- Prohibition of all kinds of logging in habitat type 91E0.
- Prohibition of activities related to changes in the hydrological regime in habitat type 91F0 and 91E0.
- Prohibition of fodder collection in habitat type 91F0.
- Prohibition of fencing, including for the purposes of intensive breeding of wildlife in habitat type 91F0.
- Prohibition of livestock grazing in habitat type 91F0.

- Prohibition of change in use of land, except in the interest of public health and safety or other reasons of paramount social importance, including those having a very favorable impact on the environment in habitat type 91F0 and 91E0.

- thinning and retention of key elements of biodiversity – groups of old trees, hollow trees, etc. in habitat type 91F0.

➢ **Protected area ROSCI0088 Gura Vedei - Şaica - Slobozia**

Type - protected area for conservation of natural habitats and of wild fauna and flora. Declared as a territory of European Union Importance, part of the European ecological network Natura 2000 by virtue of Order No 1964 of December 13, 2007 issued by the Minister of Environment and Sustainable Development of Romania. Area: 9792 ha (data from the standard form of the area last updated in January 2011).

The territory covers the area between the lower reaches of the river Vedea and lower reaches of rivers Pasarya and Parapanca at Slobozia and from the island of Mokan in Giurgiu to the coast opposite the island Vazhetoariya.

Riverbed is formed exclusively by young alluvial deposits with system of canals and dikes against flooding. The estuary of Vedea is inhabited by some species of amphibians and reptiles – *Bombina bombina* and *Emys orbicularis*, and by many species of fish - *Aspius aspius*, *Romanogobio albipinnatus*, *Gymnocephalus baloni*, *Gymnocephalus schraetzer*, *Misgurnus fossilis*, *Rhodeus sericeus amarus*, *Sabanejewia balcanica*, *Zingel zingel* and *Zingel streber*, and also animal species listed in Annex II of the Habitats Directive.

The protected zone is a territory with preserved natural habitats (rivers, beaches, lakes, swamps, bogs, meadows, arable land, deciduous forests) and place for the protection and preservation of the two types of habitats:

- 92A0 – Riparian galleries of *Salix alba* and *Populus alba*
- 91F0 - Riparian mixed forest of *Quercus robur*, *Ulmus laevis* and *Fraxinus excelsior* or *Fraxinus angusti folia* along the great rivers (*Ulmenion minoris*).

The boundary of the protected area Gura Vedei-Saica-Slobozia ROSCI0088 is located at a distance of 0.39 km from extraction tract 1 and 0.19 km from extraction tract 10 of the extraction area near Mishka Island from km 462.0 to km 459.4., ie the extraction site does not fall within the boundaries of the protected area.

Subject to conservation in the protected area are representatives of the different classes of animals.

***Amphibians and reptiles included in Annex II of Directive 92/43/EEC::***

1188 European fire-bellied toad *(Bombina bombina)*

1220 European Pond Turtle *(Emys orbicularis)*

***Fish, included in Annex II of Directive 92/43/EEC:***

1130 *Aspius aspius,* 1149 *Cobitis elongatoides = Cobitis taenia,* 1124 *Romanogobio albipinnatus,* 2555 *Gymnocephalus baloni,* 1157 *Gymnocephalus schraetzer,* 1145 *Misgurnus fossilis,* 1134 *Rhodeus sericeus amarus,* 1146 *Sabanejewia balcanica,* 1160 *Zingel streber,* 1159 *Zingel zingel,* 4125 *Alosa immaculata.*

***Mammals listed in Annex II to Directive 92/43 / EEC***

1355 *Lutra lutra,* 1302 *Rhinolophus mehelyi,* 1303 *Rhinolophus hipposideros,* 1321 *Myotis emarginatus,* 1324 *Myotis myotis,* 1310 *Miniopterus schreibersi,* 1335 *Spermophilus citellus.*

***Invertebrates listed in Annex II to Directive 92/43/EEC:***

1032 *Unio crassus*

**Threats:**

Threats to habitat and species in the protected area are of mainly anthropogenic origin, river transport, industrial fishing, as well as natural changes in river level.

### 5.2.2. Protected area under Directive 2009/147 / EEC on the conservation of wild birds

- **Protected area „Kalimok Complex“ BG0002030 under the Birds Directive**

Protected Area "Kalimok Complex" BG0002030 was proclaimed by Order No RD-831 of 17.11.2008 of the Minister of Environment and Water, and published in SG. 108 of 19.12.2008 with area of 9429.217 ha.

According to the order of the Ministry the purpose of the protected area is:

1. Preservation and maintenance of habitats of birds mentioned in it. 2 of the Order to achieve their favorable conservation status;

2. Restoration of habitats of birds mentioned in it. 2 of the Order required to improve the conservation status

The protected area covers the grounds of the village of Ryahovo, Babovo, Brashlen, Golyamo Vranovo, Slivo pole Municipality and Tsar Samuil Municipality, Nova cherna, Staro selo and the town of Tutrakan, Tutrakan Municipality. This is also the territory of the former Tutrakan floodplain between Ryahovo and Tutrakan to the north of the village of Nova Cherna within the municipality of Slivo pole and Tutrakan, the Bulgarian Danube islands in this part of the Danube: Mishka, Malak Brashlen, Pyasachnik, Bezimenen, Kalimok and Radetzky (Malak Kalimok) and the watercourse between the islands and the Bulgarian coast. Territory south of the Danube includes the areas formerly occupied by large marshlands near the Danube converted into fishponds, which were drained in the 1950s by building a dike and drainage channels.

The area is designated for protection of 101 bird species as per the MEW Order. The territory is inhabited by 188 bird species, 61 of which are included in the Red Book of Bulgaria (1985), and 85 species are of European conservation concern (SPEC) (BirdLife International, 2004).

Nine species are listed as globally endangered in category SPEC1, 18 species as threatened in Europe in Category SPEC2, and 58 species - in SPEC3. The area provides suitable habitats for 71 species listed in Annex 2 of the Biodiversity Act, which require special protection measures. Of these, 64 are also listed in Annex I of Directive 79/409. Fishponds are of global importance for the Ferruginous Duck (Aythya nyroca) nesting here and are also a resting place for the Dalmatian Pelican (Pelecanus crispus). Here is one of the two breeding colonies of Black-winged Stilt (Himantopus himantopus). During the breeding season Kalimok complex is one of the most important places for the European Union in the country for the Ferruginous Duck, Night Heron (Nycticorax nycticorax), Little Egret (Egretta garzetta), Squacco Heron (Ardeola ralloides), great bittern (Botaurus stellaris), Eurasian Spoonbill (Platalea leucorodia), black-winged Stilt, European Roller (Coracias garrulus), as well as three species of terns - the Common Tern (Sterna hirundo), Whiskered Tern

(Chlidonias hybridus) and Black Tern (Chlidonias niger). The Complex is a constant feeding ground for one couple of sea eagles (Haliaeetus albicilla). Significant numbers of white storks (Ciconia ciconia) and Glossy Ibis (Plegadis falcinellus) gather in the area during migration periods. During this period and in winter ponds are of global importance for the Pygmy Cormorant (Phalacrocorax pygmeus) and Greylag Goose (Anser anser). They are important as winter home for the migratory Fieldfare (Turdus pilaris). Large numbers of waterbirds, including the Red-breasted Goose (Branta ruficollis), Greater White-fronted Goose (Anser albifrons) and others also gather in great numbers during the cold season.

Due to its small size, the area is susceptible to all kinds of disturbance by human activities such as hunting, fishing during the breeding season, collecting plants and animals, and others.

**In the protected area shall be prohibited:**

- destruction of landscape features (hedges, single trees and groups) in the use of agricultural land as such.
- afforestation of meadows, pastures, and their conversion into arable land and permanent crops.
- The use of pesticides and fertilizers in pastures and meadows.
- The destruction of island formations.
- Tree harvesting that leads to replacement of natural alluvial forests.
- Removal of vegetation growing along the banks of irrigation / drainage canals during the breeding season (March to August).
- Setting fire to reedbeds and coastal vegetation.

By virtue of Order No RD-86/21.08.2013 of MEW the preservation regime of Kalimok Complex BG0002030 Protected Area is changed to include the following prohibitions:

- Use of non-selective means of pest control in agriculture;
- mowing of meadows and pastures from the periphery to the center with mowing machinery or before July 15.

### ➢ 4.2.2. Protected area ROSPA0090 Ostrovu Lung-Gostinu under the Birds Directive

This is an area protected under the Birds Directive, located on the territory of Romania opposite the Bulgarian coast between the city of Marten and Ryahovo village, Rousse. It covers 2488,5 ha.

. It is located about 300 m northwest of the border of the reviewed investment proposal. The area includes one of the most extensive wetlands represented in the lower parts of the Danube valley. The most part of the protected area is covered by former marshlands Baltă Greaca drained in 1965, currently farmland. The remaining parts of the area along the Romanian bank and the Danube islands include forest habitats, meadows, forests and lakes. Deciduous forests, consisting almost entirely of black and white poplar, wicker and different species of willow occupy 43% of the protected area. Higher places along the coast, which are rarely and briefly flooded, are occupied by Quercus pedunculiflora and Quercus robur and Fraxinus angustifolia. Common dogwood and rarely hawthorn and dog rose are found on dikes. Amorpha, which is an invasive shrub, occupies at a rapid pace all the dry and

vegetation-free areas. Wild vine is also common, and on some islands grows periploca as well, which is of Mediterranean origin. All forest habitats are important as breeding and resting grounds during migration for many bird species.

The protected area provides nesting and feeding grounds for many species of birds, including rare and vulnerable species of national and European importance. Subject of protection in the area are 119 species of birds. In small-scale plantations of willow and wicker on the islands nest several species of herons, up to 200 Little Egrets, between 120 and 130 pairs of night heron, 200 pairs of Squacco Heron and 10-20 pairs of glossy ibises. Most often herons nest in mixed colonies, unlike the little bittern, which nests in isolated reed beds. So does the large bittern. The populations of these six types of the family Ardeidae nesting in protected area are in excellent state of preservation. Hollows of old willows are occupied by 40-45 pairs of the European roller. Species threatened on a European scale that lay their eggs in the hollows are the black woodpecker, gray woodpecker and the middle spotted woodpecker. They also nest in deep holes in the high clay banks of the Danube. On the high slopes there are isolated nests of kingfisher which population is impressive: 30-40 pairs. More than 3000 pairs of Sand Martin and 120 pairs of European bee-eater also nest here. Old trees in the forest, far from any human intervention harbour nesting pairs of black storks, and in the villages nesting pairs of white storks. Both nesting birds and birds flying from other places gather here to form flocks before migration. In these periods over 40 black storks and up to 700 white storks can be seen in the protected area. In forest habitats almost unaffected by human activity nests a pair of white-tailed sea eagles, one pair of toed eagles and 2-3 pairs of levant sparrowhawk. Black Kites do not nest here every year, but several pairs of Red-footed Falcons reproduce among a colony of Rook. Other species that raise their chicks in small forest habitats and bushes in the area are nightjar, forest lark, tawny pipit, barred warbler, red-backed shrike and lesser grey shrike. During migration collared flycatcher and red-breasted flycatcher can also be found in the area as well as all species listed as species of Community interest and subject to protection in it. In aquatic habitats in the area nest up to ten pairs of ferruginous duck, over 20 pairs of Black-winged Stilt, 7-8 pairs of pied avocet, up to 12 pairs of white-fronted tern and 60 pairs of whiskered tern. Near farmlands and drier sandy and overgrown areas are the nesting places of the stone curlew. In the days of autumn and spring migrations many waterfowl individuals fly in, some of which are subject to conservation and of community interest: glossy ibis (30-40 individuals), Spoonbill (30-40 individuals), Ferruginous Duck (60-80 individuals), Ruff (200-300 individuals), wood sandpiper (80 individuals), small-headed gull (40-70 individuals), little gull (400-500 individuals), Little Tern (60-70 individuals), whiskered tern (up to 400 individuals) and the Common Tern (1000-1200 individuals). There are flocks of pink pelicans (120 individuals), Dalmatian pelicans (over 30 individuals) and Red-breasted Goose (30 individuals). These three species are included as species with an excellent evaluation of the degree of protection, although they are present in the area only during the migration. But some species such as the pygmy cormorant are regularly present in the area from which a few hundred individuals reside from autumn to spring. Another well-protected species in the area is the Whooper swan, over 100 individuals of which can be observed in cold days.

The mosaic of natural habitats and agricultural land provides optimal conditions for the development of large populations of rodents, which provide enough food for birds of prey during migration. A great number of species of Community interest fly over the area during migration, such as the lesser spotted eagle (up to 40 individuals), osprey (up to 20 individuals), marsh harrier (up to 15 individuals), Black Kite (up to 10 individuals), Pallid Harrier (up to 10 individuals), little eagle (up to 5 individuals) and four legged sea eagles.

Between 15 and 20 individuals of hen harrier and up to 5 individuals of Marsh Harrier use the area as wintering grounds.

The most important role for the conservation of the target species play the wetlands on both sides of the Danube, where there were once vast marshes.

**Birds subject to conservation in the protected area**

***Bird species listed in Annex I of Directive 2009/147 / EEC:***

*(Accipiter brevipes), (Anthus campestris), (Aquila pomarina), (Branta ruficollis), (Burhinus oedicnemus), (Chlidonias hybridus), (Circaetus gallicus), (Circus macrourus), (Coracias garrulous), (Cygnus cygnus), (Dendrocopos medius), (Dryocopus martius), (Falco vespertinus), (Ficedula albicollis), (Ficedula parva), (Hieraaetus pennatus, (Himantopus himantopus), (Ixobrychus minutus), (Larus melanocephalus), (Larus minutus), (Lullula arborea), (Nycticorax nycticorax), (Pandion haliaetus), (Pelecanus crispus), (Pelecanus onocrotalus), (Phalacrocorax pygmeus), (Philomachus pugnax), (Recurvirostra avosetta), (Sterna albifrons), (Sterna hirundo), (Sylvia nisoria), (Tringa glareola), (Lanius minor), (Caprimulgus europaeus), (Alcedo atthis), (Ardea purpurea), (Ardeola ralloides), (Aythya nyroca), (Botaurus stellaris), (Ciconia nigra), (Circus aeruginosus), (Haliaeetus albicilla), (Picus canus), (Platalea leucorodia), (Plegadis falcinellus), (Buteo rufinus), (Ciconia ciconia), (Milvus migrans), (Circus cyaneus), (Egretta garzetta), (Lanius collurio).*

***Migrating birds not listed in Annex I of Directive 2009/147 / EEC:***

*(Galerida cristata), (Columba oenas), (Columba palumbus), (Cuculus canorus), (Cygnus olor), (Falco subbuteo), (Ficedula hypoleuca), (Fringilla coelebs), (Fringilla montifringilla), (Hippolais icterina), (Hippolais pallida), (Hirundo rustica), (Jynx torquilla), (Lanius excubitor), (Larus cachinnans), (Larus ridibundus), (Luscinia megarhynchos), (Merops apiaster), (Miliaria calandra), (Motacilla alba), (Motacilla flava), (Muscicapa striata), (Oriolus oriolus), (Otus scops), (Phoenicurus ochruros), (Phylloscopus collybita), (Phyllo-scopus sibilatrix), (Phylloscopus trochilus), (Pyrrhula pyrrhula), (Regulus ignicapillus), (Regulus regulus), (Remiz pendulinus), (Saxicola torquata), (Streptopelia turtur), (Actitis hypoleucos), (Alauda arvensis), (Anas platyrhynchos), (Anser albifrons), (Asio otus), (Carduelis cannabina), (Carduelis carduelis), (Carduelis chloris), (Carduelis spinus), (Chlidonias leucopterus), (Coccothraustes coccothraustes), (Sturnus roseus), (Sylvia atricapilla), (Sylvia borin), (Sylvia communis), (Tachybaptus ruficollis), (Tringa erythropus).*

***The protected area is important for the populations that reproduce in it:***

*(Aythya nyroca), (Ardeola ralloides), (Plegadis falcinellus), (Egretta garzetta), (Milvus migrans), (Ixobrychus minutus), (Sterna albifrons), (Recurvirostra avosetta), (Himantopus himantopus), (Botaurus stellaris), (Ardea purpurea), (Nycticorax nycticorax).*

***The protected area is important for species that gather there during migrations:***

*(Phalacrocorax pygmaeus), (Sterna hirundo), (Larus minutus), (Ciconia ciconia), (Platalea leucorodia), (Philomachus pugnax.).*

Activities of anthropogenic origin with negative impacts on birds subject to conservation in the protected zone include human presence on the islands, uncontrolled tourism and fishing (if near nests or areas of concentration of birds during roosting and feeding) and reed mowing or burning (this significantly reduces the nesting habitats of many species of birds). Poaching, intensive grazing and over-exploitation of forests can lead to degradation of habitats for different numbers of birds.

The section of the Danube designated for extraction of inert materials is of very small conservation value for the species that are protected within the protected area.

## 6. Landscape

### Brief description of the landscapes in the area under consideration

According to the classification system of the landscapes in Bulgaria / Geography of Bulgaria, Prof. P. Petrov, 1997 / the extraction site falls within the North Bulgarian zone in the Northern Danube plain subarea, Brashlyanski landscape area**.**

The Northern zone is characterized by relatively uniform and homogeneous regional landscape structure. It covers almost all flat and lowland areas of the country south of the Danube up to the Balkan landscape area. As one of its four subregions, the Northern Danubian plain has its own specific set of landscapes, which determines its natural regional differentiation.

This is evident from the data identifying the predominant groups of landscapes in the horizontal structure. The Northern Danubian plain is predominated by meadow-steppe alluvial lowlands with moderate agricultural utilization and landscapes of chernozem meadow steppes of loess rocks with high agricultural utilization.

The North Danubian Plain is characterized by the following quantitative indicators: absolute height from 20 to 160 meters, density of segmentation from 0.0 to 2.0 km / km², depth of indentation from 0 to 150 m / km² and contemporary vertical crustal movements from 0 to +3 mm / yr.

Brashlyanski landscape area where the project for extraction of sand and gravel from alluvial sediments from the bed of the Danube, Mishka Section (from km 462.0 to km 459.4) will be implemented is distinguished from neighboring areas by its natural conditions, resources potential and specific landscape structure. Carbonate and typical chernozem soils are predominant there while alluvial and deluvial soils are predominant in river valleys. Soils and climatic conditions in this region favor the cultivation of crops.

The specificity of landscape structure of the region is determined by two basic elements of the landscape - the Danube and Brashlyanska Valley. They are a prerequisite for the formation and connection between other elements of the landscape, i.e. islands, river and riparian areas, agricultural land, urban and industrial units.

The Convention for the delimitation of the river border on the Danube signed by Bulgaria and Romania in 1908 determines which islands belong to one or the other country. Islands on the right side of the border towards the river mouth are property of Bulgaria and on the left - Romanian.

The object of the investment proposal for the extraction of inert materials falls within the section of the Danube, bordering on the largest Danube Valley - Pobrezhie or Brashlyanska Valley. It stretches along the right bank of the Danube from Rousse to Tutrakan. Its length is 60.7 km and its width varies from 10 to 15 kilometers. The altitude gradually increases to the south. Its area is 420.6 $km^2$.

Typical of it is that it comprises two parts differing in height and area:

- Low floodplain known as Brashlyanska, Martenska or Sandrovska Valley. It is a floodplain river terrace along the Danube with an area of 100 $km^2$ and a width of about 3-4 km. It rises 3-6 m above river level. It contains Danubian

sediments, combined with high groundwater and alluvial marsh soil.

- High non-flood plain, a remnant of three river terraces, rising 10 to 55 meters above the Danube. Its area is 320 km$^2$ and its width is 8-10 km. It occupies the southern, higher parts of the valley. This part of the valley was formed by Cretaceous rocks covered with alluvial deposits and loess with maximum thickness of about 30 meters. This part of the valley is crinkled by low linear hills, the so-called intercontinental dunes. The soil is chernozem and is very well utilized.

Besides basic cereals, sunflower and sugar beet, large areas of the Brashlyanska valley are occupied by vineyards and orchards.

There are 15 settlements in the valley, including 2 towns and 13 villages. Transport links are well developed.

This description forms the landscape character of the area of interest - riparian vegetation, crops, linear infrastructure elements, silhouettes of small settlements, urbanized area with a developed industry (the port city of Ruse) alternate on the flat to hilly terrain.

*Depending on the prevailing part of natural or anthropogenic components landscapes in the region can be divided into:*

- Natural landscapes - they are formed under the influence of natural factors and do not fall under the influence of human activity; sustainability of their structure is determined by the processes of self-development and self-regulation; natural landscape in the reviewed area includes natural objects falling under the protection of the law; These are protected areas under the PAA, such as PA "Kalimok Brashlen" and protected areas part of the national ecological network Natura 2000, such as PA "Kalimok Brushlen" and "Complex Kalimok"; they protect specific ecosystems and habitats important for biodiversity; natural landscapes also include the river and riparian landscapes developed along the Danube and its tributaries; they are represented by island formations, floodplains, banks overgrown with shrubs, changing riverbeds;
- - Agrarian landscapes /agrolandscapes/ - formation of agrarian landscapes in the area has been significantly influenced by weather conditions and natural resources of the region; widely spread chernozem and alluvial soils are very fertile and suitable for the development of agriculture; temperate continental climate also has a beneficial impact on the development of this sector; prevailing in the region are cereals / wheat, barley, corn, sunflower /, followed by perennial crops / trees and vines / and vegetable crops; there is a decline in the number of vineyards and vegetable plantations due to frost on the vines in winter and the trend of increasing imports of vegetable products;
- - Urban landscapes - they are the result of human activity changing in varying degrees some natural components and forming a new structure; they cover different natural conditions modified by human business, construction and cultural activities; small both in size and population territorial units such as Nikolovo, Borisovo, Marten, Ryahovo, Babovo and Rousse with the largest port in the Bulgarian section of the Danube River fall within this classification; small settlements are dominated by low construction; manufacturing activities are less pronounced; they are associated with agricultural production or fishing; Rousse stands out with its developed urban structure and its trend of becoming a strategic intermodal and logistics center of the country;

- Industrial /technogenic/ landscapes - the scope of technogenic landscapes includes enterprises in industrial zones, ports, airports, the existing engineering infrastructure, excavation of mines and quarries, artificial mounds of mining activities, etc .; within the relevant IP territory this type of landscapes is represented by the West Industrial Zone of Rousse, the Eastern Industrial Zone of Rousse, Rousse Industrial Park, Rousse Port, Rousse Airport, landfills, quarries for construction materials, etc.

Elements of the technical infrastructure in the region are evenly distributed and well developed. In most cases there are linear structures - roads, railway lines, power lines, pipelines, etc., which pass through the territory, ground and / or surface, forcing its contours on the landscape. The main roads of the republican road network fan out from Rousse. Major transport links cross the territory such as I-5 / E-85 (Ruse-Byala-Makaza-Greece border), I-2 / E-70 (Rousse-Varna). The routes of Pan-European Corridor No 7 (Rhine-Main-Danube) and No 9 (Helsinki-Moscow-Kiev-Bucharest-Rousse-Alexandroupolis) intersect here. There is a well-developed road network between settlements and good communication between the municipalities of Rousse district. The two main railway lines are: Rousse-Gorna Oryahovitsa-Podkova and Rousse -Varna.

An important structural element of the modified technogenic landscape is the Danube Bridge, which connects the road network of Bulgaria with the road network of Romania.

The conclusion that can be drawn is that the area of the investment proposal for extraction of sand and gravel from alluvial sediments from the bed of the Danube, Mishka Section (from km 462.0 to km 459.4) in the area of Babovo, Slivo Pole Municipality is subjected to weak anthropogenic interference in terms of urban and industrial development, and moderate in terms of infrastructure and agricultural utilization of the territories.

The area of the investment proposal for extraction of sand and gravel from alluvial sediments from the bed of the Danube, Mishka Section bears the marks of natural landscapes of the riverine type, part of the natural riverbed. The investment proposal will be implemented in a relatively small area - a section of the river bed with a length of 2.6 km and a width of 300 meters in the SW part and up to 100 meters in the NE part. Activities for the extraction of sand and gravel from the riverbed will occupy a relatively small portion of the water area.

Extraction of inert materials is not expected to have a significant impact on the features of the landscape due to the relatively small size of the extraction area.

The specific extraction process is carried out via removal of sediment material from the bottom of the river by floating bucket dredge type KS - 250 with a maximum depth of dredging 12 m and 32 (250-liter) buckets. The material istransferred to a self-propelled barges and transported to a wharf located in the East Industrial Zone of Rousse and owned by the Assignor. The material is unloaded by a jib crane and stored temporarily on site until its transportation by dumper trucks to the sorting and treatment facility. The site where the sorting and treatment facility is situated is property of the Assignor. The facility is located on plot of land nr. 63427.8.1076 of neighbourhood 1 as per the plan of the town of Rousse, Eastern Industrial Zone, which is not the subject of this investment proposal.

Extraction of alluvial sediments is expected not only to change the landscape visually, but also the structure and the type of the existing landscape. Implementation of the project will lead to the creation of a deepened section near the shores of the Mishka Island (1 and 2) and the newly formed island - "Mishka-3.

## 7. 6. Cultural and Historical Heritage

The Mishka extraction site is located on Bulgarian territory on the bottom of the Danube and is more than 100 m away from shore.

There is no evidence for the presence or absence of archaeological sites among alluvial deposits of the area (opinion by ref. No 168 / 04.04.2013, the Museum of Rousse) (Appendix No 1).

On the Bulgarian coast near Mishka section have been established the following archaeological sites (Appendix No 1)

- km 458.0 – km 460– Roman fortress and the Late Antique city Apiaria, an ancient necropolis (Rec No 7824/39).

The above sites have been declared immovable cultural assets under the Cultural Heritage Act, according to which declared cultural monuments retain their status as cultural values. As such, the above mentioned sites are under the protection of the state and are state property.

## 8. Noise. Harmful physical factors

***Noise***

Noise is any unwanted sound that causes unpleasant or disturbing perception or has a harmful effect. There is no area of human activity free of noise emission. The term noise defines complex sounds that act unfavorably on the human organism in a wide frequency range - from 16 Hz to 20 kHz. Environmental noise caused by transport, industrial and repair works is one of the major modern environmental problems. The acoustic load is higher in large urban areas.

Assessment, management and control of environmental noise caused by road, rail, air and water transport, as well as industrial installations and facilities, including the categories of industrial activities listed in Annex No 4 to Art. 117, para. 1 of the Environmental Protection Act, and local sources of noise is regulated by the Environmental Noise Protection Act, which is effective from 01.01.2006 and any regulations thereto.

Ordinance 54 of December 13, 2010 of the Ministry of Health and Ministry of Environment and Waters (Prom. SG 3 of January 11, 2011) on the operation of the national system for monitoring of environmental noise and requirements for internal monitoring and providing information on industrial sources of environmental noise entered into force on 12 February, 2011. Said Ordinance regulates the procedure and method of operation of the national system for monitoring of noise in urban areas, and requirements for internal monitoring and providing information on industrial sources of environmental noise. The purpose of the Ordinance is to assess the noise levels in urban areas created by the major sources of noise.

Ordinance No 6 of 26 June 2006 of the Ministry of Health and the Ministry of Environment and Waters determines:

1. indicators of environmental noise, taking into account the degree of discomfort in different parts of the day;

2. the limit values of indicators of environmental noise;

3. methods for assessing the values of the environmental noise and the harmful effects of noise on human health.

This makes it possible to assess and forecast the state of noise pollution in urban areas and in quiet areas outside them, the development of strategic noise maps and action plans to protect public health and improve quality of life. Limits of noise levels in different areas and development zones in urban areas and outside them are presented in the following table:

| No | Territories and development zones in urban areas and outside them | Equivalent noise level in dB (A) | | |
|---|---|---|---|---|
| | | day | evening | night |
| 1 | 2 | 3 | 4 | 5 |
| 1. | Residential areas and territories | 55 | 50 | 45 |
| 2. | Downtown areas | 60 | 55 | 50 |
| 3. | Areas of intense vehicle traffic | 60 | 55 | 50 |
| 4. | Territories subjected to aviation noise | 65 | 65 | 55 |
| 5. | Production and storage areas and zones | 70 | 70 | 70 |
| 6. | Areas for public and personal recreation | 45 | 40 | 35 |
| 7. | hospitals and sanatoriums | 45 | 35 | 35 |
| 8. | Quiet areas outside agglomerations | 40 | 35 | 35 |

The IP of GRAVEL AND SAND PITS – BULGARIA EAD, Sofia is for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region.

Acoustic environment in the project area intended for extraction and transportation of aggregates from the bed of the Danube River is formed by the intensity of water transport traffic and the on-going operations in the area of the wharf in the Eastern Industrial Zone of Rousse and adjacent production and warehouse facilities.

The extraction area is located within the Bulgarian part of the river, at the mandatory distance (327 meters to the southwest to 194 m to the north-east) of the river's mainstream. This means that the noise-emitting water transport corridor is located at least 194 meters from the extraction area.

For the purposes of this report and assessment of the noise impact on the environment of the investment proposal for extraction of sand and gravel from alluvial deposits in the bed of the Danube, Mishka section (from 462.0 km to 459.4 km), in the region of Babovo, Slivo pole Municipality, Rousse District were conducted measurements of noise levels under contract No 40/06.08.2013 concluded between "Bioinform Consult" OOD, Bourgas and EEA-Bourgas Regional Laboratory accredited for noise testing. The results were included in Testing Results Report No 03-0663/15.08.2013.

Table *No III.8.-1* below summarizes the results of the measurements conducted on 12.08.2013 of equivalent noise levels $\mathbf{L_{Aeq}}$ [dB(A)] in measuring points (MP) in the area of the Mishka island:

***Table No III.8.-1:***

| **№ по** | Consecutive No | MP as per | Description |
|---|---|---|---|

| ред | | PI No 03-0663/15.08.2013 | |
|---|---|---|---|
| 1 | MP 1 | Bulk berth Eastern Industrial Area of Rousse | 67,7 |
| 2 | MP 2 | across the Mishka Island – the future site, background noise level | 31,2 |
| 3 | MP 3 | barge passing about 350 meters from the Mishka Island | 79,5 |
| 4 | MP 4 | the village of Ryahovo – residential area | 42,1 |
| 5 | MP 5 | the village of Babovo – residential area | 39,5 |
| 6 | MP 6 | the village of Sandrovo – pier (next to residential area) | 40,5 |
| 7 | MP 7 | Dredge (Bucket-type Dredge) near the island of Aleko | 86,5 |
| 8 | MP 8 | Sieve facility near the town of Marten | 68,6 |

The results of measurements at MP No 1, 3, 7 and 8 characterize the noise emitted by objects similar to the sources of noise envisaged in the investment proposal.

Assuming that the noise emitted from the passage of a vessel is similar to that emitted by a passing barge - 79,5 dB (A), in accordance with Annex No 3, item 4 to Art. 6 of Ordinance No 6/2006 of the Ministry of Health and Ministry of Environment and Waters at a distance of 200 meters the level will be reduced by about 55 dB (A) and noise reaching the extraction area will reach about 24-25 dB (A). Small vessels passing accidentally at a shorter distance cannot create significant noise emissions for a long time; such emissions disappear with the passing of the vessel. Another source of noise in the area near the future site for extraction of aggregates could be another operational mining facility. At the moment we have no information about the presence of such, therefore we cannot make assumptions on the level of noise pollution. In any case, such a facility would be far enough and would not load the area of the extraction site in acoustic aspect.

Impact on the acoustic situation in the area of implementation of the investment proposal of GRAVEL AND SAND PITS - BULGARIA EAD would have traffic flows passing nearby. The closest road to the extraction site is the road connecting the village Babovo and the village Ryahovo. The shortest distance between it and the extraction site is approximately 1500 meters. The intensity of traffic on this route is low, which is why noise from passing vehicles cannot reach over such a distance. The busy road II-21 from the national road network "Ruse - bypass Tutrakan - bypass Silistra" is located in its nearest part at more than 4500 meters and also does not affect the acoustic environment of the future site for extraction of river sediments opposite Mishka Island.

The acoustic environment in the area of the wharf where extracted aggregates will be unloaded and dispatched will be formed by the activities carried out in neighbouring production and storage areas of other operators. Measurements performed on a bulk cargo wharf located in the Eastern Industrial Zone of Rousse, where the site of the Investor is located also, reported noise level of 67.7 dB (A). Noise level limits for such sites is 70 dB (A) measured at the borders of the site in accordance with Annex No 2 to Art. 5 of Ordinance No 6/2006 of the Ministry of Health and Ministry of Environment and Waters.

RIEW - Rousse organizes the measurement, evaluation, management and control of noise emitted by industrial plants and facilities in the districts of Rousse, Razgrad and Silistra. According to the 2013 annual report by RIEW ruse, the analysis of the results of the test measurements and reported own periodic measurements of noise from industrial plants in the region has shown no exceedances of the limit values.

In general, the acoustic environment in the project area intended for the extraction of sand and gravel from alluvial deposits in the bed of the Danube at Mishka section is typical of a main transportation corridor, with periodic short-term noise exposure.

***Vibrations***

The physical definition of vibration is "mechanical oscillation of the elastic medium." Vibration measurement is imperative to assess vibrations' influence on the service life of machines and to establish the direct impact on human health, if any. Also, vibrations transmitted by machinery, structures and buildings are emitted in the environment as noise, which leads to deterioration of the overall acoustic setting

There is no evidence of vibration sources within the project area for the extraction of sand and gravel from alluvial deposits in the bed of the Danube at Mishka section.

***Electromagnetic Radiation***

Sources of electromagnetic radiation in the environment are high-voltage power lines and power equipment. They have a defined area of influence within the relevant easements. In the project area for the extraction of sand and gravel from alluvial deposits in the bed of the Danube there are no such facilities.

Basic facilities of the main mobile telecom operators generate a specific electromagnetic background in the area. The parameters of these broadcast stations comply with regulatory requirements so as not to burden the surrounding area and cause damage to human health. The impact of radar systems and telecommunication facilities of passing vessels is temporary and will not create excessive electromagnetic loads in the area of the investment proposal.

***Radiation***

Ionizing radiation determined the radiation environment in a given area. Radiation state of the environment is controlled by measuring the natural radiation background ("gamma background"), and by evaluating the content of natural radionuclides Uranium-238, Radium-226, Thorium-232 and Potassium-40 and other in various components of the environment. This involved the Ministry of Environment and Water, Ministry of Health, the National Centre of Radiobiology and Radiation Protection and other institutions through its regional offices.

The structure of the Executive Environmental Agency at the MoEW includes laboratories for radiological tests within an established national network which periodically monitor the radiation status of the environment. The data for the dose gamma radiation (gamma radiation background) in the country are produced in real time by 27 stations of the National Automated System for Continuous Monitoring of Gamma Radiation, administered by the EEA.

In the area of Rousse and particularly within the project area of GRAVEL AND SAND PITS - BULGARIA EAD there are no sources of excessive radiation contamination. Rousse is included in the network of stations for radiological monitoring of the EEA. According to the 2012 annual report on the environmental state the content of natural

radionuclides is in the lower limits of its natural distribution in the Earth's Crust. The results obtained for the values of specific activities of natural radionuclides in the topsoil from the individual monitoring points do not show increased background values. Gamma background for the town Rousse ranges from 70 to 85 nanoGrey / hour, which is within the range typical for the territory of Bulgaria.

There have been no reported radiation incidents in the area of the future extractions sites opposite Mishka Island and the wharf at the Eastern Industrial Zone of Rousse property of Gravel and Sand Pits Bulgaria EAD.

Samples of the aggregates subject to extraction have not been tested for radionuclide levels; however, it is common knowledge that the natural radioactivity of this type of aggregates is very low and falls within the lower range of the typical values for the country. Samples taken from similar sites have shown the following values:

| U-238 [Bq.kg$^{-1}$] | Ra-226[Bq.kg$^{-1}$] | Th-232[Bq.kg$^{-1}$] | K-40[Bq.kg$^{-1}$] | Pb-210[Bq.kg$^{-1}$] |
|---|---|---|---|---|
| < 23,9 | 22,7 | 32,6 | 459 | < 70,5 |

In general, risk energy sources are not expected to have adverse negative impact on the environment or closely situated residential areas during implementation of the investment project of Gravel and Sand Pits Bulgaria EAD.

## IV. Description, analysis and assessment of the likely significant environmental impacts and health. Characteristics of pollution sources envisaged in the investment proposal

### 1. Air

#### 1.1. Expected emissions during construction and operation

*Construction works*

Implementation of the investment proposal will involve changes in the existing infrastructure of the wharf located in the East Industrial Zone of Rousse. Existing buildings on the wharf owned by the company will be demolished and site for unloading of material and buffer depot for about 17 000 t of alluvial materials will be prepared..

Implementation of the project for reconstruction of the wharf will include carrying out of activities such as demolition of existing buildings, removal of construction waste, and delivery and installation of caravans, which are generally associated with fugitive dust emissions. Construction of new roads is not required. Insofar as these works will be carried out in different periods and in different parts of the wharf quantification of these emissions cannot be done with high accuracy. For such cases the Environment Agency of the US ofers only one set of emission factors (***Compilation of Air Pollutant Emission Factors, 5th ed. (AP-42), Vol I: Stationary Point and Area Sources. 13.2.3. Heavy Construction Operations. Research Triangle Park, North Carolina: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, October 1998***.) derived from the study of the construction of a shopping centre with apartments (2,69 Mg/(hectare.month activity)). According to the guidelines of the US EPA, it may be used for estimations of the emission of TSP during the whole construction period. Its application for the evaluation of the instantaneous values is associated with an increase in the uncertainty. These emission factors are complex and include emissions from all construction activities, including transportation to the construction site etc. Calculation is based on 30 working days per month and 12-hour

working day. The same source states that, if the data obtained for TSP is used to calculate the emission of PM, the results are usually slightly higher.

In order to evaluate the dust emissions and fine particulate matter at the depot during the construction period by applying the above cited empirical model, the following assumptions have been made:

- It is assumed that the entire area of the wharf will be used directly or indirectly during construction (4558 $m^2$).
- It is expected that construction works will be performed 12 hours per working day and will last for three months.

Annual emissions of dust and fine particulate matter are presented in Table IV.1.1.-1.

***Table IV.1.1.-1***

***Annual emissions of dust and PM during reconstruction of the wharf owned by the investor and situated in the Eastern Industrial Zone***

| | т/год |
|---|---|
| PM -2.5 | 0.032 |
| PM -10 | 0.129 |
| PM -15 | 0.172 |
| PM -30 | 1.678 |
| **Note:** In the mass of PM-30 are included the masses of all the other factions. | |

Reconstruction of the wharf will employ various construction machines, the main of which are:

- excavator and bulldozer;
- concrete truck;
- pneumatic hammer and front loader;
- heavy duty truck for transportation of materials and waste;
- compressor and energy generator;
- construction machinery.

It is assumed further that the total output of construction equipment will not exceed 350 kW, and the rate of simultaneous operation is 0.2. With an average specific consumption of diesel oil at 0.3 kg/kW, substitution costs of diesel fuel on the quay wall is expected to be around 210 kg. Harmful emissions from diesel engines of construction equipment calculated on this basis are presented in Table 2 IV.1.1.

***Table IV.1.1.-2***

***Emissions from construction equipment diesel engines during the reconstruction of the wharf***

| | EF | emissions |
|---|---|---|

| | kg/ton | g/hour | t/3 months |
|---|---|---|---|
| Sox | 4 | 40.00 | 0.04 |
| NOx | 48.8 | 488.00 | 0.53 |
| volatile organic compounds | 7.08 | 70.80 | 0.08 |
| CH4 | 0.17 | 1.70 | 0.00 |
| CO | 15.8 | 158.00 | 0.17 |
| CO2 | 3150 | 31500.00 | 34.02 |
| N2O | 1.3 | 13.00 | 0.01 |
| soot | 4.6 | 46.00 | 0.05 |
| NH3 | 0.007 | 0.07 | 0.00 |

*Emissions during exploitation*

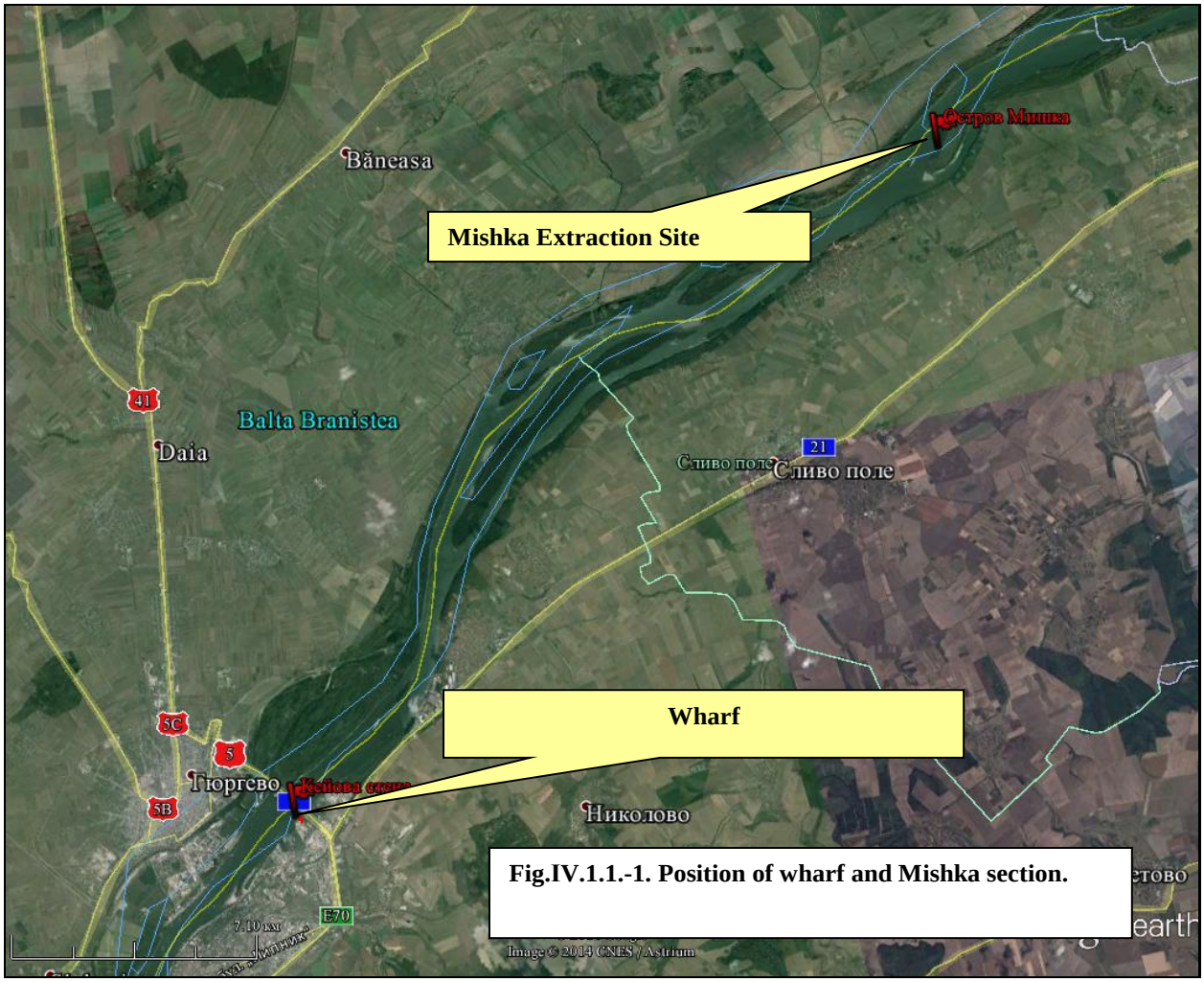



**Fig.IV.1.1.-1. Position of wharf and Mishka section.**

Operations conducted within Mishka extraction site can be divided into two conditional parts:

- extraction works within Mishka section, transportation of raw materials to the wharf and unloading;
- transportation of stored materials to the washing and sorting plant for further processing

The location of Mishka extraction site and the wharf property of the company is shown in Fig. IV.1.1.-1. The reference shows that the distance between the two sites as the crow flies is about 27 km. This means that superposition of emissions cannot be expected.

**Extraction area**

Technology for extraction of inert materials from the bottom of the Danube River near Mishka Island is detailed in the technical project of the site. According to calculations, the daily yield of the dredge can reach 5400 tons in a 12-hour working day. For 210 days working days per year, the annual yield is expected to reach 1.134 thousand tons. The annual volume of extracted inert materials, however, is designed to not exceed 540 thousand tons. Extracted material will be transported by three 1,000-ton barges which will provide daily transport for 2,400 tons of sand and gravel to the site for unloading. Estimated cost of diesel fuel extraction, transportation and storage of the extracted raw material is 908 t / yr. Harmful emissions from diesel engines on dredges and barges calculated on this basis are shown in Table-3 IV.1.1..

***Table IV.1.1.-3***

***Emissions from diesel engines of dredges and barges during excavation in Mishka section***

| | EF | emissions | |
|---|---|---|---|
| | kg/ton | g/hour | t/year |
| Sox | 4 | 1320.00 | 3.64 |
| NOx | 48.8 | 16104.00 | 44.45 |
| volatile organic compounds | 7.08 | 2336.40 | 6.45 |
| CH4 | 0.17 | 56.10 | 0.15 |
| CO | 15.8 | 5214.00 | 14.39 |
| CO2 | 3150 | 1039500.00 | 2869.02 |
| N2O | 1.3 | 429.00 | 1.18 |
| soot | 4.6 | 1518.00 | 4.19 |
| NH3 | 0.007 | 2.31 | 0.01 |

Due to the high humidity, generation of dust and PM emissions during extraction and transportation of sediments is not expected.

**Wharf**

There are two possible scenarios for generation of dust and PM emissions on the wharf:

- **Direct unloading of barges on dumpers**

In this scenario, emissions of dust and PM generated during loading of trucks is not expected. The reason for this is that the extracted material is not fully dried up and humidity is very high. Secondary dust and PM emissions will be generated by material dispersed along the truck route. The only emissions of other harmful gases will be generated by the engines of the dredge and barges.

- **Loading of trucks at the buffer depot**

This scenario envisages the construction of a buffer depot for extracted materials with a capacity of 17,000 tons. As explained herein above, the unloading of barges at the buffer depot will not generate dust and PM emissions. It is envisaged that the site be fenced from the west and north by a concrete wall with a height of 2.5 meters. The purpose is to prevent the spreading of the material over the entire wharf.

Raw ballast stored at the depot is completely drained and subsequently the surface layer completely dries up. The construction of partition walls will reduce the effects of wind erosion, which can be observed at wind speeds above 15 m / sec.

In this scenario, the loading will be done by two wheel loaders and dumpers will be positioned adjacent to the depot. The operation of the front loaders is connected to the loosening of the surface layer of raw material and the inevitable spreading of the material in the vicinity of the pile. Dispersed material dries quickly and is easily suspended by the tires of trucks and loaders in the air.

Dust emissions in aggregates processing are calculated on the basis of an empirical model developed by the US EPA on the basis of data from the operation of open pit mines (*G. E. Muleski, Update Of AP-42 Emission Factors For Western Surface Coal Mines And Related Sections, Summary Report, Prepared for Emission Factors And Inventory Group (MD-14), Emissions, Modeling And Analysis Division, Office Of Air Quality, Planning, And standards, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711, 1998*). As a result of multiannual observations and measurements was developed a series of empirical equations, enabling the calculation of emission factors for operations such as loading and unloading of trucks, operation of bulldozers and loaders, working rope shovels and other equipment and operations typical for open pit mining. The displayed patterns take into account certain properties of the processed materials such as moisture and particles suspended in the material. Weather conditions typical of the region are determined by the average wind speed. Movement of heavy machinery is related to studying of power factors such as average speed and total weight. Unloading (and loading) of trucks requires taking into account of the height from which the material is loaded (unloaded). It is recommended humidity parameters and content of suspended particles to be determined by the specific material. If this is impossible then the range within which these parameters vary must be indicated as well as the reference values (average values) depending on the type of material. It is also assumed that roads are not paved in the area where unloading takes place. Application of the described models in the current case is done after making the following assumptions:

- Average moisture content in the aggregates 1%;
- Average content of suspended particles 0.5%;
- Average wind speed (Rousse) 4 m / sec;
- Dump height upon unloading - 2 m;
- Average transport distance - 0.5 km.

It is assumed further that the average transport distance from the place of loading (depot) to exit from the wharf is 0.5 km. and the average speed of trucks is 20 km/h. The total number of operations is calculated based on performance set in the project: extraction and transport of 540,000 tons/year of untreated ballast. As per the technical project, the annual output is calculated based on 230 working days a year and 12 working hours per working day.

Expected TSP emissions and PM10 emissions are presented in *Table IV.1.1.-4*.

***Table IV.1.1.-4***

***TSP emissions and PM10 emissions as a result of single loading operations of ballast from depot to dumper trucks***

| | mass | PM-2-5 | PM-10 | PM-15 | PM-30 |
|---|---|---|---|---|---|
| | ton/yr | t/yr | | | |
| Wheel loader | 540000 | 0.20 | 0.91 | 1.21 | 1.92 |
| loading | 540000 | 0.07 | 1.13 | 1.51 | 3.76 |
| Dumper truck | 540000 | 8.10 | 81.65 | 136.08 | 261.27 |
| **amount** | | **8.37** | **83.69** | **138.80** | **266.95** |
| | | kg/day | | | |
| Wheel loader | | 0.21 | 0.94 | 1.25 | 1.99 |
| loading | | 0.07 | 1.17 | 1.56 | 3.90 |
| Dumper truck | | 8.38 | 84.52 | 140.87 | 270.46 |
| **amount** | | **8.67** | **86.63** | **143.68** | **276.35** |
| | | g/sec | | | |
| Wheel loader | | 0.00 | 0.02 | 0.03 | 0.05 |
| loading | | 0.00 | 0.03 | 0.04 | 0.09 |
| Dumper truck | | 0.19 | 1.96 | 3.26 | 6.26 |
| **amount** | | **0.20** | **2.01** | **3.33** | **6.40** |

Emissions from diesel engines of construction and transport machinery operating on site are shown in Table IV.1.1.-5. They are calculated based on the assumption that:

- Annual yield of raw ballst is 540,000 tons;
- Working days per year – 230;
- 12 working hours per day;
- Continuous operation of two wheel loaders and two dump trucks;
- Continuous operation of the engine of one barge.

***Table IV.1.1.-5***

***Emissions from diesel engines of cargo and transport equipment during operation on site***

| | EF | emissions | |
|---|---|---|---|
| | kg/ton | g/hour | kg/ton |
| Sox | 4 | 1320.00 | 3.64 |

| | | | |
|---|---|---|---|
| NOx | 48.8 | 16104.00 | 44.45 |
| volatile organic compounds | 7.08 | 2336.40 | 6.45 |
| CH4 | 0.17 | 56.10 | 0.15 |
| CO | 15.8 | 5214.00 | 14.39 |
| CO2 | 3150 | 1039500.00 | 2869.02 |
| N2O | 1.3 | 429.00 | 1.18 |
| soot | 4.6 | 1518.00 | 4.19 |
| NH3 | 0.007 | 2.31 | 0.01 |

## 1.2. Atomespheric Dispersion Modelling

### *Model*

In order for the air pollutant plume dispersion of PM10 emitted from the wharf in the Eastern Industrial Zone of Rousse to be estimated a model was created with the help of Aermod, an air dispersion modeling software with graphical Microsoft® Windows®-based interfaces by Lakes Environmental. This is a Gaussian Dispersion Model. Final results are presented in the form of concentrations of pollutants in the network of pre-selected receptors or by calculating deposition (dry, wet or generally dry and wet). Calculations apply multiple modifications of the Gaussian air pollutant dispersion equation, including the topography of the terrain (flat and rugged) and downwash. The averaging of the results (concentrations) may be performed for various periods of time, including 1, 2, 3, 6, 8, 12 and 24 hours. Long-term averages can be calculated monthly, yearly and for the entire studied period (including several years). Any source can be defined as a point source, volume source, line source or area source. The number of simultaneously studied sources of all types is virtually unlimited and depends on the capabilities of the used computer system. These can be grouped according to a particular characteristic, and thus to monitor the effect of individual groups of sources. Each source requires input of altitude of the source above sea level, height above the ground, mass emission of pollutants, temperature of the gas at the outlet of the source, etc., depending on the type of the source (depending on the type of source part of the input data is modified). The main data includes the value of mass emissions reflecting the maximum load of the source during the study period. The reporting of uneven distribution of concentration of emissions is done by introducing a system of coefficients characterizing hourly (in hours per day), weekly (on weekdays), monthly (every month of the year) seasonal (spring, summer, autumn, winter) and annual load source (if the study period is longer than one year). For this purpose it is necessary to have detailed information about the work intensity of the sources (for linear sources - traffic volume for each source). In order to calculate downwash it is necessary to know the dimensions (width, length and height) of adjacent buildings and their orientation towards the coordinates system used. If you examine the diffusion and precipitation of particles to underlying data should be added to the average diameter of each fraction, and its relative share in parts by mass and density. Evaluation of the plume dispersion of PM-10 is done under a different procedure.

### *Meteorological file*

Applying the AERMOD model requires the application of hourly meteorological file. In the current case utilities of the model have been applied for the compilation of an hourly meteorological file, recreating all possible weather conditions for calculation of the maximum

ground concentrations of a pollutant. Calculations are executed by a program that consistently makes all possible combinations, including all categories of stability of the atmosphere with their inherent wind speed and height of the mixing zone. This procedure is repeated for each of the directions of the wind. In the current case this change covers the entire range from 0 to 360 degrees in 5-degree range. This meteorological preprocessor was created as part of the AERMOD model.

***Map, topography, receptor model***

The first step is to introduce digital map (maps) of the study area in a certain scale. For this purpose the mapping system software is used, which allows input of digital terrain data in an appropriate scale in an unlimited number of layers.

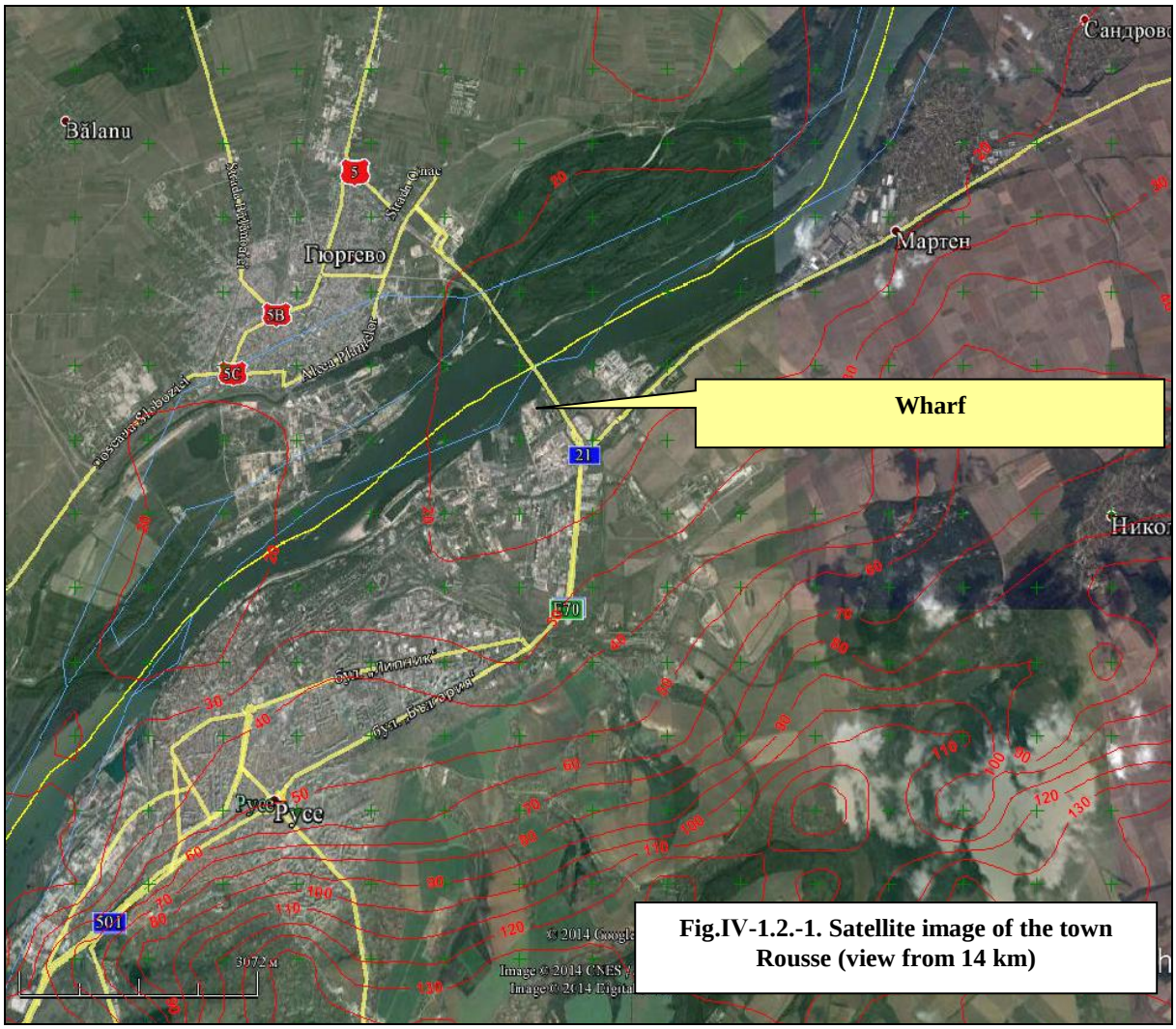



**Fig.IV-1.2.-1. Satellite image of the town Rousse (view from 14 km)**

In this case a satellite image of the Municipality of Rousse taken from a height of 14 km is input. It covers an area of 16,000 m in direction X (east-west) and 14,000 meters in direction Y (south-north). The base map is shown in Fig. IV.1.2.-1. Red solid lines reflect the topography of the area. It was introduced by a digital file. Although the area is mostly flat, it is clearly shown that displacement exceeds 100 meters from north to south. The lowest points are in the Danube area and this may be critical when assessing the diffusion and distribution of maximum ground concentrations. The applied receptor model covers the entire territory.

This is a Cartesian grid with uniform density of 1000 meters between two adjacent receptors. The total number of receptors is 255.

***Presentation of final results***

The type and volume of final results can be set with special options. For each of the specified averaging periods (1, 2, 3, 4, 6, 8, 12, 24 hours, month, year, given period) can be drawn up tables (files) for the first, second, third, fourth, fifth and sixth in value concentrations of each receptor. Max-files contain all concentrations exceeding the threshold value with information about the coordinates of the receptor, hour, date, month and year. Dispersion of toxic substances is reflected in the so-called TOX-files containing information about the points where toxicological threshold value is exceeded. Treshold-files contain information on the exceedance of a predetermined concentration limit (specifies the number of exceedances of a norm for one year). Daily files contain information about the distribution of concentrations for each separate day of the study period. The final results of data processing are presented in the form of contour graphs, serial histograms, tabular lists or other types of graphics selected by user. Contour graphs represent a series of irregular lines connecting the receptors with equal concentration plotted with different colors on the information map of the survey area. Of the many options provided by the system for calculation of air pollutant plume dispersion of PM10 the following ones were selected:

- First, third and sixth in order averaged values for 24 hours - a contour map with the corresponding values of daily average concentrations for all receptors;
- medium concentrations of the study period – as the study period is one year the contour map depicts the annual average concentrations for all receptors.

***Output modeling data***

In this case, atmospheric dispersion is calculated only for the operations related to loading of trucks at the temporary depot during operation. For this purpose the wharf is presented as an area source with a surface equal to the total area of the site (4558 $m^2$). It includes the emissions of PM-10 generated by front loaders, loading of dumper trucks and their movement within the wharf.

***Table IV.1.2.-1***

***Parameters of the wharf as PM-10 area source***

| source | length m | width m | area $M^2$ | emission $g/m^2$. s |
|---|---|---|---|---|
| wharf | 100 | 25 | 2500 | 0.000802144 |

The respective intensity coefficients have been applied to introduce the following modelling restrictions:

- Hours of work - 12 (the qoefficient for the time period from 7 a.m. to 6 p.m. is 1, and for the remaining hours - zero);
- Working days per week - six (the qoefficient for the days from Monday to Saturday is one), Sunday is a day off (coefficient zero);
- Working months per year - eight (November, December, January and February are excluded);

**First in value 24-hour concentrations of PM-10**

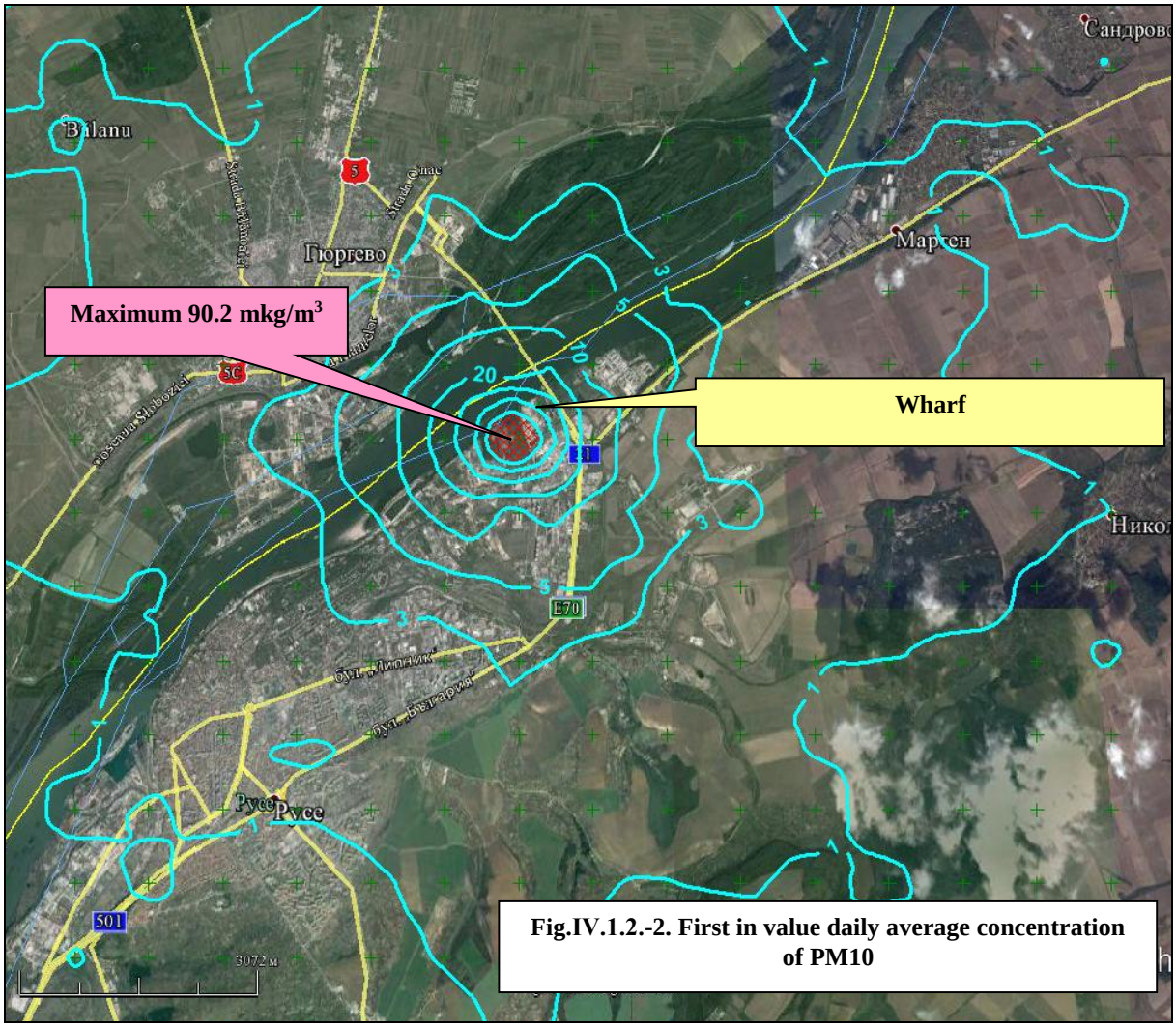



**Fig.IV.1.2.-2. First in value daily average concentration of PM10**

The distribution of the maximum daily average PM10 concentrations is shown in Fig. IV.1.2.-2. Blue lines mark constant concentrations (isoconcentration lines) of PM-10 in μg/m$^3$. The area shaded in red circles the territory in which the concentration of PM-10 exceeds the daily limit value for the protection of human health of 50 μg/m$^3$ set forth in Ordinance No 12/2010. This picture was obtained by "filtering" the array of daily average concentrations of each receptor for each hour of the calendar period and displaying the maximum values. Consequently, it does not reflect the pollution of the atmosphere in a particular point in time but unites the most unfavorable conditions for dispersion for all receptors, which most diverge in terms of time. The zone shaded in red marks the territory in which the daily limit value for the protection of human health is possible to be exceeded once. It has a diameter of about 600 meters and is offset about 550 meters southwest of the center of the wharf. The absolute maximum of ground level concentration, about 90 μg/m$^3$ is also situated there. This area does not reach the residential neighborhoods of the city of Rousse, but it is located above the port for bulk cargo, including coal for TPP Rousse. Fig. IV.1.2.-2 does not depict the existing background concentration caused by other sources of PM-10 located on the territory of the Eastern Industrial Zone and the town of Rousse.

The figure reflects the worst possible weather conditions and maximum concentrations emitted from the wharf at reduced humidity of bulk materials and dry transport routes.

**Third in value 24-hour concentrations of PM-10**

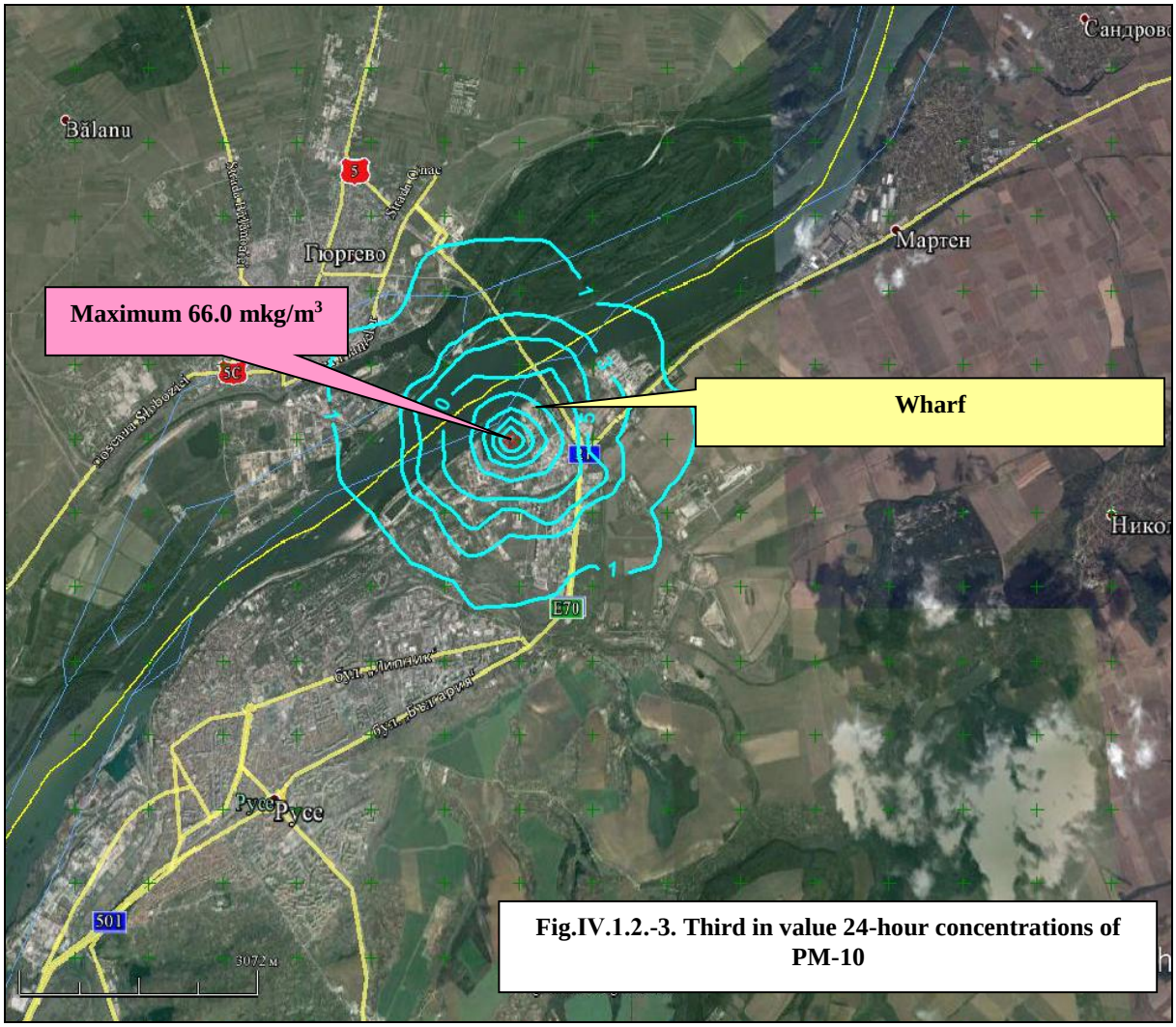



**Fig.IV.1.2.-3. Third in value 24-hour concentrations of PM-10**

The dispersion of the third in value daily average PM10 concentrations is shown in Fig. IV.1.2.-3. The area shaded in red circling the territory in which the concentration of PM-10 exceeds the daily limit value for the protection of human health of 50 µg/m$^3$ set forth in Ordinance No 12/2010 has shrinked to a diameter of 250 m. This picture was obtained by "filtering" the array of daily average concentrations of each receptor for each hour of the calendar period and displaying the third in line values. It is again displaced by nearly 550 meters southwest of the center of the wharf. The third in value absolute maximum of ground level concentration, about 66 µg/m3 is also situated there.

**Sixth in value 24-hour concentrations of PM-10**

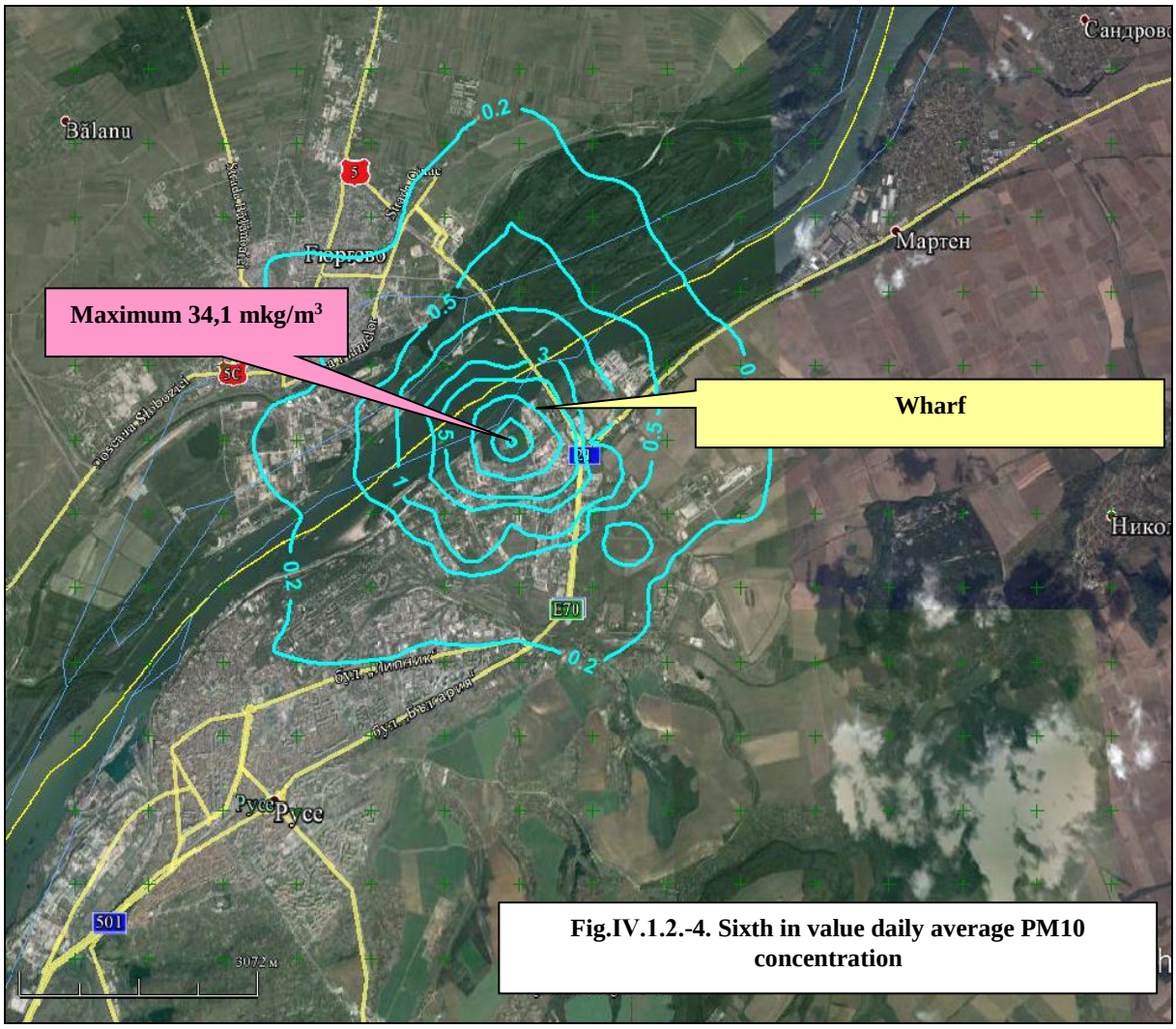



**Fig.IV.1.2.-4. Sixth in value daily average PM10 concentration**

The dispersion of the sixth in value daily average PM10 concentrations is shown in Fig. *IV.1.2.-4.* There is no zone shaded in red, consequently the daily limit value for the protection of human health of 50 µg/m$^3$ set forth in Ordinance No 12/2010 is not exceeded. The sixth in value absolute maximum of ground level concentration reaches 66 µg/m$^3$. It is again located in the port area for bulk cargo.

***Average annual concentrations of PM10***

The distribution of annual average concentrations of PM10 is shown in Fig. IV.1.2., 5. In this case, isoconcentric lines are shown in green. In the zone of maximum impact the concentration of PM-10 reaches about 6 µg/m$^3$, which is much lower than the daily limit value for the protection of human health. Concentrations of up to 1 µg/m$^3$ are confined within the port area and do not reach residential areas. From a practical point of view, Fig. IV.1.2.-5 shows that the new source has practically no influence on the average annual indicators of air quality in the town of Rousse.

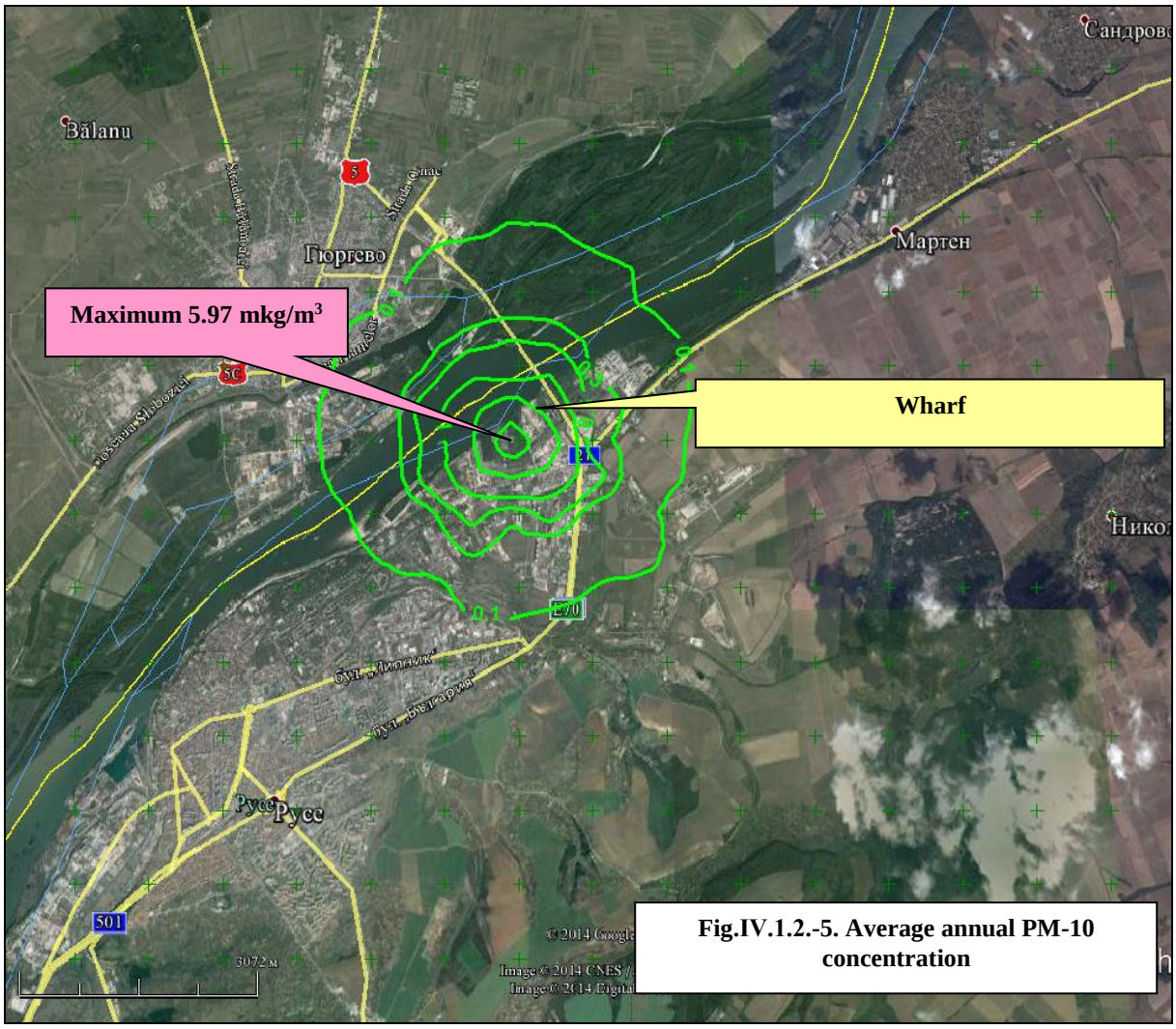



**Fig.IV.1.2.-5. Average annual PM-10 concentration**

**Conclusion**

Quantification of emissions generated from the implementation of the investment proposal for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section leads to the following conclusions:

- No construction works will be carried out within the extraction area, consequently no emissions of harmful substances will be generated;
- Construction works in the area of the wharf will be limited in time (no more than three months). The small number of simultaneously operating machines (no more than 5-6 machines with a coefficient of simultaneous operation 0.2) defines low emissions from diesel engines. Expected emissions of dust and PM can be compared to similar emissions from a small construction site. It is expected within the construction period (three months) the total quantity of emissions of PM-10 to remain within 130 kg (about 0.04 g/sec or 1.6E-05 g/m$^2$.sec). This level of emissions cannot lead to excessive pollution of the area.
- Works carried out within the extraction area do not generate emissions of dust and PM. The main reason for this is the high humidity of the extracted material. The only emissions on site will be generated by the engines of the dredge and barges. The instantaneous emission of nitrogen oxides (4.47 g/sec) cannot cause excessive

pollution of the area. Furthermore, the nearest village is more than one kilometer away, and the town of Rousse - about 27 km.

- Operations in the area of unloading (wharf) are mainly related to emissions of dust and PM. The level of these emissions will be very low if barges are unloaded directly on tippers.
- Storage of extracted materials at a temporary depot and loading of material on tippers by front loaders will lead to increased levels of these emissions. Evaluation of the dispersion of these emissions has shown that exceedances of the PM-10 daily limit value for the protection of human health are possible only in a small area adjacent to the wharf. The expected number of these exceedances is not more than 3 or 4 per calendar year, which is much lower than the permissible 35 exceedances as per Ordinance No 12. The expected maximum average annual concentrations in these conditions (about μg/m$^3$) are much lower than the permissible 40 μg/m$^3$.
- The results from PM10 dispersion refer to particularly adverse weather conditions, long-term storage of ballast in the temporary depot (reduced moisture) and overloaded dumpers moving along dry transport routes covered with accidentally spilled material.
- Given that the average annual number of days with precipitation in Rousse is about 110, the real annual level of emissions of PM-10 is expected to be lower than predicted.

The level of emissions generated by diesel engines of wheel loaders, dumpers and moored barge is insignificant and can not cause a significant increase in ground-level concentrations, leading to exceedances of the daily limit value for the protection of human health.

## 2. Surface and groundwater

The implementation of the project concerns a small portion of the water body of the Danube within the Bulgarian territory from the border village of Novo Selo to the border town of Silistra with code BG1DU000R001. Ecological state of the Danube is defined as "moderate" and chemical state - as "bad." The body is heavily modified.

The objectives for environmental protection in respect of the heavily modified body of water BG1DU000R001 are as follows:

- Prevention of deterioration of the ecological potential and achievement of good ecological potential by 2021;
- Prevention of deterioration of the chemical status and achievement of good ecological status by 2027.

### 2.1. Impact assessment on the status of surface water bodies. Significance of impact

***Mishka Section***

In connection with the implementation of the investment proposal by "Gravel and sand pits - Bulgaria" EAD, “HIDROKOM" OOD was assigned with the conduct of engineering and hydrological and hydraulic study for extraction site.

The aim of the hydraulic study is to determine the rate of changes occurring in the section from km 458 to km 463 of the Danube, in the area of Mishka Island, where extraction of inert materials will take place.

The following facts have been taken into account for the study:

- In the period after 1997 river traffic mainly navigates the bed between the north coast of Mishka Island and the Romanian coast;
- At km 456 - km 457 on the right bank of the river there is a water intake facility for humidification of the Kalimok Brashlen wetland with an approach channel to mainstream Danube;
- the main river bed between the Bulgarian coast (the left coast of Mishka Island) and the Romanian coast is characterized by powerful processes of accumulation, more intense near the coast of the island, strongly reducing the penetrability of the main armlet;
- The study takes into account the fact that after 1970 the entire stretch of the Danube below Iron Gate 2 HPP is marked by conversion of accumulation processes to erosion processes. For the period after 1970 and until 1999, there was a stabilization of the river bed in the area of Novo Selo near Svishtov, after significant erosion and transport of bottom material downstream. Most likely, a significant part of the sediments transported down the river below Rousse deposited in the Mishka armlet between the Bulgarian coast of the island and the Romanian coast. A further part of the silts deposited in the aprons, the most critical of which are those at Belene Island (km 561 - km 565), Batin (525 km) and the newly formed aprons between Rousse and Silistra.

The survey was conducted by HIDROKOM OOD with the participation of specialists from Rousse and the University of Architecture, Civil Engineering and Geodesy. Software of the US Corps of Engineers and dissertations of the team members were also used.

The final part of the report makes the following observations in terms of sustainability of the banks and bottom of the river in the area of dredging:

1. *The main bed of the Danube between Mishka Island and the Bulgarian coast is dominated by processes of accumulation of alluvial material. The main bed of the river is located between the island and the Romanian coast. The main bed is navigable. Due to the strong shallowing processes near the island the navigation route is close to the Romanian coast.*
2. *……*
3. *The change of the average and maximum flow velocities given for profile 11 in Table 56 for shaping of the riverbed the average annual maximum water quantity - 10 957 $m^3$ / s is considered negligible.*

*Table 56.*

| *Bottom* | *Average speed* | | *Maximum speed* | |
|---|---|---|---|---|
| *Q = 10957 ($m^3$/s)* | *R. coast – Mishka Island (m/s)* | *Mishka Island – B. coast (m/s)* | *R. coast – Mishka Island (m/s)* | *Mishka Island – B. coast (m/s)* |

| | | | | |
|---|---|---|---|---|
| *Natural coonditions* | *1.20* | *0.62* | *1.34* | *1.11* |
| ***Dredging to level 1 мASL*** | ***1.14*** | ***0.60*** | ***1.24*** | ***1.02*** |

4. *Impact on water levels after dredging to elevation 1.00 m in the planned area of the armlets between the two islands and the coast is within 1-3 mm and can be assessed as negligible. This is due to the fact that the impact is local and practically does not affect the flow of the river above and below Mishka Island.*

Furthermore, some of the mining and technical parameters of the deposit (Technical project for the extraction of inert material / sand and gravel / from the bed of the Danube, Mishka Section) should be taken into account, namely:

- *The distance of the area of extraction from the Bulgarian coast is 200-300 m, and from the north coast of Mishka Island - 100 m;*
- *In order to observe the boundaries of the approved perimeter, a 20° slope will be formed upon extraction of alluvial sediments within the extraction area .*

**Conclusion:**

*There is no reason to expect occurrence of erosion prossesses on the coast of Mishka Island as a result of implementation of the above-mentioned IP within the approved area for extraction and parameters described in the Technical Project.*

*Implementation of the project will not cause negative impacts on the regime and quality of the water body by water intake from the river and through the discharge of wastewater. Extraction works will not affect or cause a negative impact on the cross section of the riverbed - natural coasts, floodplains (sandspits), dykes and water management facilities. Implementation of the project with the strict observance of measures envisaged in it is expected to be in accordance with the requirements of river basin management plans and measures regarding the Danube.*

*Extraction of alluvial deposits from the river bed will be carried out after authorization by the competent authority, namely the Executive Agency for Exploration and Maintenance of the Danube and subject to the conditions therein.*

*Estimates predict absence of a negative impact on water quality of the Danube in the area of IP. The activities related to implementation of the IP are expected to comply with the provisions of RBMP regarding the ecological and chemical status of the water body.* To prevent accidental pollution, extraction and transport facilities should be kept permanently in good condition. To this end, item IV.2.3. suggests additional measures as conditions for the implementation of IP.

*After termination of the operation any anthropogenic impacts will cease and the natural water regime and sediment in the river will be gradually restored.*

- ***Wharf***

**The wharf** is situated on the shore of the Danube. Chemical toilets maintained by a specialized company will be provided on site. The site is to be equipped with a small treatment plant type ACO Clara 5-10 with hydraulic load of 0.75 to 1.05 m3 per day and discharge of purified water in the Danube. Estimated quantities are very low compared to

river runoff and the capacity of the treatment facility satisfies the criteria for purification in terms of quantity and quality.

Water drained from extracted alluvium will flow back into the river.

Since the site is situated on the riverbank, rainwater will drain in the surrounding land and the river.

The elevation of the wharf is from 21.20 to 21.50, and the quay wall – from 21.17 to 21.20 m ASL. Intense rainfall and high water levels do not pose a threat of the site being flooded by surface runoff from adjacent areas, since it is higher than them.

The water level in the Danube at $Q_{1\%}$ = 15 533 m3 / s is 20.50 m ASL. Therefore as per the statutory requirements (protection against water quantity in the river with a probability of repetition once in 100 years), the site will not be flooded by the river (see Appendix No 2 – wharf layout*).*

Construction of a warehouse for fuel and lubricants is not envisaged.

The above circumstances determine the absence of a negative impact on the quantity and quality of surface water under normal operating conditions.

Upon termination of site operation, the wharf will continue to operate as an industrial site and port handling general and bulk cargo.

***Summary of the impact on surface water:***

*The expected impact on surface water and water bodies during preparation and operation of the extraction site is expected to be as follows:*

Mishka Section

***Territorial scope of impact:*** The territorial scope of impact on surface water will affect limited parts of the Danube.

***Degree of impact:*** low impact if measures for maintenance of technical and technological equipment and compliance with regulatory requirements for wastewater management and their treatment are ensured

***Duration of impact:*** limited for the term of exploitation.

***Frequency of impact:*** permanent under the conditions of seasonal extraction.

***Cumulative impact:*** This kind of impact on surface water is possible only in the event of simultaneous failure of similar sources of pollution nearby.

***Transboundary impact:*** Risk of transboundary impact with the envisaged equipment and technology for extraction, transportation and wastewater management exists only in the event of incidental spill of petroleum products. Implementation of the emergency plan will prevent transboundary impact on surface water.

Wharf

*The expected impact on surface water and water bodies during preparation and operation of the extraction site is expected to be as follows*:

***Territorial scope of impact:*** The territorial scope of impact on surface water will reach only the sections of the Danube adjacent to the site.

***Degree of impact:*** low impact if measures for maintenance of technical and technological equipment and purification of effluents is ensured.

***Duration of impact:*** limited for the term of exploitation.

***Frequency of impact:*** permanent under the conditions of seasonal extraction.

***Cumulative impact***: this type of impact in the area of the wharf can be caused by discharges of household waste water from settlements in the area as part of the impact of the site is negligible compared with that of the settlements.

***Transboundary Impacts:*** Risk of transboundary impact with the envisaged equipment and technology for storage and transportation of materials to the crushing and sorting plant exists only in the event of incidental spill of petroleum products. Implementation of the emergency plan will prevent transboundary impact on surface water.

***The expected impact on surface water in the process of closure is expected to be as follows*:**

Mishka Section

***Territorial scope of impact:*** limited

***Degree of impact:*** very low, practically absent

***Duration of impact:*** very short

***Frequency of impact:*** practically absent

***Cumulative impact:*** not expected

***Transboundary impact:*** not expected

Wharf

***Territorial scope of impact:*** limited

***Degree of impact:*** very low, practically absent

***Duration of impact:*** very short

***Frequency of impact:*** accidental, only in emergency situations and until their elimination.

***Cumulative impact:*** not expected

***Transboundary impact:*** not expected.

### 2.2. Impact assessment on the state of groundwater. Significance of impact

**Mishka section**

Mishka extraction site is located in the bed of the Danube. The investment proposal does not envisage direct or indirect discharge of pollutants in the ground, or activities which would lead to indirect discharge of such. This determines the absence of impact on chemical status of groundwater under normal operating conditions.

Construction of water intake facilities and water intake is not envisaged; therefore, the quantitative status of groundwater will not be affected.

According to hydrological estimates extraction works will cause river water level within the extraction area to drop by 5.0 mm at the most. This will have essentially no influence on feeding and draining of groundwater associated with the river.

Based on the above facts, the forecast is for the absence of a negative impact on the groundwater regime in the implementation of the investment proposal within Mishka section.

The level of Danube waters infiltrating the alluvial sediments will not be affected either.

**Wharf**

The site is situated on the banks of the Danube.

*The fundament is made of concrete and the reconstruction and operation works carried out there will not affect groundwater*.

The investment proposal does not provide for the discharge of contaminants in the subsurface or carrying out of activities that lead to indirect discharge of such. Construction of water intake facilities that could induce changes in the quantitative status of groundwater is not envisaged either.

Chemical toilets maintained by a specialized company will be provided on site for the term of carrying out of reconstruction works. For the term of operation of the site workers will use sanitary premises in the administrative headquarters. Formed domestic wastewater will be discharged into the Danube after treatment on the basis of a permit.

Site in question does not provide for construction of a warehouse for fuels and lubricants. This determines the absence of a negative impact on the quantitative and qualitative status of groundwater under normal operating conditions.

The possibility of potential groundwater pollution resulting from accidental spills of fuel and lubricants by equipment and transport machinery cannot be excluded completely in view of the specific operation of the site, employed technology and machinery. However, this probability is very low because the incidence of accidental spills is low, the quantities are minimal, and the fundament of the site is made of concrete, which helps to quickly eliminate any emergency spills.

***Assessment of the impact of activities provided by the project on sources of drinking water to the population***

**Mishka Section**

The closest Ranney well of ViK Razgrad-Ryahovo is located 150,0 m away. The plot is located outside zone I of KBS.

**Wharf**

The site is located at a great distance from sources of drinking water to the population.

The aforementioned source near the extraction area is the one that should be studied in view of assessing the risk of being affected by planned project activities due to its proximity to the extraction area and direction of surface and underground streams.

Below we present expert assessment of the impact of IP on the state of WSP water sources in view of the perimeter of the investment proposal.

We consider two cases:

***a) Location of the IP (extraction areas and quay platform) compared to water sources for WSP in the Quaternary - unprotected groundwater body within the meaning of Ordinance No 3 for SPZ.***

Mishka extraction site is located in the bed of the Danube. Extraction is envisaged only of modern sediments from the river and they cannot fall into 1st, 2nd, or 3rd zone as these zones are situated inland and near the border of feeding - the shoreline of the Danube.

The wharf is located on the banks of the Danube in the Eastern Industrial Zone of Rousse and does not fall within the 1st, 2nd, or 3rd SPZ in the areas of groundwater recharge accumulated in the Quaternary aquifer.

***b) Location of the IP (extraction areas and quay platform) compared to water sources for WSP in the Lower Cretaceous – protected underground water body within the meaning of Ordinance No 3.***

Mishka extraction site is located in the bed of the Danube. Extraction is envisaged only of modern sediments from the river and they cannot fall within the 1st belt as it is located inland where water intake facilities are located.

The wharf is located on the banks of the Danube in the Eastern Industrial Zone of Rousse and cannot fall within the 1st SPZ belt of water intake facilities supplying water to the population taken from the Lower Cretaceous aquifer.

According to Ordinance No 3 for SPZ – Annex 2, it. 12 and 13, the following activities are prohibited within the 2nd belt and limited within the 3rd belt: extraction of natural resources within the water body supplying water to the population, in this case - the Lower Cretaceous aquifer, and violation of the integrity of the watertight layer – i.e. marl sediments of the Lower Cretaceous. IP does not envisage extraction of sediments from the Lower Cretaceous layer or violation of its integrity, only extraction of modern quaternary river sediments.

The results of the performed assessment show that imposition of prohibitions or restrictions in relation to the available water sources for potable water supply in the Quaternary and Lower Cretaceous layer would not be required in relation to implementation of the investment project.

***Significance of the impact of the project on groundwater***

The expected impact on groundwater in the process of preparation for commissioning and operation of the site is expected to be as follows:

**Mishka Section**

***Territorial scope of impact:*** impact on groundwater is not expected as extraction works will be carried out in the river bed of the Danube.

***Degree of impact:*** very low, practically absent.

***Duration of impact:*** for the term of exploitation of the site .

***Frequency of impact****:* practically absent.

***Cumulative impact:*** *not expected.*

***Transboundary impact:*** not expected for either of the transboundary groundwater bodies. Causes:

a) Transboundary groundwater body "*Karst and porous waters in Neogen – Sarmat – Dobrudzha* (BG1G0000N1049)" does not fall within the scope of the project and its borders are located about 150 km to the east;

b) Transboundary groundwater body „*Malmian-Valanginian Karst Water* (BG1G0000J3K051)" falls within the project area, but the body is of the confined type and water from the site will not come into contact with groundwater; the potential for contamination resulting from the activities of the IP is very low, practically non-existent; the

quantitative characteristics will remain unaffected as groundwater abstraction is not envisaged.

**Wharf**

***Territorial scope of impact**:* within the site.

No impact on SPZ of drinking water sources is expected due to the absence of hazardous and noxious substances in the stored materials. Also, the wharf is situated at a significant distance from SPZ.

***Degree of impact:*** practically absent.

***Duration of impact:*** for the term of exploitation of the site.

***Frequency of impact**:* practically absent.

***Cumulative impact:*** *not expected.*

***Transboundary impact:*** not expected for either of the transboundary groundwater bodies. Causes:

a) Transboundary groundwater body "*Karst and porous waters in Neogen – Sarmat – Dobrudzha* (BG1G0000N1049)" does not fall within the scope of the project and its borders are located about 150 km to the east;

b) Transboundary groundwater body „*Malmian-Valanginian Karst Water* (BG1G0000J3K051)" falls within the project area, but the body is of the confined type and water from the site will not come into contact with groundwater; the potential for contamination resulting from the activities of the IP is very low, practically non-existent; the quantitative characteristics will remain unaffected as groundwater abstraction is not envisaged.

***The expected impact on groundwater in the process of closure is expected to be as follows:***

**Mishka Section**

***Territorial scope of impact:*** direct impact on groundwater will not occur as the extraction site falls outside the area of groundwater bodies.

***Degree of impact:*** practically absent.

***Duration of impact:*** for the term of termination of works on site.

***Frequency of impact**:* practically absent.

***Cumulative impact:*** *not expected.*

***Transboundary impact:*** not expected

**Wharf**

***Territorial scope of impact:*** potential impact on groundwater could occur only within the confined area of the wharf.

***Degree of impact:*** practically absent.

***Duration of impact:*** for the term of termination of works on site.

***Frequency of impact**:* practically absent.

***Cumulative impact:*** *not expected.*

***Transboundary impact:*** not expected

The nature of the activities covered by the investment proposal is not associated with a potential risk of change in regime or quality of groundwater. Extraction works and operation of infrastructure and auxiliary elements will not affect in any way the protection zones of WSP sources.

### 2.3. Measures set in RBMP for the Danube region

According to letters ref. No 378 / 30.08.2013, and 378 / 07.04.2014 of the Danube Water Management Directorate with HQ in Pleven the investment proposal is acceptable in terms of achieving environmental objectives and measures for good condition of waters and areas for their protection set in RBMP 2010 – 2015 for the Danube region. The investment plan will be implemented in compliance with the measures cited in the letters. Additional measures are envisaged in item VII of this Report with the purpose of reducing the potential negative impact of the site on ecosystems and their favorable conservation status.

## 3. Land and Soil. Geological Base

***Forecast and assessment of the impact on the soil on the territory of the IP and adjacent lands with degrees and areas of damage***

The proposed extraction activities affect the river bed of the Danube, which is public property. Alluvial sediments are covered by clay sludge with little thickness. Extraction works will destroy it and it will get carried away by the water currents.

Implementation of the investment proposal does not provide for disruption of adjacent sections of land and soils. Lands outside the water body will not be affected.

The wharf subject to reconstruction is already anthropogenically influenced. New disruptions of land and soils within the wharf will not occur.

During operation contamination of adjacent lands and soils is not expected due to the high humidity of the extracted material.

***Forecast of the impact on the geological environment by the implementation of the investment proposal***

The sensitivity of the subsoil is determined by the geological structure - lithological variations and their geological characteristics and tectonic setting of the affected area.

The degree of change depends on the depth of excavation works.

For the purposes of this evaluation the significance of the impact is defined as:

- *Negligible* - when only the top weathered layer is affected;
- *Low* - the impact on the geological base affects a small area and depth;
- *Medium* - the impact is limited in size or on relatively shallow depth (up to 10 m);
- *High* –a large area with a considerable depth is affected

The base of the riverbed is made of resistant carbonate rocks that lie at 8 m to 10 m below sea level. This lime substrate is covered by a conglomerate layer, the upper surface of which rises 2 to 3 m above sea level. In the vertical cross section over the conglomerate layer lays linearly extended geological and geomorphological swell-shaped formation of alluvial deposits with an average thickness of 6 m which in some places reaches 11.5 m. They form

the useful resource of alluvial sand and gravel to be mined for construction. In the river bed of the Romanian armlet or between the Romanian coast and Mishka island this useful natural resource was formed by accumulative processes stabilized after 1970 along the entire stretch below WPS Iron Gate, including the Bulgarian section and Mishka section. These processes were determined by the transverse geometry of the Danube riverbed and the occurring hydrodynamic processes. These factors determine the genesis of the geological and geomorphological swell-shaped formation, which at low water leads to shallowing and reduction of the longitudinal gradient of the river, changes in the size and conductivity of the Bulgarian armlet and difficult navigation access to the harbor of Ryahovo.

Active hydrodynamic and accumulation processes occur in the northwestern periphery of Mishka island. A swell-shaped geological and geomorphological body of alluvial deposits has been formed here that defines the asymmetric riverbed of the Romanian armlet. In low water this asymmetry causes a significant reduction in size and throughput and navigational conditions within the main armlet. Due to the strong shallowing processes in the armlet near the island the fairway of the navigation route is shifted closer to the Romanian bank.

Implementation of the project will cause local and direct physical changes in the volume of geological and geomorphological bodies lying in the bed of the Danube. Extraction of alluvial sediment deposits in the authorized concession area in the bed of the Bulgarian armlet, however, will shape a trough-bed deepening of the sleeve and the formation of two sub-parallel 20° slopes (1:2.75). The formed slope is actuially a stable condition for such unconsolidated, water saturated river sediments. Transformations due to the extraction of sand will result in improved hydraulic conditions - increased conductivity, volume and speed of the river flow, which in turn will shape and improve navigation conditions in the armlet.

The implementation of extraction works will determine the destruction and carrying away by water currents of thin clay and mud layers covering the useful layer of alluvium.

Transportation of raw material will be carried out with specialized self-propelled barges with net capacity of 1000 t.

Drilling and blasting works are not part of the investment proposal. Ore crushers will not be installed. Planned site will take up a relatively small area of the Danube, about 2.6 km in length.

Impact on the geological environment caused by extraction of alluvial deposits is expected to be as follows:

***Territorial scope of impact:*** direct local physical impact on the geological environment - permanent seasonal extraction works will temporarily reduce the volumes of dynamic Holocene alluvial reserves and deepen the riverbed of the Danube.

***Degree of impact:*** moderate impact

***Duration of impact:*** during the term of exploitation

***Frequency of impact:*** constant during seasonal operation

***Cumulative impacts:*** Mishka section is situated at a distance of 20, 40 and 55-60 km respectively from the sites for the extraction of river sediments near the islands Aleko, Luylyaka and Batin. Due to the significant distance between Mishka and the other sites with permits for extraction of inert materials cumulative effects are not expected.

***Transboundary impacts:*** not expected.

# 4. Flora and Fauna

## 4.1. Flora

### Vascular plants:

Extraction of sand and gravel from alluvial deposits in the bed of the Danube will take place entirely in the aquatic environment without affecting superior vegetation. Unloading of raw material will take place on an existing port in the Eastern Industrial Zone of Rousse and buffer depot for unloading and temporary storage of nearly 17 000 t of alluvial deposits.

Processing of raw materials will be carried out on an industrial site equipped with a sorting and treatment installation for the treatment of river sediment deposits from the Danube and a concrete plant located on plot of land nr. 63427.8.1076 of neighbourhood 1 as per the plan of the town of Rousse, Eastern Industrial Zone, which is not the subject of this investment proposal.

All onshore activities will be carried out at existing industrial sites, without affecting protected vegetation.

### Phytobenthos

During extraction of the surface layer of alluvial deposits diatoms encrusted on gravel and boulders will inevitably be collected as well. Diatoms bloom massively in a favourable environment with availability of sufficient nutrients in the water and sunlight intensity, therefore the amount of diatoms extracted from the bottom will be negligible compared to the total mass of phytobenthos in the river. Most of the species are found in the periphyton communities (fouling on floating stationary equipment) and are periodically removed during repair of vessels.

### Phytoplankton

Dredging in the Danube does not influence phytoplankton (concentration of chlorophyll and phytoplankton) and the amount will continue to be determined by the quality of water discharged from each tributary and the presence of hydraulic structures on the river as confirmed by the results of studies made in the last two expeditions of the International Commission for the Protection of the Danube. In terms of species composition of phytoplankton of the Danube diatoms (*Bacillariophyceae*) will remain dominant, followed by green algae (*Chlorophyceae*) with a significant contribution from *Cryptophyceae*.

## 4.2. Fauna

### Mammals:

All operations related to the extraction of sand and gravel from alluvial sediments from the bed of the Danube, extraction, transport and unloading of alluvial materials (sand and gravel) / aggregates / will take place about 100 meters from Mishka Island, 200-500 m off the Bulgarian coast and 310 meters to 836 meters from the Romanian coast. River flow of the Danube is relevant only as a transport corridor for some mammals. Exchange of individuals between populations in Romania and Bulgaria is only possible if the river freezes over. Extraction of aggregates will cease during the summer low water.

The KS-250 type dredger will be positioned on the extraction site with the help of a self-propelled barge that will tow the dredger to the required location. This operation will take place twice a year: at the start of extraction works and at the end of the season in order to put away the dredger for the winter. Movement of the dredger within the specified tract is done through a system of stern and side anchors located at the top to the left and right of the axis of

the dredger. Movement is achieved by rolling anchor ropes on one side and releasing the ones on the other. Thus movement of mammals from one habitat to another and exchange of species between different populations will not be prevented.

For mammals inhabiting the Bulgarian and Romanian coast effects of extraction will be subtle. Processing will be performed on an existing industrial site inhabited only by small mammals living in residential and industrial buildings and warehouses. Closest to the extraction site, only 100 m away is Mishka Island. The same is inhabited mainly by small mammals hiding in underground habitats. The effects on them will be similar to those of maintaining and growing poplar plantations on the islands.

Movement on the island itself is impossible because of dense vegetation - willows and 3-4 years old shrubs. In summer the sandy beach in the eastern part of the island is used for sunbathing. The poplar plantations cultivated in the south central region of the island are taken care of by a brigade of forest workers. For these reasons, large mammals hide in inaccessible places during the day and come out only at night in search of food on the island. The island itself is about 2.5 km long and there are many suitable hiding places difficult to access. Expulsions of mammals of the island is not expected, and their movement towards the banks of the Danube is only possible when weather conditions allow passage.

Neither exploitation of the area nor extraction works endanger the habitats of bats, because their presence is temporary. All activities will be carried out during the day when the bats remain in hiding. Activities on the shores of the islands are not foreseen and impacts on habitats of forest species of bats will be negligible. Mining activities will be carried out within the prescribed area, therefore caves, mines and underground galleries inhabited by bats will not be affected.

The majority of small mammals occupying the Danube islands hide in underground shelters during the day and to them noise pollution caused by the dredger will be similar to the noise emissions of navigation on the fairway of the Danube and the activities associated with the cultivation of poplar plantations on the islands. All this allows the effects of the implementation of the project on the mammal fauna to be defined as temporary, with pronounced seasonality and insignificant as it will not lead to a change in the number of populations inhabiting the region.

**Birds**

Some of the persons consulted with in the procedure of drafting of the terms of reference for the EIA who have had no direct observations of dredging operations have expressed concern that the noise made by the engine of the dredger and buckets would chase away the birds nesting on Mishka Island.

In order to measure the actual noise levels on the territory of Mishka Island in the summer of 2014 experts involved in drafting of the report made measurements of noise levels generated by a dredge near Aleko Island (86,5 dB (A) and at 100 meters after taking into account the attenuation.

***Table IV.4.2.-1: Measured noise levels***

| Consecutive No | MP as per PI No 03-0663/15.08.2013 | Description | measured $L_{Aeq}$, dB(A) |
|---|---|---|---|
| 11 | MP 1 | Bulk berth Eastern Industrial Area of Rousse | 67,7 |

| | | | |
|---|---|---|---|
| 22 | MP 3 | barge passing about 350 meters from the Mishka Island | 79,5 |
| 23 | MP 7 | Dredge (Bucket-type Dredge) near the island of Aleko | 86,5 |
| 24 | MP 8 | Sieve facility near the town of Marten | 68,6 |
| 25 | MP 2 | across the Mishka Island – the future site, background noise level | 31,2 |
| 26 | MP 4 | the village of Ryahovo – residential area | 42,1 |
| 27 | MP 5 | the village of Babovo – residential area | 39,5 |
| 28 | MP 6 | the village of Sandrovo – pier (next to residential area) | 40,5 |

The shortest distance from the approved extraction area to the north coast of Mishka Island is 100 m, and the largest – 200 m.. The separate tracts for extraction of inert materials are at a different distance from the coastline of Mishka Island where a colony of herons and cormorants is residing. Tracts numbered from 1 to 8 are farthest from the colony. Tracts 9 and 10 are 100 meters away from the coastline of Mishka Island where the colony of herons and cormorants is residing. Formed noise levels during dredging have different values depending on the distance to the colony of nesting birds on Mishka Island. Greater distance from the sound source (floating bucket dredger, self-propelled barge) means lower noise levels. Attenuation of sound during propagation outdoors depends, besides on the distance and the type of ground, on the relief (presence of obstructions) and atmospheric absorption as well *(ENISO 9613-1&2: Acoustics – Attenuation of sound during propagation outdoors, Part 1 & Part 2).*

The area planned for extraction of inert materials is located between the Romanian and the Bulgarian bank of the Danube, which are overgrown with trees. Existing natural tree and shrub vegetation on both sides of the extraction area plays the role of natural silencer limiting sound propagation.

The results of the measurements show that the noise level at the shore of the Mishka Island will be 36,5 dB (A). This level is below the limit of 40 dB (A) specified by Ordinance No 6/2006 of the Ministry of Health and the Ministry of Environment and Waters for quiet zones outside agglomerations

The observations on the behavior of waterfowl inhabiting Mishka Island during passing of river convoys show that birds have adapted to the impacts of vessels. Regardless of the significantly greater power of their engines and big noise impacts and vibrations during the passage of each convoy, there was no reaction on the part of birds such as change in flight direction, quick departure, and change of position of birds perched in trees or hunting in the water. A great number of bird species inhabiting the river can be seen near the port of the Danube dredging fleet and the operating crushing and sorting plant. In connection with similar investment proposals the team has conducted studies along the Struma River near operating crushing and sorting plants and mining areas. Large Egrets and Little Egrets have been observed about 50 m away from the facilities. Current practice in shipping and fishing

has shown that waterfowl both wintering and permanently residing in the Danube basin show no sensitivity to the presence of vessels and often follow them or use their spars and masts to rest. Mergansers and grebes that winter in the area remain at a safe distance, but still do not appear disturbed by vessels. Shorebirds feeding in the coastal zone remain at a safe distance of 20-50 m from people and machines. It can therefore be assumed that exploitation of the natural resources in the planned section will not lead to expulsion of nesting birds in nearby islands. Since mining activities will be carried out in the bed of the river they are not expected to have an impact on the populations and the habitats of the bird species inhabiting areas north and south of the river banks and the inside of the Danube Islands (Hen Harrier, Marsh Harrier, Levant Sparrowhawk black woodpecker, Pern, Lesser Kestrel, Kestrel, Red-backed Shrike, Lesser Grey Shrike, Black Kite, Lesser Spotted Eagle, Short-toed Eagle, sparrowhawk, great Wood Sandpiper, Lapwing, Hobby, Common Buzzard, etc.).

The observations of bird behavior near dredgers working elsewhere show that the dredgers attract waterfowl like trawlers in the Black Sea instead of chasing them away. The dredger attracts waterfowl that feed on invertebrates rising from the bottom during dredging just like trawling attracts waterfowl.

The impact will be reduced to retreating of flying birds to a safe distance from the area of moving barges or dredger, without leading to their displacement.

Below, the report examines the expected impacts particularly for species that are found to nest in the area.

**White-tailed eagle *(Haliaeetus albicilla)***– Resident species for Bulgaria, with mostly young birds from more northerly areas spend the winter here. The estimated amount of the population in Bulgaria is 10-15 breeding pairs. In winter the number increases at the expense of vagrant and moving young birds mainly from the Danube delta and fluctuates between probably 30 and 40 individuals. It inhabits the coasts of seas, rivers and lakes rich in fish and waterfowl, high and comfortable nesting trees. In winter it inhabits areas around ponds - lakes, fishing ponds and others. Young birds are vagrant, but between the fifth and the tenth year they settle in a particular place. It nests in moist and dense forests mainly in tall white poplars (Populus alba). Pairs have several nests, and change them from year to year.

The closest nesting ground to the extraction area is on the territory of the protected area "Brushlen - Kalimok" - coastal poplar forests. Trees where nests have been found are situated at a distance greater than 5 km from the planned dredging area.

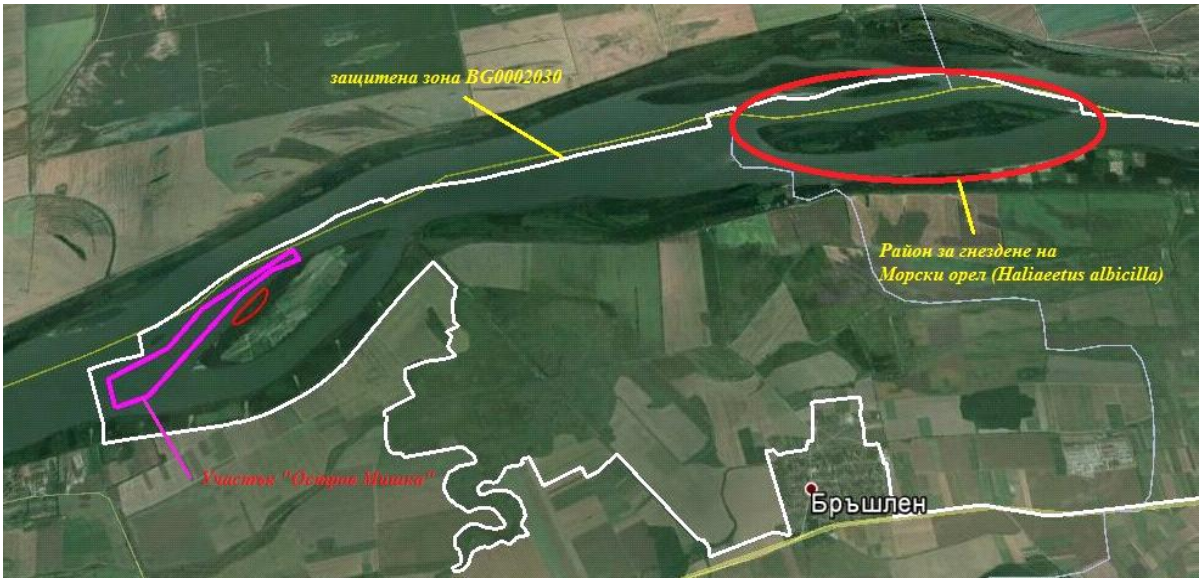



***Fig. IV.4.2.-1: Location of the dredging area and the nesting area of white-tailed eagle (Haliaetus albicilla)***

Prior to the year 2000 this species bred on Mishka Island, but after active forest operations (2000-2006), during the breeding season the pair was banished. Food range of sea eagle (Haliaetus albicilla) is very diverse, the composition of food is different in different seasons. It feeds on fish, birds and mammals. It often takes away the prey of otters, gulls, terns, cormorants and other predators. It also feeds on the young of many waterfowl, sometimes destroying whole colonies of cormorants (Turun Sanomat, 2012). Often in pursuit of prey the white-tailed eagle forces its victim to dive repeatedly until complete exhaustion and then it catches it. Each fish appearing on the water surface is a potential victim of the hunting white-tailed eagle. Mammals that fall prey to this species include voles, rabbits, lambs and in some cases small deer. It also feasts on carrion (Ferguson-Lees, J.; Christie, D.,2001).

Disturbance, banishing of breeding pairs, low nesting success and death of offspring due to dredging and related activities is not expected. Pairs nest in inaccessible places on the territory of the protected area "Kalimok Brushlen". Territories in which Haliaeetus albicilla seeks food are shallow places along the banks of the Danube, spills and wetlands in which fish is easily spotted and caught and which are inhabited by waterfowl. Birds rarely seek food near the fairway as fish swim in the deep there and are hard to spot.

During dredging buckets raise small invertebrates to the surface. Fish pursue them to feed on them and also come to the surface. The rise of invertebrates and fish feeding on them in the surface water layer attracts fish-eating birds, and white-tailed eagles may be among them. For these reasons, the effects of the implementation of the project on *Haliaetus albicilla* can be defined as negligible. Banishing of breeding pairs from their nesting grounds and habitat loss is not expected.

**Osprey *(Pandion haliaetus)*** – In the past it used to breed in many places along the Danube, but later disappeared from the lower Danube. It is spotted regularly during migration. The species is vulnerable because it is often shot at from various fish farms throughout the country, which has led to the reduction of the breeding population in Bulgaria and it is currently estimated at 3-6 pairs (Jankov, 2007). Disturbance, displacement of breeding pairs, low nesting success and death of offspring due to dredging and related activities is not expected since the species is not among the nesting ones, and migratory birds show no

sensitivity. Hunting birds may appear near the dredge as a result of fish chased to the surface layer by dredging. For these reasons, the effects of the implementation of the project on *Pandion haliaetus* can be defined as negligible. Disturbance or chasing away of migrating birds is not expected.

**Common kingfisher (*Alcedo atthis*)** – It is a breeding, migrating and wintering species for Bulgaria. Birds from Central Europe and Russia fly through Bulgarian territory. It propagated in loess walls on the banks of swamps, bogs and low altitude rivers, reservoirs of anthropogenic origin, fisheries, ballast pits and dams. Characteristic of the common kingfisher are post-nesting migrations and wanderings. Vagrant and migratory birds appear in Bulgaria at the end of July (Nankinov, 2012). Only one pair has been spotted during field studies in the last third of Mishka Island to the east. This pair has been observed in previous years (2009-2012.). In suitable habitats - hatcheries and stocked dams it does not show any signs of disturbance near human presence, only keeps at a safe distance. If it senses threat while nesting it hides deep in its hole and comes out after the threat has passed. During the nesting and hatching period dredging works in tract 9 and tract 10 will cease. At a distance of 100 meters from the nest the dredge is not perceived as a threat by nesting and hunting birds. Banishing of the pair is only possible at very high spring waters when banks will be fully flooded. A few pairs of kingfishers nest and raise their offspring on the Ropotamo River despite its width being significantly smaller and despite the all-day boatings with tourists. Bearing in mind the behavior of *Alcedo atthis* on the Ropotamo, hatcheries and stocked dams, the effects of the implementation of the project on the species can be defined as negligible. Disturbance of nesting pairs or loss of habitat is not expected.

**Black-winged stilt *(Himantopus himantopus)*** – Breeding, migrating and wintering species for Bulgaria with the number of breeding population around 200-250 pairs. It inhabits swamps, wetlands, coastal brackish and saline lagoons, ponds, salt production sites, areas for storage of wastewater and dams. The species has been found to breed in the former fish ponds Zona-Iztok - 15 pairs (Gateway - East) and over 30 pairs in June 2013 in Zona - Zapad on the territory of the protected area "Kalimok Brushlen." Flying birds have been identified over the sand spit in front of Mishka-3 Island. Birds seek food in the shallows. They do not stay at sites with characteristics similar to those of the dredging area, only fly over them. Disturbance, displacement of breeding pairs, nesting unsuccess or death of offspring due to dredging or related activities is not expected as the species does not breed close to the dredging area. Furthermore, migratory birds show no sensitivity to such activities.

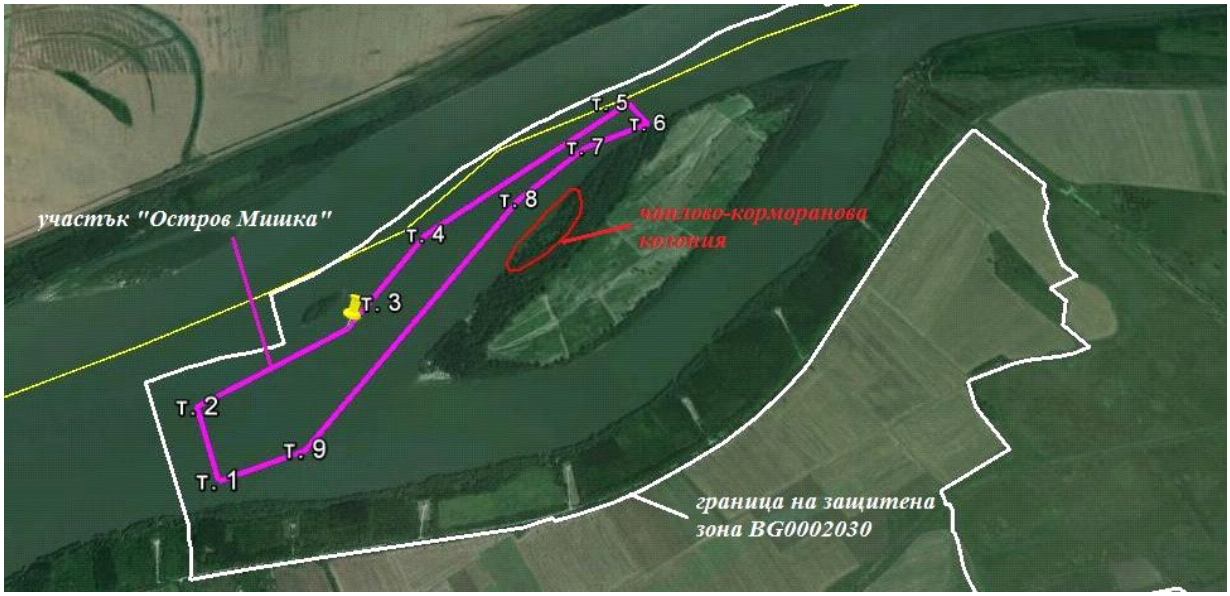



***Fig. IV.4.2.-2: Location of the colony of herons and cormorants near Mishka Island***

There is a mixed colony of herons and cormorants on Mishka Island. A characteristic feature of this and other colonies is the great fluctuation of the number of pairs formed each year. This is typical of species such as *Phalacrocorax pygmeus*, *Ardeola ralloides*, *Platalea leucorodia*, *Nycticorax nycticorax* and *Egretta garzetta* and *Phalacrocorax carbo* and *Ardea cinerea*. The impacts expected for each of these island nesting species will be the following:

**Great cormorant *(Phalacrocorax carbo)* –** In appropriate habitats non-nesting individuals do not seem to become disturbed in human presence, only remain at a safe distance. In hatcheries and stocked reservoirs Phalacrocorax carbo is difficult to expel even with the presence of guards. Often fireworks, carbide and propane cannons are used unsuccessfully. The birds get used to the noise and leave the area after catching all available fish or to go to their nesting grounds. Phalacrocorax carbo inhabits waters in the vicinity of large settlements. In search of food great cormorants regularly fly over the southern industrial zone of Bourgas, Bourgas shipyards, Meden rudnik residential complex, the port city of Rousse, etc.. Cormorants in protected area "Poda" near Burgas city nest on electricity poles about 80 m away from the Burgas- Sozopol road with heavy traffic. In the fishing season Cormorants can be found in each trap. In the summer of 2014 an experiment was conducted to establish the reactions of nesting birds to vessels and boats with people. Smaller distances provoked the following reactions - cries, wing flapping and flying away. Reactions were not observed at a distance of 100 m from the island - all birds remained in place and there was no change in the usual noises they made. When the boat was 10 m away from the colony on the island gray herons started issuing warning cries, cries and flapping of wings was observed at 5m and upon disembarking on the island the birds flew away. The gray heron showed highest sensitivity, while the great cormorant proved to be least disturbed.

Dredging works in tracts 9 and 10 will not be carried out during the breeding season and carrying out of dredging activities 100 m away from the island in the post-nesting period will guarantee that disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults will not occur. The species is observed in the port of the Danube dredging fleet of the town of Rousse, near the sorting plant at Marten and others. In the harbor of the dredging fleet of Rousse Cormorants seeking food come as close as 20 m to the vessels and dredgers working in the area behind the bucket chain, where invertebrates and fish rise to the surface water layer or perch on the highest parts of the dredge.

Implementation of the project does not provide for actions that would lead to disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, overall assessment of the impacts of dredging operations will be negligible.

**Pygmy cormorant** (*Phalacrocorax pygmeus*) – nesting, migratory and wintering species included in the Red Book of Bulgaria. They nest in wetlands with large reedbeds or floodplain forests. During the winter period, nearly 20% of the European population of the species gathers in our country. Roosting birds have been registered in areas overgrown with reeds and locations within major cities such as Plovdiv, Yambol and Burgas. Birds stay at the same places every night. In the town of Bourgas hundreds of roosting birds have been observed in the channel Vaya - Black Sea along Sportna Street and on trees along Todor Alexandrov Street near Mr. Bricolage. In Plovdiv the Pygmy Cormorant (Phalacrocorax pygmeus) winters in the vegetation in the western part of the river Maritsa and near Yambol in the overgrowth along the banks of the river Tunja.

The behavior of wintering birds in large cities makes it safe to asume that the intended mode of operation, work stoppage in tracts 9 and 10 during the breeding season and the border area of 100 meters from the Mishka Island will prevent banishing of individuals from their habitats, low breeding success and mortality among hatchlings and adults. The effect of implementation of the project can be assessed as negligible, as it will not lead to a change in the number of Pygmy Cormorants occupying Mishka Island and the wetlands on the Bulgarian and Romanian bank of the Danube.

**Grey heron** (*Ardea cinerea*) – It is a breeding, migrating and wintering species for Bulgaria. In winter, the number of species increased significantly, and in summer only separate wandering non-breeding individuals remain. It nests in colonies in trees near water but not always as separate individuals have been observed as well. The colony of nesting birds occupies a small area with high old trees in the northern part of Mishka-2. In previous years the colony consisted of 23 nesting pairs; however, in 2013 only 17 pairs were registered. After the breeding season and during migration and wanderings single specimens have been observed in the shallows south of Mishka Island, where they hunt.

***Fig. IV.4.2.-3: Nests of Ardea cinerea on Mishka Island***

Observations made in 2014 to establish the sensitivity of the species on the island revealed that with the cessation of dredging in Tract 9 and Tract 10 during the breeding period and dredging at a distance of 100 m during the post breeding season disturbance of nesting

pairs, low breeding success and mortality among adults and hatchlings will be avoided. In the post breeding season the species is not sensitive to human presence and can often be seen along Trakia highway in the rice fields near the towns of Plovdiv and Pazardzhik. In the summer people cruising on the river Ropotamo can see gray herons roosting on the shore. Change of bird position is reported only if birds are approached at a distance shorter than what they tolerate. Implementation of the project does not provide for actions that would lead to disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, overall assessment of the impacts of dredging operations will be negligible.

**Great egret (*Egretta alba*)** – nesting, migratory and wintering species included in the Red Book of Bulgaria. The only nesting ground in Bulgaria is Srebarna Lake with sporadic occurrences in the Lake Vaya and marshes along the river Danube. There are no nests on the territory adjacent to the dredging site. During migration and wintering it is common in micro-dams, marshes, swamps, canals etc., ponds, paddy fields, meadows and damp places along roads. Wintering great egrets are often seen along Trakia highway.

In appropriate habitats non-nesting individuals do not seem to become disturbed in human presence, only remain at a safe distance. In hatcheries and stocked reservoirs ***Egretta alba*** is difficult to expel even with the presence of guards. The closest nesting place is located at a distance greater than the range of impacts of the extraction site, consequently expelling of individuals from their habitats, low breeding success and mortality among hatchlings and adults is not expected. As the implementation of the project will not cause a drop in the number of species, disturbance during the nesting season, low breeding success and mortality among hatchlings and adults, the overall assessment of the impacts of implementation of the project will be classed as negligible.

**Little egret** (*Egretta garzetta*) – nesting and migratory species for Bulgaria. It always nests in mixed colonies of herons, glossy ibises, spoonbills and little cormorants. The nests are built in reedbeds or on willows and poplars (Mitchev, 2012). It feeds on small fish, frogs and tadpoles, aquatic insects and other aquatic animals. Colonies are distributed in groups along the Danube and other major rivers and wetlands in the Danube plain, Thracian Valley, the Black Sea coast and Sofia valley. Non-breeding birds can be seen in various water reservoirs around the country.

The nearest likely habitat of the species is on the Romanian coast, northeast of the dredging area. The same is to the north of the fairway (Danube Waterway), where noise emissions are common and breeding of the species does not seem to be affected by them.

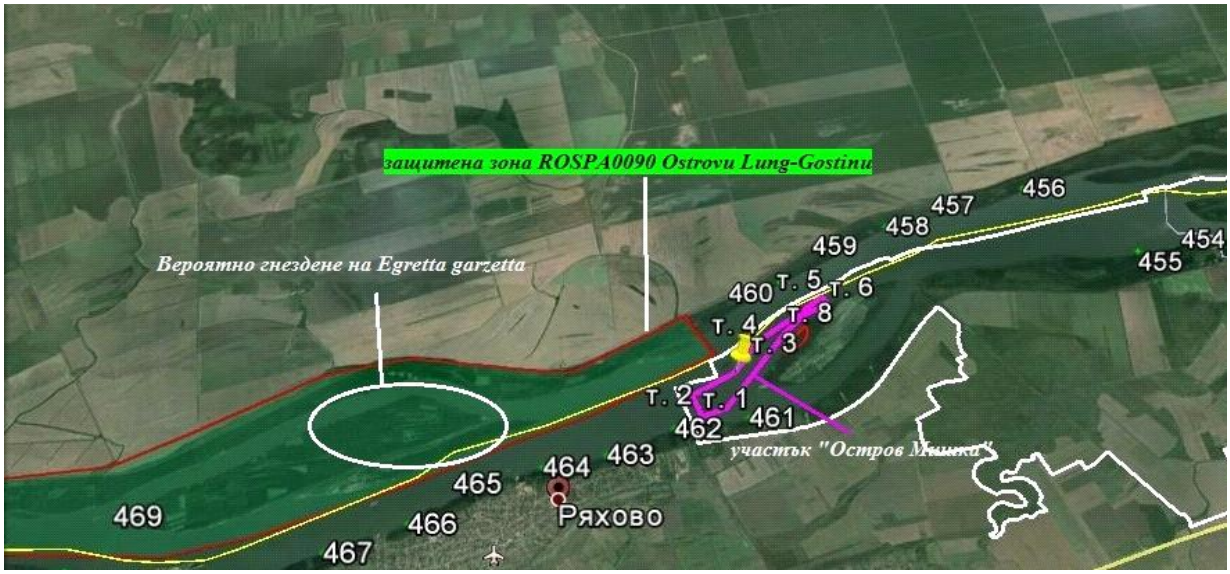



***Fig. IV.4.2.-4: Location of Mishka section compared to the closest place where little egret probably nests (Egretta garzetta).***

In their appropriate nesting habitats individuals do not exhibit signs of disturbance near human presence, only maintain a safe distance. In the Mandra dam have been found individuals feeding at about 50 m from buildings, under the weir and on both sides of the road passing on the dam wall (Valchanov unpublished.). In fishponds and stocked reservoirs it is difficult to expel these birds even with the presence of guards. The place where they probably nest is on the Romanian coast and at a distance greater than the range of impacts of the extraction site, consequently expelling of individuals from their habitats, low breeding success and mortality among hatchlings and adults is not expected. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible.

**Squacco heron *(Ardeola ralloides)*** – Nesting, migratory and passing for Bulgaria species. The number of the breeding population in the country ranges between 200 and 300 breeding pairs (Nankinov, 2004). By the middle of the 20$^{th}$ century the only known nesting sites were along the Danube and probably in Sofia region, but later ***Ardeola ralloides*** was found to breed on the Black Sea coast and in the valleys of the rivers Maritsa, Syutliyka and Tundzha. Known nesting grounds are found along the Danube (6 established locations), in the Danube Plain (4 established locations), in the Burgas lakes, around Plovdiv (3 established locations) and in a marsh east of Sofia. ***Ardeola ralloides*** only breeds in mixed colonies of herons, glossy ibises, spoonbills and little cormorants. The nests are located in reeds or willows and poplars. In 2011, three pairs bred in the mixed colony on Mishka Island while in 2012 - 2013 nesting of the species in the mixed colony on the island was not registered. At a distance of about 50 meters ***Ardeola ralloides*** shows no sensitivity to the effects of human presence and allows to be photographed.

***Fig. IV.4.2.-5:*** **Squacco heron in the Arkutino lake–** ***August 2013, photograph made by author***

Dredging works in tracts 9 and 10 will not be carried out during the breeding season and carrying out of dredging activities 100 m away from the island in the post-nesting period will guarantee that disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults will not occur. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible.

**Black-crowned Night-heron** ***(Nycticorax nycticorax)*** – Nesting, migratory, passing and rarely wintering species. The number of breeding population in Bulgaria is between 1800 and 2500 pairs (Yankov, 2007). It is a colonial species that nests with other species of herons, cormorants, glossy ibises and spoonbills in inaccessible reedbeds or willows and poplars. It feeds on small fish and large insects. It inhabits swamps, lakes, rivers, dams and reservoirs, and brackish ponds with trees along the banks. It spends the winters in Africa. It is included in the Red Book of Romania (Munteaunu, 2005). It probably nests on the Romanian coast to the north of Mishka Section.

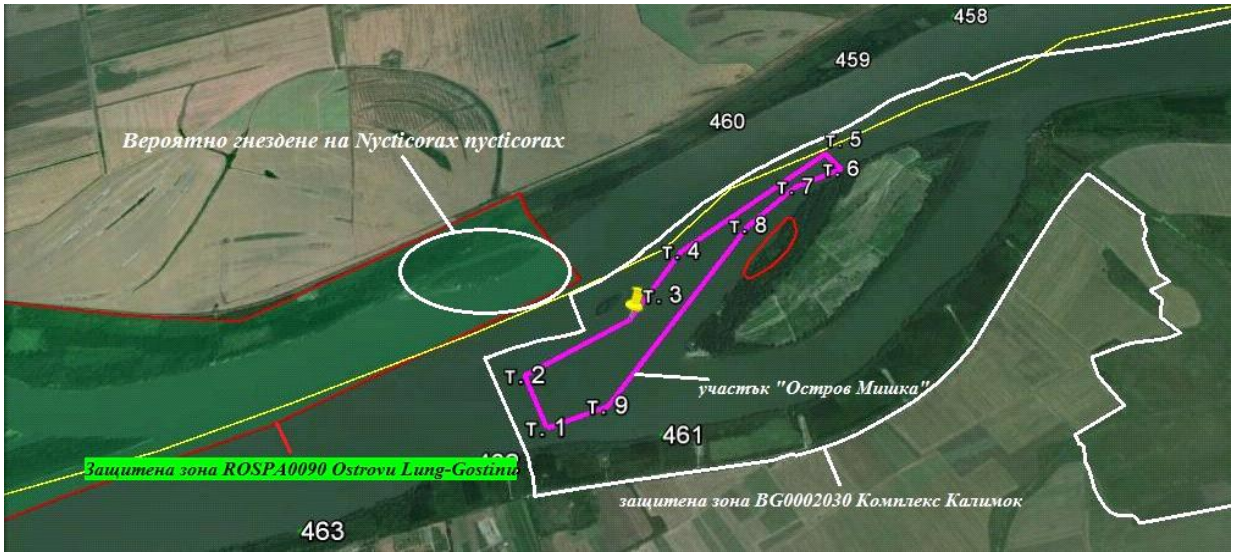



***Fig. IV.4.2.-6: Location of Mishka section compared to probable habitats of Black-crowned Night-heron (Nycticorax nycticorax)***

As probable nesting sites are located more than 500 meters away from the extraction site, disturbance of nesting pairs, low breeding success and mortality among adults and hatchlings due to implementation of the project is not expected. Suitable feeding grounds for this species are shallow sections where carrying out of dredging works is technically difficult and therefore avoided. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible.

**Purple heron (*Ardea purpurea*)** – Nesting and migratory species listed in the Red Book of Bulgaria. It nests in marshes and ponds along the Danube and Black Sea coast, in most places represented by 5 nesting pairs (Boev et al 2012). Its habitats are always in close proximity to open, vast reservoirs. It feeds mainly on fish, frogs, snakes, mice, insects, amphibians, eggs, remains of dead animals and others. It seeks food in bays and shallow open waters where it can walk freely. It winters in Africa and resides in Europe from April to September. It does not gather in large groups during migration, like other species. Threats to the species pose the drainage of wetlands, water pollution, poaching, disturbance during the breeding season. It has not been found to nest in areas adjacent to Mishka section. Suitable feeding grounds for this species are shallow sections where carrying out of dredging works is technically difficult and therefore avoided. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible.

**Little bittern (*Ixobrychus minutus*)** – Nesting and migratory species for Bulgaria with national population ranging from 1500 to 4500 nesting pairs (Jankov, 2007). It inhabits swamps overgrown with reed and cane riverbanks with shrubs and trees, flooded rivers and other water bodies. It nests on the ground along the banks between piles of dry reeds in the water or low shrubs. It feeds early in the morning or evening with small fish, frogs, tadpoles and water insects. It spends the winter in the Mediterranean and Africa. It inhabits places inaccessible to humans such as bogs, marshes and overgrown with vegetation coastal freshwater. It remain hidden during the day and is only active in the evening and night, consequently expelling of individuals from their habitats, low breeding success and mortality

among hatchlings and adults is not expected. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible..

**Great bittern *(Botaurus stellaris)* –** Migratory species for Bulgaria. It breeds in the Danubian Plain (Kalimok, fish ponds near the villages Mechka and Hadjidimitrovo, on the Black Sea coast (Durankulak, Shabla, Atanassovsko lake and Poda, Burgas), in some places in the Upper Thracian Plain and Western Bulgaria. Wintering birds are found in Aldomirovtsi marsh, lakes Vaya, Mandra, Shabla and Durankulak, near the village Bezden, Rupite (Petrich), Poda and Burgas Lakes. The number of the breeding population in Bulgaria is between 40 and 50 breeding pairs (Nankinov et al, 2004). Eighteen confirmed, seven plausible and thirteen suspected nesting sites have been established. ***Botaurus stellaris*** winters in the Mediterranean, only individual birds remain to winter here.

The nearest breeding site is more than 7 km away from the dredging area. It inhabits places inaccessible to humans such as bogs, marshes and overgrown with vegetation coastal freshwater. It remain hidden during the day and is only active in the evening and night, consequently expelling of individuals from their habitats, low breeding success and mortality among hatchlings and adults is not expected. Implementation of the project does not provide for actions that would lead to reduction in numbers, disturbance, displacement of breeding pairs, low breeding success and mortality among hatchlings and adults, therefore the overall assessment of the impacts of dredging operations will be negligible.

**Laridae family: *Larus melanocephalus, Larus minutus***, ***Larus ridibundus, Larus canus, Larus fuscus, Rissa tridactyla, Larus argentatus***, ***Larus cachinnans***. These are species that do not nest in the area and do not show sensitivity to vessels and human presence. The first two species do not nest in the country at all while the Caspian Gull (Larus cachinnans) is sinatropic species that nests in populated areas. Observations have revealed that the place where they gather in large groups is the shallow spot southeast of Mishka Island. They are usually attracted by dredging devices and congregate in the area where operating dredger buckets raise bottom invertebrates and small fish to the water surface. They often rest on dredgers and vessels. For those bird impacts from the implementation project will be insignificant.

**Sternidae family: *Sterna hirundo, Gelochelidon nilotica, Chlidonias niger, Chlidonias hybridus, Sterna albifrons, Chlidonias leucopterus.*** These species are threatened by drainage and degradation of wetlands, building on the banks of reservoirs, fluctuations in water levels, destruction of nests and the young by wandering dogs, disturbance during the breeding season. Their behavior is similar to that of observed gulls and indicates that this species is not sensitive to dredging operations. They gather in large groups in the shallow spot southeast of Mishka Island together with gulls. They are also attracted by dredging devices and congregate in the area where operating dredger buckets raise bottom invertebrates and small fish to the water surface. They often rest on dredgers and vessels. For those bird impacts from the implementation project will be insignificant.

***Charadriinae*** – Members of the ***Charadriinae*** family inhabit the coastline and shallow areas near the shore, where the soil is still wet. Extraction of sand and gravel from alluvial sediments will take place about 100 meters from Mishka Island, 200 m off the Bulgarian coast and 310 meters to 836 meters from the Romanian coast. Vessels and people at such a distance are not perceived as a threat by Members of the ***Charadriinae*** family and the effects of the implementation of the project on them will be insignificant.

**Since dredging activities will not lead to the drying out and degradation of wetlands, building on the banks of reservoirs, fluctuations in water levels, destruction of nests and young, anxiety and displacement of birds, the overall assessment of the expected impacts of dredging activities on birds will be negligible.**

**Reptiles**

There are three protected species of reptiles in the area: Blotched snake (*Elaphe sauromates*), European pond turtle (*Emis orbicularis*) and Spur-thighed tortoise (*Testudo graeca ibera*). The first species has not been registered in the region over the past six years. Existence of the second species only has been confirmed. This species is found mainly in the strip along the Danube and in places with standing water or areas with low-flow. Occurrence within the dredging area would be only temporary and accidental, therefore negative impacts on the species are not expected.

**Amphibians**

Implementation of the project is not connected with the discharge of untreated sewage, pollution or drainage of swampland that could damage the habitats of representatives of amphibians. Impact of implementation of the project on this group of organisms is not expected.

**Ichtyofauna**

Most of the potential direct impacts will mainly occur locally within the worksite of the dredge. Fish have primitive nervous system. Behavioral responses such as anxiety and displacement are exhibited only by mammals and birds, while the responses of lower classes of vertebrates obey reflexes. Observations made during dredging in Lake Vaya and dam Mandra show that rising sediments increase the amount of detritus and benthic organisms that attract fish.

Most of the potential direct impacts will mainly occur locally within the worksite of the dredge. Expected ichtyofauna impacts are associated with damage to bottom habitats in the Danube basin within the extraction site. The distribution of species in catches indicates that the most widespread species are of the Ciprinidae family, which spawn in the shallow sections of the river. Impact on these species is not expected.

Extraction of bottom sediments may primarily affect the habitats of demersal species inhabiting the river bed, such as loach, white-finned gudgeon, the two species of ruffe and several species of gobies. The results of hydro-biological research into the composition and quantity of zoobenthos in the future extraction area show that in terms of species composition it is extremely poor and can serve as a nutritional basis for a limited number of fish. Four of the species seeking food there are *Neogobius fluviatilis, Neogobius melanostomus, Neogobius(Ponticola) kessleri* and *Neogobius (Babka) gymnotrachelus* have demonstrated invaseive behavior in recent years. They have already reached Serbia, the Austrian section of the river and the Baltic basin and as a result have been included in the list of invasive species..

Sand and gravel deposits dominating the extraction area make it undesirable as breeding ground for Acipenseridae. Dredging operations have been carried out in the Danube for the last 40 years, but the beginning of the century showed an increasing number of Sterlet in catches (Zhivkov et al. 2001), giving rise to claims that implementation of the project would not create negative impact leading to a reduction in the population of Sterlet in the Danube. On the contrary, the deepening rocky bottom would rather have a beneficial impact on Acipenseridae as it leads to an increase in the number and size of locations suitable for spawning grounds. After extraction of the dynamic reserves of alluvial deposits in one section

the dredger will move to the next; however, deposits in the depleted section will begin forming again with the first high water. Benthic organisms, some of which are invasive species, have a short life cycle and high reproduction capacity, so the food base of the ichthyofauna in the river will be restored quickly.

The process of extraction is not connected with discharge of untreated sewage and turbidity will be limited within the scope of operation of the dredger. The concentration of suspended particles in the water will be comparable to that during high flow or after precipitation. It does not have any effect on fish as they are adapted for life in the aquatic environment. Considering the foregoing, the expected effects on the ichthyofauna can be assessed as negligible. No change is expected in the number of species inhabiting the river or the amount of catches in the bed of the Danube.

**Zoobenthos**

Extraction works in Mishka section will affect only a limited stretch of the Danube, in which the number of represented zoobenthos taxa is limited.

The scuba descent and study of the bottom section made it possible to assume with a high degree of certainty that the high flow rate (except substrate) is the main factor limiting the development of a stable bottom community. It was established that the high speed of water flow in the demersal zone (about 50 cm high) is creating turbulent eddies that draw fine particles of sand and suspended solids in the water column and justifying dynamic instability of the bottom substrate. The constant movement of sand and sediment influence the psammophile Corbicula fluminea as well by constantly burying individuals. This claim is supported by samples collected with the help of diving equipment, which show that the number of species is very low – 3-5 specimens per square meter. The station located in the village of Ryahovo is characterized by a much greater density of bottom communities. Here between 678 ind. / m2 (August) and 87 ind. / m2 (September) of macrozoobenthos organisms were found. Two of the species found in the area are invasive ones: Corbicula fluminea and Dikerogammarus villosus.

Implementation of the project envisages removal of the surface layer of bottom sediments, and together with it the existing Zoobenthos dominated mainly by invasive and widespread species. The probability of representatives of Danubian ichthyofauna feeding on bottom dwelling invertebrates within the area of the investment proposal is very low. Species composition and quantitative parameters of the benthic fauna show that only some molluscivores such as Neogobius melanostomus can use the benthos (mainly C. fluminea) for food. It can be assumed that this species of fish is not actively using benthic fauna for food, and probably does not occur permanently in the area due to lack of suitable habitats (mostly rocky bottom), and the lack of smaller, immature individuals of mussels that are preferred food. The underwater study revealed that fish habitats are practically non-existent because there are no large stones, the bottom relief does not offer places for hiding, there are no roots, or higher aquatic vegetation.

Implementation of the investment proposal (extraction of inert materials from the bottom of the Danube) will not lead to significant adverse effects on benthic fauna or species feeding on it due to the fact that this community is extremely deformed and depressed by unfavorable natural conditions in the area of the future extraction site. The assumption that most of the species found during the survey had not developed in this area, but had accidentally appeared there and developed to the extent possible in these conditions makes it safe to assume that invertebrate fauna would recover quickly after termination of extraction works via the occurrence of new fish species from the upper river sections.

***Zooplankton***

Implementation of the project will have only a negligible effect on the zooplankton in the extraction area. Both quantitative and qualitative zooplankton composition will continue to be determined by the seasonal dynamics, the concentration of substances dissolved in the water, flow velocity and the amount of phytoplankton. At river flow velocity of 6 km/h the amount of biomass of plankton in the water depends mainly on the quantities that come with water inflow from the upper stretches of the river and its tributaries.

Implementation of the investment proposal for the development of the field of dynamic river sediments in Mishka section of the Danube is expected to have the following impacts on biodiversity:

**Territorial scope of impact:** Local within the territory of the extraction site.

**Degree of impact:** negligible subject to compliance with the technological requirements for dredging from the river Danube. Affected demersal communities are of very poor qualitative and quantitative composition, therefore the affected territory does not represent a favorable habitat and food base for river fish species.

There will be no impact on protected natural habitats as there are none within the project area.

**Duration of impact:** Period of operation.

**Cumulative and synergistic effects on the environment:** Not expected.

## 5. Protected Territories and Zones

### 5.1. Protected territories

Implementation of the project will not come in conflict with the Order declaring "Kalimok Brashlen" a protected area or the approved management plan of the latter. All activities related to the extraction of sand and gravel from alluvial deposits from the bed of the Danube River (from km 462.0 to km 459.4) and processing of raw materials will be made outside of protected areas under the PAA. Any negative effects caused by operation of the dredger and the loading of barges will be short-ranged and limited within the operational area of the exploited section. Engine power required for operation of machinery and extraction of inert materials from the bottom (500 kW) and for powering of self-propelled barges (820 hp) is much lower than that of pusher boats of Bulgarian River Shipping AD with engine power ranging from 1740 hp to 3150 hp. In view of the above it could be argued that the expected impact of the operation of the dredger and self-propelled barges will be much lower in intensity than that of ship traffic in the fairway of the Danube. Implementation of the project is compatible with the goals set in the "Kalimok Brashlen" Management Plan, namely improvement of the standard of living of local population without damaging the environment.

***Impacts on protected areas designated under the Law on Environmental Protection of the Republic of Romania (****LEGE nr.137 din 29 decembrie 1995).*

**Parcul Natural Comana** – Southern borders of the park are more than 9 km away from the planned extraction area and impacts associated with violation of the regime of conservation and damage to the object of protection are not expected. Changes in the hydrological regime, leading to damage to NATURA 2000 areas (SPA, SCI), wetlands, Ramsar sites or nature reserves located within the park depend solely on the construction of hydraulic structures impeding the flow of water from the Danube toward the protected areas during high water, and facilitating runoff during summer droughts.

**Pădurea Oloaga–Grădinari Scientific Reserve:** the reserve will remain unaffected by dredging operations. Habitats of butcher's broom (Ruscus aculeatus) and natural deciduous forests with ash, sycamore and oak will remain unaffected.

**Pădurea Padina Tătarului Scientific Reserve:** all impacts of extraction will be undetectable within the Reserve, the natural habitat of *Paeonia peregrina var. romanica* will remain unaffected. All operations related to the extraction of sand and gravel will be carried out in the south of the state border with the Republic of Romania, without disturbing the regime of protection of the above-mentioned protected areas and in compliance with Ordinance No 236/24.11.2000 on the regime of protected natural areas, conservation of natural habitats and wild fauna and flora ORDONANTA DE URGENTA Nr. 236 din 24 noiembrie 2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei si faunei salbatice, PUBLICAT IN: MONITORUL OFICIAL NR. 625 din 4 decembrie 2000) and Law No 462/ 8.07. 2001 for the implementation of Ordinance No 236 / 24.11.2000 of the Government on the regime of protected natural areas, conservation of natural habitats and wild fauna and flora ( LEGE Nr. 462 din 18 iulie 2001 pentru aprobarea Ordonantei de urgenta a Guvernului nr. 236/2000 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei si faunei salbatice, PUBLICAT IN: MONITORUL OFICIAL NR. 433 din 2 august 2001).

### 5.2. Natura 2000 sites

Implementation of the project will not cause negative impacts on protected areas of the Natura 2000 network due to the remoteness of the extraction section from the key elements important for biodiversity in the protected zone "Kalimok Brushlen" BG 0000377, ROSCI0088 Gura Vedei - Șaica -Slobozia for conservation of natural habitats and of wild flora and fauna and protected areas "Complex Kalimok" BG0002030 and ROSPA0090 Ostrovu Lung-Gostinu under the Directive on the Conservation of Wild Birds. Dredging will be carried out in a section of the Danube away from breeding sites, concealment sites and habitats of species subject to conservation in Natura 2000 sites. The fairway (Waterway) of the Danube River passes along the section. Many different sized barge convoys belonging to shipping companies of all Danube countries use the fairway. Notwithstanding the heavy traffic significant negative impacts on species subject to protection in these areas have not been confirmed. All impacts associated with the implementation and operation of the Project will occur within the concession area and the emergence of negative impacts on the subject of conservation in protected areas will not be allowed.

## 6. Landscape

### 6.1. Analysis and evaluation of pollutants

The expected impact of pollutants on the landscape during the process of extraction of inert materials - sand and gravel from alluvial sediments from the bed of the Danube can be divided into two phases:

- **Site exploitation** – technological process involves extraction, transportation, handling and storage; this is accompanied by seizure, loading, transportation, unloading and storage of alluvial deposits, availability of equipment, vehicles and manpower / noise, turbid water around the pump for dewatering of sediment and minor amounts of waste /; changes in the landscape will be related to structural anomalies – changes in the bottom profile, which will have an impact on the ichthyofauna and dynamics of water flow; most perceptive will be the changes in visual perception of the landscape in the area of the IP / presence of machines, vehicles, etc. /; there will be disturbances in the

habitats of waterfowl. On Mishka Island is found one of the largest mixed breeding colonies of great cormorants, Spoonbill, gray heron, night heron and Little Egret

The duration of impact will be limited only to the term of operation.

All operations related to the extraction of inert materials will be carried out within the concession area. They will end after the planned utilization of the reserves. In the process of operation will be used a total number of 32 buckets, three barges, one crane and the required number of tippers for transportation of the alluvial materials to the crushing washing and sorting plant. The wharf and the plot where the crushing and sort plant is located are the property of the Assignor. They are established in the Eastern Industrial Zone of Rousse. Barges will be unloaded on the first site, while crushing, washing, screening and sorting of boulders will take place on the second site. The main warehouse and the concrete plant will be on the second site. They are not the subject of this investment proposal.

Subject to all production, technology and work rules, a significant impact on the landscape of adjoining and adjacent areas and estates is not expected.

The process of operation of the site is linked to a periodic change in the existing visuality / dominant - up to about 2 km; relative - to 5 km and only visible on a clear day - up to 10 km /. Studies conducted in the area showed that the perception of the visual changes to the landscape of the site for extraction of inert materials is limited to 3.5-4 km. These changes can be seen from the following vantage points:

- From Port Ryahovo - from the dock or aboard a moored vessel;
- From vessels / tourist vessels, cargo ships and Border Police patrols / sailing along the fairway to the north of the concession area along the left armlet of the river;
- From vessels / boats with fishing authorization only because of low water / sailing south of the concession area along the right armlet of the river.

This limitation is due to the peculiar nature of the landscape in this part of the river - flat terrain, with low vertical and horizontal segmentation, overgrown with dense vegetation shores / Romanian and Bulgarian / and uninhabited islands. This typical riparian vegetation is lush, rugged and limits the visual perception of dredging operations. While the process of extraction and loading of alluvium will be visible most notably when sailing along the left armlet of the river, transportation of alluvium by barges will cause discomfort to passengers on tourist vessels.

- **After permanent termination of dredging operations**– after permanent termination of extraction of inert materials - sand and gravel from the dynamic resources of the Danube the impact on the landscape will be expressed by durable destructive changes.

Destroyed territories will be gradually restored to blend with the surroundings, following the sequence of the different stages of development of the individual sections.

Changes in the landscape will be related to changes in the profile of the riverbed and the sediment and terrestrial layer, changes in river flora and fauna, changes in visual perception. The end result of permanent termination of dredging operations would be to allow restoration of the aesthetic and economic functions of the destroyed areas.

The restoration period depends on the self-restorative capabilities of the landscape and the natural and human factors which may influence it.

### 6.2. Estimate of the impact on the landscape

The section of the river where the project for extraction of inert materials from the dynamic reserves of the Danube will be implemented is an aquatory near the Bulgarian Mishka Island (1 and 2) and the newly formed island "Mishka-3". The closest settlements Oryahovo and Babovo are 1.0 and 2.0 km away from the site respectively. Operations planned by the Assignor will cause anthropogenic changes, which include changes in the characteristics of the river bed and biodiversity. Changes in morphology (varying depth) of the river will lead to changes in the demersal profile, which will have an impact on biological elements and dynamics of water flow not only in the place of extraction, but also upstream and downstream. The layers below the sediments will suffer mechanical impact. Extracted inert material will be transported by water transport.

Implementation of the investment proposal for the extraction of aggregates in the area of interest will cause destructive changes in the landscape. Visual changes will occur in the vertical and horizontal structure. As a result of the planned anthropogenic impact the profile of the riverbed in the exploited area and the adjacent riparian lands will change.

***Estimates of the impact of future extraction of inert materials on the landscape is the following:***

1) As a result of planned works of the Contracting Authority the function of landscape will change significantly - from an area of natural water flow to an area for the production of raw material for aggregates.
2) There will be changes in the visual perception of the territory, both in spatial respect and aesthetically. The river area is outside the boundaries of settlements and away from main roads. The visual impact of the work in the field of extraction of sand and gravel is not expected to cause a negative feeling for strong anthropogenic interference in the territory.
3) These changes in visual perception of the territory will remain over 10 years until termination of extraction works.

### 6.3. Assessment of expected landscape changes caused by implementation of the project

The possible impact on the landscape can be assessed as follows:

- **by type -** the type of impact on the landscape will be direct; the proposed utilization of the area provides a change of landscape structure on an area of 0.433 sq. km;
- **by territorial scope** - the scope of the impact on the landscape will be limited to the territory of the concession area**;**
- **by reversability –** the effect is irreversible;
- **by degree of complexity -** the complexity of this type of impact will be high because of the possibility of destruction of some of the key elements of the landscape in the extraction of inert materials;
- **duration of impact –** effects will last until the exhaustion of the estimated reserves of sand and gravel; the term of operation is specified in the concession contract; this will be a period of not less than ten years;
- **by frequency -** repeatedly and in stages depending on the exploitation of each tract;

- **cumulative effect –** not expected during operation of the facility; the closest object for extraction of inert materials is located 2 km SW of the investment proposal;

- **value and vulnerability of space -** a change in spatial visual perception of the object in operation, on the background of the existing landscape in the region;

- **impact on spaces and landscapes which have a recognized national or international protection status –** not expected.

Subject to the measures in the report, the IP for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region can be implemented as it is estimated that it will have no significant effects on the landscape of the area of interest.

## 7. Cultural and Historical Heritage

The Danube river valley is a modern steady erosion and accumulation system. There may be sites of archaeological interest within Mishka section. Therefore in the event of discovery of objects having characteristic of movable cultural property, it is necessary to comply strictly with the requirements of Art. 93 (1) and 93 (2) of the Law on Cultural Heritage.

## 8. Waste

Waste is a problem that threatens the environment and poses a risk to human health if managed contrary to legal requirements.

The municipality is developing for approval Municipal Program for Waste Management, which sets strategic objectives for the implementation of anticipated investment projects with the following main objectives:

- Reduction of the harmful effects of waste by preventing their formation and promoting their reuse;
- Increased quantity of recycled and utilized waste and reduction and prevention of waste-related risks; Environmentally sound waste disposal;
- Waste management, which ensures a clean and safe environment by implementation of sub-program for information security, preservation and improvement of the administrative capacity of municipal waste management;
- Making the public a key factor in applying the hierarchy of waste management by sub-program for implementation of awareness campaigns and public information on waste management;
- Provision of sufficient and reliable data on waste.

As the WMA requires municipal program for waste management to be developed in accordance with the structure, objectives and provisions of the National Plan for Waste Management, it defines the framework for the scope and content of the programs for municipal waste management. In this context, the Waste Management Act contains specific requirements for NPWM content, which must include:

1. analysis of the condition and prognosis for the type, quantity and source of waste generated in the country, as well as waste likely to be the subject of cross-border transport from or to the national territory;

2. existing waste collection plans and basic installations and facilities for disposal and reuse of waste, including special arrangements for waste oils, hazardous waste or waste streams for which requirements are regulated by this law and regulations for its implementation;
3. evaluation of the need for new collection plans, closure of existing waste processing plants and facilities, additional infrastructure for installations and waste facilities, as well as the investments related thereto;
4. information on the criteria used to determine the location and capacity of key installations and facilities for disposal or recovery of waste which are subject to development;
5. common policies for waste management, including planned technologies and methods for waste management, and specific policies for selected waste classes that require special management;
6. measures to promote the re-use of products and preparation for re-use, in particular by encouraging the establishment of networks for re-use and repair and support for them, the use of economic instruments, procurement criteria, quantitative objectives or other actions;
7. measures to promote high quality recycling by introducing separate collections of waste where technically, environmentally and economically practicable and appropriate in order to guarantee the necessary quality standards for the relevant recycling sectors;
8. organizational aspects related to waste management including a description of the allocation of responsibilities between the central and local executive bodies, natural and legal persons who carry out waste management;
9. evaluation of the usefulness and appropriateness of application of economic and other tools to solve different problems related to waste by taking into account the need to maintain smooth functioning of the market;
10. measures to encourage separate collection of waste for composting and anaerobic digestion and treatment of bio-waste in a way that ensures high degree of environmental protection, including measures to gradually reduce the amount of landfilled biodegradable waste;
11. measures for the promotion of options for waste management, which provide the most favorable environmental results and observe the hierarchy of waste management referred to in WMA;
12. The use of environmentally safe materials produced from bio-waste;
13. separate chapter on the management of packaging and packaging waste, including measures for prevention and reuse;
14. national strategy for limiting the quantities of biodegradable waste disposed of in landfills;
15. information about historically contaminated sites for waste disposal and measures for their rehabilitation;
16. measures for the implementation of awareness campaigns and information provision directed at the general public or specific groups of users;
17. objectives, milestones and deadlines for achieving them;
18. Evaluation of the funds required for implementation of the plan;

19. Coordination with other plans and programs pertaining to business;
20. accounting and implementation control system;
21. results evaluation and plan update system.

The main indicator in defining the quantity of solid waste is the rate of accumulation, showing the amount of waste generated from the established unit for a certain period of time.

In view of the planned number of workers on site - 41, the amount of mixed municipal waste, which is expected to be formed per year is between 3.7 tons and 4 tons.

On-site, outside the stocks area will be prepared a special platform with shelter and bund for placing of a metal container type "Meva" or another type of small specialized container for temporary storage of household waste.

Waste containers will be approved by the municipality and the local waste collection company. The latter will also be engaged in a contract for collection and transportation of household waste.

If there is a system for separate waste collection in the municipality, a special container for storage of recyclable packaging waste will be provided.

***Waste generated during extraction of alluvial deposits from the river***

Prior to reconstructing the wharf, the investor should provide the necessary warehouses and containers required for waste management under the Waste Management Act (SG 53 of 13.07.2012, in force as of 13.07.2012, amend. SG 66 от 26.07.2013, in force as of 26.07.2013; amend. By Resolution No 11 of 10.07.2014 г. of CC of RB - SG 61 of 25.07.2014), and to enter into contracts for transport, utilization or disposal of waste with entities entitled to carry out such activities in accordance with Article 35.

***Waste that is expected to be generated during preparation and operation of the wharf.***

Different types of construction waste will be generated during the demolition of existing facilities on the wharf and its preparation for unloading of extracted alluvial materials from barges and for temporary storage of about 17 000 tons of alluvial deposit.

These wastes will be generated once during the reconstruction, which will continue for a maximum period of 6 months.

Construction waste will be handled by a company specialized in activities as per Article 35 and possessing thr required permit.

Construction waste will be sent for further treatment on the basis of a contract concluded with companies that have the necessary documents under Art. 35 of the WMA.

Expected quantity is about 1000 t.

The extraction of alluvial deposits from the river will not be associated with the generation of technological waste.

In the process of extraction, the whole quantity of sand and gravel will be loaded on barges and transported to landing site property of the investor.

*Estimated quantities of expected waste with codes and names according to Ordinance No 2 of 23.07.2014 on the classification of wastes / SG. 66 of 8.08.2014/*

.***Table IV.8.-1: Non-Hazardous Waste***

| Code | Name | Waste generation activity | Total estimated amount in tons |
|---|---|---|---|
| 16 02 14 | discarded equipment other than that classified as 16 02 09 to 16 02 13 | replacement of switchboards on site | 0,2 |
| 17 01 07 | mixtures of concrete, bricks, tiles, porcelain and ceramics other than those classified under 17 01 06 | demolition of existing buildings on the wharf | 1000 |
| 17 02 01 | wood | Clearing the wharf | 0.1 |
| 17 02 02 | glass | Clearing the wharf and preparation for unloading of extracted alluvial deposits | 0.1 |
| 17 02 03 | plastic | | 0.3 |
| 17 04 05 | Iron and steel | | 20.0 |
| 17 04 11 | cables other than those classified under 17 04 10; | | 0.1 |
| 20 03 01 | mixed municipal waste | Personnel hired to clean the wharf | Depending on the number of people engaged in construction works |
| **Packaging waste** | | | |
| 15 01 01 | paper and cardboard packaging | supply of materials and equipment, and staff | 0.2 |
| 15 01 02 | plastic packaging | | 0.1 |
| 15 01 03 | Containers made of wood materials | | 0.5 |
| 15 01 04 | Metal packaging | | 0.5 |
| 15 01 05 | Composite / multilayer packaging | | 0.1 |
| 15 01 06 | mixed packaging | | 0.5 |
| 15 01 07 | glass packaging | | 0.05 |

Metal waste, such as shaped iron, construction iron and others that will be generated during the demolition of buildings, and preparation of the wharf for unloading activities are expected to reach around 20 t. Waste will be collected and temporarily stored in a designated area / assigned and marked with the code and the name of the waste / until being handed over for processing to entities possessing documents pursuant to Art. 35 of the WMA**.**

Municipal solid waste will be generated during clearing of the site and during exploitation of the facilities subject to the investment proposal.

Mixed waste from the dredger and barges will be stored on board of the vessels until its transportation to shore.

Quantities will be insignificant and will be stored in containers on a specially designated area which meets the minimum technical requirements for temporary storage of hazardous and non-hazardous industrial and municipal waste.

Generated waste will be transported to a depot specified by Rousse Municipality. The expected amount of solid waste to be generated is about 3.7 t per year.

Reconstruction and operation of the existing river port is expected to generate the following hazardous waste (*Table IV.8.-2*):

***Table IV.8.-2: Hazardous Waste***

| ***Code*** | ***Name*** | ***Waste generating activity*** | ***Total estimated amount in tons per year*** |
|---|---|---|---|
| 13 02 05* | Non-chlorinated mineral-based engine, lubricating and gear oils | accidental spills occurring during machine operation | 0,1 |
| 13 07 01 | waste diesel fuel | accidental spills occurring during machine operation | 0,1 |
| 13 08 99 | oil wastes not otherwise specified | accidental spills occurring during machine operation | 0,1 |
| 15 01 10* | packaging containing residues of hazardous substances or contaminated by dangerous substances | from the supply of paint, oil, antifreeze, etc. | 0,2 |
| 15 02 02* | absorbents, filtering materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances | emergency repairs on site and staff | 0,1 |
| 16 06 01 * | Discarded accumulator batteries | Extraction site | 0,1 |

| | | | |
|---|---|---|---|
| 16 06 02 * | Ni-Cd batteries | Extraction site | 0,1 |
| 20 0136* | discarded electrical and electronic equipment other than that classified as 20 01 21 and 20 01 23 and 20 01 35 | external lighting on site | 0,2 |
| 20 01 21* | fluorescent lamps and mercury-containing lamps | lighting on site | 0,1 |

The amount of generated hazardous waste will be insignificant, given the relatively small volume of construction work and the small number of machines and construction workers.

Hazardous waste generated on the premises will be collected in place of their formation, stored in steel drums and promptly transported to the site for temporary storage of hazardous waste on the premises of the wharf. The site for temporary storage of hazardous waste is to meet the requirements of the relevant regulations.

Waste stored on the site for temporary storage of hazardous waste will be handed over to companies licensed for such business activities under Article 35 WMA Transportation of hazardous waste will be carried out by specialized transport meeting the requirements of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

Packages of hazardous waste must be accompanied by identification documents in accordance with the requirements of the Waste Management Act.

Other waste will be disposed of following the terms of disposal of other hazardous waste .

Waste-related problems are not expected to occur on the sites subject to the investment proposal.

Estimated quantities of waste that will be generated during reconstruction of the existing port and operation of the facilities are negligible, and therefore cannot have any significant impact on the environmental components.

Since activities will be carried out in the bed of the river, there is no immediate danger from direct contamination of these components on the extraction sites. Given the small number of machines and equipment for the extraction of aggregates concentrated in certain sections of the river, such contamination would be limited, insignificant and short-term.

Likelihood of contamination of surface water exists in the event of disruption in the normal operating mode of the plant and equipment for the extraction of aggregates or natural disasters and emergency situations.

## 9. Hazardous Substances

According to the Protection against Harmful Effects of Chemical Substances Preparations and Products Act (SG 10 of 4.02.2000, last amend. and suppl. SG 61 of 25.07.2014), chemical substances and preparations are classified as hazardous if they provenly possess at least one of the following properties:

***Table № IV.9.1.-1: Properties of chemical substances and mixtures that define them as hazardous within the category of their classification***

| | |
|---|---|
| 1. Explosive | 8. Harmful |

| | |
|---|---|
| 2. Oxidizing | 9. Corrosive |
| 3. Extremely flammable | 10. Irritant |
| 4. Highly flammable | 11. Sensitizing |
| 5 flammable | 12. Carcinogenic |
| 6. Highly toxic | 13. Toxic to reproduction |
| 7. toxic | 14. Mutagenic |
| | 15. Dangerous for the environment * |

The investor as employer is to comply with the requirements of health and environmental legislation and provide all required conditions for safe operation of their staff.

Demolition of existing wharf buildings and facilities requires use of construction machinery and equipment that may need to be serviced from time to time. There are a number of recommendations for the sites where such servicing takes place relating to the storage of oils, fuels and other hazardous substances.

It is recommended construction machinery to be fueled with diesel fuel that meets the requirements of Ordinance on the Quality of Liquid Fuels, terms and manner of their control, effective from 01.10.2003, adopted with Decree No 156 of 15.07.2003 (Prom. SG. 66 of 25 July 2003).

***Table № IV.9.1.-2: Toxicological characteristics of the most commonly used hazardous substances***

| **Chemical substance or preparation** | **Adverse health effects** | **Risk exposure** |
|---|---|---|
| Diesel fuel | Harmful if inhaled. Irritating to the skin. Limited evidence of a carcinogenic effect. Harmful: may cause lung damage if swallowed. Occupational exposure to the substance or mixture may cause adverse health effects. Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment. Inhalation of high concentrations of vapors may cause dizziness, drowsiness, headache, nausea and loss of coordination. Prolonged inhalation can lead to loss of consciousness. Prolonged or repeated contact may cause redness, itching, irritation, eczema / cracking and oil akne.Product ingredients can penetrate into the body through the skin. May cause liver damage. Suspected risk of cancer. Drops aspirated into the lungs through ingestion or vomiting may cause serious chemical pneumonia. | Development of chronic diseases if safety regulations are not complied with. |
| Cement | Irritant to skin, eyes and respiratory tract. Allergen. Contains contaminants (Cr-VI, Cd, Co, Ni) and is controlled by Government Decree 156/2004). Causes inflammation and allergic reactions of skin and mucosae. | Development of chronic diseases if safety regulations are not complied with. |
| Paints, varnishes, | Damage to the nervous system, liver, endocrine system, respiratory system, skin and mucous membranes. Allergic diseases. | Development of chronic diseases if |

| | | |
|---|---|---|
| adhesives, polymers | | safety regulations are not complied with. |

Demolition works may cause spills of oil, insoluble substances or other mechanical impurities, which will fall directly on the site. The sewerage system of the site should be revised and brought into working order before the start of demolition works to prevent possible pollution of the Danube River near the wharf.

Engines of machinery and equipment for the extraction of aggregates from the river are a source of contamination by hazardous substances.

Minimum fuel reserves stored on the extraction sites are to comply with the requirements for occupational safety and protection of river waters and aquatic organisms.

Hazardous substances and mixtures are not expected to have any adverse effect on the populations of closely located settlements, either during reconstruction of the existing port or during operation of the sites object of the investment proposal.

**10. Noise. Harmful physical factors**

**Noise pollution**

Object and purpose of the project is the extraction of sand and gravel (alluvial deposits) from the bed of the Danube. According to the notification submitted to the MEW the extracted sand and gravel will be used as raw material in the production of aggregates by „GRAVEL AND SAND PITS - BULGARIA" EAD. Extraction of alluvial materials (sand and gravel) from the Danube River will be done by using floating multi-bucket dredger, after which the material will be transferred to a drying sieve and via a rubber conveyor belt to self-propelled barges for transportation to the wharf. Material will be unloaded on the wharf by a 15-ton grabbing jib crane.

Implementation of the investment proposal of Gravel and Sand Pits Bulgaria EAD will generate noise emissions resulting from operating machinery (dredger and self-propelled barge). Extraction works will be carried out from east to west (upstream). Extraction sections will be divided into separate tracts, i.e. the dredger will continuously change its position. Thus the source of noise pollution will move away from the closest protected area – Mishka Island. Extracted sediments will be loaded on self-propelled barges and transported to the wharf. According to the investment plan three barges will be used to transport material, with each barge making one course per day or a total of 3 courses per day will be made in a 12- hour working day. Therefore, noise generated during transportation will subside shortly. Moreover, extraction activities are seasonal.

The nearest site subject to protection against extraction works impact is the Mishka Island. According to layouts of sections for extraction of alluvial deposits with floating devices prepared by the Executive Agency for Exploration and Maintenance of the Danube the permitted extraction area will be situated at a minimum distance of 100 m from the north shore of the Mishka Island and a maximum distance of 250 m.

The dredger will be positioned on the extraction site with the help of a self-propelled barge that will tow the dredger to the required location. This operation will take place twice a year: at the start of extraction works and at the end of the season in order to put away the dredger for the winter.

All these activities will generate noise emissions in their surroundings and the environment. In order to assess these emissions the investor has conducted their own measurements of the acoustic load of similar sources in the month of August 2013. The measured noise level emitted from a floating bucket dredge from 86.5 dB(A) will be reduced by about 50dB(A) at a distance of 100 m according to Annex No 3 item 4 to Art. 6 of Ordinance No 6/2006 of the Ministry of Health and the Ministry of Environment and Waters. This means that at the shore of the Mishka Island the noise level will be 36,5 dB (A). This level is below the limit of 40 dB (A) specified by Ordinance No 6/2006 of the Ministry of Health and the Ministry of Environment and Waters for quiet zones outside agglomerations (although Mishka Island is located in a water transportation corridor with heavy traffic at times and should not be classified as a quiet area outside agglomerations. Dredged material will be carried from the bucket dredger to the wharf at the Eastern Industrial Zone of Rousse by a barge according to the investment proposal. The noise emission of a similar barge that sets off fully loaded from the dredger is 79.5 dB (A). At a distance of 100 to 110 m (10 m is the width of the dredger) the noise level that will reach the Mishka Island is 29.5 dB (A). Upon simultaneous operation of the two sources of noise the total noise level reaching Mishka Island would be 37.3 dB (A), again lower than the aforementioned limit of 40 dB (A).

The closest residential areas, namely the village Ryahovo and the village Babovo are located at 1 km to the south-west and 2 km to the southeast of the approved extraction area. According to Annex No 3 to Art. 6 of Ordinance No 6/2006 of the Ministry of Health and the Ministry of Environment and Waters noise levels are reduced to 75 dB (A) at a distance of 1,000 m, ie the total level of noise emitted by the simultaneous operation of the dredge and sailing barge (or passing vessel far enough from the dredge) reaching the nearest residential area of Ryahovo will be about 12,5 dB (A). Therefore, carrying out of extraction and transport activities will in no way affect the acoustic environment in the nearby residential areas.

Other activities provided by the investment proposal will be carried out on the territory of the private production site situated in the Eastern Industrial Zone of Rousse, near the very busy transport corridor Danube Bridge 1. Noise emissions will be typical of port operations, reaching about 67 - 68 dB(A) according to the measurements cited above and usually within the limit of 70 dB (A) set by Ordinance No 6/2006 of the Ministry of Health and the Ministry of Environment and Waters along the borders of the site. A new 15-ton gantry crane with grab powered by electricity and grab volume of 4.5 m3 will replace the two grab bucket cranes with bucket volume of 2.5 m3 that are currently under exploitation. This replacement will improve the acoustic environment near the wharf as electrically powered cranes emit low noise.

Some additional noise pollution will occur during the planned reconstruction of the wharf. Existing buildings on the wharf will be demolished and site for unloading of material and buffer depot for temporary storage of alluvial materials will be prepared. Caravans along the south fence will meet the housing and administration needs by providing a checkpoint, administration office, changing room with showers and toilets, accommodation for eating with kitchenette etc. This reorganization will provide additional shielding against ground noise generated on site. Generally, noise emissions from the proposed improvements will be short-term and will load insignificantly the overall acoustic environment of the Eastern Industrial Zone of Rousse.

The above cited noise emissions will not affect the acoustic environment in the residential area of Rousse due to the large distances and multiple screening objects.

Distance downriver from the extraction area to the bridge over the Danube in Rousse adjacent to the site of the investor is 29.5 km. Works on the excavation site will not affect the acoustic environment of the Mishka Island or the nearby residential areas of Ryahovo and Babovo.

**Vibrations**

Operating self-propelled floating dredge and barges may generate vibrations that would affect the persons working on them. Therefore, appropriate precautions should be taken. Regular system maintenance and support would prevent the occurrence of undesirable and dangerous vibrations. The possible occurrence of transient vibration will be limited to the platform of the floating facility.

Operational floating extraction equipment and transport vessels must meet the requirements set by the Bulgarian Register of Shipping and possess the relevant documents evidencing their fitness for normal and safe operation issued by the State Shipping Inspectorate. Proper maintenance of the aforementioned machinery and vessels will secure avoidance of any additional abnormal vibrations that would affect the crew. Generated vibrations, if any, would not have a significant adverse impact on adjacent water areas or the nearby residential areas of Ryahovo and Babovo.

Ground equipment operating on the wharf for unloading of sand and gravel could also cause temporary undesirable vibrations. Such vibrations will be limited within the area of the site and the Investor shall apply safety measures to prevent the occurrence of additional vibrations.

***Electromagnetic radiation***

Powering of the wharf with electricity will be provided by existing technical communications, which comply with regulatory requirements for the construction of electrical networks and installations. Construction of new electrical facilities is not planned so occurrence of excessive electromagnetic radiation in the environment is not expected.

Transportation of extracted materials will be carried out by specialized self-propelled barges. The barge is a river vessel propelled by one screw propeller and equipped with a radar system, echo sounder, autopilot and course indicator, mobile communications and talkies, with an option for installation of a GPS system and an electronic card, which would increase shipping safety. All these systems are to comply with the relevant regulations in the field of radio and mobile communications, so as not to create excessive electromagnetic radiation in adjacent areas.

***Ionizing Radiation***

The investment proposal envisages extraction of river deposits (sand and gravel). Its implementation incudes extraction and transportation of natural resources - sand and gravel. According to the provided geological report sand is mainly coarse, containing grains of quartz and feldspar, very slightly clayey. Gravel is of small and medium sized boulders made of quartz, flint, gneiss, diorite, amphibolites, limestone, marble, sandstone and other sedimentary, metamorphic and igneous rocks. Natural radioactivity of this type of rock is low, typically within the range mentioned in the literature. Usual specific activities in Bq.kg-1 according to the International Atomic Agency are presented in the following table:

| $^{238}$U | $^{226}$Ra | $^{232}$Th | $^{40}$K |
|---|---|---|---|
| 5 - 50 | 5 - 50 | 3 - 30 | 10 - 450 |

Variations around these values are typical for each particular region of the Earth's surface.

On this basis, we believe that during the extraction and transportation of mined river deposits (sand and gravel) extra radiation load in the environment is not expected to occur.

Activities carried out by "Gravel and Sand Pits - Bulgaria" EAD will not generate ionizing radiation in the adjacent areas and nearest settlements. With the implementation of the investment plan there will be no change in the radiation status of the region of Mishka Island or the wharf site in the Eastern Industrial Zone of Rousse.

The extraction area is 418 meters away from the Romanian border and 836 meters away from the Romanian coast in the southwest and 50 m and 310 m in the northeast respectively, therefore transboundary pollution from operating transport and extraction machinery and facilities is not expected

**11. Health and hygiene aspects of the environment**

Health assessment to this report will reflect human health aspects of environmental impact and characterize the sources of harmful effects from the investment proposal for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region.

The framework for assessing health risk, quality of life and well-being in the area adjacent to the surface water body is an integrated approach, which requires a combined assessment of the risk and its management to control diseases associated with sources of impact, examination of the state of the environment and characteristics of the main pollutants. This provides a harmonized framework of guidance on health-related risks and the emergence of cumulative effects.

The framework includes an assessment of health risks prior to setting health goals and measures to reduce negative impacts and enhance the quality of life wherever possible as part of the broader process of engagement.

This health assessment is required in order for the purpose of analysis and evaluation of health and hygiene aspects of the environment and human health risks during the construction of the facility and its operation.

In regard to the conduct of consultations on the scope and content of the EIA, the Ministry of Health sent a letter with issue number IP-00-2/ 04.08.2014 to the Assignor Gravel and Sand Pits – Bulgaria AD acting by and through the Director Alexander Nakov Chakmakov requiring detailed processing and review of all data, facts and conclusions characterizing health risks to workers and the population.

**Health and Hygiene**

Health assessment clarifies the health and hygiene aspects of the location of the project area and extraction of alluvial deposits. The extraction of inert materials - sand and gravel will be carried out mainly in the mainstream of the Danube with prior removal of alluvium by floating bucket dredger with a maximum working depth of 12 meters. The extracted sand and gravel will be used as a raw material by the company.

Prolluvial deposits are composed of unsorted inequigranular gravel grains of different size with sand and clay filler. Between them lay layers of clay with gravel grains.

The Quaternary in the region is represented by alluvial deposits of the Danube and its larger tributaries and alluvial and talus soils. The Danube River forms river terraces built of gravel, sand and clay layers. There is a noticeable pattern in the deposition of terrigenous material in the structure of alluvial deposits. At the base of alluvium there is an underlying layer of coarse material - coarse gravel, sandy gravel aggregate, inequigranular sands and sands, a top layer of loamy sands, sandy clays and clays.

Dynamic reserves within the approved concession area amount to 2,475,047 $m^3$, 1,812,869 $m^3$ of which are extractable reserves. The extraction area will be divided into 10 tracts. The capacity of extracted material will reach 345,000 $m^3$/year, and extraction per day – 1,500 $m^3$.

The investment proposal will be implemented on two sites – extraction area, located in the bed of the Danube, and wharf and unloading platform for extracted aggregates, located in the Eastern Industrial Zone of Rousse, which is a currently operating licensed port for bulk cargo.

The area of Mishka site for gravel and sand extraction from alluvial sediments in the bed of the Danube river is 433,626 m2 (0.433 km2), 2.6 km long and 300 m wide in the southwest part and up to 100 m in the northeast part. Mishka Island and the wharf in the Eastern Industrial Zone of Rousse. The extraction area is 418 meters away from the Romanian border and 836 meters away from the Romanian coast in the southwest and 50 m and 310 m in the northeast respectively The wharf owned by the company and used for loading and unloading of sand and gravel extracted from the river is over 4,558 m2.

Extraction of alluvial materials (sand and gravel) from the Danube River will be done by using floating multi-bucket dredger, after which the material will be transferred to a drying sieve and via a rubber conveyor belt to self-propelled barges for transportation to the wharf for unloading and temporary storage of about 17,000 tons of river alluvial deposits. Excess water flows back into the river. Transportation of raw material will be carried out by three specialized self-propelled barges with bulk capacity of 1000 t. Each barge will make 1 course a day. Material will be unloaded on the wharf by a 15-ton grabbing jib crane on a longitudinal pile, parallel to the crane runway.

Drilling and blasting works are not part of the investment proposal. The material loaded on dumper trucks will be covered with tents and transported to an industrial site owned by the company and equipped with a sorting and treatment installation. This, however, is outside the scope of the current Investment Proposal. Alluvial materials will be processed by other legal entities or used for direct application.

Repair and maintenance works will be carried out by external specialized companies in their repair stations. There will be no repairs or inspections conducted on the territory of the extraction site.

The extraction site spreads from km 462.0 to km 459.4 of the Danube catchment area, to the north of the village of Ryahovo and the village of Babovo, to the north and north-west of Mishka Island (Golyam Mishka – 1 and Malak Mishka-2) and to the south of Mishka-3..

The nearest settlement, Ryahovo Village is located at 1 km to the southwest, and the village of Babovo at 2 km to the southeast. The distance along the river to the bridge of the Danube River in the town of Ruse is 29.5 kilometers.

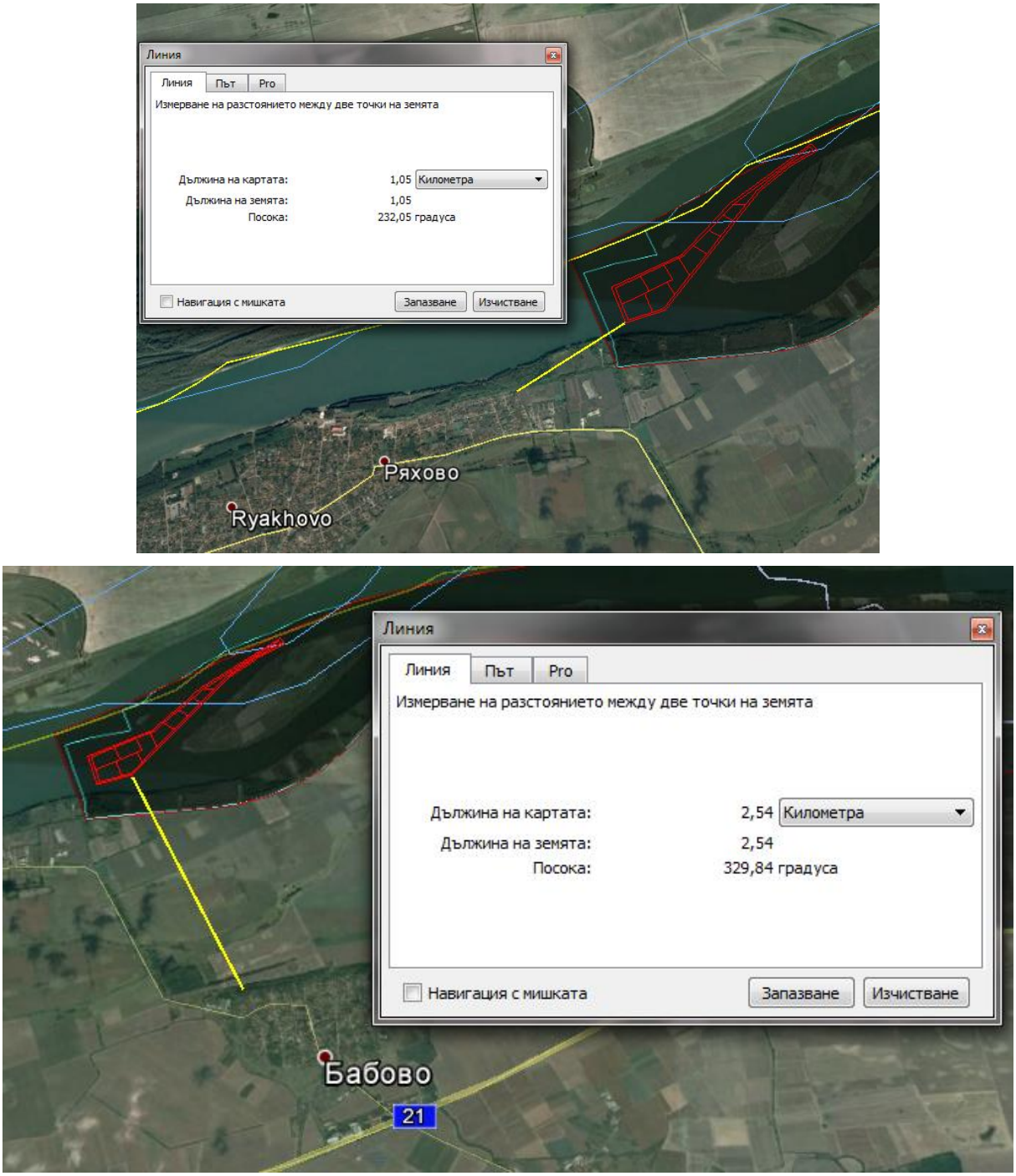



***Fig. IV.11.-1: Satellite image showing the future extraction site and the closest settlements***

During operation of the extraction site pollution is lower than permissible. Subject to technical and technological requirements extraction works are not expected to make negative impacts on the urban environment.

The investment proposal does not affect the sanitary zones of drinking water sources, objects subject to health protection or objects of the food industry.

The noise level at the site and in a radius of 2 km is expected to be admissible as for an industrial zone. Operations on site will not disturb the urban environment in Riahovo

despite the short distance (1 km) between them. It should be noted that blasting works will not be conducted, therefore the normative values of 55dB / A / for settlements will be observed.

The vibrations caused by the operation of the envisaged project mechanization will have a small perimeter of dispersal only within the envisaged project area.

The terrain of the bed of the Danube has not been influenced by radiation. Natural radioactivity of mined aggregates - sand and gravel has very low radiation background values.

Contamination of surface waters of the Danube is not expected, since the proposed technology does not use chemically active substances and reagents and processing and transportation of raw materials is not related to the formation of waste water flow.

Controlled waste management is envisaged. Waste will be collected and stored in accordance with the requirements of the Waste Management Act.

Increased risk of work accidents exists only on the worksite. The total number of people employed in operations will be 41 people. A specific protective regime for restricting access to the site will be enforced. Hazards will be marked with signs and signals, and information sources and labor safety and fire protection warnings will be placed.

### 11.1. Characteristics of risk factors. Impact on human health

As part of preparations for the assessment of health impacts a detailed account has been made of the risk factors studied by the primary process, the activities in the process of exploitation, transport of mined aggregates, condition and maintenance of the road network as well as their impact on health human and environmental components.

**Nitrogen dioxide**

The group of nitrogen oxides includes various oxides of nitrogen, the most widely found in various emissions being NO and $NO_2$.

Health effects - inflammation of the lung and reduced resistance to respiratory infections (flu). Prolonged exposure to concentrations above the threshold values can cause structural changes in the lung.

Sources - combustion processes at high temperatures (Energy, Internal Combustion Engines)

Recommendation - Patients with chronic respiratory diseases are more sensitive to higher concentrations of $NO_x$.

**Carbon monoxide**

Carbon monoxide is a colorless, burning gas without odor. It is formed by burning different fuels with oxygen deficiency.

Health Effects - Carbon monoxide reacts rapidly with hemoglobin of the blood, forming carboxyhemoglobin. The reaction proceeds 200 times faster than that of oxygen and hemoglobin. It reduces the efficiency of man. It is a toxic gas.

Sources - The largest source is road transport - more than 65% of total emissions are generated by power plants, industry, etc..

Recommendation - Patients with cardiovascular disease are sensitive to high concentrations. It is necessary to avoid prolonged stay at high concentrations

**Sulphur dioxide**

Sulphur dioxide belongs to the group of sulfur oxides (SOx), which are formed during combustion of fuels with a high sulfur content.

Health Effects - breathing problems, respiratory diseases, increased sensitivity of those with chronic diseases such as bronchitis, emphysema, and cardiovascular disease. $SO_2$ and NOx are key components of "acid rain".

Sources - industry, energy production, heating with coal containing sulfur.

Recommendation - patients with chronic respiratory diseases are more sensitive to higher concentrations of $SO_2$. It is necessary to avoid prolonged stay at concentrations above the maximum.

**Respiratory diseases**

The highest share of morbidity falls to diseases of the respiratory system (23.3% of all diseases). The first place is held by diseases of the circulatory system / 24.8% /, also in different locations.

The results of the analysis of the structure of respiratory disorders show some specifics as to different locations, and statistically significant differences between reference settlements ($P < 0,05$).

Registered respiratory diseases of the upper respiratory tract include nasopharyngitis and acute tonsillitis and the lower sections of the lungs are affected by pneumonia and bronchitis.

**Total dust and particulate matter (PM10) and fine particulate matter (PM 2.5).**

Health effects - Dust is a major atmospheric pollutant. Harmful health effects depend mainly on the size and chemical composition of the suspended particulate matter, chemical compounds adsorbed on their surface, including mutagens, DNA modulators, etc., as well as the portion of the respiratory system in which they are deposited . The powder enters the body mainly through the respiratory tract, wherein larger particles are retained in the upper and in the fine particles (below 10 μm - PM10) reach the lower sections of the respiratory system.

The harmful effects of dust pollution is more pronounced in the presence of sulfur dioxide into the air. Dust and sulphur dioxide act snergystically on the respiratory organs and mucous membranes. They cause irritation which depends on the duration of exposure. Short-term exposure of 500 μg / m3 to dust and sulfur dioxide increases general population mortality and morbidity and deterioration in pulmonary function is observed at lower concentrations. Prolonged exposure to sulfur dioxide and dust is manifested by an increase in non-specific lung diseases, particularly respiratory infections of the upper respiratory tract and bronchitis - at significantly lower concentrations (30 to 150 μg / m3), which is especially pronounced in children. The most vulnerable to the combined action of dust and sulfur dioxide are the people suffering from chronic bronchial asthma and cardiovascular diseases.

**Noise pollution**

Noise and noise "pollution" of the environment constitutes one of the major environmental problems of our time. Noise is a complex of sounds that act unfavorably on the human body. The minimum sound energy, which in humans is able to cause auditory perception is called lower auditory threshold and is 0 dB. The upper limit at which a person perceives sound as pain is called the hearing threshold or upper threshold of pain and corresponds to sound of 130 dB at 1000 Hz frequency.

Main types and sources:

*Traffic noise*: vehicles - cars and trucks, motorcycles, mopeds, rail and aviation.

*Production Noise*: enterprises, workshops.

*Neighbourhood noise*, parking lots, garages, refuse vehicles, stations, places of public use.

*Inner city noise*: HVAC, sanitary equipment, fans, elevators and others.

*Residential noise*: from household devices.

Noise not only at the workplace but also in the environment is a serious problem for human health. Noise can sometimes be painful, but the real problem is when it damages health. Noise contributes to the most serious damage to hearing as proven by large-scale medical studies on the relationship between noise and some health problems**.**

Health effects

Occupational health practices in Bulgaria have adopted three noise grades that correspond with the degree and nature of the biological effects of noise: First Grade / 86-95 dB / - noise having adverse effect on the functional state of the body; Second Grade / 96-105 dB / - noise levels causing deepening hearing disabilities; Third Grade / above 106 dB / - particularly dangerous for the body. A number of authors offer scales for subjective evaluation of the impact of noise, covering a wide range of intensity from 45 to 105 dB.

For example Gödeke discerns four different degrees of effect of noise on the body:

I grade - / 40-50dB / - causes physical reactions;

II grade - / 60-80dB / - causes disorders of the autonomic nervous system;

III grade - / 90-110 dB / - causes hearing disability;

IV grade - / 120 dB / - creates conditions for irreversible damage to the auditory nerve.

## Demographics for the area near the site

Rousse Region consists of 8 municipalities with a total of 67 mayoralties. Settlements are 83, 9 of which are towns and 74 villages. The total population in Rousse by 31.12.2011 was 233,767 people, which equates to 3.29% of the population of the Republic of Bulgaria. Rousse Region has the highest population density per sq km in the North Central region / 90.7 people per sq km / significantly higher than the national average - 69.0 people per sq km. In 2011, the share of urban population in the total population was 75.9%. According to NSI data by 2011 the value of natural growth for Rousse region was 6.0%. The overall trend shows a reduction of the negative values of the natural growth in the region. The dynamics of the population of the area is related to the age structure. Characteristic is the high share of the population between 15 and 64, which forms the core labor resources. One of the main problems arising from the aging of the population in the region and the country is an increase in pathology associated with advanced age.

Diseases that are a major cause of death are typical for the area and the country as a whole. Registered cases in the last year compared to the previous year show the levels of morbidity remain the same.

**Conclusion:**

The analysis of the health and demographic status of the population leads to the following conclusions*:*

- the dynamics of the demographic development of the field shows that there is a steady trend towards an overall reduction of the population, which is characteristic of the demographic processes at the national level;
- there is a growing trend of concentration of the population in urban areas and rural depopulation, mainly due to economic reasons and also to the fact that in the villages live mainly elderly people with high level of mortality;
- more and more aging population in the area, which affects the share of economically active population;
- negative natural population growth forms a durable trend towards depopulation and retention of natural growth in the negative; there is an aging population and a deterioration of the relationship between working and non-working age.

There are also the problems specific to "big fast-growing cities," which are associated with congestion of city traffic, frequent traffic accidents, outdated and hazardous housing, polluted environment, problems with cleanliness and household waste, bad roads and increased street noise.

The analysis of the health and demographic status of the population in the area shows a favorable trend for retention in the development of basic demographic indicators. Reinforcing this trend is related to promotion of employment through the implementation of such investment proposals.

**Morbidity of the population. Profile Summary**

Health and the health status of citizens is one of the indicators of socio-economic development of the Municipality of Rousse, quality of life and development of human resource. The main indicators that determine health status and health of citizens are life expectancy, fertility rates, mortality, child and maternal mortality data for the overall morbidity and data on socially significant diseases with a wide range.

In recent years there have been negative trends in demographic and health indicators of the population both in Rousse municipality and across the country. Total mortality and emigration are increasing, and women of childbearing age are fewer. However, infant mortality tennds to decrease. In rural areas it continues to be higher than in urban areas.

Increasing morbidity of the population is defined by Noncommunicable Diseases, due to demographic factors associated with aging population, unhealthy diet, smoking, alcohol use, irrational and unhygienic lifestyle, less physical activity and sports, stressful life, etc..

Environmental factors such as air, drinking water and food quality also have a huge impact on citizens' health. Morbidity in urban areas, which are exposed to intense pollution from industry and transport, is higher than the average for Bulgaria.

The highest numbers hold the diseases of the respiratory system, the genitourinary system, and diseases of the circulatory system, which are the most common cause of death. They are followed by diseases of the skin and subcutaneous tissue and sensory organs. The lowest number of sufferers of respiratory diseases was observed in 2011. In 2008 diseases of the circulatory system were most common. There is also an increase in diseases of the genitourinary system, with the lowest values in 2008, and the highest in 2010.

The problems in the health system are related to insufficient information, as well as various factors such as corruption. There is poor coordination between information sources, incorrect data and lack of information about directions and activities.

Analysis of the morbidity of citizens in the Municipality of Rousse shows that the main health problems arise from diseases associated with aging and the prevalence of risk factors which are biological and behavioral. The biological factors include hypertension, obesity, diabetes, high cholesterol levels in blood and behavioral factors include smoking, high salt, sugar and alcohol intake, and low physical activity.

**Regional Health Network**

Public healthcare in Rousse is part of the social infrastructure of the area. Its status reflects to a large extent the existing adverse factors in the economic environment of the country and registers serious problems with the financing of the hospitals, their facilities, as well as acute shortage of doctors and nurses nationwide. Conclusions about the state of public healthcare in the region can be made on the basis of statistical data on the number of medical institutions and beds in them as details are given in the table below for the number of medical and health institutions in Rousse for the period from 2006 to 2011.

| *Facilities* | *2006* | | *2007* | | *2008* | | *2009* | | *2010* | | *2011* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *number* | *beds* | *number* | *beds* | *number* | *beds* | *number* | *beds* | *number* | *beds* | *number* | *beds* |
| *Hospitals* | 11 | 1555 | 13 | 1629 | 13 | 1628 | 13 | 1636 | 13 | 1562 | 11 | 1514 |
| *Outpatient care* | 53 | 15 | 53 | 9 | 58 | 7 | 63 | 7 | 64 | 7 | 66 | 7 |
| *Other medical facilities* | 5 | - | 4 | - | 4 | - | 5 | 190 | 5 | 210 | 4 | 210 |

The data presented demonstrate initial tendency to increase the number of beds in hospitals and specialized centers (former dispensaries) in the region during the first two years of the studied period. This trend remains unchanged in the following years and turns to decrease over the last year. Facilities for outpatient care (medical centers, diagnostic and consultative centers (DCC), dental centers, laboratories) gradually increase in number due to the increasing share of private hospitals. For the period from 2006 to 2011, there was a trend to increase the number of doctors per 10 000 people for Rousse - from 26 in 2006 to 29.6 in 2011. Similar findings were reported by medical professionals (from 56 to 63.6). It should be noted, however, that this increase is mainly due to depopulation (reduction of the total population) in the region. Despite the relatively stable numbe of medical care professionals in the region there are a number of problems requiring urgent resolution.

Rousse Municipality has a well developed network of health care facilities for outpatient and inpatient care. A leader among health institutions is "Multi-profile Hospital for Active Treatment" AD, which serves all residents of Rousse. The hospital has 600 beds in 31 departments, and 205 highly qualified doctors.

Other healthcare facilities include "Specialized Hospital for Active Treatment of Pneumophtisiatric Diseases Dr. Dimitar Gramatikov - Ruse" EOOD; "Oncology Center - Rousse" EOOD and "Mental Health Center - Rousse" EOOD. All centers have private hospitals and private beds and serve not only the residents of Rousse but also neighboring areas.

Outpatient care is provided by three medical centers: "Diagnostic and Advisory Centre 1 Rousse" EOOD; "Diagnostic and Advisory Centre 2 Rousse" EOOD and "Medical Center Rousse 1" EOOD. Dental care is provided by a specialized clinic "Center of dental medicine - 1 - Rousse" EOOD.

Primary health care and preventive activities require more funding. In remote and sparsely populated areas there are difficulties in the selection of GPs and access to them. Citizens in inaccessible and remote areas and high risk individuals do not get enough quality healthcare services by specialized doctors.

Lack of integrated information system leads to insufficient and unreliable health statistics. This in turn hampers the monitoring, forecasting and management of the system.

**Conclusion:**

Improving health demographics is a complex and lengthy process. Socio-economic factors are of great importance as well as lifestyle (unbalanced nutrition, psycho-emotional stress, low physical activity, smoking), chronic non-communicable diseases (hypertension, cerebrovascular disease, obesity, diabetes), genetics, environmental factors, low health and sexual culture, especially among minority groups, and regressive age structure of the population.

### 11.2. Potentially affected population and territories

The area of the extraction site is away from inhabited places - the closest residential buildings of the village Ryahovo are 1 km away and the wharf is located in an industrial area. There are no schools, kindergartens, sanatoriums, recreational areas, parks, resort areas, tourist sites or monuments located near the extraction site. The investment proposal does not affect the sanitary protection zones of sources of drinking water and mineral water. In the region there is no livestock or poultry farms, fodder silos, agricultural products or food, food production companies, pharmaceutical or cosmetic industry facilities.

Item. I.1. and I.2. of this report details the location of the extraction site and the wharf, adjacent settlements, sanitary zones of water sources for potable water supply, manufacturing enterprises operating in Eastern Industrial Zone -. Rousse and other investment proposals, which in combination with the present investment proposal may have a cumulative effect.

Operation of the site in question is not related to violation of the ecological balance in the area. Factors favoring the minimum impact on the environment and the lack of impact on the health status of the residents of nearby villages during the operation of the investment plan are the following:

- operations in the region of the extraction will not generate emissions of dust and fine particulate matter (due to high humidity of the extracted material). Engine emissions of dredges and barges will not cause excessive pollution of the area;

- evaluation of the emissions that are expected during operation of the wharf shows that they will be insignificant and will not have a significant impact on human health in the region;

- the expected concentrations of pollutants after dispersal will be below the threshold

values for settlements;

- extraction works will not change the background content of dust and harmful substances in the air of the region;

- the extraction of minerals and operation of infrastructure and auxiliary elements will not affect in any way the protected areas of groundwater (sources of WSP);

- carrying out of extraction and transport activities will in no way affect the acoustic environment in the nearby residential areas. The noise level in the existing urban environment will remain within the MAC;

- noise pollution generated by the planned reconstruction works will be brief and will not affect the acoustic environment in the residential area of the town of Rousse due to the large distance and multiple shielding objects;

- Reconstruction works will improve the acoustic environment near the wharf as electrically powered cranes emit low noise;

Generated vibrations, if any, would not have a significant adverse impact on adjacent water areas or the nearby residential areas. They could not reach the closely located Mishka Island, let alone the nearby residential areas Ryahovo and Babovo;

- Ground equipment operating on the wharf for unloading of sand and gravel could also cause temporary undesirable vibrations. Such vibrations will be limited within the area of the site and will not affect the population;

- Extraction of alluvial sediments from the river will not be associated with generation of technological waste. In the process of extraction, the entire amount of dredged sand and gravel will be loaded on barges and transported to the wharf for unloading;

- exploitation of the site will not contaminate the soil with toxic or organic substances;

- an emergency plan will be developed for the prevention and elimination of accidents in risky activities related to exploitation of the site for the purpose of protection of local populace;

- there are no sanitary protection zones of sources of drinking water or mineral water near the wharf. Near the site there are no objects with specific hygiene protection status.

**Conclusion:**

Implementation of the investment proposal is not expected to affect public health.

### 11.3. Health risk assessment

Risk assessment takes into account the materials, labor, equipment and technologies used at work; work processes, work organization and the impact on workers of materials and equipment, and the type, likelihood, frequency and duration of exposure to hazards during the construction and operation of the wharf and extraction site.

The health risk is assessed based on indicators of exposure, the likelihood of risk to human health during exploitation of the deposit and individual exposure as regards the expected concentrations of pollutants and their limit value. Individual exposure is lower than 1 for all emitted pollutants, and therefore contaminants at concentrations lower than the TLV will not pose a systemic health risk.

Health assessment of workers at the site and residents in the area has been conducted by applying a model used to assess the variance of emissions of PM-10 from implementation

of the investment plan. Protective measures and risk management require compliance with some recommendations. The duration of the working day - 12 hours a day, six days a week and eight months a year / without the winter months/ has been taken into account. Expected potential impacts of the site in question are the following:

- Construction works will not be performed within the extraction site therefore there will no harmful emissions;
- the construction period will last three months and the total quantity of emissions of PM-10 is expected to remain within 130 kg which is below the norms;
- operations conducted within the extraction area are not related to dust or PM emissions.
- Operations in the area of unloading (wharf) are mainly related to emissions of dust and PM. The level of these emissions will be very low if barges are unloaded directly on tippers.
- The level of emissions generated by diesel engines of wheel loaders, dumpers and moored barge is insignificant and can not cause a significant increase in ground-level concentrations, leading to exceedances of the daily limit value for the protection of human health.

*Ambient Air Quality*

Extraction of alluvium will be carried out within the riverbed, the moisture content will be high and this will greatly hinder the formation of dust emissions.

During operation of the extraction site air quality will be influenced by:

- Minimal dust emissions from mineral raw materials due to the high humidity of the deposit;

- Emissions from internal combustion engines for the extraction and transport of production

Considering the sector, which covers the activities of the investment plan - extraction of sand and gravel from river silt deposits from the mainstream of the Danube, ie from the catchment area of the river. They are represented mostly by sandstones and limestones. There are almost no igneous rocks. Quartz, feldspars, and very rarely black flint are present. The pieces in the most part are angular and rounded in part - indicative of transport of small distances. Gravel is almost ungraded.

Alluvium extracted from such river quarries belongs to non-metalliferous resources with dust - emitting operations, loading and transport. This makes it possible to determine the type of emitted dust, which is a mineral mixed with non-metallic mineral and accompanying rocks. This powder is varied in composition, and containing free crystalline silica in natural free forms – quartz, tridymite, cristobalite, chalcedony. Contained free crystalline silica is respirable and causes inflammation and deterioration of lung and heart diseases. This dust is dangerous for pneumoconiosis disease because of inhaled it can reach the alveoli and settle there. Its dimensions are less than 10 μm, but their core mass is smaller than 5-6 μm.

Characteristics of the investment proposal show that the production site will employ excavation and loading equipment / floating bucket dredger / for extraction and loading of material from the river bed. Up to 41 people will work on site for 230 days /9 months/ a year, 6 days a week.

The most common occupational diseases:

- Silicosis - caused by dust containing free silica (quartz, chalcedony, cristobalite, opal and others.);
- Silicatoses - caused by dust, which contains bonded silica (asbestos, mica, talc, kaolin, cement, etc.);
- Asbestosis, anthracosis (coal powder), siderosis (from iron ore powder), aluminosis, manganosis etc.

Free respirable crystalline silica is a common ingredient with variable content in natural mineral resources. Many minerals can also contain natural admixture of fine mineral fibers /acicular mineral fiber fragments or minerals, for example. amphibole types of asbestos/.

Ordinance No 13/2003 on the protection of workers from risks related to exposure to chemical agents at work establishes a set of regulatory parameters and limits for the different powders.

When selecting the normative parameters for exposure to mineral / natural materials / and mixed powders / mineral ingredients / an individual approach has been taken to each specific type of dust, depending on the content of respirable free crystalline silica and fine fibrous particles that are present as natural impurities in most minerals.

We believe on the basis of forecast data that offsite inhalation of dust particles with dimensions and in concentrations sufficient to affect public health is unlikely.

Evidence shows that prolonged exposure to high concentrations of particulate matter PM10 can affect health, especially the cardiovascular system and people who are vulnerable or suffer from respiratory diseases.

The latest data on air quality in Rousse show that both pollutants are well below the safety limits set by national legislation

Staff working on site should ensure compliance with the rules for health and safety at work in terms of particulate levels.

**Recommendation:**

- Strict observance of the technology of extraction;
- Loading and unloading to be carried out at the lowest possible altitude, to minimize dust emissions.

*Quality of water and soil*

Expected additional adverse effects of the implementation of the investment plan on soils, surface and underground waters are mostly related to the transportation of material, mining waste, accidents, fires and transport accidents due to lack of markings, safety signs and warnings of hazardous intersections.

The deposits in the bed of the river have been studied by experts for the purpose of the project for use of the water body.

Quaternary made up of sand and gravel deposits with occasional lense and clay layers prevents ingress of contaminants in groundwater. The internal overburden is represented by clay marl, which sporadically outbreaks between sandstone and is the main yield determinant.

Because of the low permeability, rainwater from rainfall and snowmelt is retained and floods workings. Its prolonged detention is a serious obstacle.

Within the catchment area of the Danube there is no intense human activity that would materially affect the river flow.

According to the adopted plan for extraction, transportation and storage of extracted material, water for production and technological needs will not be necessary.

The necessary quantities of water for domestic purposes in Mishka section will be stored in special tanks on the dredge and transport barges. They will be refilled in specific locations by an outside company owner of the dredger and barges. Necessary water quantities during wharf operation for staffing of 10 people will be about 0.5 m3 per working day. Personnel's personal hygiene needs will be met at the housing and administration section of the site. Water will be supplied via the urban water supply system on the base of a contract with the water operator.

Implementation of the investment proposal will not cause pollution of surface water, as it does not provide for discharge of polluted wastewater. The total quantity of generated wastewater will amount to about 0.75 $m^3$ per working day. Domestic sewage will be generated on the dredge and transport barges, which will be hired from an outside company.

According to the projections of the investment proposal, the dredger crew will consist of 6 people, and the barge crew of 3. Three barges will be used to transport material extracted from Mishka area.

Domestic wastewater will be generated during extraction activities in the administrative and residential facilities on site. Quantities shall not exceed 0.5 m3 per working day given the small staff of 10 people. The site is to be equipped with a small treatment plant type ACO Clara 5-10 with hydraulic load of 0.75 to 1.05 m3 per day. Inflow and outflow of the plant is controlled by gravity. The investment proposal does not envisage discharge of contaminants in the subsurface or activities that would lead to indirect discharge of such. Construction of water intake facilities that would change the quantitative status of groundwater is not envisaged.

Purified water will be discharged in the Danube owing not least to the certified parameters of the plant allowing a high enough degree of water purification.

Water drained from extracted alluvium will flow back into the river.

Since the site is situated on the riverbank, rainwater will drain in the surrounding land and the river.

The extraction of inert materials from the bed of the Danube is not linked to pollution or deterioration of groundwater

The impact is estimated as one with a low level of complexity in Mishka section and the wharf. Cumulative impact on surface water of the Danube is not expected. This type of impact in the area of the wharf can be caused by discharges of household waste water from settlements in the area as part of the impact of the site is negligible compared with that of the settlements. The territorial scope of impact is assessed as limited. Transboundary impact is not expected either.

Negative impact on the groundwater regime is not expected in the implementation of the investment proposal regarding Mishka section. The investment proposal does not provide

for the discharge of contaminants in the subsurface or carrying out of activities that lead to indirect discharge of such. Construction of water intake facilities that could induce changes in the quantitative status of groundwater is not envisaged either.

The extraction area does not fall within sanitary protection zones.

According to letter ref. No 378 / 30.08.2013 of the Danube Water Management Directorate with HQ in Pleven the investment proposal is acceptable in terms of achieving environmental objectives and measures for good condition of waters and areas for their protection set in RBMP 2010 – 2015 for the Danube region, provided that natural habitats and species are protected from new negative changes in the hydrological regime of the Danube and is their favourable condition is preserved.

**Recommendation:**

- extraction works be carried out in strips parallel to the water flow with the greatest possible width and length, starting from the inner part of the section in the direction of the banks up to the planned elevation;

- prevention of possible pollution of the water body and the surrounding areas with oil.

*Impact on the road, including issues related to traffic*

Emissions of harmful substances from transport of aggregates from the area of production to the site of the company in the town of Ruse and during the reconstruction of the wharf in the Eastern Industrial Zone are estimated to slightly increase levels of atmospheric pollutants. Upon reaching the daily output of 1,500 m3, the expected emissions remain at the level of residential heating of the two villages (Ryahovo and Babovo) with a total of 2100 inhabitants. **Cumulative effect is not expected, since extraction will be carried out during the summer, when residential heating is off.**

The distance between Mishka extraction site and the wharf is about 27 km. The estimated emission of pollutants from diesel engines of dredge and barges will not combine due to high humidity. Scenarios for anticipated emissions and models of dispersion of the wharf show ground-level PM10 concentration of about 90 μg/m3. This area does not reach the residential districts of Ruse.

Operation of the investment proposal will lead to increased road traffic from and to the site, which in turn may lead to:

- dispersion of harmful emissions;
- Higher incidence of all types of road accidents in the region;
- More frequent damage to roads caused by heavy trucks.

Emissions generated by transport travelling to and from the site include particulate matter (PM - (PM10, PM2.5)), carbon oxides ($CO_X$) and nitrogen oxides ($NO_x$). Threshold values of those pollutants relate to the average concentration of the component unit in micrograms per cubic meter (μg / m3). The level of air pollution in the region will be determined by the component or position, whichever is higher.

| **Air quality** | **Impact of air quality on health** | **$PM_{10}$** | **$PM_{2.5}$** | **$NO_2$** |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Very unhealthy | High health risk | >150 | >100 | >200 |
| unhealthy | Significant risk | 100-150 | 50-100 | 150-200 |
| moderate | Moderate risk | 50-100 | 25-50 | 100-150 |
| good | Low risk | <50 | <25 | <100 |

Health effects associated with air pollution:

| Air quality | **Health effects associated with air pollution** |
|---|---|
| Very unhealthy | People with allergies and people with severe heart and respiratory problems should not stand in heavily polluted areas. Healthy people may experience accidental mucous membrane irritation and discomfort. |
| unhealthy | People with allergies and people with severe heart and respiratory problems should avoid polluted areas. Sensitive people should limit their stay outdoors in affected areas. |
| moderate | Health effects can occur in asthmatics. It is recommended for sensitive people to reduce their physical activity in the affected area. |
| good | The health risk is negligible or absent. |

The forecast was made by using comparative literature for control of pollutants from points located in areas with approximate characteristics and existing sites. The degree of contamination expressed as concentrations of carbon monoxide, sulfur dioxide and nitrogen oxides into the air in major streets correlates well with road traffic intensity.

Increased number of road vehicles leads to a proportional increase in fuel consumption and traffic in the area. It should be expected that with the increase of the total number of vehicles in the area of IP the emissions of harmful substances characteristic of road transport will increase rpoportionately. Tailpipe emissions will also be formed.

For the purpose of minimizing the risk of future incidents in the region the Assignor should cooperate with partners from Ruse Municipality, the police and the Roads Agency in order to improve the quality of road surface, speed limits, signs and routes that need to be addressed at an early stage.

**Recommendation:**

- The determination of service roads should be discussed at an early stage of the planning process to ensure that concerns about the quality of the road surface are identified and addressed in order to minimize any possible negative impact on local communities;

- It is necessary to mark the routes for heavy equipment and machinery by using existing roads and not allowing construction of new roads;

- It is necessary to ensure that routes for trucks and other related to production are diverted away from the settlements, if possible;

- Permanent control and prevention of overloading of vehicles, which will be transporting the extracted materials;

- In particular, an assessment of potential impacts should be made to minimize the risks for children and adults;

- intense training for drivers and raising the awareness within the community; issues relating to road safety and road network must also be addressed.

*Noise impact*

Noise levels emitted by machinery / bucket dredger and passing barge / are in the range of 80-90 dB (A) of measured equivalent noise levels emitted by objects similar to the sources of noise envisaged in the investment proposal. Noise generated during extraction works can be classified as noise from a local source. Noise reaching the nearest residential area - Ryahovo, located approximately 1000 meters from the planned extraction area is estimated in the range of 12,5 dB (A). Aggravation of the acoustic environment in the nearest residential area or negative impact on local populations is not expected. The severity of the impact is likely to vary only on workers at the site, which will be exposed to excessive noise levels and general and local vibrations. This however is an acceptable health risk if health recommendations are complied with.

Noise generated on the wharf will be of local nature and will reach about 68 dB (A). Residential areas and territories will not be adversely affected.

**Recommendation:**

- observance of strict technological discipline, use of personal protective equipment and carrying out of periodic medical examinations for compliance with safety and health at the workplace.

*Impact on certain groups - the elderly, the disabled, children.*

The impacts on environmental components and factors may have a different impact on different groups of people who are more sensitive to changes in air quality or an increase in traffic, especially at certain times. This effect should be taken into account in the development of measures to reduce risk. These groups are particularly susceptible to effects of increased dust pollution and increased traffic in the immediate area around the extraction of minerals.

**Recommendation:**

- reduced outdoor physical activity in areas affected by extraction works.

*Summary of expected potential impacts of the site in question:*

- Performed comparison does not reveal causal relationships between environmental factors, sources of harmful effect and health status of the population in the region.

- disabilities and diseases of different age groups caused by the investigated sources of impact have not been identified.

- The rate of morbidity and mortality from socially significant diseases is connected with the style and way of life.

- there are no sources of air pollution in the area of the site and nearby. Operation of the extraction site will emit PM in the process of extraction and transport.

- Pollutants emitted into the air are non-toxic and at sufficient distance from the site so as not to affect the nearby settlement formations. They do not cause long-term effects on the organism. They are not classified as chemical sensitizers, mutagens, carcinogens or toxic for reproduction.

- The exposure time is short. Individual exposure to all pollutants is under 1.

- The planned extraction technology, mode of transport and handling will not include formation of industrial waste water..

- The activity is not associated with the accumulation of waste of organic origin, therefore violation of sanitary and hygienic conditions is not expected. If as a result of emergency situations and incidents hazardous waste spills of fuels and lubricants including adsorbents occur, then they will be collected separately and submitted for processing to a company holding a permit under Art. 12 WMA.

- The nature of the project will cause stress and discomfort of the environment by noise pollution at the site of the operation of machinery and dust emissions. If strict compliance with the requirements set out in technical projects is ensured, the negative effects will be minimal, localized only within a limited area - the site and will not cause any negative impact on the residents of surrounding villages - Ryahovo and Babovo.

- Natural resources, which are intended for use during operation, are dynamic reserves of aggregates - sand and gravel. Development of the deposit does not require the use of other natural resources.

- Possible risk of accidents during operation and occurrence of emergencies is not excluded. Measures will be taken to prevent, control and eliminate any accidental releases of pollutants.

***Conclusion:***

The significance of the expected impacts is determined by each component. The assessment shows that exposure to any expected impacts from the site in question is significant in size for the local area, but significantly below the legal limits and standards for surrounding settlements.

**The exploitation of the Danube for extraction of sand and gravel does not pose a significant risk to the health status of the population in the region.**

## 12. Forecast of cumulative effects

### Assessment of cumulative effects

The report identified the importance of expected impacts after assessment of the potential cumulative effect on each of the components and environmental factors.

During the EIA procedure, a check was made with MEW, RIEW Ruse and the Executive Agency for Exploration and Maintenance of the Danube regarding investment

proposals and plan programs that together with the investment proposal in question could cause cumulative effects (Table I.2. -1, I.2.-2 and I.2.-3 in this report).

For detailed assessment of the cumulative environmental effects the so-called methodology of Seven Steps to Cumulative Impacts Analysis, Clark, R (1994): Cumulative Effects Assessments: A Tool for Sustainable Development Impact Assessments 12, 319-331 was applied. The methodology consists of the following steps:

**1) Setting of goals**:

The goal is based on the existing state of the environment in the area and potential impacts expected from the operation of the site to assess the ability of the environment to sustain the proposed activity and to take action (still in the planning phase) to minimize future negative effects.

**2) Establishment of spatial and temporal boundaries:**

- The area of the offered investment proposal is a section of the bed of the Danube River that is public state property falling within Mishka section (from км 462.0 to км 459.4), to the north of the village of Ryahovo and the village of Babovo, to the north and north-west of Mishka Island (Golyam Mishka – 1 and Malak Mishka-2) and to the south of Mishka-3;
- The extraction area is located within the Bulgarian part of the river, at the mandatory distance of the river's mainstream (327 m in the southwest and 194 m in the northeast.);
- The extraction area is 418 meters away from the Romanian border and 836 meters away from the Romanian coast in the southwest and from 50 m to 310 m in the northeast respectively.
- The nearest settlement, Ryahovo Village is located at 1 km to the southwest, and the village of Babovo at 2 km to the southeast. The distance along the river to the bridge of the Danube River in the town of Ruse is 29.5 kilometers.
- The transport corridor for transportation of sand and gravel extracted from the Mishka section to the wharf site owned by the company is the Danube River.
- The wharf owned by the company and used for loading and unloading of sand and gravel extracted from the river is located in the Eastern Industrial Zone of the town of Rousse with an area of 4,558 $m^2$
- Existing buildings on the wharf will be demolished and site for unloading of material and buffer depot for temporary storage of 17,000 tons of alluvial materials will be prepared. • The construction near the wharf will be limited in time (no more than three months).
- The site is to be equipped with a small treatment plant type ACO Clara 5-10 with hydraulic load of 0.75 to 1.05 m3 per day. Purified water will be discharged in the Danube owing to the certified parameters of the plant allowing a high degree of water purification.
- The material loaded on dumper trucks will be covered with tents and transported to an industrial site owned by the company and equipped with a sorting and treatment installation for processing of alluvial materials from the Danube River and concrete plant on plot with identification No 63427.8.1076 from neighbourhood No 1 as per the plan of the town of Rousse, Eastern Industrial Zone at a distance of 1 km from the

wharf.

- Table I.2.-3 shows that investment proposals marked with number 1, 2 and 3 have not been implemented. Investment proposals number 5 and 6 are situated at 40 and 50 kilometers away from the site. Of the remaining investment proposals marked as number 4, 7-17 cumulative effect can be expected only with number 4 (extraction of alluvial deposits from the river bed of the Danube from km 468.00 to km 464.000). The distance from the latter to Mishka section is about 2 km. Investment proposal number 18 is currently undergoinf procedure under Chapter VI EPA and its implementation may cause additional cumulative effect.
- Production companies operating within the Eastern Industrial Zone - Rousse, which in combination with the investment proposal for the extraction of sand and gravel from alluvial sediments from the bed of the Danube, Mishka section (from km 462.0 to km 459.4) may form cumulative effect are described in Table I.2.-5.

**3) Current state of the environment:**

According to the analysis of components and factors of the environment in item III environmental quality in the area is in good condition and self-restoration capability is preserved.

**4) Determining the expected impacts**:

Expected potential impacts of the reviewed investment proposal, and of other future plans or IP are the following:

- Emissions from transport machinery and noise during construction works (wharf) and extraction works;
- Extraction works are not related to the discharge of wastewater into surface or groundwater;
- hazardous waste will not be generated during operation.

**5) Identifying the importance of expected impacts:**

The importance of expected impacts has been identified after assessment of the potential of a cumulative effect on each of the components and environmental factors. A possible cumulative effect on the site from air, noise and vibration has been established. It is this potential that will be assessed below.

**6) Assessment of the expected cumulative effects and minimization measures:**

*Ambient air:*

The forecast for the impact on air quality assesses the impact of the exploitation of the deposit on air quality in the area. Construction works will not be carried out within the extraction area, therefore emissions of harmful substances will not be generated. Works carried out within the extraction area do not generate emissions of dust and PM. The main reason for this is the high humidity of the extracted material. The only emissions on site will be generated by the engines of the dredge and barges. The instantaneous emission of nitrogen oxides (4.47 g/sec) cannot cause excessive pollution of the area.

The closest currently operating facility for the extraction of inert materials from the Danube is located about 2km southwest of the area of the investment proposal (at the front of the island of Aleko) near the village of Ryahovo. Other two sites are located southwest of the

investment proposal for extraction of alluvial deposits near Mishka Island and are 40 km away from Luylyaka Island and 55- 60 km away from the island of Batin.

The remaining sites listed in table *I.2.-3* have not been developed. Regardless of that fact their cumulative impact on air quality is calculated as if they were operating all at the same time. The technology for extraction of sediments from the Danube at all sites is floating multi-bucket dredger. Dewatered alluvial deposits are transferred to self-propelled barges via rubber belt conveyor. High humidity of the mined material precludes formation of dust emissions during dredging, loading and transportation.

Air pollution from internal combustion engines of dredges and barges of the closest objects (Aleko Island) added to regular Danube navigation cannot lead to accumulation of harmful air emissions and excessive pollution, which in turn to have a negative cumulative effect on protected areas. These harmful emissions are in quantities not exceeding the threshold limit value and are of local, temporary and reversible nature.

Considering the distance at which the sites are from each other and the local perimeter of the concentration of these harmful emissions the amount of harmful substances in the air is not expected to exceed the threshold values which would lead to the formation of cumulative impact on air quality in the region.

Given, however, the total power of the equipment, which is intended to be operated and the remoteness of the site from any settlements (1 km to the southwest of Ryahovo and 2 km to the southeast of Babovo Village), the object is not expected to have significant impact on air quality, neither locally, nor on a larger scale.

Development of separate investment proposals for extraction of inert materials from the bed of the Danube will not be simultaneous, therefore will not lead to accumulation of contaminants in the air which in turn to deteriorate air quality over the TLV and become causes of cumulative effect on protected areas.

Construction works in the area of the wharf will be limited in time (no more than three months). Operations in the area of unloading (wharf) are mainly related to emissions of dust and PM. The level of these emissions will be very low if barges are unloaded directly on tippers. Storage of extracted materials at a temporary depot and loading of material on tippers by front loaders will lead to increased levels of these emissions. Evaluation of the dispersion of these emissions has shown that exceedances of the PM-10 daily limit value for the protection of human health are possible only in a small area adjacent to the wharf. The expected number of these exceedances is not more than 3 or 4 per calendar year, which is much lower than the permissible 35 exceedances as per Ordinance No 12. The expected maximum average annual concentrations in these conditions (about µg/m3) are much lower than the permissible 40 µg/m3. The results from PM10 dispersion refer to particularly adverse weather conditions, long-term storage of ballast in the temporary depot (reduced moisture) and overloaded dumpers moving along dry transport routes covered with accidentally spilled material.

The results indicate a low level of harmful atmospheric emissions and expected emissions remain much lower than the general background level as a result of all available sources of influence in the Municipality of Rousse.

The extraction area and temporary storage facility are far from the production sites listed in Table I.2.-5. Formation of cumulative effects is not expected.

*Minimization and prevention measures:*

The expected concentrations of pollutants emitted from reviewed sources will not have a significant impact on the residential area of Ryahovo and Babovo and the town Rousse. For the purpose of preventing potential pollution measures under Ordinance No 1/2005 on limiting dust emissions during loading / unloading, transport and storage of soil and building materials must be applied.

*Noise and vibration:*

The assessment of noise at the point of impact for each discreet receptor can be conducted under the methodology for reporting of noise and local industrial sources of Regulation 6/26.06.2006 on the indicators and standards of environmental noise, taking into account the degree of discomfort in different parts of the day. The model set by the Ordinance is simplified and does not take into account the cumulative effect of all sources.

In the current situation the closest site for extraction of alluvial deposits is the one near the village of Ryahovo, 2 km to the southwest of the investment proposal (at the front of the island of Aleko). Simultaneous operation of both extraction sites will not lead to the occurrence of cumulative impacts. Propagation of noise in this area will be mitigated by the topography of the area and the trees on the island and will attenuate its strength in the direction of Mishka Island. There will be no overlay of noise levels from both sites, which could otherwise create cumulative impacts on the population inhabiting the closest settlements.

Other developed deposits of aggregates on the Danube are located at a large distance, so there will be no formation of cumulative impacts.

Some additional noise pollution will occur during the planned reconstruction of the wharf. Generally, noise emissions from the proposed improvements will be short-term and will load insignificantly the overall acoustic environment of the Eastern Industrial Zone of Rousse. The above cited noise emissions will not affect the acoustic environment in the residential area of Rousse due to the large distances and multiple screening.

*Cumulative impact on hydrofauna*

The projected investment proposal for the extraction of sand from the river bed is concentrated in an area located between the islands "Golyam Mishka-1," "Malka Mishka-2" (Mishka Island) and " Mishka -3" and the river fairway. The existence of islands is evidence of accumulation of aggregates over time at specific locations, which is why the investment plan is concentrated there.

Development of the extraction site will affect the standalone Aquatic (water) complex, while the second terrestrial (land) complex will remain outside the area for extraction of inert materials and will not be affected.

The results of hydro biological studies show that this section of the river bed is not suitable for the formation of food for demersal species.

The standard form of protected area BG0000377 "Kalimok - Brushlen" includes 13 fish species subject to protection. It is highly unlikely for representatives of Danubian ichthyofauna to feed on bottom dwelling invertebrates within the area of the investment proposal. The results of hydro biological studies show that this section of the river bed is of no importance for the breeding and growth of fish included in the scope of protection of nearby protected areas because:

- there are no large stones,

- the bottom relief does not offer places for hiding,
- there are no roots, or higher aquatic vegetation.

Bottom sediments within the area of the investment proposal are not suitable for habitation and breeding of fish subject to conservation of the nearby protected areas and there are not enough benthic invertebrates to feed them.

The extraction of inert mass from the bed of the Danube River will not cause cumulative impacts from areas near the island of Aleko and island of Mishka on the fish subject of conservation of nearby protected areas, because these places are unsuitable for breeding and feeding, and are relevant only as a corridor for movement during migration.

For the purposes of mesohabitat mapping necessary to determine the cumulative impact of dredging on benthos the width of the section of the project was tested with portable sonar type SideScan Himminbird 798cSI. Sonar pictures show that there are no fish in this area, either passing or using the planned extraction area as a habitat, breeding and feeding grounds. These results will be discussed in detail in the section of the report dedicated to impact on protected fish during the extraction of inert materials.

**Conclusion:** *the hydrobiological research conducted within the area of the investment proposal leads to the conclusion that extraction of aggregates near the island of Mishka no will not cause occurrence of negative cumulative impacts on benthic fauna existing in this part of the Danube. Extraction of bottom sediments will not affect the food base of fish included in the scope of protection of nearby protected areas and their breeding places. These places do not fall within the area of extraction of inert materials. Breeding sites of other river fish species breeding in the Danube will not be affected.*

*Extraction of alluvial sediments is expected to have a positive impact because of the deepening of the bottom. Rising river flow and runoff in this area is desirable, given the need for a strong water flow which is to enter if necessary the floodplain areas of the protected area "Kalimok Brushlen" and protected area BG0000377 "Kalimok Brushlen" and protected area BG0002030 " Complex Kalimok".*

*Cumulative impacts on Romanian protected areas*

Practical implementation of IP for extraction of aggregates within the Mishka area is not expected to have a negative cross-border impact on the ROSPA0090 Ostrovu Lung-Gostinu protected area, or on ROSPA 0022 (Comana Natural Park) protected under the Birds Directive or ROSCI 0043 (Comana) protected under the Habitats Directive, all of them spreading across the Romanian bank. Vegetation and habitats of conservation importance and associated target species and their populations will not be affected. All presumed environmental impacts of the proposed activity are of local nature and negligible in volume and scale. Technology for extraction does not imply quantitative or qualitative changes in river water either in the Bulgarian or in the Romanian sector of the Danube. If technology for the extraction of alluvial material from the bed of the Danube is strictly observed, cross boundary negative impact is not expected within the designated area.

***CONCLUSION***

The cumulative impact of the development of the site can be hypothetically defined as negligible as there are no other extraction sites in the area. Anthropogenic pressure, however, will increase slightly, and the negative impact will be permanent, yet local and reversible.

*The cumulative impact on natural habitats and wildlife subject to conservation in protected areas is discussed in more detail in the CA report.*

## 13. Transboundary Impacts

### Air

Preparation and implementation of the investment proposal for the extraction of inert materials from the bed of the Danube will not compromise air quality with excessive contaminants. The estimated quantities of gas emissions from mining, transport, loading and unloading works will not exceed the prescribed levels of air purity in local and cross-border aspect. The emission levels of dredger and barges are typical of the commercial vessels on the Danube. Emissions generated are not able to cause significant deterioration of air quality, either in the area or in more distant areas on the territory of the Republic of Romania.

### Water

Implementation of the project will have no negative impact on the quality, level and mode of river flow. The activities related to implementation of the IP are expected to comply with the provisions of RBMP regarding the ecological and chemical status of the water body.

If technical specifications are complied with extraction works cannot possibly cause a change in the fairway or navigation conditions. Change in water levels after the dredging work is expected to be within 1-5 mm for the armlet between the island and the coast of the relevant section. The impact can be assessed as negligible and local and will practically not affect the water level or the river. The distance from the extraction area to the banks (Romanian and Bulgarian) and the technological sequence of production ensure the integrity of the banks and avoidance of work-up or erosion as a result of extraction. There is no possibility of cumulation of impacts on the river banks. If technology for extraction of river alluvium deposits and unloading at the wharf is complied with transboundary impacts are not expected.

Risk of cross-border impact with the intended equipment and technology for the extraction, transportation and wastewater management exists only in the event of accidntal spills of petroleum products. Implementation of an emergency plan will prevent transboundary impacts on surface water

Implementation of the investment proposal is not expected to have a negative impact on the transboundary water body „Malmian-Valanginian Karst Water" (BG1G0000J3K051).

### Geological environment, land and soils

Cross-border impact on the geological base cannot occur because the extraction will be performed in authorized area within the Bulgarian territorial waters, and the legally required distances to the river fairway and the Bulgarian coast are complied with. Fairway and the main river route pass to the north of the island and the future extraction site respectively, along the deeper Romanian armlet. The shortest distance to the fairway and navigational routes in the eastern segment is 250 m. This excludes the possibility of extraction works affecting navigation or navigation regime on the river, or giving rise to eroding processes on the Bulgarian coastal zone.

### Flora and fauna

Compliance with the recommended measures regarding flora and fauna within the protected areas and sites part of the National Ecological Network will prevent the occurrence of negative transboundary impacts. Implementation of the recommended measures will ensure that extraction of sand and gravel and their transportation to the quay wall will not disturb birds and other inhabitants of the nearby islands and coasts. The effects of noise are negligible

and will not disturb the birds nesting on the surrounding islands and the coast, as the noise levels are within permissible limits.

**Waste and hazardous substances**

Strict compliance with the measures envisaged for storing various types of wastes and hazardous substances will prevent negative transboundary impacts.

**Energy sources**

The extraction area is 418 meters away from the Romanian border and 836 meters away from the Romanian coast in the southwest and 50 m and 310 m in the northeast respectively, therefore transboundary pollution from operating transport and extraction machinery and facilities is not expected

**Landscape**

The Danube Region is where Europe opens to the east. In view of the many opportunities the Region has, the European Union has adopted a Strategy for Danube Region with some of its main tasks being development of transport and trade links through the TRACECA transport network connecting the EU through the Black Sea region to the Caucasus and Central Asia, and sustainable preservation and restoration of exceptional fauna and flora, precious water resources and outstanding landscapes.

The content of such strategic documents shows that the focus of EU policy is placed on territorial cohesion and cross-border cooperation between Bulgaria and Romania, including bilateral support for utilization of local resources and potentials, which until now have not been developed in compliance with the environmental decisions for implementation of specific activities, such as the present IP for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region, Bulgaria.

Under the Convention on the assessment of environmental impact in a transboundary context and the European Landscape Convention, negative impacts and disturbance in the ecological status of the landscape is not expected.

**6. Cultural and Historical Heritage**

Extraction of alluvial deposits from the bed of the Danube requires strict compliance with the requirements of Art. 93 (1) and 93 (2) of the Law on Cultural Heritage.

## 14. Summary of the potential impacts on people and the environment

The following Table IV.14.-1 assesses the direct and indirect, permanent and temporary, short-term and long-term, positive and negative, and cumulative impacts on components and environmental factors.

***Table IV.14.-1:***

| impact | site | likelihood of impact | Territorial scope of impact | Type of impact Direct / indirect | Degree of Impact | Characteristics of Impact | | | Transboundary impact |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Frequency | Duration | Cumulation | |
| **On air** | Mishka section | expected | local | direct | low | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| | wharf | expected | local | direct | limited | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| **On surface water** | Mishka section | expected | local – parts of the Danube | direct | low | Constant in terms of seasonal extraction | For the period of extraction | not expected in normal operation | not expected in normal operation |
| | wharf | expected | local | direct | low | Constant in terms of seasonal extraction | For the period of extraction | not expected in normal operation | not expected in normal operation |
| **On groundwater** | Mishka section | Not expected | - | - | - | - | - | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |

| impact | site | likelihood of impact | Territorial scope of impact | Type of impact Direct / indirect | Degree of Impact | Characteristics of Impact | | | Transboundary impact |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Frequency | Duration | Cumulation | |
| **On subsoil** | Mishka section | expected | local | пряко | средна | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **On soil** | Mishka section | Not expected | - | - | - | - | - | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **On flora and fauna** | Mishka section | Not expected | local | indirect | negligible | | For the period of extraction | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **On protected territories** | Mishka section | expected | local | indirect | low | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |

| impact | site | likelihood of impact | Territorial scope of impact | Type of impact Direct / indirect | Degree of Impact | Characteristics of Impact | | | Transboundary impact |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Frequency | Duration | Cumulation | |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **On landscape** | Mishka section | expected | local | direct | high | | For the period of extraction | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **On cultural objects** | Mishka section | Not expected | - | - | - | - | - | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |
| **Waste generation** | Mishka section | Not expected | local | - | - | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| | wharf | Not expected | local | - | - | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| **Harmful physical factors** | Mishka section | expected | local | indirect | low | Constant in terms of | For the period of extraction | Not expected | Not expected |

| impact | site | likelihood of impact | Territorial scope of impact | Type of impact Direct / indirect | Degree of Impact | Characteristics of Impact | | | Transboundary impact |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Frequency | Duration | Cumulation | |
| | | | | | | seasonal extraction | | | |
| | wharf | expected | local | indirect | low | Constant in terms of seasonal extraction | For the period of extraction | Not expected | Not expected |
| **population** | Mishka section | Not expected | - | - | - | - | - | Not expected | Not expected |
| | wharf | Not expected | - | - | - | - | - | Not expected | Not expected |

## V. Information about the methods used to forecast and evaluate the environmental impact

Estimates have been made by applying the following methods:

- To calculate the expected emissions of TSP during the reconstruction of the wharf in the Eastern Industrial Zone a set of emission factors of the U.S. Environmental Protection Agency was applied ( *Compilation of Air Pollutant Emission Factors, 5th ed. (AP-42), Vol I: Stationary Point and Area Sources. 13.2.3.Heavy Construction Operations. Research Triangle Park, North Carolina: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, October 1998.*) derived from the study of the construction of a shopping centre with apartments (2,69 Mg/(hectare.month activity)).
- Dust emissions in aggregates processing are calculated on the basis of an empirical model developed by the US EPA on the basis of data from the operation of open pit mines (*G. E. Muleski, Update Of AP-42 Emission Factors For Western Surface Coal Mines And Related Sections, Summary Report, Prepared for Emission Factors And Inventory Group (MD-14), Emissions, Modeling And Analysis Division, Office Of Air Quality, Planning, And standards, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711, 1998*).
- In order for the air pollutant plume dispersion of PM10 emitted from the wharf in the Eastern Industrial Zone of Rousse to be estimated a model was created with the help of Aermod, an air dispersion modeling software with graphical Microsoft® Windows®-based interfaces by Lakes Environmental.
- The characteristics of flora and vegetation have been compiled based on field studies and existing information from scientific publications. Floristic studies were carried out by the method of botanical routes, including inspection on foot. Floral characteristic has been compared with information contained in the Guide on habitats of European importance in Bulgaria (Kavrakova et al., 2005) and vegetation of Bulgaria (Bondev 1991.1997).
- Evaluation of conservation significance has been made by using existing legal documents, scientific publications, the standard forms of protected areas, Flora of Bulgaria, Internet sources. Information from field studies and mapping made in 2011-2012 by the MoEW was also used.
- Studies on fauna are based on the Bulgarian environmental legislation adapted to the European one- Environmental Protection Act, Biological Diversity Act and Protected Areas Act and the ensuing regulations - rules, regulations and tariffs for compensations on irremediable damages.
- For the field study of the target fauna and avifauna the transect method was applied, together with inspection on foot of the border areas of protected areas in Bulgaria. Registration of species was performed by visual identification and by specific sound marks of birds. As a basis for comparison and analysis of the target fauna was used information from the standard data form of protected areas, as well as data from scientific literature and field research and taxation under the project "Mapping and determining the conservation status of habitats and species - Phase I".
- Bird surveys were conducted by the Danube River in the project area.

- Projections and impact assessments were made based on years of experience gained in the study of natural habitats, monitoring of wetlands, protected areas of rare, endangered and protected species nationwide. The estimate is subjective based on information about the degree of impact on the respective habitats in the study area.
- in order to assess the noise impact on the environment based on the stated investment plan EEA Burgas Regional Laboratory accredited for testing of noise and Bioinform Consult OOD, Burgas conducted measurements of noise levels pursuant to agreement No 40/06.08.2013.

## VI. Description of the measures envisaged to prevent, reduce and eliminate where possible any significant adverse environmental impacts, and plan for implementation of said measures

The envisaged measures are given in Table ***VI-1.***

***Таблица VI.-1:***

| **Consecutive number** | **measures envisaged to prevent, reduce and eliminate where possible any significant adverse environmental impacts** | **term/phase of implementation** | **result** |
|---|---|---|---|
| **1. AIR** | | | |
| 1.1. | Transportation of aggregates to be carried out with tippers covered with canopies to prevent secondary emissions | During site operation | Reducing dust in the area |
| 1.2. | Daily irrigation of roads leading to the wharf and the wharf itself on dry days | During site operation | Reduction of particulate emissions in the air |
| 1.3. | Daily collection of material scattered along the roads | During site operation | Reducing dust in the area |
| **2. SURFACE AND GROUNDWATER** | | | |
| 2.1. | Submission of applications for:<br>- permit for use of water body for the extraction of alluvial deposits;<br>- permit for discharge of treated domestic effluents and compliance with conditions set in permits | During planning and operation | Administrative regulation through Authorisation regime according to the EIA and RBMP - measure BG1MB137 |
| 2.2. | Prohibited planning and construction of facilities that could divert the watercourse and facilities that may affect the water regime of the river and protected areas | During planning and operation | Compliance with the rules of the specific protected areas under RBMP - measure BG1MB162. |

| | | | |
|---|---|---|---|
| | | | Preserving the environmental potential of the river |
| 2.3. | Prohibited restriction of water flow to the secondary channels around the islands, and internal channels of the islands | During site operation | Compliance with the rules of the specific protected areas under RBMP - measure BG1MB162 |
| 2.4. | Prohibited damage to natural coasts, floodplains, embankments and aquaculture facilities | During site operation | Compliance with the rules of the specific protected areas under RBMP - measure BG1MB162 |
| 2.5. | Compliance with the conditions for collection and treatment of wastewater from vessels, according to the "Rules for navigation in Bulgarian stretch of the Danube" | During site operation | Preservation of the good chemical status of the water body |
| 2.6. | extraction and transport machinery and equipment to be maintained constantly in good condition to prevent accidental pollution | During site operation | Preventive measure to prevent a new load on the chemical condition of the water body - measure BG1MB120 |
| 2.7. | Provision of specialized equipment for for oil spill response in the event of failure of extraction and transport machines and equipment | During planning and operation | Mitigation of harmful effects resulting from accidents – RBMP measure BG1MB120.<br>Reducing pollution of river water |

| | | | |
|---|---|---|---|
| 2.8. | Prevention of contamination of the area with wastewater following washing of transport equipment outside designated areas; periodic inspection of mechanical equipment on wharf | During site operation | Reduction of pollution by petroleum products |
| 2.9. | a local treatment facility - PPE for the FIVB will be installed and operated on the wharf, which ensures compliance with emission standards for acceptable content of dangerous substances in wastewater discharged into water bodies | During site operation | Preventive measure to prevent a new load on the chemical condition of the water body - measure - BG1MB054 |
| 2.10. | self-monitoring by the holder of the permit for discharge of wastewater into water bodies, i.e. the Danube | During site operation | Receipt of information about emission status of watersтe, as per RBMP measure - BG1MB077 |
| 2.11. | Preliminary monitoring on water quality, on hydrobionts and natural habitats in water bodies within the protected areas, near the site for extraction of sediments | Within the procedures for EIA and CA | Receipt of information about the status of water as per RBMP measure - BG1MB153 |
| **3. SUBSOIL, NATURAL RESOURCES, SOILS** | | | |
| 3.1. | immediate decontamination of soil in the event of leaks or spills of oil and petroleum products | During construction and exploitation | Soil protection |
| 3.2. | Preparation of action plan for emergency situations taking account of the possibility of natural disasters such as floods, earthquakes and more. | Upon exploitation initiation | Water and soil protection |
| **4. FLORA AND FAUNA, PROTECTED AREAS** | | | |

| | | | |
|---|---|---|---|
| 4.1. | Before the start of dredging operations employees of the contractor will be instructed on the objectives, the subject of protection and prohibitions in protected areas "Kalimok - Brushlen" BGpSCI0000377 under the Habitats Directive, "Complex Kalimok" BGSPA0002030 under the Birds Directive, ROSPA0090 Ostrovu Lung-Gostinu under the Birds Directive and "Gura Vedei-Saica-Slobozia" under the Habitats Directive | Prior to operation initiation | Compliance with protected areas regime and avoidance of disturbance of birds |
| 4.2. | Extraction site borders must be clearly marked | During operation | Limitation of extraction works within the investment proposal area |
| 4.3. | During the breeding season of birds dredging in tract 9 and tract 10, 200 m off its eastern border will be suspended. Dredging will be carried out in tracts away from established colonies of birds on Mishka Island. | During operation | Ensuring peace of birds nesting on Mishka Island during the breeding period |
| **5. LANDSCAPE** | | | |
| 5.1. | operation of the section to be undertaken in full compliance with the mining technology proposed in the investment project and the European Landscape Convention | During operation | Reduction of the risk of disruption of the ecological balance and preservation of natural potential |
| 5.2. | Limiting the impact on the landscape elements within the perimeter of the work area for the extraction of sand and gravel and the wharf | During operation | Reduction of the risk of disruption of the ecological balance and preservation of natural potential |
| **6. MEASURES FOR ENVIRONMENTAL FACTORS IMPROVEMENT** | | | |
| **6.1. WASTE MANAGEMENT** | | | |

| | | | |
|---|---|---|---|
| 6.1.1. | drafting of plan for management of construction waste, as required by Art. 11 para 1 of the Waste Management Act (prom., SG, issue 53/13.07.2012) and the Ordinance on Management of construction waste and use of recycled building materials (adopted by Decree 277/05.11.2012, SG 89813.11.2012 | During planning | Preventing contamination of the surrounding area with waste from construction works, repair and reconstruction |
| 6.1.2. | classification of waste generated during site operation, according to Decree No 2 of 23.07.2014 on waste classification issued by the Minister of Environment and Water and the Minister of Health, prom. SG. 66 on 8.08.2014 | During planning | Environmentally responsible waste management in compliance with the European legislation |
| 6.1.3. | Designation of warehouses, areas and containers for pre-production and storage of hazardous waste generated during maintenance and/or emergency situations of construction machinery, meeting the requirements of the Waste Management Act/ Prom. SG 53 of 13.07.2012, effective from 13.07.2012, last recorded amend. SG 98 of 28.11.2014/ and Ordinance on the requirements for treatment and transportation of industrial and hazardous waste /SG 29 of March 30, 1999/.<br>Organization of control of technical condition of construction equipment, in order to prevent accidental spills of oil and fuel | During implementation of construction and installation works | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| 6.1.4. | Provision of appropriate containers for separate storage of waste on site and disposal of waste based on a written contract with persons possessing documents pursuant to Art. 35 WMA | During construction works and operation of the facility | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| 6.1.5. | Providing adequate absorbents on site to ensure complete capture of leaked chemicals and mixtures of hazardous waste | During construction works and operation of the facility | Preventing contamination of adjacent areas; prevention of cross-border pollution |

| | | | |
|---|---|---|---|
| 6.1.6. | Waste formed from construction works and their lawful management will be carried out in compliance with Art. 10 of the Ordinance on the management of construction waste and use of recycled building materials (adopted by Decree 277 of 05.11.2012, SG. 89, effective from 13.11.2012): Persons whose activities are related to formation of construction waste must apply the following hierarchy for waste treatment:<br>1. prevention;<br>2. preparation for reuse;<br>3. recycling of construction waste that cannot be reused;<br>4. use in backfilling;<br>5. utilization for power generation of construction waste, which cannot be recycled and / or utilized;<br>6. disposal of construction waste, which cannot be reused, utilized and / or recycled in ways specified in Item 1-5 to achieve the objectives set out in Art. 11 pt. 3 | During construction and installation works | Preventing contamination of adjacent areas; prevention of cross-border pollution<br>Prevention of contamination of soil, water and air |
| 6.1.7. | Delivery and acceptance of industrial, construction and hazardous waste will be done only on the basis of a written contract with persons having authorization, complex permit or registration document under Art. 35 and site for collection of waste with the appropriate code according to the ordinance for classification of waste, according to Art. 8, para. 1 WMA | During construction and installation works | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| 6.1.8. | Timely submittal of construction waste to companies holding the necessary documents in accordance with Art. 35 WMA for subsequent transportation and treatment / storage prior to utilization and / or disposal, sorting, recovery and / or disposal / construction waste site | During construction and installation works | Preventing contamination of adjacent areas; prevention of cross-border pollution |

| | | | |
|---|---|---|---|
| 6.1.9. | Preventing contamination of the site and adjacent areas with waste | During construction and installation works and site operation | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| 6.1.10. | Determination by Order of a person responsible for hazardous waste who is to exercise control over the formation, pre-storage and disposal of waste. His/her responsibilities will include record keeping on waste as defined under the Waste Management Act and regulations for its implementation, as well as provision of instructions and periodic training of personnel handling hazardous waste | During construction and installation works and site operation | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| 6.1.11. | planning and implementation of the necessary measures for prevention of pollution after closure of the site, as well as warehouses, areas and containers for waste treatment | Closing of site | Preventing contamination of adjacent areas; prevention of cross-border pollution |
| **6. 2. ACOUSTIC ENVIRONMENT. VIBRATIONS. ELECTROMAGNETIC FIELDS AND IONIZING RADIATION** | | | |
| 6.2.1 | Machinery and equipment is to meet the requirements of the Ordinance on the essential requirements and conformity assessment on noise emitted by machinery and equipment operating outdoors | During planning, operation and construction | Reduction of noise emissions of different technical resources in the environment |
| **7. SAFETY AND SECURITY OF LABOR** | | | |
| 7.1. | Performance of construction works is to comply with the instructions and safety measures provided in Ordinance No 2 of 06.11.2004 on Health and Safety at Work and HSCWA and instructions for safe operation in the preparation and maintenance of the site | During construction | Provision of safe working conditions |
| 7.2. | Placement of required signs and warnings on hazardous workplaces during reconstruction and operation in compliance with Ordinance No 4 for the signs and signals for occupational safety and fire protection | During planning and operation | Providing safe working conditions in order to reduce labour accidents. |

| | | | |
|---|---|---|---|
| 7.3. | construction works to be carried out with application of adequate measures for the prevention of accidents involving electricity, demolition, floods, heavy trucks and machinery | During planning, operation and construction | Providing safe working conditions in order to reduce labour accidents. |
| 7.4. | development and submittal of Fire Safety and Population Protection Plan for prevention and elimination of accidents at Mishka extraction site to RIEW Ruse in concert with the relevant territorial unit of the General Directorate | Prior to initiation of operation | Providing safe working conditions in order to reduce labour accidents. |
| **8. CULTURAL HERITAGE** | | | |
| 8.1. | Within seven days of discovery of a finding the nearest state or municipal museum must be notified and preservation of the finding in the form and state it has been found in must be ensured until its submittal to the competent authorities | During operation | Preservation of cultural heritage |
| **9. TRANSBOUNDARY IMPACTS** | | | |
| 9.1. | extraction works must be strictly confined within the geographical coordinates of the border points | During operation | Prevention of negative impacts resulting from implementation of the IP |
| 9.2. | Self-propelled barges (3 courses per working day for Mishka section) must use the regulated navigable channel of the Danube | During operation | Minimal noise levels reaching the Romanian territory |
| 9.3. | Marking of working areas between km 462.0 and km 459.4 and excavation installations in compliance with the Ordinance on the regime of navigation on the Danube. | During operation | Securing shipping area |
| 9.4. | Changes in the dimensions of the navigational routes by mining equipment, anchors and ropes of servicing vessels must not be allowed | During operation | safety |

## VII. Views and opinions of the public concerned, the authority competent for granting a resolution on the EIA and other specialized agencies as a result of the consultation

Pursuant to Art. 95, para. 1, para. 2 and para. 3 EPA and Art. 4 para. 2 and Art. 9, para. 2 and para. 2 of the Ordinance on the conditions and procedures for assessing the environmental impact (last. amend. and suppl. SG. 94 of 30.11.2012) the affected population has been notified through the mass media (Annex No 3) for the conducting of consultation from 19/03/2014 to 08/04/2014, incl. in connection with the terms of reference for the scope of the Evaluation Report on the environmental impact of IP for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region .

„Gravel and sand pits - Bulgaria" EAD sent letters of notification of the investment proposal to:

- Slivo pole Municipality
- Babovo Mayoralty
- Ryahovo Mayoralty
- Rousse Municipality
- Ministry of Health
- Executive Agency for Exploration and Maintenance of the Danube
- Danube region Basin Water Management - Pleven
- Coalition for Sustainable Development
- Museum of History - Rousse
- "Friendly Support" Foundation - Rousse
- Regional Forest Directorate - Rousse.

Based on prior consultation assignment scope of EIA report was prepared and consulted with MH, RIEW Ruse, Executive Agency for Exploration and Maintenance of the Danube, Slivo pole Municipality, Babovo Mayoralty and Ryahovo Mayoralty.

As a result of the conducted consultations, „Gravel and sand pits - Bulgaria" EAD undertook the following actions:

- Preparation of corrected assignment on the scope and contents of EIA Report;
- Assignment of the preparation of the EIA report to an independent team of experts with team leader.
- preparation of a CA report by experts meeting the requirements of Art. 31, para. 20 of the Biodiversity Act and Art. 9, para. 1 of the Ordinance on CA, with expertise in the following areas: Phytocoenology, Hydrobiology and Ornithology.

Appendix No 3 of the report contains copies of correspondence and statements of the parties concerned and Table VII-1 below shows the actions taken by *„Gravel and sand pits - Bulgaria" EAD for* the adoption of the opinions, recommendations and findings.

***Table VII.-1:***

| № | consultation (municipality/ department/ organization/other) | Expressed opinions / recommendations / comments etc. | Adopted/dismissed |
|---|---|---|---|
| 1. | consultations with the public held from 19.03.2014 to 04.08.2014 incl. – Notices published in the "24 Chasa" newspaper on 03.19.2014, and the "Trud" newspaper on 19.03.2014 | No objections or comments (oral, telephonic, or written ones); no interest in IP shown | - |
| 2. | Consultation with Danube region Basin Water Management - Pleven - Letter **ref. No 378/24.03.2014** | Letter with ref no 378/07.04.2014 regarding scope and contents of EIA report | Adopted and implemented |
| 3. | Consultation with the Executive Agency for Exploration and Maintenance of the Danube- **Letter ref. No 369/24.03.2014** | - | - |
| 4. | Consultation with the Museum of History, Nature Department, Ruse - **Letter ref. No 136/24.03.2014** | Opinion ref. No 169/04.04.2014 and No 168/04.04.2014 of the Nature and Archaeology Department | Adopted and implemented |
| 5. | Consultation with Ryahovo Municipality - Letter ref. No 53/25.03.2014 | - | - |
| 6. | Consultation with Babovo Municipality - Letter ref. No 16/24.03.2014. | - | - |
| 7. | Consultation with the Coalition for Sustainable Development, Sofia - Letter ref. No 014/21.03.2014 | - | - |
| 8. | Consultation with the Ministry of Health - Letter | Letter ref. No IP-00-2/22.04.2014 regarding the content of the Terms of | Adopted and |

| | | | |
|---|---|---|---|
| | ref. No IP-00-2/21.03.2014 | Reference for the scope and content of EIA report | implemented |
| 9. | Consultation with the Municipality of Ruse - Letter ref. No 30-423-1/24.03.2014 | - | - |
| 10. | Consultation with Slivo pole Municipality - Letter ref. No SP 1519/21.03.2014 | Opinion ref. No SP-1519/26.03.2014 stating that Slivo pole municipality has no objection to the implementation of the investment proposal | adopted |
| 11. | Consultation with "Friendly Support" Foundation, Rousse - Letter ref. No 04/24.03.2014 | Opinion ref. No 036 / 28.03.2014 recommending various options for carrying out of extraction works in order to protect the colony of herons and cormorants on Mishka Island | Adopted and implemented |
| 12. | Consultation with the Regional Forest Directorate - Rousse – Letter ref. No 940/23.04.2014 | Letter ref. No GF-88/19.05.2014 | - |
| 13. | Ministry of Environment and Waters | letter with ref. No OVOS-74/01.04.2014 as guidance on the next steps that the investor should take: preparation of terms of reference for the scope and content of the EIA report, consultation, preparation of EIA, as well as the requirements of the Convention on Environmental Impact Assessment in a Transboundary Context. | adopted |
| 14. | Danube River Basin Management Directorate with HQ in Pleven | Opinion with ref. no 378 / 30.08.2014 on the admissibility of the investment proposal | Adopted and implemented |
| 15. | Ministry of Environment and Climate Change - Romania | Letter with ref. No 6187 / RP / 23.01.2014 – expressing wish for participation in the EIA procedure | adopted |
| 16. | Ministry of Environment and Waters | Opinion ref. No OVOS-74 / 05.08.2014 on the contents of the terms of reference for the scope and content of EIA - additional information on the content of the EIA Report, CA Report and competencies | Adopted and implemented |

| | | | |
|---|---|---|---|
| | | of experts preparing reports | |
| 17. | Ministry of Health | Opinion with ref. No IP-00-2 / 04.08.2014 on the contents of the terms of reference for the scope and content of the EIA report - additional information on the content of the EIA report | Adopted and implemented |
| 18. | Associations and foundations, members of the Coalition for Sustainable Development | Statement with ref. no OVOS-74/08.10.2014 of MEW | adopted |
| 19. | RIEW - Rousse | Opinion with ref. no A03308/29.07.2014 on the contents of the terms of reference for the scope and content of EIA - additional instructions on the content of the EIA Report, and CA Report | Adopted and implemented |
| 20. | Ministry of Environment and Climate Change - Romania | Letter with ref. no 4072/AK/26.08.2014 on the contents of the terms of reference for the scope and content of EIA - additional instructions on the content of the EIA Report, and CA Report and corrected terms of reference | Adopted and implemented |
| 21. | Ministry of Environment and Waters | Statement with ref. no OVOS-61/01.12.2015 on the evaluation of the quality of the EIA and CA report - positive evaluations and additional instructions for correction of EIAReport and all appendices thereto | Adopted and implemented |

## VIII. Conclusion

The EIA report addressing the issues of the implementation of the investment proposal for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region implements the precautionary principle for protection of the environment and protected areas. The requirements of the Ordinance on the conditions and procedures for assessing the environmental impact and the Environmental Protection Act have been met. The views, opinions and recommendations of interested individuals and legal entities, and inhabitants of nearby settlements have been taken into account. The report makes specific recommendations for minimum impact on the environment and human settlements in the region of extraction. There are specific measures for the conservation of threatened species in the area of IP.

Based on the Investment Proposal of „Gravel and sand pits - Bulgaria" EAD for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region within the agreed area, additional inquiries about the area and the estimated impact of the sites during their operation on the components of the environment and human settlements in the area, the team of authors recommends that the Supreme Expert Environmental Council at the Ministry ALLOW implementation of the investment proposal for extraction and primary processing of sand and gravel from the area.

## IX. Description of difficulties (technical deficiencies or lack of data) encountered during collection of information for preparation of the EIA report

*We did not encounter any technical difficulties during preparation of the current EIA Report* on IP for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region .

We had sufficient information during preparation of the report and we did not encounter any difficulties in its collection from the Assignor, stakeholders or competent authorities.

## SOURCES

1) Biserkov, V. et al. (ed.), 2011. Red Book of Bulgaria. Volume II - Animals. BAS, MEW, Sofia

2) Bl. Blagoev et al., 2007 Report for the 2007 exploration work on the alluvial deposits in the bed of the river Danube, in the sections "Kama - Rousse " (km 512.0 – km 508.0) and "Mishka - Vetovo" (km .462.0 - km.459.5), Rousse region, with calculation of stocks by 8.07.2007.

3) Bondev, I., 1991. The vegetation of Bulgaria. Map in scale 1: 600 000 with explanatory text, Univ. ed. "St. Kliment Ohridski ", Sofia, p. 183.

4) Bondev, I., 1997. Geo-botanical zoning. In: Geography of Bulgaria. 1997. Acad. Ed. "Prof. M. Drinov".

5) Bonchev, E., 1957. Geology of Bulgaria. S., Narodna prosveta

6) Gruev, B., B. Kuzmanov, 1994. General biogeography, Univ. ed. "St. Kliment Ohridski ", Sofia, p 498.

7) Directive 2009/147 / EEC on the conservation of wild birds.

8) Directive 92/43 on the Conservation of Natural Habitats and of Wild Flora and Fauna.

9) Health 2014, NSI, NCPHA, MH;

10) Kostadinova, I., M. Gramatikov (corr. Ed.). 2007. Important Bird Areas in Bulgaria and Natura 2000 BSPB, 11, Sofia, 639 p. (in Bulgarian and English Language).

11) Stefan Modev, 2009. Engineering, hydrological and hydraulic studies for extraction of aggregates from the Danube near Mishka Island, Sofia;

12) Natura 2000 Standard data form for Protected Area "Kalimok - Brushlen" (BG0000377), Ministry of Environment and Water, p. 19.

13) Natura 2000 Standard data form for Protected Area "Complex Kalimok" (BG0002030), Ministry of Environment and Water, p. 15.

14) Nedyalkov, P. et al 2013. EIA Report on IP for gravel and sand extraction from alluvial sediments in the bed of the Danube river, Mishka section (462.0 km. – 459.4 km.), in the area of Babovo village, Slivo pole municipality, Rousse region.

15) Nikolov, T., 1969. Stratigraphy of the Lower Cretaceous of northeastern Bulgaria. - Izv.Geol.inst., Ser. stratigr. and Lithol., 18, 31-71;

16) Nikolov, T., N.Ruskova. 1987. Cretaceous system - Lower Cretaceous series. - In: Geological conditions for crude oil and gas reserves in Northeast Bulgaria .S., Tehnika, 75-91;

17) Petrov, P., 1997. Geography of Bulgaria

18) Plamen Lenov - chief expert in EEA-regional laboratory - Veliko Tarnovo – Assessment of the ecological status of surface waters in the Bulgarian - Romanian border region of the Danube;

19) RBMP 2010-2015, Danube Region;

20) "Groundwater Abstraction Plan" by "Ecology and Geology" Ltd.

21) RIEW Ruse Report on the State of Environment 2012

22) RIEW Ruse Report on the State of Environment 2013

23) EC Guidance on undertaking new non-energy extractive activities in accordance with Natura 2000

http://ec.europa.eu/environment/nature/natura2000/management/docs/neei_report_bg.pdf

24) Flora of the People's Republic of Bulgaria, T. I-X, 1963-1995. Ed. BAS S.

25) Ferguson-Lees, J.; Christie, D. (2001). Raptors of the World. London: Christopher Helm.ISBN0-7136-8026-1.

26) LEGE nr.137 din 29 decembrie 1995 Legea protecţiei mediului

27) ORDONANTA DE URGENTANr. 236 din 24 noiembrie 2000privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei si faunei salbatice, ACT EMIS DE: GUVERNUL ROMANIEI, PUBLICAT IN: MONITORUL OFICIAL NR. 625 din 4 decembrie 2000

28) Murariu D,The state of the mammals (Mammalia) along the Danube, between Garla mare and Calarash (Romania),Travaux du Muséum National d'Histoire Naturelle«Grigore Antipa», Vol. XLVIII, pp. 427–445, 30 Dec.2005

29) Turun Sanomat: Merikotkat oppineet syömään aikuisiakin merimetsoja(in Finnish). Retrieved3 February2012

**Legal Acts**

1) Environmental Protection Act, Prom. SG. 91 of 25 September 2002, last amend. SG 61 of 11.08.2015;

2) Water Act, effective from 28.01.2000, Prom. SG. 67 / 27.07.1999, last. amend. SG 61 of 11.08.2015;

3) Protection against the Harmful Effects of Chemical Substances and Mixtures Act prom. SG 10 of 4.02.2000, last amend. SG 61 of 25.07.2014;

4) Protection against Environmental Noise, effective from 01.01.2006, Prom. SG. 74 of 13.09.2005, the last recorded. amend. SG. 98 on 28.11.2014;

5) Protected Areas Act, promulgated. SG. issue133 from 11 November 1998, last amend. SG.61 from 11 August 2015;

6) Health Act, promulgated. SG 70 of 10.08.2004, last. Suppl. SG 80 of 16.10.2015;

7) Healthy and Safe Working Conditions Act, prom. SG 124 of 23.12.1997, Last. amend. and supplemented. SG 79 of 13.10.2015;

8) Cadastre and Property Register Act, promulgated. SG. 34 of 25, effective from 01.01.2001, last. amend. SG. 61 of 11.08.2015;

9) Concessions Act, promulgated SG 36 of 02.05.2006, Last. amend. SG 107 of 24.12.2014;

10) Cultural Heritage Act, effective from 10.04.2009, promulgated SG 19 of 13.03.2009, last. amend. SG. 98 of 28.11.2014;

11) Environmental Protection Act, promulgated. SG 91 of 25.09.2002, last. amend. and supplemented. SG 62 of 14.08.2015;

12) Mineral Resources Act, promulgated SG 23 of 12.03.1999, the last recorded. amend. and supplemented. SG 56 of 24.07.2015;

13) Soil Protection Act, promulgated SG 89 of 06.11.2007, last. amend. SG. 98 on 28.11.2014;

14) Law on ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal, prom. SG. 8 of 26.01.1996;

15) Waste Management Act, Prom. SG. 53 of 13.07.2012, effective from 13.07.2012, the last recorded. amend. SG 98 of 28.11.2014;

16) Spatial Planning Act, prom. SG. 1 of 2.01.2001, effective from 31.03.2001, last. amend. and supplemented. SG79 of 13.10.2015;

17) Clean Air Act, effective from 29.06.1996, prom. SG 45 of 28.05.1996, the last recorded. amend. SG. 98 of 28.11.2014;

18) Ordinance on the conditions and procedures for assessing the environmental impact, prom. SG. 25 of 18.03.2003, the last recorded. amend. SG. 94 of 30.11.2012, effective from 30.11.2012;

19) Ordinance on Conditions and Procedures for Conformity Assessment of Plans, Programs, Projects and Investment Proposals in regard to the Object and Purpose of Conservation of Protected Areas, effective from 11.09.2007, adopted by Decree No 201 of 31.08.2007, promulgated. SG. 73 of 11.09.2007, last. amend. SG. 94 of 30.11.2012;

20) Ordinance on Management of construction waste and use of recycled building materials (adopted by Decree 277/05.11.2012, prom. SG 89/13.11.2012, effective from 13.11.2012;

21) Ordinance on treatment and transportation of industrial and hazardous wastes Prom. SG. 29 of 30.03.1999;

22) Ordinance on packaging and packaging waste prom. SG 85/06.11.2012, amended. and suppl., SG. 76 / 30.08.2013

23) Ordinance on the requirements and conformity assessment of noise emitted by machinery and equipment working outdoors, effective from 11.02.2005, adopted by Decree No 22 of 29.01.2004, promulgated. SG. 11 of 10.02.2004, last. amend. SG. 37 of 8.05.2007;

24) Ordinance No 1 of 10.10.2007 on the study, use and protection of groundwater prom. SG 87 of 30.10.2007, effective from 30.10.2007, last. amend. and supplemented. SG 90 of 31.10.2014.

25) Ordinance No 2 / 08.06.2011 on issuing permits for discharge of wastewater into water bodies and setting individual emission limits for point sources of pollution prom. SG. 47 of 21.06.2011, effective from 21.06.2011;

26) Ordinance No H-4 / 14.09.2012 on the characterization of surface water prom. SG 22 / 05.03.2013

27) Ordinance 1 of 11.04.2011 on monitoring of water prom. SG 34 of 29.04.2011, Last. amend. and supplemented. SG 60 of 22.07.2014;

28) Ordinance No 9 of 16.03.2001 on the quality of water intended for drinking purposes prom. SG 30 of 28.03.2001, last. amend. and supplemented. SG 102 of 12.12.2014.

29) Ordinance No 7 of 14.11.2000 on the terms and conditions of discharge of industrial water in collecting systems of settlements prom. SG. 98 on 1.12.2000

30) Ordinance No 3, SG 40/2005 on the protection of health and safety of workers from the risks related to exposure to vibration;

31) Ordinance No 4 of 27 December 2006 on the limiting of harmful noise by planned sound-proofing of buildings and rules and standards applied during construction of buildings in terms of attenuation of noise emitted during construction, MRDUW, MH, MIA and MEW, SG. 6 of 2007

32) Ordinance No 6 of 26 June 2006 on indicators of environmental noise, taking into account the degree of discomfort in different parts of the day, limit values of indicators of environmental noise, evaluation methods of the parameters of the noise and the harmful effects of noise on human health (SG 58/18.07.2006) by MH and MEW;

33) Ordinance No 12 on standards for sulfur dioxide, nitrogen dioxide, particulate matter, lead, benzene, carbon monoxide and ozone in ambient air, SG. 58/2010

34) Ordinance No 1 of 04.06.2014 on the procedures and forms for provision of information about waste and procedures for keeping of public registers;

35) Ordinance No 2 of 23.07.2014 on the classification of waste;

36) Ordinance No 7 on the requirements for location of facilities for waste treatment (issued by the Minister of Environment and Water, the Minister of Regional Development and Public Works, Minister of Agriculture and Forestry and the Minister of Health, promulgated SG. 81 of 17.09.2004;

37) Ordinance on electronic waste, adopted by Decree No 256 of 13.11.2013, prom. SG. 100 of 19.11.2013, effective from 01.01.2014;

38) Ordinance on batteries and accumulators and spent batteries and accumulators, adopted by Decree no 351 of 27.12.2012, prom. SG 2 of 01.08.2013, last Amend. and supplemented. SG 66 of 28.08.2015;

39) Ordinance on waste oils and petroleum products, adopted by Decree No 352 of 27.12.2012, prom. SG 2 of 08.01.2013.