



INTERMEDIATE ENVIRONMENTAL MONITORING REPORT AFTER WORKS

ARANKINA ADA – SUMMARY OF RESULTS

Introduction

The main objective of this environmental report after 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 works to the environment.

According to the ToR, one Monitoring report must be prepared until 3 months after execution of dredging works (for critical sectors with only dredging works). 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 began in Arankina ada on December 21st 2020 and were completed 26th April 2021, So that, this report has the purpose of analyse the status of environment once completed three months after the dredging activities.

The Environmental Monitoring Report 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 carried out in the critical sector Arankina ada and their exact location according to the Final Design:

Nº	Name of critical sector	Type of works	Chainage from	to
	Arankina ada	Dredging	1247+000	1244+800

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

Description of work site

Dredging works are completed.

Status of the works after 3 months

As works ended last April 2021, there is not any activity associated to the project in this sector.



Project context

The stretch Arankina ada has been located between the gauging stations Novi Sad, Titel and Zemun, nearer to Novi Sad. Titel is a referent gauging station for the Tisza river, and it is located in the vicinity of the Tisa Danube confluence.



Arankina ada stretch is one of the typical Danube stretches with several interconnected isles arranged in a row along with the river current. The most downstream river island name (Arankina Ada) named the whole stretch. The stretch morphological development begins after several sharp bends in Novi Sad's zone when the river current slows down and creates the circumstances for bedload deposition.

The consequent river islands are located in the middle of the river flow closer to the left riverbank, except the last one (Arankina Ada), which splits the river current into two equivalent river branches. Even water depths in the branches are similar, around 7m below LNL. Accordingly, the capacities in terms of the bedload and water volume discharges are similar too.

The survey made in July 2021 shows that the navigation channel formed by the dredging works permanently maintain width and depth for the navigational channel. Three months after the work completion, the width available for navigation between km1246+050 and km 1245+850 is severe narrowed. The navigational channel contraction on the appointed section is about 20m. The critical contour line is 69maAs (cyan), separating 3m water depth related to the Low Navigational Levels (LNL).

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.



During the works execution phase, a total of one regular monitoring campaign was conducted (February, 26/02/2021).

During this regular campaign, sampling was performed at a position located about 100 m downstream of the sedimentation works, at three different depths (1,0; 2,5; 5,0 m). Sampling and further analysis was performed by the accredited laboratory Anahem from Belgrade.

In the meantime, 9 water samples in 9 campaigns were taken for additional analyses during the works at Arankina Ada. Samples were taken downstream from the deposit site.

After works execution is finished, in phase of monitoring state on the location after that, until now, one campaign and analysis of the Danube water has been carried out at the Arankina Ada location, where the works have been completed, in accordance with the initial Monitoring Plan, but also the Terms of Reference. Sampling was performed downstream from the place of disposal, on 07/07/2021, and a regular analysis was performed with the entire range of parameters.

Sediment monitoring

In the phase of works execution, a total of one sampling campaign was conducted at the location Arankina Ada, at the same time when water samples were taken on 26/02/2020.

After works execution is finished, in phase of monitoring state on the location after that, a campaign of sampling and analysis of sediments has been carried out so far, in accordance with the initial Monitoring Plan, but also the Terms of Reference. Sampling was performed downstream from the place of sediment disposal at the location Arankina Ada, on 07/07/2021.

Review of water and sediment quality results

The results obtained during the **first regular sampling campaign carried out after the completion of works at Arankina Ada** on 07/07/2021, show that the quality of water samples of the Danube, taken downstream of the sedimentation site, was not different from the quality of the samples analyzed in previous campaigns, both within this Project (reference values) and official campaigns.

The results of physical and chemical analyzes show that the water quality of the Danube at the Arankina Ada location predominantly corresponds to the quality of class I waters, except for the parameters dissolved oxygen, ammonia and nitrites which correspond to class II water quality. BOD belong to class III.

Regarding the microbiological classification of the quality of this sample, it can be concluded that the waters of the Danube at the location of Arankina Ada, belong to class I for intestinal enterococci; total coliform bacteria correspond to class II; coliform bacteria of fecal origin to class III, while aerobic heterotrophs correspond to class IV surface waters.



During the additional sampling and analysis of water at the Arankina Ada location, during and after the construction phase, 9 campaigns have been carried out so far and 9 samples have been taken to determine the quality of water temperature parameters, suspended solids and mineral oils. The value of the results corresponds to class I water quality for all three parameters.



ARANKINA ADA																					
SAMPLING POINTS	RESULTS OF WATER QUALITY IN DIFFERENT CAMPAIGNS																				
	15.12.2020.	20.12.2020.	09.01.2021.		18.01.2021.		26.02.2021.		05.03.2021.		16.03.2021.										
	temperature (°C) / suspended matters (mg/l) / mineral oils (mg/l)																				
Sampling point 1 (upstream)																					
Sampling point 2 (downstream)	5,5	12	<0,1	7	10	<0,1	6,9	12	<0,1	4,2	16	<0,1	7,1	18	<0,1	6,2	26	<0,1	6,4	20	<0,1
LEGEND:	I CLASS II CLASS III CLASS IV CLASS V CLASS																				

The results of testing the values of sediment quality parameters obtained during the regular monitoring campaigns, **in the phase after the completion of works**, performed on 07/07/2021 at the site Arankina Ada, show that the values of all tested parameters are below the prescribed limit values, and most of them are not detected. That means it is at the level of the natural background. Only exception is zinc which here measured concentration is higher than targeted value but much lower than defined maximum allowed concentration.

Waste

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

Phytoplankton

This is typical phytoplankton community structure for this season. Community structure was uniform along depth gradient and among localities.

Macrozoobenthos

Water level is high, and water entered very deep into the habitat, around 10 m, in a spatial-length sense, in comparison with situations in habitat in previous years. Riverbank does not "exist", habitat is flooded and extremely wet, with water which cover herbaceous plants, including species from Poaceae. Because of that, mussels were not visible, but only some individuals which remained on the bank from some previous high water level. Three mussel species from three genera were found. Several individuals of Asian clam (*Corbicula fluminea*) were recorded on the bank, as well as Painter's mussel (*Unio pictorum*). In the Karlovački sleeve one individual of Chinese pond mussel (*Sinanodonta woodiana*) was recorded. Contrary of this, in the river sediment on sampling sites upstream and downstream of the work zone were no mussels.

Sector	<i>Unio sp.</i>	<i>Other species</i>
Sector 21 Arankina ada	<i>Unio pictorum</i>	<i>Corbicula fluminea</i> <i>Sinanodonta woodiana</i>

Birds

Bird population consisted of Mallard (*Anas platyrhynchos*), which was dominant species in number. European herring gull (*Larus argentatus*) was primarily close to the left riverbank. Barn swallow (*Hirundo rustica*) was in fast flight over the water and close to the right riverbank, dominantly as males. Several individuals of Great tit (*Parus major*) were recorded in the forest trees on the bank and by sound.



Sector	<i>Charadrius dubius</i>	<i>Riparia riparia</i>	Other species
Sector 21 Arankina ada	--	--	<i>Anas platyrhynchos</i> <i>Larus argentatus</i> <i>Parus major</i> <i>Hirundo rustica</i>

Fishes

In the standing nets three fish species from three genera, with 4 individuals, has been caught. In pulling the net no one individual of fish has been caught. In electrofishing 63 individuals from 14 genera has been caught..

.Sectors	<i>Acipenser ruthenus</i>	Other species
Sector 21 Arankina ada	<i>No individuals</i>	<i>Cobitis elongatoides</i> (1) <i>Alburnus alburnus</i> (5) <i>Carassius gibelio</i> (19) <i>Cyprinus carpio</i> (4) <i>Hypophthalmichthys molitrix</i> (3) <i>Aspius aspius</i> (3) <i>Leuciscus idus</i> (5) <i>Pseudorasbora parva</i> (2) <i>Rutilus rutilus</i> (11) <i>Esox lucius</i> (2) <i>Neogobius fluviatilis</i> (1) <i>Micropterus salmoides</i> (1) <i>Perca fluviatilis</i> (4) <i>Sander lucioperca</i> (6)

Macrovegetation

Macrovegetation are well developed. Health status of woody plants are good. Some plant individuals are partially or totally flooded. Roots of some herbaceous or woody species are fully exposed to the water. *Populus alba* and *Salix alba* dominates in abundance. In some parts of riverbank, habitat look like as wetland. This is conditionary appearance which may persist, depending on water level, percentage of humidity and light conditions-

Sector	Species: <i>Limosella aquatica</i>	Other species
Sector 21 Arankina ada	No results	<i>Populus alba</i> <i>Populus nigra</i> <i>Salix alba</i> <i>Fraxinus sp.</i> <i>Amorpha fruticosa</i> <i>Stellaria media</i> <i>Urtica dioica</i> <i>Chelidonium majus</i> <i>Malva sylvestris</i> <i>Conium maculatum</i> <i>Geranium purpureum</i>



		<i>Geranium robertianum</i> <i>Galium aparine</i> <i>Robinia pseudoacacia</i> <i>Calystegia sepium</i> <i>Rubus sp.</i> <i>Justicia americana</i>
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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 21 Arankina ada	No results

Development of vegetation

Forest plant species has regular seasonal development. Herbaceous species are under the water which may disturb and degrade some non-hydrophyte species. Water enters the terrestrial habitat approximately 5-10 m in comparison with situation when the water level is average. Many tree roots are covered by water. Terrestrial habitat is with great humidity, snails are present in greater number and frogs retreated towards forest habitat. *Salix alba* are good adapted on wet conditions.

Riparian areas

Habitat is overflowed in almost whole length. More individuals of snails (Gastropoda) are present in the shallow water and on the riverbank. Insects are represented by Papilionidae, Pieridae, Syrphidae, Calopterygidae, Gomphidae, Vespidae, Apidae, Nepidae, Gerridae and Culicidae (species *Papilio machaon*, *Pieris brassicae*, *Syrphus sp.*, *Calopteryx splendens*, *Gomphus sp.*, *Vespa sp.*, *Apis mellifera*, *Nepa cinerea*, *Gerris lacustris* and *Culex sp.*). Several species of fungi are numerous on tree trunks. Birds are occurred by three genera, dominated by Mallards and Barn swallows. Some bird species has been recorded visually and by sound (*Parus major*). Vertebrata, except birds, were represented by several individuals of frogs and lizards. Sludge are deep up to 30 cm on some places on the riverbank.

Protected areas

Following the EIA document (section 3.8 and from EIA Appendix VII), the protected areas that could be affected by the work at Critical Sector of Arankina ada are summarized in the table below:

Sector 21	Protected Area
Arankina ada	Kovilj-Petrovaradin marsh"

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 Special nature reserve "Kovilj-Petrovaradin marsh". This area is not affected by the works because all planned activities took place in the river ".

Summary of results

After surveys during November 2017, August 2018, July, August and November 2020, the following target species have been found in sector Arankina ada.



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	-	-	-	-	-	-
August 2018	-	-	-	-	-	-
February 2021	-	-	-	-	-	-
March 2021	<i>Unio tumidus (several)</i> <i>Unio pictorum (several)</i>	-	-	-	-	-
July 2021	<i>Unio pictorum (several)</i>	-	-	-	-	-

Summary of main impacts in the sector during this period

Several monitoring has been executed during construction phase, which results have been compared with surveys carried out in July 2021 in order to compare the status of environment three months after works finalization.

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

From the point of view of biology, the results show that the nature has not been affected by the works, which confirm the conclusion obtained in previous reports.

Bearing in mind that works were being executed from the water, the riparian vegetation existing in the river banks not suffered 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.

This survey after three months without works disturbances shows how the environment in vicinity of structure remains in the same conditions as was addressed in monitoring made before works.

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 Arankina ada during the field surveys.

Protective and corrective measures

As works in critical sector Arankina ada are already completed, there no need to apply protective or corrective measures:

Conclusions & Recommendations

It is necessary to monitor the same parameters in the Final Environmental Report.

Works that are being executed in another sector will be assess in different report..