



This Project is funded by the European Union

Supervision and Environmental Monitoring of River Training and Dredging Works on Critical Sectors on the Danube River

THE SECOND STAKEHOLDERS' FORUM MEETING – 4th May 2018

Republic of Serbia Ministry of Construction, Transport and Infrastructure





The Project

Titel

THE PROJECT

The Project includes:

- ✓ dredging on five selected critical sectors, and
 ✓ construction of several
 - training structures on three critical sectors

Novi Sad

No	Name of critical	Type of works	Chainage	to
	sector		from	
18	Susek	Dredging A	1285+000	1283+950
		Dredging B	1282+650	1282+050
19	Futog	Dredging	1266+400	1265+000
		Detached groyne	1263+350	
		Chrevon	1262+700	
21	Arankina Ada	Dredging	1246+600	1245+300
22	Čortanovci	Dredging	1240+300	1239+350
		Sill nº 1	1237+700	
		Sill nº 2	1237+150	
		Sill nº 3a	1236+150	
		Sill nº 3b	1236+000	
23	Beška	Dredging	1229+600	1227+400
24	Preliv	Chrevon nº 1	1200+600	
		Chrevon nº 2	1199+800	



Sector 18 - Susek

Works planned:

✓ Dredging activities







The Project

Sector 19 - Futog



Works planned:

- ✓ Detached groyne
- ✓ Chevron
- ✓ Dredging activities





Sector 21 – Arankina Ada

Works planned:

✓ Dredging activities





Sector 22 – Čortanovci

Works planned:

- ✓ 2 sills
- ✓ 1 sill with the opening
- ✓ Dredging activities







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Sector 23 – Beška

Works planned:

✓ Dredging activities





Sector 24 – Preliv

Works planned:

✓ Two chevrons





Environmental Monitoring during and after the Works



Main parameters to be analyzed

Environmental monitoring during the Works will start with the commencement of the Works (dredging and training works), covering the six critical sectors and extending for some parameters to Bačka Palanka (km 1295) and Zemun (km 1270).

Parameters to be considered are the same that have be included in the Monitoring before Works:

- Hydromorphology
- Sediment and water quality
- Biology

Macrozoobenthos, Vegetation (*Limosella aquatica*)

Birds (Charadrius dubius and Riparia riparia) Fish (Acipenser ruthenus)

- Protected Areas
- Archaeology and cultural heritage



Works schedule

Distribution of tasks

Environmental monitoring will be covered by Environmental Monitoring Reports during and after the execution of the Works, concluding with the Final Monitoring Report.

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Performance certificate for dredging works



Ciona Ingeniería Hydromorfology

Climate characteristics

Main data from Gauging stations to be installed in each critical sector by the WCKS:

- ✓ water level
- ✓ air temperature
- ✓ water temperature
- ✓ wind speed
- ✓ direction and ice presence

Automatic recording and transmission of the stated parameters







Water and sediments quality

Water quality monitoring – methodology for the WORKS EXECUTION

- Performed following the same rules established during the baseline monitoring
 - Same parameters, same analytical approach, same locations
- Regular systematic sampling and analyses every 3 months from the start of the Works at each critical sector till the end of the 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)
- Water quality will be monitored **on three depths on the same profile** during the Works execution

Additionally, more specific local monitoring will be performed

- Depending on the extend and intensity of the operation and local hydromorphological conditions there may be a need for taking samples and determine temperature, TSS and mineral oil at least one per week in a distance of 200 m downstream the dredging and disposal activity, but only during the execution of the Works
- Official data about water quality on SEPA's stations will be followed and compared
 - In situation that additional investigation on those locations is needed, SEM will perform it in accordance with defined requirements



Water and sediments quality

Sediment quality monitoring – methodology for the WORKS EXECUTION

- Will be performed following the same rules established during the baseline monitoring
 - Same parameters, same analytical approach, same locations
- It is accepted for sediment quality be monitored by taking 2-3 samples equally distributed per dredging area or 10000 m³ of dredged material plus 3 samples equally distributed in the dredging deposit area, **2 times per year** i.e. during the dredging works

Additional sediment monitoring

- During the construction period monitoring of changes in sediment structure and organic content can be relevant in case of dredging, excavation or other activities that may result in high concentration of suspended material
- Program will be determined based on the situation on the field
 - Such program will be to focused primarily on the grain size distribution (granulometric analysis) and the total organic content of the surface sediment, eventually a content of mineral oils in sediments, as well as oil in suspended material



CCIONA Water and sediments quality

Proposed monitoring during the Works execution



Monitoring plan could be modified related to changes that will be eventually made in the works execution dynamic and type, or situation on the field will require that.

Reports about those investigations will be performed separately for each sector

	Planned const	ruction works	Number of samples during construction works						
Location	Dredging	Traning	Water sampling	Sediment sampling					
Bačka Palanka									
	yes			3					
Sec 1 19	yes		6	3					
Susek -18	yes			3					
	yes		6	3					
E (10	yes	yes		3					
Futog - 19	yes	yes	12	3					
Novi Sad (upstream)									
Novi Sad (downstream)									
Amerika Ada 21	yes			3					
Afankina Ada - 21	yes		3	3					
Čerten erei 22	yes	yes		3					
Cortanovei - 22	yes	yes	6	3					
D	yes			3					
Beska - 23	yes		6	3					
Slankamen (upstream from Tisa confluence) Tisa River									
(1 km from confluence)									
Preliv - 24		yes	12	6					
Zemun									
TOTAL 1			51	42					



Water and sediment quality monitoring – methodology for the PERIOD AFTER WORKS EXECUTION

- Environmental monitoring after works execution will be provided:
 - until 3 months after execution of dredging works (for critical sectors with only dredging works – critical sector Susek, critical sector Arankina Ada and critical sector Beska);
 - until the end of Defects Notification Periods (12 months after signing of the Taking-over Certificates) (for sectors on which only river training structures are built, and no dredging is performed - critical sector Preliv);
 - until 3 months after execution of dredging works or until the end of Defects Notification Periods, whichever comes later (for sectors with both river training and dredging works – critical sector Futog and critical sector Cortanovci)
- Water quality could only be determined through the analysis of nutrients, heavy metal and organic compounds, in accordance with the EIA
- For the assessment of the water quality status in the operational phase following the construction phase, the data obtained by the state monitoring of water quality should also be used.
- Sediment quality should be performed at least 1 time after construction works as well.



acciona Ingeniería Water and sediments quality

Proposed monitoring for the period after the Works execution

		Number of samples after works completion (DNP)								
Cod 1	Location	Water sampling	Sediment sampling							
BP	Bačka Palanka									
SUS 1										
SUS 2		1	1							
SUS 3	Susek -18									
SUS 4		1	1							
FUT 1	E 10									
FUT 2	Futog - 19	4	2							
NS	Novi Sad (upstream)									
NS DOWN	Novi Sad (downstream)									
AA 1	Arankina Ada 21									
AA 2	Alankina Ada - 21	1	1							
ČOR 1	Čortanovci 22									
ČOR 2	Contailover-22	4	2							
BEŠ 1	Baška 23									
BEŠ 2	Deska - 25	1	1							
SLAN	Slankamen (upstream from Tisa confluence)									
TISA	Tisa River (1 km from confluence)									
PREL	Preliv - 24	4	2							
ZEM	Zemun									
TOTAL 1	TOTAL 1	16	10							



Monitoring plan could be modified related to changes that will be eventually made in the Works execution dynamic and type, or situation on the field will require that.

Reports about those investigations will be performed separately for each sector.



Water and sediment quality

Methodology of sampling and analysis performing



Sampling and analysing of taken samples will be performed in accordance with Serbian legislation and carried out by authorized laboratory.

On site:

- temperature,
- turbidity,
- pH value,
- conductivity,
- dissolved oxygen.

Off site: all other parameters

Ship and some equipment used for water and sediment sampling (November 2017)



Biology

Field surveys

Proposed monitoring during the Works

One in three months:



Invertebrate fauna	One sample in close upstream flow relative to the Works, one sample on every 500 m in the working area and one sample directly downstream relative to the Works
Phytoplankton	One sample around 500 m upstream relative to the Works, one sample on every kilometre in the working area and one sample around 500 m close downstream relative to the Works, on every meter of depth starting from water surface
Macro vegetation	Line transect of 1 km on the both river banks and 5 m from water line on banks
Plants	Line transect of 1 km on the both river banks and 2-3 m from the water line on banks
Birds	Line transect of 1 km on the both river banks and 3-4 m (depends of nesting sites and habitat) from water line on banks
Development of vegetation	Line transect of 1 km on the both river banks and 5 m from the water line on banks
Fishes	Around 500 m upstream of the Works and 500 m downstream of the Works, and in the working area nets should be placed on every 500 m
Riparian area	Line transect of 1 km on the both river banks and 5 m from water line on banks



Biology

Field surveys

Proposed monitoring after the Works

Three visits after execution of the dredging works (one visit per month) or six visits until the end of DNP (one visit in two months), depends whichever comes later



Invertebrate fauna	One sample in close upstream flow relative to the Works, one sample on every 500 m in the working area and one sample directly downstream relative to the Works
Phytoplankton	One sample around 500 m upstream relative to the Works, one sample on every kilometre in working area and one sample around 500 m close downstream relative to the Works, on every meter of depth starting from water surface
Macro vegetation	Line transect of 2-3 km (depends on the scope of the Works on each sector) on the both river banks and 5 m from water line on banks
Plants	Line transect of 2-3 km (depends on the scope of the Works on each sector) on the both river banks and 2-3 m from water line on banks
Birds	Line transect of 2-3 km (depends on the scope of the Works on each sector) on the both river banks and 3-4 m (depends of nesting sites and habitat) from water line on banks
Development of vegetation	Line transect of 2-3 km (depends on the scope of the Works on each sector) on the both river banks and 5 m from water line on banks
Fishes	Around 500 m upstream of works and 500 m downstream of works, and in the working area nets should be placed on every 500 m
Riparian area	Line transect of 2-3 km (depends on the scope of the Works on each sector) on the both river banks and 5 m from water line on banks



Methodology - mussels

Samples will be taken from water sediment by using stainless steel "hand bucket" (on the motor boat) up to 7 m depths. After getting out of the water, samples will be partially dried in order to reduce the mass of the sediment, after which mussel individuals will be separated and identified.





Methodology - plants

Phytocenological records will be implemented according to Braun-Blanquet methodology and LEAFPACS protocol. Semiaquatic records will be taken according to LEAFPACS field protocol (Willby *et. al.*, 2009; Gunn *et al.*, 2010), in the line with Pan European standard for sampling macrophytic vegetation (15460: 2007 Water quality-Guidance standard for the surveying of macrophytes) (CEN, 2007).

According to field procedure, a tour of entire river habitat along the river bank, in order to get insight in diversity and distribution of *Limosella aquatica*, will be performed.

> In line with results of EMbW field tour, representative 100 m along sectors are selected within which recording will be performed. Along those 100 m long sectors, on every 20 m record will be taken in area of 1-9 m^2 on depths from 25, 50 and >75 cm.





Methodology - fishes

For the estimation of the fish fauna, networks of 10 x 3 m and fine mesh (30 mm) are used. Five sets are made in the riparian zone of the River, comprising an approximate area of 150 m². The section of the habitat where this type of fishing is applied vary depending on the size of the habitat.

Biology





The sampling efforts are measured in seconds (maximum 1000). At the same time, geographic (coordinates), ecological and physical and chemical characteristics of existing aquatic environments (including photographic records) are recorded.

Found Sterlets will be counted and after that all individuals are returned to the water.



Methodology - birds

Line transects involve the observer in continually walking and recording all contacts with birds either side of the track walked. In order to identify more and more common types of an area, it is necessary to allocate a certain number of transects per field, bearing in mind that different habitats are approximately equally present.

Transects 100 m long in rich bird areas can be chosen, up to 1000 m in poor areas. It is important that the transects are sufficiently distant from each other (at least 150-200 m) so that the birds that were disturbed in the first one will not be counted again in the second, and that each transect will be covered at about the same speed at approximately the same time.







Methodology - phytoplankton

Biology

Samples will be taken by Rutner's bottle volume of 1 L. A fresh sample and a sample fixed with Lugol's solution are viewed on the light microscope with the digital camera and the corresponding software. Taxon identification will be done using standard algae identification keys. Quantitative aspect will be expressed in number of algae cells per one liter. Algal biomass will be calculated by geometric approximations and standard mathematics formulas. Average values of cell dimension wil be used, by measuring at least 25 different individuals of certain taxon from the same sample.

Formula that is used is:

V total = Σ (Ni x Vi)

V total – total phytoplankton biomass (μm³/L) Ni – number of cell i-species Vi – average volume of cell i–species (μm³/L)

Special attention will be given to algal composition in areas with reduced flow.



Methodology - macro vegetation

Vegetation will be visually monitored on both river banks, especially in river sleeves and side branches where river flow is variable. Main type of vegetation will be registered on each sector with main representative species. Typical habitat species will be recorded and mentioned.



Macro vegetation will be monitored in a line transect of 1 km to 2-3 km (depending on whether it is monitoring during the Works or after the Works) on the both river banks and 5 m from water line on banks.



Methodology - development of vegetation

Development of vegetation will be recorded especially on embankments where changed physical conditions may occur. Bank protection works can endanger bank vegetation in sense that they can harm habitats, land conditions or decrease shadow percentage, which is important for some species.



Development of vegetation will be monitored in a line transect of 1 km to 2-3 km (depending on whether it is monitoring during the Works or after the Works) on the both river banks and 5 m from the water line on banks.



Methodology - riparian areas

Biology

Riparian areas will be monitored in order to determine the Works impacts on bank vegetation and water-related sensitive vertebrata organisms (frogs, newts) due to changed water levels or potential floods which can disturb their populations.

Riparian areas will be monitored in a line transect of 1 km to 2-3 km (depending on whether it is monitoring during the Works or after the Works) on the both river banks and 5 m from water line on banks.

Thank you for your attention

