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 FIFTH STAKEHOLDER'S FORUM MEETING – 05th April 2019

Republic of Serbia
Ministry of Construction,
Transport and Infrastructure

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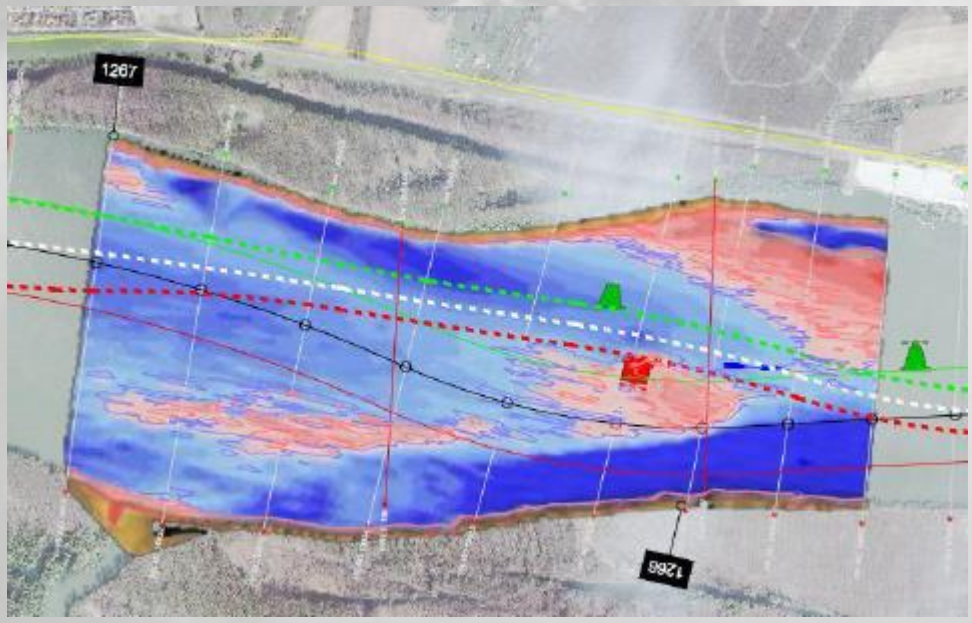
Ingeniería

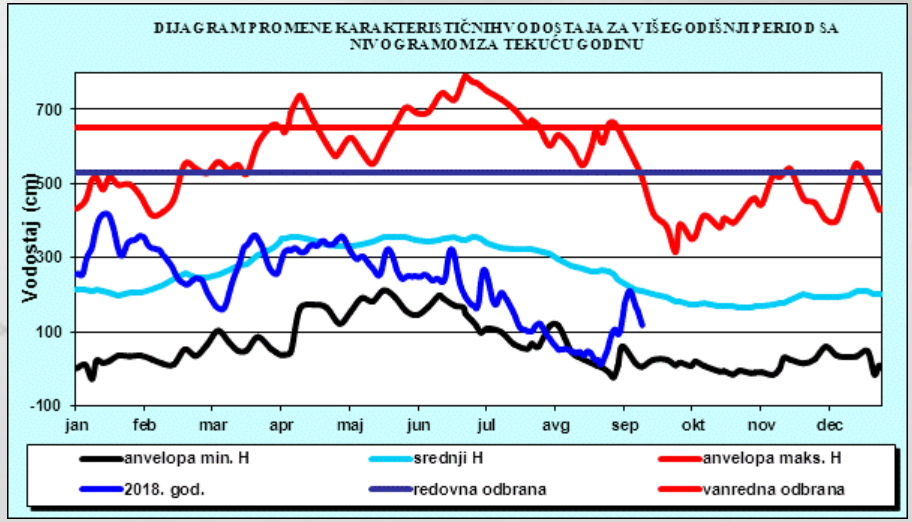
Hydromorphology

Futog km 1267.400 to km 1261.600

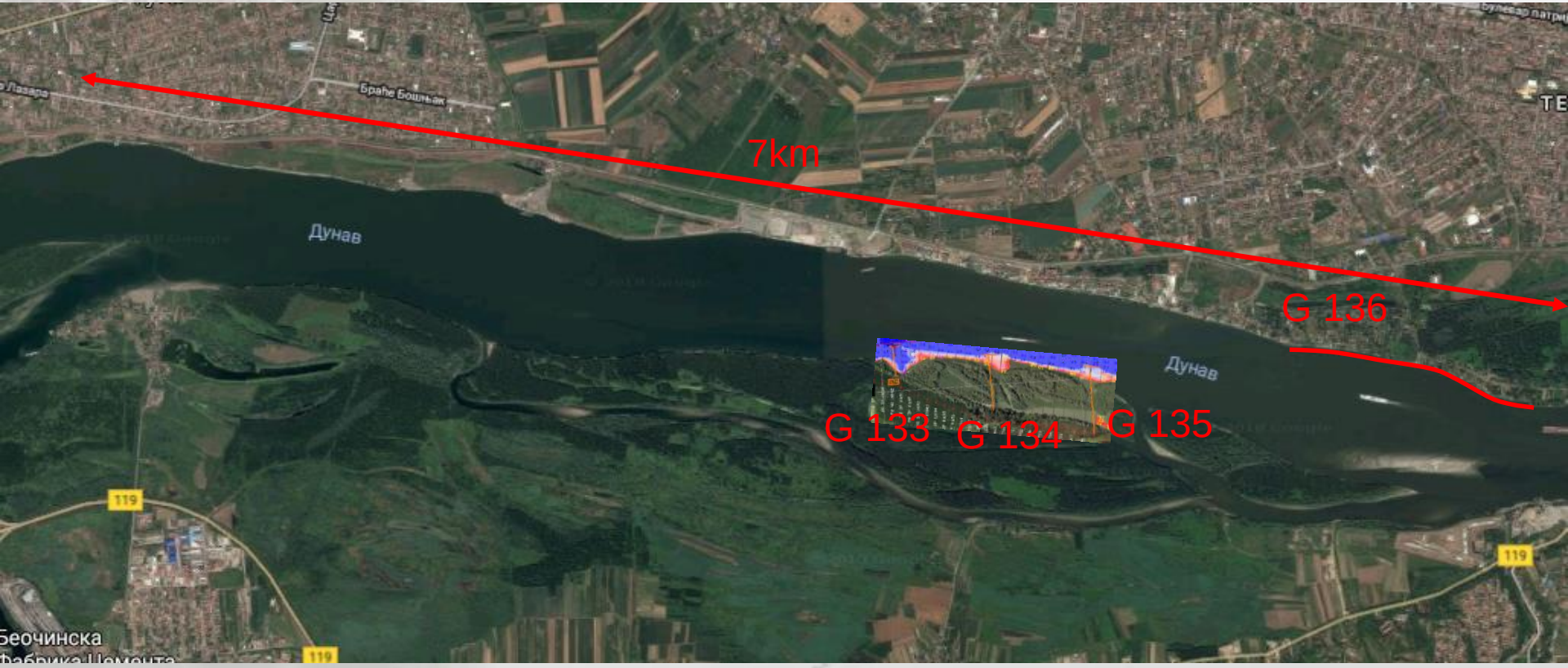
Morphology



Hydrology

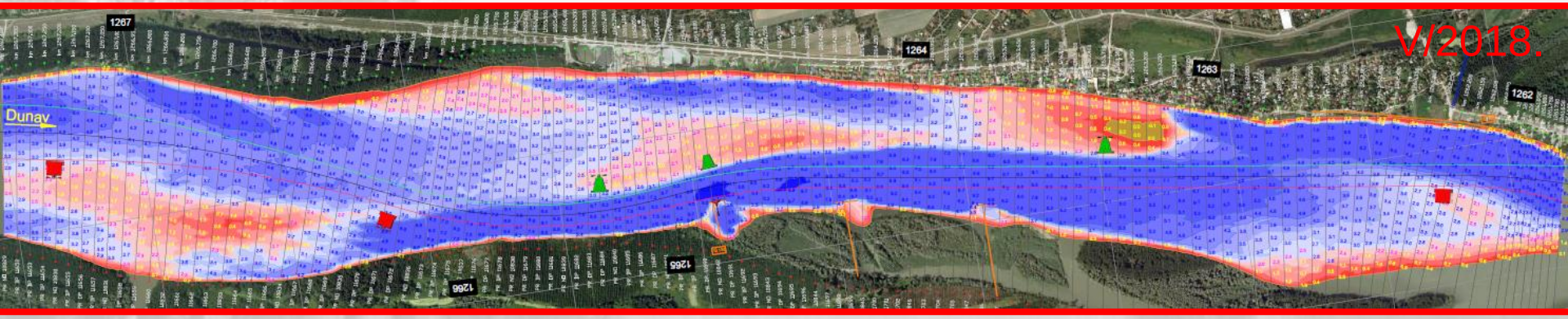


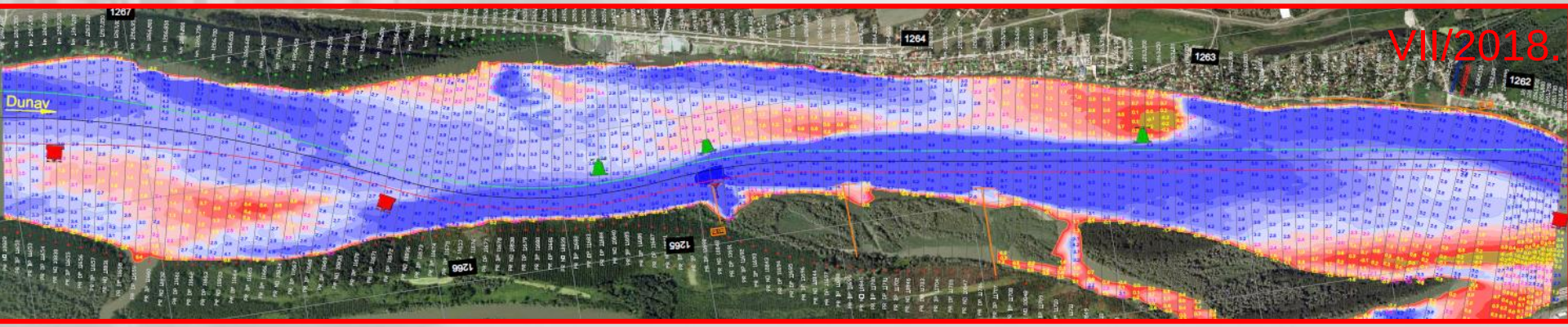
General Flow Conditions



Historical development - morphology

2018.

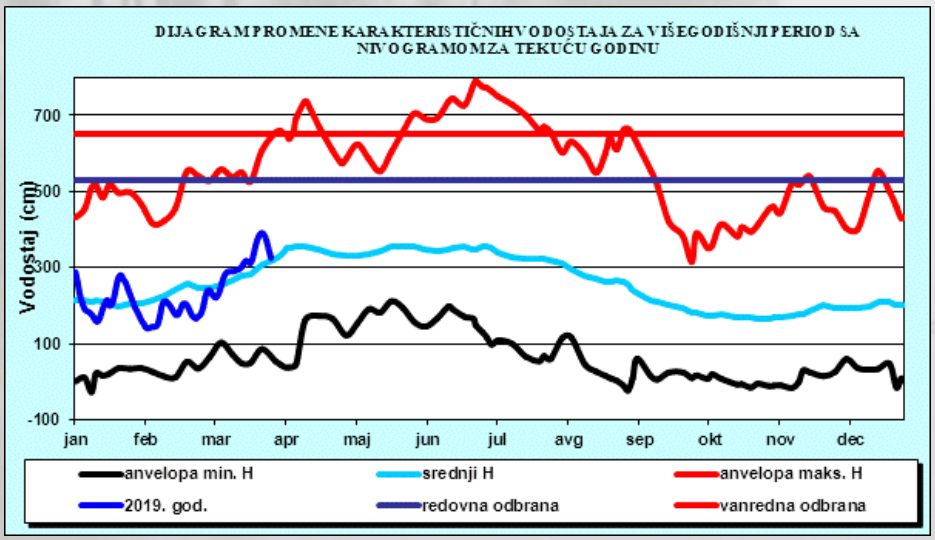


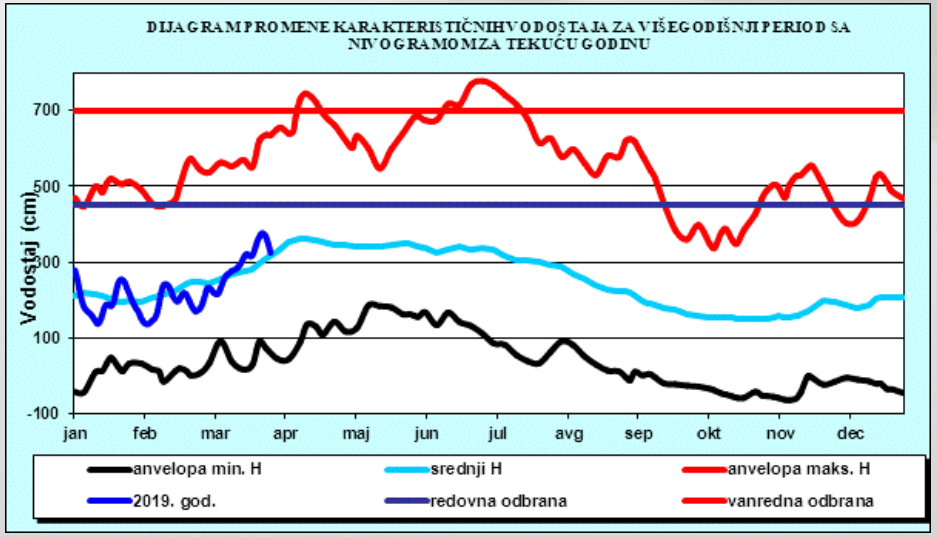


Water level gauging stations

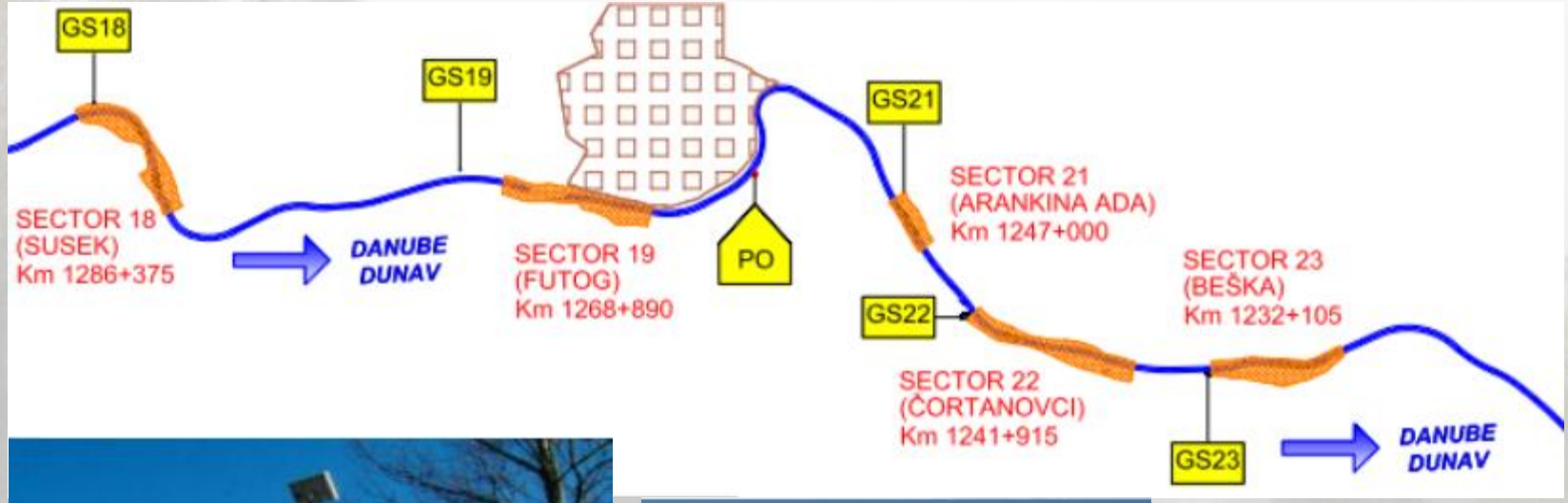
Bačka Palanka:
„0“ 73.97 maAs
Km 1298.560

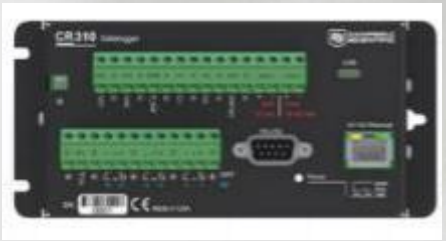
Novi Sad:
„0“ 71.73 maAs
Km 1254.980



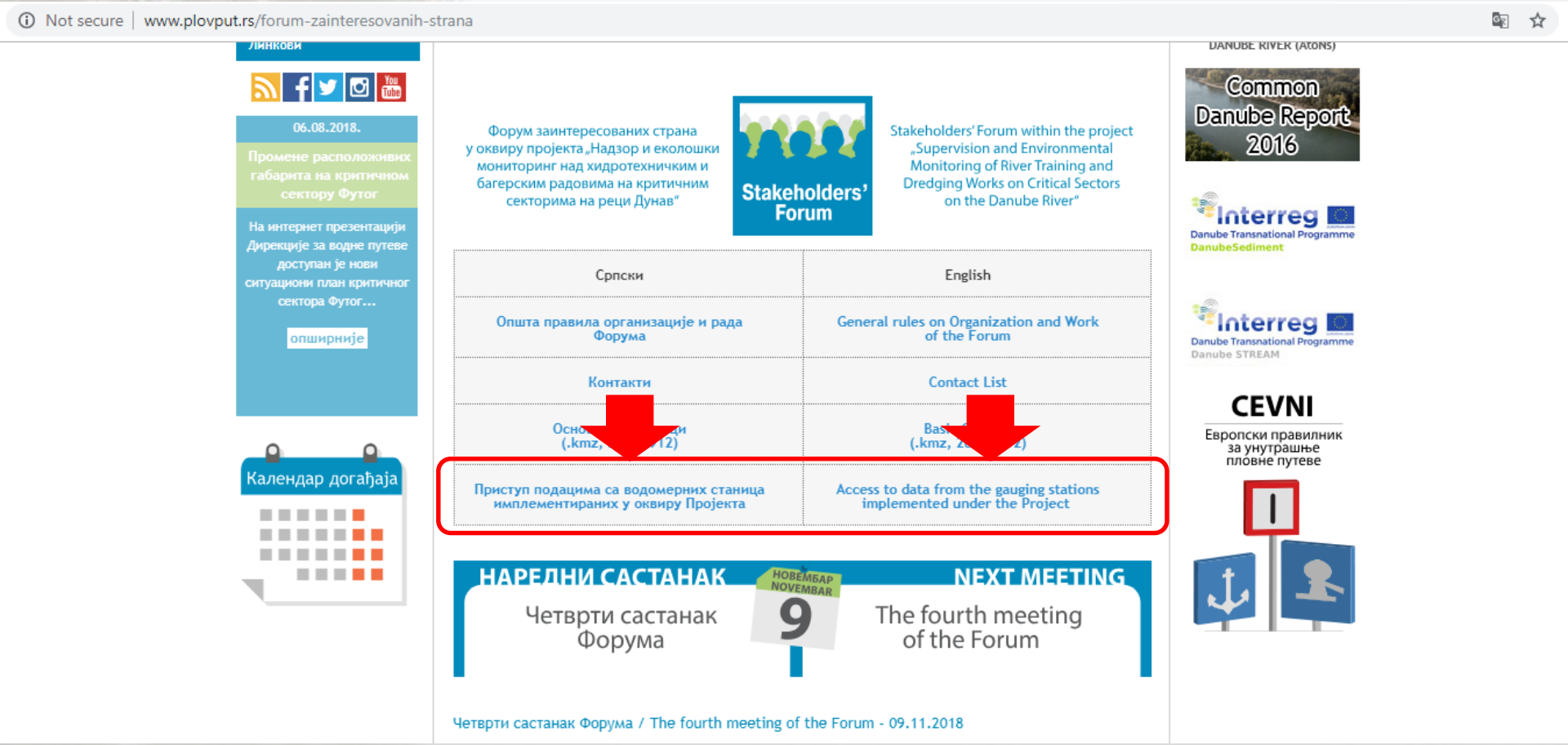


Gauging stations on building sites





Gauging stations – web portal



Gauging stations – web portal

Not secure | www.meteos.rs/user/agromah/dunav.php

Republic of Serbia
Ministry of Construction,
Transport and Infrastructure

RIVER TRAINING AND DREDGING WORKS ON CRITICAL SECTORS ON THE DANUBE RIVER

This project is co-funded by the European Union

Susek - sektor 18

lat=45.25582500°					lon=19.53029167°					kota=68.903 m		
datum	sat	nivo [cm]	kota [m]	temperatura vode [°C]	temperatura vazduha [°C]	brzina vetra [m/s]	smer vetra [°]	udar vetra [m/s]	vreme udara vetra	smer udara vetra [°]	upozorenje na led
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Futog - sektor 19

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04.11.2018	14:00	508	74.476	13	20	2.0	132	4.6	13:52:05	196	nema

Gauging stations – web portal

Not secure | www.meteos.rs/user/agromah/dunav.php?id=7932

Republic of Serbia
Ministry of Construction,
Transport and Infrastructure

RIVER TRAINING AND DREDGING WORKS ON CRITICAL SECTORS ON THE DANUBE RIVER

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Futog - sektor 19

lat=45.23503611°						lon=19.71118889°			kota=69.393 m		
datum	sat	nivo [cm]	kota [m]	temperatura vode [°C]	temperatura vazduha [°C]	brzina vetra [m/s]	smer vetra [°]	udar vetra [m/s]	vreme udara vetra	smer udara vetra [°]	upozorenje na led
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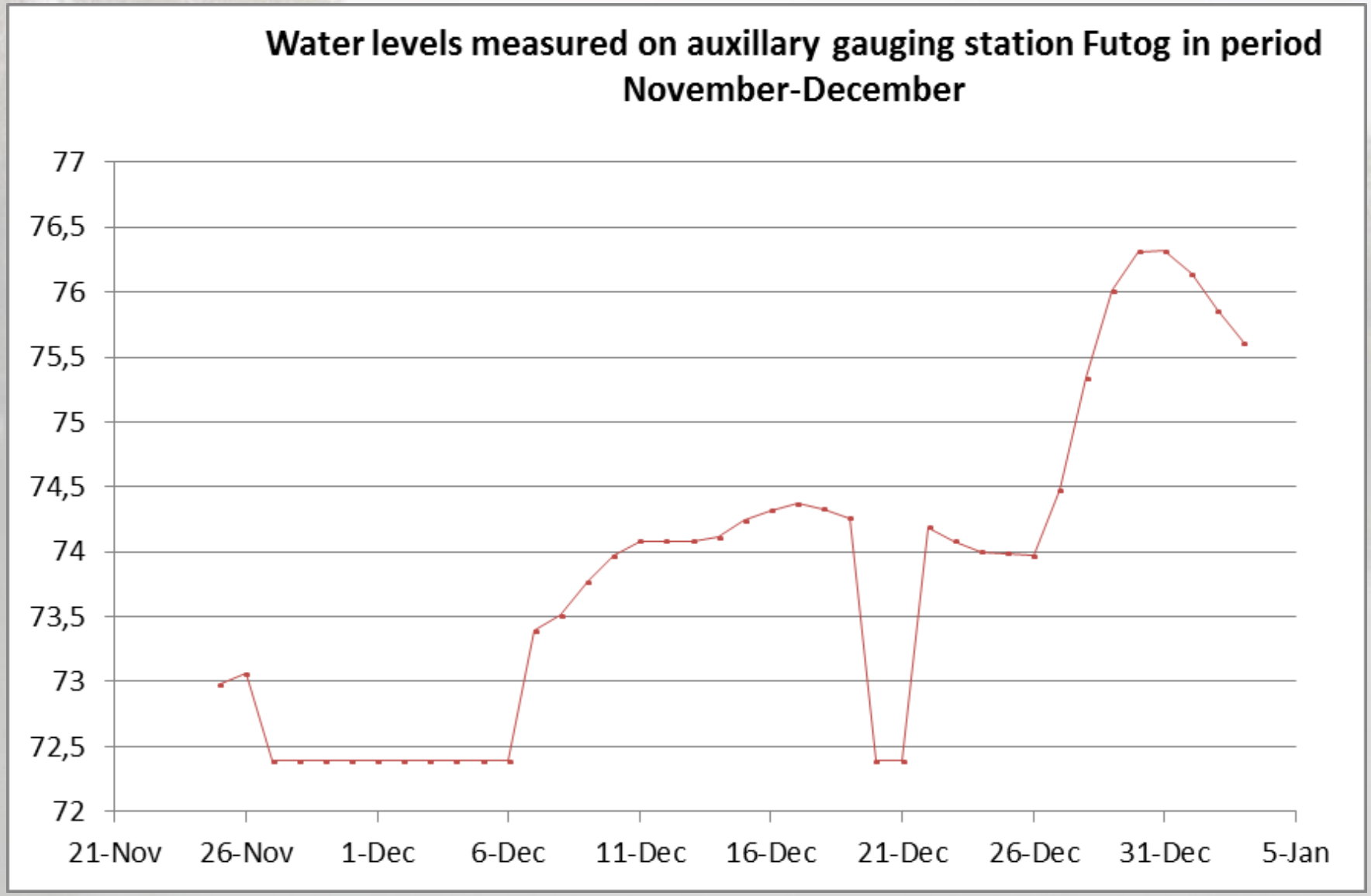
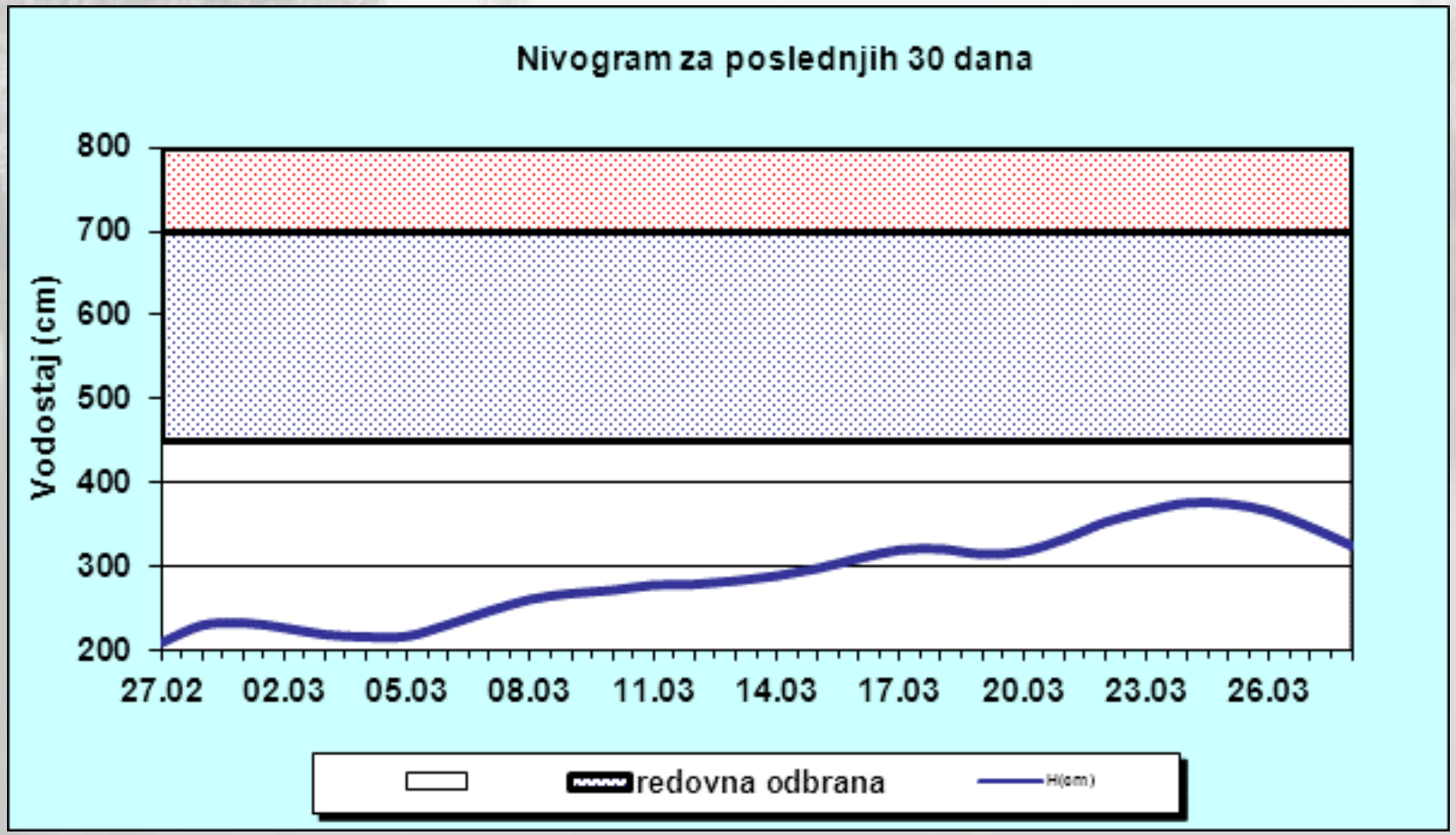
04.11.2018	14:00	508	74.476	13	20	2.0	132	4.6	13:52:05	196	nema
04.11.2018	13:00	507	74.465	13	20	1.7	118	3.6	12:44:05	145	nema
04.11.2018	12:00	507	74.458	13	18	2.7	134	7.0	11:21:45	156	nema
04.11.2018	11:00	506	74.450	13	18	3.6	150	7.8	10:27:05	148	nema
04.11.2018	10:00	505	74.439	13	18	3.3	152	9.0	09:53:40	160	nema
04.11.2018	09:00	503	74.427	13	15	0.3	247	1.8	08:02:35	213	nema
04.11.2018	08:00	502	74.416	13	10	0.3	269	1.0	07:06:00	247	nema
04.11.2018	07:00	501	74.406	13	8	0.2	300	1.4	06:59:05	230	nema
04.11.2018	06:00	500	74.394	13	8	0.3	315	1.2	05:10:35	318	nema
04.11.2018	05:00	499	74.382	13	10	0.5	316	2.6	04:28:15	304	nema
04.11.2018	04:00	498	74.371	13	13	0.8	240	4.6	03:48:00	118	nema
04.11.2018	03:00	496	74.357	13	13	0.8	134	3.2	02:28:50	101	nema
04.11.2018	02:00	495	74.341	13	12	0.5	18	3.0	01:42:35	28	nema
04.11.2018	01:00	494	74.334	13	11	0.4	307	1.2	00:49:05	307	nema
04.11.2018	00:00	492	74.314	13	13	0.8	50	2.6	23:22:10	41	nema
03.11.2018	23:00	491	74.300	13	13	0.6	35	2.4	22:40:15	37	nema

Water levels Graph 25/11 to 04/01 2019



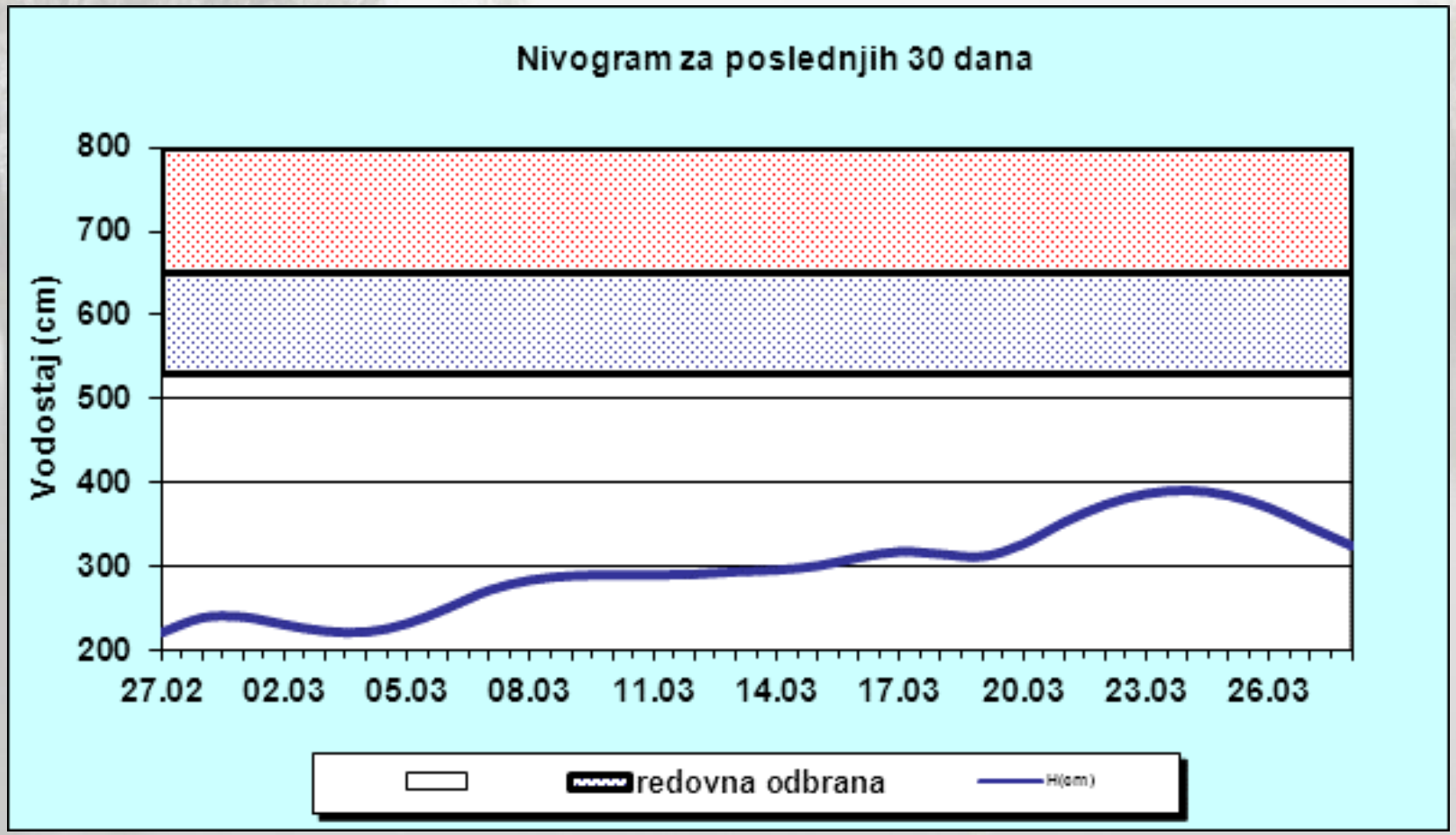
Gauging station Novi Sad – last 30 days

Novi Sad:
„0“ 71.73 maAs
Km 1254.980



Gauging station Backa Palanka – last 30 days

Backa Palanka:
„0“ 73.97 maAs
Km 1298.560



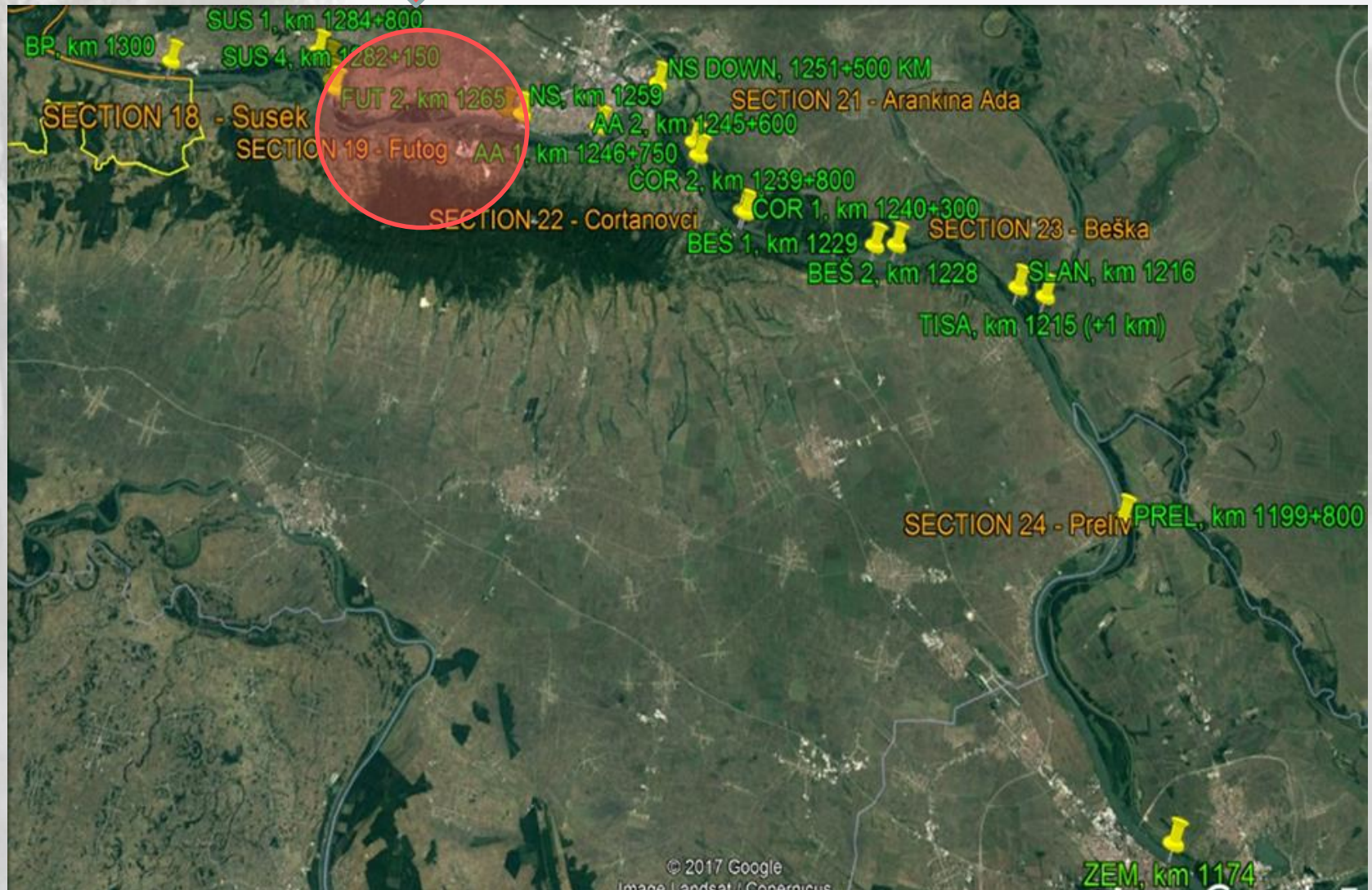
WATER AND SEDIMENT QUALITY MONITORING

3 PHASES OF WATER AND SEDIMENT MONITORING

BASELINE	DURING WORKS EXECUTION	AFTER WORKS
FINISHED	IN PROGRESS	WILL BE PERFORMED
RESULTS COMPARED WITH EXISTING PRIMARY DATA FOR 10 YEARS PERIOD	WILL BE COMPARED CONTINOUSLY	WILL BE COMPARED CONTINOUSLY

WATER AND SEDIMENT QUALITY MONITORING

FUTOG – Detached groyne and chevron / dredging



WATER AND SEDIMENT QUALITY MONITORING

FUTOG – Detached groyne and chevron / dredging

Detached groyne construction

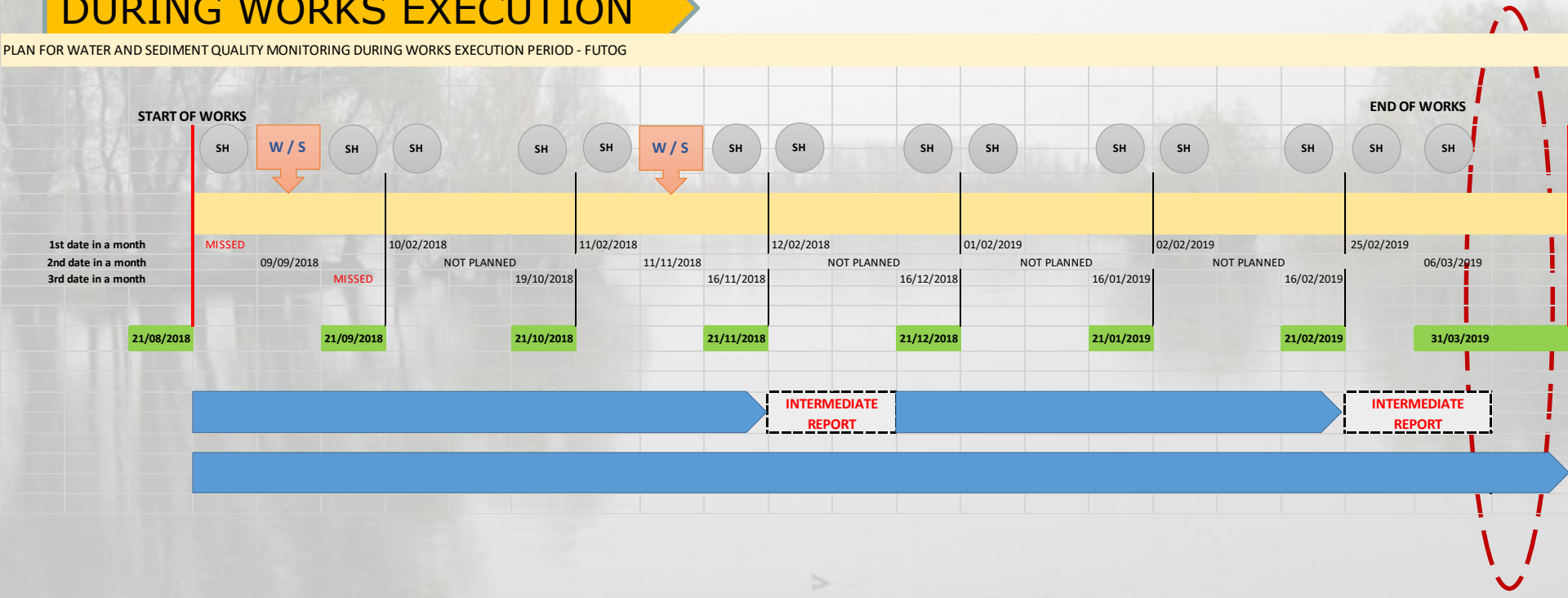
Chevrone construction

WATER AND SEDIMENT QUALITY MONITORING

FUTOG – Detached groyne and chevron / dredging

DURING WORKS EXECUTION

PLAN FOR WATER AND SEDIMENT QUALITY MONITORING DURING WORKS EXECUTION PERIOD - FUTOG



FUTOG – Detached groyne and chevron / dredging

RESULTS OF REGULAR ANALYSES

BASELINE

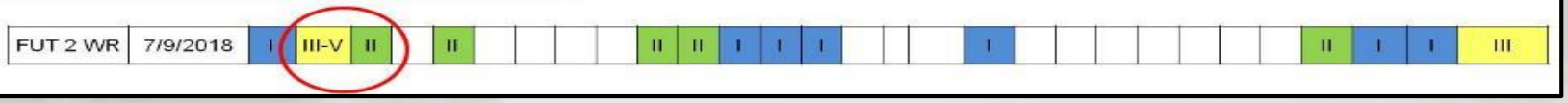
VALUE OF THE WATER QUALITY PARAMETERS

Profile	Chainage	Code of water body or sampling points	General Paramete		Oxygen regime					Nutrients						Salinity				Metals							Microbiological parameters			
			pH value	Suspended metters	Dissolved oxigen (O2)	Percentage of saturation of water by oxigen	BOD 5	COD from K2Cr2O7	COD from KMnO4	Total Organic Carbon (TO	Total nitrogen (N)	Nitrates (NO3-N)	Nitrites (NO2-N)	Amonium ion (NH4-N)	Total phosphates (P)	Orthophosphates (PO4-P	Chlorides (Cl-)	Sulphates (SO4--)	Total soluble salts	Electroconductivity	Arsenic (As)	Boron (B)	Copper (Cu)	Zinc (Zn)	Chromium (Cr)	Iron (Fe)	Manganese (Mn)	Fecal coliforms	Total coliforms	Fecal enterococci	Number of aerobic heterotrophs (Kohl method)
				mg/l	mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	µS/cm	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	cfu/ 100	cfu/ 100	cfu/ 100	cfu/ 100 ml
Futog																															
	km 1265	FUT 2 WL	I	I	I		II			II	III	II	I/II	I	I	I/II	I	I		I	I	I	I	I	II	I	III	II	II	III
		FUT 2 WM	I	I	I		II			II	III	II	I/II	I	I	I/II	I	I		I	I	I	I	I	II	I	III	II	II	III
		FUT 2 WR	I	I	I		II			I	III	II	I/II	II	I	I/II	I	I		I	I	I	I	I	II	I	III	II	II	IV

I class II class III class IV class V class

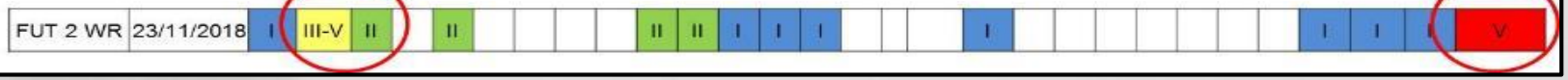
DURING WORKS EXECUTION

I regular monitoring campaign 07/09/2018



DURING WORKS EXECUTION

II regular monitoring campaign 23/11/2018



DURING WORKS EXECUTION

III regular monitoring campaign 19/02/2019

FUTOG - Detached groyne and chevron / dredging

RESULTS OF SHORT ANALYSES

SAMPLING POINTS AND OBJECTS AT THE SITE	RESULTS OF WATER QUALITY IN DIFFERENT CAMPAIGNS											
	22/10/2018			30/10/2018			19/02/2019			14/03/2019		
	temperature (°C) / suspended metters (mg/l) / mineral oils (mg/l)											
Sampling point 1	15	10	<0.1	14	2	<0.1	4.8	4	<0.1	7	10	<0.1
DETACHED GROYNE												
Sampling point 2	15	6	<0.1	14	6	<0.1	X			7	12	<0.1
CHEVRONE												
Sampling point 3	X			14	<2	<0.1	X					
Sampling point 4				14	8	<0.1	4.7	20	<0.1	7	8	<0.1

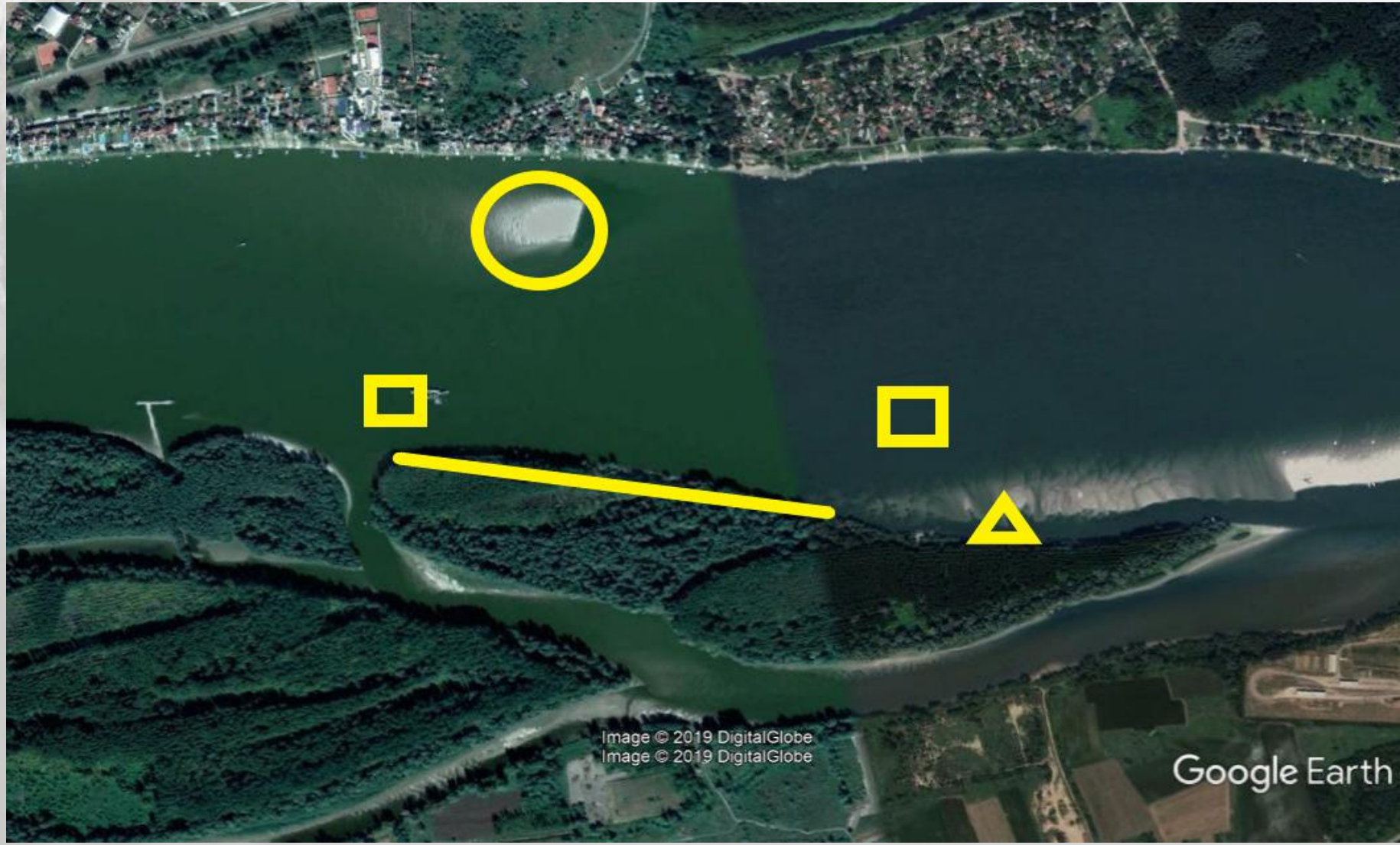
LEGEND:	I CLASS	II CLASS	III CLASS	IV CLASS	V CLASS

Biology – main aspects

Main biological groups of biota included in monitoring consists of nine aspects:

- ✓ phytoplankton
- ✓ mussels
- ✓ birds
- ✓ fishes
- ✓ macrovegetation
- ✓ plants
- ✓ development of vegetation
- ✓ riparian areas
- ✓ protected areas and ecological network

Biology – monitoring area on Critical Sector Futog



Biology - phytoplankton

Methodology of sampling

Biology - phytoplankton

Summary of results – qualitative analysis - total

December 2018 Groyne	December 2018 Chevron	February 2019 Groyne	February 2019 Chevron
77 species	65 species	87 species	83 species
Most dominant phyla are Bacillariophyta with 102 and Chlorophyta with 40 species.			

Summary of results – quantitative analysis – December 2018

	Groyne			Chevron		
	0 m	1 m	1,8 m	0 m	1 m	2 m
Individual/ml	165	228	151	165	229	241
Cell/ml	664	894	862	664	746	736

Summary of results – quantitative analysis – February 2019

	Groyne			Chevron		
	0,5 m	2 m	4 m	0,5 m	2 m	4 m
Individual/ml	3138	3329	3468	1689	2337	3014
Cell/ml	3440	5932	4249	4030	3344	3202

Biology - phytoplankton

Summary of results – chlorophyll a – December 2018

Locality	Chl-a (µg/l)
Groyne, 0 m	2,87
Groyne, 1 m	3,11
Groyne, 1,8 m	3,23
Chevron, 0 m	2,62
Chevron, 1 m	3,11
Chevron, 2 m	2,93

Summary of results – chlorophyll a – February 2019

Locality	Chl-a (µg/l)
Groyne 0 m	10.97
Groyne, 2 m	10.36
Groyne, 4 m	11.21
Chevron, 0 m	10.85
Chevron, 2 m	11.28
Chevron, 4 m	11.76

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

Biology - mussels

Summary of results:

General conclusion is that mussels on the bank are not endangered by ongoing works on sector Futog duo to long distance between work machinery and mussel habitats.

	***Unio* sp.**	***Other species***
Sector 19 - Futog	*Unio tumidus* (1 -Dec-2018 1 – Feb 2019)	*Corbicula fluminea* *Sinanodonta* (*Anodonta*) *woodiana* *Dreissena polymorpha, D. rostriformis bugensis*

Biology - mussels

Corbicula fluminea

Dreissena polymorpha

Unio tumidus

Sinanodonta (Anodonta) woodiana

Biology - birds

Summary of results:

Bird populations are not endangered by ongoing works due to long distance between bird colonies on the river bank and islands and location of work machinery.

	Charadrius dubius	***Riparia riparia***	***Other species***
Sector 19 - Futog	No individual	No individiual	*Phalacrocorax carbo* *Larus argentatus* *Anas platyrhynchos*

Biology - birds

Mallard (*Anas platyrhynchos*)

European herring gull (*Larus argentatus*)

Great cormorant (*Phalacrocorax carbo*)

Biology - fishes

Summary of results:

Fish population in this part of sector in this period is, generally, represented by small number of species and individuals. No one individual of Sterlet, *Acipenser ruthenus*, have been recorded.

	Acipenser ruthenus	**Other species**
Sector 19 – Futog	No individual	*Abramis bjoerkna* *Abramis brama* *Carassius gibelio* *Rutilus rutilus* *Sander lucioperca*

Biology - fishes

Sander lucioperca and *Abramis bjoerkna*

Carassius gibelio, *Abramis brama* and *Abramis bjoerkna*

Biology - macrovegetation

Summary of results

Highest floor (woody plants) is dominated by Black Poplar (*Populus nigra*) and, in lesser extent in numerical and height sense, White Willow (*Salix alba*), which is very good adapted on the semiaquatic conditions in its habitat. Lower and ground floor is represented by herbaceous plants. European dewberry (*Rubus caesius*), as perennial plant, is present in the lower floor. Ground floor is characterized by frequent presence of some perennial such as genus *Galium*. Annual plant *Stellaria media* will grow up in the spring period.

	Species: Limosella aquatica	**Other species**
Sector 19 Futog	No individual	*Populus nigra* *Salix alba* *Fraxinus americana* *Acer* sp. *Amorpha fruticosa* *Rubus caesius* *Gallium molugo* *Galium* sp./*aparine*? *Stellaria media*

Biology - macrovegetation

Populus nigra

Salix alba

Fraxinus americana

Acer sp.

Biology - macrovegetation

Amorpha fruticosa

Rubus caesius

Galium molugo

Stellaria media

Biology - plants

Summary of results:

No one individual of species *Limosella aquatica* and *Lindernia palustris* have been found.

	Species*: Limosella aquatica* Species*: Lindernia palustris*
Sector 19 - Futog	No individual

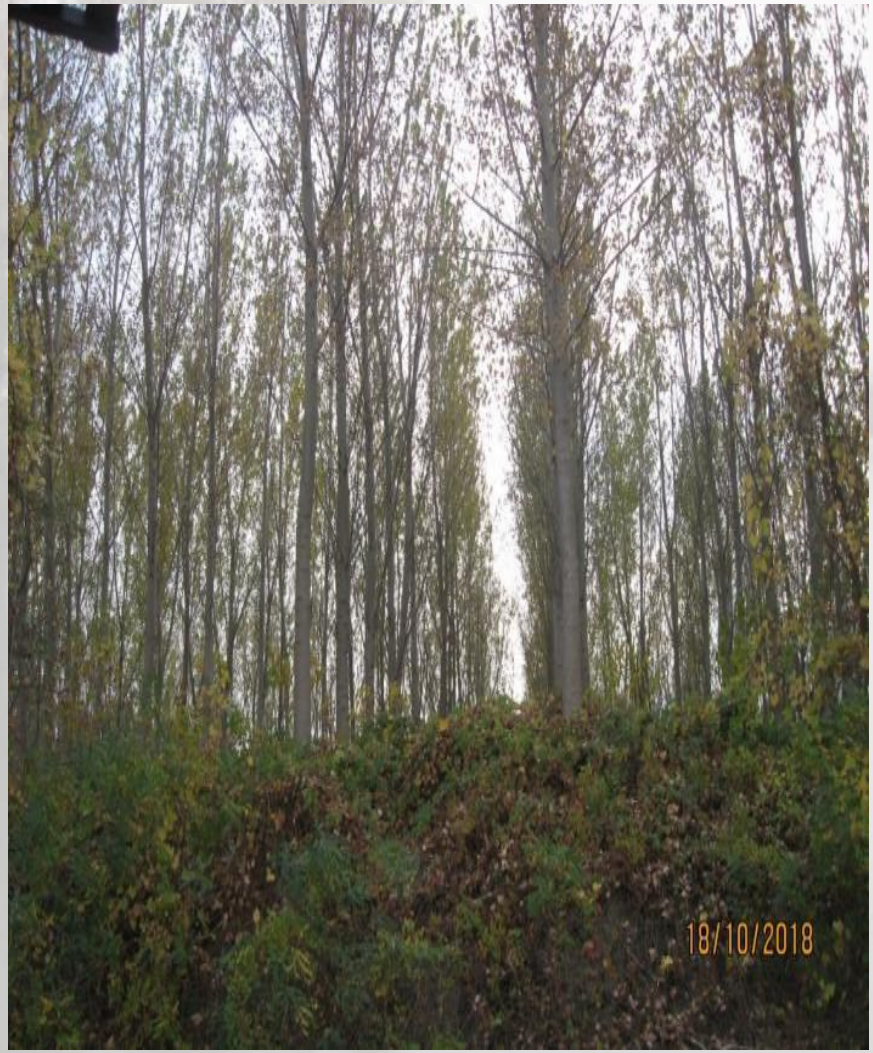
Biology – development of vegetation

Forest vegetation has regular life and space development. Basic humus layer is preserved, land conditions are favorable for small vertebrate and invertebrate organisms and there is enough humidity for some part of life cycles.

Now, forest vegetation and herbaceous plants are preparing for spring flowering and leafing. Changed physical or land conditions, except variable water level and strong erosion on the border forest line to the riparian area, have not been registered.

Current work activities include work on the river and from the river and none of activities are taking place on and from the river bank and habitat. As a result, none of the negative impacts on the vegetation, forest habitats or land conditions have occurred.

Biology – development of vegetation



Biology – riparian areas

Riparian areas, as transitional zone, have favourable conditions for semiaquatic and water-related vertebrate organisms (primarily frogs). In front of water line a sand zone is located with enough humidity and width for such organisms. Neighbouring forest vegetation provides shadow and other necessary conditions for some elements of life cycle. Sand zone have enough humidity and other conditions for some parts of life cycle of these organisms. Forest vegetation provides feed- and land conditions and serve as refugium, in case of necessity.

This winter water level was variable, but this had effects only on the survival of mussels.

Riparian areas, habitats and forest vegetation are not damaged and endangered by ongoing works because all work activities are performed from the water and there are no work activities on the river bank

Biology – riparian areas

Biology – protected areas and ecological network

Protected areas – National park "Fruška Gora"

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

Ecological network

One area (as part of ecological network), relatively close to work zone, is mentioned as ecological corridor of international importance in the Republic of Serbia. This is Monument of Nature "Marsh forest on Mačkov sandbank" in the Beočin municipality. Area of protected zone is 4 ha and Danube bank length in protected zone is 0.5 km.

Previous and ongoing activities on the critical sector Futog do not show negative effect on the mentioned area.

Summary Results

Summary results

Sector	Macrozoo benthos (*Unio sp*)	Fishes (*Acipenser ruthenus*)	Plants (*Limosella aquatica*)	Plants *Lindernia palustris*	Birds *Riparia riparia*	Birds *Charadrius dubius*
November 2017	-	-	-	≈10 individuals	-	-
February 2018	-	-	-	-	-	-
March 2018	-	-	-	-	-	-
July 2018	-	-	-	-	-	-
August 2018	-	-	-	-	-	-
October 2018	1	-	-	-	-	-
November 2018	-	-	-	-	-	-
February 2019	1					

Thank you for your attention

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