



INTERMEDIATE ENVIRONMENTAL MONITORING REPORT DURING WORKS n° 1

ČORTANOVCI – SUMMARY OF RESULTS

Introduction

The main objective of this environmental report during works is to address the base values of the main parameters identified during the elaborations of the EMRbW. These values were established during the Inception Phase and will serve as the base for evaluation of effects of river training and dredging works to the environment.

According to the ToR, one Monitoring report must be prepared every 3 months from the start of the construction works at each critical sector till the end of works (at critical sectors on which dredging activities are performed) and until the start of the Defects Notification Period (for critical sectors on which river training structures have been constructed), identifying all changes in environmental parameters compared to the base values identified in the Environmental Monitoring Report Before Works, also arguing the reasons for these changes, as well as their long-term impact to the integrity of the affected areas.

Works have begun in Čortanovci on April 23th 2019 and they have not been finished by the end of July 2019, so this report is necessary in order to identify the current status of environment after three months.

The Environmental Monitoring Report n° 1 covers the following fields:

- Hydromorphology
- Sediment and water quality
- Waste
- Biology
 - Phytoplankton
 - Macrozoobenthos
 - Vegetation (*Limosella aquatica*)
 - Birds (*Charadrius dubius* and *Riparia riparia*)
 - Fish (*Acipenser ruthenus*)
- Development of vegetation and riparian areas
- Protected Areas and Ecological Networks

The table below shows the works to be carried out in the critical sector Čortanovci and their exact location according to the Final Design:

N°	Name of critical sector	Type of works	Chainage from	to
	Čortanovci	Sill 22.1	1237+700	
		Sill 22.2	1237+150	
		Sill 22.3a	1236+150	
		Sill 22.3b	1236+000	
		Dredging	1240+300	1239+350

The report shows the status of environment once completed three months of works, according to ToR statements.



Description of work site

Čortanovci is the only critical sector where works execution is in progress in this moment. Construction works are being performed on two locations Sill 22.2 and sill 22.1.

Construction works were started at the downstream location (sill 22-2), and just after approximately three weeks (May 15th they were started at the upstream location, sill 22.1.

Floating barge with construction material is used as a temporary storage for solid material like steel armature (reinforcement bar) and new rolls of geotextile are into the foil Floating office.



Status of the works after 3 months (April 2019 to July 2019)

The construction Works in the sector 22 (Čortanovci) are not completed. The table below shows the current status of each planned activity per structure.

Sector 22 (Čortanovci)	Sill 22.1	Sill 22.2	Sill 22.3a	Sill 22.3b
Geotextile	Completed	Completed	Not started	Not started
Base layer (phase I)	Completed	Completed	Not started	Not started
Base layer (phase II)	Completed	Completed	Not started	Not started
Profiling the base layer	Completed	Completed	Not started	Not started
Construction of the body	Completed	Not started	Not started	Not started
Profiling of body	On going	Not started	Not started	Not started



Project context

River stretch Čortanovci is located downstream from gauging station Novi Sad.



Hydromorphology

The main characteristic of the river in this sector is its width, between 350 and near 600 meters. In this sector the banks are unprotected and afforested. The Danube in this stretch has a braiding tendency with three channels separated by an island on the right side of the river and a mid-channel sand bar.

It is characterized with typical hourglass shape, with approximately 350m width at the narrowest section. Upstream part is approximately 600m wide and downstream 840m. Whole stretch is 11.6km long, but part of stretch with above depicted contraction is just 3.4km long.

This contraction locally affects flow conditions and consequently shapes river bed morphology. Actually, river current upstream of contraction, slows down due to increased flow resistance, water level rises and kinetic energy of river flow transforms into potential energy on this location. Such dynamics is suitable for sediment deposition. As consequence, has been generated sandbar along the left river bank (km1240), 1km upstream of river contraction (km1239).

Downstream of contraction, flow conditions are totally different. Increased potential energy enables current acceleration and consequence is increased sediment transport capability. Reflection of increased sediment transport capability is scour generated on narrowest part of stretch with depth higher than 10m. Water, enriched with excavated material (from scour) continuous flow and downstream encounters expansion of river bed. Under such circumstances, river current slows down and bed load are falling down and deposits. Sandbar, downstream of contraction is consequence of local river dynamics. As evidence for allegations outlined here, may be used gradual decrease of river depth from contraction to the downstream sandbar.

According to the results of the bathymetric studied carried out during the last summer (2018), additional volumes of sediment has been partly deposited in the right bank and partly protrudes into the fairway nearby the upstream end causing navigation problems. The sediment planned for dredging works in the left side of the fairway have been removed considerably by flowing water.



Water quality monitoring

Detailed Monitoring plan for both water and sediment quality was created in accordance with monitoring plan from the Inception Report but also in accordance with currently valid dynamic plan and prediction that working period are going to be longer than it was planned.

Regular water quality monitoring is performed every third month (four times per year), while additional monitoring is performed more frequently. During additional monitoring campaigns parameters like temperature, TSS and mineral oil are being determined. Extra monitoring of these parameters is not predicted within the Inception Report for the locations where the construction is performed, only where dredging and sediment disposal is performed. However, the SEM team concluded that additional monitoring could be useful for screening the situation during works execution in Čortanovci.

Until now, one regular monitoring campaign was carried out on the section Čortanovci, in mid-August (16/07/2019). During this campaign, sampling was performed at the position located about 100 m downstream from the works. Sampling and further analyses were performed by accredited laboratory Anahem from Belgrade.

In the meantime, four water samples in two campaigns were taken for additional screening analyses. Samples were taken downstream of the construction sites on 13/05/2019 (just downstream second sill) and upstream and downstream of the construction sites, as well as between them, on 16/07/2019 (one upstream the first sill, one downstream the second one, and one between sills).

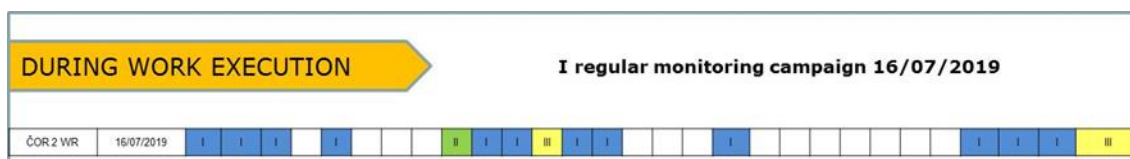
Sediment monitoring

Until now one sampling campaign was carried out in Čortanovci, in the same time as water samples were taken in the mid-August 2019.

Additional sampling and testing of sediment quality during the construction works is not proposed with the Inception Reports, only for the dredging and sediment disposal activities.

Review of water and sediment quality results during forth campaign

Results obtained during the **first regular sampling campaign** carried out on 16/07/2019 show that quality of water sample was not quite different than quality of the samples analysed in previous performed baseline obtaining campaign (other official campaigns are not performed on this location on the Danube River). The results of the physico-chemical analyzes show that the quality of the River Danube at location Čortanovci - downstream of the work site predominantly corresponds to the quality of water I class, except for oxygenated soluble parameters and total nitrogen, that correspond to quality water of the II class and for the ammonium ion parameter that corresponds to the quality of water of the III class. In terms of the microbiological classification of the quality of this sample, it can be concluded that the Danube waters at the site of Čortanovci belong to the class I for intestinal enterococci, total coliform and coliform bacteria of fecal origin and in the class IV for aerobic heterotrophs. No one analyzed priority and priority hazardous substances were detected within the taken sample.



During additional sampling and analyses of water from Čortanovci sector, performed on 13/05/2019 and 16/07/2019, quality of parameters temperature, suspended matters and mineral oils of all 11 samples corresponds to the class I of water quality.



SAMPLING POINTS AND OBJECTS AT THE SITE	RESULTS OF WATER QUALITY IN DIFFERENT CAMPAIGNS					
	13/05/2019			16/07/2019		
	temperature (°C) / suspended matters (mg/l) / mineral oils (mg/l)					
Sampling point 1				22.5	14	<0.1
Sill 22.1						
Sampling point 2				22.5	6	<0.1
Sill 22.2						
Sampling point 3	14	12	<0.1	24.5	14	<0.1
LEGEND:	I CLASS	II CLASS	III CLASS	IV CLASS	V CLASS	

Results of the sediment quality obtained during regular monitoring campaign performed on 16/07/2019 show that all parameters values are below target values and most of them are not even detected.

Waste

During this period regular inspections have been carried out with the purpose of detecting uncontrolled discharges of waste or pollution incidents. The monitoring has been done by visual inspection of vessels and water analysis.

Conclusions show that all the established preventive measures are been followed by WKSC, so that during this period there has been no incident related to discharges or waste

Phytoplankton

This is typical phytoplankton community structure for this season, characterized by low intermediate primary production. Community structure was uniform along depth gradient and among localities

Macrozoobenthos

Mussels fauna were represented by three genera and four (five?) species. Due to decreased water level, right river bank is covered by thousands of dead *Corbiculae* (average dimensions of 2,5 x 3 cm) and *Dreissena* (average dimensions of 1,5 x 3 cm) individuals (mostly *polymorpha* species, but there are probably also some *rostriformis* species). As water is in lower level for one to three meters (depends on mussel habitat), mussels remained on the bank without water and consequently died. Genus *Unio* was represented by two species - Swollen river mussel (*Unio tumidus*) has been recorded on the bank by around ten individuals, and Painter's mussel (*Unio pictorum*) by round 5-7 individuals. *Unio* individuals were of dimensions from 2 x 4,5 cm to 3 x 8 cm.

Sector	<i>Unio</i> sp.	Other species
Sector 22 Čortanovci	<i>Unio tumidus</i> <i>Unio pictorum</i>	<i>Corbicula</i> sp <i>Dreissena polymorpha</i> <i>Dreissena rostriformis</i> (?)



Birds

Bird populations are represented by: Grey heron (*Ardea cinerea*), several individuals on the branches in the river sleeve and on the sand bar; Great cormorant (*Phalacrocorax carbo*), several individuals on the trunks in the water and in the river sleeve, Great White Egret (*Ardea alba*), several individuals on the trunks in the river sleeve and on the sand bar; White stork (*Ciconia ciconia*), several individuals on the bank and on the sand bar; Mallard (*Anas platyrhynchos*), one pair on the left bank and in the flight; European herring gull (*Larus argentatus*), colony from 30-40 individuals on the sand bar; Common king fisher (*Alcedo atthis*), one individual in fast flight.

Not any individual of migratory birds *Charadrius dubius* and *Riparia riparia* has been found.

Sector	<i>Charadrius dubius</i>	<i>Riparia riparia</i>	Other species
Sector 22 Čortanovci	--	--	<i>Phalacrocorax carbo</i> <i>Anas platyrhynchos</i> <i>Ardea cinerea</i> <i>Ardea alba</i> <i>Ciconia ciconia</i> <i>Alcedo atthis</i> <i>Larus argentatus</i>

Fishes

No any individual of Sterlet, *Acipenser ruthenus*, has been found. Other species are represented by three species. Table below presents found fishes species in sector Cortanovci.

Sectors	<i>Acipenser ruthenus</i>	Other species
Sector 22 Čortanovci	-	<i>Abramis sapa</i> (9) <i>Rutilus rutilus</i> (1) <i>Hypophthalmichthys</i> sp. (1)

Macrovegetation

Woody vegetation and shrubs have high species diversity and dense populations. Land and climatic conditions are very favourable for macrovegetation growth.

Sector	Species: <i>Limosella aquatica</i>	Other species
Sector 22 Čortanovci	No results	<i>Populus euroamericana</i> <i>Populus alba</i> <i>Salix alba</i> <i>Acer campestre</i> <i>Quercus pubescens</i> <i>Morus alba</i> <i>Tilia</i> sp. <i>Fraxinus</i> sp.



		<p><i>Ulmus</i> sp. <i>Crataegus monogyna</i> <i>Amorpha fruticosa</i> <i>Rubus</i> sp.</p>
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Plants

Not any individual of species *Limosella aquatica* and *Lindernia palustris* have been found.

Sector	Species: <i>Limosella aquatica</i> Species: <i>Lindernia palustris</i>
Sector 22 Čortanovci	No results

Development of vegetation

Herbaceous plants have high species diversity are represented by species from families *Adoxaceae*, *Poaceae*, *Plantaginaceae*, *Urticaceae*, *Araliaceae*, *Papaveraceae*, *Lamiaceae*, *Boraginaceae*, *Polygonaceae*, *Fabaceae*, *Apiaceae*, *Ranunculaceae*, *Typhaceae* and *Asteraceae*.

Riparian areas

Water level is in decreasing. From group of invertebrates, Mussels, Snails and Insects were recorded. From Vertebrates, one individual of Dice snake (*Natrix tessellata*) and two species of Frogs were recorded, and one dead individual of European mole (*Talpa europea*).

Conclusion: Vegetation has rich species diversity in qualitative and quantitative sense. Birds are occurred by several common genera and species, some of them with larger colonies on the sand bar. Invertebrates are represented by Snails and Insects (families **Papilionidae** – *Papilio machaon*, **Zygaenidae** – *Zygaena* sp., **Erebidae** – *Amata phegea*, **Pieridae** – *Pieris rapae*, *Pieris brassicae*, *Colias croceus*, **Coccinellidae** – *Coccinella septempunctata*, **Staphylinidae** – *Ocypus olens*, **Vespidae** – *Vespula vulgaris*, *Vespa crabro*, **Tabanidae** – *Tabanus* sp., **Cerambycidae** – *Cerambyx cerdo*, **Lucanidae** – *Dorcus parallelipedus*, **Formicidae** – *Formica rufa*, **Pentatomidae** – *Graphosoma lineatum*, *Palomena prasina*, **Aeshnidae** – *Aeshna cyanea*, **Cordulegastridae** – *Cordulegaster* sp., **Calopterygidae** – *Calopteryx splendens*, **Libellulidae** – *Sympetrum sanguineum*, *Orthetrum* sp. and **Gerridae** – *Gerris lacustris*). Amphibians and reptiles are represented by Dice snake (*Natrix tessellata*) and *Anura* (*Rana* sp./*Pelophylax* and *Hyla arborea*). Mammalia has been represented by *Talpa europea*.

Vegetation and animals are not endangered in no way, except variable water level which can influence on mussels and their habitats

Protected areas

During this period, negative effect over the Special Nature Reserve “Kovilj-Petrovaradin marshes”, due to the activities of this project, have not been observed.

During this period, negative effect over the National Park of “Fruška Gora” due to the activities of this project have not been observed.

Ecological network

One area, which is near to work zone, is mentioned in Decree on Ecological Network (“Official Gazette of RS”, No. 102/2010). This is “Kovilj-Petrovaradin marshes”, on left river bank. This area



is not affected by the works because all planned activities are going close to the right river bank or in the river closer to the left bank.

Previous and ongoing activities on the critical sector Čortanovci does not show negative effect on the mentioned area.

Summary of results

After field surveys during November 2017, March and August 2018, May, June and July 2019 the following target species have been found **in sector Cortanovci**

Period	Macrozoobenthos <i>Unio</i> sp.	Fishes <i>Acipenser ruthenus</i>	Plants <i>Limosella aquatica</i>	Plants <i>Lindernia palustris</i>	Birds <i>Riparia riparia</i>	Birds <i>Charadrius dubius</i>
November 2017	-	-	Two individuals	-	-	-
March 2018	-	-	-	-	-	-
August 2018	<i>U. pictorum</i> (several) <i>U. tumidus</i> (several)	-	-	-	-	-
May 2019	<i>U. tumidus</i> (1)	-	-	-	-	-
June 2019	<i>U. tumidus</i> (1)	-	-	-	-	-
July 2019	<i>U. tumidus</i> (~10) <i>U. pictorum</i> (5-7)	-	-	-	-	-

Summary of main impacts in the sector during this period

In this sector is defined the construction of some river training structures and dredging activities.

During these three months activities have been focused on the construction of sills 22.2 and 22.1. The monitoring activities during this period has been focused on determination of the potential effects on biological parameters and water and sediments parameter, due to the fact that the effects on the hydromorphology would be analysed once the works will have been completed.

According to the data explained in precedent sections, several monitoring have been executed during this months, the last of them after complete three months since the beginning of works in Čortanovci. The obtained results have been compared with data included in Environmental Monitoring Report before Works.

Regarding water and sediments, after this first three months it is possible to conclude that there are no significant effects over these parameters. The obtained results during field surveys in July are significantly similar to the previous ones. This can be interpreted as the works are not affecting the quality of water and sediments in the vicinity of critical sector of Čortanovci.

From the point of view of biology, the results show that the nature is not been affected by the works.

Bearing in mind that works are being executed from the water, the riparian vegetation existing in the river banks are not suffering any impact except a little dust deposited on leaves. This impact cannot be avoided because mainly depends on wind direction. However, it is not significant and the general status of riparian habitat remains in good conditions.



None of individuals of protected species of plants have been affected during these months and wildlife seems not to be impressed by the presence of machinery and workers. Protected species of birds have not been detected in Čortanovci during the field surveys.

Protective and corrective measures

The following mitigation measures have been carried out during these months to reduce or to avoid the described adverse impacts resulting from the proposed project activities:

- Confirm the absence of the river mussel (*Unio* sp.) in the vicinity of the working area.
- Perform monitoring of spills and suspended concentration during the execution of the works. If exceedance of the critical concentration is observed the work intensity is to be reduced;
- Monitor the incidence of works over the vegetation surrounding the working area
- Monitor the variations, if any, of wildlife population around the working areas, focused on the main species mentioned in the EIA.

Conclusions & Recommendations

Works that are been executed currently in critical sector of Čortanovci are following the methods and recommendations regarding environment protection included in EIA report and official decision. Additionally, WKSC is accomplished the environmental measures included in the tender specifications and taking into consideration conclusions of Inception Report. The environmental monitoring begun at the same moment that the works and has been considered one of the most important elements of the project. Thank to this, the measures implemented by WKSC and the continuous monitoring are avoiding negative effects over the nature.

The main recommendation is to continue with the strong and continuous monitoring until the end of works in this sector. If any negative effect would appear, the environmental team should be immediately advised in order to take the most adequate corrective measures.