J O I N T   A N N U A L   R E P O R T
on environment monitoring
in 2016

according to the "Agreement between the Government of the Slovak Republic and the Government of the Republic of Hungary concerning Certain Temporary Technical Measures and Discharges in the Danube and Mosoni branch of the Danube", signed on April 19, 1995

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C O N T E N T S

List of Appendices

A.1. Agreement between the Government of the Slovak Republic and Government of the Republic of Hungary concerning Certain Temporary Technical Measures and Discharges in the Danube and the Mosoni Branch of the Danube, signed on April 19, 1995

A.2. Statute on the Activities of the Nominated Monitoring Agents Envisaged in the "Agreement between the Government of the Slovak Republic and Government of the Republic of Hungary concerning Certain Temporary Technical Measures and Discharges in the Danube and the Mosoni Branch of the Danube", signed on May 29, 1995

A.3. Minutes from meeting of Monitoring Agents held on April 25, 2007 in Győr, on which the Statute on the Activities of Nominated Monitoring Agents was modified.
- in Slovak language
- in Hungarian language

A.4. Minutes from the negotiation and signature of the Joint Annual Report in 2015 on the joint Slovak-Hungarian monitoring established by the intergovernmental Agreement from April 19, 1995.
- in Slovak language
- in Hungarian language

PREFACE

Antecedents

On April 19, 1995 Agreement between the Government of the Slovak Republic and the Government of the Republic of Hungary concerning certain temporary technical measures and discharges in the Danube and Mosoni branch of the Danube[1] (hereinafter the Agreement) was signed in Budapest (**Appendix A.1**). In the Agreement the monitoring of environmental impact of the increased discharges into the Danube and Mosoni branch of the Danube, and the water supply into the right-side river branch system is defined. The environmental monitoring is coordinated by Nominated Monitoring Agents of both Parties, whose activities are described in the Statute signed on May 29, 1995 in Gabčíkovo[2] (hereinafter the Statute) (**Appendix A.2**). This Joint Annual Report on environment monitoring in 2016 is the twenty-second report since signing the Agreement.

The validity of the Agreement, which was to expire after the judgment of the International Court of Justice in the Haag in the case concerning the Gabčíkovo - Nagymaros Project, have been prolonged by the Slovak Republic on October 23, 1997, by the letter of the Ministry for Foreign Affairs, and by the Republic of Hungary with the Resolution of Hungarian Government from December 17, 1997. The validity of the Agreement was prolonged until an agreement on implementation of the Judgement of International Court of Justice, declared on September 25, 1997, is reached.

Nominated Monitoring Agents on April 25, 2007 have agreed on the Statute modification (**Appendix A.3**). The modification reflected changes in the water quality monitoring according to the Water Framework Directive (2000/60/EC) and defined changes in the time schedule for elaboration of the National and Joint Reports. Certain modifications were also in monitoring sites, observed parameters and the frequency of measurements. Currently experts of both sides are reviewing proposals for monitoring optimisation. After their approval by the Nominated Monitoring Agents, the changes will be reflected in the next modification of the Statute.

In the Agreement the Slovak Party has undertaken to supply an annual average of 400 $m^3.s^{-1}$ of water into the Danube downstream of Čunovo dam, in the case of an annual average flow rate of 2025 $m^3.s^{-1}$ in the Danube at Bratislava-Devín gauging station, and another 43 m^3s^{-1} into the Mosoni branch of the Danube and the right-side seepage canal. Both discharges are subject to hydrological and technical conditions described in Appendices No. 1 and 2 of the Agreement. The Hungarian Party, according to the Agreement, built up the submerged weir in the common section of the Danube at rkm 1843, and put it into operation in June 1995. This weir enables the water supply into the right-side river branches in the inundation area on the Hungarian territory. The water

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1 Agreement between the Government of the Slovak Republic and Government of the Republic of Hungary concerning Certain Temporary Technical Measures and Discharges in the Danube and Mosoni branch of the Danube, signed on April 19, 1995.

2 Statute on the Activities of the Nominated Monitoring Agents envisaged in the "Agreement between the Government of the Slovak Republic and Government of the Republic of Hungary concerning Certain Temporary Technical Measures and Discharges in the Danube and Mosoni branch of the Danube", signed on May 29, 1995, modified on April 25, 2007.

discharged into the Mosoni branch of the Danube ensures the water supply of the Mosoni Danube and river branches in the Hungarian flood-protected area.

With respect to the Article 4 of the Agreement the Parties are obliged to mutually exchange and evaluate data obtained by the environmental monitoring on both, Slovak and Hungarian sides of the Danube. These data serve for an assessment of impacts of the increased flow rate in the Danube and the water supply on the Hungarian territory. Technical details of the environmental monitoring – the determination of influenced area, the specification of sampling and measuring points, the frequency of measurements, the list of exchanged parameters, the frequency of data exchange, etc. – are described in the Statute (Appendices A.2 and A.3) and other relevant documents.

According to the Article 3 of the Agreement the observation results and the measured data in tabular and graphical form, together with their evaluation, constitute the National Annual Reports prepared by the Parties themselves. The Joint Annual Report is elaborated jointly and is based on approved and mutually exchanged National Annual Reports.

The present Joint Annual Report on environmental monitoring gives an evaluation concerning the year 2016. The evaluation of the Slovak side is based on data collected by the Slovak Hydrometeorological Institute (SHMÚ), Slovak Water Management State Enterprise (SVP-BA), Water Research Institute (VÚVH), Western Slovakia Water Company (ZsVS), Bratislava Water Company (BVS), National Agricultural and Food Centre - Soil Science and Conservation Research Institute (NPPC-VÚPOP), National Forest Centre - Forest Research Institute (NLC-LVÚ), Slovak Academy of Sciences (SAV), Faculty of Natural Sciences of the Comenius University (PriF UK) and Ground Water Consulting Ltd. (GWC). The data exchange and the evaluation of monitoring under the frame of joint monitoring were co-ordinated by the Plenipotentiary of the Government of the Slovak Republic for Construction and Operation of Gabčíkovo - Nagymaros Project at the Ministry of Transport, Construction and Regional Development of the Slovak Republic.

The evaluation of the Hungarian side is based on data collected by the Győr-Moson-Sopron County Government Office (GYMSMKH), Department of Environment Protection and Nature Conservation), North-Transdanubian Water Directorate (ÉDUVIZIG), Regional Water Companies, Faculty of Agricultural and Food Sciences of the University of West Hungary (NYME-MÉK), Forest Research Institute (ERTI), Hungarian Natural History Museum (MTM), Hungarian Academy of Sciences (MTA) and Eötvös Lóránd University (ELTE). The data exchange and the evaluation of monitoring were co-ordinated by the Deputy State Secretary for Environmental Affairs at the Ministry of Agriculture of Hungary.

Goals of the Joint Monitoring

The main goal of the joint Slovak-Hungarian monitoring, in accordance to the intergovernmental Agreement, is to observe, record and jointly evaluate the quantitative and qualitative changes of surface and groundwater bodies and water dependent natural environment in connection to the realised measures and the water supply. The water supply into the right-side river branches on the Hungarian territory is assured by the submerged weir at rkm 1843 in the Danube old riverbed, which increases the water level upstream of the weir. The water supply into the Mosoni Danube is realised through the intake object at Čunovo and by the right-side seepage canal.

The evaluation includes changes in hydrological regimes of surface and ground water, changes in surface and ground water quality, changes in soil moisture and changes in forest stands and biota.

The goal of mutual data exchange is to provide information on monitoring results (measurements, analyses, observations), about development of parameters included in the data exchange, and about environmental changes in the influenced area of both Parties. The basic condition of exchanged data evaluation is the usage of equal or similar methods of measurements and analyses and application of agreed methods of interpretation.

The final goal of the Joint Annual Report is to submit joint evaluation of monitoring results and joint recommendations for monitoring improvement and environment protection activities to the respective governments.

Joint monitoring activities in the year 2016

In the year 2016 the monitoring of surface water levels, flow rate and quality and the monitoring of ground water levels and quality have been performed in accordance with the intergovernmental Agreement and the modified Statute. The measurements of soil moisture, monitoring forest stands and the biological observations were realized by Slovak Party only. Similarly to previous two years the Hungarian Party had not carried out the monitoring of soil moisture, forestry and biology.

On the meeting of Nominated Monitoring Agents, held on January 27, 2016 in Budapest, the Joint Annual Report on environment monitoring in 2014 was approved and signed (**Appendix A.4**). The mutual exchange of the monitoring data for the year 2015 was realized, in accordance with the Statute, on May 31, 2016 in Győr (**Appendix A.5**). Subsequently, after the data exchange, both Parties elaborated their National Annual Reports on the joint Slovak-Hungarian monitoring in the year 2015. The electronic versions of National Annual Reports on monitoring in 2015 were mutually handed over on August 15, 2016 in Győr (**Appendix A.6**). On October 5, 2016 the Government of the Slovak Republic by its Resolution No. 462/2016 recalled Mr. Ladislav Lazár from its position as the Plenipotentiary of the Government of the Slovak Republic for construction and operation of the Gabčíkovo-Nagymaros System of Waterworks, the Head of the Governmental Delegation of the Slovak Republic for the negotiations with the Governmental Delegation of Hungary on implementation of the Judgement of the International Court of Justice in the Hague in the case of the Gabčíkovo Nagymaros Project, and the Nominated Monitoring Agent under the intergovernmental Agreement concerning certain temporary technical measures and discharges in the Danube and Mosoni branch of the Danube and has appointed Mr. Stanislav Fialík to his place. The Joint Annual Report on environmental monitoring in 2015 was discussed and approved by the Nominated Monitoring Agents on their negotiation held on January 12, 2017 in Gabčíkovo (**Appendix A.7**).

The hydrological situation on the Danube in the spring was favourable, so in the period May 18-31, 2016 it was possible to discharge higher amount of water into the Danube old riverbed and to realize artificial flooding in the right-side river branch system.

The present Joint Annual Report in 2016 was elaborated on the basis of Slovak and Hungarian data, that were mutually exchanged on May 31, 2017. The mutual exchange of National Annual Reports on environmental monitoring in 2016 was realized on August 31, 2017 in Budapest.

Fulfilment of recommendations in the Joint Annual Report 2015

1. Both Parties, on the basis of background documents, will elaborate a joint proposal on optimisation of the monitoring, carried out under the Intergovernmental Agreement of 1995, and shall submit it to the Nominated Monitoring Agents for approval.

    Based on proposals of both Parties a joint proposal on the monitoring optimisation, concerning the surface water levels and flow rates, surface water quality, hydrobiology and sediments, groundwater levels and groundwater quality, have been discussed and elaborated on the negotiation of experts on March 27, 2017.

    Both Parties agreed that a joint proposal for optimisation of the monitoring of soil moisture, forest stands and biota would be discussed by the end of October 2017, so that the whole proposal for monitoring optimisation would be presented for negotiation and approval by the Nominated Monitoring Agents when signing the Joint Annual Report for 2016. The proposed monitoring program should be implemented from January 1, 2018.

PART 1

Surface water levels and flow rates

In 2016 the observation of surface water levels and flow rates continued without changes and in the extent prescribed by the Agreement. The only exception was the observation site No. 4052 on the Slovak territory, where the observation was terminated, since the water level at this object throughout the monitoring period was very similar to the water level at the object No. 4051. The list of gauging stations on the Slovak and the Hungarian territories, where water levels are observed, is given in the **Table 1-1**. The observation network is presented in **Fig. 1-1a, b**. Data from the given stations were mutually exchanged by the Parties for the purpose of evaluation of the surface water level and flow rate regimes. At selected gauging stations (10 gauging stations on each side) joint flow rate measurements were performed and time series data were compiled. Mutually agreed data form the basis for joint assessment of measures and water supply taken under Articles 1-3 of the Agreement. The assessment of surface water in this joint report covers the period from January 1 to December 31 of the reported year.

Table 1-1: List of gauging stations

No.	Country	Station No.	Location and station name
Slovak side			
1	**Slovakia**	**1250**	Danube, Bratislava-Devín
2	**Slovakia**	**2545**	Danube, Hamuliakovo
3	**Slovakia**	**2558**	Danube, Dobrohošť
4	**Slovakia**	**1251**	Danube, Gabčíkovo
5	**Slovakia**	**1252**	Danube, Medveďov
6	**Slovakia**	**1600**	Danube, Komárno
7	**Slovakia**	**2848**	reservoir, Čunovo - dam
8	**Slovakia**	**2552**	Danube, Čunovo - downstream from the Čunovo dam
9	**Slovakia**	**2851**	Mosoni branch of the Danube, intake at Čunovo
10	**Slovakia**	**3126**	left-side river arm system, intake at Dobrohošť
11	**Slovakia**	**2849**	power canal, Gabčíkovo Power Plant
12	**Slovakia**	**2850**	tail-race canal, Gabčíkovo Power Plant
13	**Slovakia**	**3124**	seepage canal - upper water level, Čunovo
14	**Slovakia**	**3125**	seepage canal - lower water level, Čunovo
15	**Slovakia**	**1653**	Little Danube, Malé Pálenisko
16	**Slovakia**	**4045**	left-side river arm system, A-1
17	**Slovakia**	**4046**	left-side river arm system, B-1
18	**Slovakia**	**4047**	left-side river arm system, B-2
19	**Slovakia**	**4048**	left-side river arm system, C-1
20	**Slovakia**	**4049**	left-side river arm system, D-1
21	**Slovakia**	**4050**	left-side river arm system, E-2
22	**Slovakia**	**4051**	left-side river arm system, F-1
23	*Slovakia*	*4052*	*left-side river arm system, F-3 - observation terminated*
24	**Slovakia**	**4053**	left-side river arm system, G-1
25	**Slovakia**	**4054**	left-side river arm system, H-1
26	**Slovakia**	**4055**	left-side river arm system, H-3
27	**Slovakia**	**4056**	left-side river arm system, J-1
28	**Slovakia**	**4057**	left-side river arm system, lake B (former gravel dredging pit)

No.	Country	Station No.	Location and station name
Hungarian side			
1	**Hungary**	**000001**	Danube, Rajka
2	**Hungary**	**004515**	Danube, Doborgaz
3	**Hungary**	**000002**	Danube, Dunaremete
4	**Hungary**	**000005**	Danube, Komárom
5	**Hungary**	**000017**	Mosoni Danube, Mecsér
6	**Hungary**	**000018**	Mosoni Danube, Bácsa
7	**Hungary**	**003939**	Danube, submerged weir
8	**Hungary**	**004516**	right-side river arm system, Helena
9	**Hungary**	**003873**	seepage canal, lock No. I.
10	**Hungary**	**003875**	seepage canal, lock No. II.
11	**Hungary**	**003940**	seepage canal, lock No. V.
12	**Hungary**	**003871**	seepage canal, lock No. VI.
13	**Hungary**	**110106**	Zátonyi Danube, Dunakiliti, Gyümölcsös út
14	**Hungary**	**110113**	right-side river arm system, Z-1
15	**Hungary**	**110127**	right-side river arm system, Doborgaz-15
16	**Hungary**	**110115**	right-side river arm system, B-2
17	**Hungary**	**110117**	right-side river arm system, B-3
18	**Hungary**	**110170**	right-side river arm system, Z-6
19	**Hungary**	**110152**	right-side river arm system, Z-8
20	**Hungary**	**110119**	right-side river arm system, B-4
21	**Hungary**	**110129**	right-side river arm system, B-5
22	**Hungary**	**110162**	right-side river arm system, B-6
23	**Hungary**	**110138**	right-side river arm system, B-7
24	**Hungary**	**110198**	right-side river arm system, B-8
25	**Hungary**	**110131**	right-side river arm system, B-9
26	**Hungary**	**110133**	right-side river arm system, B-11
27	**Hungary**	**110142**	right-side river arm system, Z-12
28	**Hungary**	**110155**	right-side river arm system, Z-10
29	**Hungary**	**110157**	right-side river arm system, Gatya enclosure

The intergovernmental Agreement, signed on 19th April 1995, set up a temporary water management regime. Parties have agreed that in case of an average annual flow rate of 2025 $m^3.s^{-1}$ in the Danube at gauging station Bratislava-Devín an annual average of 400 $m^3.s^{-1}$ of water should be discharged into the Danube old riverbed downstream of the Čunovo dam. Actual daily amount of water is governed by the flow rate coming into the Bratislava-Devín cross-section, taking into consideration the rules of operation set out in Annex 2 of the Agreement (**Appendix A.1**). The average daily flow rate in the vegetation period (between April 1 and August 31), depending on the hydrological conditions, should fluctuate between 400 and 600 $m^3.s^{-1}$; in non-vegetation period (between September 1 and March 31) the average daily flow rate should not be less than 250 $m^3.s^{-1}$. According to the methodology agreed in the Joint Annual Report in 2004, in case of flow rates over 5400 $m^3.s^{-1}$ the water amount over 600 $m^3.s^{-1}$ discharged through the Čunovo dam is not taken into consideration when the annual average is calculated for the purpose of this evaluation. In the Joint Annual Report in 2011 the methodology for calculating the annual average was adjusted further. Modification relates to flow rates over 600 $m^3.s^{-1}$ discharged through the Čunovo dam during maintenance works. In such cases, for the purpose of calculation an annual average, the higher flow rates will be reduced to an amount corresponding to flow rates as defined in the Annex 2 of the Agreement.

Besides this, another 43 $m^3.s^{-1}$ of water was agreed in the Agreement to be discharged into the Mosoni branch of the Danube and into the right-side seepage canal. Discharges are dependent on hydrological and technical conditions.

The gauging station Bratislava-Devín plays a key role in determining the actual amount of water to be released into the Danube old riverbed downstream of Čunovo dam. The basic monthly characteristics of flow rate in the Danube for the year 2016 are given in the **Table 1-2**. The *Minimum* and the *Maximum* values represent the lowest and the highest recorded data. The *Avg. min* and the *Avg. max* represent the lowest and the highest average daily values. The *Average* is calculated from average daily values.

Table 1-2: Monthly characteristics of flow rate in the Danube at Bratislava-Devín gauging station in 2016

Year	**2016**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	812	1639	1265	1460	1439	2633	1728	1404	1171	1093	1098	939	**812**
Avg. min	822	1722	1310	1511	1521	2767	1812	1441	1217	1148	1107	954	**822**
Average	1193	2420	1659	1781	2258	3352	2772	2318	1654	1368	1481	1119	**1944**
Avg. max	1710	4824	2335	2325	3548	4463	5435	4059	2715	1801	2202	1289	**5435**
Maximum	1773	5171	2400	2367	3723	4747	5645	4292	3006	1868	2284	1357	**5645**

The minimal annual flow rate in 2016 (**Table 1-2**) occurred at the beginning of the year on January 2, 2016 and reached 812 $m^3.s^{-1}$, together with the lowest average daily flow rate of 822 $m^3.s^{-1}$. The highest annual flow rate occurred during the summer on July 15, 2016 and it reached 5645 $m^3.s^{-1}$ at culmination, with the highest average daily flow rate of 5435 $m^3.s^{-1}$. The average annual flow rate at this station in the year 2016 reached 1944 $m^3.s^{-1}$, what represents a flow rate slightly below the average (**Table 1-3**). Similar average annual flow rates were recorded also in years 1992, 1993, 1998 and 2007, with values of 1934, 1909, 1921 and 1916 $m^3.s^{-1}$ respectively.

At the end of 2015 the flow rates on the Danube decreased below 1000 $m^3.s^{-1}$ and on December 31, 2015 the annual minimum in 2015 occurred with a value of 789 $m^3.s^{-1}$. In the following days the flow rate in the Danube remained low and on January 2, 2016 the annual minimum in 2016 was recorded at 812 $m^3.s^{-1}$, with the average daily flow rate of 822 $m^3.s^{-1}$. The flow rates in January mostly ranged between 800 and 1700 $m^3.s^{-1}$ and were mainly well below the long-term average, however due to more intense precipitation in the Upper Danube two less significant discharge waves occurred in the middle and at the end of the month, slightly exceeding 1700 $m^3s.^{-1}$. Heavy rainfall in the German and Austrian Danube river basin at the end of January generated a significant discharge wave early in February, which culminated on February 2, 2016 at 5171 $m^3.s^{-1}$, what was the second highest flow rate in 2016. The average daily flow rate reached 4824 $m^3.s^{-1}$. However, the flow rate after the culmination fell sharply to 2000 $m^3.s^{-1}$. Similar, but less significant discharge wave occurred due to precipitation also at the beginning of third decade of February, when the flow rate culminated around 4000 $m^3.s^{-1}$. As a result of the aforementioned abundant precipitations the flow rates in February moved exclusively above the values of long-term average daily flow rates. In March and April the average daily flow rates ranged from 1300 to 2400 $m^3.s^{-1}$ and they were again well below the long-term average daily values. The situation was similar also in April and May, when the flow rates moved mostly below the long-term daily averages, however at the beginning and in the middle of May the flow rates increased due to rather abundant precipitations in the German and Austrian Danube river basin. The discharge wave in the middle of May achieved 3723 $m^3.s^{-1}$ and the average daily flow rate was 3548 $m^3.s^{-1}$. At the end of May the flow rate began to rise again and in June, due to frequent precipitations in the German and Austrian Danube basin, it fluctuated from 2700 to 4400 $m^3.s^{-1}$ and moved exclusively above the values of the long-term average daily flow rates. During the month several higher discharge waves occurred, the most notable of which occurred at the very beginning of the month, when the flow rate on June 2, 2016 peaked at 4747 $m^3.s^{-1}$ and the average daily flow rate reached 4463 $m^3.s^{-1}$.

The average daily flow rates in July ranged from 2000 to 3000 $m^3.s^{-1}$ and mostly fluctuated around or above the long-term average daily values. Significantly below the long-term average the flow rates moved only in the second half of the first and the beginning of the second decade. Subsequently, however, due to the heavy rainfall that fell in the German and Austrian Danube river catchments, the flow rate began to rise sharply and on July 15, 2016 it culminated with a value of 5645 $m^3.s^{-1}$, which was the annual maximum. Also the average daily flow rate was the highest in the year 2016 and reached 5435 $m^3.s^{-1}$. After this culmination the flow rate fell sharply and oscillated around the values of the long-term daily average by the end of the month. Also in the first half of August the flow rates due to more abundant precipitations moved exclusively above the long-term average daily flow rates, with two more significant discharge waves, the second culminating on August 11, 2016 at 4292 $m^3.s^{-1}$, with an average daily flow rate of 4059 $m^3.s^{-1}$. After the decline of this wave the flow rates almost continuously decreased and moved exclusively below the values of the long-term daily averages, and by the end of the month they fell to 1404 $m^3.s^{-1}$.

The flow rates during September fluctuated significantly and reached values between 1200 and 2700 $m^3.s^{-1}$, while they were moving mostly below the long-term daily averages. Above the long-term average daily flow rate values they increased only at two discharge waves during the first and at the turn of the second and the third decade, when both culminated around 3000 $m^3.s^{-1}$, and the average daily flow rates reached 2690 and 2715 $m^3.s^{-1}$ respectively. During October the flow rates on the Danube were fairly flat and the average daily flow rates varied from 1150 to 1800 $m^3.s^{-1}$ and were again mainly below the long-term daily averages. Similar course was observed also in the first half of November, although the flow rates were closer to the long-term daily averages. At the end of the second decade of November a smaller discharge wave occurred due to weaker precipitations, which culminated on November 18, 2016 at 2284 $m^3.s^{-1}$ and the flow rates during this wave exceeded the long-term average daily values. At the end of the month the flow rates fell below these values and remained below them over the whole December, while they fluctuated only in a narrow range of 950 to 1300 $m^3.s^{-1}$.

Based on the above assessment it can be concluded, that the flow rate regime of the Danube in 2016 was closer to a typical one than in 2015. Atypical were the two discharge waves in February and low flow rates during most of the spring period. Flow rates in January mostly fluctuated well below the long-term average. At the beginning of February there was a relatively significant discharge wave and the average daily flow rates over the whole month did not fall below the long-term average daily values. In March, April and during the first half of May, the average daily flow rates were almost exclusively below the long-term averages, often rather significantly. Increased flow rates occurred from the second half of May to the end of the first half of August and they are typical for late spring and summer months. Since the second half of August until the end of the year, the flow rates on the Danube moved well below the level of long-term average values occurring in these months. The discharge waves occurring over the year did not cause significant flooding of the floodplain. Exceptions were the flood waves at the beginning of February and in mid-July, during which the lower part of the inundation in the Istragov area was partially flooded.

Table 1-3: Average annual flow rates

Station No.	Period	Average annual flow rate in the hydrological year[3] ($m^3.s^{-1}$)	% of average flow rate	Average annual flow rate in the calendar year ($m^3.s^{-1}$)	% of average flow rate
1249[4]	**1901-2000**	**2050**	**-**	**2050**	**-**
1250	**1990-2014**	**2038**	**-**	**2038**	**-**
1250	1990	1711	84.5	1721	85.0
1250	1991	1752	86.5	1737	85.8
1250	1992	1775	87.7	1934	95.5
1250	1993	2030	100.2	1909	94.3
1250	1994	1908	94.2	1866	92.1
	Agreement	**2025**	**100.0**	**2025**	**100.0**
1250	1995	2278	112.5	2329	115.0
1250	1996	1993	98.4	2015	99.5
1250	1997	2094	103.4	2031	100.3
1250	1998	1723	85.1	1921	94.9
1250	1999	2582	127.5	2387	117.9
1250	2000	2393	118.2	2379	117.5
1250	2001	2170	107.2	2232	110.2
1250	2002	2458	121.4	2683	132.5
1250	2003	2001	98.8	1646	81.3
1250	2004	1807	89.2	1852	91.5
1250	2005	2128	105.1	2097	103.6
1250	2006	2152	106.3	2186	108.0
1250	2007	1768	87.3	1916	94.6
1250	2008	2014	99.5	1876	92.6
1250	2009	2163	106.8	2186	108.0
1250	2010	2098	103.6	2130	105.2
1250	2011	1782	88.0	1700	84.0
1250	2012	2018	99.7	2121	104.7
1250	2013	2444	120.7	2417	119.4
1250	2014	1809	89.3	1788	88.3
1250	2015	1768	87,3	1788	88,3
1250	**2016**	**1909**	**94,3**	**1944**	**96,0**

When comparing the average daily flow rates measured at gauging stations No. 1250 – Bratislava-Devín, 1252 – Medveďov and 1600 – Komárno it can be stated that even in the year 2016, these flow rates have not showed significant changes. (**Fig. 1-2**). Larger differences between these stations occurred during the discharge waves in February, June, July and August, when at the station Bratislava-Devín higher daily average flow rates were recorded than at the other two stations in Medveďov and Komárno. Slightly higher flow rate in the station at Komárno in mid February, during March and at the end of the year can

[3] The hydrological year runs from 1st November of the previous year to 31st October of the current year.

[4] Data from gauging stations No. 1249 - Bratislava (until 23.10.1992) and 1250 - Bratislava-Devín were used in the average annual flow rate calculation for the period 1901-2000.

be attributed to the impact of increased flow rates in the tributaries of the Danube. The difference between the stations Bratislava-Devín and Medveďov largely corresponds to the water amount discharged to the Little Danube and Mosoni Danube, which returns to the Danube downstream from the Medveďov gauging station.

1.1. Discharge into the Danube downstream of the Čunovo dam

Based on the Agreement the average daily amount of water in the Danube downstream of Čunovo dam is determined according to the average daily flow rates at gauging stations Doborgaz and Helena (**Fig. 1-3**). At these stations joint flow rate measurements are performed. The basic monthly characteristics of water amount supplied to the Danube downstream of the Čunovo dam (consisting of the sum of flow rates in gauging stations at Doborgaz and Helena) for the year 2016 are show in **Table 1-4**. The *Minimum* and the *Maximum* values represent the lowest and the highest recorded data. The *Avg. min* and the *Avg. max* represent the lowest and the highest average daily values. The *Average* is calculated from the average daily values.

Table 1-4: Monthly characteristics of flow rate in the Danube downstream of the Čunovo weir in 2016

Year	**2016**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	226	227	223	228	382	505	450	303	228	204	209	197	**197**
Avg. min	228	230	227	295	404	561	513	361	269	235	228	219	**219**
Average	239	344	268	383	629	585	592	508	489	243	241	237	**397**
Avg. max	246	1125	406	475	801	615	913	603	1606	282	292	247	**1606**
Maximum	259	1660	415	511	806	631	1300	617	1680	309	345	270	**1680**

The total average annual flow rate in the Danube downstream of the Čunovo dam in 2016 was 397 $m^3.s^{-1}$ (**Table 1-4**), what represents 103.4 % of the agreed water amount. The minimal annual flow rate of 197 $m^3.s^{-1}$ was recorded on December 7, 2016, when also the lowest average daily flow rate of 220 $m^3.s^{-1}$ was recorded. The highest annual flow rate occurred on September 21, 2016, when it reached 1680 $m^3.s^{-1}$, and the highest average daily flow rate reached 1600 $m^3.s^{-1}$. Taking into consideration the obligations envisaged in the intergovernmental Agreement, the Slovak Party, in the case of average annual flow rate of 1944 $m^3.s^{-1}$ at Bratislava-Devín, was obliged to release an average annual discharge of 384 $m^3.s^{-1}$ into the Danube riverbed downstream of Čunovo dam.

A situation, when it was necessary to release increased discharges (over 600 $m^3.s^{-1}$) into the Danube old riverbed due to higher flow rates in the Danube (over 5400 $m^3.s^{-1}$) occurred only once in 2016. However, during the discharge wave in February 2016 the flow rate exceeded the 600 $m^3.s^{-1}$ for one day, and higher flow rate was also released during six days in September due to technical maintenance of the Gabčíkovo Hydropower Plant (19.-24.9.2017). If reduction of flow rate, in terms of methodology for calculating the average annual discharge, is applied in connection with the higher amount of water released into the Danube old riverbed, an average annual discharge of 383 $m^3.s^{-1}$ (99,2 %) is obtained. Since the hydrological conditions in 2016 were rather favourable, increased flow rate (800 $m^3.s^{-1}$) was discharged into the Danube old riverbed in the second half of May, to realize a partial flooding of the right-hand branch system.

Some deficiencies regarding the minimal discharges during the non-vegetation period, when the deficit of discharge exceeded the acceptable deviation of ± 7 %, have been registered again, however in a significantly smaller extent. Based on the jointly accepted flow rate data the deficit in 2016 was higher than the acceptable deviation in January for six days, in February for four days, during March for thirteen days, in November for five days and in December for nine days. Certain deficiencies as regard the minimal values have been recorded also in the vegetation period. Acceptable deviation in the case of 400 $m^3.s^{-1}$ was exceeded for seven days in early April and for three days at the end of August. All during very low flow rates in the Danube. Neither the deficiencies during the non-vegetation period, nor in the summer period had significant impact on the biota of the area affected.

Based on the above evaluation it can be stated that the Slovak Party has fulfilled the average annual discharge jointly agreed in the intergovernmental Agreement. Taking into consideration the minimal values prescribed in the Agreement (in the winter period not less than 250 $m^3.s^{-1}$, in the vegetation period at least 400 $m^3.s^{-1}$) and the acceptable deviation (±7 %) it can be stated that flow rates below 250 $m^3.s^{-1}$ occurred 37 times (difference max to 13.4 $m^3.s^{-1}$) and flow rates lower than 400 $m^3.s^{-1}$ occurred 10 times (difference max to 21.2 $m^3.s^{-1}$).

1.2. Discharge into the Mosoni branch of the Danube

In terms of the intergovernmental Agreement from April 1995 the flow rate into the Mosoni Danube, which consist of flow rate released into the Mosoni branch of the Danube through the intake structure at Čunovo and flow rate through the seepage canal, should be 43 $m^3.s^{-1}$.

Joint discharge measurements in the Mosoni branch of the Danube are carried out downstream of intake structure on the Slovak territory at 0.160 rkm and also upstream of lock No. I on the Hungarian territory. Average daily flow rates were agreed upon joint evaluation of common discharge measurements performed at both profiles.

Regarding the discharge released into the Mosoni branch of the Danube data measured downstream of intake structure were considered in this evaluation (**Fig. 1-4, Table 1-6**.

Table 1-6: Monthly characteristics of water amount released into the Mosoni branch of the Danube through the intake at Čunovo in 2016

Year	**2016**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	14.6	13.7	21.2	11.3	7.0	7.6	14.8	20.9	12.3	27.3	31.4	23.1	**7.0**
Avg. min	22.7	14.1	22.4	23.3	17.9	18.6	29.0	30.7	21.3	38.7	40.6	24.3	**14.1**
Average	23.2	22.7	26.5	30.2	28.6	30.9	31.4	36.5	38.6	43.3	42.6	38.7	**32.8**
Avg. max	24.0	24.0	32.0	32.4	33.9	33.3	32.8	43.6	43.8	45.2	44.0	43.0	**45.2**
Maximum	24.5	24.9	32.9	32.7	34.5	33.7	33.6	44.2	44.2	45.3	45.1	43.5	**45.3**

In the year 2016 the average annual discharge released into the Mosoni branch of the Danube through the intake at Čunovo was 32.8 $m^3.s^{-1}$ (**Table 1-6**). The minimal annual discharge of 7.0 $m^3.s^{-1}$ occurred on May 23, 2016, while the lowest average daily discharge of 14.1 $m^3.s^{-1}$ was recorded on February 11, 2016. The highest annual discharge of

45.3 m^3.s^{-1} occurred on October 6, 2016, while the highest average daily discharge of 45.2 m^3.s^{-1} was recorded on October 13, 2016.

The flow rate in the right-side seepage canal was also measured at two sites. The first is on the Slovak territory at Čunovo; the second is on the Hungarian territory upstream of the Lock No. II. In this evaluation the data observed at the Lock No. II were considered (**Table 1-7**).

Table 1-7: Monthly characteristics of flow rate determined at the Lock No. II in 2016

Year	2016												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	2.33	1.20	1.63	1.82	1.82	0.98	0.20	1.73	1.54	2.22	1.92	1.73	**0.20**
Avg. min	2.33	1.49	1.73	1.82	1.85	1.08	0.21	1.76	1.58	2.33	1.96	1.74	**0.21**
Average	2.48	1.90	1.90	2.16	2.36	1.95	2.07	2.33	2.43	2.55	2.19	2.03	**2.20**
Avg. max	2.76	2.40	2.14	2.57	2.82	2.91	3.11	2.64	3.11	3.07	2.55	2.23	**3.11**
Maximum	2.77	2.54	2.22	2.65	2.90	3.15	3.41	2.77	3.15	3.15	2.77	2.43	**3.41**

In the year 2016 (**Table 1-7**) the average annual flow rate in the right-side seepage canal at Lock. No. II was 2.20 m^3.s^{-1}. The minimal annual flow rate of 0.20 m^3.s^{-1} occurred on July 8, 2016, when also the lowest average daily flow rate of 0.21 m^3.s^{-1} was determined. The highest annual flow rate of 3.41 m^3.s^{-1} occurred on July 19, 2016, while the highest average daily flow rate of 3.11 m^3.s^{-1} was recorded on July 20, 2016.

The total flow rate into the Mosoni Danube consist of flow rate released into the Mosoni branch of the Danube through the intake structure at Čunovo and flow rate through the right-side seepage canal, determined at Lock. No. II.

Table 1-8: Monthly characteristics of flow rate released into the Mosoni Danube in 2016 (average daily values)

Year	2016												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Avg. min	25.0	16.1	24.2	25.8	20.3	20.5	31.3	32.6	23.3	41.2	42.9	26.5	**16.1**
Average	25.7	24.6	28.4	32.3	31.0	32.9	33.5	38.9	41.0	45.8	44.8	40.8	**35.0**
Avg. max	26.6	26.2	34.1	34.5	36.2	35.5	35.2	46.1	46.4	47.7	46.2	45.0	**47.7**

In the year 2016 (**Table 1-8**) the average annual discharge released into the Mosoni Danube was 35.0 m^3.s^{-1}. The lowest average daily flow rate of 16.1 m^3.s^{-1} was recorded on February 11, 2016. The highest average daily flow rate of 47.7 m^3.s^{-1} occurred on October 13, 2016.

In the year 2016, technical maintenance of turbines was carried out at the beginning of April for three days and in the first half of December for six days. Besides this, construction works were finalized from the beginning of the year until mid August, due to what the discharge ranged mostly from 14 to 32 m^3.s^{-1}. The average annual discharge into the Mosoni Danube in the year 2015 was 35.0 m^3.s^{-1}, which is 81.4 % of the agreed amount. With respect to the above mentioned limitations, the total amount of water discharged into the Mosoni Danube was lower than the water amount set out in the intergovernmental Agreement. The Hungarian Party have been informed about the exceptional water discharge into the Mosoni Danube during the construction works by

Slovak party at the negotiations of the Nominated Monitoring Agents on December 11, 2014 and in letters dated January 27, March 30, June 13 and November 10, 2016.

1.3. Water distribution on the Hungarian territory

The water distribution on the Hungarian territory is regulated by the Operation rules, that took into account the water amount entering the Bratislava-Devín cross-section and the season The water discharged to the Hungarian side is distributed between the Danube old riverbed, river branches in the inundation area, Mosoni Danube and river branches on the flood-protected area.

1.3.1. Water supply into the inundation area

River branches in the inundation area on the Hungarian territory are supplied with water from two sources:

a) the main supply comes from the Danube old riverbed through three openings in the riverbank, the supplied amount of water is regulated by manipulating the water level impounded by the submerged weir and the Dunakiliti dam;

b) additional resource is the remaining amount of water after the water supply to Mosoni Danube and the river branches in the flood protected area and is supplied from the right-side seepage canal through the lock No. V.

These two sources are summed to determine the total amount.

The water distribution is regulated according to the criteria of the reference status, that was determined at the end of the nineties with participation of stakeholders. The water distribution should reflect the hydrological regime of the fifties which is represented by characteristic water levels in river branches in the inundation area. Environmental status of Szigetköz in the reference period was determined as the most similar to a state that can be sustainable on a long run, and provides sufficient information on riverbed morphology and hydro-geological regime for determining the reference status. The daily flow rate is determined as a function of flow rate entering the Bratislava - Devín cross-section, while the annual periods are also taken into account.

The total water amount inflowing through the three openings in the Danube riverbank upstream of the submerged weir is determined at the Helena gauging station. Joint flow rate measurements at this gauging station were performed by both Parties. Measurements were jointly evaluated and average daily flow rate data were adopted (**Table 1-9**).

Table 1-9: Monthly characteristics of flow rate determined at the Helena station in 2016

Year	**2016**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	22.8	32.0	31.0	35.8	69.0	130	100	68.0	31.6	14.3	6.8	7.4	**6.8**
Avg. min	24.6	34.0	31.4	40.8	78.3	133	109	72.5	33.8	15.1	8.0	9.8	**8.0**
Average	37.4	67.7	52.9	74.6	156	155	139	106	74.4	26.8	20.2	19.4	**77.4**
Avg. max	44.1	154	82.0	92.8	215	186	164	129	186	63.4	35.9	33.5	**215**
Maximum	44.9	187	83.4	101	217	187	170	141	196	74.8	37.0	34.8	**217**

In the year 2016 (**Table 1-9**) the average annual discharge into the right-side river branches at Helena gauging station was 77.4 $m^3.s^{-1}$. The minimal annual flow rate of 6.8 $m^3.s^{-1}$ was recorded on November 8, 2016, while the lowest average daily flow rate of 8.0 $m^3.s^{-1}$ was determined on November 6, 2016. The highest annual flow rate of 217 $m^3.s^{-1}$ occurred on May 30, 2016, when also the highest average daily flow rate of 215 $m^3.s^{-1}$ was recorded.

The water amount inflowing from the right-side seepage canal is determined at the Lock No. V. The residual amount of water from the Mosoni Danube supply is released through this object.

Table 1-10: Monthly characteristics of flow rate determined at the Lock No. V in 2016

Year	2016												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	6.30	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	13.2	20.6	0.20	**0.00**
Avg. min	7.80	0.00	1.16	0.03	0.00	0.00	0.00	0.00	0.11	16.5	21.2	0.95	**0.00**
Average	13.1	2.40	7.03	2.97	0.85	0.08	0.17	0.69	9.30	20.8	22.7	14.1	**7.87**
Avg. max	16.2	7.84	16.4	11.8	5.25	0.35	0.47	4.78	17.3	22.5	24.4	24.6	**24.6**
Maximum	17.4	8.10	16.8	13.1	5.60	1.50	1.20	5.80	17.9	24.3	24.9	25.1	**25.1**

In the year 2016 the average annual flow rate through the Lock. No. V was 7.87 $m^3.s^{-1}$ (**Table 1-10**). The minimal annual flow rate was 0.00 $m^3.s^{-1}$ and it occurred several times in February, April, May, June, July, August and September 2016, the lowest average daily flow rate of 0.00 $m^3.s^{-1}$ was recorded several times in February, May, June, July and August. The highest annual flow rate of 25.1 $m^3.s^{-1}$ was recorded on December 6, 2016, while the highest average daily flow rate of 24.6 $m^3.s^{-1}$ occurred at three occasions on December 4, 5 and 6, 2016.

The total flow rate inflowing to the inundation area consist of water amount flowing through the Helena cross-section and water amount flowing through the Lock No. V in the right-side seepage canal (**Fig. 1-5, Table 1-11**).

Table 1-11: Monthly characteristics of total water amount released into the inundation area in 2016 (average daily values)

Year	2016												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Avg. min	36.0	41.8	47.6	52.6	83.6	133	109	76.8	48.6	37.5	32.1	30.0	**30.0**
Average	50.5	70.1	59.9	77.6	157	155	139	107	83.7	47.7	42.9	33.5	**85.3**
Avg. max	55.4	154	84.2	94.2	215	186	164	129	186	84.9	58.1	37.0	**215**

Concerning the total flow rate in the right-side river branch system in the year 2016 (**Table 1-11**) the average annual value was 85.3 $m^3.s^{-1}$. The lowest average daily flow rate of 30.0 $m^3.s^{-1}$ was recorded on December 7, 2016, the highest average daily flow rate of 215 $m^3.s^{-1}$ occurred on May 30, 2016, at the end of artificial flooding of the right-side river branch system.

Thanks to favourable hydrological conditions in the Danube artificial flooding was realized in the right-side river branch system in the period from May 18 to May 31, 2016.

1.3.2. Water levels in the right-side river branch system

The aim of the water supply and its regulation in the right-side river branch system is to create and manage the water level regime in the river arms so that the water levels shall correspond to the selected reference status. Concerning the water supply system the right-side inundation area can be divided into four parts. In the individual parts of the river branch system characteristic water levels were determined for the selected reference status.

Water levels in the Tejfalusi river branch system are in general slightly lower than the required water levels. In the central part of the inundation area, in the Cikolai and Bodaki river branch systems, the created water levels achieved the projected levels, but they are slightly above them. The water levels in the lower part of the inundation, thanks to finalizing the rehabilitation interventions in the Ásványi river branch system, are closer to the targeted levels in comparison with the previous years.

Based on the above mentioned it can be concluded that the water levels in a great part of the river branch system are acceptable for the reference status in the case of low and average flow rates. However, some further adjustments of the water supply system would be required to be able to create more accurate water levels at the key regulation objects.

1.3.3. Water supply into the Mosoni Danube

The water supply into the Mosoni Danube is realized from the right-side seepage canal through the Lock No. VI (**Fig. 1-6**). The flow rate is measured at the cross-section downstream of the lock (**Table 1-12**).

Table 1-12: Monthly characteristics of flow rate discharged into the Mosoni Danube through the Lock No. VI in 2016

Year	**2016**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	6.85	11.0	15.8	8.10	7.37	7.80	28.9	28.4	14.8	14.3	14.6	10.0	**6.85**
Avg. min	7.06	11.8	16.0	20.4	15.3	16.0	29.8	31.1	17.2	16.6	16.2	14.8	**7.06**
Average	10.1	19.4	18.9	27.6	27.4	30.9	31.7	35.8	27.7	19.9	19.0	16.8	**23.8**
Avg. max	15.0	23.5	21.2	30.7	32.2	34.6	33.9	41.8	41.4	22.0	20.2	19.3	**41.8**
Maximum	16.6	28.9	21.4	30.9	32.7	35.0	34.4	44.3	42.1	25.3	20.4	27.8	**44.3**

In the year 2016 (**Table 1-12**) the average annual discharge released through the Lock No. VI into the Mosoni Danube was 23.8 $m^3.s^{-1}$. The minimal annual flow rate of 6.85 $m^3.s^{-1}$ occurred on January 1, 2016, when also the lowest average daily flow rate of 7.06 $m^3.s^{-1}$ was recorded. The highest annual flow rate of 44.3 $m^3.s^{-1}$ occurred on August 18, 2016, while the highest average daily flow rate of 41,8 $m^3.s^{-1}$ was recorded next day on August 19, 2016.

The water supply regime of the Mosoni Danube is controlled by the rules of operation and follows the Danube's water regime, similarly to the river branch water supply. In the non-vegetation period a low water period was simulated in the Mosoni Danube. This was realised by redirecting of a greater part of water into the inundation area.

1.4. The Danube water level characteristics on Čunovo-Vámosszabadi stretch

Concerning the water level regime the Danube old riverbed in the stretch between Čunovo and Vámosszabadi can be divided, according to the prevailing influence, into four different sections. These sections are characterised by data obtained from gauging stations situated on this stretch: Rajka and Hamuliakovo, Dunakiliti, Doborgaz and Dobrohošť, Dunaremete and Gabčíkovo, Vámosszabadi and Medveďov.

Water level characteristics on Čunovo - Vámosszabadi stretch in the year 2016 were as follows:

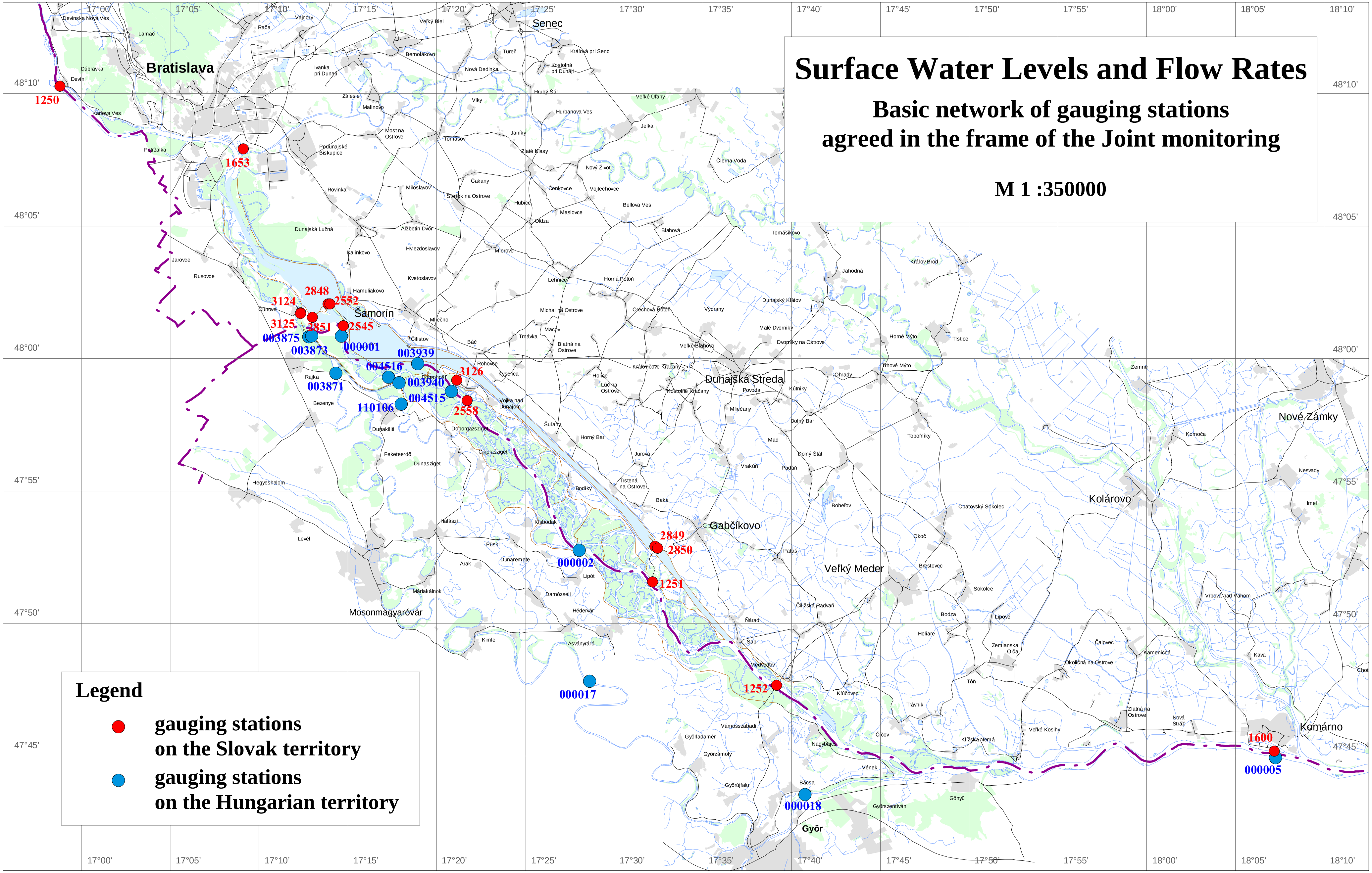
a) Section Čunovo - Dunakiliti. The water level in this section is impounded by submerged weir. By regulating the water level with the Dunakiliti dam, the amount of water gravitationally flowing into the right-side river branch system is regulated as well. Under normal circumstances the water level is maintained in the mid-water riverbed. Flow velocities measured in the Rajka profile in 2016 fluctuated in the range between 0.29-0.78 $m.s^{-1}$ (211-808 $m^3.s^{-1}$). Flow rates exceeding 600 $m^3.s^{-1}$ in 2016 occurred on several occasions. In short term (1-2 days) it was during the discharge waves in February and July. During the artificial flooding of the right-side river branch system the flow rate was around 800 $m^3.s^{-1}$ during two weeks and more water was also discharged for five days during the technical maintenance of the Gabčíkovo Hydroelectric Power Plant in September.
In the year 2016 the average daily water level at the Hamuliakovo gauging station (rkm 1850) fluctuated from 122.61 to 124.35 m a. s. l. (122.55-123.52 m a. s. l. in the year 2015) and the average annual water level was 123.08 m a. s. l (122.95 m a. s. l. in 2015). The average daily water level in the Rajka profile (rkm 1848.4) fluctuated from 122.58 to 124.01 m a. s. l. (122.53-123.51 m a. s. l. in 2015) and the average annual water level was 123.05 m a. s. l. (122.93 m a. s. l. in 2015) (**Fig. 1-7**). Compared with the previous year the minimal water levels in the year 2016 were higher by 0.06 m and 0.05 m respectively, and the maximal water levels were higher by 0.83 m and 0.50 m respectively. The average annual water levels were higher by 0.13 m and 0.12 m respectively.

b) Section between Dunakiliti and Dunaremete. This section of the Danube is not influenced by any measures and the water level is determined only by flow rate in this stretch of the river. In the upper part of this section the water level in the river branches is about 3 m higher than the water level in the main riverbed. In the year 2016 the average daily water level at the Dobrohošť gauging station (rkm 1838.6) fluctuated in the range from 117.17 to 120.67 m a. s. l. (117.08-118.69 m a. s. l. in the year 2015) and the average annual water level was 117.72 m a. s. l. (117.60 in 2015). The average daily water level at the Dunaremete profile (1825.5) fluctuated from 113.48 to 116.42 m a. s. l. (113.36-115.22 m a. s. l. in 2015) and the average annual water level was 114.00 m a. s. l. (113.87 in 2015) (**Fig. 1-8**). Flow velocities measured in the Dunaremete profile fluctuated in the range between 0.70-1.14 $m.s^{-1}$ (231-471 $m^3.s^{-1}$). Compared with the previous year the minimal water level in 2016 at Dobrohošť was higher by 0.09 m, at Dunaremete by 0.12 m. The maximal water levels were higher by 1.98 m and 1.20 m respectively. The average annual water levels were higher by 0,12 m and 0,13 m respectively.

c) Section between Dunaremete and Sap. The water level in this section is influenced by backwater effect from the confluence of the tailrace canal and the Danube old riverbed (rkm 1811). The water level changes, especially in the lower part of this section, are influenced by the flow rates in the tailrace canal. Length of the upstream section influenced by the backwater effect depends on the actual flow rate distribution between the hydropower plant and the Danube old riverbed. In normal operation it can be stated that the backwater effect reaches the Dunaremete profile (rkm 1825.5) at flow rates exceeding 2500 $m^3.s^{-1}$ at Medveďov. In the year 2016 the average daily water level at Gabčíkovo gauging station (rkm 1819) fluctuated in the range from 111.67 to 114.55 m a. s. l. (111.60-114.48 in the year 2015) and the average annual water level was 112.24 m a. s. l. (112.10 m a. s. l. in 2015) (**Fig. 1-9**). Daily water level fluctuation at Gabčíkovo gauging station in the Danube old riverbed can reach about 0.20 m as a consequence of hydropower plant operation. Compared with the previous year the minimal and the maximal water levels in 2016 were higher by 0.07 m. The average annual water level was higher by 0.14 m.

d) Section Sap - Vámosszabadi. Daily water level fluctuation in this stretch (up to 0.30 m) depends on the hydropower plant operation. Major changes occur at low flow rates in the Danube due to the ratio of total flow rate and the capacity of one turbine, which may be put into operation or stopped. The average annual flow rate at Vámosszabadi - Medveďov profile in the year 2016 was 1880 $m^3.s^{-1}$. In the year 2016 the average daily water level at Medveďov profile (rkm 1806.3) fluctuated in the range from 107.74 to 113.38 m a. s. l. (107.85-113.43 in the year 2015) and the average annual water level was 109.91 m a. s. l. (109.68 m a. s. l. in the year 2015) (**Fig. 1-10**). Flow velocities measured during flow rate measurements fluctuated in the range between 1.06-1.37 $m.s^{-1}$ (1161-2441 $m^3.s^{-1}$). Compared with the previous year the minimal water level in 2016 was lower by 0.11 m and the maximal water level was lower by 0.05 m. The average annual water level in 2016 was higher by 0.23 m.

Fig. 1-1a


Surface Water Levels and Flow Rates
Basic network of gauging stations
agreed in the frame of the Joint monitoring
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Legend
gauging stations
on the Slovak territory
gauging stations
on the Hungarian territory
1250
1653
2848
2552
3124
3125
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3126
2558
2849
2850
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1600
003875
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000001
003939
004516
003940
004515
003871
110106
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000017
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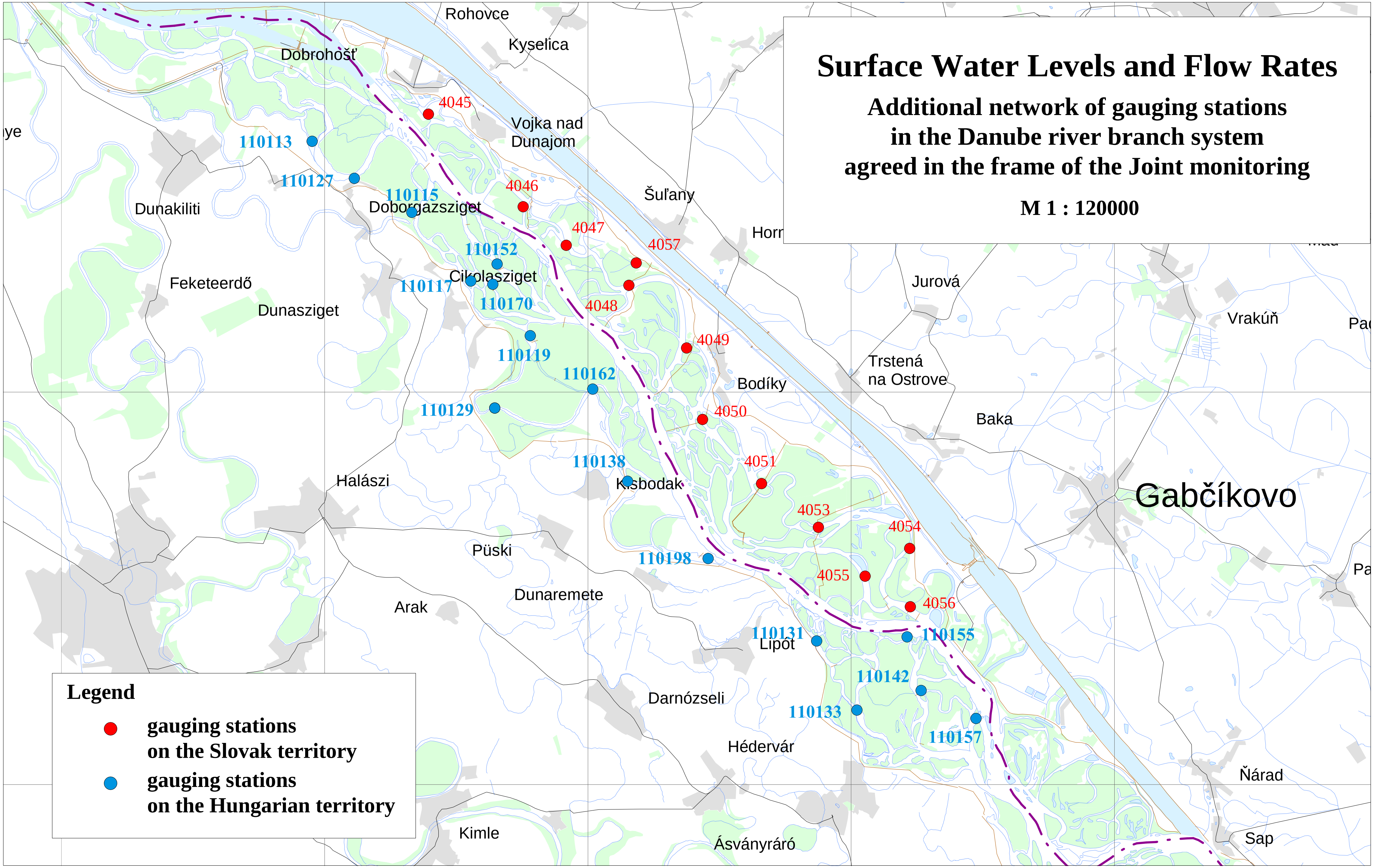
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr

Fig. 1-1b


Surface Water Levels and Flow Rates
Additional network of gauging stations
in the Danube river branch system
agreed in the frame of the Joint monitoring
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Legend
gauging stations on the Slovak territory
gauging stations on the Hungarian territory
Rohovce
Kyselica
Dobrohošť
Vojka nad Dunajom
Šuľany
Dunakiliti
Doborgazsziget
Cikolasziget
Feketeerdő
Dunasziget
Jurová
Vrakúň
Trstená na Ostrove
Bodíky
Baka
Gabčíkovo
Halászi
Kisbodak
Püski
Dunaremete
Arak
Lipót
Darnózseli
Hédervár
Ňárad
Kimle
Ásványráró
Sap
4045
4046
4047
4057
4048
4049
4050
4051
4053
4054
4055
4056
110113
110127
110115
110152
110117
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Fig. 1-2

Surface Water - Flow Rate

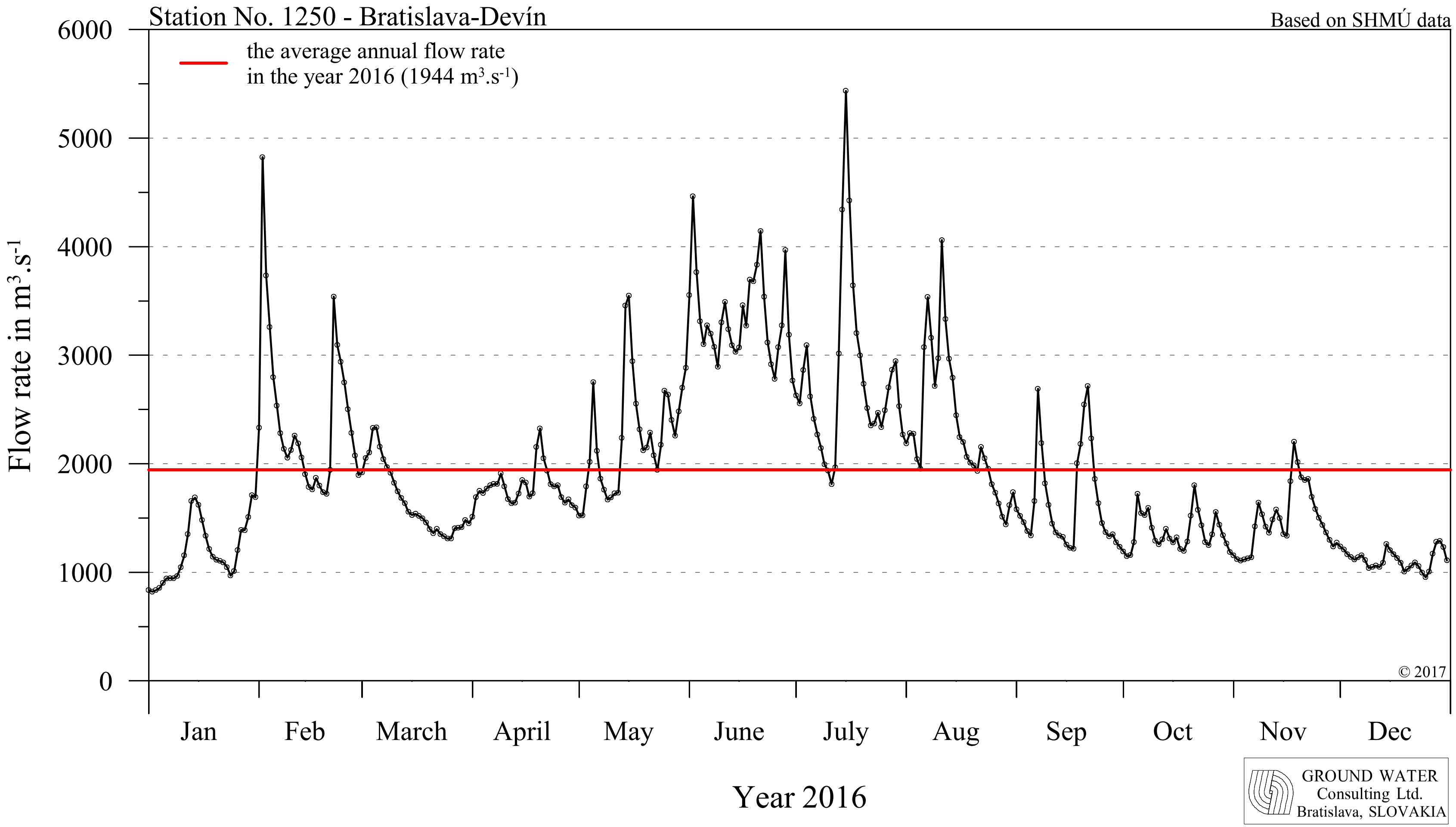


Fig. 1-3 **Surface Water - Flow Rate**

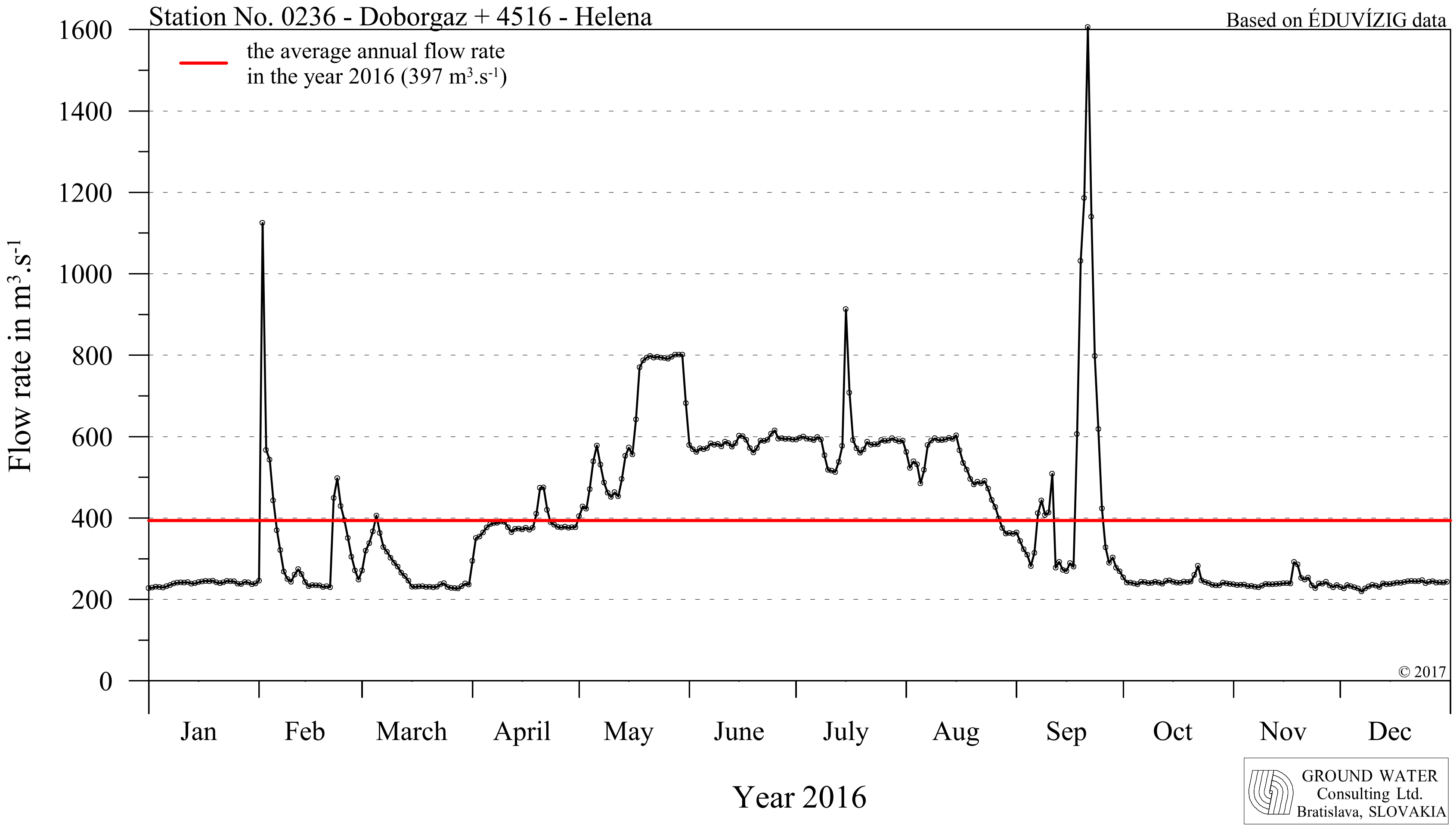


Fig. 1-4

Surface Water - Flow Rate

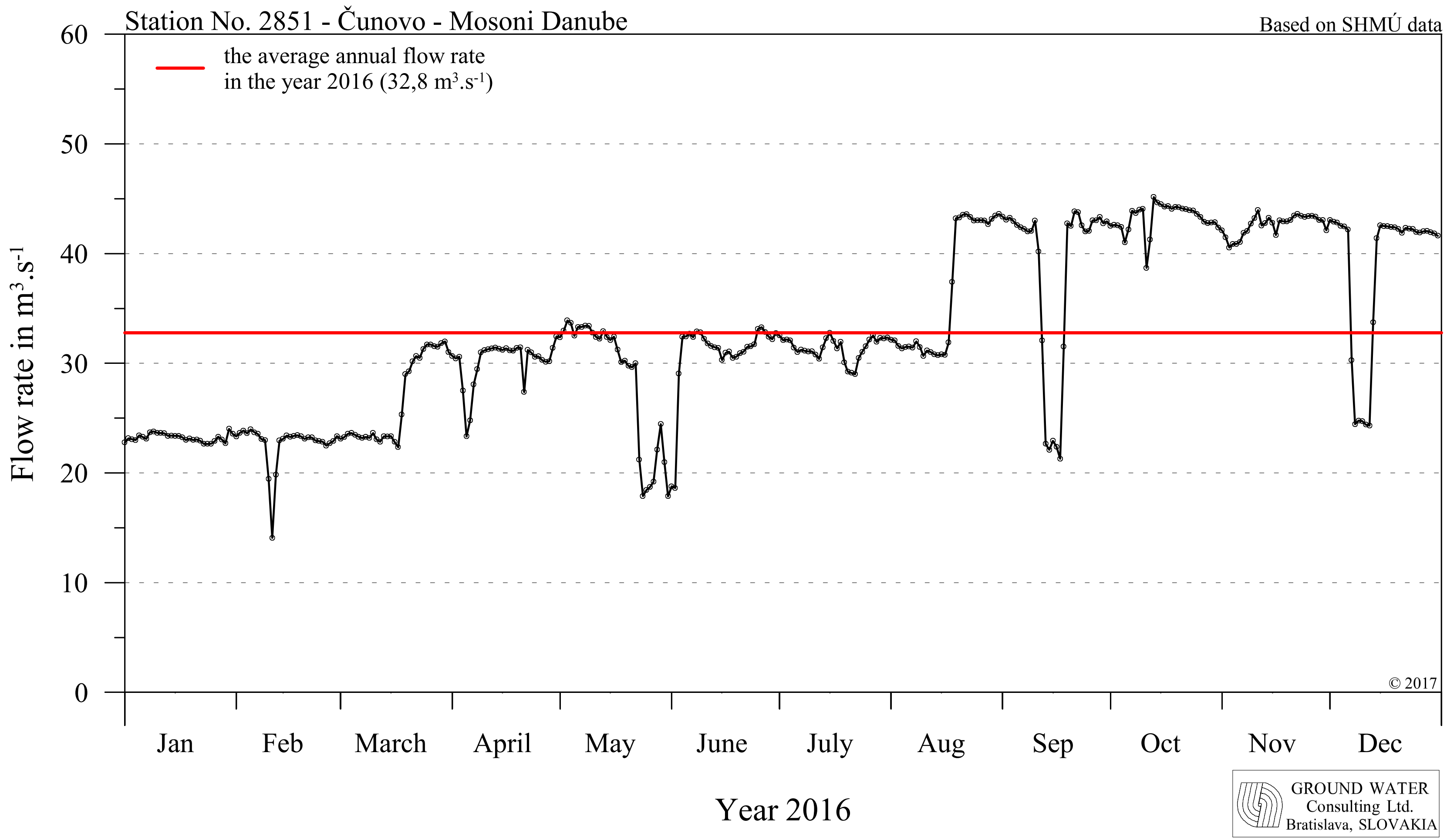


Fig. 1-5 **Surface Water - Flow Rate**

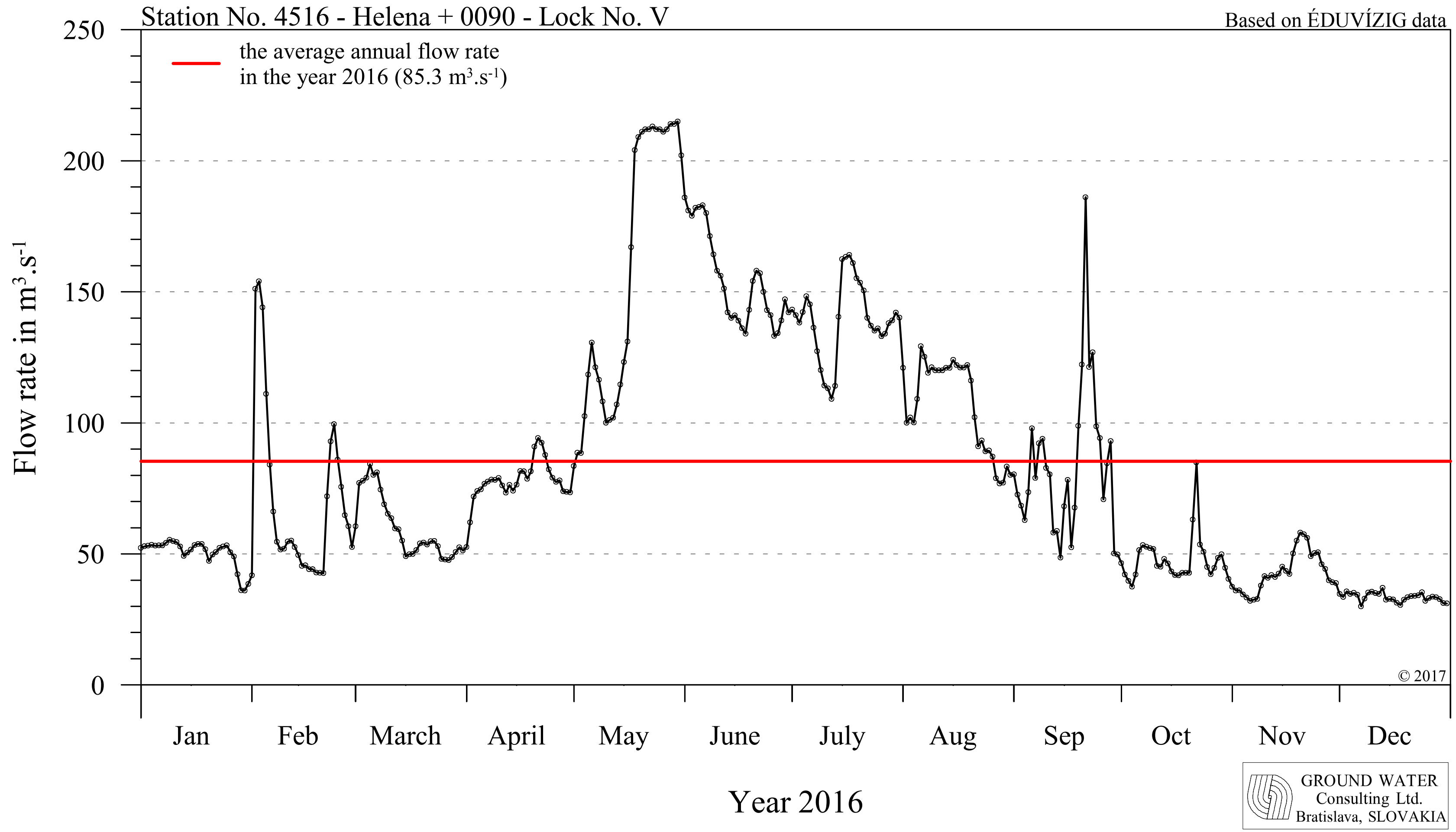


Fig. 1-6

Surface Water - Flow Rate

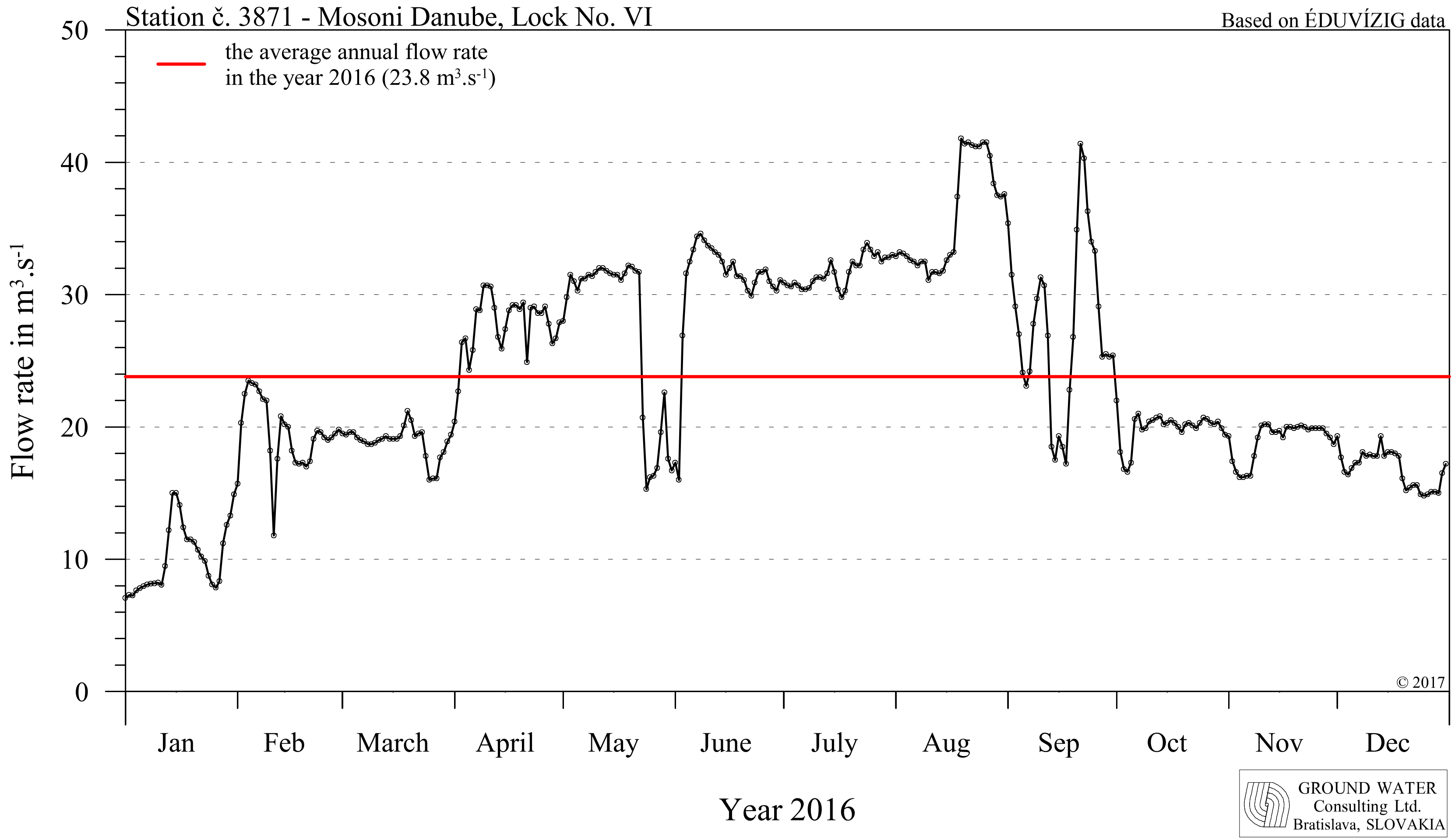


Fig. 1-7 **Surface Water Level**

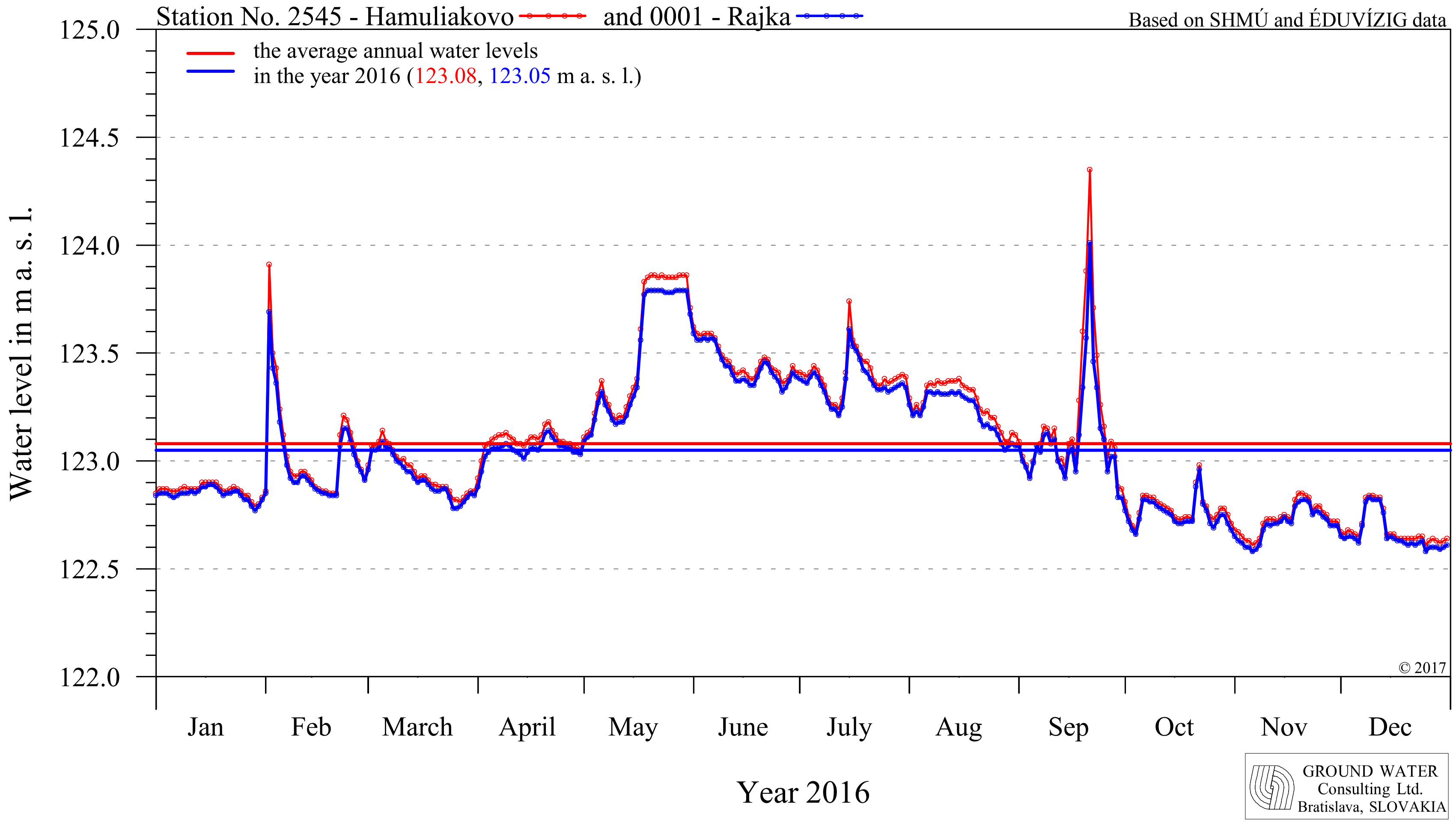


Fig. 1-8 **Surface Water Level**

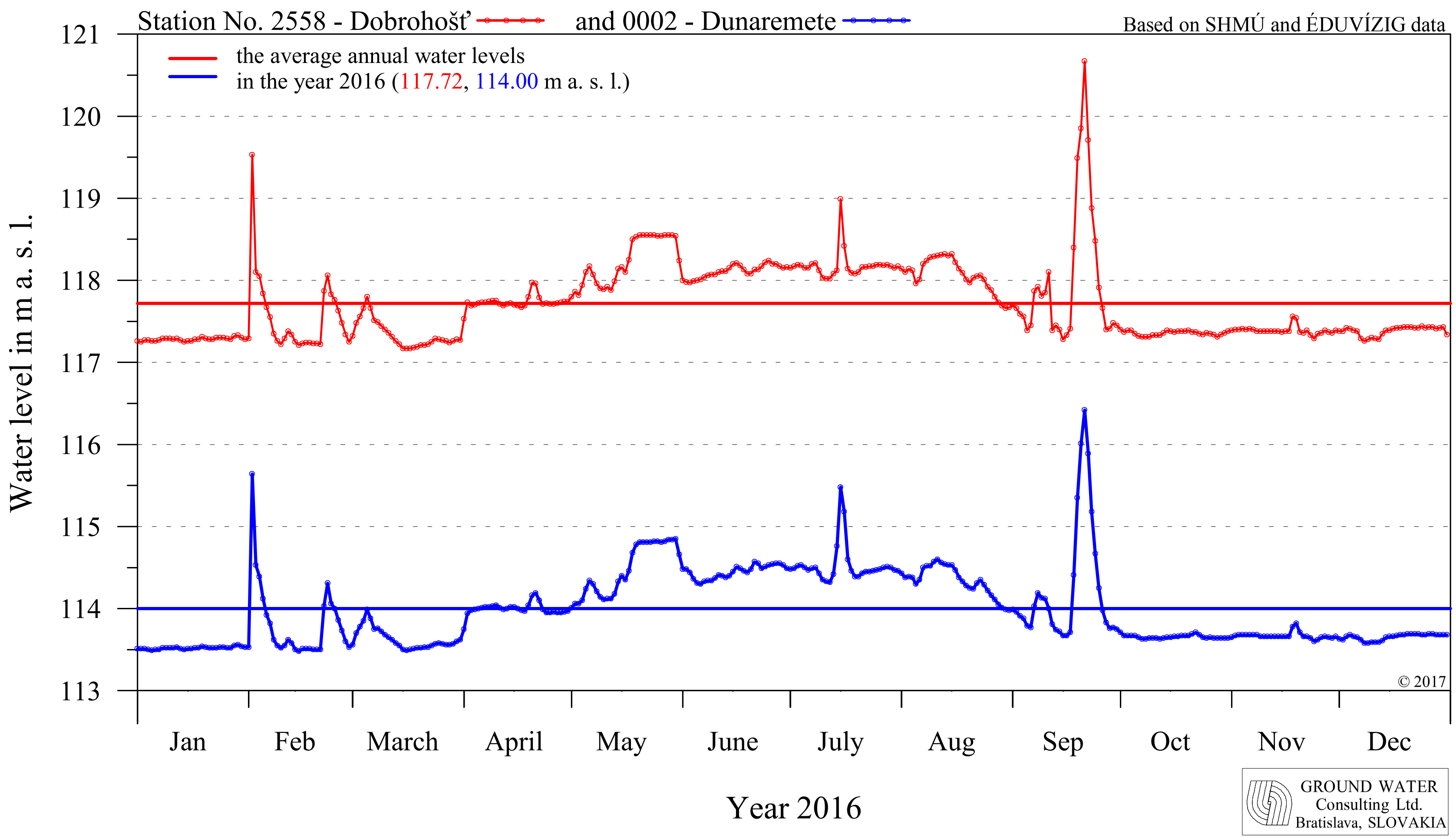


Fig. 1-9

Surface Water Level

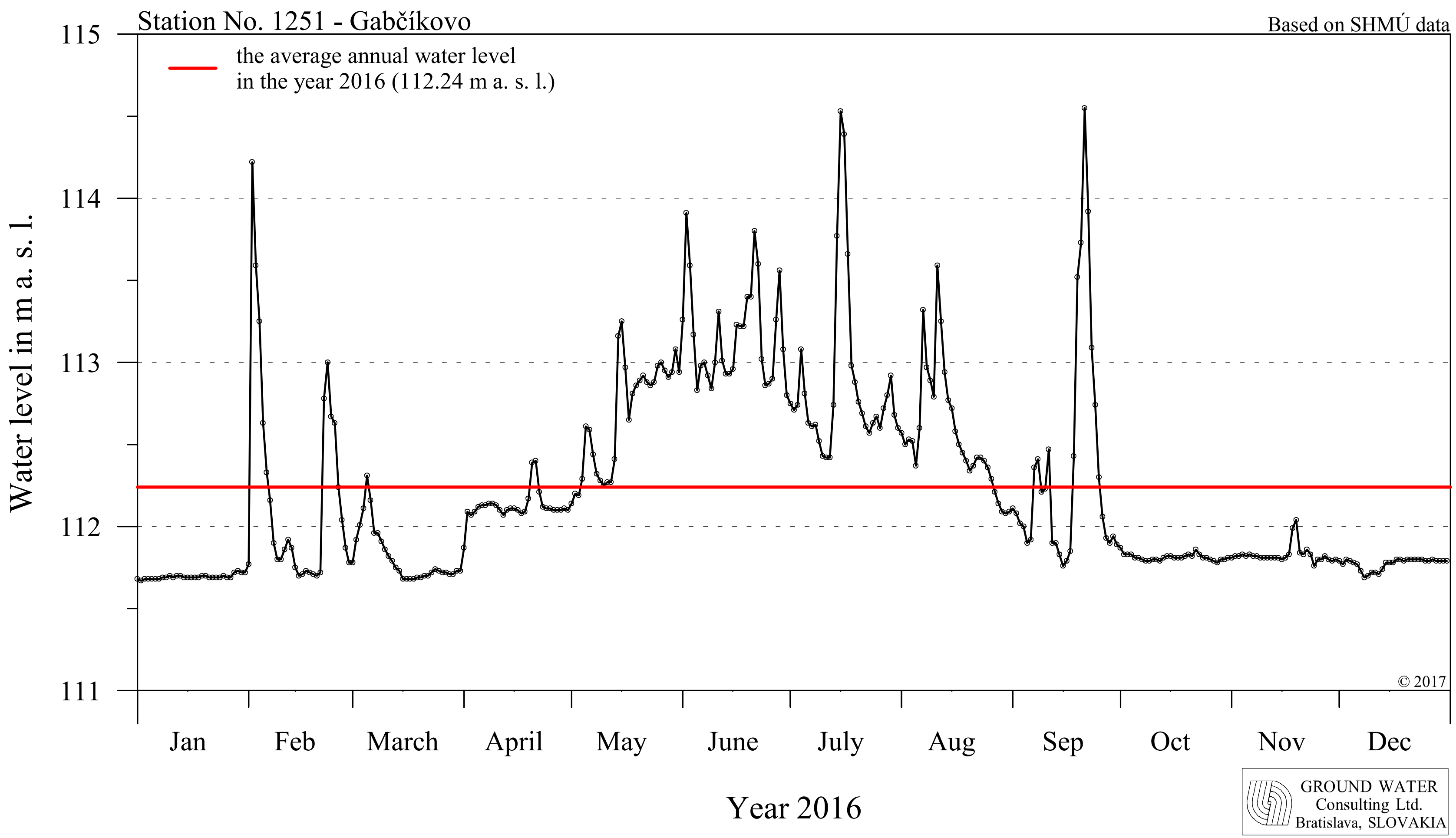
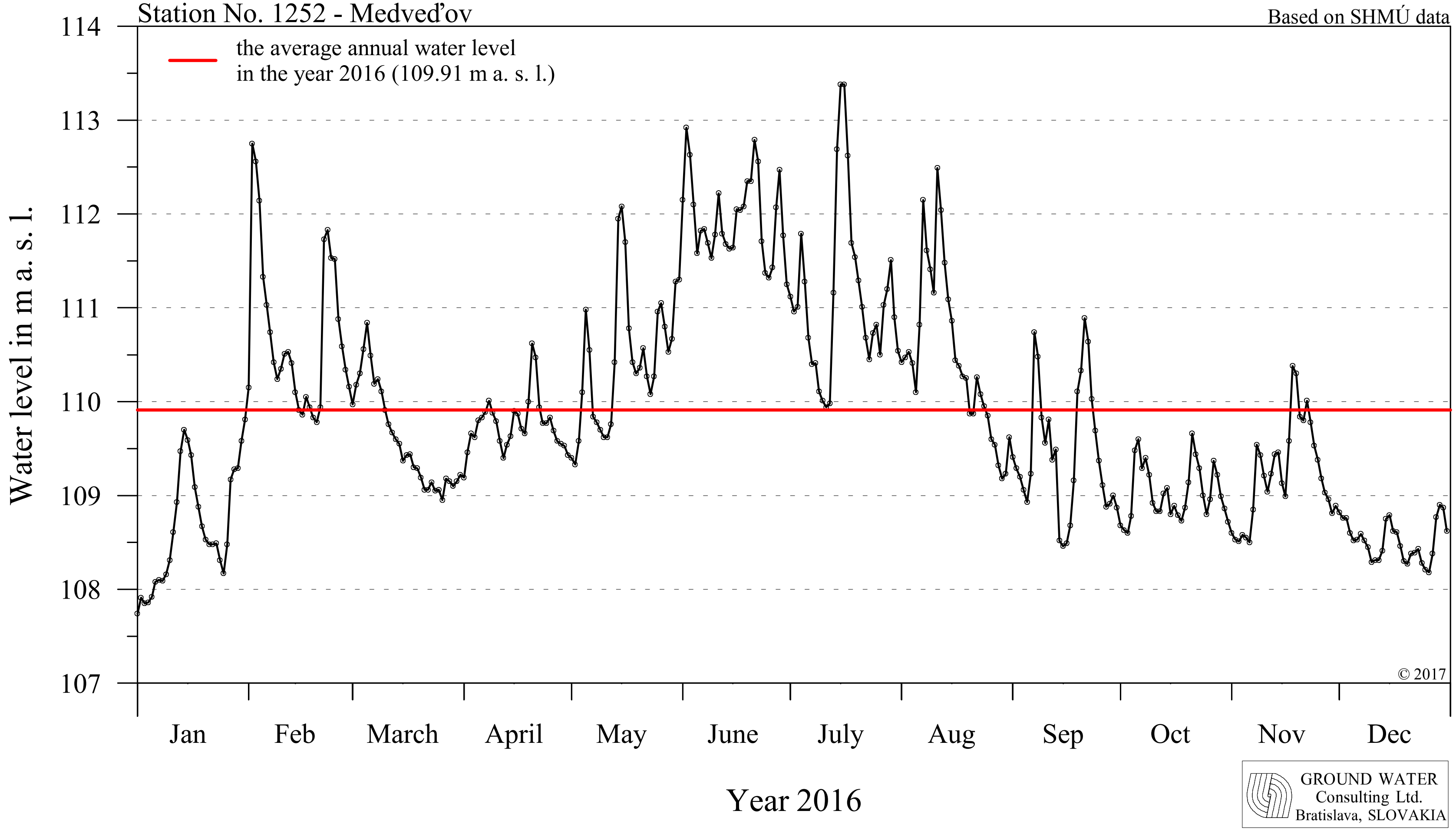


Fig. 1-10 **Surface Water Level**



PART 2

Surface Water Quality

In the year 2016, the quality of surface water was monitored similarly to the previous years, on the Slovak territory at 15 sampling sites and on the Hungarian territory at 11 sampling sites. The list of sampling sites is presented in **Table 2-1**, and their location is shown in **Fig. 2-1**. At all monitoring sites the influence of measures, described in the Agreement, on the surface water quality was observed. The main factors that could affect the water quality, are: the backwater effect upstream of the submerged weir, increased discharges into the Danube downstream of the Čunovo dam and into the Mosoni branch of the Danube, the water supply into the right-side river branch system, and morphological changes in the riverbed.

Table 2-1: List of monitoring sites

	Country	Sampling site No.	Location and sampling site name
Slovak side			
1	**Slovakia**	**109**	Danube, Bratislava - middle
2	**Slovakia**	**4016**	Danube old riverbed, upstream of the submerged weir
3	**Slovakia**	**4025**	Danube old riverbed, Dobrohošť - left side
4	**Slovakia**	**3739**	Danube old riverbed, Sap – upstream of the confluence
5	**Slovakia**	**112***	Danube, Medveďov - middle
6	**Slovakia**	**1205**	Danube, Komárno - middle
7	**Slovakia**	**307**	reservoir, Kalinkovo - navigation line
8	**Slovakia**	**308**	reservoir, Kalinkovo - left side
9	**Slovakia**	**309**	reservoir, Šamorín - right side
10	**Slovakia**	**311**	reservoir, Šamorín - left side
11	**Slovakia**	**3530**	tail race canal, Sap - left side
12	**Slovakia**	**3529***	Mosoni Danube, Čunovo - middle
13	**Slovakia**	**3531***	right-side seepage canal, Čunovo - middle
14	**Slovakia**	**317**	left-side seepage canal, Hamuliakovo - middle
15	**Slovakia**	**3376**	left-side river arm system - Dobrohošť
Hungarian side			
1	**Hungary**	**0001***	Danube old riverbed, Rajka
2	**Hungary**	**0043**	Danube old riverbed, Dunakiliti, submerged weir, upstream
3	**Hungary**	**0042**	Danube old riverbed, Dunakiliti, submerged weir, downstream
4	**Hungary**	**0002**	Danube old riverbed, Dunaremete
5	**Hungary**	**2306***	Danube, Medve
6	**Hungary**	**1141**	Mosoni Danube, Vének
7	**Hungary**	**0082***	Mosoni Danube, Lock No. I
8	**Hungary**	**0084***	right-side seepage canal, Lock No. II
9	**Hungary**	**1112**	right-side river arm system, Helena weir
10	**Hungary**	**1114**	right-side river arm system, Szigeti arm, 42.2 km
11	**Hungary**	**1126**	right-side river arm system, Ásványráró, 23.9 km

* - jointly observed monitoring sites

Surface water quality and sediment quality data for agreed monitoring sites, and graphical representation of the time-series data of particular surface water quality parameters, are presented in the Slovak and Hungarian National Annual Reports on the Environment Monitoring in 2016 or in their Annexes. Figures in the Joint Report represent the data of selected parameters at selected monitoring sites.

Table 2-2: Agreed limits for surface water quality classification

Parameter / Class	Unit	I.	II.	III.	IV.	V.
Temperature	°C	<20	25	27	30	>30
Electric conductivity	$mS.m^{-1}$	<40	70	110	130	>130
Suspended solids	$mg.l^{-1}$	<20	30	50	100	>100
pH	-	6.5-<8	8-<8.5	6-<6.5 8.5-<9.0	5.5-<6.0 9.0<9.5	<5.5 >=9.5
Fe	$mg.l^{-1}$	<0.5	1	2	5	>5
Mn	$mg.l^{-1}$	<0.05	0.1	0.3	0.8	>0.8
O_2	$mg.l^{-1}$	>7	6	5	4	<4
BOD_5	$mg.l^{-1}$	<3	5	10	25	>25
COD_{Mn}	$mg.l^{-1}$	<5	10	20	50	>50
TOC	$mg.l^{-1}$	<3	7	10	12	>12
NH_4^+	$mg.l^{-1}$	<0.26	0.39	0.77	1.93	>1.93
NO_3^-	$mg.l^{-1}$	<4.4	13.3	26.6	66.4	>66.4
NO_2^-	$mg.l^{-1}$	<0.03	0.20	0.39	0.99	>0.99
PO_4^{3-}	$mg.l^{-1}$	<0.15	0.31	0.61	1.53	>1.53
total N	$mg.l^{-1}$	<1.5	4	8	20	>20
total P	$mg.l^{-1}$	<0.1	0.2	0.4	1	>1
Cl^-	$mg.l^{-1}$	<100	150	200	300	>300
SO_4^{2-}	$mg.l^{-1}$	<150	250	350	450	>450
Dissolved solids	$mg.l^{-1}$	<300	500	800	1000	>1000
UV oil	$mg.l^{-1}$	<0.01	<0.05	0.1	0.3	>0.3
Zn	$\mu g.l^{-1}$	<2	5	10	50	>50
Cu	$\mu g.l^{-1}$	<1	2	4	10	>10
Cr	$\mu g.l^{-1}$	<1	2	4	10	>10
Cd	$\mu g.l^{-1}$	<0.05	0.1	0.2	0.5	>0.5
Hg	$\mu g.l^{-1}$	<0.05	0.1	0.2	0.5	>0.5
Ni	$\mu g.l^{-1}$	<0.5	1	2	5	>5
Pb	$\mu g.l^{-1}$	<0.5	1	2	5	>5
As	$\mu g.l^{-1}$	<0.5	1	2	5	>5
Saprobic index of biosestone	-	<1.8	2.3	2.7	3.2	>3.2
Saprobic index of macrozoobenthos	-	<1.8	2.3	2.7	3.2	>3.2
Saprobic index of phytobenthos	-	<1.5	2.0	2.5	3.0	>3.0
Chlorophyll-a	$mg.m^{-3}$	<10	35	75	180	>180

The results of monitoring of surface water quality at selected sampling sites, as assessed according to limits in **Table 2-2**, are shown in the conclusion of this chapter**.**

2.1. General evaluation of the actual year

The year 2016 in terms of flow rate belonged to more water bearing than the previous one. Extremely water bearing month was February, during which two significant discharge waves occurred. The flow rates subsequently decreased and in March, April and in the first half of May the average daily flow rates were almost exclusively below the long-term averages, often significantly. Increased flow rates occurred from he second half of May to mid August with the highest discharge wave in mid July (culmination on July 15, 2017 at 5645 $m^3.s^{-1}$). In addition to February and early March, flow rates over the long-term daily averages occurred also in June, during shorter periods in July, August and November, and occasional occurrences were recorded in May, September and October. Discharge waves were of short terms. Except the two highest ones, that exceeded 5000 $m^3.s^{-1}$ (at the beginning of February and in min July), discharge waves with culminations over 4000 $m^3.s^{-1}$ occurred in June and August, and over 3000 $m^3.s^{-1}$ in late February, in mid May and in the second half of June. Two discharge waves in September and less significant in November were already below 3000 $m^3.s^{-1}$. Flow rates in December were low, fluctuating to about 1300 $m^3.s^{-1}$.

Values of the average daily air temperature and water temperature in the Danube for a while moved over the long-term average, then dropped sharply below its level and again began to rise. This scenario was repeated quite often and the temperatures over the long-term average values for longer time were during February, April and then in the period from August to early October. The hottest period of the year was at the turn of July and August. In mid July and also in min August it cooled down significantly, as a result of which the water temperature in the Danube decreased sharply below the long-term daily average, in August for longer time.

The annual precipitation amount in the assessed year was higher the in the previous one. The highest monthly precipitation total at the station Bratislava-airport was recorded in July (106.2 mm) and rather high value was also measured in May (67.1 mm). The monthly precipitation total in February and November just exceeded 60 mm. The most dry month was March, when the monthly precipitation amount was only 8.9 mm and rather dry was also December (11.6 mm).In the other months values fluctuated between 20 and 50 mm.

2.2. Basic physical and chemical parameters

Water temperature

The development of water temperature during the year is closely related to climatic and hydrological conditions. The course of measured water temperature values shows a seasonal character and their fluctuation is similar, except sampling sites in the seepage canals. The water temperature in the winter period is low and maximal values occur in the summer period. In the year 2016, the lowest values occurred at the beginning of the year (in January and February) or at the end of the year (in November and December). The lowest water temperature of 2.6 °C was recorded in January and also in December at sampling site No. 0042 in the Danube old riverbed below the weir at Dunakiliti. The highest values were measured during the warmest period of the year - in July and in August. Maximum in the assessed year (25.1 °C) was recorded in July on the sampling site No. 1141 in the Mosoni Danube at Vének (**Fig. 2-3**). Except this sampling site the water temperature at other sites varied maximally up to 21.6 °C (No. 1114 Szigeti arm). In connection with the significant cooling in the middle of July, when the highest discharge in the assessed year, there was a temporary decline of water temperature recorded at sampling sites in the reservoir, on the left side of the Danube old riverbed and in the tail-race channel. The most balanced course of water temperature was characteristic for water in the left-side seepage canal at Hamuliakovo (sampling site No. 317), where the temperature fluctuated from 9,1 to 14.9 °C (**Fig. 2-3**). Values in the right-side seepage canal ranged in wider range, from 6.9 to 20.4 °C. With regard to the frequent and short-term discharge waves and frequent fluctuations in water and air temperatures during the summer period, the maximal water temperatures were lower than in the year 2015. They slightly increased only on the common sampling point in the right-side seepage canal No. 3531/0084 at Rajka/Čunovo.

pH

The water quality indicator pH is closely related to the development of phytoplankton. Higher values occur in seasons corresponding to periods with increased assimilation activity of phytoplankton. The main wave of phytoplankton development in the assessed year occurred during the spring months, the abundance in the summer months was low. The highest pH values occurred mainly in April and May in connection with the main wave of phytoplankton development. Occasional occurrences of higher values were recorded also in the months of September, November and December, mainly on sites monitored by the Hungarian Party. On sampling site in the right-side river branch system the pH fluctuated in a relatively narrow ranges from 7.88 to 8.44, increased values occurred at the end of March and the highest at the end of the year (from October to December). Also on the right side of the Danube old riverbed and in the Mosoni Danube at Vének the annual maxima were recorded in October. The lowest value was measured in June on the sampling site No. 1141 in the Mosoni Danube at Vének and the highest on the sampling site No. 308 in the upper part of the reservoir at Kalinkovo. The pH value in the main stream of the Danube ranged from 7.72 to 8.48 and at Komárno up to 8.65. At sampling sites in the reservoir and in the tail-race channel they fluctuated in a wider range from 7.72 to 8.78. For the seepage canals a narrow range, in which fluctuate the pH values during the year, used to be typical. However, in the assessed year they did not belonged to the narrowest ranges. In the left-side seepage canal (sampling site No. 317 at Hamuliakovo) the pH fluctuated from 7.84 to 8.28 and at the common sampling site No. 3531/0084 in the right-side seepage canal at Čunovo/Rajka, the values observed by the Slovak Party moved in a narrower range 7.65-8.03, than values measured by the Hungarian Party 7.69-8.40. At the common sites it is still possible to see the difference in values determined by the Slovak and the Hungarian Parties. The narrowest ranged in the assessed year was recorded on two sampling sites on the right-side of the Danube old riverbed, No. 0042 below the weir at Dunakiliti (8.16-8.39) and No. 0002 at Dunaremete (8.11-8.34). Compared to 2015, pH values were higher. Exceptions were the sampling sites on the right bank of the Danube old riverbed and in the right-side river branch system, where the pH fluctuated in a narrower ranges and reached lower values than in 2015. The development of pH values at selected sampling sites is shown in **Fig. 2-4**.

Specific electric conductivity

The specific electric conductivity of surface water refers to the content of dissolved salts of mineral origin. It has a seasonal character, that is less pronounced in the seepage canals. Values are higher in winter months, lower values occurs during summer. The highest conductivity values in 2016 were recorded at the beginning of the year. In February they temporarily decreased, probably due to significant discharge waves at the beginning and at the end of the month, but in March the conductivity increased again. Subsequently it gradually dropped to the lowest value in June, July or August, depending on the location. From August, or September the conductivity began to rise again. The highest conductivity values during the year are typical for the sampling site No. 1140 in the Mosoni Danube at Vének, where the conductivity in the assessed year ranged from 34.0 to 61.3 $mS.m^{-1}$ and it was lower than in 2015 (36.7 to 87.0 $mS.m^{-1}$). On other observed sampling sites it varied in the range from 29.1 to 51.7 $mS.m^{-1}$ (in 2015 from 27.6 to 56.5 $mS.m^{-1}$). The maximum (except the sampling site at Vének) was measured at the beginning of February in the lower part of the reservoir on the sampling site No. 311, and the minimum 29.1 mS.m^{-1} in June in the Danube old riverbed at Rajka on the common sampling site No. 1203/0001. The Slovak Party did not confirmed this value (at the same time it measured 33.4 mS.m^{-1}), what is related to long-term differences in the conductivity values between the Slovak and Hungarian Parties, which are most visible at the common sampling sites (**Fig. 2-5**). The content of dissolved salts in the seepage canals is relatively stable throughout the year. The electric conductivity values fluctuates in narrow ranges and in the evaluated year the lowest spread of values (40.6-47.8 mS.m^{-1}) was typical for water in the left-side seepage canal at Hamuliakovo (sampling site No. 317). Compared with the previous year, the conductivity values in 2016 slightly increased on sampling sites in the right-side river branch system (No. 1112, 1114, 1126) and on three sites on the right bank of the Danube old riverbed (No. 0043, 0042, 0002). On the other sampling sites lower values were recorded compared to the previous year.

Suspended solids

The suspended solids content is closely related to the flow rate. It rises with discharge waves and higher values are characteristic mainly for the summer period. The year 2016 was characterized by a large number of discharge waves, which were mostly of short-terms. Significant discharge waves occurred in February, in June, July and August, while the July discharge wave was the highest. Maximal values at particular sites were recorded just in these months. Exception was the sampling site No. 1141 in the Mosoni Danube at Vének, where the maximal concentration of suspended solids (90.0 mg.l^{-1}) occurred in November, and the sampling site No. 308 in the upper part of the reservoir, where the maximum (80.1 mg.l^{-1}) was in May. The annual maximum (216 mg.l^{-1}) was recorded in July on sampling site No. 1205 in the Danube at Komárno and was probably associated with the highest discharge wave (culmination on July 15,2016 at 5645 m^{3}.s^{-1}). On the sampling site No. 109 in the Danube at Bratislava, where the highest values of suspended solids usually occur, the July sampling was carried out prior the arrival of the highest discharge wave. The highest concentration 184 mg.l^{-1} at the sampling site at Bratislava was found in February, in connection with the discharge wave in the second half of the month. Higher contents (over 100 mg.l^{-1}) occurred also in June (147.0 mg.l^{-1} and 103.0 mg.l^{-1}) and at the beginning of August (105.0 mg.l^{-1}). On other sites similar contents were recorded in July on sampling site No. 4025 in the Danube old riverbed at Dobrohošť (144.7 mg.l^{-1}), at No. 307 in the reservoir (114.0 mg.l^{-1}), on the sampling site No. 3530 in the tail-race channel at Sap (106.9 mg.l^{-1}). In the left-side river branch system the content of suspended solids varied from <2 to 92.6 mg.l^{-1} (sampling site No. 3376), in the right-side maximally up to 70.0 mg.l^{-1} (Helena weir). In the Mosoni Danube at the common sampling site at Čunovo/Rajka (No. 3529/0082) concentrations ranged from 5.0 to 59.0 mg.l^{-1} and at Vének, except the maximum in November, in similar range from 5.0 to 53.0 mg.l^{-1}. The content of suspended solids in the Danube at Medveďov (sampling site No. 112), as well as in the lower part of the reservoir (sampling sites No. 309 and 311) was low throughout the year, it ranged from <2 to 45.2 mg.l^{-1}. The lowest contents of suspended solids are typical for the water-in seepage canals. The values within the narrowest range, from <2 to 3.2 mg.l^{-1}, fluctuated in the left--side seepage canal at Hamuliakovo (sampling site No. 317). At the common sampling site in the right-side seepage canal the concentrations measured by the Hungarian Party were higher (from 3 to 32.0 mg.l^{-1}), than by the Slovak Party (<2 to 3.6 mg.l^{-1}). Compared to the previous year, higher maxima were reached on most of the sampling sites. Similar or slightly lower contents occurred on the sampling site in the Danube at Medveďov (No. 112/2306), in the Mosoni Danube at Čunovo/Rajka (No. 3529/0082), in the left-side seepage canal (No. 317) and on two sampling sites in the reservoir (No. 308 at Kalinkovo and No. 309 at Šamorín). The content of suspended solids measured downstream of the reservoir (sampling site No. 112/2306 at Medveďov) during discharge waves was lower than in the Danube at Bratislava, what indicates the settling effect of the reservoir. The suspended solids content at selected sampling sites is shown in **Fig. 2-6**.

Iron

The amount of suspended solids influences the iron content in the surface water, therefore higher iron content occurs in samples taken at higher flow rates. The iron content on the sampling site No. 109 at Bratislava, where it is usually the highest, was not determined in 2016. The iron content in the evaluated year the Slovak Party did not observed even on the common sampling sites (in the Danube at Medveďov, in the Danube old riverbed at Rajka, in the Mosoni Danube at Čunovo and in the right -side seepage canal at Čunovo). Compared to the previous year, the iron contents measured in 2016 were higher and at sampling sites monitored by the Hungarian Party even significantly higher. The highest iron concentrations 8.82 $mg.l^{-1}$ was recorded in September on the sampling site No. 1141 in the Mosoni Danube at Vének (in 2015 the highest concentration was 0.96 $mg.l^{-1}$). At other locations maxima occurred mainly in June, when high water stages were recorded during the whole month. The June maximum of 8.30 $mg.l^{-1}$ was detected in the Danube old riverbed below the weir at Dunakiliti (sampling site No. 0042). A slightly lower concentration of 7.92 $mg.l^{-1}$ was measured upstream of the weir. The maximum of 6.32 $mg.l^{-1}$ in the right-side river branch system was recorded also in June at sampling site No. 1112 (Helena weir). Contents in the left-side river branch system (sampling site No. 3376) fluctuated within a narrow range from 0.90 to 1.21 $mg.l^{-1}$. Besides the June values, relatively high contents were documented also in August (2.47 to 7.08 $mg.l^{-1}$) and in the Mosoni Danube also in March (6.78 $mg.l^{-1}$) and April (6.85 $mg.l^{-1}$). In the Danube main stream the iron content varied from <0.01 to 3.31 $mg.l^{-1}$. The contents in the upper part of the reservoir were higher (0.07 to 0.90 $mg.l^{-1}$) than in the lower one (0.08 to 0.36 $mg.l^{-1}$). The lowest iron concentrations are characteristic for the seepage water. In the evaluated year the iron content in the left-side seepage canal at Hamuliakovo (sampling site No. 317) varied in the narrowest range from <0.01 to 0.18 $mg.l^{-1}$. In the right-side seepage canal at Rajka (sampling site No. 0084) the contents were higher, with a maximum of 2.72 $mg.l^{-1}$. Overall, the iron contents in 2016 on monitored sampling sites, compared with the previous year, were higher, only in the lower part of the reservoir and in the left-side seepage canal they were similar.

Manganese

Similarly to iron, neither the manganese was monitored by the Slovak party on sampling site in the Danube at Bratislava and on the jointly observed sampling sites (the Danube at Medveďov, the Danube old riverbed and the Mosoni Danube at Rajka and the right-side seepage canal at Čunovo). In the assessed year also in the case of manganese significant maxima occurred in some localities. The annual maximum of 0.74 $mg.l^{-1}$ was recorded in August on the sampling site No. 0001 in the Danube old riverbed at Rajka. Slightly lower concentration (0.59 $mg.l^{-1}$) was detected in the Mosoni Danube at Rajka (sampling site No. 0082). Other concentrations on the monitored localities in the Danube old riverbed varied in the range from <0.001 to 0.20 $mg.l^{-1}$, in the Mosoni Danube at Rajka only up to 0.06 $mg.l^{-1}$. In the Danube main stream the maximum of 0.21 $mg.l^{-1}$ was recorded in July on the sampling site No. 1205 at Komárno. The manganese concentrations at Medveďov (sampling site No. 2306) fluctuated to a maximum of 0.06 $mg.l^{-1}$. In the river branch system the manganese concentrations ranged from <0.001 to 0.13 $mg.l^{-1}$. Slightly lower values were characteristic for sampling sites in the reservoir and in the seepage canals (<0.01 to 0.08 $mg.l^{-1}$). In the narrowest range the concentrations of manganese fluctuated on the sampling site No. 309 in the reservoir (0.02 to 0.03 $mg.l^{-1}$). The manganese contents were higher in comparison with the previous year, on some sampling sites significantly higher (in 2015 the maximum was 0.15 $mg.l^{-1}$ and other concentrations varied to a maximum of 0.10 $mg.l^{-1}$). Only on sampling sites in the lower part of the reservoir and in the seepage canals the were similar.

2.3. Cations and Anions

The quantitative ratio of ionic composition of the surface water in the year 2015 showed high stability, just as in previous years. The seasonal fluctuation of individual ion contents followed the changes in conductivity. Changes of dissolved solids content are related to the flow rate fluctuation in the Danube. Compared to the long-term measurements the values of basic cations and anions have not changed. The development of cations and anions concentrations at particular sampling sites was similar. Higher content of salts is characteristic for the sampling site in the Mosoni Danube at Vének, because of its tributaries and cleaned wastewater from Győr. The average values of sodium, potassium, chlorides and sulphates at Vének exceeded the average values recorded at other sampling sites. The most stable ionic composition is characteristic for seepage water. In comparison with the year 2015 mostly slight decrease of cations and anions concentrations was recorded in the evaluated year, on some localities their content remained similar. Slight increase of sodium, chlorides and bicarbonates concentrations occurred only in the river branch system (mainly at the Helena weir). Contents of sulphates on the right bank of the Danube old riverbed and in the right-side river branch system were less volatile than in the previous year. A species development of the concentration of cations and anions was observed on the sampling site in the Mosoni Danube at Vének. Contents has decreased in comparison with the previous year, however they still remained the highest compared to their contents on other monitored sites. The highest concentrations occurred at the beginning of the year, from January to March, what correlates also with the highest conductivity values recorded on this sampling site.

2.4. Nutrients

<u>Ammonium ion</u>

The ammonium ion content in 2016 in the Danube was similar to the previous year (sampling site No. 109 at Bratislava and No. 1206 at Komárno), or it slightly increased (sampling site No. 112 at Medveďov). The concentrations fluctuated in the range from <0.02 to 0.12 $mg.l^{-1}$. On the right bank of the Danube, in the right-side river branch system and in the Mosoni Danube (sampling sites monitored by the Hungarian Party) the values were more volatile (higher values were alternated with low values) and were higher than in the year 2015. Except the sampling site No. 1141 in the Mosoni Danube at Vének, the contents ranged from <0.02 to 0.16 $mg.l^{-1}$. For the sampling site at Vének the highest content of ammonium ions is characteristic throughout the year. The concentrations in the assessed year fluctuated from 0.07 to 0.23 $mg.l^{-1}$, and the highest value represents the annual maximum. On the left bank of the Danube old riverbed and in the left-side river branch system the concentration of ammonium ions was similar as in the year 2015 and contents moved at a narrower range than on the right bank (<0.05 to 0.11 $mg.l^{-1}$). A similar range was characteristic also in the reservoir, except the sampling site No. 308 in the upper part of the reservoir, where contents fluctuated at a wider range than on other locations in the reservoir (from <0.05 to 0.15 $mg.l^{-1}$). The maximum values at particular sampling sites occurred mainly in February, on some sampling sites in July or August and on the sampling site No. 308 in May. The narrowest range from <0.05 to 0.08 $mg.l^{-1}$ was detected in the left-side seepage canal. On the common sampling site No. 3531/0084 in the right side seepage canal the contents detected by the Slovak Party fluctuated within a narrower range (0.03 to 0.06 $mg.l^{-1}$), than it was detected by the Hungarian Party (0.02 to 0.11 $mg.l^{-1}$). Similar differences have also occurred on other jointly monitored localities.

Nitrates

In the case of nitrates seasonal fluctuation of measured values is characteristic, which is less remarkable in the seepage canals. Seasonal fluctuation is related to the growing season and the consumption of nutrients in the water. In the growing period the nutrient content usually falls to a half of the winter amount. The highest concentrations of nitrates in the evaluated year were recorded in January on the sampling site No. 109 in the Danube at Bratislava, in February on three localities (No. 112/2306, 3529/0082 and 1141) and on other monitored sampling sites in March. Subsequently, the concentrations until June gradually declined to the lowest contents in the period from June to August, and they began to rise again from September. At some sampling sites slight increase of values was visible in the summer period during cooling down in July (**Fig. 2-7**). Except the seepage canals, the development of nitrates contents was similar at individual sampling sites and the concentrations varied from 2.1 to 16.0 $mg.l^{-1}$. Both, the minimum and the maximum of this range were detected on the sampling site No. 1141 in the Mosoni Danube at Vének. On other locations the nitrate contents varied up to 14.1 $mg.l^{-1}$. The lowest nitrates content was characteristic for the seepage water, where the seasonality is not so pronounced. On the sampling site No. 317 in the left-side seepage canal at Hamuliakovo contents of nitrates fluctuated in the narrowest range from 4.5 to 7.4 $mg.l^{-1}$. Compared to the previous year, it can be concluded that nitrates concentrations in the evaluated year slightly increased or were similar, a slight decrease was documented only at four sampling sites (No. 1205 in the Danube at Komárno, in the Danube old riverbed above and below the weir at Dunakiliti - No 0042, 0043, and on the sampling site No. 311 in the lower part of the reservoir).

Nitrites

In general, higher contents of nitrites occurred during the colder months (January, February, November and December) and during discharge waves or after cooling down (in May, June and in August). In the assessed year on several locations (in the reservoir, on the left bank of the Danube old riverbed, in the left-side river branch system and in the left-side seepage canal) significantly higher contents occurred in May. The highest value was recorded on the sampling site o. 317 in the left-side seepage canal at Hamuliakovo, however other concentrations on this sampling site varied to a maximum of 0.082 $mg.l^{-1}$. In addition to these high May values, the nitrites content on the monitored sites varied in the range from 0.011 to 0.107 $mg.l^{-1}$. The exception was again the sampling site in the Mosoni Danube at Vének, for which the highest contents of nitrites during the year are typical

(0.026 to 0.138 mg.l^{-1}). The lowest contents were documented on the common sampling site in the right-side seepage canal at Čunovo/Rajka, where they fluctuated from 0.016 to 0.065 mg.l^{-1}. The content of nitrites in the evaluated year was higher or similar as in the year 2015, depending on the sampling site.

Total nitrogen

The total nitrogen belongs to water quality parameters with significant seasonal fluctuation. Changes of total nitrogen in the water follow the seasonal changes of nitrates. The highest contents are usually recorded at the beginning of the year in the coldest period. In 2016, the maxima in individual locations were recorded from January to February. The exception was the sampling site No. 1141 in the Mosoni Danube at Vének, where it the maximum of 6.97 mg.l^{-1} was recorded in May. However, it was an unique value, the other concentrations at this site fluctuated from 1.65 to 4.17 mg.l^{-1}. At other monitored sampling sites the total nitrogen content varied in narrower range from 0.84 to 3.84 mg.l^{-1}. The development of total nitrogen concentrations, except the seepage canals, was similar (**Fig. 2-8**). In the river branch system and in the reservoir was the range even slightly narrower (1.23 to 3.58 mg.l^{-1}). The lowest concentrations on monitored locations occurred during summer months (mostly in August). The seasonal fluctuation in the seepage canals is less remarkable and regarding the origin of water the total nitrogen content is lower. In the left-side seepage canal (sampling site No. 317 at Hamuliakovo) the total nitrogen in the evaluated year fluctuated in the narrowest range from <1.31 to 2.01 mg.l^{-1}. In the right-side seepage canal at Čunovo/Rajka (the common sampling site No. 3531/0084) the differences in values determined by the Slovak and Hungarian Parties were lower than in 2015. The total nitrogen content fluctuated here from 0.84 to 2.87 mg.l^{-1}. Like in the case of nitrates, also in the case of total nitrogen, slightly increased concentrations occurred at some sampling sites in May, July and in August, which were probably related to discharge waves and with cooling down. Compared to the year 2015, the total nitrogen contents slightly decreased on common sampling sites and on locations monitored by the Hungarian Party (on the right bank of the Danube old riverbed, in the right-side river branch system). On the other monitored sites similar or slightly higher concentrations were recorded, than in the previous year.

Phosphates

Higher contents of phosphates are characteristic for colder months and during high flow rates. Low values are typical for the vegetation period, when intensive growth of algae going on. The main wave of phytoplankton development in the assessed year was documented in the spring months and low contents of phosphates were recorded from March to May (**Fig. 2-9**). Due to the climatic and hydrological conditions in the summer months (significant cooling, heavy rainfall, frequent short-term discharge waves, with the highest discharge wave in July) the summer wave of phytoplankton development did not occurred. Phosphates concentrations were relatively high in the summer months, with annual maxima in July, August or early in September. Exceptions were the sampling sites in the Mosoni Danube at Vének and in the Danube old riverbed, where the maxima occurred in November. High concentrations of phosphates (0.71 to 1.10 mg.l^{-1}) detected on common sampling sites (in the Danube at Medveďov, in the Danube old riverbed at Rajka, in the Mosoni Danube at Čunovo/Rajka and in the right-side seepage canal at Čunovo/Rajka) by the Slovak Party at the beginning of September, were not confirmed by the Hungarian Party on any of the sampling sites. The Hungarian Party at the same time measured much lower values, maximally 0.14 mg.l^{-1}. Also the highest concentrations of phosphates in the assessed year (1.17 mg.l^{-1}), measured on the sampling site No. 109 in the Danube at Bratislava, was recorded in September. At Medveďov higher content occurred also in November - 0.46 mg.l^{-1} and in the Danube old riverbed at Rajka also at the beginning of October - 1.07 mg.l^{-1}. Besides these high values, the concentrations of phosphates on the common sampling sites varied from <0.03 to 0.37 mg.l^{-1}. On the other monitored locations they were lower, <0.03 to 0.22 mg.l^{-1}. For the left-side seepage canal at Hamuliakovo (sampling site No. 317) the narrowest range <0.03 to 0.16 mg.l^{-1} was characteristic. Compared with the previous year the contents of phosphates were higher or similar, with high maxima recorded by the Slovak Party in the Danube at Bratislava and on the common sampling sites. However, these values were not confirmed by the measurements of the Hungarian Party.

Total phosphorus

Changes of the total phosphorus content over time only partially follow the quantitative changes of phosphates. The increase of its concentration in surface water is often caused by phosphorus bound to suspended solids. Therefore higher concentrations can occur in connection with discharge waves. Such concentrations in the assessed year occurred in June and July. As in the case of phosphates, early in September high concentrations of total phosphorus 0.23 and 0.43 mg.l-1 were measured by the Slovak Party in the Danube at Bratislava and on common sampling sites (in the sampling site in the Danube old riverbed at Rajka also in October and in the Danube at Medveďov also in November). However, these values were not confirmed by the Hungarian Party, as it measured maximally 0.06 mg.l^{-1} at the same time. On the contrary, the Hungarian Party in June determined on the common sampling site in the Danube old riverbed at Rajka a concentration of 0.30 mg.l^{-1}, while the Slovak Party only 0.12 mg.l^{-1}. After excluding these high values, the total phosphorus content at Bratislava and on the jointly monitored locations varied in a range from <0.02 to 0.17 mg.l^{-1}. For the sampling site No. 1141 in the Mosoni Danube at Vének specific development of this parameter is characteristic and usually the highest values. In 2016 the values over the year were slightly higher than on the other locations, they ranged from 0.07 to 0.34 mg.l^{-1}. On the other sampling sites the total phosphorus contents in the assessed year fluctuated from 0.03 to 0.19 mg.l^{-1}. The lowest contents were recorded in the left-side seepage canal at Hamuliakovo (sampling site No. 317), where the total phosphorus fluctuated in the range from 0.02 to 0.05 mg.l^{-1}. Compared with the year, the total phosphorus contents has increased or were similar and only on two sampling sites (No. 308 in the upper part of the reservoir and No. 317 in the left-*side seepage canal) slightly decreased. The time course of total phosphorus concentrations in the year 2016 at selected sampling sites is shown in **Fig. 2-10**.

2.5. Oxygen regime parameters

Dissolved oxygen

The dissolved oxygen content in the surface water is, besides the decay processes of organic pollution, affected by hydro-meteorological conditions and by assimilation activity of phytoplankton. The dissolved oxygen content proportionally decreases with the increasing water temperature. Low values in 2016 were recorded from June to September, depending on the sampling site location and the lowest oxygen concentrations occurred mainly in July. The highest concentrations were recorded in the first three months of the year. Overall, the dissolved oxygen content in the assessed year ranged from 5.5 to 18.6 $mg.l^{-1}$. the lowest value was measured in July on the sampling site No. 1141 in the Mosoni Danube at Vének, the highest at the beginning of February in the reservoir on the sampling site No. 308. Concentrations below 7 $mg.l^{-1}$, which is the limit for the I. quality class according to the **Table 2-2**, occurred on four localities: No. 1141 in the Mosoni Danube at Vének (5.5 $mg.l^{-1}$), No. 1126 in the Ásványi river arm (6.8 $mg.l^{-1}$), No. 308 in the reservoir (6.1 $mg.l^{-1}$ and 6.8 $mg.l^{-1}$.), and the values recorded by the Slovak Party (6,3 $mg.l^{-1}$ a 6,5 $mg.l^{-1}$) on the common sampling site No. 3531/0084 in the right-side seepage canal at Čunovo/Rajka. However, low values in the right-side seepage canal were not confirmed by the Hungarian Party. The oxygen content in the narrowest range, from 8,8 to 12,2 $mg.l^{-1}$, fluctuated on the sampling site in the left-side seepage canal at Hamuliakovo (sampling site No. 317). In the right-side seepage canal on the common sampling site No. 3531/0084 at Čunovo/Rajka the oxygen conditions detected by the Slovak Party slightly improved in comparison with the year 2015, only two values below 7 $mg.l^{-1}$ occurred. Other concentrations here fluctuated up to 10.1 $mg.l^{-1}$. The Hungarian Party for this sampling site recorded an interval from 7.3 to 12.8 $mg.l^{-1}$. In the widest range, from 6.1 to 18.3 $mg.l^{-1}$, the values on the sampling site No. 308 in the reservoir varied. At other locations the oxygen content fluctuated up to 15.7 $mg.l^{-1}$. In connection with the decrease in water temperature during discharge waves in June and July, increased values were recorded on some sampling sites.

In general, it can be stated that the oxygen conditions in the year 2016 were mostly good, slight deterioration in comparison with the previous year was recorded on three sampling sites (No. 1141 in the Mosoni Danube at Vének, No. 308 in the reservoir and No. 1126 in the Ásványi river arm). There was a slight improvement in the right-side seepage canal at Čunovo/Rajka (No. 3531/0084). The dissolved oxygen content on the monitored sites varied mostly at similar ranges as in 2015. At the sampling on the right bank of the Danube old riverbed, in the right-side river branch system and in the Mosoni Danube at Vének was the spread of values, due to lower minima, slightly greater. An exception was the sampling site No. 308, where the development of oxygen in the assessed year was specific (**Fig. 2-11**), and differed from other sites, the values varied at a wider range than in 2015.

COD_{Mn} and BOD_5

COD_{Mn} and BOD_5 parameters are used for expression of organic water pollution, they indicate the chemically and biologically degradable organic matter content. Higher values of COD_{Mn} and BOD_5 usually occur in periods with higher flow rates in the Danube, when the water contains higher amount of natural organic matter. In the Mosoni Danube and in the right-side seepage canal the Slovak Party in 2016 did not observed the COD_{Mn} parameter.

Due to the amount of discharge waves in the assessed year, the COD_{Mn} values were more volatile than in the previous year and higher maxima were reached on several observed locations. COD_{Mn} values varied in the range from <0.8 to 8.0 $mg.l^{-1}$. Most of the values ranged up to 5.0 $mg.l^{-1}$ and only on three sites also higher values were detected: the sampling site No. 1205 in the Danube at Komárno (5.9 $mg.l^{-1}$), the sampling site No. 3739 in the Danube old riverbed (5.6 $mg.l^{-1}$), and three values on the sampling site No. 1141 in the Mosoni Danube at Vének (8.0 $mg.l^{-1}$, 5.6 $mg.l^{-1}$ and 5.1 $mg.l^{-1}$). For this sampling site the highest values throughout the year are characteristic (in 2016 from 2.2 to 8.0 mg.l^{-1}). The maxima on particular locations occurred in different months: in January, February, May, June, July, September and the maximum at Vének was recorded in November. The least polluted water in terms of organic pollution was the water in seepage canals, where the COD_{Mn} values fluctuated within a narrow range, from 0.9 to 2.2 mg.l^{-1} (the sampling sites No. 317 in the left-side and No. 0084 in the right-side seepage canal). In general, it can be stated that the organic pollution expressed by the COD_{Mn} in comparison with the previous year have increased at the sampling sites on the left bank of the Danube old riverbed, in the Mosoni Danube at Vének and in the tail-race channel at Sap, while on the others it was similar. A decline was documented only on the sampling site No. 308 in the reservoir.

In the case of the BOD_5 water quality parameter, the greatest differences in values measured by the Hungarian and the Slovak Parties are characteristic in long-term, what is most visible at common sampling sites (**Fig. 2-12**). Higher values are determined by the Hungarian Party. In 2016 the BOD_5 values determined by the Hungarian Party varied from <0.1 to 7.7 mg.l^{-1} (maximum on the sampling site No. 0001 in the Danube old riverbed at Rajka and No. 2306 in the Danube at Medveďov), while Slovak values ranged from <0.5 to 3.2 mg.l^{-1} (maximum on the sampling site No. 109 in the Danube at Bratislava). The highest values on individual sites were registered on the Hungarian side mainly in January and February, on the Slovak side most frequently in April. The BOD_5 values in the Mosoni Danube at Vének throughout the year did not belonged to the highest, they fluctuated within a similar range as in 2015, but with lower minimum (from 0.1 to 5.3 mg.l^{-1}, in the previous year from 1.3 to 5.3 mg.l^{-1}). On the right bank of the Danube old riverbed the BOD_5 fluctuated in the range from 0.3 to 7.7 mg.l^{-1}, while the values on the left bank ranged from <0.5 to 2.0 mg.l^{-1}. A slightly wider range was recorded in the reservoir, from <0.5 to 2.7 mg.l^{-1}. High values, from 1,0 to 4.2 mg.l^{-1}, occurred also in the right-side seepage canal on the common sampling site No. 3531/0084 at Čunovo/Rajka, but the maximum recorded by the Slovak Party was only 1.8 mg.l^{-1} (**Fig. 2-12**). In the left-side seepage canal on the sampling site No. 317 at Hamuliakovo the pollution expressed by the BOD_5 slightly increased in comparison to the year 2015, and the narrowest range in the assessed year (from <0,5 to 1,7 mg.l^{-1}) was detected in the left-side river branch system on the sampling site No. 3376. The BOD_5 values in the right-side river branch system varied from 0.1 to 6.6 mg.l^{-1}. Compared to 2015, a slight increase in organic pollution expressed by the BOD_5 indicator was recorded in the reservoir and in the left-side seepage canal at Hamuliakovo. The pollution on the other locations was similar as in 2015, with the exception of values measured by the Hungarian Party on the common sampling site in the Danube at Medveďov and in the Danube old riverbed at Rajka, which were higher than in the previous year. However, the Slovak Party also on these locations recorded similar values as in the previous year.

2.6. Heavy metals

From among heavy metals the joint monitoring includes observation of zinc, mercury, arsenic, copper, chromium, cadmium, nickel and lead contents. In 2016 the Slovak Party did not observed heavy metals on the sampling site: No. 3376 in the left-side river branch system at Dobrohošť, on the sampling site No. 3529 in the Mosoni Danube at Čunovo and on the sampling site No. 3531 in the right-side seepage canal at Čunovo. In general, the contents of heavy metals in the evaluated year were low. In the case of chromium all concentrations in the evaluated year were below the detection limits, in the case of cadmium, mercury, lead, arsenic and nickel most of values were below the detection limits.

The highest zinc content of 48 µg.l^{-1} was recorded on the sampling site No. 109 in the Danube at Bratislava. Slightly lower concentration of 30.7 mg.l^{-1} was detected in December on the sampling site No. 1112 in the river branch system (Helena weir). Except these two values all others were less than 20 µg.l^{-1}, what is the detection limit in case of analyses carried out by VÚVH. In the case of Hungarian data only six values were higher than the detection limit of 1 µg.l^{-1} (except of the above-mentioned concentration at Helena they fluctuated from 2.0 to 4.9 µg.l^{-1}). At sampling sites monitored by the organization SVP-BA only few values were lower than the detection value, thus lower than 1 µg.l^{-1}. Measured concentrations ranged from 1.2 to 15.1 µg.l^{-1}, similarly as in the year 2015 (1.9-15.8 µg.l^{-1}).

In the case of mercury only at two sampling sites in the Danube three values higher than the detection limit were determined by the Slovak Party (in the Danube at Bratislava 0.037 µg.l^{-1} and 0.045 µg.l^{-1}, in the Danube old river bed at Rajka 0.023 and 0-031 µg.l^{-1}). At the common sampling site No. 1203/0001 in the Danube old riverbed at Rajka the Hungarian Party, however, at the same time has determined a concentration lower than the detection limit, <0.02 µg.l^{-1}. The other values of mercury were lower than 0.02 µg.l^{-1} or lower than 0.05 µg.l^{-1}, what are the detection limits for the Hungarian and Slovak data.

Arsenic concentrations ranged below 5.0 µg.l^{-1}, what is the detection limit value in the case of analyses carried out by SVP-BA. At sampling sites observed by the VÚVH or the Hungarian Party the arsenic concentrations fluctuated in the range from <1.0 to 2.7 µg.l^{-1}. Measured contents occurred at ten sampling sites, with a frequency of 1-3 times.

All chromium contents fluctuated below the level of detection limits (for the Hungarian data it was 1 µg.l^{-1}, on the Slovak side it was in the case of SVP-BA 0.5 µg.l^{-1}, and in the case of VÚVH it was changed three times during the year: from 2 µg.l^{-1} to 0.5 µg.l^{-1} and then to 1 µg.l^{-1}).

Similarly as in the case of chromium, also for the cadmium in the case of VÚVH several times in the assessed was changed the detection limit. The cadmium concentrations on sampling site in the Danube at Bratislava and at Medveďov, and in the Danube old riverbed at Rajka were mostly lower than the limit of determination, thus 0.1 µg.l^{-1} or 0.08 µg.l^{-1} or 0.02 µg.l^{-1}. After decreasing the detection limit to the level of 0.2 µg.l^{-1} values above this level were also measured from September to December, fluctuating from 0.020 to 0,041 µg.l^{-1}. On sampling sites monitored by SVP-BA, all cadmium concentrations in the assessed year were lower than the detection limit (0.08 µg.l^{-1}) and on the Hungarian side they were all lower than 0.1 µg.l^{-1}.

The lead contents in the evaluated year varied mostly below the level of 1 µg.l^{-1} (the determination limit for the Slovak and the Hungarian Party). Exceptions were only two concentrations (1.34 µg.l^{-1} in February and 4.09 µg.l^{-1} in November), which were recorded on the sampling site No. 109 in the Danube at Bratislava.

The highest frequency of concentrations above the detection limit is characteristic for copper. Except one higher values, the copper concentrations in the evaluated year ranged from <0.38 to 7.50 µg.l^{-1}. Higher copper content of 17.90 µg.l^{-1} was recorded in September in river branch system on the sampling site No. 1112 (Helena weir).

The content of nickel in the surface water in the year 2015 was similar as in the previous year. It varied in the range from <1.0 to 3.8 µg.l^{-1} with one higher value of

8.7 µg.l^{-1} recorded in April on the sampling site No.1112 at Helena weir in the river branch system (in 2015 the nickel varied from 0.7 to 4.5 µg.l^{-1}). Most of the values were below the detection limit, while on the Slovak side all concentrations were exclusively lower than 1 µg.l^{-1}, what is the detection limit of this parameter.

In summary it can be concluded that heavy metal concentrations, which were determined from filtered samples, were low during the assessed year. Higher concentrations occurred in the case of copper, zinc and nickel, three values on the sampling site in the river branch system - Helena weir (nickel – 8,7 µg.l^{-1} in April, copper – 17,9 µg.l^{-1} in September, zinc – 30,7 µg.l^{-1} in December) and one concentration on the sampling site in the Danube at Bratislava (48 µg.l^{-1}). A large part of the measured values was below the detection limits of applied analytical methods. Such concentrations were characteristic mainly for chromium, lead, mercury, cadmium and arsenic. The highest frequency of concentrations above the detection limit was characteristic for copper. Compared to the previous year, the concentrations of observed heavy metals were similar, only in the case of lead, nickel, zinc and copper higher concentrations occasionally occurred.

The detection limits of particular heavy metals often correspond to the II., III. or IV. class of surface water quality according to the **Table 2-2**. The detection limits vary depending on the laboratory. The evaluation of heavy metals according to the agreed limits (**Table 2-2**) at selected sampling sites is given in **Table 2-8**.

Based on the comparison of heavy metal concentrations with the limits pursuant to the Directive of the European Parliament and of the Council No. 2008/105/EC on environmental quality standards, and limits according to the national standards (Hungarian standard MSZ No. 12749 „The quality of surface water, quality characteristics and evaluation" and „Regulation of the Government of the Slovak Republic No. 269/2010 Z.z., laying down the requirements for achieving good water status") it can be stated, that in the year 2016 concentrations of heavy metals were in compliance with environmental quality standards.

2.7. Chlorophyll-a

Chlorophyll-a content refers to the amount of phytoplankton and provides information about the eutrophic status of water. The amount of chlorophyll-a is influenced by the flow rate and temperature conditions of the evaluated year and by the fluctuation of nutrients content in the surface water. In the year 2016, higher contents occurred in the spring months, where the main development of phytoplankton was documented. Overall, the chlorophyll-a content in the assessed year fluctuated from 0.3 to 31.2 mg.m^{-3}, and the highest value was recorded in March on the sampling site No. 109 in the Danube at Bratislava. Besides this sampling site, the highest values on individual sampling sites were recorded in April or May. An exception was also the sampling site in the right-side seepage canal. where the maximum of 11.8 mg.m^{-3} was detected by the Hungarian party in September, however the Slovak Party at the given time measured only 1.8 mg.m^{-3}. The abundance of phytoplankton at the end of May, or at the beginning of June decreased on all sites and subsequently also the contents of chlorophyll-a to declined to low values (on some sampling sites below the detection limit). Since June the chlorophyll-a contents until the end of the year. A very slight increase in contents at several sampling sites in July, in August or in September did not exceeded 5.6 mg.m^{-3}. Except the maximum of 31.2 mg.m^{-3} at Bratislava, the other contents in the main stream, in the Danube old riverbed and in the Mosoni Danube fluctuated in the range from 0.3 to 23.3 mg.m^{-3}. In the river branch system they were even lower <2 to 13.7 mg.m^{-3} and in the reservoir slightly higher <2 to 27.4 mg.m^{-3}. In the left-side seepage canal at Hamuliakovo (the sampling site No. 317), the chlorophyll-a content was low throughout the year, without significant fluctuations, and varied from 0.9 to 8.5 mg.m^{-3}. On the common sampling site No. 3531/0084 in the right-side seepage canal, except the above-mentioned September value, the others varied only in a narrow range from 0.9 to 3.8 mg.m^{-3}. Compared to the previous year, higher maxima in the spring period were detected at multiple locations. Exceptions were the sampling sites on the right bank of the Danube old riverbed, on the left bank At Sap, at two locations in the river branch system (Szigeti and Ásványi arms) and at one location in the reservoir (No. 308, where relatively high values were detected in 2015). In contrast to the year 2015, there was no significant increase of contents in the summer period, due to the lack of summer wave of phytoplankton development. The development of chlorophyll-a at selected sampling sites is shown in **Fig. 2-13**.

2.8. Other biological indicators

The assessment of biological quality indicators in 2016 on jointly monitored sampling sites and on sampling sites monitored only by the Hungarian Party was carried out in accordance with the methodology agreed in the frame of the Transboundary Water Commission. On sampling sites monitored only by the Slovak Party, the evaluation used in the previous period was applied.

2.8.1. Biological indicators and evaluation of ecological status of surface water at jointly monitored sampling sites

Biological indicators in 2016 on jointly monitored sampling sites were evaluated within the ecological status of surface waters and in accordance with the methodology agreed in the frame of the Transboundary Water Commission (”Assessment of the status and quality of waters of Slovak-Hungarian boundary watercourses in the year 2016”, May 2017 and the Hungarian National Annual Report in 2016). The overall ecological status of surface water is determined by biological quality elements, together with supporting hydromorphological, physico-chemical and chemical elements. The assessment of the ecological status in 2016 was focused on sampling sites, not water bodies. Hydromorphology was not a part of the joint monitoring, therefore it was not included in the evaluation. The ecological status was assessed at all sampling sites on the Slovak territory, despite the fact that some sampling sites are situated in water bodies designated as heavily modified. The basic principle of the assessment is the type specificity and the comparison of changes in environment quality with reference values, which reflect the state of the environment without or with minimal anthropogenic influence. From among the biological quality elements the benthic invertebrates (macrozoobenthos), phytobenthos, phytoplankton and macrophytes were evaluated.

The assessment of monitoring results for particular biological elements was carried out according to the classification schemes, which include the limit values for classification into the relevant quality classes in the range of I.-V. class of quality, together with the relevant ecological status: I. class - high, II. - good, III. - moderate, IV. - poor, V. - bad. Limit values are determined by metrics (indexes), which reflect the response of aquatic organisms to disturbances (stressors) and also express the species diversity, abundance or the biomass and sensitive species. Metrics (indexes) were developed by the Slovak and Hungarian Party separately at the national level. The Slovak Party assesses the macrozoobenthos according to the multimetric index that adequately responds to the degree of degradation of the environment and is type specific. The phytoplankton is evaluated according to the proportional representation of the four groups (*Cyanophyta*, *Chromophyta*, *Chlorophyta*, *Euglenophyta*) and according to the abundance and biomass. The assessment of phytobenthos is based on three indexes (CEE - the response of diatoms to overall pollution, EPI-D - detects the eutrophication processes in streams, IBD - biological diatoms index) and macrophytes on IBMR index - biological index (more details in Government Regulation No. 269/2010 Z.z. as amended by later regulations). The basis of the Hungarian evaluation of phytoplankton is the multimetric index HRPI (Hungarian River Phytoplankton Index) that characterizes the quantitative and qualitative conditions of phytoplankton. Macrozoobenthos in 2016 was assessed on the basis of new national evaluation system HMMI (Hungarian Macroinvertebrate Multimetric Index). The assessment of phytobenthos in the case of the Danube is based on the IPS index, or in the case of other flows according to the IPSITI index (a combination of three diatomaceous indexes: IPS - Integrated Pollution Index, SID - Saprobic Index, TID - Trophic Index). Macrophytes are evaluated on the basis of reference index (RI), which except the relative estimation of biomass of species, takes into account the characteristics of the indicator (more details in the Hungarian National Annual Report in 2016).

Table 2-3: Evaluation of ecological status for biological quality elements at jointly monitored sampling sites

No.	Sampling site	macro-zoobenthos		phyto-benthos		macro-phytes		phyto-plankton	
		SK	HU	SK	HU	SK	HU	SK	HU
109	Danube, Bratislava	II		II		x		I	I
0001	Danube old riverbed, Rajka	x	III	x	II	x	x	I	I
112/2306	Danube, Medveďov	II	III	III	III	x	x	I	I
3531/0084	seepage canal, Čunovo/Rajka	x	III	x	I	x	II	I	II
3529/0082	Mosoni Danube, Čunovo/Rajka	x	III	x	II	x	II	I	II

SK - Slovak results, HU - Hungarian results, x - not evaluated

Table 2-3 lists the evaluation of ecological status according to particular biological quality elements separately for each country. The resulting class of the water body quality is determined by the worst ranked biological element (the worst case rule).

Surface water quality

- according to macrozoobenthos is classified into II. or III. quality class, what corresponds to a good or moderate ecological status;
- according to phytobenthos it was set into the range from I. to III. quality class, what corresponds to a high, good or moderate ecological status;
- according to macrophytes the water quality was good (II. class);
- according to phytoplankton it belongs to the I. quality class (high ecological status) or II. quality class (good ecological status).

Ecological status of the individual sampling sites based on the biological quality elements was determined as follows:

Danube at Bratislava - this sampling site according to Slovak results was classified into the good status (II. class).

Danube at Medveďov - according to the Slovak and Hungarian results was classified into the moderate status (III. class).

Danube old riverbed at Rajka - according to the Slovak results this sampling site was classified into the high status (I. class), but only on the basis of phytoplankton, the Hungarian results corresponded to a moderate ecological status (III. class).

Right-side seepage canal at Čunovo/Rajka - according to the results of the Slovak Party was classified into a high status (I. class), results of the Hungarian Party corresponded to a moderate status (III. class).

Mosoni Danube at Čunovo/Rajka - according to the results of the Slovak Party this site was classified into a high status (I. class), but only on the basis of phytoplankton, the results of the Hungarian Party corresponded to a moderate ecological status (III. class).

For the assessment of the overall ecological status, supporting elements were also included in the evaluation. The Slovak Party, besides the biological elements of quality considered the physico-chemical quality elements and synthetic and non-synthetic substances relevant to Slovakia. The overall ecological status according to the obtained results corresponds to the ecological status referred above. A good overall ecological status was achieved on the sampling site in the Danube at Bratislava, in the Danube old riverbed at Rajka, in the right-side seepage canal at Čunovo/Rajka and in the Mosoni Danube at Čunovo/Rajka. A moderate ecological status was determined in the Danube at Medveďov. The level of reliability of the ecological status assessment was high to medium.

The Hungarian Party, taking into account the results of the evaluation of physico-chemical quality elements and other specific substances (heavy metals) determined a moderate ecological status at all common sampling sites.

2.8.2. Biological indicators and evaluation of ecological status of surface water at sampling sites monitored only by the Hungarian Party

From among the biological quality elements the Hungarian Party in 2016, except the jointly monitored sampling sites, observed the macroinvertebrates, phytobenthos and phytoplankton on another seven sampling sites in the Danube old riverbed, in the right-side river branch system and in the Mosoni Danube. A summary of the evaluation results of biological quality elements is presented in **Table 2-4**.

By the Government resolution No. 1155/2016, the Hungarian Government adopted the revised Hungarian River Basin Management Plan 2 (RBMP2) of 2015, which was drawn up for the fulfilment of the Member State's obligation contained in the Directive 2000/60 of the European Parliament and of the Council. The Background document No. 6.1 RBMP2 contains a methodology for assessing the ecological status and the limit values of the biological, physico-chemical, hydromorphological and chemical parameters assessment system. The classification of biological quality elements (phytoplankton, phytobenthos, macrozoobenthos and macrophytes) was performed on the basis of limit values for types of water bodies determined within the RBMP2, taking into account the typology as follows:

the right-side seepage canal, the river branch system, the Danube old riverbed (Danube at Szigetköz).

Table 2-4: Evaluation of ecological status for biological quality elements at sampling sites on the Hungarian territory

No.	Sampling site	macro-zoobenthos	phyto-benthos	phyto-plankton
0043	Danube old riverbed, Dunakiliti, upstream of the submerged weir	III	II	I
0042	Danube old riverbed, Dunakiliti, downstream of the submerged weir	III	II	I
0002	Danube old riverbed, Dunaremete	III	II	I
1112	river branch system, Helena	II	II	I
1114	river branch system, Szigeti river arm	II	II	I
1126	river branch system, Ásványi river arm	II	I	I
1141	Mosoni Danube, Vének	III	III	II

Based on the results obtained from the monitoring of biological quality elements in 2016 it can be stated that according to the phytoplankton a high ecological status (I. quality class) was achieved on six sampling sites, and on the sampling site No. 1141 in the Mosoni Danube at Vének good ecological status (II. quality class). At sampling times, when the amount of chlorophyll-a was lower than the limit value for the I. quality class (<15 $\mu g.l^{-1}$), a detailed analysis of phytoplankton was not performed, therefore the chlorophyll-a EQR values were took into account in the phytoplankton assessment (more details in the Hungarian National Annual Report in 2016).

According to the phytobenthos, a good ecological status (II. quality class) was achieved on five observed sampling sites, on one sampling site in the river branch system (Ásványi river arm) a high status (I. quality class) was achieved, and only on the sampling site in the Mosoni Danube at Vének a moderate ecological status was determined (III. quality class).

Based on macrozoobenthos moderate ecological status (III. quality class) was achieved on sampling sites in the Danube old riverbed and in the Mosoni Danube at Vének. In the river branch system a good ecological status (II. quality class) was determined.

Concerning the overall ecological status, when besides the biological quality elements also the supporting elements (physico-chemical quality elements and other specific substances) are included in the evaluation, the following results were achieved (Hungarian National Annual Report in 2016). At three sampling sites in the river branch system a good overall ecological status was determined and on four sampling sites (in the Danube old riverbed and in the Mosoni Danube at Vének) moderate overall ecological status was achieved.

2.8.3. Biological indicators at sampling sites monitored only by the Slovak Party

The monitoring and evaluation of biological quality elements was carried out according to the methodology applied in previous years.

Phytoplankton

In the period from March and October, twelve samples of phytoplankton were collected on monitored sites in 2016, and six in the seepage canals (**Table 2-5**).The vegetation period of the assessed year can be characterized by more frequent alteration of warmer and cooler periods, by fluctuating and relatively high flow rates (especially in the period from May to August), as well as by months rich in precipitation (the highest rainfall total was recorded in July). Due to a relatively high discharge waves in February 2016 and rather cold spring, the development of phytoplankton was shifted from the traditional March to April and May. The highest values of the phytoplankton abundance were achieved in April (at five sampling site), in May (also at five), only in the seepage canals was the maximum in other months, in the right-side at Čunovo in July and in the left-side at Hamuliakovo in March. High values were achieved mainly due to the development of centric diatoms, which in the spring months formed a major part of the phytoplankton. Values above 10000 cells.ml^{-1}, what represents the mass development of phytoplankton, were not recorded in the assessed year. In June the abundances declined significantly and by the end of the vegetation period remained mostly on low level. Thanks to the more intense cooling in mid July and August, also to higher water stages and to summer rich in precipitation, the second (summer) wave of the phytoplankton development did not occurred, or only to a very limited extent. The highest abundance value (990 cells.ml^{-1}) was found on the sampling site No. 3531 in the right-side seepage canal at Čunovo. A very slight increase in abundance in the summer period was recorded on sampling sites No. 109, 311 and 307, however, the values ranged maximally to 564 cells.ml^{-1}. September was fairly warm, but two discharge waves occurred (peaking around 3000 $m^3.s^{-1}$), so the abundance values remained low. The lowest, or the second lowest values of the phytoplankton abundance were found mostly at the end of the vegetation period.

The phytoplankton abundance in 2016 ranged from 8 to 9094 cells.ml^{-1}, while the lowest value was determined on the sampling site No. 3530 in the tail-race channel at Sap in October and the highest occurred at the beginning of May in the lower part of the reservoir on the sampling site No. 311. The limit for the mass development of phytoplankton was not exceeded even in one case. In 2015 the mass development of phytoplankton was documented three times on two sites (No. 3529 and 308).

The annual average of phytoplankton abundance at particular sampling sites ranged from 119 to 1457 cells.ml^{-1}, which are substantially lower values than in the previous year (77 to 2973 cells.ml^{-1}). A very slight increase in average abundance was recorded only on one sampling site in the left-side seepage canal at Hamuliakovo (No. 317). The average abundance in the right-side seepage canal at Čunovo was similar to the previous year. On the other sampling sites significant decrease of the average annual abundance occurred. The most significant decrease was documented on the sampling site No. 308 in the upper part of the reservoir, where an annual maximum was recorded in 2015. The values of the annual average of phytoplankton abundance in 2016 were far below the limit for mass development.

The largest portion in the phytoplankton composition in the evaluated year, except the seepage canals, had the centric diatoms (*Bacillariophyceae - Centrales*), the pennate diatoms were on the second place. Relatively high portion had also the cellular green algae (*Chlorococcales*) and cyanobacteria (*Cyanophyceae*) (mainly on the sampling site No. 308 in the upper part of the reservoir, but were not represented by toxin-producing species). In the left-side seepage canal at Hamuliakovo (sampling site No. 317) the portion of centric diatoms is low in long-term. In the assessed year, the portion of pennate diatoms (*Bacillariophyceae - Pennales*), which have dominant presence on this sampling site in long-term, has increased significantly. In contrast to the previous year, the cyanobacteria (*Cyanophyceae*) were not recorded at all. In the right side seepage canal at Čunovo (sampling site No.3531) a similar portion in the assessed year had the yellow-green algae (*Chrysophyceae*), the pennate diatoms (*Bacillariophyceae - Pennales*), and the cryptomonads (*Cryptophyceae*). The share of centric diatoms after the significant decline in the year 2015, has decreased further.

Table 2-5: Values of saprobic index of biosestone in 2016

No.	Sampling site	Min	Max	Yearly average		Saprobity level
				2016	*2015*	
109	Danube, Bratislava	1.94	2.37	**2.18**	*2.17*	β -mesosaprobity
112	Danube, Medveďov	1.90	2.41	**2.17**	*2.20*	β -mesosaprobity
1205	Danube, Komárno	1.79	2.40	**2.11**	*2.16*	β -mesosaprobity
4016	Danube, submerged weir	1.99	2.39	**2.16**	*2.18*	β -mesosaprobity
4025	Danube, Dobrohošť	1.99	2.37	**2.12**	*2.16*	β -mesosaprobity
3739	Danube, Sap	1.76	2.41	**2.10**	*2.17*	β -mesosaprobity
3529	Mosoni Danube, Čunovo	1.81	2.42	**2.07**	*2.21*	β -mesosaprobity
307	reservoir - Kalinkovo	1.82	2.40	**2.16**	*2.23*	β -mesosaprobity
308	reservoir - Kalinkovo	1.92	2.32	**2.12**	*2.17*	β -mesosaprobity
309	reservoir - Šamorín	2.04	2.45	**2.23**	*2.21*	β -mesosaprobity
311	reservoir - Šamorín	1.85	2.46	**2.20**	*2.21*	β -mesosaprobity
3530	tailrace canal, Sap	1.98	2.37	**2.17**	*2.16*	β -mesosaprobity
3376	river branch system	1.81	2.39	**2.14**	*2.14*	β -mesosaprobity
3531	right-side seepage canal	1.62	2.21	**1.92**	*1.98*	β -mesosaprobity
317	left-side seepage canal	1.44	1.90	**1.72**	*1.70*	β -mesosaprobity

The saprobic index of biosestone is determined by the composition of phytoplankton. The saprobic index of biosestone in 2016 varied from 1.44 to 2.46 (**Table 2-5**). It fluctuated in the range that corresponds to β-mesosaprobity. Such an environment provides appropriate living conditions for a wide scale of organisms with high species diversity. At the sampling site No. 317 in the left side seepage canal a value of 1.44 was even recorded in august, which is at the level of oligo-saprobity. The average values of saprobic indexes at eight sampling sites were similar as in the year 2015, on the others were improved, the most significantly in the Mosoni Danube at Čunovo (No. 3529). The level of saprobity has not changed.

Concerning the abundance of phytoplankton, it can be stated that the hydropower system neither in 2016 had negative impact on the level of saprobity.

<u>Macrozoobenthos</u>

From an ecological point of view, the monitoring of macroinvertebrates in flowing water bodies appears to be the most appropriate method for bioindication. Samples are relatively easy to access and quickly processable. In 2016 the macroinvertebrate samples were collected in April or May, in August and in October on the monitoring sites listed in **Table 2-6**. In the spring and summer periods, due to long-term inappropriate hydrological conditions, sampling was not possible to perform.

In sections with fast flowing water with gravely or rocky bottom (sampling sites No. 109 at Bratislava, No. 112 at Medveďov in the Danube, No. 4025 in the Danube old riverbed at Dobrohošť and No. 3529 in the Mosoni Danube at Čunovo) rheophillic and oxybiontic macroinvertebrate species prevail, indicating β-mesosaprobity. At these sampling sites in 2016 the following species dominated: *Dikerogammarus villosus*, *Limnomysis benedeni*, *Chironomus sp.*, Lumbriculidae g. sp. div., *Echinogammarus ischnus*, *Jaera istri* and in the Danube old riverbed at Dobrohošť also *Lithoglyphus naticoides*. On the sampling site at Sap (No. 3739), upstream of the confluence of the Danube with the tail-race channel, with a slower flow of water, stagnophillic and oligooxybiontic species appear, which withstand slight pollution. In this section the bottom is sandy or muddy. In the assessed year representatives of the families Lumbriculidae g. sp. div., Chironomidae g. sp. div. and Naididae g.sp.div. dominated, further also species such as *Potamopyrgus antipodarum*, *Lithoglyphus naticoides*, *Bithynia tentaculata*, *Corbicula fluminea*, *Theodoxus fluviatilis*, *Valvata piscinalis* and *Limnomysis benedeni*. Due to the different environmental conditions, the sampling site at the weir at Dunakiliti (No. 4016) has a specific position, when the lithophilous, rheophilous and oxybiontic species prevail on the weir with a fast turbulent flow, but on the place upstream the weir with a slower flow stagnophilous and oligooxybiontic species prevail. At this sampling site a greater variety of dominant species was recorded, besides the above mentioned also species *Simulium balcanicum*, *Micronecta minutissima* and of the family Tanytarsini g. sp. div. dominated on this sampling site.

In the reservoir there are places with different flow velocities. Depending on the flow velocity there are different types of bottom substrates. The sandy and gravely substrate (sampling sites No. 307 and 308) at places with slow flow velocity gradually changes into muddy substrate (sampling sites No. 309 and 311). Dominant macrozoobenthos species in 2016 on the muddy substrate were Lumbriculidae g. sp. div., *Pisidium henslowanum*, *Pisidium sp.*, *Corbicula fluminea* and *Lithoglyphus naticoides*. On mostly gravely and sandy substrate (sampling sites No. 307 and 308) representatives of the family Lumbriculidae g. sp. div., Tubificidae g. sp. div., Chironomidae g. sp. div. and also species *Lithoglyphus naticoides*, *Corbicula fluminea*, *Potamopyrgus antipodarum* dominated. On the sampling site No. 308 the largest variety of dominant species was observed. In addition to the above, dominant presence had here also *Limnomysis benedeni*, *Valvata piscinalis*, *Theodoxus fluviatilis*, *Katamysis warpachowskyi* and *Polypedilum sp.*.

Based on the determined species the saprobic indexes of macrozoobenthos were calculated, which varied in the range from 1.97 to 2.66, with the degree of saprobity at the level of β-mesosaprobity and α-mesosaprobity. The maximum value was recorded on the sampling site No. 307 in the upper part of the reservoir, where α-mesosaprobity was detected in the spring and also the summer sampling. From the long-term of view, similar values on this sampling site occurred only sporadically. In the autumn, a value of saprobic index just above the limit for α-mesosaprobity (2.51) was found also on the sampling site No. 3739 in the Danube old riverbed. The average value of saprobic index were calculated only on those sampling sites, where three samplings were performed (**Table 2-6**) and they ranged from 2.04 to 2.55. The average value at the level of α-mesosaprobity (2.55) was found on the sampling site No. 307 in the upper part of the reservoir. Compared to 2015, the average values on the particular sampling sites were similar or slightly increased, only the increase on the sampling site No. 307 was significant. A slight improvement occurred only at one sampling site (No. 308) where the most significant increase in the average value was found in 2015.

Table 2-6: Values of saprobic index of macrozoobenthos in 2016

No.	Sampling site	IV.	VIII.	X.	Yearly average		Saprobity
					2016	2015	
109	Danube, Bratislava, left	-	-	2.17	**-**	***2.19***	β -mesosaprobity
109	Danube, Bratislava, right	-	-	1.97	**-**	***2.16***	β -mesosaprobity
112	Danube, Medveďov, left	-	-	2.30	**-**	***2.29***	β -mesosaprobity
4016	Danube, bottom weir	2.09	2.09	2.16	**2.11**	***2.09***	β -mesosaprobity
4025	Danube, Dobrohošť	2.14	-	2.04	**-**	***2.13***	β -mesosaprobity
3739	Danube, Sap, left	-	-	2.51	**-**	***2.07***	β -mesosaprobity
3528	Mosoni Danube, Čunovo	1.98	2.12	2.01	**2.04**	***2.00***	β -mesosaprobity
3376	river branch system	2.03	2.15	2.13	**2.10**	***2.00***	β -mesosaprobity
307	reservoir, Kalinkovo	2.66	2.60	2.39	**2.55**	***2.23***	α -mesosaprobity
308	reservoir, Kalinkovo, left	2.14	2.03	2.24	**2.14**	***2.20***	β -mesosaprobity
309	reservoir, Šamorín, right	2.29	2.18	2.42	**2.30**	***2.11***	β -mesosaprobity
311	reservoir, Šamorín, left	2.46	2.45	2.37	**2.43**	***2.38***	β -mesosaprobity

Note: left - left bank; right - right bank

Other aspects of the development of macrozoobenthos communities are evaluated in Part 7 – Biological monitoring, where more detailed evaluation for cladocerans (*Cladocera*), copepods (*Copepoda*), molluscs (*Mollusca*), dragonflies (*Odonata*), mayflies (*Ephemeroptera*) and caddisflies (*Trichoptera*) can be found.

Phytobenthos

Phytobenthos represents communities of algae and heterotrophic microorganisms attached to submerged substrates in all aquatic ecosystems. Indicates short-term changes in the water quality. The saprobic index of phytobenthos correlates with the through-flowing water quality, especially with organic pollution. The saprobic index of phytobenthos in the evaluated year was monitored in the Danube (sampling sites No. 109 at Bratislava, left and right bank, No. 112 at Medveďov), in the Mosoni Danube at Čunovo (No. 3529) and in the river branch system at Dobrohošť (No. 3376). At the monitored localities mainly the algal component of phytobenthos, especially the benthic diatoms, were observed. The sampling in the year 2016 was carried out in May, August and October. In May and August on the sampling sites in the main stream and in August also at the beginning of the river branch system (No. 3376) it was not possible to take phytobenthos samples, due to high and fluctuating water stages at the time of collection.

The value of the saprobic index of phytobenthos at monitored sampling sites ranged from 1.46 to 2.00. The average value on the sampling site No. 3529 in the Mosoni Danube was lower than in the year 2015 (1.59 vs. 1.81) and also the values of saprobic indexes on the other sampling sites were low (**Table 2-7**) and ranged on the level of β-mesosaprobity.

In terms of species diversity, the dominant part of phytobenthos in the evaluated year was formed by pennate and centric diatoms (*Bacillariophyceae - Pennales, Centrales*) - 36 taxa. Other groups were represented by a lower number of taxa. The dominant species at the monitored sites were *Melosira varians*, *Diatoma vulgaris*, *Cymbella compacta*, *Navicula avenacea* from the group of diatoms (*Bacillariophyceae*), *Phormidium autumnale* from blue-green algae (*Cyanophyceae*), *Cladophora glomerata* from the siphonous green algae (*Chlorophyceae - Siphonocladales*), *Bangia atropurpurea* from the red algae (*Rhodophyceae*) and *Ulothrix zonata* and *Oedogonium sp.* from filamentous green algae group (*Chlorophyta - Ulotrichales*).

Table 2-7: Values of saprobic index of phytobenthos in 2016

No.	Sampling site	May	July	September	Yearly average 2016	Yearly average 2015
109	Danube, Bratislava, left	-	-	1.79	**-**	*2.04*
109	Danube, Bratislava, right	-	-	1.73	**-**	*2.02*
112	Danube, Medveďov, left	-	-	2.00	**-**	*1.88*
3528	Mosoni Danube, Čunovo	1.66	1.44	1.64	**1.59**	*1.81*
3376	river branch system	1.66	-	1.56	**1.61**	*1.92*

Note: left - left bank; right - right bank

2.9. Quality of sediments

The quality of sediments in the year 2016,was assessed according to the „Canadian Sediment Quality Guideline for Protection of Aquatic Life" (CSQG) published in 1999, revised in 2002. The sediment sampling in the frame of the Joint Monitoring by the Slovak Party was performed in October 2016 at six sampling sites. The Hungarian Party sampled the sediments at seven sampling sites twice: in March and in October. The situation of sampling sites is shown in **Fig. 2-2**. The list of analysed parameters has not changed. In addition to inorganic and organic microelements the Hungarian Party also analysed the contents total phosphorus and total nitrogen.

Pollution of sediments by inorganic micro-pollutants on the Slovak territory has increased slightly in comparison with the previous year. Concentrations of mercury and lead, despite their increase, corresponded on all localities to the natural environment without anthropogenic impact. Contents of chromium and zinc on four sites slightly exceeded the threshold value. The copper, cadmium and arsenic contents in all six samples of sediments were higher than in an uncontaminated environment. Their concentrations were only within the range >TEL and <PEL. The copper fluctuated from 35.8 to 44.8 $mg.kg^{-1}$ (TEL=35,7 $mg.kg^{-1}$, PEL=197,0 $mg.kg^{-1}$) and the highest concentration was recorded on the sampling site No. 311 in the lower part of the reservoir. The cadmium content ranged from 1.15 to 1.33 $mg.kg^{-1}$ (TEL=0,60 $mg.kg^{-1}$, PEL=3,50 $mg.kg^{-1}$) and the highest concentration was recorded on the sampling site No. 307 in the upper part of the reservoir. The copper and cadmium contents only slightly exceeded the lower limit of the range and were therefore closer to the values without effect (TEL). In the case of arsenic, the situation was different, since all detected concentrations exceeded half of the range and were closer to the PEL (17,0 $mg.kg^{-1}$) than to the TEL (5,9 $mg.kg^{-1}$) values The highest content of 16.8 $mg.kg^{-1}$ was recorded on the sampling site No. 4016 in the Danube old riverbed at Dunakiliti and it was already close to the PEL limit. Concentrations from the range >TEL and <PEL represent the level, when the adverse effects on biological life can be observed occasionally and indicate a potential for the occurrence of eco-toxicological effect and moderate level of contamination.

In sediment samples collected on the Hungarian territory fewer number of heavy metal concentrations occurred above the threshold values. Contents corresponding to the unpolluted environment occurred on all sampling sites at spring sampling in the case of led and chromium, and in the autumn samplings in the case of lead and mercury. In autumn one concentration of chromium slightly exceeded the threshold limit of 37.3 $mg.kg^{-1}$ on the sampling site No. 1141 in the Mosoni Danube at Vének. In the case of copper, three slightly higher concentrations than the threshold limit of 35.7 $mg.kg^{-1}$ were recorded (in the spring and autumn on the sampling site No. 1141 in the Mosoni Danube at Vének and in the autumn also on the sampling site No. 0042 below the weir at Dunakiliti). The mercury concentrations were increased in the spring. Except the right-side seepage canal (the sampling site No. 0042), they varied from 0.37 to 0.45 $mg.kg^{-1}$ and in the range >TEL and <PEL (TEL=0.170 $mg.kg^{-1}$, PEL=0,486 $mg.kg^{-1}$) they were closer to the upper limit. The highest content of 0.45 $mg.kg^{-1}$ was measured in the sediment sample from the sampling site No. 0042 below the weir at Dunakiliti. In the autumn the mercury content dropped to values corresponding an uncontaminated environment. The most exceedances of the threshold limit was recorded in case of zinc and cadmium, in the spring on six locations and in the autumn on five. The highest zinc content of 222 $mg.kg^{-1}$ was found the sampling site No. 1141 in the Mosoni Danube at Vének and it was already closer to the probable effect level PEL (315 $mg.kg^{-1}$) than to the threshold limit TEL (123 $mg.kg^{-1}$). Similarly, also in the case of cadmium the maximum of 3.0 $mg.kg^{-1}$, which was closer to the PEL limit (3.5 $mg.kg^{-1}$) than to the threshold limit TEL (0.6 $mg.kg^{-1}$), was found on the sampling site No. 1141. The arsenic concentrations exceeded the threshold limit (5.9 $mg.kg^{-1}$) in the spring on two sampling sites and in the autumn on four. The maximum of 18.2 $mg.kg^{-1}$, recorded on the sampling site No. 1141 in the Mosoni Danube at Vének, exceeded the limit of pollution characterized by the level of PEL (17.0 $mg.kg^{-1}$). Such values already represent the level, when the adverse effect on biological life associated with the aquatic environment can occur frequently (in more than 50 % of cases).

Organic pollution of sediments on the Slovak territory has decreased in comparison with the previous year, in particular as regards the content of substances from the group of PAHs. The concentrations of observed organic substances were mostly at the level of an uncontaminated environment. Only in the case of two substances from the group of PAHs (phenanthrene and benzo(a)pyrene) values above the threshold limit were recorded. Contents of phenanthrene, corresponding to a mildly contaminated environment, occurred on two locations in the reservoir (No. 307 - 45.4 $mg.kg^{-1}$ and No. 309 - 53.3 $mg.kg^{-1}$) and only slightly exceeded the threshold limit (41.9 $mg.kg^{-1}$). As in the previous year, the benzo(a)pyrene on all six sampling sites exceeded the threshold value for this parameter (31.9 $mg.kg^{-1}$), with the highest concentration of 54.4 $mg.kg^{-1}$ on sampling site No. 307. All measured concentrations of organic pollution of sediments from the range >TEL and <PEL, which corresponds to a slightly contaminated environment, were closer to the lower limit of the given range and thus closer to an uncontaminated environment, than to the level, when the adverse effect on biological life is often expected.

Pollution of sediments with organic matter on the Hungarian territory has increased slightly. The concentrations of eight organic substances on two sampling sites in the river branch system exceeded the threshold limit. In the spring, the concentrations of pyrene, acenaphthylene, phenanthrene, fluoranthene, benzo(a(anthracene, dibenzo(a,h)anthracene, chrysene and benzo(a)pyrene were only slightly exceeded on the sampling site No. 1114 in the Szigeti arm. In the autumn sampling, slight exceedances were found in the case of pyrene, fluoranthene, fluorine, benzo(a(anthracene, dibenzo(a,h)anthracene and benzo(a)pyrene. However, the concentrations acenaphthene (68.6 $mg.kg^{-1}$) and phenanthrene (294.0 $mg.kg^{-1}$) were, in the range >TEL and <PEL, already closer to the upper limit of PEL (88.9 $mg.kg^{-1}$ for acenaphthene and 54.4 $mg.kg^{-1}$ for phenanthrene). The autumn exceedances occurred only on the sampling site No. 1112 (Helena weir). The other concentrations of organic substances in the spring and autumn terms corresponded to the natural environment without anthropogenic influences.

The highest concentrations of heavy metals were recorded by the Slovak Party on the sampling site No. 309 in the lower part of the reservoir and the highest concentrations of organic micro-pollution on the sampling site No. 307 in the upper part of the reservoir. On the Hungarian territory the highest inorganic pollution of sediments was found on the sampling site No. 1141 in the Mosoni Danube at Vének, and the highest concentrations of organic substances in the river branch system on the sampling site No. 1114 in the Szigeti river arm in the spring and in the autumn on the sampling site No. 1112 at the Helena weir.

The lowest sediment contamination in 2016 was documented on the sampling site No. 3739 in the Danube old riverbed at Sap on the Slovak territory and on the Hungarian territory in the spring and in the autumn on the sampling site No. 0084 in the right-side seepage canal at Rajka.

The Hungarian Party also analysed the total phosphorus and total nitrogen content in sediments. The total phosphorus content in 2016 varied in the range from 314 to 2640 $mg.kg^{-1}$. The lowest value was recorded in the spring in the right side seepage canal at Rajka (sampling site No. 0084), and the highest in the spring in the Mosoni Danube at Vének (sampling site No. 1141). The concentrations of total nitrogen fluctuated in the range from 147 to 2627 $mg.kg^{-1}$. The lowest concentration was recorded in autumn in the Danube old riverbed on the sampling site No. 0042 below the weir at Dunakiliti, and the maximum was measured in the autumn on the sampling site No. 0084 in the right side seepage canal at Rajka. In comparison with the year 2015, the total phosphorus and the total nitrogen contents fluctuated in wider ranges and reached higher maxima.

Overall it can be stated that organic micro-pollution of sediments in 2016 on the Slovak territory decreased (mainly the content of organic substances from the group of PAHs). On the Hungarian territory it increased in the river branch system, in the spring in the Szigeti arm and in the autumn at Helena weir. The contamination with heavy metals has increased on both, the Slovak and Hungarian territory. Particularly the content of arsenic increased, which was at several locations closer to the probable effect level (PEL), and on the site No. 1141 in the Mosoni Danube at Vének exceeded this value in the autumn (at the same site the PEL level was exceeded in the case of zinc in 2015).

2.10. Indicative assessment of surface water quality parameters according to agreed surface water quality classification limit values

In **Table 2-8** an indicative classification of selected sampling sites and selected surface water quality parameters was done.

The indicative classification was performed using the limit values for five-classes system, according to the trans-boundary water quality classification adopted by the Slovak-Hungarian Trans-boundary Water Commission at its LXV. session, and referred in the „Directive for surface water quality monitoring of the Slovak-Hungarian boundary waters and for extended water quality monitoring on the Danube”.

Certain part of the observed parameters shows seasonal fluctuation, which subsequently affects the classification into the quality classes. In the case that a range is given (e.g. I-II), this means natural seasonal fluctuation of particular parameters or their dependence on climatic conditions. If in the evaluated period one or two values of different quality class occurred (mostly during higher discharges or flood waves), it is expressed by a cross mark in the colour of the respective class. In the case of two values, which fall into various classes, the colour of the cross corresponds to the worst class. The range with asterisks (e.g. I*-II*) represents a situation, when every recorded value was below the detection limit of applied analytical method, but the two Parties have different detection limits.

Table 2-8: Indicative assessment of surface water quality parameters according to agreed surface water quality classification limit values

Parameter	Sites situated on the Danube			Mosoni Danube		Seepage canal	Right-side river branch system
	Bratislava	Rajka	Medveďov	Čunovo/ Rajka	Vének	Čunovo/ Rajka	Helena, Szigeti, and Ásványi river arm
temperature	**I**	**I** +	**I** +	**I** +	**I-II**	**I**	**I** +
pH	**I-II**	**I-II** +	**II**	**I-II**	**I-II** +	**I-II** +	**II** +
conductivity	**I-II**	**I-II**	**I-II**	**I-II**	**II** +	**I-II**	**I-II**
suspended solids	**II-V**	**I-IV**	**I-III**	**I-IV**	**I-III** +	**I** +	**I-II** +
Cl^-	**I**	**I**	**I**	**I**	**I**	**I**	**I**
SO_4^{2-}	**I**	**I**	**I**	**I**	**I**	**I**	**I**
NO_3^-	**II** +	**II** +	**II** +	**II-III** +	**II** +	**I-II**	**II**
NH_4^+	**I**	**I**	**I**	**I**	**I**	**I**	**I**
NO_2^-	**I-II**	**I-II**	**I-II**	**I-II**	**II** +	**I-II**	**I-II**
total nitrogen	**II**	**I-II**	**II** +	**I-II**	**II-III**	**I-II**	**II** +
PO_4^{3-}	**I-II** +	**I-II** +	**I-II** +	**I-II** +	**I-II** +	**I-II** +	**I-II**
total phosphorus	**I-II** +	**I-III**	**I-II** +	**I-II** +	**I-II** +	**I** +	**I-II**
O_2	**I**	**I**	**I**	**I**	**I** +	**I** +	**I** +
COD_{Mn}	**I**	**I**	**I**	**I**	**I-II**	**I**	**I**
BOD_5	**I** +	**I** +	**I-III**	**I** +	**I-III**	**I-II**	**I-II** +
chlorophyll-a	**I** +	**I** +	**I** +	**I** +	**I** +	**I** +	**I** +
Fe	-	**I-IV** +	**I-III** +	**I-III** +	**I-II** +	**I** +	**I-IV** +
Mn	-	**I** +	**I** +	**I** +	**I-II** +	**I** +	**I** +
Zn	**IV****	**I*-IV***	**I*** +**-IV***	**I***	**I***	**I***	**I*-II** +
Hg	**I****	**I****	**I***	**I***	**I***	**I***	**I***
As	**II*** +	**II*** +	**II*** +	**II*-III***	**II*- III**	**II*- III****	**II*- III**** +
Cu	**I-II** +	**I-III**	**I- II** +	**I-III**	**I-III** +	**I-II** +	**I-III** +
Cr	**I*- II***	**I*- II***	**I*- II***	**I***	**I***	**I***	**I***
Cd	**I**- II***	**I**- II***	**I**- II***	**II***	**II***	**II***	**II***
Ni	**II***	**II*** +	**II*** +	**II***	**II*- III** +	**II*** +	**II*** +
Pb	**II*** +	**II***	**II***	**II***	**II***	**II***	**II***

Quality classes: **I. class** **II. class** **III. class** **IV. class** **V. class**

* all the data below the detection limit

** most of the data below the detection limit

\+ one or two values of different quality class occurred and the colour represents the worst quality class/the highest value

Based on a comparison of water quality entering the affected area (sampling site at Bratislava) and water quality, which leaves the affected area (sampling site at Medveďov) it is evident, that the water quality that leaves the system is very similar.

2.11. Conclusions

Compared to the previous years, the surface water quality at sampling sites monitored in the frame of Joint monitoring has not changed significantly in 2016 and in long-term is balanced. The increase or decrease of the concentrations of individual parameters during the observed period appears already in Bratislava on the sampling site No. 109, which is located upstream of the Gabčíkovo Waterworks, and monitors the surface water quality entering the Slovak territory. Some monitored parameters of surface water quality in the Danube, in the reservoir and in the river branch system show seasonal variations, some parameters depend mainly on the flow rate, others are affected by biochemical processes in the surface water. The fluctuation of quality parameters in the Mosoni Danube and in the seepage canals reflects the different characteristics of these water bodies. The water quality in the Mosoni Danube is influenced by the Danube water and on the sampling site at Vének by its tributaries and wastewater from Győr. The water in the seepage canals is influenced mainly by the leaking groundwater. Typical for this water are fairly balanced time series data of quality indicators, which fluctuate only in narrow ranges.

From among the basic physical and chemical surface water quality parameters, the water temperature on the monitored sampling sites in the assessed year was lower than in 2015, due to frequent short-term discharge waves and frequent fluctuations in water and air temperature. It slightly increased only on the common sampling site in the right-side seepage canal. The values of the specific electric conductivity slightly increased in the right-side river branch system and on the right-bank of the Danube old riverbed, while on the other sites lower conductivity values were recorded. Compared to 2015, the pH values were higher. Exceptions were the sampling sites in the right-side river branch system and on the right-bank of the Danube old riverbed, where the pH fluctuated at narrower ranges and achieved lower values than in the previous year. The contents of suspended solids, iron and manganese were affected by the actual hydrological regime. The year 2016 was more water bearing in terms of flow rates, than the previous year, with several discharge waves. The achieved maxima of suspended solids were higher than in 2015 at most of sampling sites. In the case of iron and manganese, significant maxima occurred in several locations. Overall, the iron and manganese content was also higher and only in the lower part of the reservoir and in the seepage canals it remained unchanged.

The development of cations and anions concentrations at particular sampling sites was similar. Higher content of salts is characteristic for the sampling site in the Mosoni Danube at Vének, because of its tributaries and cleaned wastewater from Győr. The average values of sodium, potassium, chlorides and sulphates at Vének exceeded the average values recorded at other sampling sites. The most stable ionic composition is characteristic for seepage water. Compared to 2015, a slight decrease of cations and anions was recorded mostly in the assessed year, on some locations their content remained similar. A slight increase of sodium, chlorides and bicarbonates concentrations occurred only in the river branch system.

Some nutrients show seasonal fluctuation. Higher concentrations are characteristic for colder months; decrease of values is recorded in the spring after warming. Seasonal fluctuation is related to the biochemical processes in the water, which are temperature dependent. Contents of phosphates and total phosphorus can increase at higher flow rates. Low values of phosphates are typical for the vegetation period, when intensive growth of algae going on and their contents frequently decrease below the detection limit. In the assessed year, low contents occurred in the spring months, from March to June. In the summer period, the concentrations were relatively high, due to climatic and hydrological conditions, which affected also the poor development of phytoplankton. In general, the nutrient contents in the assessed year were similar or higher than in the previous year. A slight decrease was recorded only in the case of the total phosphorus on the sampling site in the upper part of the reservoir (No. 308) and in the left-side seepage canal, in the case of nitrates in the Danube at Komárno, upstream and downstream of the weir at Dunakiliti and on the sampling site in the lower part of the reservoir (No. 311), and in the case of the total nitrogen on the jointly monitored site and locations observed by the Hungarian Party. At some sampling sites, increased concentrations of nitrates and total nitrogen occurred in May, July and in August, that were likely related to discharge waves and cooling. In the case of phosphates and the total phosphorus, significant maxima were recorded by the Slovak Party at the beginning of September on the sampling site in the Danube at Bratislava and on the common sampling sites, which were not confirmed by the Hungarian Party. The most polluted water in terms of concentration of nutrients appears to be the surface water in the Mosoni Danube at Vének, where higher concentrations of nutrients occur more frequently during the year and disrupt the seasonal fluctuation. Compared with the year 2015, concentrations of nutrients at this sampling site were higher. Compared to other monitored sites, the largest difference was observed for ammonium ions and the total phosphorus. Their concentrations on the sampling site at Vének are significantly higher than on other locations. The lowest and the most balanced nutrient values can be found in the seepage water, what results from its groundwater origin. The seasonality here is not as strong as elsewhere. Along with other suitable conditions, the nutrient content in the Danube water is potentially sufficient for the development of eutrophication processes.

Oxygen conditions in 2016 can be classified as good. The dissolved oxygen content on the monitored sites mostly varied at similar ranges as in 2015. A slight deterioration was recorded only on three sampling sites (in the Mosoni Danube at Vének, in the Ásványi arm and on the sampling site No. 308), where lower minima were recorded. A slight improvement occurred in the right-side seepage canal. Due to the amount of discharge waves in the assessed year, the COD_{Mn} values were more volatile than in the previous year and higher maxima were reached on several observed locations. In the case of BOD_5 indicator, on the common sampling sites significant differences in values measured by the Slovak and the Hungarian Parties were again registered. The values obtained by the Hungarian Party were higher. Pollution in the left-side seepage canal, expressed by BOD_5 slightly increased in comparison with the year 2015, and the narrowest range in the assessed year was found in the left-side river branch system. The organic pollution in the right-side seepage canal expressed by COD_{Mn} was low, however in the case of BOD_5 several high values occurred, which were recorded by the Hungarian Party. The dissolved oxygen content, however, slightly improved. The oxygen conditions on sampling site in the Mosoni Danube at Vének were good in the evaluated year, although the COD_{Mn} values were among the highest, but the organic pollution expressed by BOD_{Mn} was lower than in the on the right bank of the Danube old riverbed.

Concentrations of heavy metals, which were determined from the filtered samples, were low during the evaluated year. Only one sampling site (in the right-side river branch system at the Helena weir) higher concentration of copper and nickel occurred and two concentrations of zinc were recorded on two sampling sites (the Helena weir and the Danube at Bratislava). A large part of the measured values was below the detection limits of applied analytical methods. Low concentrations were characteristic mainly for chromium, lead, mercury, cadmium and arsenic. The highest frequency of concentrations above the detection limit was characteristic for copper. Compared with the previous year, the concentrations of monitored heavy metals were similar, only in the case of lead, nickel, zinc and copper higher concentrations occasionally occurred. Based on the comparison of heavy metal concentrations with the limits pursuant to the Directive of the European Parliament and of the Council No. 2008/105/EC on environmental quality standards, and limits according to the national standards (Hungarian standard MSZ No. 12749 and the Government Regulation No. 269/2010 Z.z., as amended) it can be stated, that in the year 2016 concentrations of heavy metals were in compliance with environmental quality standards.

Chlorophyll-a content refers to the amount of phytoplankton and provides information about the eutrophic status of water. Compared to the previous year, higher maxima in the spring period were detected at multiple locations. In contrast to the year 2015, there was no significant increase of contents in the summer period, due to the lack of summer wave of phytoplankton development. Except the spring season, its contents were low until the end of the year.

Based on long-term observations of the water quality entering the affected area and the water quality, which leaves the affected area, it can be stated that the physico-chemical composition of Danube water passing through the Gabčíkovo Waterworks basically does not change. The situation in the quality of individual parameters is similar.

In the frame of monitoring in accordance with the Agreement the macrozoobenthos, phytoplankton and phytobenthos are observed in long-term from among the biological quality elements. Since 2007 the Commission of boundary waters at common sampling sites assesses the biological quality elements within the ecological status of surface water bodies.

Based on the results obtained from the monitoring of biological quality elements (macrozoobenthos, phytobenthos, phytoplankton and macrophytes) on common and Hungarian sampling sites it can be stated that good ecological status (II. quality class) has been achieved at sampling sites in the river branch system and in the Danube at Bratislava. On the other sites (in the Danube at Medveďov, in the Danube old riverbed at Rajka, upstream and downstream of the weir at Dunakiliti and at Dunaremete, in the Mosoni Danube at Čunovo/Rajka and at Vének, and in the right side seepage canal at Čunovo/Rajka) moderate status was achieved (III. quality class).

Regarding the overall ecological status (which takes into account the results of the chemical status and the evaluation results of other elements entering into the assessment of ecological status), the results are identical to the results of overall biological status.

Based on the results obtained from the monitoring of particular biological quality elements it can be stated that according to the phytoplankton high ecological status (I. class) was achieved at nine sampling sites and good ecological status (II. class) on three. According to the phytobenthos high ecological status (I. class) was achieved on two locations, good ecological status (II. class) on eight sites and moderate status (III. class) on two locations. Based on the macrozoobenthos, good ecological status (II. class) was achieved on four sampling sites and moderate ecological status (III. class) on eight.

In the frame of the monitoring of biological quality elements on the Slovak side the macrozoobenthos, phytoplankton and phytobenthos are monitored in long-term and within the evaluation of biological status of water quality the saprobic indexes of biosestone, macrozoobenthos and phytobenthos are determined.

In macrozoobenthos in the sections with fast flowing water with gravely or rocky bottom rheophillic and oxybiontic species prevail, indicating β-mesosaprobity. In sections with slow flowing water stagnophillic and oligooxybiontic species appear, which withstand slight pollution. In these sections the bottom is sandy or muddy. In 2016, the average values of saprobic index of macrozoobenthos were at level of β-mesosaprobity, except one site. On the sampling sites No. 307 in the reservoir α-mesosaprobity was detected in the spring and also in the summer sampling and also the average value of the saprobic indexes of macrozoobenthos was at the level of α-mesosaprobity (2.55), what represents a water with higher pollution. Compared with the previous year, the average values at particular locations were similar or slightly increased and only on the sampling site No. 307 was the increase more significant. Improvement was documented only on the sampling site No. 308 in the upper part of the reservoir.

The development of phytoplankton was weaker in comparison with the year 2015, especially in the summer period. The limit for mass development was not exceeded in any case, in 2015 it was three times. Phytoplankton consisted mainly of small centric diatoms, in the seepage canals of pennate diatoms. The highest abundance at 9094 cells.ml^{-1} was recorded on the sampling site No. 311 in the lower part of the reservoir at Šamorín. At this sampling site also the highest value of the annual average phytoplankton abundance (1457 cells.ml^{-1}) was documented. The average abundance of phytoplankton in the left-side seepage canal slightly increased and in the right-side canal it was similar. On the other sampling sites the average values significantly decreased, and all ranged well below the limit for mass development of phytoplankton. The saprobic index of biosestone on observed monitoring sites in the long-term fluctuates in the range, which corresponds to the β-mesosaprobity. Such an environment provides appropriate living conditions for a wide range of organisms with high species diversity and represents a natural load of organic matter in the river. The average values of saprobic index on most observed sampling sites were similar as in the year 2015. Slight improvement occurred at three locations (No. 3739, 307, 3531) and a significant improvement on the sampling site in the Mosoni Danube at Čunovo (No. 3529). The level of saprobity has not changed. Concerning the abundance of phytoplankton, as a key determinant of saprobic index, it can be stated that the hydropower system neither in 2016 had negative impact on the level of saprobity.

In terms of species diversity, the dominant part of phytobenthos in the evaluated year was formed by pennate and centric diatoms. The average values of the saprobic indexes of phytobenthos in the Mosoni Danube at Čunovo was lower than in 2015 and also the values of saprobic indexes on the other sampling sites were low and ranged on the level of β-mesosaprobity.

The sediment quality in 2016 for the purposes of the Agreement was assessed according to the Canadian standard „Canadian Sediment Quality Guidelines for the Protection of Aquatic Life". Overall, the organic micro-pollution of sediments in 2016 on the Slovak territory was lower (mainly the content of organic substances from the group of PAHs decreased). On the Hungarian territory it increased in the river branch system (in the spring in the Szigeti arm and in the autumn at Helena weir). The contamination with heavy metals has increased on both, the Slovak and Hungarian territory. Particularly the content of arsenic increased, which was at several locations closer to the probable effect level (PEL), and on the site No. 1141 in the Mosoni Danube at Vének exceeded this limit in autumn (at the same site the PEL level was exceeded in the case of zinc in 2015).

The highest concentrations of organic micro-pollution were recorded by the Slovak Party on the sampling site No. 307 in the upper part of the reservoir, and the highest concentrations of heavy metals on the sampling site No. 309 in the lower part of the reservoir. On the Hungarian territory the highest inorganic pollution of sediments was found in the spring on the sampling site No. 1141 in the Mosoni Danube at Vének, and the highest concentrations of organic substances were detected in the river branch system on the sampling site No. 1114 in the Szigeti river arm in the spring and in the autumn on the sampling site No. 1112 at the Helena weir. The lowest sediment contamination in 2016 was documented on the sampling site No. 3739 in the Danube old riverbed at Sap on the Slovak territory, on the Hungarian territory it was on the sampling site No. 0084 in the right-side seepage canal at Rajka in the spring and also in the autumn.

Fig. 2-1

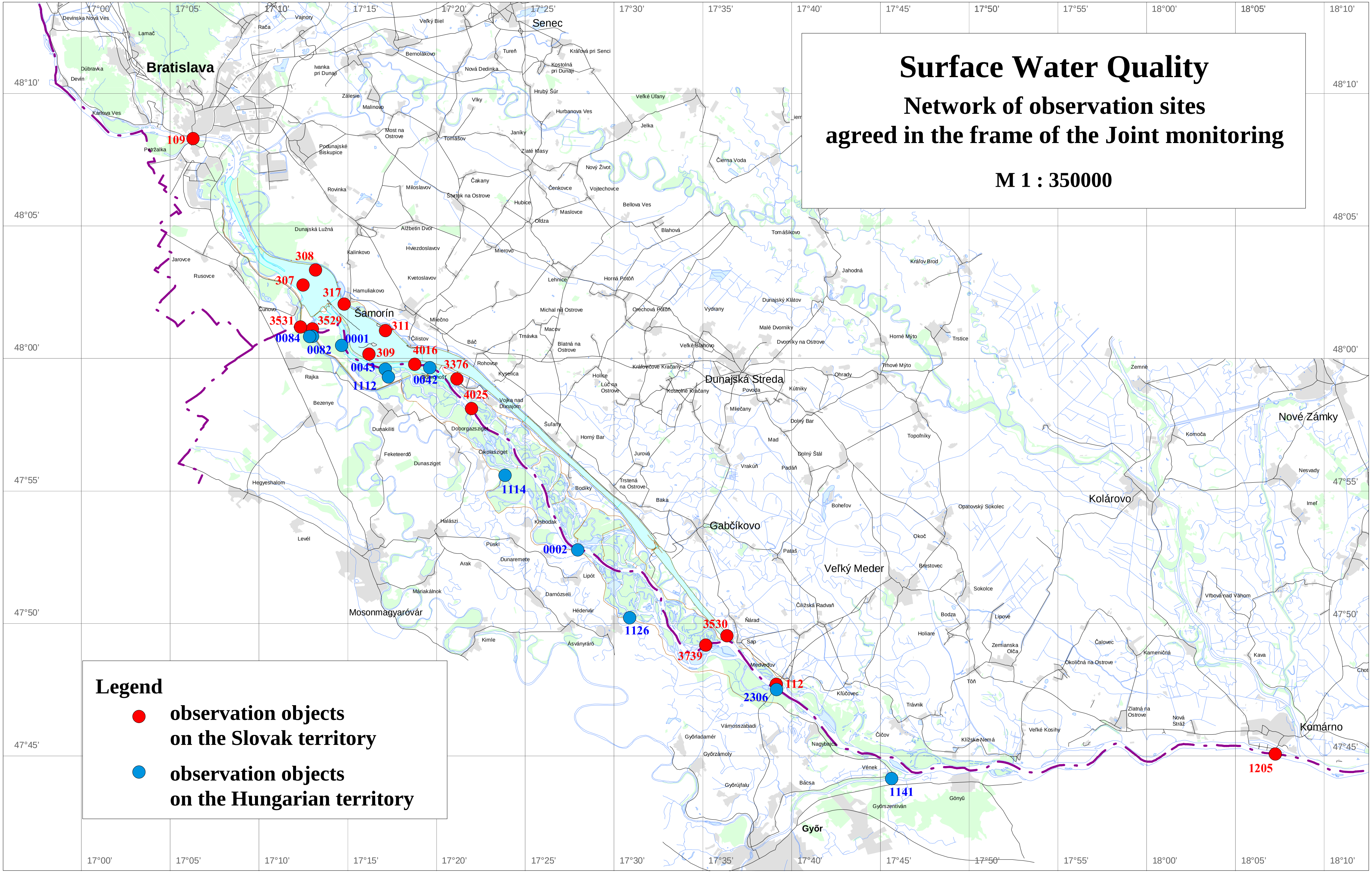
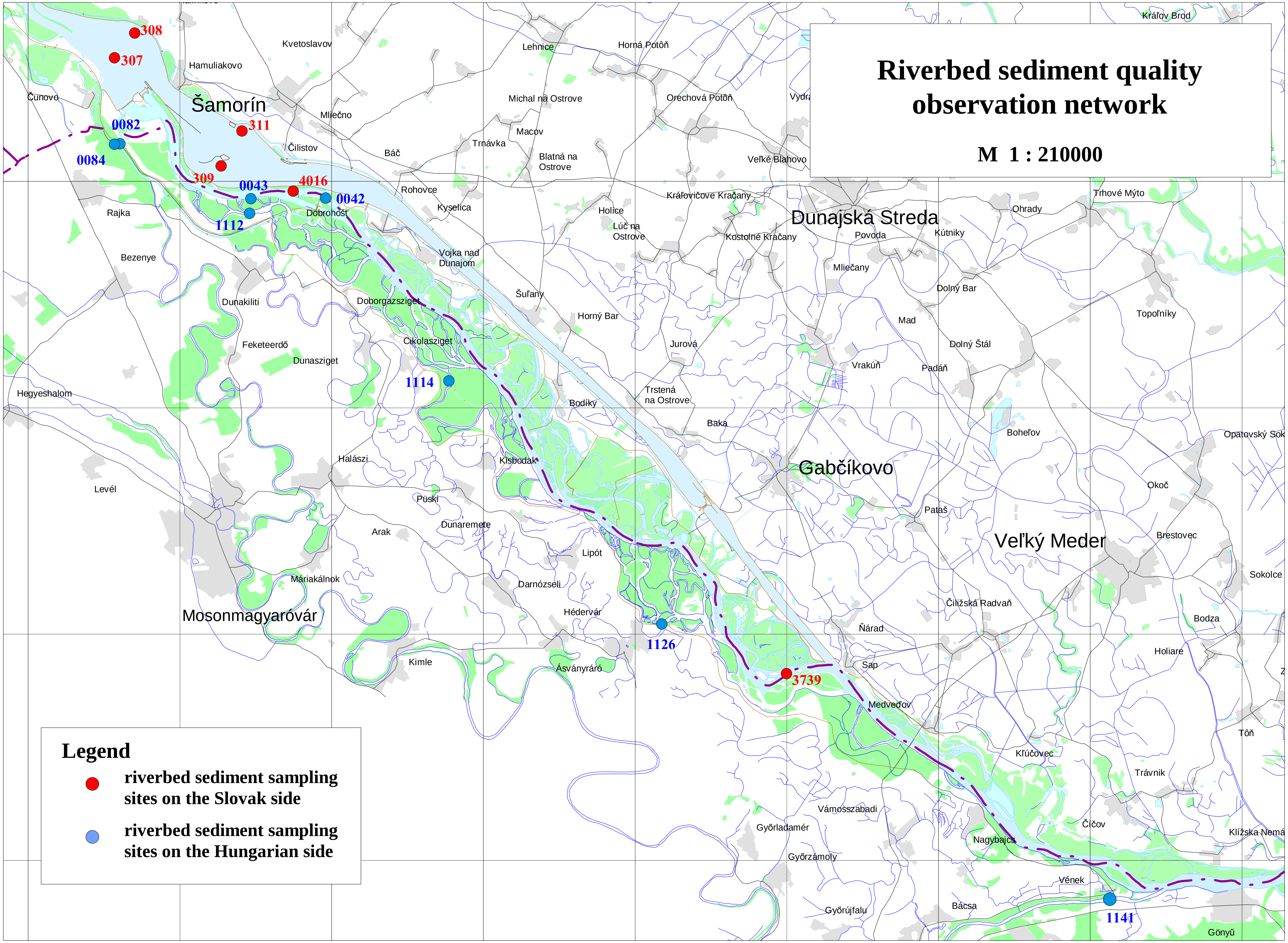

Surface Water Quality
Network of observation sites
agreed in the frame of the Joint monitoring
M 1 : 350000
Legend
observation objects on the Slovak territory
observation objects on the Hungarian territory
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
109
308
307
317
3531
3529
311
309
4016
3376
4025
3530
3739
112
1205
0084
0082
0001
0043
1112
0042
1114
0002
1126
2306
1141

Fig. 2-2



Riverbed sediment quality observation network
M 1 : 210000
Legend
riverbed sediment sampling sites on the Slovak side
riverbed sediment sampling sites on the Hungarian side
308
307
311
309
4016
3739
0082
0084
0043
1112
0042
1114
1126
1141
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Mosonmagyaróvár
Čunovo
Hamuliakovo
Kvetoslavov
Mliečno
Čilistov
Báč
Rohovce
Kyselica
Dobrohošť
Rajka
Bezenye
Dunakiliti
Feketeerdő
Dunasziget
Hegyeshalom
Levél
Vojka nad Dunajom
Dobrogazsziget
Cikolasziget
Šuľany
Horný Bar
Bodíky
Kisbodak
Halászi
Püski
Dunaremete
Arak
Máriakálnok
Darnózseli
Lipót
Hédervár
Kimle
Ásványráró
Lehnice
Horná Potôň
Michal na Ostrove
Orechová Potôň
Macov
Trnávka
Blatná na Ostrove
Veľké Blahovo
Kráľovičove Kračany
Holice
Lúč na Ostrove
Kostolné Kračany
Jurová
Trstená na Ostrove
Baka
Povoda
Mliečany
Kútniky
Ohrady
Dolný Bar
Mad
Dolný Štál
Vrakúň
Padáň
Pataš
Boheľov
Čiližská Radvaň
Ňárad
Sap
Medveďov
Kľúčovec
Trávnik
Čičov
Vámosszabadi
Győrladamér
Győrzámoly
Győrújfalu
Nagybajcs
Vének
Bácsa
Gönyű
Topoľníky
Trhové Mýto
Kráľov Brod
Opatovský Sok
Okoč
Brestovec
Sokolce
Bodza
Holiare
Tôň
Klížska Nemá
Vydra

Fig. 2-3

Surface water quality

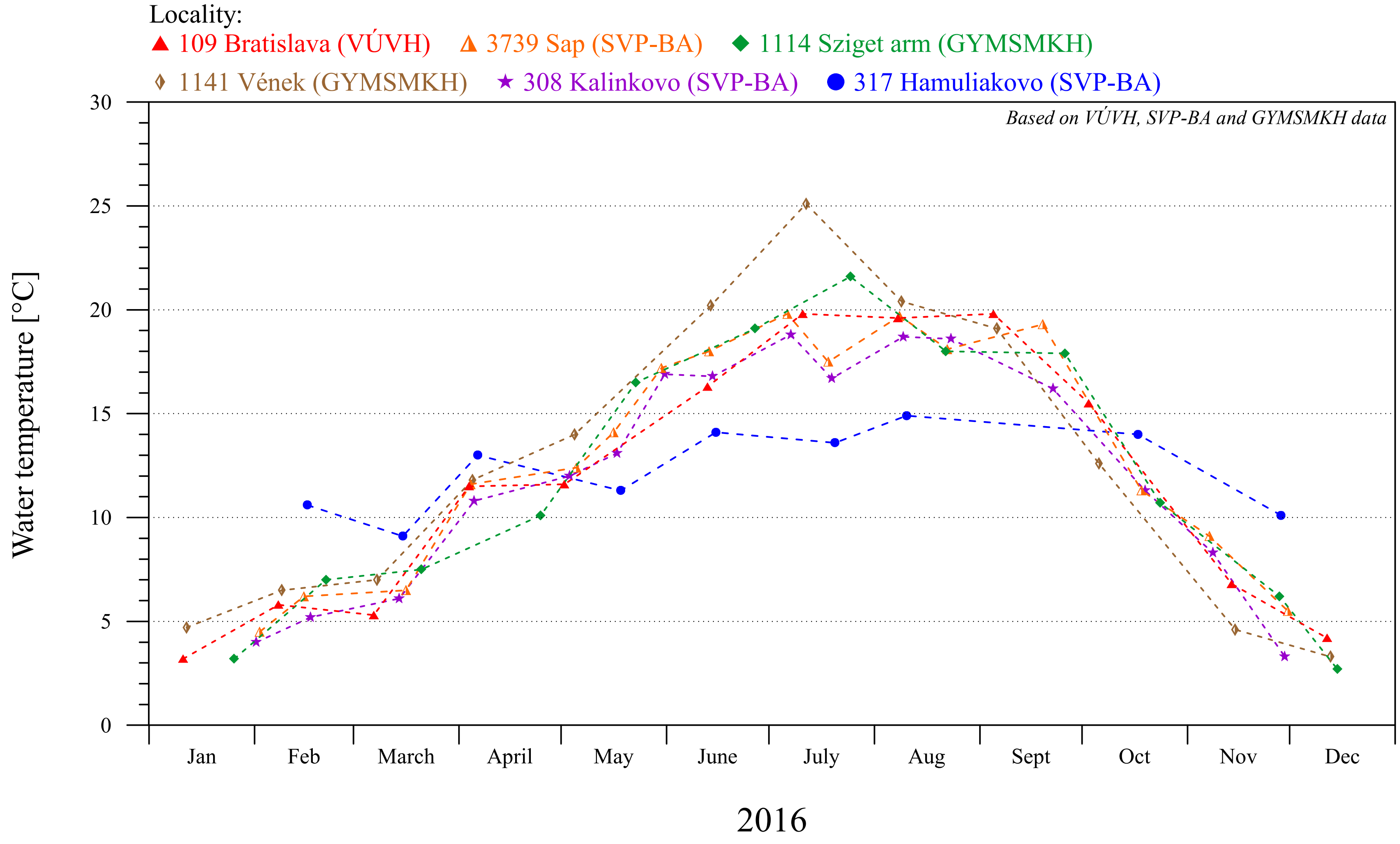


Fig. 2-4

Surface water quality

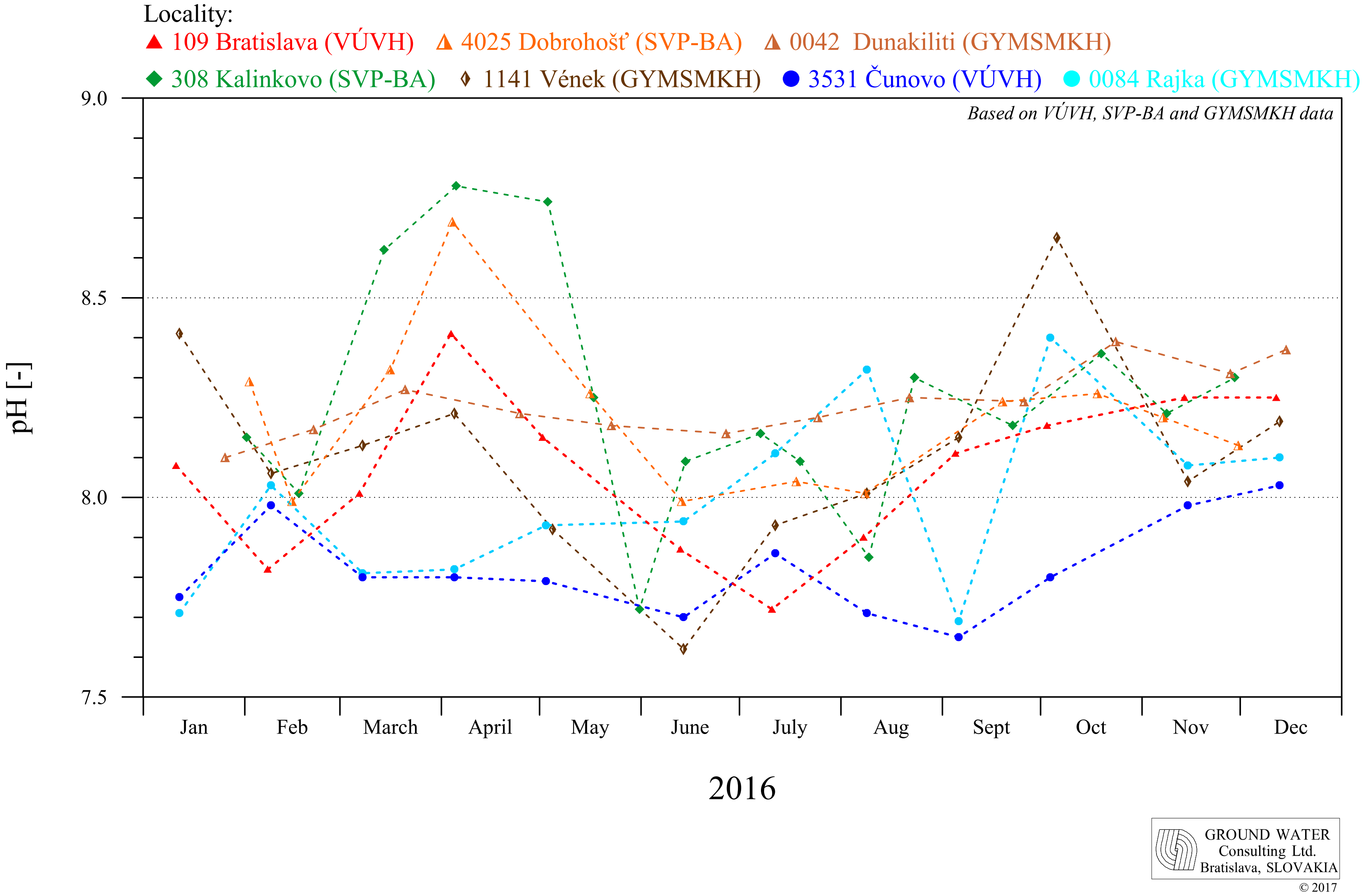


Fig. 2-5

Surface water quality

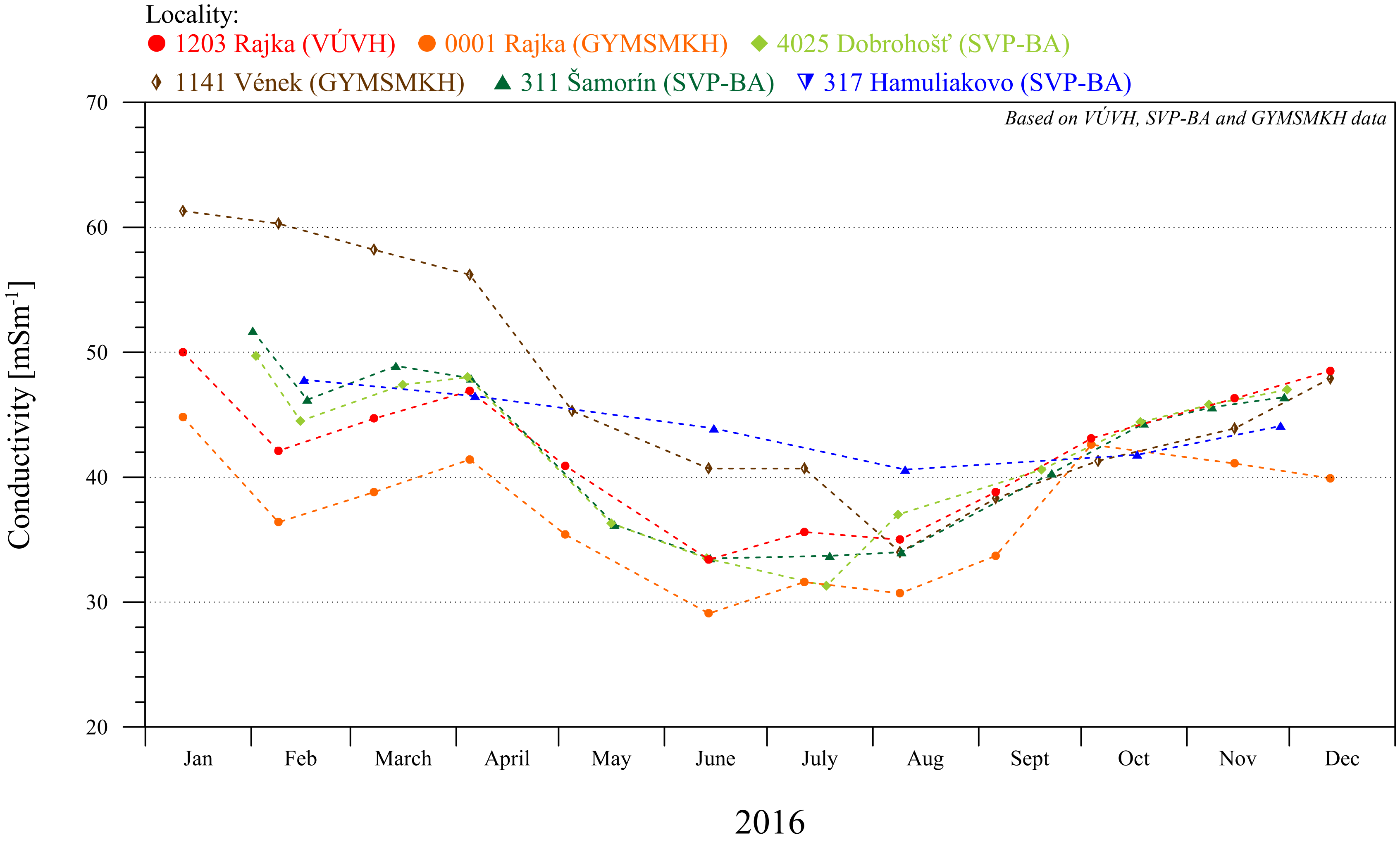


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Fig. 2-6

Surface water quality

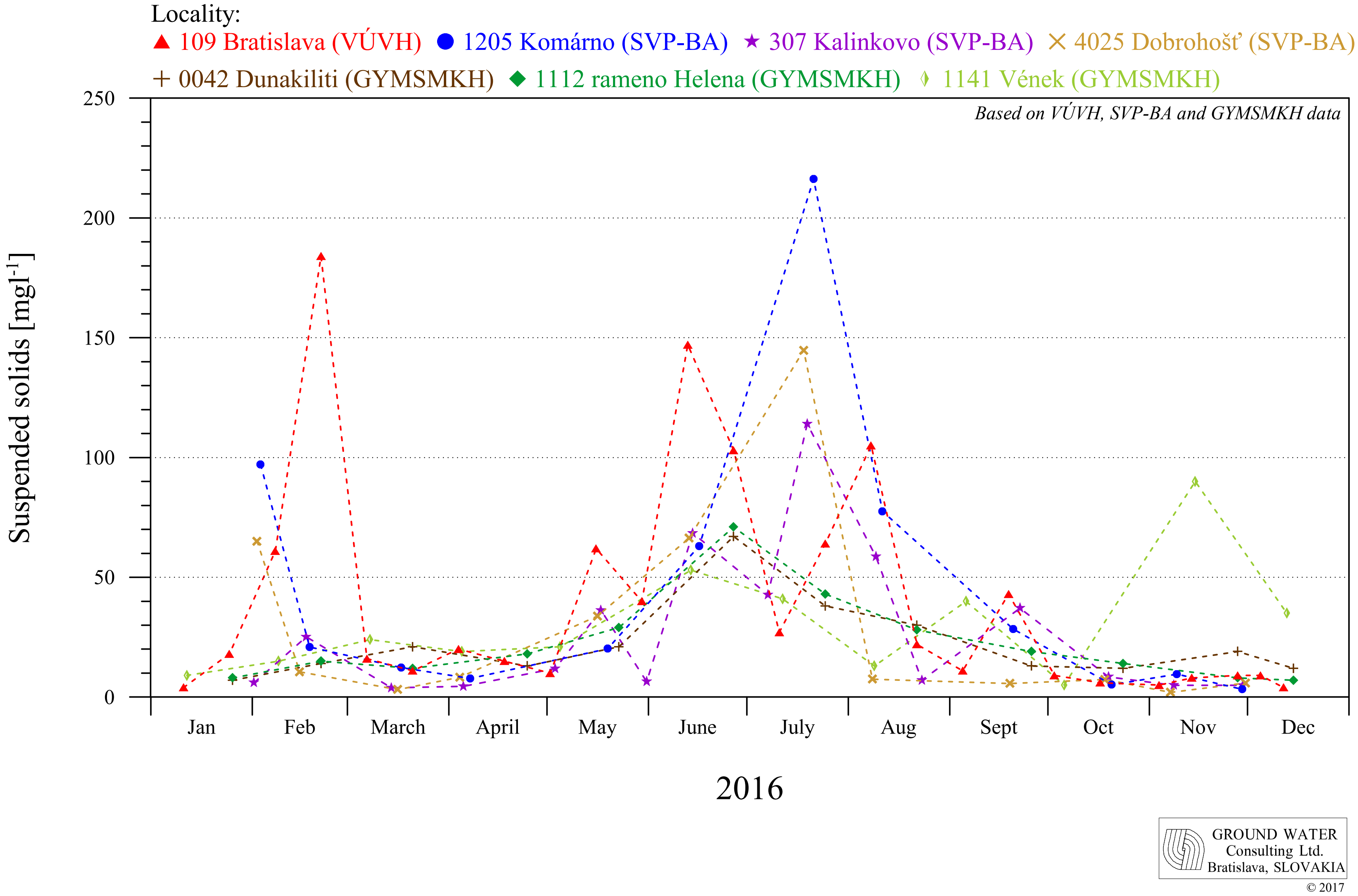

Fig. 2-7

Surface water quality

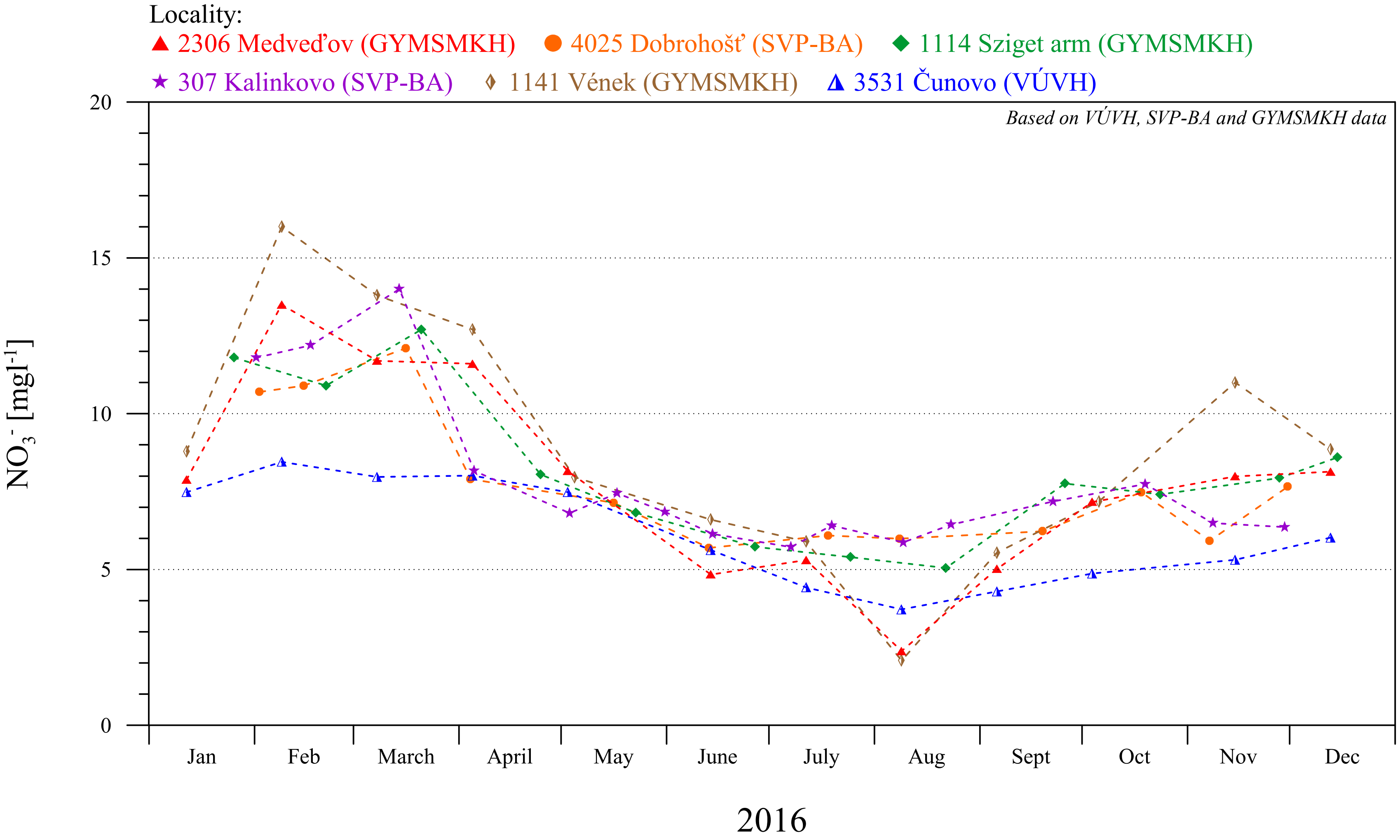

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Fig. 2-8

Surface water quality

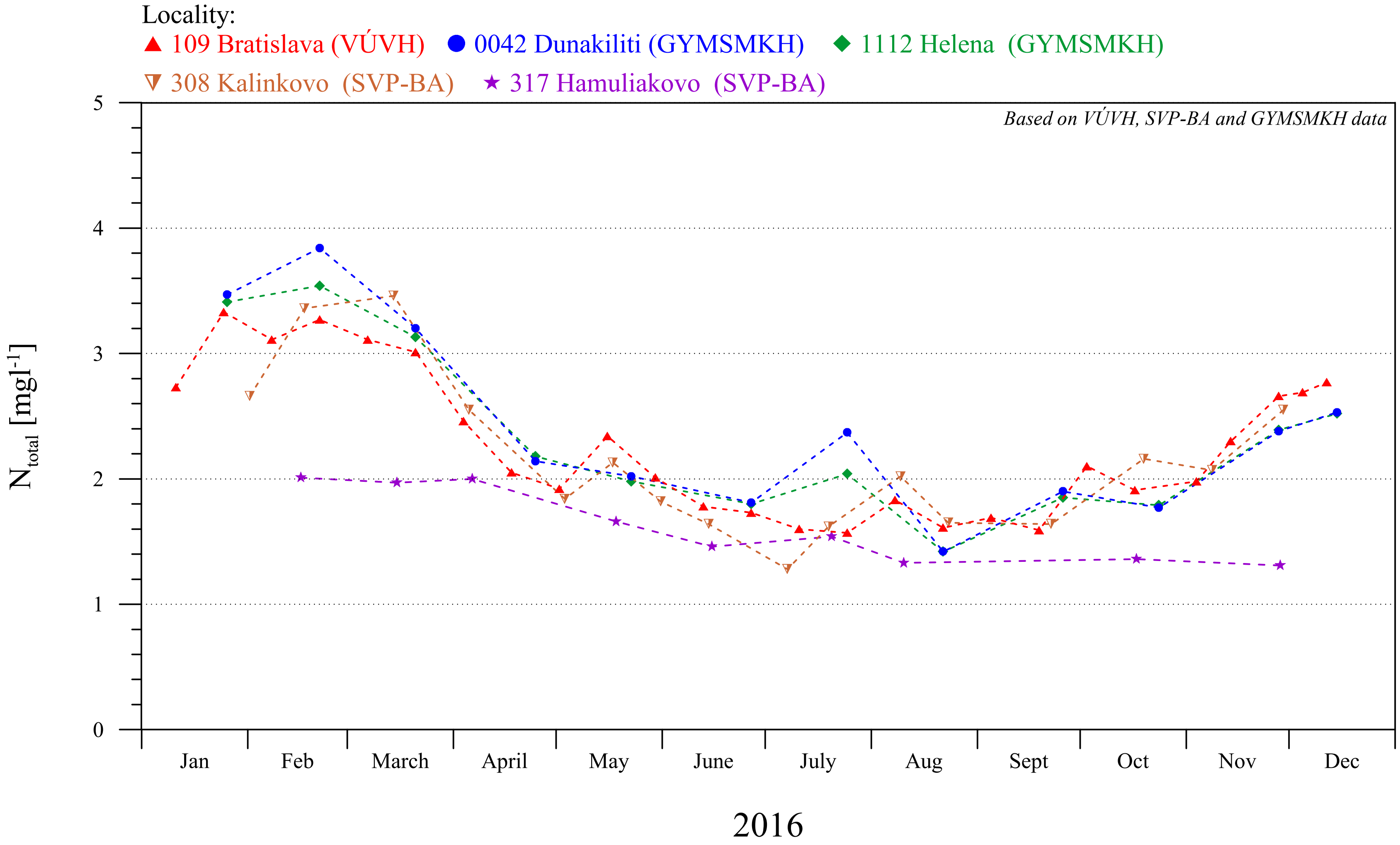

Fig. 2-9

Surface water quality

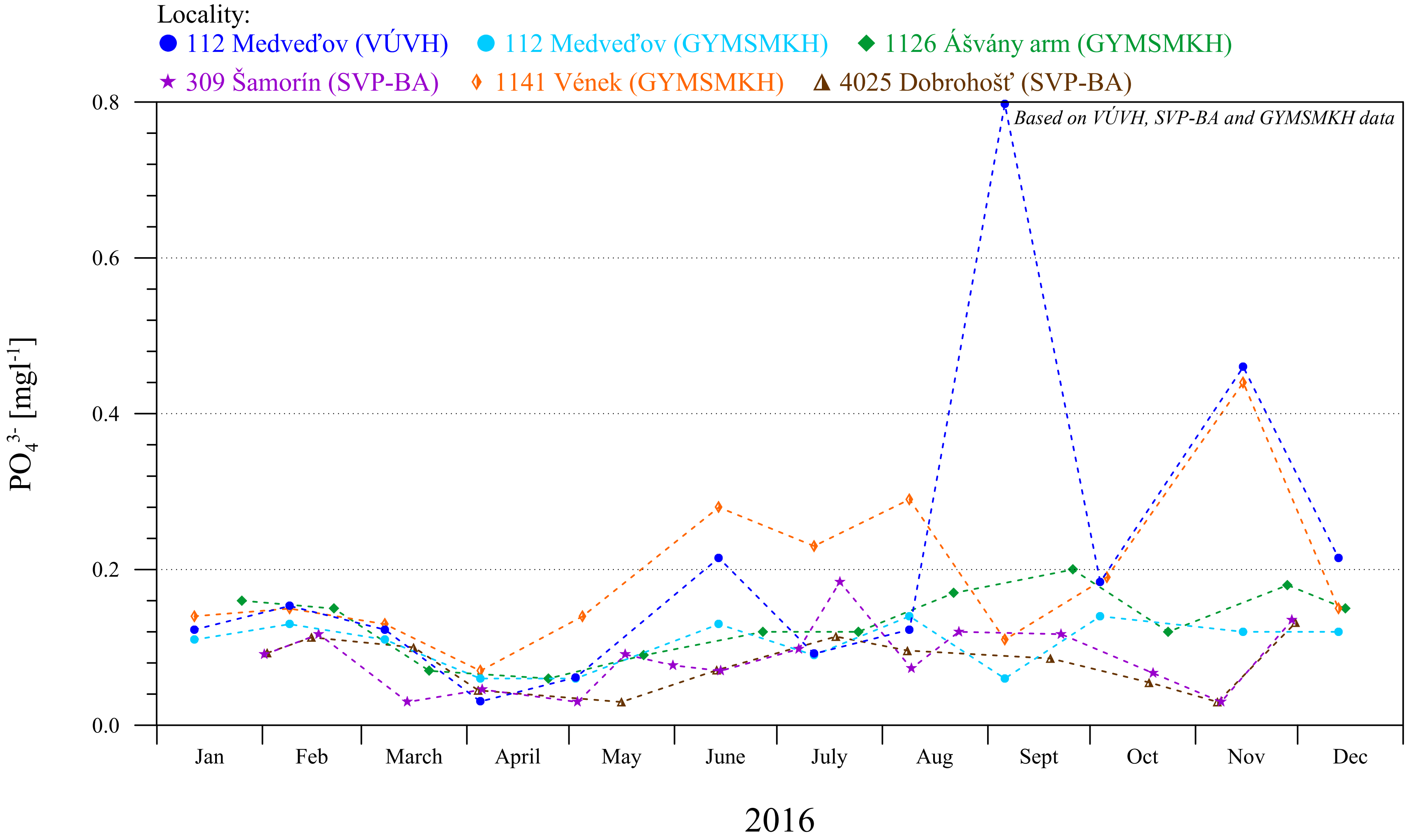

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Fig. 2-10

Surface water quality

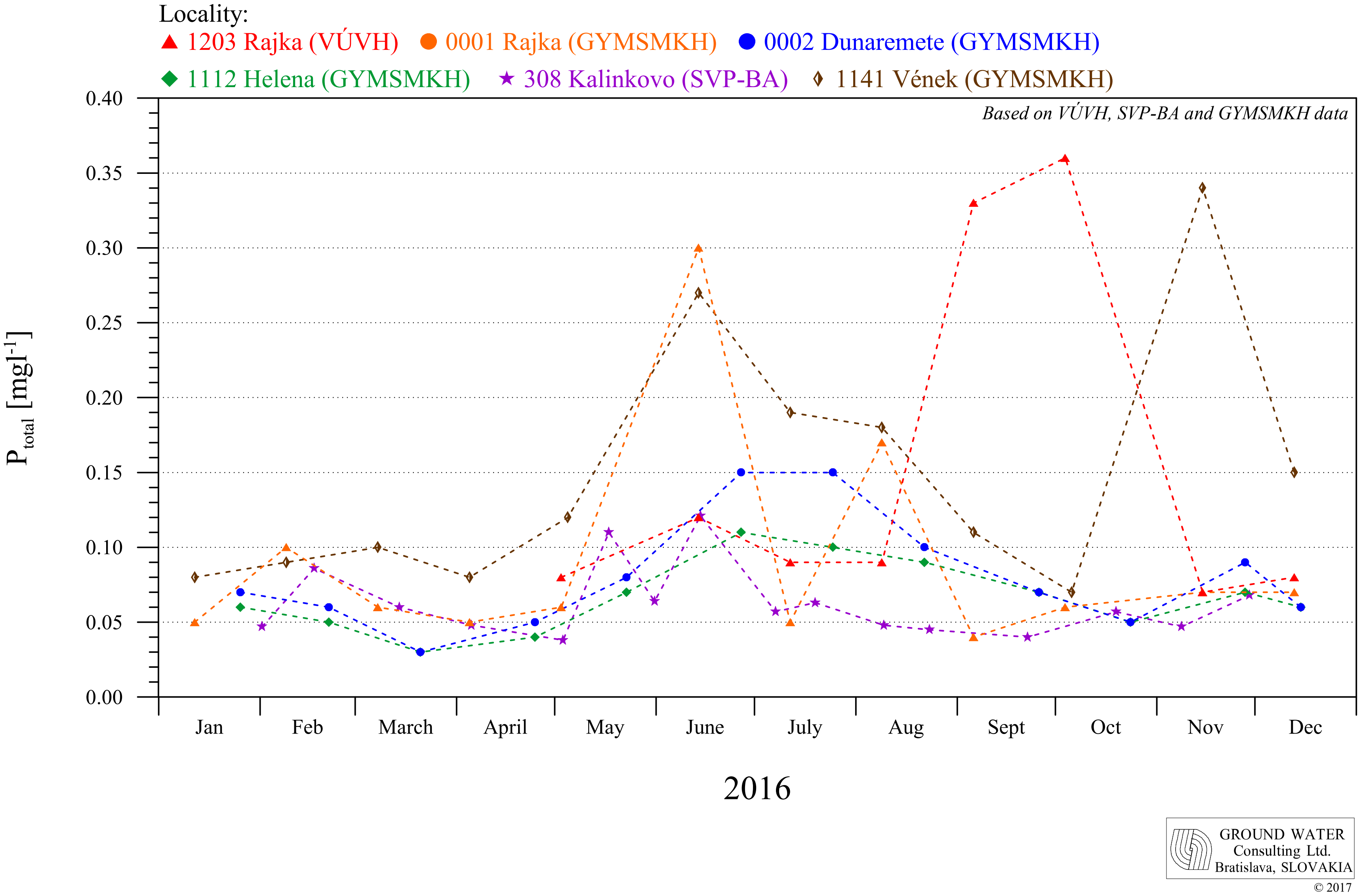

Fig. 2-11

Surface water quality

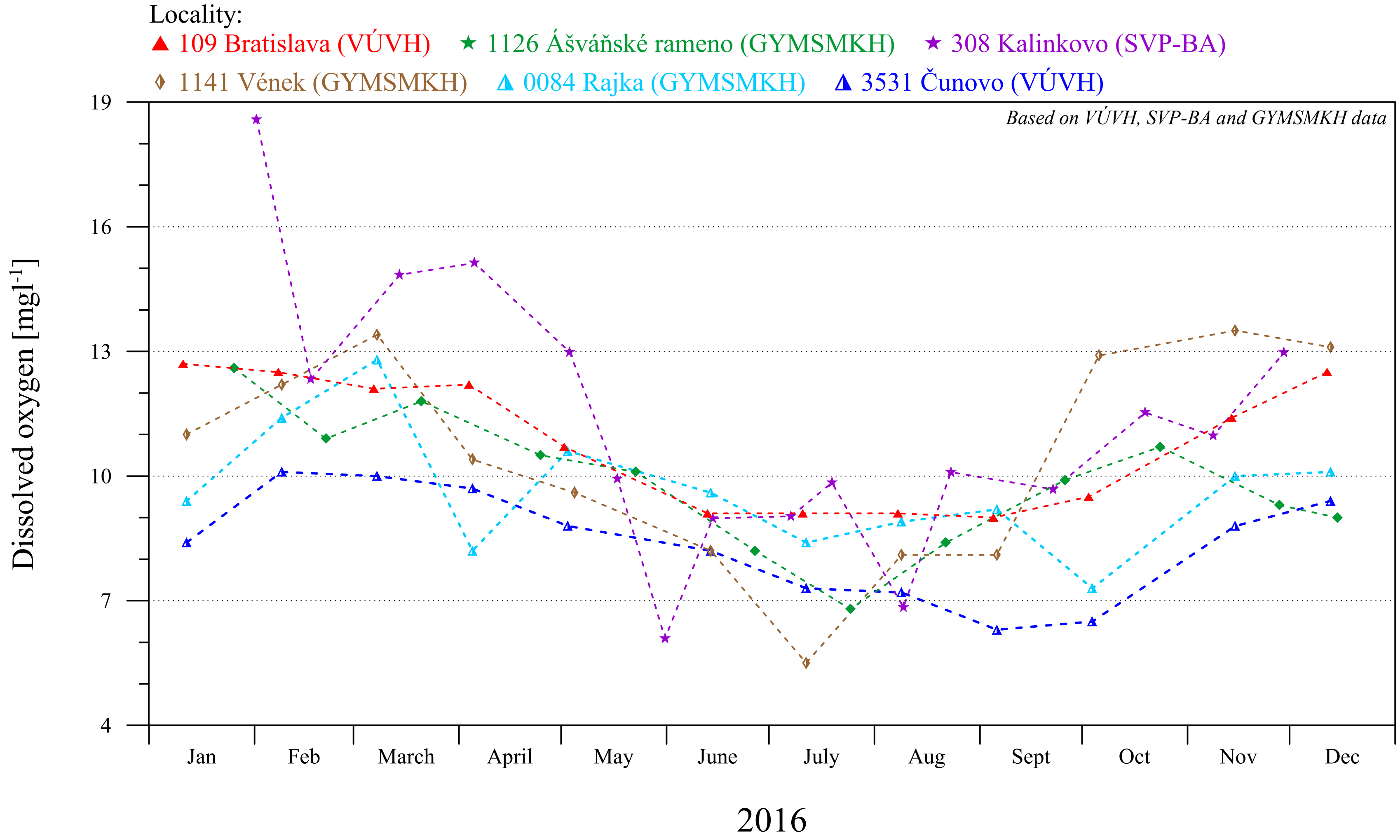

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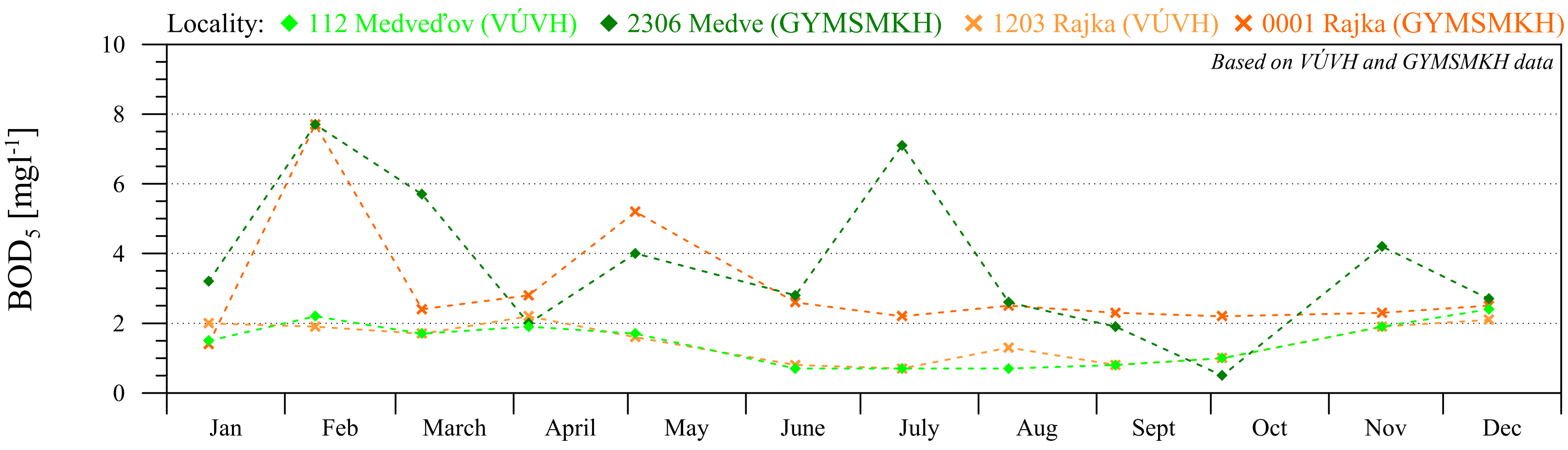
Fig. 2-12

Surface water quality



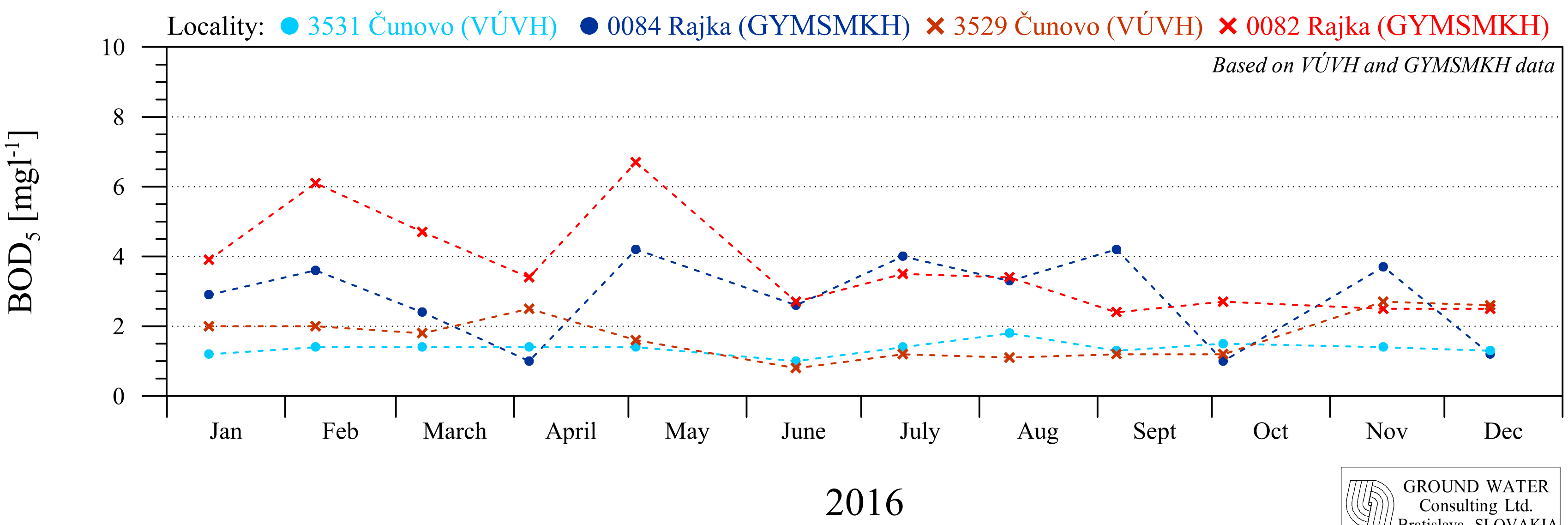


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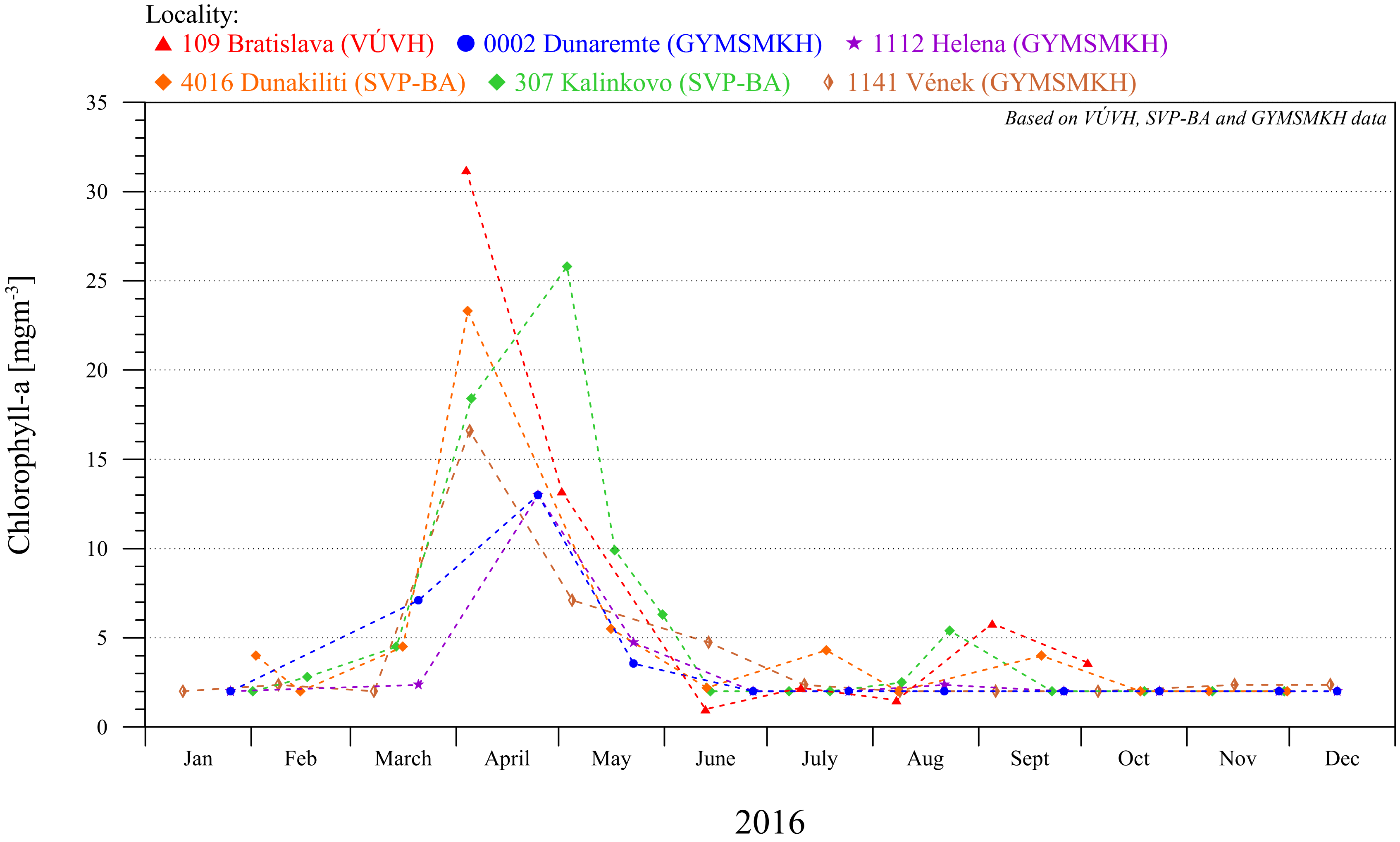
Fig. 2-13

Surface water quality



GROUND WATER Consulting Ltd. Bratislava, SLOVAKIA

PART 3

Groundwater Regime

In the year 2016 the monitoring of groundwater levels on both sides of the Danube continued without changes. The observation network consists of 264 observation wells (136 on the Slovak territory and 128 on the Hungarian territory) that are situated in the area of Žitný ostrov and in the Szigetköz region. During the previous year large number of old observation wells on the Slovak side had been replaced by new ones. The number of observation objects included in the data exchange have not changed, and new objects were mostly located close to the old wells. If the new object was situated farther, or the position of water level changed significantly, the object was given a new number. The list of observation wells is given in the respective National Annual Reports on environmental monitoring. The situation of observation networks on both sides is shown in **Fig. 3-1**. Observation wells that have undergone reconstruction are shown in a different colour.

The groundwater level data were used for evaluation of impacts of applied technical measures and discharges into the Danube and the Mosoni branch of the Danube and impact of water supply on the groundwater regime. The evaluation in a local scale was done by the Parties themselves and is given in their National Annual Reports. In this Joint Report, the regional evaluation was jointly elaborated according to computed groundwater level equipotential lines. The equipotential lines were constructed in order to compare groundwater levels of the influenced area in the current year and in the period before construction of submerged weir and introducing the water supply into the river branches on Hungarian side.

3.1. Joint evaluation of groundwater regime

The groundwater levels in the whole observed area are primarily influenced by surface water levels in the Danube and in the reservoir. Besides this, the groundwater level in the inundation area is strongly influenced by drainage effect of the Danube old riverbed. This adverse effect is being mitigated by the water supply into the river branch system on both sides of the Danube. In contrast to the previous year, the Danube flow rate regime in 2016 was closer to the typical course. Unusual were the two significant discharge waves in February, first of which culminated with a flow rate over 5000 $m^3.s^{-1}$, and low flow rates during the greater part of the spring period (March-April), when the average daily flow rates varied between 1310 and 2335 $m^3.s^{-1}$ and moved mostly below the long-term daily averages. Increased flow rates, typical for late spring and summer months, occurred from the second half of May to the mid of August. During this period several discharge waves occurred, the highest of which in the middle of July exceeded 5600 $m^3.s^{-1}$. Moreover, the average daily flow rate from the end of May to the end of June was almost exclusively above 3000 $m^3.s^{-1}$. From the second half of August up to the end of the year flow rates were mostly below the long-term average values, usually occurring in these months, and except three smaller discharge waves they did not exceeded 2000 $m^3.s^{-1}$.

Groundwater levels in 2016 started from a relatively low position, due to low discharges in the Danube in last three months of the previous year. On a greater part of the Szigetköz area, in the inundation area on the Slovak territory and in the inland area along the derivation channel the lowest groundwater levels in 2016 were recorded. Groundwater levels, especially in the vicinity of the Danube, remained stagnant or even slightly decreased until the end of January, when significant discharge wave occurred on the Danube. However, due to short duration of the discharge wave notable increase of water level appeared only at observation objects situated close to the river. The groundwater level started to increase after discharge waves and above-average precipitations in February, what was reflected in highest groundwater levels in the lower part of the Szigetköz and on the greater part of the inland area of Žitný ostrov, recorded in February and March. In March, April and May groundwater levels decreased and started to increase again after the series of discharge waves in June and especially after the largest discharge wave in July. In the upper and middle part of Szigetköz and in the vicinity of the lower part of the reservoir and along the derivation channel the highest groundwater levels were recorded. However, the highest groundwater levels in the Hungarian inundation were recorded mainly during the artificial flooding of this area, mostly in May. The highest groundwater levels in the Slovak inundation area were related to the higher discharge released into the Danube old riverbed during the technical maintenance of the Gabčíkovo Hydropower Station in September. Due to the gradually decreasing and in general very low flow rates in the second half of the year, the groundwater level on observation objects under the influence of the Danube gradually declined. The lowest groundwater levels on objects in the upper part of the Žitný ostrov, in the area between the Mosoni Danube ant the Lajta river and partially in the upper part of the Szigetköz occurred at the end of the year in December.

To compare changes in groundwater levels in the selected period prior to the introduction of water supply (1993) and in the evaluated year (2016), a calculation of groundwater differences was made for three hydrological situations. The selected hydrologic situations characterise the low, average and high flow rate conditions in the Danube, corresponding to flow rates approximately 1000, 2000 and 3000 m^3s^{-1}.

The selected dates and the corresponding flow rates in the Danube at Bratislava-Devín gauging station are the following (**Table 3-1, Fig. 3-2, Fig. 3-3a, b**):

Table 3-1: Selected dates and the corresponding flow rates in the Danube at Bratislava-Devín gauging station

hydrologic situation	before the water supply 1993		after the water supply 2016	
	date	Q ($m^3.s^{-1}$)	date	Q ($m^3.s^{-1}$)
low flow rate	09.03.1993	975.5	19.12.2016	1006
average flow rate	09.05.1993	1937	09.07.2016	1993
high flow rate	25.07.1993	2993	19.07.2016	2997

The low flow rate period (app. 1000 $m^3.s^{-1}$), comparable with the period chosen in 1993, was selected at the end of the year 2016. Although the flow rate at the beginning of the year achieved the desired size, the hydrological situation that preceded the possible dates was not comparable with the period in 1993. The chosen date in the second half of December can be regarded as corresponding for both, the hydrological and the climatic aspects. The period for average flow rate was chosen in the first half of July. In this case the hydrological situation was similar to that in 1993, but in terms of the climatic situation higher evaporation can be assumed in 2016 than in 1993. In the case of high flow rates similar hydrological situation as in 1993 was after the discharge wave in mid July, when the decreasing flow rate achieved the desired value about 3000 $m^3.s^{-1}$. The climatic situation in this case can be regarded as comparable.

The jointly constructed maps of equipotential lines for the selected dates, using the measured groundwater levels, are given on **Figs. 3-4 to 3-6**. In wells where the water level is measured once a week, the groundwater level for the selected dates was computed by linear interpolation. In all other wells the average daily values were used. Altitudes of groundwater levels are given on maps for each observation object that was used for calculating of equipotential lines. For calculation of equipotential lines the computed surface water level data in the Danube were used as well. These data were computed by calibrated model, using river morphology data and measured water levels data on the given stretch. The other surface water levels were not used for calculating the equipotential lines. The equipotential lines represent general groundwater levels and flow direction, and do not show the local influences of channels or river branch systems.

Differences between groundwater levels for selected hydrologic situations in years 1993 and 2016 are displayed in **Figs. 3-7 to 3-9**.

The evaluation is focused mainly on the area influenced by technical measures and discharges according to the intergovernmental Agreement and by the water supply realised on the Hungarian side. The influenced area in this sense is represented by the inundation and the flood-protected area on the Hungarian side, and partly by the inundation area on the Slovak side.

Low flow rate conditions (**Fig. 3-7**)

The result of groundwater level comparison in the period prior the implementation of the technical measures and discharges according to the Agreement and in the assessed year 2016 (2016 compared to 1993) for low flow rate conditions on the Danube (approximately 1000 $m^3.s^{-1}$) shows a decrease of groundwater level in vicinity of the lower part of reservoir. The decrease in groundwater level on right-side of the Danube can be seen in a part of the originally planned reservoir and in the uppermost part of the Szigetköz and the inundation area up to Dunakiliti. The decrease around the lower part of reservoir is caused by decrease in permeability of the reservoir bottom as compared with the situation just after its filling. Observation results in recent years show that the decline of groundwater levels almost stopped and the area with groundwater level decrease does not change significantly. Groundwater levels on a large part of the Žitný ostrov area remained unchanged. The unchanged groundwater level in upper part of the Szigetköz and the inundation area is the result of implemented water supply according to the Agreement. The water supply into the Mosoni Danube and into the inundation area caused groundwater level increase in a large part of middle Szigetköz region. Increase of groundwater levels can be seen also in the river arm system at Ásványráró thanks to completion of technical measures in the lower part of Hungarian inundation area, which had previously been characterized by decrease. Increase of groundwater levels occurred also in the Bagoméri river arm system, which resulted in groundwater levels similar to levels in 1993. The groundwater levels in the vicinity of the tail-race canal on the Slovak territory, that are affected by riverbed erosion in the tailrace canal and downstream the confluence of tailrace canal and the Danube old riverbed, remain lower than in 1993. The decline in groundwater levels along the river Váh in lower part of Žitný ostrov area is related to lower surface water level in the river Váh in compared period.

The change of groundwater levels in the area influenced by technical measures and discharges according to the Agreement in 2016 ranged between -0.7 and +0.7 m in comparison to groundwater levels in 1993. But decrease of groundwater levels in comparison with the previous year was registered only in the uppermost part of Szigetköz, near the lower part of reservoir. Since completion the water supply system in lower part of the Hungarian river arm system increase of groundwater level can be seen in a part of the river arm system at Ásványráró and the previous decrease in the Bagoméri river arm system has disappeared. Increase of groundwater levels, which has been evoked by the water supply, in the middle part of Slovak and Hungarian inundation area reaches up to +0.7 m and in the lower part of Hungarian inundation area between 0 and +0.7 m. The decrease of groundwater levels around lower part of the reservoir, reflecting the decrease in permeability of the reservoir bottom, reaches -0.2 to -0.7 m, on the left side up to -1.2 m. Decline in groundwater level along the tail-race canal and around its confluence with the Danube old riverbed on right side of the Danube has disappeared and on the Slovak territory achieves maximally -1.0 m.

The groundwater flow direction in upper part of the river up to Dunakiliti shows infiltration from the river and reservoir into the surrounding area. Along the Danube old riverbed from Dunakiliti to the lower part of inundation area (approximately up to Ásványráró) the groundwater flow direction turns towards the Danube old riverbed and the groundwater is drained by the river. Below the Ásványi river arm system the water from the Danube again infiltrates and flows towards the inland area (**Fig. 3-4**).

Average flow rate conditions (**Fig. 3-8**)

In the case of average flow rate conditions in the Danube (approximately 2000 $m^3.s^{-1}$) the comparison of groundwater levels in the period prior to the implementation of the technical measures and in the evaluated year shows an increase of groundwater levels almost on the whole area of Szigetköz. This increase in the uppermost part of Szigetköz is reduced by the groundwater level decrease, caused by decreased permeability of the reservoir bottom, what resulted in no change regarding the groundwater levels on right side of the lower part of the reservoir. This area approximately equals to the area where slight decrease was detected for the condition of low flow rates on the Danube. Decrease of groundwater levels in this area practically disappeared. On left side of the lower part of the reservoir the decline in groundwater levels remained unchanged and achieves up to -1.2 m. This fact proves that the decline of groundwater level in this area has almost stopped in recent years.. Moreover, despite the decrease, the groundwater level reaches higher or similar levels as before damming the Danube. On a large part of upper, middle and lower Žitný ostrov area and on the lowermost part of Szigetköz no change in groundwater levels were observed. The groundwater level decrease in lower part of the Žitný ostrov area near the Little Danube and along the river Váh results from different surface water levels in rivers and in the channel system in compared periods. The positive effect of water supply in the rest of upper Szigetköz, in mid and partially in lower Szigetköz as well is reflected in increase of groundwater level by +0.25 to +0.75 m, at some places in mid and lower part up to +1.25 m. Completion of the water supply system in lower part of Szigetköz resulted in increase of groundwater level on a large part of this area, while the decrease in the Ásványi river arm system has been eliminated. Thanks to the hydrological situation in 2016 even the decrease along the tail-race canal on the Slovak territory has been partially eliminated by the water supply applied in the Ásványi and Bagoméri river arm systems. The groundwater level decrease occurred only in the upper part of the tail-race canal and achieved up to 0.7 m. Higher groundwater levels in the Slovak inundation area, besides the water supply, also reflect the different water supply regime in the river arm system in 1993 and 2016.

The groundwater flow direction along upper part of the Danube up to Dunakiliti shows infiltration from the river and reservoir into the surrounding area. In the inundation area from Dunakiliti up to Dunaremete the groundwater flows into the riverbed and the river is draining the adjacent area. In lower part of the inundation the groundwater flow turns back into the inland area. The groundwater flow direction in the Szigetköz and Žitný ostrov inland areas remained unchanged (**Fig.3-5**).

High flow rate conditions (**Fig. 3-9**)

At the high flow rate conditions in the Danube (approximately 3000 $m^3.s^{-1}$) a significant decrease of groundwater level can be seen around the reservoir and along the Danube old riverbed, including the inundation area on both sides (**Fig. 3-9**). The decline around the reservoir, particularly on its left side and in the upper part of Szigetköz, is caused by decreased permeability of the reservoir bottom. Besides this, the decrease in the vicinity of lower part of the reservoir is enlarged by significantly lower water levels in the Danube old riverbed, as well as its drainage effect. The decrease along the Danube old riverbed results from the difference in flow rates discharged into the Danube old riverbed in 1993 (approximately 760 $m^3.s^{-1}$, and from 1000 to 2300 $m^3.s^{-1}$ for several days before the chosen date) and in 2016 (407 $m^3.s^{-1}$). This difference was reflected in a significantly lower surface and ground water level in 2016. The water level in the Danube old riverbed at Dunaremete gauging station reached 114.39 m a.s.l., while in the year 1993 it was 115.24 m a.s.l.. This is also the reason, why the groundwater level decline in 2016, against the year 1993, appears in the inland area behind the flood protective dikes. Compared to the previous year, the inflow of groundwater from the peripheral parts of the territory below Bratislava and from the Little Carpathian Mountains was also lower than in the previous year, as it can be seen on the lower groundwater levels. This fact was reflected in expanding of the area showing decrease to the entire upper part of Žitný ostrov. The size of the decrease has not changed. Groundwater levels on the right side of the Danube at a greater distance from the reservoir, on the Hungarian territory up to the Lajta river, remained at the high flow rate conditions almost unchanged. The water supply into the Mosoni Danube and into the river branches in the floodplain and in the flood-protected area on Hungarian side at the high flow rate conditions contributes to the elimination of the decrease of groundwater levels caused by the drainage effect of the Danube old riverbed and on the greater part of the upper, middle and also lower part of Szigetköz the groundwater levels are similar as in 1993. Along the Mosoni Danube, approximately from the village of Kimle up to the mouth, the groundwater levels are even slightly higher. Completion of the water supply system in the lower part of the Hungarian floodplain resulted in elimination of the decrease of groundwater levels in a part of the Ásványi and in the entire Bagoméri river arm system. Compared to the period before completion of the water supply system, when the decrease of groundwater level exceeded -0.7 m in the whole area of the Ásványi river arm system, nowadays it gradually fades away and almost half of this area show no change in comparison with the year 1993. The groundwater level decline along the Danube old riverbed in the close vicinity of the reservoir reaches up to -1.25 m, from Dunakiliti towards the lower part of Szigetköz, decreases to -0.25 m and in the Ásványi river arm system gradually disappears. In the central and large part of the lower Žitný ostrov the groundwater level remained unchanged. The slight decline in the area of the mouth of the Little Danube into the river Váh, or the slight increase in a part of the lower Žitný ostrov is related to the local conditions influenced by surface water levels in the rivers and channel system.

The groundwater flow direction in the upper part of the Danube up to Dunakiliti shows water supply from the river and the reservoir into the adjacent area (**Fig. 3-6**). Along the Danube old riverbed from Dunakiliti to Gabčíkovo, the groundwater flow direction in the floodplain indicates the drainage of the groundwater. However, in the inland area on both sides of the Danube and in the lower part of Žitný ostrov the groundwater flow direction documents the refilling of groundwater from the river.

3.2. Conclusions

Based on the evaluation of groundwater regime it can be stated that the water supply into the right-side river branch system and into the Mosoni Danube plays an important role in influencing groundwater levels over the Szigetköz region. The measures implemented under the intergovernmental Agreement, as well as the measures made in the right-side inundation, caused a significant rise in groundwater levels in the upper, middle, and after completion the modifications of the water supply system also in the lower Szigetköz. The most significant increase in groundwater levels can be seen in the middle and lower part of floodplain area, for both, low and average flow rate conditions in the Danube. The groundwater level increase in the upper part of the Szigetköz region and around the reservoir is reduced due to the decrease of permeability of the reservoir bottom. Adverse effect on groundwater levels also have changes in sediment transport regime of the Danube, due to measures taken on the Austrian section of the Danube just upstream of Bratislava in recent years. Observation results in recent years show that the decline of groundwater levels almost stopped and the area with groundwater level decrease does not change significantly. Compared to previous years, the most significant change, in relation to the groundwater level, is the completion of the water supply system in the lower part of the Hungarian inundation area. Since completion the water supply system, in the case of low and average flow rate conditions, a significant increase in ground water levels can be seen in the Ásványi river arm system, which had previously been characterized by decrease. Increase or restoration of groundwater levels to the level of 1993 is also visible in the Bagoméri river arm system, and to a considerable extent this influence is also reflected on the Slovak territory in the Istragov area. The decrease in groundwater levels on the Slovak territory remained along the tail-race canal and below its confluence with the Danube old riverbed. The groundwater level is adversely affected by the erosion of the riverbed in this area. The completion of the water supply system in the lower part of the inundation has been manifested also in the case of high flow rates on the Danube. Before its completion the groundwater level decline over the whole area of Ásványi river arm system exceeded -0.7 m, at present approximately half of this area show no change in comparison with 1993. The groundwater level decline around the reservoir is caused by decreased permeability of the reservoir bottom. In 2016, the area where groundwater levels declined compared to 1993, has expanded to the entire upper part of Žitný ostrov, because in the compared period of the assessed year there was a significantly lower inflow of groundwater from the peripheral parts of the territory. The size of the decrease has not changed. The groundwater level decline along the Danube old riverbed is due to a different flow rate discharged into the Danube in the compared dates. This is also the reason, why the groundwater level decline in 2016 also appears in the inland area behind the flood protective dikes.

Monitoring results in 2016 show that appropriate technical interventions in the river branch system and the application of effective water supply can significantly affect groundwater levels in the floodplain area. The results, on the other side, point to the fact that the water supply in the lower part of the inundation area on the Slovak territory should be resolved, particularly in the case of low and average flow rate conditions. The positive impact of water supply can be further efficiently supported by measures implemented in the Danube old riverbed (increase of water level by bottom weirs), which would ensure the increase of groundwater levels in the strip along the Danube old riverbed on both sides. Such measures may improve the overall situation in the whole inundation area on the Hungarian and Slovak territory.

Fig. 3-1

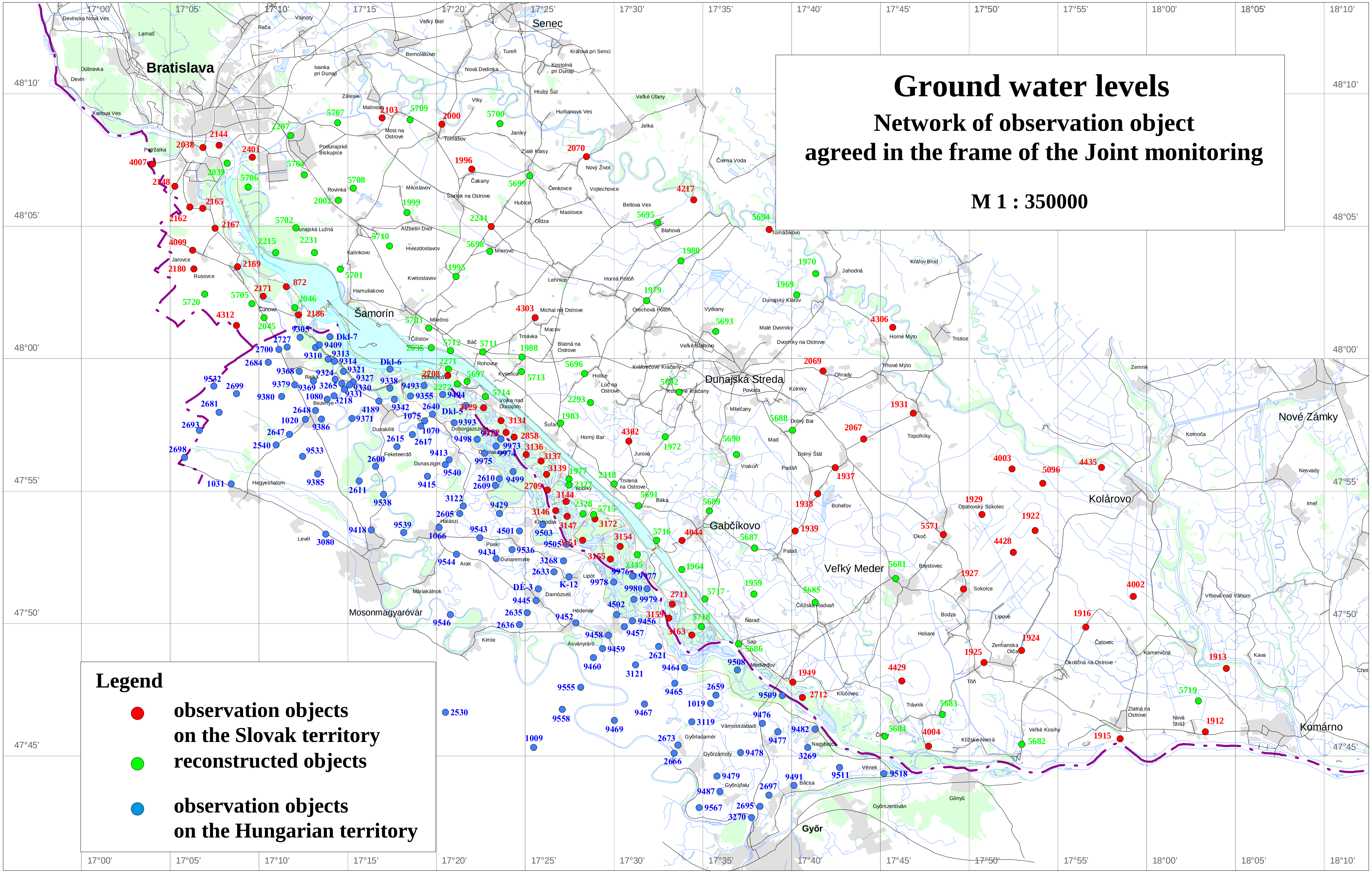

Ground water levels
Network of observation object
agreed in the frame of the Joint monitoring
M 1 : 350000
Legend
observation objects
on the Slovak territory
reconstructed objects
observation objects
on the Hungarian territory
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr

Fig. 3-2

Surface Water Flow Rate

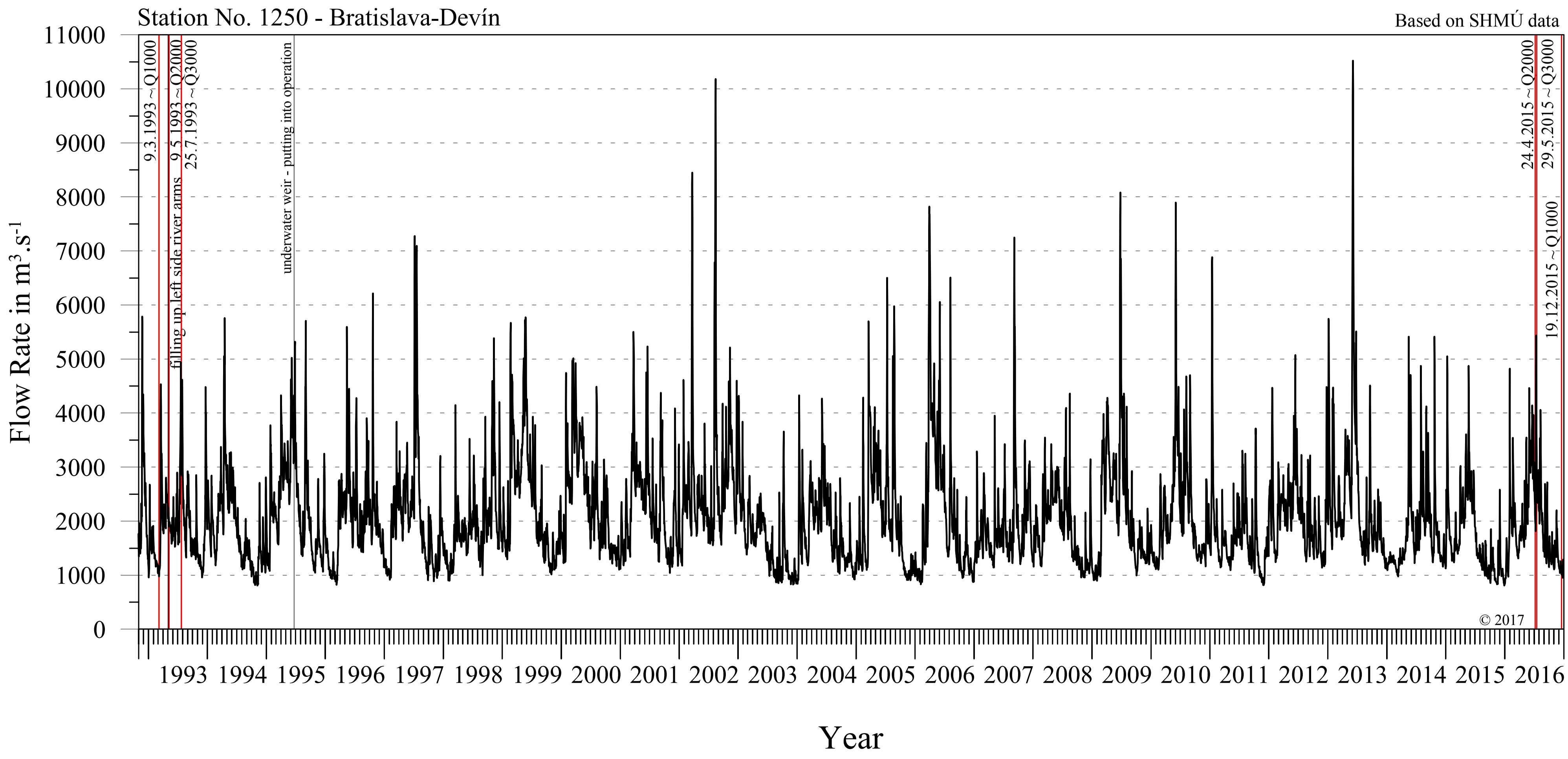


Fig. 3-3a **Surface water flow rate**

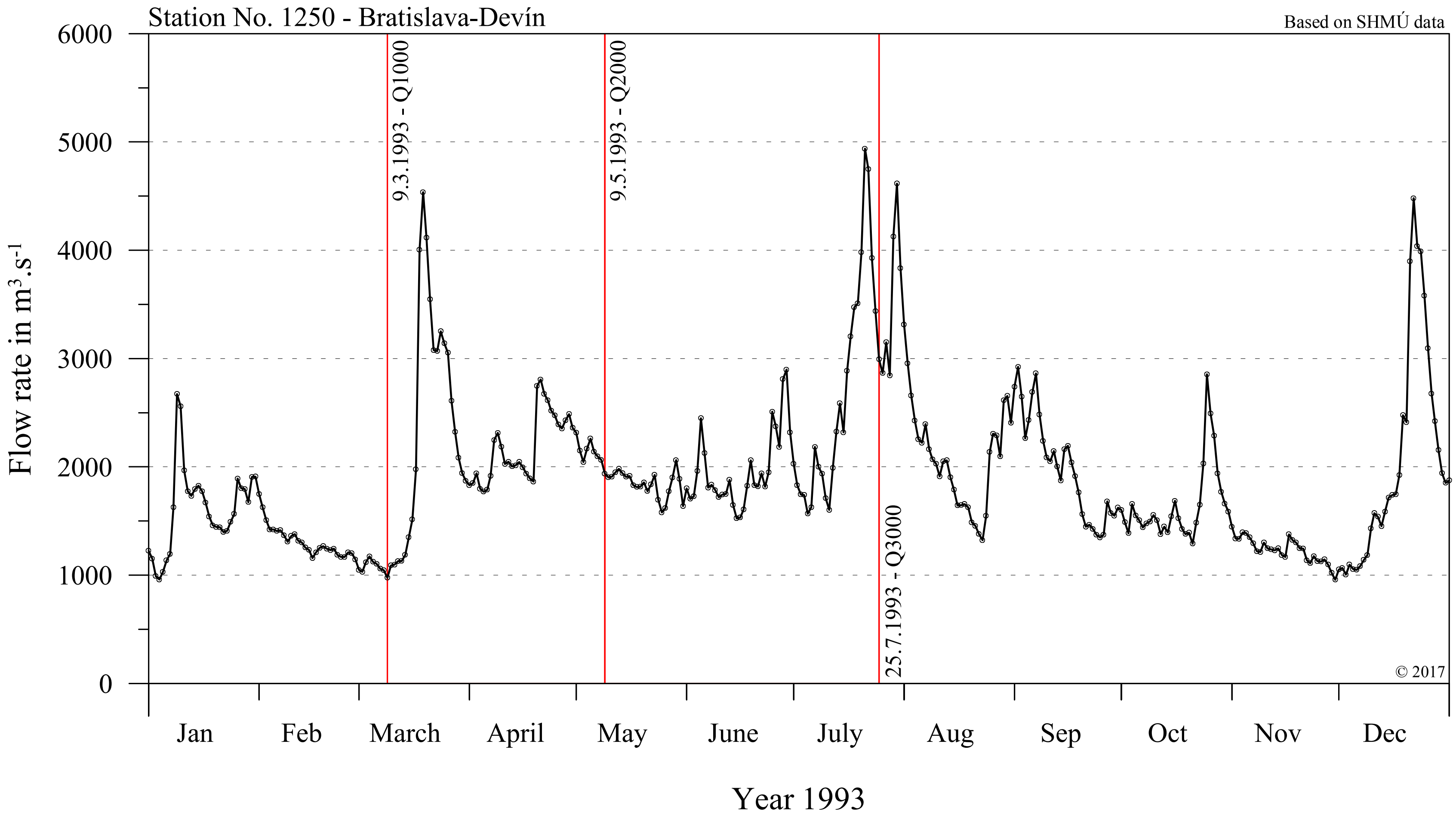


Fig. 3-3b **Surface water flow rate**

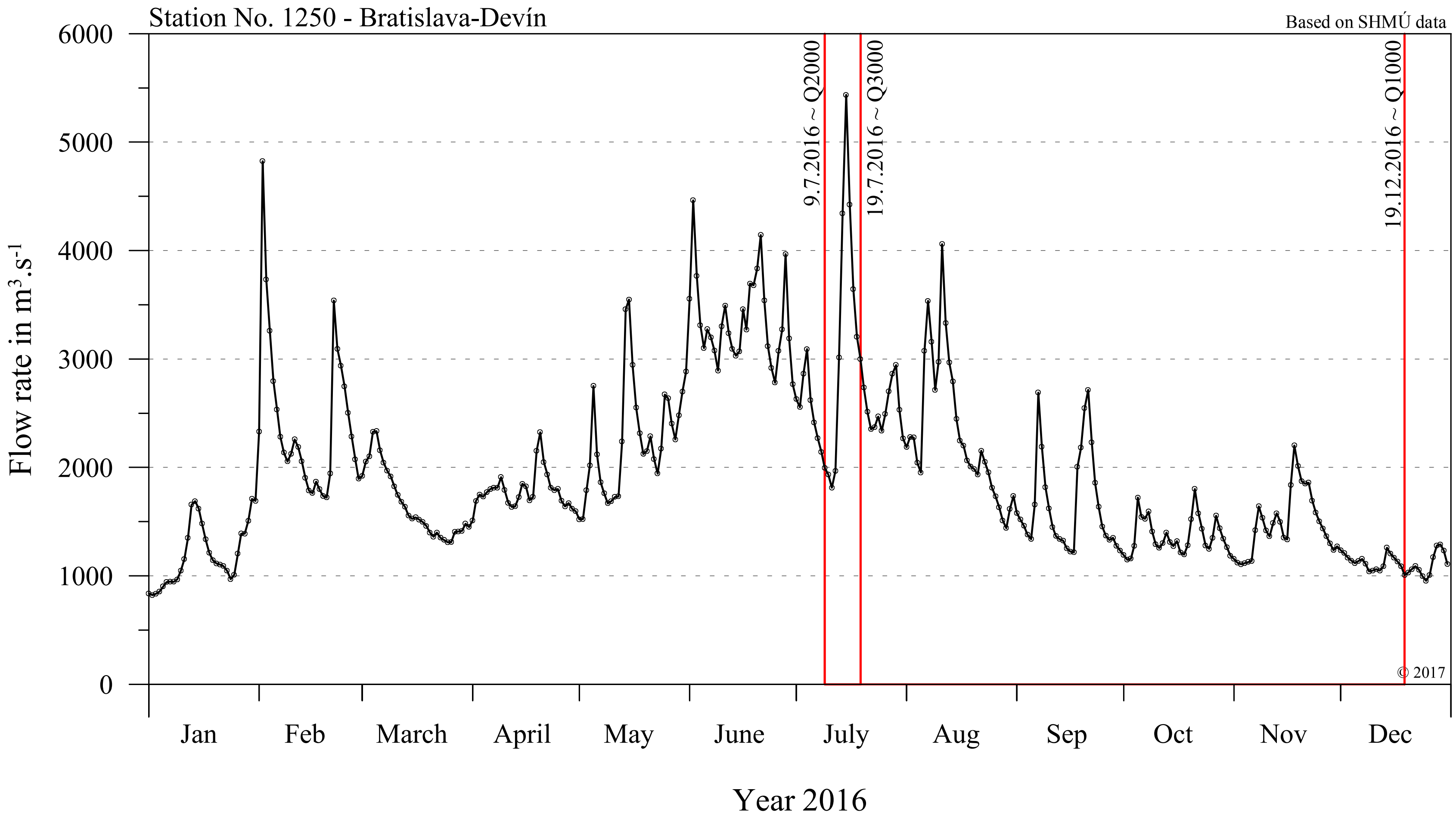


Fig. 3-4

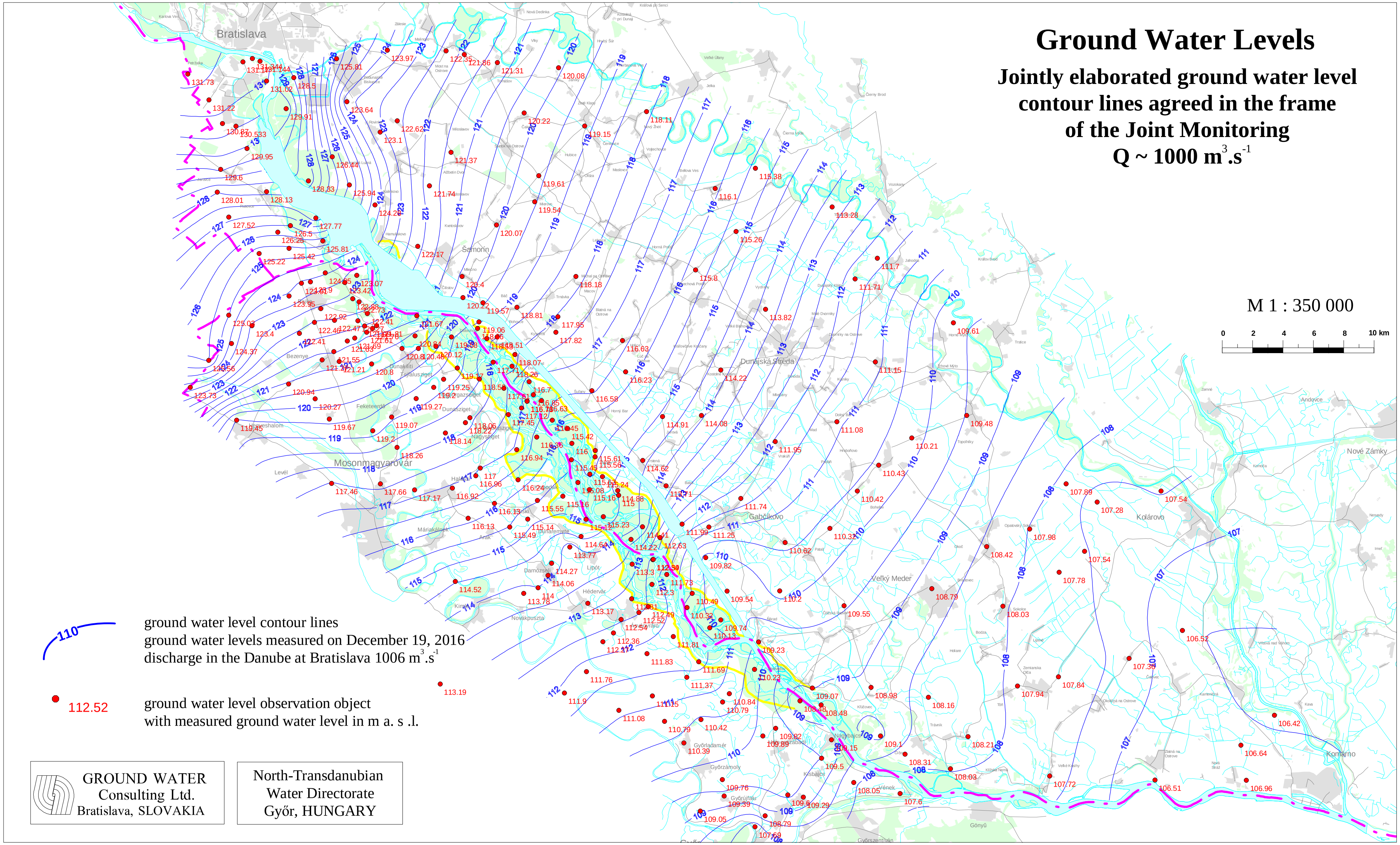
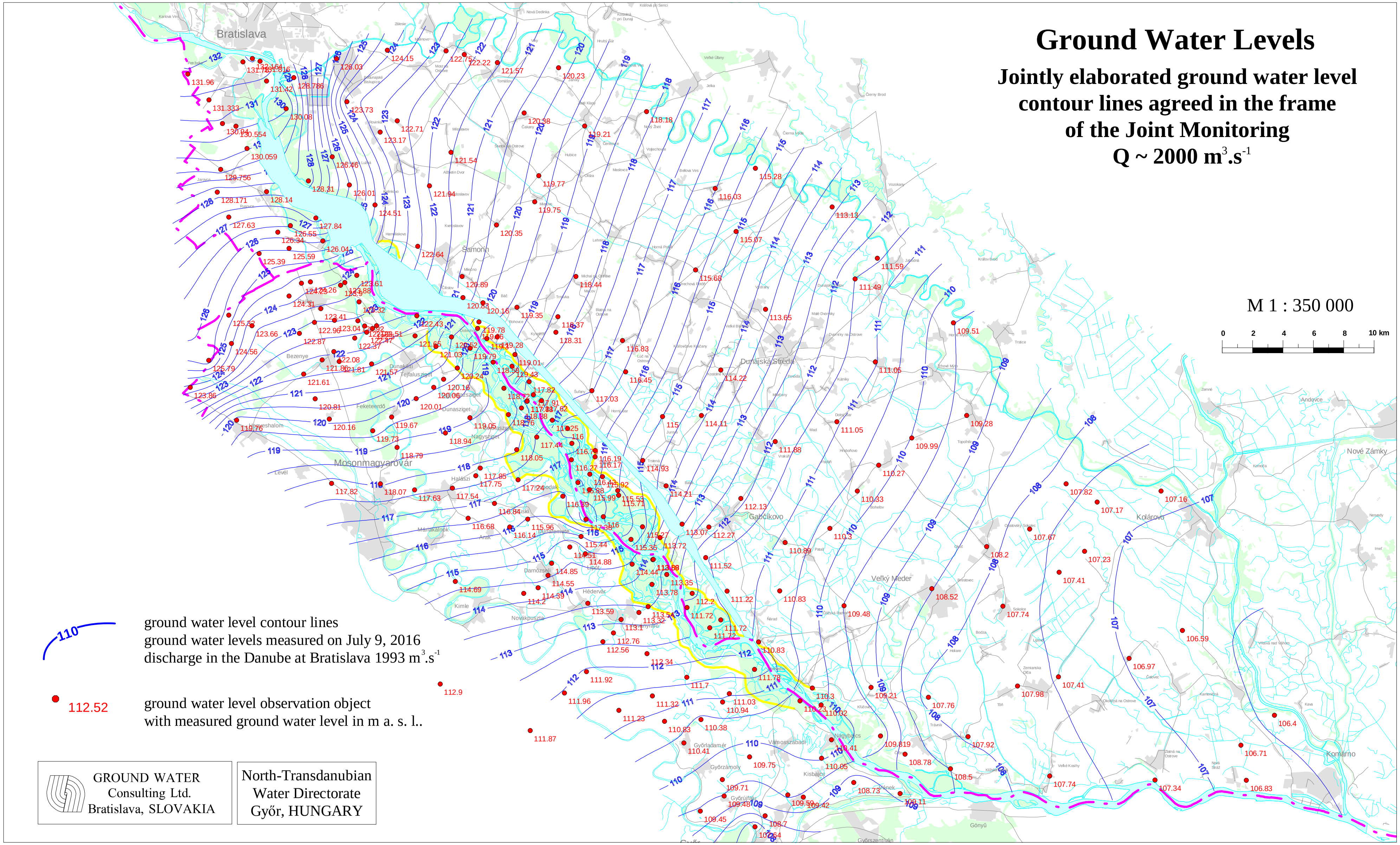

Ground Water Levels
Jointly elaborated ground water level contour lines agreed in the frame of the Joint Monitoring
Q ~ 1000 m³.s⁻¹
M 1 : 350 000
0 2 4 6 8 10 km
ground water level contour lines
ground water levels measured on December 19, 2016
discharge in the Danube at Bratislava 1006 m³.s⁻¹
112.52
ground water level observation object
with measured ground water level in m a. s .l.
GROUND WATER Consulting Ltd. Bratislava, SLOVAKIA
North-Transdanubian Water Directorate Győr, HUNGARY
Bratislava
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Komárno
Nové Zámky
Mosonmagyaróvár
Győrzámoly
Gönyű

Fig. 3-5



Ground Water Levels
Jointly elaborated ground water level contour lines agreed in the frame of the Joint Monitoring
Q ~ 2000 m³.s⁻¹
M 1 : 350 000
0 2 4 6 8 10 km
ground water level contour lines
ground water levels measured on July 9, 2016
discharge in the Danube at Bratislava 1993 m³.s⁻¹
112.52
ground water level observation object
with measured ground water level in m a. s. l..
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North-Transdanubian Water Directorate Győr, HUNGARY
Bratislava
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Mosonmagyaróvár
Komárno
Nové Zámky
Kolárovo

Fig. 3-6

Ground Water Levels

Jointly elaborated ground water level contour lines agreed in the frame of the Joint Monitoring
$Q \sim 3000\ m^3.s^{-1}$

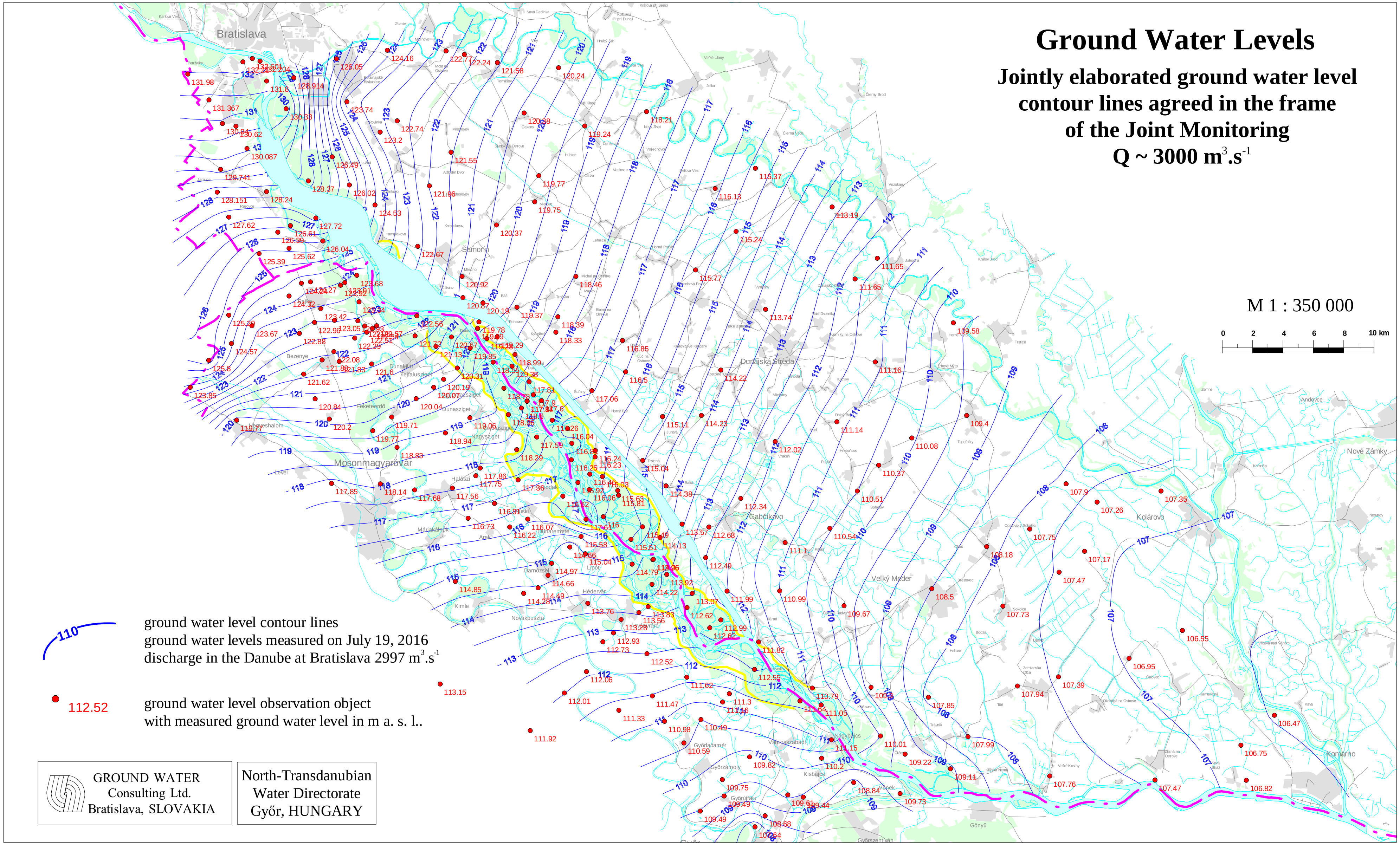
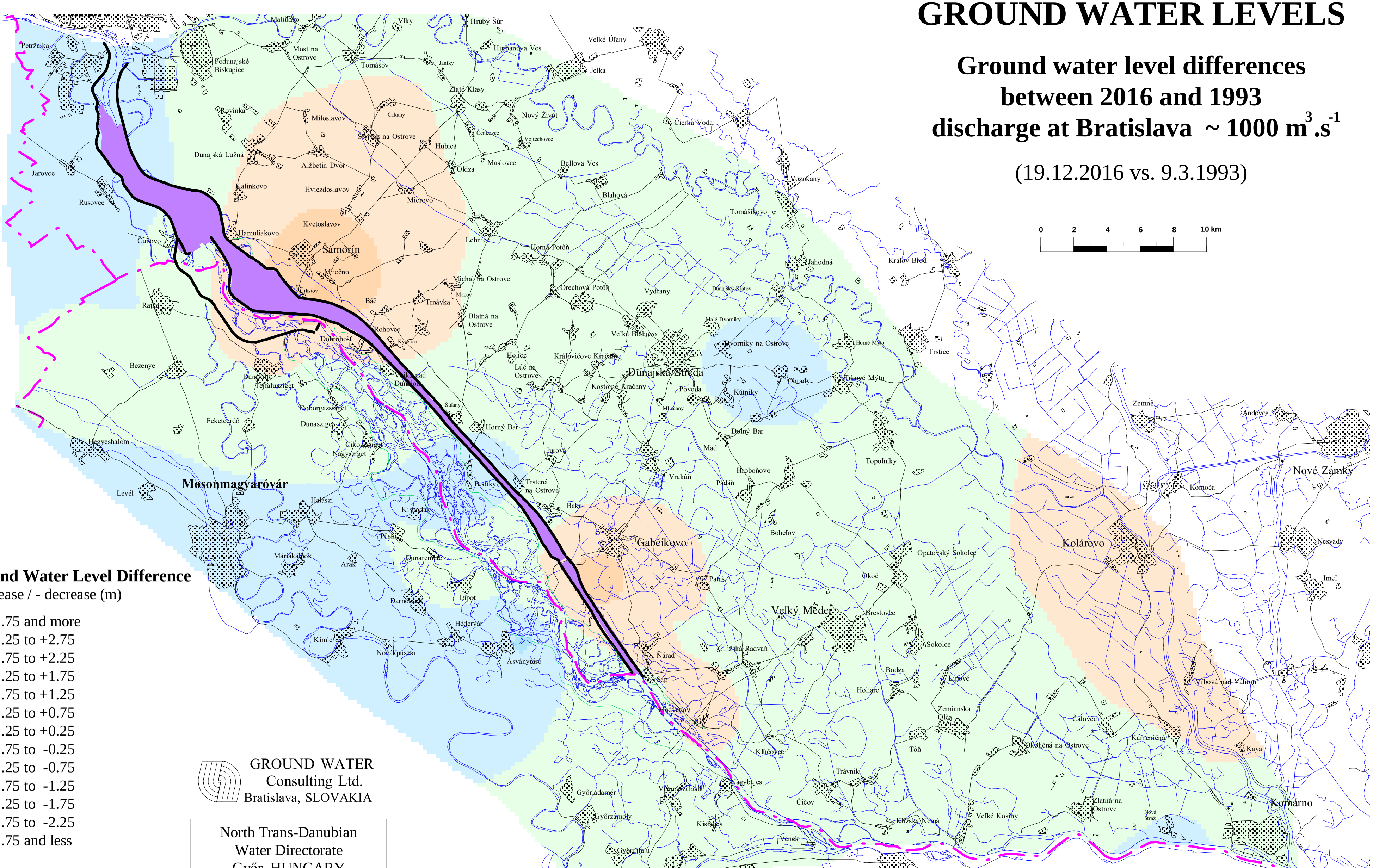


Fig. 3-7

GROUND WATER LEVELS

Ground water level differences between 2016 and 1993 discharge at Bratislava ~ 1000 $m^3.s^{-1}$

(19.12.2016 vs. 9.3.1993)



Ground Water Level Difference
+ increase / - decrease (m)

- +2.75 and more
- +2.25 to +2.75
- +1.75 to +2.25
- +1.25 to +1.75
- +0.75 to +1.25
- +0.25 to +0.75
- -0.25 to +0.25
- -0.75 to -0.25
- -1.25 to -0.75
- -1.75 to -1.25
- -2.25 to -1.75
- -2.75 to -2.25
- -2.75 and less

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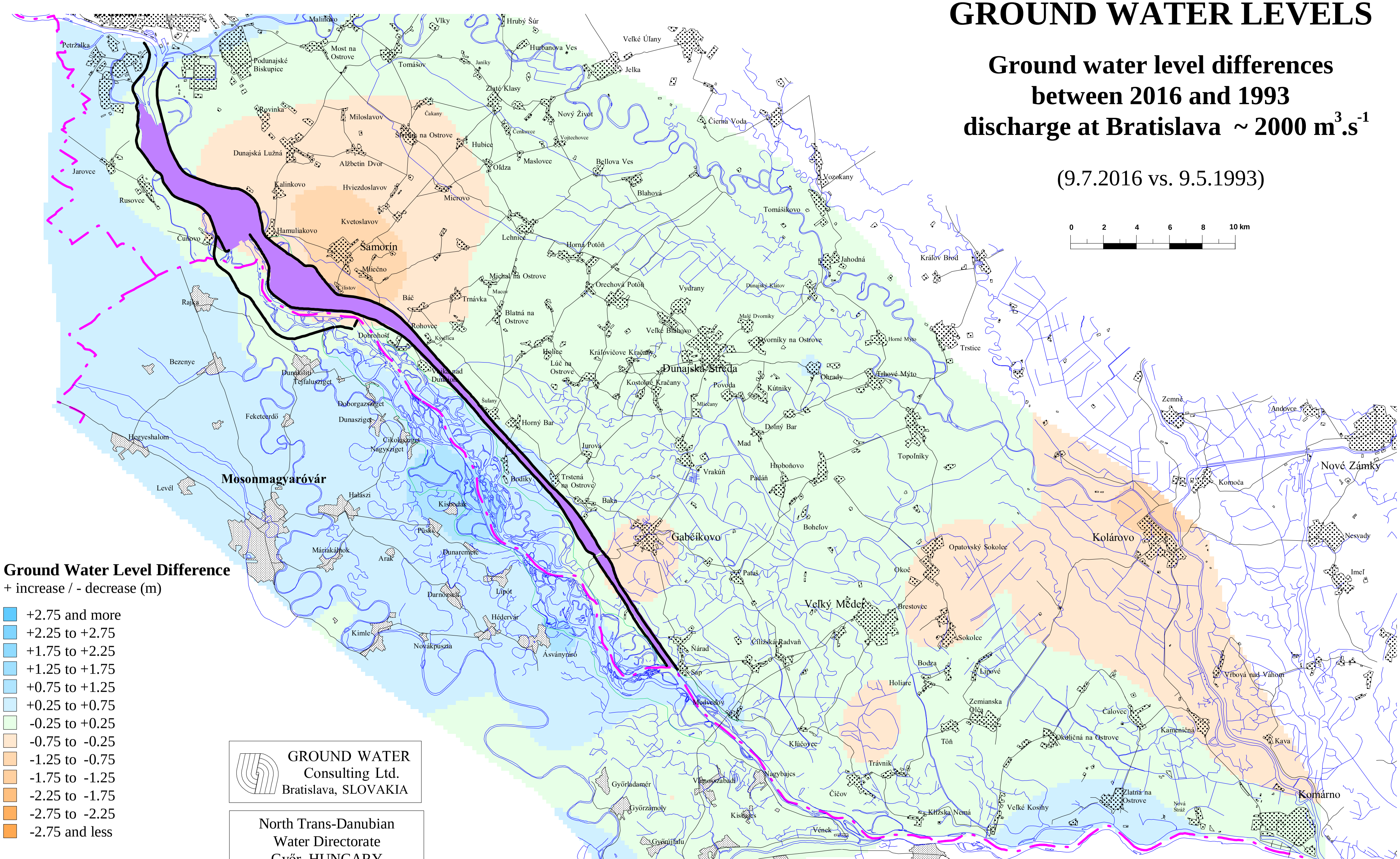
Fig. 3-8

GROUND WATER LEVELS

Ground water level differences between 2016 and 1993 discharge at Bratislava ~ 2000 $m^3.s^{-1}$

(9.7.2016 vs. 9.5.1993)



Ground Water Level Difference
+ increase / - decrease (m)

- +2.75 and more
- +2.25 to +2.75
- +1.75 to +2.25
- +1.25 to +1.75
- +0.75 to +1.25
- +0.25 to +0.75
- -0.25 to +0.25
- -0.75 to -0.25
- -1.25 to -0.75
- -1.75 to -1.25
- -2.25 to -1.75
- -2.75 to -2.25
- -2.75 and less

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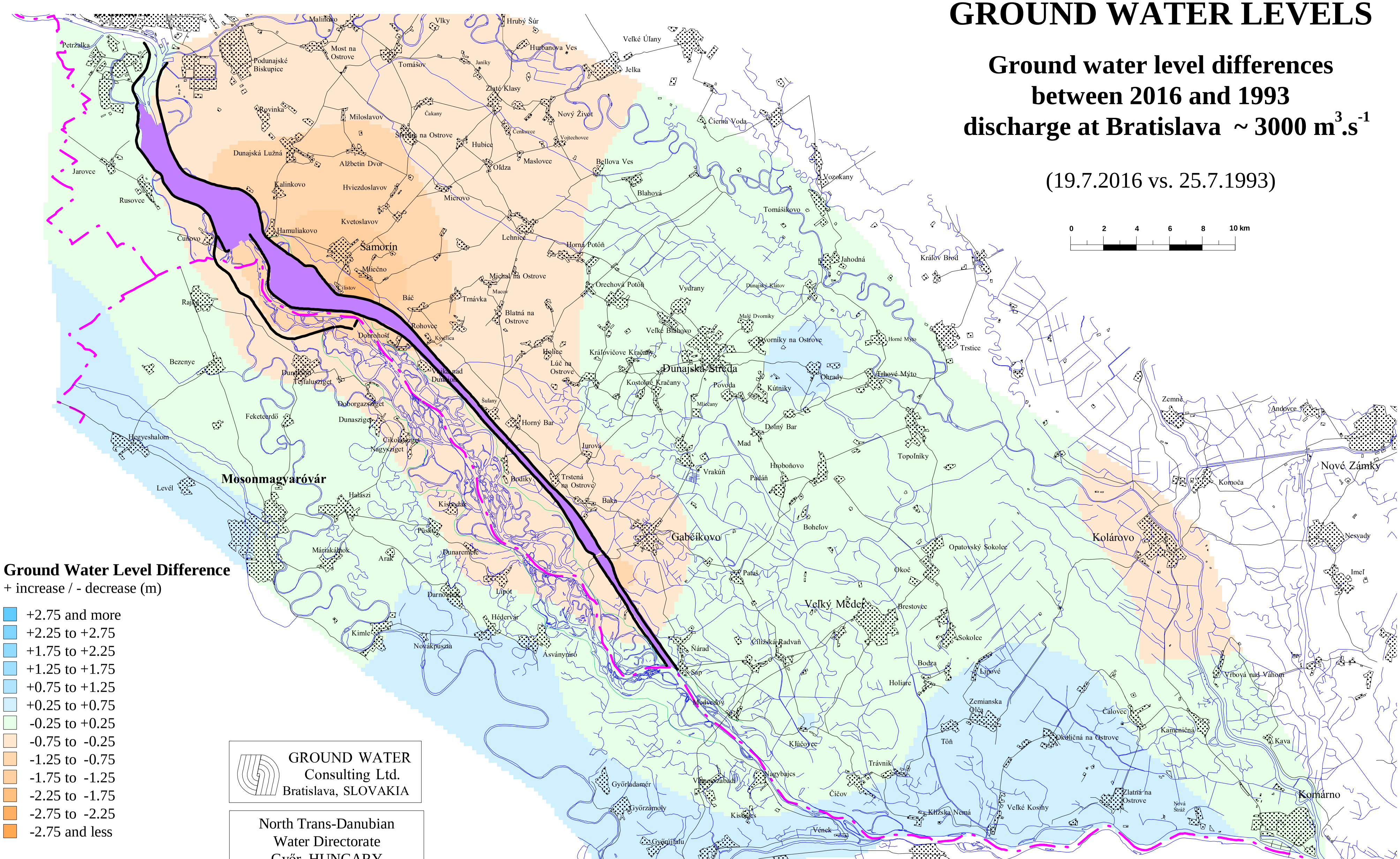
Fig. 3-9

GROUND WATER LEVELS

Ground water level differences between 2016 and 1993 discharge at Bratislava ~ 3000 m^3.s^{-1}

(19.7.2016 vs. 25.7.1993)



Ground Water Level Difference
+ increase / - decrease (m)

- +2.75 and more
- +2.25 to +2.75
- +1.75 to +2.25
- +1.25 to +1.75
- +0.75 to +1.25
- +0.25 to +0.75
- -0.25 to +0.25
- -0.75 to -0.25
- -1.25 to -0.75
- -1.75 to -1.25
- -2.25 to -1.75
- -2.75 to -2.25
- -2.75 and less

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Water Directorate
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PART 4

Groundwater Quality

The groundwater quality on the Slovak and Hungarian territory is assessed separately. The list of objects included in the joint monitoring is given in **Table 4-1** and **Table 4-2**, and their position is shown in **Fig. 4-1**. For the assessment in the Joint Report representative objects for groundwater quality observation were selected on both sides. A detailed evaluation of groundwater quality for each object included in the joint monitoring was done in the Slovak and Hungarian National Annual Reports on environmental monitoring in 2016. Monitoring data for the year 2016 in table format and the long-term graphical development of observed quality parameters for the period 1992-2016 form a part of the National Reports. The data from monitored objects are interpreted in relation to limits for groundwater quality assessment agreed in the frame of intergovernmental Agreement from 1995. The limits are listed in **Table 4-3**.

4.1. Evaluation of groundwater quality on the Slovak territory

The groundwater quality monitoring on the Slovak territory is carried out at 18 objects (10 observation objects and 8 water supply sources). Their list is given in **Table 4-1**. For the purposes of the Slovak-Hungarian monitoring data from the Western Slovakia Water Company (ZsVS), the Bratislava Water Company (BVS), Slovak Hydrometeorological Institute (SHMÚ) and Ground Water Consulting Ltd. (GWC) were used. The assessment in the Joint Report is focused mainly on groundwater quality in water supply sources, which are more representative because of their continuous pumping.

Table 4-1: List of monitoring objects on the Slovak territory

	Country	Object No.	Location
1	**Slovakia**	**899**	Rusovce, right side of the reservoir
2	**Slovakia**	**888**	Rusovce, right side of the reservoir
3	**Slovakia**	**872**	Čunovo, right side of the reservoir
4	**Slovakia**	**329**	Šamorín, left side of the reservoir
5	**Slovakia**	**87**	Kalinkovo, left side of the reservoir
6	**Slovakia**	**170**	Dobrohošť
7	**Slovakia**	**234**	Rohovce
8	**Slovakia**	**262**	Sap
9	**Slovakia**	**265**	Kľúčovec
10	**Slovakia**	**3**	Kalinkovo, left side of the reservoir
11	**Slovakia**	**102**	water supply source Rusovce
12	**Slovakia**	**2559**	water supply source Čunovo
13	**Slovakia**	**119**	water supply source Kalinkovo
14	**Slovakia**	**105**	water supply source Šamorín
15	**Slovakia**	**467**	water supply source Vojka
16	**Slovakia**	**485**	water supply source Bodíky
17	**Slovakia**	**353**	water supply source Gabčíkovo
18	**Slovakia**	**907**	water supply source Bratislava – Petržalka

From among the water supply sources, three are situated on right side of the Danube (No. 102, 2559 and 907) and five on the left side (No. 119, 105, 353, 485 and 467), while the latter two are located between the Danube old riverbed and the derivation channel. The groundwater quality in the water supply sources is stable in long-term. The water supply source Bratislava - Pečniansky les (No. 907) is influenced by the water quality in the Danube. Unlike the other water supply sources, most parameters here fluctuate and show seasonality. The groundwater quality on the water supply sources at Rusovce (No. 102) and Čunovo (No. 2559) has improved since damming the Danube. The quality on the water supply sources at Kalinkovo (No. 119) and Šamorín (No. 105) is influenced by the infiltration of surface water from the Danube and from the reservoir. The groundwater quality in the water supply source at Gabčíkovo (No. 353) differs due to prevailing direction of groundwater flow, coming from the inland area. In the water supply sources at Vojka (No. 467) and Bodíky (No. 485) the groundwater quality is significantly influenced by local conditions.

Right side of the Danube

The water supply sources at Rusovce – No. 102 and at Čunovo – No. 2559

The groundwater quality in the water source at Rusovce is similar to the water quality in the water source at Čunovo, with certain differences in the values of some parameters. The concentrations of cations, anions and conductivity values on both water sources fluctuate within a narrow range. More significant differences in measured values are recorded in the case of hydrogen carbonates, which are higher at Rusovce, and in the case of nitrates, which are higher at Čunovo. Small differences and slightly higher contents are registered in the case of calcium, magnesium and chlorides at Rusovce. The contents of these three parameters, together with hydrogen carbonates on the object No. 102 at Rusovce achieves the highest values within monitored water sources. Since 1998, hydrogen carbonates at this object range up to 300 $mg.l^{-1}$. In the last three years, however, one or two higher concentrations occurred, with a maximum of 348.4 $mg.l^{-1}$ in 2015. In the assessed year, such concentration was recorded in November (328.3 $mg.l^{-1}$). Also in the case of chlorides, similarly as in 2015, one concentration (29.8 $mg.l^{-1}$) above the level of values measured in the period 1998 to 2014 occurred. The content of sulphates, after the temporary increase in 2015, dropped to values measured in previous years of monitoring (1998-2014), and similar to their contents on the water source at Čunovo. Concentrations of ammonium ions and phosphates are low in long-term and mostly range below their detection limits. Low are also the contents of manganese and iron, which satisfy the agreed limit values in long-run. The dissolved oxygen content in the assessed year slightly increased, it ranged from 2.85 to 5.45 $mg.l^{-1}$. From the observed parameters, only the water temperature slightly exceeded the agreed limit, in two cases on the water source at Rusovce (twice 12.1 °C). The contents of the other observed parameters in the assessed year satisfied the agreed limits. For operational reasons the water source No. 2559 at Čunovo ceased to be used during the assessed year.

Waterworks at Bratislava No. – 907

With regard to the location of the water supply source Pečniansky les, near the Danube, the groundwater quality in the object No. 907 is significantly influenced by changes and fluctuation of chemical components in the Danube water. The values of the individual parameters, particularly cations, anions, water temperature, dissolved oxygen content and nitrates concentrations considerably fluctuate over the year. The groundwater quality in this water source in the assessed year has not changed and there were not recorded any high concentrations of observed parameters. In comparison with the other water supply sources, higher values of dissolved oxygen (up to 10.7 $mg.l^{-1}$, in 2016 it varied from 4.8 to 6.7 $mg.l^{-1}$), nitrates (up to 21.7 $mg.l^{-1}$, in 2016 they varied from <5.0 to 10.2 $mg.l^{-1}$) and COD_{Mn} (up to 2.0 $mg.l^{-1}$, in 2016 values varied from 0.5 to 0.9 $mg.l^{-1}$) continue to be characteristic for this water supply source. The content of iron and manganese was low, all values in the evaluated year were below 0.007 $mg.l^{-1}$, which is the limit of determination for both parameters. The contents of ammonium ions and phosphates also continues to be below the detection limits (0.03 $mg.l^{-1}$ and 0.10 $mg.l^{-1}$). In the year 2016 no exceedances of the agreed limits according to the Table 4-3 have been identified on this object.

Left side of the Danube

Water supply sources at Kalinkovo No. – 116 and at Šamorín – No. 105

The groundwater quality in water supply sources situated on the left side of the Danube was not affected by damming to such extent as the quality in water supply sources on the right side. The groundwater chemistry in the water supply sources at Kalinkovo (No. 119) and at Šamorín (No. 105) is similar from the start of monitoring and the course and changes of majority of groundwater quality parameters are also similar.

Slightly higher values occur in the water supply source at Kalinkovo (No. 119) in the case of potassium, manganese and ammonium ions. The content of ammonium ions is the second highest from among the monitored water supply sources (higher is only on the object No. 485 at Bodíky). In the evaluated year, the concentrations of ammonium ions varied from 0.01 $mg.l^{-1}$ to 0.12 $mg.l^{-1}$, but they are low compared to the agreed limit (0.5 $mg.l^{-1}$). The second highest are also the contents of manganese, which in the last three years exceeded the limit value (0.05 $mg.l^{-1}$) at each determination. Previously, higher concentrations (above the limit value) occurred only occasionally. In the assessed year, the contents of manganese ranged from 0.076 to 0.085 $mg.l^{-1}$.

In contrast to the object No. 119 at Kalinkovo, the contents of ammonium ions and manganese in the water supply source at Šamorín (object No. 105) are low and mostly fluctuate below the detection limits. In the assessed year, one manganese concentration occurred at the limit value (0.05 $mg.l^{-1}$), but it was not confirmed by further samples.

The content of dissolved oxygen was similar in comparison with 2015, at Šamorín it ranged from 3.99 to 5.25 $mg.l^{-1}$ and at Kalinkovo from 2.88 to 5.3 $mg.l^{-1}$. Over the past five years, the contents of hydrogen carbonates and magnesium has been more volatile than in the previous monitoring period, with a slight upward trend. Concentrations of chlorides and sulphates are fairly balanced since 2004, and on both objects chlorides fluctuates up to 20 $mg.l^{-1}$ and sulphates oscillate around 30 $mg.l^{-1}$. The agreed limit values for groundwater quality assessment in 2016 has been exceeded by the manganese contents on the water supply source at Kalinkovo and in one case by the water temperature in the object at Šamorín.

Waterworks at Gabčíkovo – No. 103 and 353

The groundwater quality in the water supply source Gabčíkovo differs from the groundwater quality in water supply sources at Kalinkovo and Šamorín because of the different groundwater flow direction. The values of several quality indicators are relatively balanced in this object: the water temperature, the content of calcium, sodium, chlorides, sulphates and also the conductivity values fluctuates only in a narrow ranges. Relatively balanced are also the nitrates concentrations, which in long-term oscillate around 4 $mg.l^{-1}$ (in 2016 they ranged from 3.0 to 4.1 $mg.l^{-1}$). The dissolved oxygen content is one of the lowest, in the assessed year it ranged from 0.34 to 0.61 $mg.l^{-1}$. The concentrations of sodium (about 5 $mg.l^{-1}$), potassium (about 1 $mg.l^{-1}$) and chlorides (about 10 $mg.l^{-1}$) belong to the lowest from among all other monitored objects. The sodium and potassium concentrations reach only half of the values recorded in water supply sources at Šamorín or Kalinkovo. Contents of ammonium ions, phosphates, iron and manganese are low in long-term, and mostly oscillate at the level of detection limits of the analytical methods used. The organic pollution, expressed by COD_{Mn}, is below the detection limit (0.5 $mg.l^{-1}$) since 2002. By comparing the measured contents of observed parameters in the year 2016 with the agreed limit values for groundwater quality assessment (**Table 4-3**), it can be stated that on the object No. 353 at Gabčíkovo no exceedances occurred.

Water supply sources at Vojka – No. 467 and Bodíky – No. 485

The water supply sources at Vojka and Bodíky are situated in the area between the Danube old riverbed and the derivation canal. The groundwater quality in these objects can be influenced by local conditions.

The groundwater in the water supply source at Vojka (No. 467) has a satisfactory quality for drinking purposes. The water temperature sometimes exceeds the limit value of 12 °C, in 2016 it was in one case with a value of 12.3 °C. In the period of years 2007-2016 improvement in redox conditions occurred here, and in the last three years the dissolved oxygen contents fluctuate around 1.6 $mg.l^{-1}$ (in the year 2016 from 1.3 $mg.l^{-1}$ to 1.8 $mg.l^{-1}$). Concentrations of ammonium ions, phosphates, values of COD_{Mn}, and the contents of manganese and iron are low in long-term at Vojka and are often below the detection limits. In the assessed year only in the case of phosphates one concentration (0.054 $mg.l^{-1}$) occurred, which was higher than the detection limit (0.03 $mg.l^{-1}$). The content of nitrates was similar to that in 2015 (it ranged from 3.0 to 3.2 $mg.l^{-1}$). The time series of cations and anions are balanced and fluctuate at narrow ranges. In the year 2016, on the water supply source at Vojka (No. 467) exceeding of agreed limits for groundwater quality assessment did not occurred.

The water quality in the water supply source at Bodíky (No. 485) differs in a number of parameters. From among the monitored water supply sources, for this object are characteristic the lowest contents of dissolved oxygen, nitrates and sulphates, and conversely the highest values of water temperature, ammonium ions and especially manganese. The concentrations of manganese exceed the agreed limit value at each determination in long-term, in the assessed year they varied from 0.62 to 1.00 $mg.l^{-1}$. Also the water temperature was above the limit value and ranged from 13.3 to 13.8 °C. Concentrations of ammonium ions varied in the range from 0.25 to 0.45 $mg.l^{-1}$, so they were lower than the limit value for this parameter (0.5 $mg.l^{-1}$). The dissolved oxygen content was slightly higher than in 2015 and fluctuated in the interval from 0.28 to 0.55 $mg.l^{-1}$, while in the previous year in ranged from 0.09 to 0.17 $mg.l^{-1}$. Both, the organic pollution and nitrates were below the detection limit, so they were lower than 0.5 $mg.l^{-1}$ for COD_{Mn} and 0.5 $mg.l^{-1}$ for NO_3^-. From among the monitored groundwater quality parameters on the water supply source at Bodíky (No. 485), the agreed limits were not met in the case of manganese and water temperature at each determination. Other exceedances have not occurred in the assessed year.

4.2. Conclusions regarding the Slovak territory

The chemical composition of groundwater in water supply sources indicates stable conditions for development of groundwater quality. The water supply source Pečniansky les is significantly affected by changes and fluctuations in the chemical composition of the surface water in the Danube, due to the fact that this object is located in close proximity to the river. Most parameters are volatile and show seasonality. The COD_{Mn} values, the contents of dissolved oxygen and nitrates on this object achieve the highest values from among the monitored water supply sources, but do not exceed the agreed limits. The water temperature, cations and anions fluctuate at wider ranges and occasionally occur higher values than on other water supply objects. The concentrations of observed groundwater quality parameters on other water supply sources mostly fluctuate in narrow and similar to each other ranges. The exception is the Gabčíkovo water supply source, where the contents of sodium, potassium and chlorides achieve approximately half of the values than on other water supply sources. The difference in the groundwater chemistry on the water supply source at Gabčíkovo is related to the groundwater supply from the inland area of the Žitný ostrov region, in contrast to other water supply sources, which are supplied by infiltration of water from the Danube and from the reservoir.

The quality of groundwater in the monitored water supply sources mostly satisfies the agreed limits for drinking water (**Table 4-3**). Exceedances of limits occur only on some objects in the case of water temperature, manganese and in some years also in the case of iron. In the year 2016, the limit value for water temperature was exceeded once at the water supply source at Šamorín and at Vojka, twice at the water supply source at Rusovce and three tomes at Bodíky. The manganese content exceeded the limit value on the water supply source at Bodíky in each determination, similarly to the other years of monitoring. On the water supply source at Kalinkovo exceedances also occurred in each determination , similarly to 2014 and 2015, but they does not reach such high values as at Bodíky.

Based on long-term measurements it can be stated that the organic pollution, expressed by COD_{Mn}, decreased during the observed period (to values up to 1 $mg.l^{-1}$) and on water supply sources at Gabčíkovo, Vojka and Bodíky majority of values are below the detection limit of the applied analytical method. For these three water sources low concentrations of dissolved oxygen are characteristic in long-term (around 0.5 $mg.l^{-1}$). A slight improvement was recorded between 2007 and -2016 on the object No. 467 at Vojka, where the dissolved oxygen content has risen and currently fluctuates around 1.6 $mg.l^{-1}$. On the other water supply objects it reaches values between 2 and 8 $mg.l^{-1}$. From among the nutrients, the phosphates and ammonium ions occur in low concentrations at observed objects in long-term and currently they are mostly below the detection limits of applied analytical methods. Only in Bodíky and Kalinkovo the ammonium ions fluctuate above the detection limit, but do not exceed the limit value agreed for this groundwater quality parameter. The highest contents of nitrates (up to 21.7 $mg.l^{-1}$), with strong seasonal variation, are registered on the water supply source Pečniansky les, due to its location close to the Danube. On other objects, the nitrates content recently varies at low level, from 3 to 9 $mg.l^{-1}$ or less (at Rusovce and Bodíky). The inorganic and organic micro-pollution observed in the evaluated year on the water supply source at Gabčíkovo was low. Except the above mentioned parameters (manganese and water temperature) other exceedances on monitored water supply sources in 2016 were not registered.

The groundwater quality in observation objects that are evaluated in the National Report is more influenced by local impacts. Monitoring results show that the agreed limits are exceeded more frequently in comparison with the water supply sources. Exceedances occur in the case of ammonium ions, manganese, iron and water temperature. Inorganic and organic micro-pollution is monitored at selected observation objects (No. 888, 872, 329, 170, 234, 262 and 265). In 2016, all concentrations of organic and inorganic micro-pollutants were below the limit values for groundwater quality evaluation (**Table 4-3**). The arsenic, cadmium and copper contents in the assessed year did not reached the level of detection limit. However, the measured concentrations of zinc, lead, chromium, nickel and mercury in some observation objects indicates slight pollution.

4.3. Evaluation of the groundwater quality on the Hungarian territory

The subject of joint groundwater quality monitoring on the Hungarian side consists of 22 objects, composed of 16 observation objects and 6 wells that are used for drinking water supply (water supply sources). While the observation wells have the screens located in the upper part of the gravel sediments, the water supply wells draw water from deeper horizons. The list of monitored objects is given in **Table 4-2**.

Data from wells that are used for drinking water supply are provided by Regional Water Companies. The groundwater quality monitoring in observation wells is carried out by the Győr-Moson-Sopron County Government Office, Department of Environment Protection and Nature Conservation. The frequency of monitoring on water sources was four times a year, on observation objects it was twice a year.

In the assessment of groundwater quality in the Joint Report four observation objects were selected on Hungarian territory (No. 9327, 9413, 9430 and 9456) that are mentioned below.

Table 4-2: List of monitoring objects on the Hungarian territory

	Country	Object No.	Locality
1	**Hungary**	**9310**	Rajka
2	**Hungary**	**9327**	Dunakiliti
3	**Hungary**	**9331**	Dunakiliti
4	**Hungary**	**9368**	Rajka
5	**Hungary**	**9379**	Rajka
6	**Hungary**	**9413**	Sérfenyősziget
7	**Hungary**	**9418**	Mosonmagyaróvár
8	**Hungary**	**9430**	Kisbodak
9	**Hungary**	**9544**	Halászi
10	**Hungary**	**9456**	Ásványráró
11	**Hungary**	**9457**	Ásványráró
12	**Hungary**	**9458**	Ásványráró
13	**Hungary**	**9475**	Győrzámoly
14	**Hungary**	**9480**	Győrzámoly
15	**Hungary**	**9484**	Vámosszabadi
16	**Hungary**	**9536**	Püski
17	**Hungary**	**Du-I**	water source Dunakiliti
18	**Hungary**	**T-II**	water source Feketeerdő
19	**Hungary**	**Da-I**	water source Darnózseli
20	**Hungary**	**K-5**	water source Győr - Révfalu
21	**Hungary**	**6-E**	water source Győr - Szőgye
22	**Hungary**	**25-E**	water source Győr - Szőgye

Observation well No. 9327, site: Dunakiliti

Based on long-term data, in the object No. 9327 a seasonal, periodical fluctuation of some water quality parameters is clearly observable. Periodicity primarily appears in the changes of water temperature, pH and concentrations of nitrates. The groundwater has low salt content, like the Danube water. The water temperature from time to time exceeds the limit value of 12 °C (no such case occurred in the assessed year). Pollution by organic matter, expressed by COD_{Mn}, is rather balanced over the last six years and the measured values meet the agreed limits in long-term. The content of nitrates and ammonium ions is low, permanently below the limit value. Concentrations of ammonium ions show significant fluctuation since 2010. Similarly to the previous year, the content of phosphates in October (0.58 $mg.l^{-1}$) slightly exceeded the limit value (0.5 $mg.l^{-1}$). Manganese concentrations slightly decreased and remained below the agreed limit (0.05 $mg.l^{-1}$). On the contrary, the content of iron increased in comparison with the previous year and in the spring (0.91 $mg.l^{-1}$) and also in the autumn (2.20 $mg.l^{-1}$) exceeded the limit value of 0.20 $mg.l^{-1}$. Concentrations of manganese, phosphates and iron in the last years show seasonal fluctuation. Besides the phosphates and iron, other observed parameters occurred in quantities below the relevant limit values for groundwater quality evaluation.

Observation well No. 9413, site: Sérfenyősziget

The water temperature in this object is relatively balanced, because it is only to a small extent affected by meteorological conditions. Conductivity values in 2016 were similar as in the previous year. The content of nitrates in the assessed year achieved even higher values (125.0 $mg.l^{-1}$ and 85.2 $mg.l^{-1}$), than in 2015 (78,6 $mg.l^{-1}$ and 76,6 $mg.l^{-1}$) and significantly exceeded the limit value (50 $mg.l^{-1}$). In long-term, the calcium content quite often varies above 100 $mg.l^{-1}$, what is the limit value for this parameter. In the assessed year both concentrations (136 $mg.l^{-1}$ and 130 $mg.l^{-1}$) were higher than the given limit, like in the year 2015. Concentrations of ammonium and phosphate ions and the contamination by organic matter are low in long-term. This object is characteristic by high manganese concentrations, that consistently exceed the limit value of 0.05 $mg.l^{-1}$. In the case of iron occasionally occurs higher concentration, which exceeds the limit value. In the past two years such a concentration did not occurred. Based on the data from 2016 it can be stated that from among the observed groundwater quality parameters the nitrates and manganese more significantly exceeded the agreed limit values, moderate exceedances were documented in the case of water temperature, calcium and magnesium.

Observation well No. 9430, site: Kisbodak

The groundwater in this object has a moderate salt content. The water temperature and the pH values show a slight seasonal fluctuation. The water temperature since 2001 often exceeds the limit value (12 °C), in the assessed it was in autumn with a value of 13.4 °C. Since 2002, the electric conductivity is relatively balanced. The organic matter content also shows seasonal fluctuation and, except one value of 3.3 $mg.l^{-1}$ from 2015, in long-term is below the limit value for this water quality parameter (3 $mg.l^{-1}$). Low concentrations are characteristic for phosphates and nitrates in long-term. The ammonium ions content in long-term does not achieves the limit value (0.5 $mg.l^{-1}$). Iron and manganese concentrations are predominantly high in this object and significantly exceed the limit values. In the case of iron, a low concentration occurs occasionally, and low concentrations in the past three years have been observed also in the case of manganese, during the sampling in the spring (below the limit value of 0.05 mg.l^{-1}), while the concentration in the autumn were again high (in 2016 1.03 mg.l^{-1}). In the evaluated year exceedances of limit values were registered in the case of iron and once in the case of water temperature and manganese.

Observation well No. 9456, site: Ásványráró

The groundwater has moderate mineralization and stable water temperature with slight seasonal fluctuation. The conductivity values were fairly balanced, but in the previous year in autumn declined more significantly and remained lower also in the assessed year. From the long-term of view, the content of ammonium ions is high, but even after significant decrease in concentrations in 2015 and 2016, the values remain higher than the limit value for this parameter (0.5 mg.l^{-1}). The high ammonium ion content in the water in this object is considered to be background pollution from agricultural activities. From among the other observed nutrients, the content of nitrates and phosphates is low in long-term. The organic matter content, expressed by COD_{Mn}, does not show significant changes and is below the limit value in long-term. The groundwater has a high iron and manganese content, with seasonal fluctuation. Concentrations of these parameters significantly exceed the drinking water limit values. The manganese, after a temporary decrease in the previous year, increased again to 0.35 mg.l^{-1} and 0.40 mg.l^{-1}, and significantly exceeded the limit value (0.05 mg.l^{-1}). From the observed water quality data in 2016 results that ammonium ions, iron and manganese exceeded the agreed limit values. Concentrations of other observed parameters varied below the respective limit values.

4.4. Conclusions regarding the Hungarian territory

The above results show that the groundwater in the shallow horizons of gravel sediments is enriched with iron and manganese. This also applies to other observation wells that were evaluated in the National Report. Iron and manganese concentrations in most observation wells permanently exceed the limit values.

Increased contents of nutrients and organic pollution are mostly associated with local pollution, which is of agricultural origin, or in some cases come from wastewater ponds. In general it can be stated that their content in observation objects has not changed significantly in comparison with the previous year. High contents exceeding the limit values are recorded only on some objects. For example, the water quality in object No. 9368 at Rajka continues to be affected by local pollution. High ammonium ion contents occur here in long-term, which exceed the limit value by tenfold (in some years up to hundredfold). Phosphates vary above the limit value and only the content of nitrates in the years 2007-2016 decreased and oscillates around the agreed limit, with occasional slight exceeding of this value (once in 2013, 2014 and 2016). The contents of ammonium ions occur above the limit value in long-term also on the object No. 9475 at Győrzámoly and also on the above evaluated object No. 9456 at Ásványráró. On both objects, there is a noticeable decrease in the concentrations of ammonium ions in the past two years. Obsolete animal breedings gradually being disposed of, what is reflected in the groundwater quality improvement, e.g. on the object No. 9458 at Ásványráró, where no signs of fresh pollution were detected. The content of nitrates and ammonium ions decreased, but the content of phosphates continues to be six or seven times higher than the limit value. The change in the concentration of nitrates in the object No. 9418 at Mosonmagyaróvár points to the impact of background pollution. From the long-term point of view, the measured values fluctuate around the limit value. A high increase in concentrations of nitrates was in the past two years measured on the object No. 9413 at Sérfenyősziget (up to 125 $mg.l^{-1}$).

The organic pollution, expressed by COD_{Mn}, mostly meets the limit value. During the monitoring, from time-to-time occurred values exceeding the limit value in some objects. In the last two years it was twice on object No. 9475 at Győrzámoly and once on object No. 9457 at Ásványráró and No. 9430 at Kisbodak. Only a slight increase of organic pollution was recorded on the object No. 9430 (3.3 mgl^{-1}), while a relatively high values of 6.2 mgl^{-1} and 7.0 mgl^{-1} on the object No. 9475 and 7.2 mgl^{-1} on the object No. 9457 already exceeded the highest limit value for this parameter (5.0 mgl^{-1} - **Table 4-3**). On objects close to pollution sources located in the direction of groundwater flow (objects at Rajka and Ásványráró) the changes in groundwater quality related to livestock farming can be well and sensitively observed.

Inorganic and organic micro-pollution is monitored at selected objects (No. 9379, 9413, 9536, 9456 and 9480). In the year 2016, organic micro-pollution was found in concentrations below the limit values for groundwater quality evaluation (**Table 4-3**), except one concentration of atrazine (0.018 $\mu g.l^{-1}$) on the object No. 9379, however, which was lower than then highest limit value (0.1 $\mu g.l^{-1}$). From among the inorganic micro-pollutants the concentrations of arsenic, copper, nickel and zinc on some objects indicate slight pollution. Concentrations of lead, mercury, chromium and cadmium in the assessed year did not reached the limit of detection.

The groundwater quality in deeper horizons of gravel sediments in the Szigetköz is monitored by production wells in water supply sources. The wells in the region at Győr have higher content of ammonium ions, organic matter, manganese and iron in comparison with the other monitored wells. Manganese and iron concentrations exceed the limit values or approach them. Concentrations are lower in wells where the water is pumped from greater depth. The water extracted in water supply sources Dunakiliti I, Feketeerdő T-II and Darnózseli I is of satisfactory quality and the groundwater quality is characteristic by high stability. In general, the groundwater quality in wells producing potable water (occasionally after pre-treatment) is suitable for drinking water supply.

Table 4-3: Groundwater quality limits for drinking purposes

Basic parameters - physical and chemical parameters

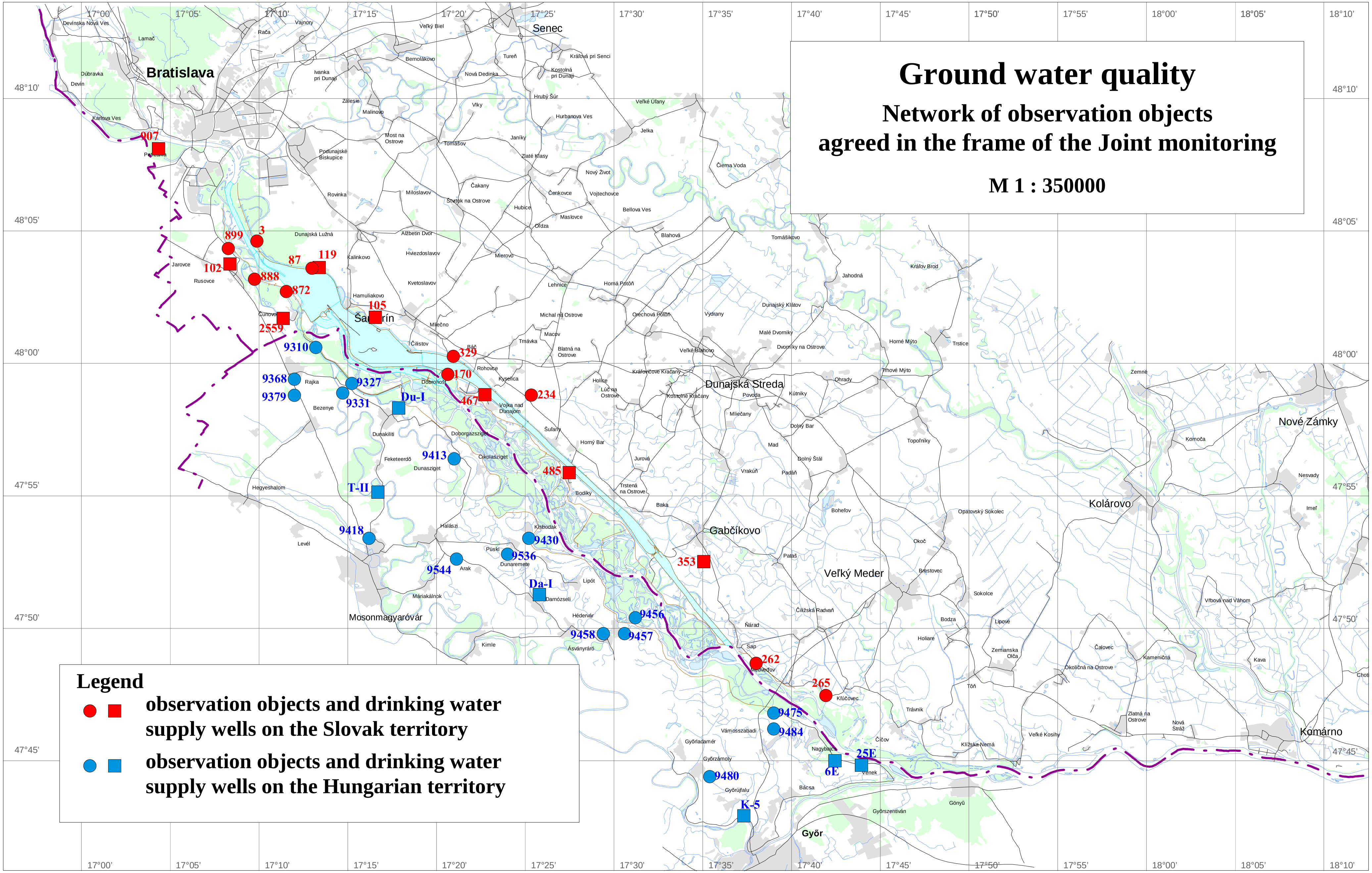
parameter	unit	limit value	highest limit value
temperature	°C	12	25
pH	-	6.5-9.5	
conductivity at 25 °C	$mS.m^{-1}$	250	
O_2	$mg.l^{-1}$	-	
COD_{Mn}	$mg.l^{-1}$	3	5
NH_4^+	$mg.l^{-1}$	0.5	
NO_3^-	$mg.l^{-1}$	50	
PO_4^{3-}	$mg.l^{-1}$	0.5	
Mn	$mg.l^{-1}$	0.05	
Fe	$mg.l^{-1}$	0.2	
Na^+	$mg.l^{-1}$	200	
K^+	$mg.l^{-1}$	10	12
Ca^{2+}	$mg.l^{-1}$	100	
Mg^{2+}	$mg.l^{-1}$	30	50
HCO_3^-	$mg.l^{-1}$	-	
Cl^-	$mg.l^{-1}$	250	
SO_4^{2-}	$mg.l^{-1}$	250	

Supplemental parameters – inorganic and organic micropollutants

parameter	unit	limit value	highest limit value
Inorganic micropollutants - heavy metals			
As	$\mu g.l^{-1}$		10
Cd	$\mu g.l^{-1}$		5
Cr	$\mu g.l^{-1}$		50
Cu	$\mu g.l^{-1}$	200	2000
Hg	$\mu g.l^{-1}$		1
Ni	$\mu g.l^{-1}$		20
Pb	$\mu g.l^{-1}$		10
Zn	$\mu g.l^{-1}$	200	3000
Organic micropollutants			
pesticides – sum	$\mu g.l^{-1}$		0.5
pesticides – individually	$\mu g.l^{-1}$		0.1
aldrin	$\mu g.l^{-1}$		$\Sigma \leq 0.03$
dieldrin	$\mu g.l^{-1}$		
heptachlor	$\mu g.l^{-1}$		0.03
heptachlor epoxide	$\mu g.l^{-1}$		0.03
trichloroethylene	$\mu g.l^{-1}$		$\Sigma \leq 10$
tetrachloroethylene	$\mu g.l^{-1}$		
DDT/DDD/DDE	$\mu g.l^{-1}$	1	5
HCH – sum	$\mu g.l^{-1}$		$\Sigma \leq 0.1$

HCH – hexachlorciclohexane

Fig. 4-1


Ground water quality
Network of observation objects
agreed in the frame of the Joint monitoring
M 1 : 350000
Legend
observation objects and drinking water supply wells on the Slovak territory
observation objects and drinking water supply wells on the Hungarian territory
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
907
899
3
102
888
87
119
872
105
2559
329
170
467
234
485
353
262
265
9310
9368
9379
9327
9331
Du-I
9413
T-II
9418
9430
9536
9544
Da-I
9456
9457
9458
9475
9484
6E
25E
9480
K-5

PART 5

Soil Moisture Monitoring

5.1. Data collection methods

Even in 2017 the soil moisture monitoring on the Slovak side was carried out without changes. Soil moisture content is measured on 20 monitoring areas (12 forest monitoring areas, 5 biological monitoring areas and 3 agricultural areas) by a neutron probe to the prescribed depth or to the depth of the groundwater level. The measurements are performed at 10 cm depth intervals and the soil moisture is expressed by the total soil moisture content in volume percentage. Monitoring of soil moisture on the Hungarian side is not carried out since 2013. By 2013, it was implemented on 14 monitoring areas (6 forest monitoring areas and 8 agricultural areas). The soil moisture was measured with a capacity probe up to a maximum depth of 3 m. Since no data are available for the current year, evaluation was not performed. The list of monitoring areas is given in **Table 5-1** and **5-2** and their situation is shown in **Fig. 5-1**.

5.2. Data presentation methods

The mode of soil moisture data presentation have not changed. The soil moisture content is displayed in figures showing the average volume percentage of moisture for the depth interval from 0 to 100 cm and from 110 to 200 cm. The measured soil moisture content at selected sampling sites is presented in colour charts with soil moisture time distribution for the entire monitoring period and for the entire measured depth. Monitoring data are comprehensively processed in the National Annual Reports on environmental monitoring and the graphical presentation of each monitoring site is given in Annexes.

Table 5-1: List of monitoring stations on the Slovak side

	Country	Station No.	Locality and position
1	**Slovakia**	**2703**	Dobrohošť, inundation area
2	**Slovakia**	**2704**	Bodíky, inundation area
3	**Slovakia**	**2705**	Bodíky, inundation area
4	**Slovakia**	**2706**	Gabčíkovo, inundation area
5	**Slovakia**	**2707**	Kľúčovec, inundation area
6	**Slovakia**	**2716**	Rohovce, agricultural area
7	**Slovakia**	**2717**	Horný Bar - Šuľany, agricultural area
8	**Slovakia**	**2718**	Horný Bar, agricultural area
9	**Slovakia**	**2755**	Sap, inundation area
10	**Slovakia**	**2756**	Gabčíkovo, inundation area
11	**Slovakia**	**2757**	Baka, inundation area
12	**Slovakia**	**2758**	Trstená na Ostrove, inundation area
13	**Slovakia**	**2759**	Horný Bar - Bodíky, inundation area
14	**Slovakia**	**2760**	Horný Bar - Šuľany, inundation area
15	**Slovakia**	**2761**	Horný Bar - Bodíky, inundation area
16	**Slovakia**	**2762**	Vojka nad Dunajom, inundation area
17	**Slovakia**	**2763**	Vojka nad Dunajom, inundation area
18	**Slovakia**	**2764**	Dobrohošť, inundation area
19	**Slovakia**	**3804**	Medveďov, inundation area
20	**Slovakia**	**3805**	Kľúčovec, inundation area

Table 5-2: List of monitoring stations on the Hungarian side
(since 2013 not observed)

	Country	Station No.	Location
1	*Hungary*	*T02*	*Halászi H15 – agricultural area*
2	*Hungary*	*T03*	*Dunakiliti 16 – agricultural area*
3	*Hungary*	*T04*	*Dunaremete – agricultural area*
4	*Hungary*	*T06*	*Rajka 0 – agricultural area*
5	*Hungary*	*T09*	*Püski P14 – agricultural area*
6	*Hungary*	*T10*	*Ásványráró A19 – agricultural area*
7	*Hungary*	*T11*	*Püski P5 – agricultural area*
8	*Hungary*	*T12*	*Lipót L18 – agricultural area*
9	*Hungary*	*T15*	*Hédervár 11B – forest stand*
10	*Hungary*	*T16*	*Dunasziget 22B – forest stand, inundation area*
11	*Hungary*	*T17*	*Dunasziget 15D – forest stand, inundation area*
12	*Hungary*	*T18*	*Lipót 4A – forest stand, inundation area*
13	*Hungary*	*T19*	*Ásványráró 27C – forest stand, inundation area*
14	*Hungary*	*T20*	*Dunakiliti 15E – forest stand, inundation area*

5.3. Evaluation of results on the Slovak side

Soil moisture on the Slovak side is observed at sites located in the inundation area and in the flood-protected agricultural area (**Fig. 5-1**).

Monitoring sites located in the agricultural area (No. 2716, 2717, 2718)

Monitoring sites that are located in the agricultural area are situated behind the derivation canal on the regularly farmed agricultural land. The soil moisture content on these sites throughout the observation period runs similarly and without major changes. Since 2004, a slight increase in soil moisture content has been observed, while the position and fluctuation of groundwater level remained mostly unchanged. However, a slight decrease of groundwater levels is apparent from 2011, what was reflected in a decline of soil moisture content, especially in the depth interval 1-2 m below the surface. In the last two years, the decline in soil moisture content more significantly appears also in the depth interval 0-1 m, what probably relates to the absence of larger and longer-lasting flood or discharge waves, that could cause rise in groundwater levels even at a greater distance from the Danube (**Fig. 5-2, Fig. 5-3**).

The groundwater level fluctuation in all three localities is fairly balanced. On the monitoring site No. 2716 the groundwater level usually fluctuates at a depth of 2.6 to 4.2 m, in 2016 it was from about 3.6 to 4.5 m. At site No. 2717 the groundwater level fluctuates at a depth of 2.0 to 3.5 m. However , in years without the occurrence of more significant discharge waves, as was the case in 2016, the groundwater level ranged only from 2.9 to 3.5 m (**Fig. 5-3**), which resulted in a more significant drying of the upper layers of the soil profile and hence also in fluctuation of the soil moisture content. The groundwater level at the site No. 2718 varies at a depth of 1.8 to 3.0 m, but at the beginning of 2014 it decreased to 3.3 m, which was the lowest level since starting the observation, and in 2016 it fluctuated from 2.7 to 3.2 m. The reason for a significant drop in groundwater levels, as seen in 2014, by the end of 2015 or in the second half of the year 2016, was the long-term low flow rates on the Danube, which moved well below the long-term average values.

As in the previous year, the fluctuation in soil moisture content in 2016 at both depth intervals were depended on climatic conditions. The groundwater level, even during discharges waves on the Danube, did not influenced the soil moisture in the layers to a depth of 2 m (**Fig. 5-3**).

The soil moisture values in the depth interval 0-1 m on the site No. 2716 mostly vary in the range between 5 to 20 %, in 2016 it was from 6 to 22 %. Values on location No. 2717 usually fluctuate between 20 and 30 %, in 2016 they varied between 17 and 32 %. The soil moisture content at the site No. 2718 mostly reaches values between 23-38 %, in 2016 it was from 20 to 36 % (**Tab. 5-5**). As in the previous year, the soil moisture content at these sites started at relatively high level in the winter period. However, unlike the previous year, due to precipitations in January and especially in February, which were also supported by a higher discharge wave at the beginning of the month, the soil moisture content increased significantly and achieved the highest values in 2016. However, already during March, when only minimal amount of rainfall fell in the entire area and also the flow rates in the Danube declined significantly, the soil moisture content began to decline rapidly. The decrease in the soil moisture content practically continued continuously until the end of autumn. Only in periods with precipitations above the average in the first half of May and in July, the continuous decline in soil moisture was interrupted by its slight increase. The minimal values occurred mostly during October. In the uppermost soil layer the soil moisture content began to rise continuously in the second half of October and during November, when above average precipitation amount fell in the whole area. The last month in 2016, however, was extremely dry in terms of precipitation, which was unfavourable for the creation of soil moisture reserves. The soil moisture content on most monitoring areas at the end of the year was lower than at its beginning.

In the depth interval between 1 and 2 m, the soil moisture values are more balanced. On the monitoring site No. 2716 they usually vary from 12 to 20 %, in 2016 were in the range from 12 to 18 %. On the monitoring site No. 2717 they mostly reach 28 to 37 %, in the year 2016 fluctuated from 21 to 27 %. On the monitoring site No. 2718 they usually range from 16 to 30 %, in the year 2016 ranged from 8 to 18 % (**Tab. 5-5**). Maximal soil moisture values at all three locations occurred at the end of February or early March, as in the higher soil layers. However, the decline since the beginning of the vegetation period continued almost without interruption until the end of the year. Only during the discharge wave in July it slightly increase, but in the second half of the year, due to flow rates on the Danube prevailingly below the average, the soil moisture content continued to decline and the minimal values were recorded in November and December.

Table 5-5: The minimal and maximal average soil moisture contents at agricultural monitoring sites

Monitoring site	Layers down to 1 m depth		Layers between 1-2 m depth	
	minimum [%]	maximum [%]	minimum [%]	maximum [%]
2716	6.23	21.64	11.94	16.31
2717	16.89	31.65	21.31	26.38
2718	20.86	35.62	8.22	18.03

Monitoring sites located in the inundation area (No. 2703-2707, 2755-2764, 3804, 3805)

The soil moisture in the inundation area, in addition to the groundwater level and precipitations, is highly dependent on natural or artificial floods. Since no flood or significant discharge waves occurred in the last three years, this has been reflected in a significant decline in moisture content in the soil, especially at sites that were previously influenced by ground water level. In 2016, the creation of soil moisture reserves was affected mainly by rainfall in the first two months of the year and a relatively large discharge wave at the beginning of February. Thanks to this, relatively good conditions for the start of vegetation were created before the growing period. In some locations, especially in the upper part of the inundation, the highest soil moisture content occurred in February. Since March, the soil moisture content began to decline and at locations in the upper and middle part of inundation it declined almost continuously until the end of autumn, in deeper layers until the end of the year. On locations near the Danube, the increase of discharge into the Danube old riverbed during the artificial flooding in the right-side river branch system at the turn of April and May, was reflected. An interruption of the soil moisture content decline occurred during the July discharge wave, when the increased groundwater level moisturized the soil layers, especially in the depth interval of 1-2 m, but heavy rainfall contributed to the increase of soil moisture content also in the upper layers. of the soil. On the monitoring sites in the lower part of the inundation in the Istragov area and below the confluence of the tail-race channel and the Danube old riverbed (No. 2706, 2707, 2755, 2756, 3804 and 3805), the series of June discharge waves and the July discharge wave were reflected in significant increase of soil moisture, some locations and lower situated sites were also flooded for a short time in July. In the depth interval of 1-2 m, the soil moisture content was influenced also on monitoring sites upstream of the estuary of the river branch system into the Danube old riverbed (No. 2756, 2757 and 2758). The development of the soil moisture content at the end of the year was different in both depth ranges. While in the depth interval of 0-1 m the soil moisture content increased due to relatively rich precipitations, especially in the second half of October, the soil moisture in the depth range of 1-2 m did not changed significantly until the end of the year. At sites in the upper part of the inundation the lowest values of soil moisture content occurred at the end of September and during October. The precipitations in the second half of October and in November in the uppermost layers of soil were reflected in rise of moisture, but the soil moisture content at the end of the year was lower than at its beginning. In the lower part of the inundation, the soil moisture content in the depth interval of 1-2 m was very low at the beginning of the year, which was related to low flow rates and precipitations below the average at the end of year 2015, and the lowest values were recorded. Maximal values on these locations occurred in June and July and were related with passing of discharge waves. With the decrease of flow rates in the Danube at the end of the year, the soil moisture content also decreased, only after the precipitations in the second half of October and in November the moisture in the uppermost part of the soil profile increased slightly again. In general, the soil moisture content at the end of the year was slightly higher in this area than at its beginning.

The thickness of soil profile in the upper part of the inundation area is low (monitoring sites No. 2703, 2764, 2763, 2762 and 2761), similarly as on the Hungarian side. The groundwater level at these locations fluctuates only in the gravel layer. In 2016 the groundwater level on area No. 2703 fluctuated from 3.2 to 5.1 m. On areas No. 2764, 2763, 2762 and 2761 the groundwater level ranged from 2.2 to 4.8 m. Layers to 1 m depth are almost exclusively dependent on climatic conditions. Only high flood waves can influence the soil moisture content by increasing the groundwater level. Layers below 1 m depth are also mostly dependent on climatic conditions, but the bottom part of this depth range may be slightly influenced by discharge waves. Maximal average soil moisture contents in both depth intervals occurred at the beginning of the year, at the end of February and in deeper layers during March. Minimal average soil moisture contents in the depth interval 0-1 m occurred in September and October, while in the depth interval 1-2 m they were recorded during November and December.

The thickness of the soil profile in the middle part of the inundation area is higher. In general, the groundwater regime in this area is influenced by water supply to the river branch system introduced in May 1993. Moreover, natural floods or discharge waves have significant impact on groundwater level. The groundwater level in 2016 fluctuated slightly above or around the boundary between the soil profile and gravel layers - monitoring sites No. 2704, 2705, 2757, 2758, 2759 (**Fig. 5-5**) and in the first half of the vegetation period partially supplied the soils with water. During the year the groundwater level on area No. 2704 fluctuated from 2 to 4 m. On areas No. 2757, 2758, 2759 and 2760 it mostly ranged from 1.7-3.6 m (**Fig. 5-4a, Fig. 5-5**). Maximal values of average soil moisture content in the layer down to 1 m depth occurred at the end of February, while in the depth from 1 to 2 m, which was influenced also by the increased discharge into the Danube old riverbed during artificial flooding in the right-side river branch system, the maximal values occurred at the beginning of May. Minimal values in the layer to a depth of 1 m. were registered already at the end of September, in the layer below 1 m depth it was at the beginning of the year (**Fig. 5-4b**). Different situation is on the area No. 2705, where the groundwater level fluctuates near the surface. Minimal soil moisture value in the depth to 1 m below the surface occurred at the beginning of October, in the depth from 1 to 2 m it was at the end of March, however the differences between the individual values are very small. Maximal value in the uppermost layer occurred at the beginning of the year, in dept below 1 m it was in September.

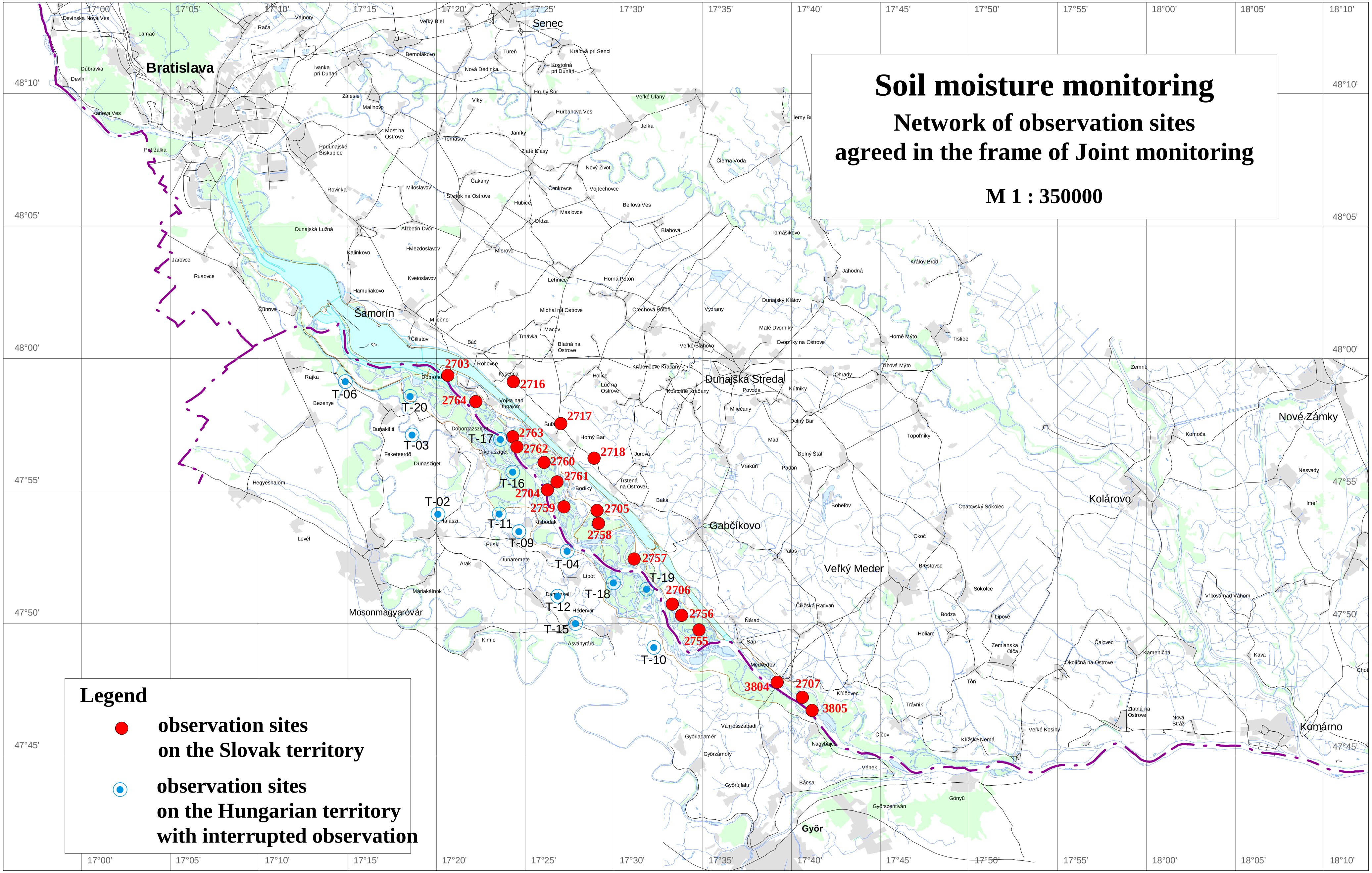
In the lower part of the inundation area, downstream of confluence of the river branch system and the Danube old riverbed (monitoring sites No. 2706, 2756, 2755), the groundwater level usually fluctuates around the boundary between the soil profile and gravel layer (**Fig. 5-6a**). The groundwater level in 2016 fluctuated in the depth between 0.8 and 4.5 m, but during discharge waves in February and July the area upstream the confluence of the Danube old riverbed and the tail-race channel was flooded for a short time. Similarly, in the same time, depressions in the lower part of the floodplain were flooded by the increasing ground water. Like in the last year, the soil moisture during the second half of the year, due to low flow rates in the Danube, was dependent only on precipitations. Similarly as on other locations, the precipitations at the beginning of the year and the discharge waves in February have created favourable conditions for the start of vegetation before the growing season. From March to May the soil moisture content decreased relatively rapidly, due to the lack of precipitations and due to the low flow rates in the Danube. The remarkable replenishment of soil moisture occurred during the series of discharge waves in June and especially during the July discharge wave, when part of this area was flooded. In the second half of the year, the soil moisture values continuously decreased and during October reached the lowest values. Precipitations in the second half of October and in November contributed to the re-creation of reserves, but the slight increase in the soil moisture content occurred mainly in the upper part of the soil profile. In the lower part of the soil profile the soil moisture content remained relatively low, as the flow rates in the Danube remained below the long-term average values,. Maximal values occurred in February and July (**Fig. 5-6a,b**).

The soil moisture contents at monitoring sites No. 2707, 3804, 3805, that are located in the inundation below the confluence of the tailrace canal and the Danube old riverbed, are highly influenced by the flow rate regime in the Danube. The development of soil moisture values over the year was similar as on the previous locations. Maximal average values in 2016 in both depth intervals occurred after the discharge waves in February or in July. The lowest values in the depth to 1 m were recorded at the beginning of October, in the layer from 1 to 2 m it was at the beginning of the year. The groundwater level at monitoring sites No. 2707, 3804 and 3805 fluctuated in the depth 1.0-4.5 m, but during the discharge waves the groundwater level rose to 0.2 m below the surface. The riverbed erosion negatively affects also these monitoring areas. During low flow rates in the Danube, as it was during the second half of the year, the groundwater level does not supply the soil profiles sufficiently.

Table 5-6: The minimal and maximal average soil moisture contents at monitoring sites in the inundation area

Monitoring site	Layers down to 1 m depth		Layers between 1-2 m depth	
	minimum [%]	maximum [%]	minimum [%]	maximum [%]
2703	8.34	29.63	10.20	21.59
2704	11.94	31.01	16.97	23.97
2705	40.16	47.58	41.91	48.70
2706	13.62	24.93	11.84	33.49
2707	9.15	16.74	11.37	27.69
2755	23.86	43.21	5.63	43.25
2756	18.74	28.73	23.50	46.81
2757	26.07	35.40	12.69	36.45
2758	35.72	41.45	14.43	39.89
2759	17.70	27.14	28.82	33.02
2760	12.78	32.78	9.21	13.87
2761	9.87	28.91	5.76	7.53
2762	15.33	35.80	11.94	25.36
2763	5.93	24.15	3.40	6.85
2764	11.35	33.04	6.11	8.26
3804	29.91	42.98	26.78	48.31
3805	28.55	40.25	12.89	40.80

Fig. 5-1


Soil moisture monitoring
Network of observation sites
agreed in the frame of Joint monitoring
M 1 : 350000
Legend
observation sites
on the Slovak territory
observation sites
on the Hungarian territory
with interrupted observation
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
2703
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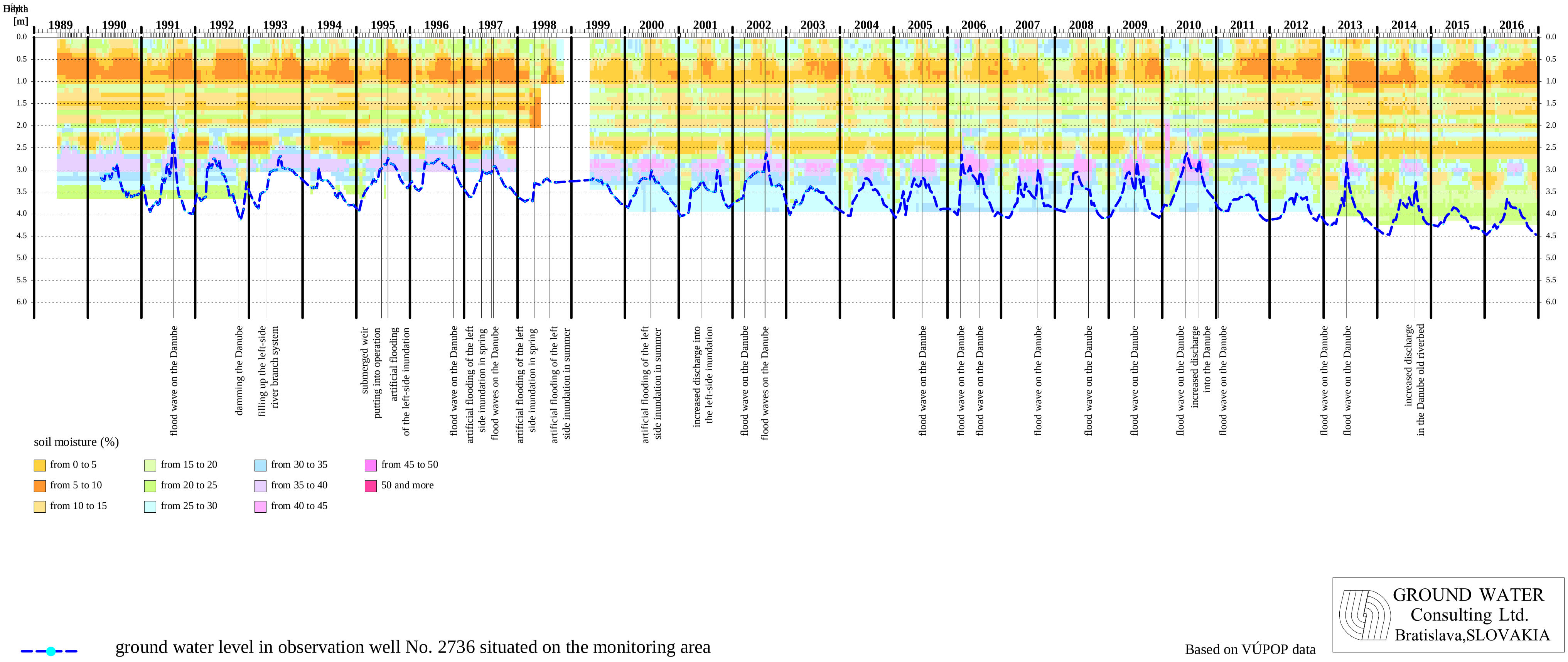
T-10

Fig. 5-2

Soil moisture monitoring

Locality: **2716 - Rohovce, MP-4**



Based on VÚPOP data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-3

Soil moisture monitoring

Locality: **2717 - Horný Bar - Šul'any, MP-5**

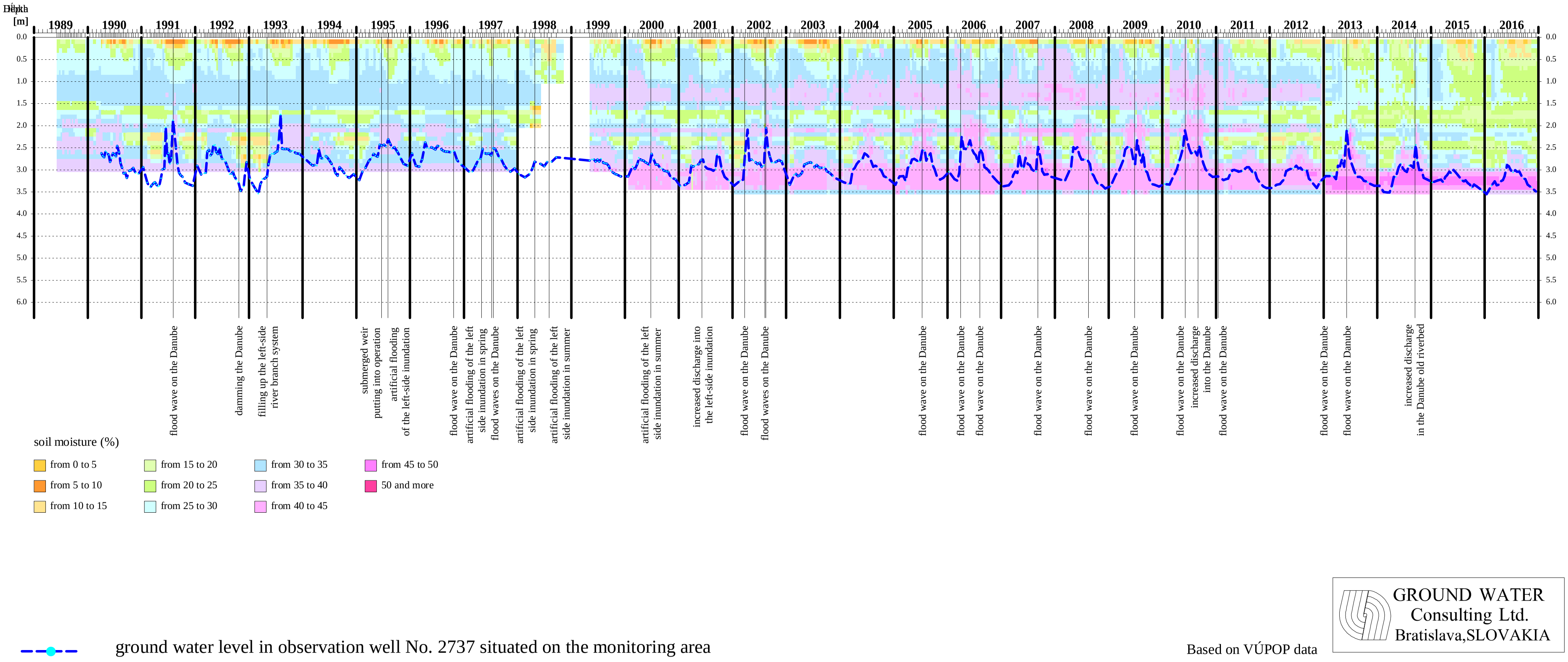


Fig. 5-4a

Soil moisture monitoring

Locality: **2760 - Horný Bar - Šuľany, L-8**

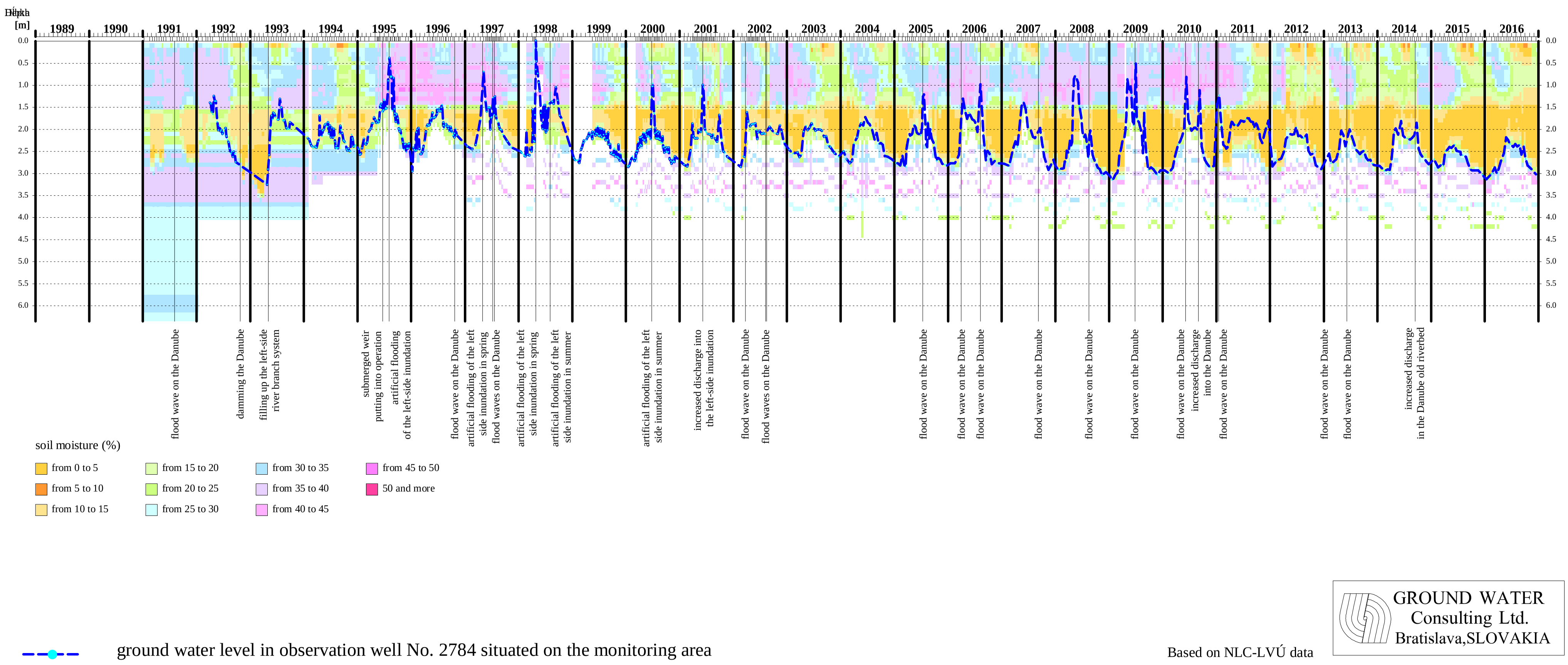
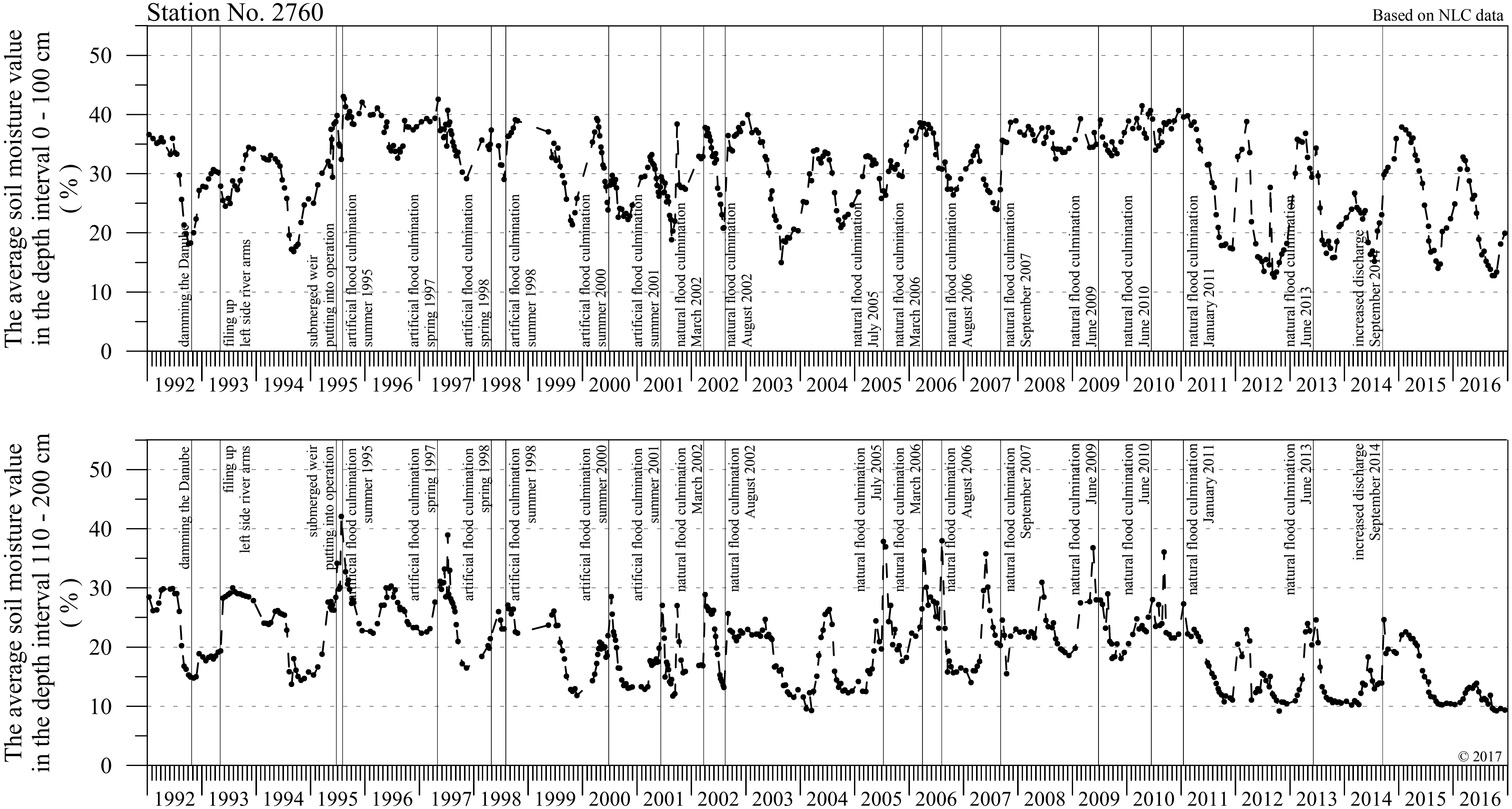


Fig. 5-4b **Soil moisture**

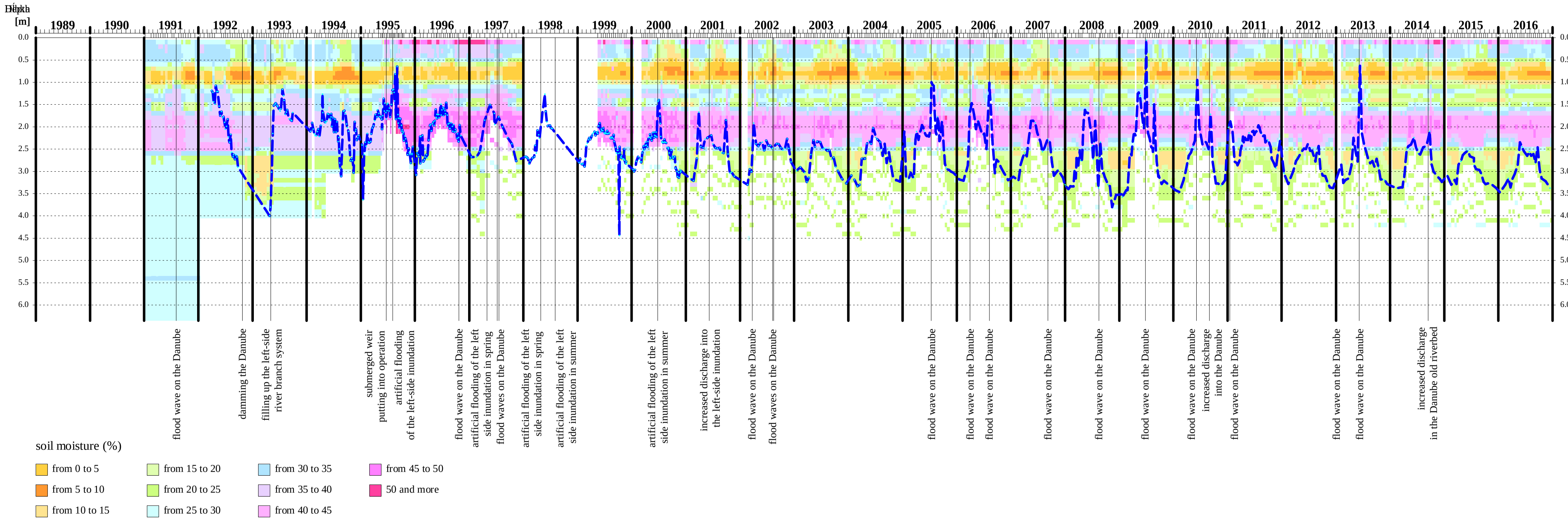


GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA

Fig. 5-5

Soil moisture monitoring

Locality: **2759 - Horný Bar - Bodíky, L-7**



ground water level in observation well No. 2783 situated on the monitoring area

Based on NLC-LVÚ data

GROUND WATER Consulting Ltd. Bratislava, SLOVAKIA

Fig. 5-6a **Soil moisture monitoring**

Locality: **2755 - Sap, L-3**

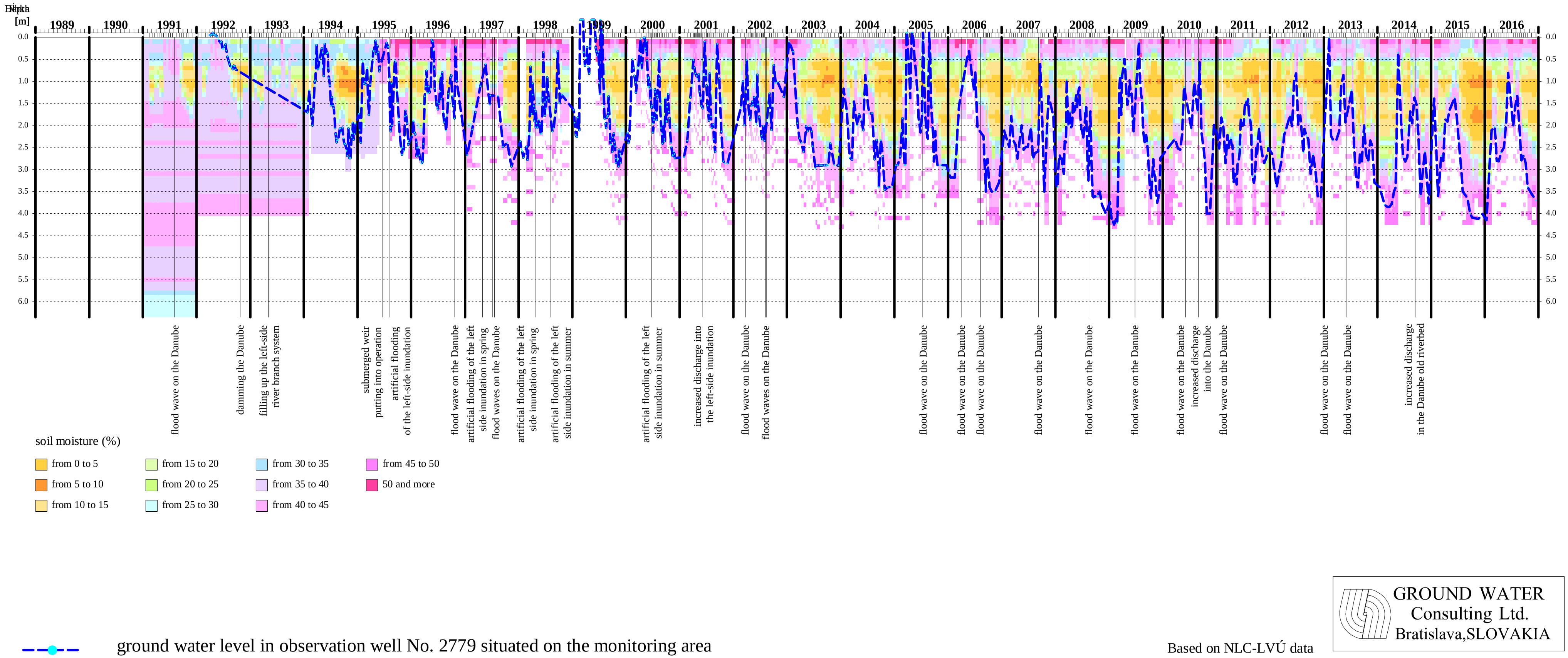
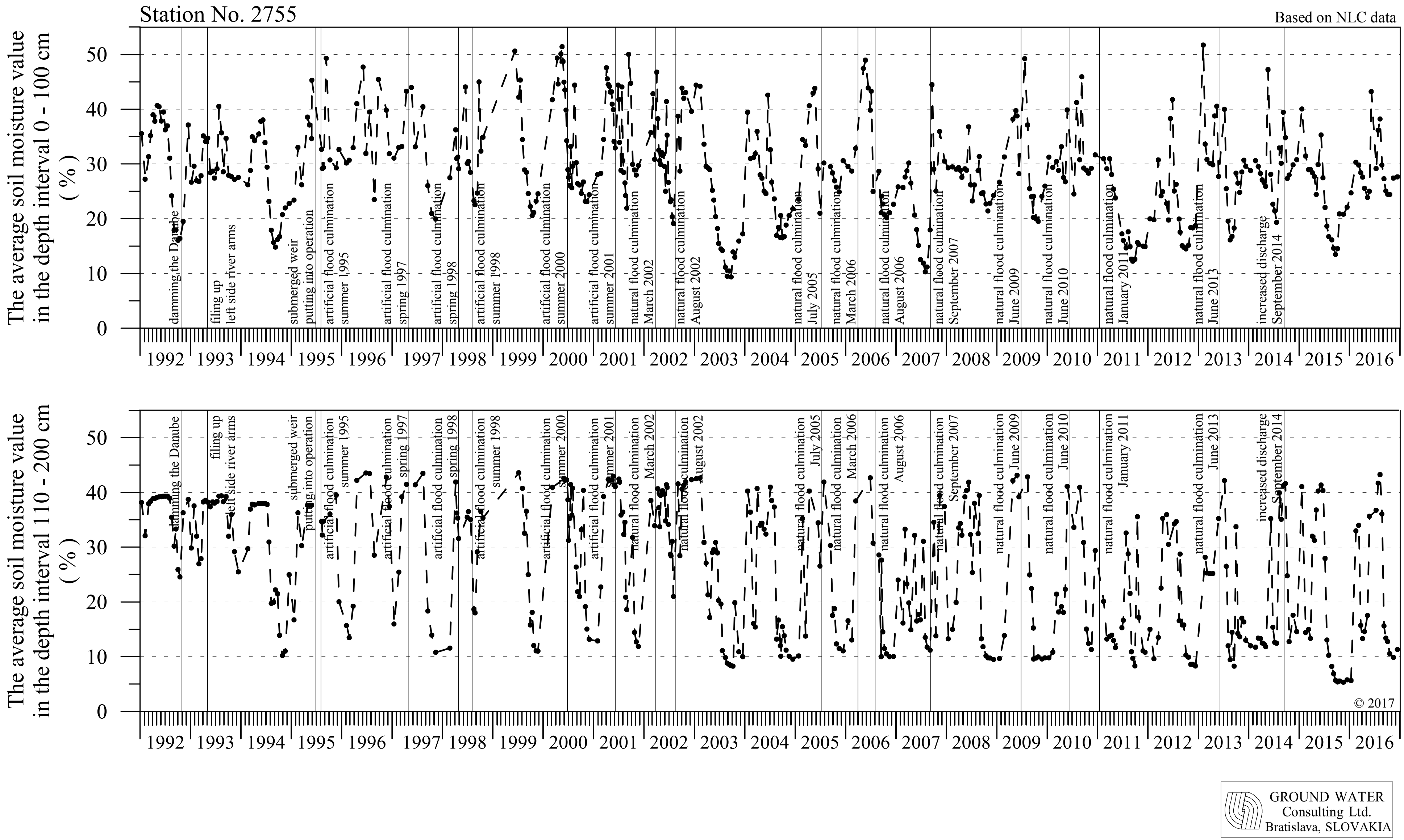


Fig. 5-6b

S o i l   m o i s t u r e



PART 6

Forest Monitoring

The development of forest stands, as well as plant and animal communities evaluated in Part 7 - Biological Monitoring, are also influenced by hydrological and climatic conditions. In the year 2016 they were relatively favourable and their brief characteristics are as follows:

- In terms of water richness, the year 2016 was assessed as moderately rich, the flow rate regime of the Danube had approached a typical course. The discharge waves that occurred during the year did not caused significant flooding of the floodplain. The exception was a partial flooding of depressions in the Ásványi river arm system and the lower part of the Istragov area and the Bagoméri river arm system in February and especially in mid July.
- The development of the soil moisture content was favourable at the beginning of the year, large amount of precipitations and the discharge wave in February provided a good basis for the start of the vegetation period. However, the following months were characterized by a rather intensive decrease in the soil moisture content, which was interrupted shortly due to precipitations in mid-May. More lasting supply and renewed increase of the soil moisture content caused the extraordinary rainfall totals in July supported with higher discharge wave. Subsequently, however, the soil moisture content declined further until the end of autumn. Re-creation of soil moisture reserves was induced by the above-average precipitations in October and November.
- In the assessed year, unusual spatial distribution of precipitation sums was registered in the observed area. The total amount of precipitation in the upper part of Žitný ostrov was average, in the middle part it was above the average and the lower part of Žitný ostrov was characterised by exceptionally high precipitation totals. The rainfall distribution in time during the year was fairly favourable. Growth of vegetation was favourably affected by the above-average precipitations during May and early June. The precipitation totals in July were more than twice of the long-term average. The following months were relatively dry or even exceptionally dry (end of September). Precipitations in October and November had little impact on the development of vegetation.
- In terms of the average daily air temperatures the year 2016, like the previous years, was thermally above the normal. However, compared to the previous year, there did not occurred extremely high average daily temperatures, nor longer extremely hot periods. The adverse effect of high temperatures on vegetation in summer months was dampened by abundant precipitations, in July significantly above the average.

6.1. Evaluation of the Slovak territory

All monitoring sites on the Slovak side are located in the inundation area. The list of monitored sites is given in **Table 6-1** and their situation is shown in **Fig. 6-1**. In accordance with the intergovernmental Agreement the Slovak Party also in the year 2016 observed the development of basic growth parameters, weekly girth growth and the health state of trees by terrestrial way. Aerial imagery of the health state of forest stands is carried out in three-year intervals, in the evaluated year was not carried out.

In the Slovak inundation area the most productive cultivated poplar stands are monitored. The Pannonia poplar clone on all monitoring areas in the present had already replaced the originally observed clones of I-214 and Robusta, as well as the white willow stand. On two substitutive areas the weekly girth growth on the poplar clone I-214 are temporarily observed.

Table 6-1: List of the forest monitoring areas on the Slovak side

Area No.	Area label	River km	Locality	Tree species	Age of trees
2681	L-3	1812	Sap	poplar - *Populus x euroamericana Pannonia*	14
2682	L-4	1816	Gabčíkovo	poplar - *Populus x euroamericana Pannonia*	9
2683	L-5	1821.5	Baka	poplar - *Populus x euroamericana Pannonia*	10
2684	L-6	1824.5	Trstená na Ostrove	poplar - *Populus x euroamericana Pannonia*	13-(15)
2685	L-7	1828.5	Horný Bar – Bodíky	poplar - *Populus x euroamericana Pannonia*	18
2686	L-8	1831.5	Horný Bar – Šuľany	poplar - *Populus x euroamericana Pannonia*	11
2687	L-9	1830	Horný Bar – Bodíky	poplar - *Populus x euroamericana Pannonia*	17
2688	L-10	1834	Vojka nad Dunajom	last unsuccessful reforestation in 2008	-
5573	L-10a*	1834	Vojka nad Dunajom	poplar - *Populus x euroamericana I-214*	cca 23
2689	L-11	1834.5	Vojka nad Dunajom	poplar - *Populus x euroamericana Pannonia*	(15)-17
2690	L-12	1838	Dobrohošť	last unsuccessful reforestation in 2006	-
4436	L-12b*	1838	Dobrohošť	poplar - *Populus x euroamericana I-214*	cca 44
3802	L-25	1806	Medveďov	poplar - *Populus x euroamericana Pannonia*	22
3803	L-26	1803	Kľúčovec	poplar - *Populus x euroamericana Giant*	20

* - on substitutive areas marked by letters “a” or “b” only temporary measurement of weekly girth growth is carried out

The development of forest stands under relatively favourable hydrometeorological conditions did not go beyond the trend of previous years.

The height increment quality classification in the majority of observed stands remains basically stable or shows only slow changes. A substantial part of the stands is characterized by intense or moderately intense growth. On the area No. 2687 a gradual long-term improvement of the height increment occurs. The opposite trend, which had been recorded on the area No. 2682 was interrupted, but in the actual year it has been registered again. From the point of view of the development of the annual thickness increment it can be pointed to the unusually high increments of stands on areas No. 2683 and 2684 that were recorded in last two years. Significant intensification of thickness increment of the poplar stand is registered in last two years also on the area No. 2682, after implementation of forestry interventions.

The weekly girth growth measurements in young Pannonia poplar stands (monitoring areas No. 2681, 2683, 2684, 2686) have been started in 2011. The cumulative girth growth values of young poplars are rather low during the whole observation period. Increased values of this parameter in the assessed year were recorded on areas No. 2683 and 2684, but not on all three observed trees. The weakest thickness increment is shown on the area No. 2686. On the substitutive areas No. 5573 and 4436, after a decline in the last year, a slight increase in cumulative increment values was recorded in the assessed year.

An unambiguous growth peak could not be identified on poplars on the most of observed areas. Nor in the case of lower growth peaks it was possible to determine the unambiguous effect of certain hydrometeorological conditions. In general, however, it can be concluded that the growth of poplars in the actual growing period was more stable and more intense in the first summer months, at the end of summer basically on all areas it significantly slowed down.

Probably due to the relatively favourable distribution and plenty of precipitation, as well as the absence of exceptionally warm and dry periods, the occurrence of zero weekly girth growth occurred expressly occasionally (at the end of August). Compared to the previous year, this development can be seen as positive.

The length of the growing season in the evaluated year was average. The initiation of growth on areas was recorded by mid-April. The majority of stands already during August had slower growth, during September only minimal increments having been recorded and the end of the growing period of all trees was dated at the end of month.

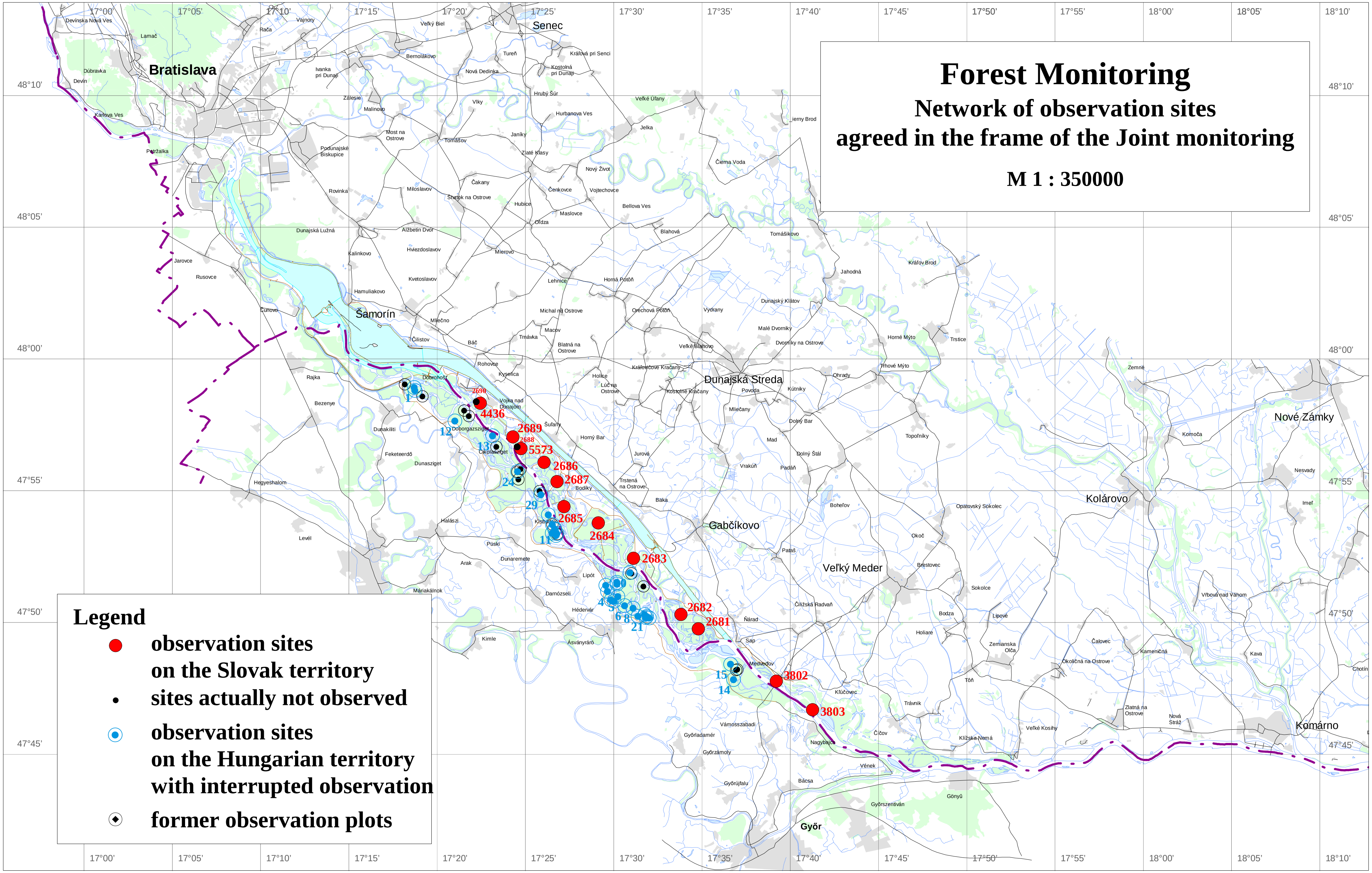
The observed cultivated poplar stands (Pannonia and Giant clones) were without changes healthy and vital. It is still observed only sporadic infestation of trees by diseases and pests. Due to the presence of more humid summer climatic conditions overall increase of spreading of two fungal diseases along with retreat of leaf and technical pests has been registered on most areas in the assessed year.

At the end it is necessary to point out the need for efficient use of the existing weirs in the river arm system to mitigate the effects of the groundwater level decline and to ensure regular artificial flooding of the area especially during periods of long-lasting drought. The significant effect of increased water levels in the river arm system was also confirmed by results over flow rate calibration measurements performed in the river arm supply system during August. Permanent solution would be the increase of water level in the Danube old riverbed by submerged weirs. The unfavourable impact of lower groundwater levels from the point of view of the development of forest stands was less appreciable in the assessed year due to the more favourable meteorological conditions.

6.2. Evaluation of the Hungarian territory

The monitoring of forest stands in the Szigetköz area was not carried out in 2016.

Fig. 6-1


Forest Monitoring
Network of observation sites
agreed in the frame of the Joint monitoring
M 1 : 350000
Legend
observation sites
on the Slovak territory
sites actually not observed
observation sites
on the Hungarian territory
with interrupted observation
former observation plots
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Győr
2690
4436
2689
2688
5573
2686
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18°00'
18°05'
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47°55'
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47°45'

PART 7

Biological Monitoring

Monitoring of agreed groups of plants and animals in the year 2016 was performed only on the Slovak territory. The Hungarian side has not realized the monitoring, similarly as in 2012, 2014 and 2015. The monitoring on the Slovak side is performed on six complex monitoring areas, their position is displayed on **Fig. 7-1**. The list of observed groups of plants and animals is given in **Table 7-1**.

Table 7-1: The list of monitoring areas and monitoring sites

No.	Name	Id	Locality	Monitored groups									
								Macrozoobent.				Zoopl.	
				A	B	C	D	E	F	G	H	I	J
Slovak side – complex monitoring areas													
1	B-6	2600	Dobrohošť – Dunajské kriviny	●		●	●	●	●	●		●	●
2	B-9	2603	Bodíky – Bodícka brána	●	●	●	●	●	●	●		●	●
3	B-10	2604	Bodíky – Kráľovská lúka	●	●	●	●	●	●	●		●	●
4	B-14	2608	Gabčíkovo – Istragov	●	●	●	●	●	●	●		●	●
5	B-15	2609	Sap – Erčéd	●			●						
6	B-18	2612	Kľúčovec – Sporná sihoť	●	●	●	●	●	●	●		●	●
Hungarian side – monitoring sites (in the years 2012, 2014, 2015 and 2016 monitoring suspended)													
1	*28a*	*B-01*	*Dunasziget – oak forest*	-									
2	*28b*	*B-02*	*Dunasziget – meadow*	-									
3	*31*	*B-03*	*Halászi – oak forest Derék*	-									
4	*30*	*B-04*	*Lipót – poplar forest, Gombócos closure*	-									
5	*4*	*H-04*	*Dunasziget – Schisler dead arm*		-	-						-	-
6	*5*	*H-05*	*Zátonyi Danube*									-	-
7	*5, 6*	*H-06*	*Lipót – Lipóti marsh*		-	-						-	-
8	*7*	*H-07*	*Danube, rkm 1828*		-								
9	*8*	*H-08*	*Zátonyi Danube*		-								
10	*9*	*H-09*	*Dunasziget – Csákányi Danube*		-	-						-	-
11	*10*	*H-10*	*Danube, rkm 1833*			-							
12	*2, 11*	*H-11*	*Danube, rkm 1839*		-	-							
13	*12*	*H-12*	*Gázfűi Danube, rkm 28.5*			-							
14		*F-26*	*Dunaremete-Pálfi island, forest, river arm*				-	-					
15		*F-27*	*Rajka – forest Felső*				-						
16		*F-28*	*Novákpuszta –alder forest*				-						
17	*22*	*F-31*	*Lipót – Zsejkei canal*						-				
18	*20*	*F-35*	*Mosonmagyaróvár – Mosoni Danube*						-				
19	*17*	*F-17*	*Arak – Nagy Kerek, alder forest*					-					
20	*19*	*F-19*	*Danube, rkm 1824*				-						
21		*F-N3*	*Arak, Nováki canal*						-				
22		GAZ	Gázfűi Danube, Galambos		x					x			
23		MOS	Mosoni Danube, Szilos		x					x			

● – data provided according to the Agreement x – evaluation according to WFD methodology
- – observation not realized, monitoring suspended

Legend: A - Phytocoenology (Braun-Blanquet)
B - Macrophytes (according to Kohler and Braun-Blanquet as well)
C - Fish (Osteichthyes)
D - Terrestrial Molluscs (Gastropoda)

E - Aquatic Molluscs (Mollusca)
F - Dragonflies (Odonata – aquatic larvae on the Slovak side + flying imagines as supplement)
G - Mayflies and Caddisflies (Ephemeroptera and Trichoptera - aquatic larvae on the Slovak side + flying imagines as supplement)
H - other groups of macrozoobenthos according to the WFD requirements
I - Cladocerans (Cladocera)
J - Copepods (Copepoda)

Considering, that similarly as in the year 2015 the Hungarian party did not provided any data from biological monitoring, evaluation of the Hungarian territory in 2016 was not carried out. A short description of climatic and hydrological conditions in the evaluated year, which influenced the development of observed groups of fauna and flora is given in Part 6 – Forest Monitoring.

7.1. Phytocoenology

The left-side river branch system

On the area No. 2600 community of the driest type of floodplain forest occur, in which slight positive changes can be observed in last four years after the revitalization interventions (the peripheral arm and the central depression are permanently supplied with water from the Dobrohošť canal). In the evaluated year slow disintegration of the poorly developed tree layer continued to be registered. Under it there is a well developed shrub layer, which give the character of the stand. In the dense herb layer, consisting mainly of nitrophilous species, the synanthropic species, which emerged after disruption by revitalizing works, continued in retreating according to the assumptions. However, the similar tendency show also the more moisture-demanding species, while the wetland species absent. The occurrence of the invasive species is still insignificant.

The impacts of forest management interventions (cutting of the shrub layer) carried out on the monitoring area No. 2603 in previous years are already negligible. The coverage of the particular layers basically stagnates. In terms of the herb layer species composition it can be stated the persistent dominance mainly of nitrophilous species, as well as the absence of hygrophilous species. The significant presence of the invasive woody plant, especially in the shrub layer, is considered to be unfavourable, at the same time it is present also in the other two layers.

The monitoring area No. 2604 is characterized by a stabilized willow stand. Willows were again favourably supplied with moisture and the shrub layer remained negligible. In the spring a developed hygrophilous herb layer was also registered, but during the summer it was affected by stronger light after clearing the neighbouring stand. There was a lush development of undemanding synanthropic and also invasive species, while the absence of hydrophytes vegetation has been registered already for the second year.

The woody vegetation on the monitoring area No. 2608 is created by young poplars, whose coverage increases only slowly. Slightly higher is the coverage of the shrub layer, which consists of lower poplars and especially of shoots of native trees and shrubs. In the dense herb layer the original nitrophilous species continue to consolidate their position, and alongside this in the assessed year the presence of rare snowflake (*Leucojum aestivum*) and hydrophytes were not registered, on the contrary, the coverage of the invasive plant has increased.

The tree layer on the monitoring area No. 2609 is created by young poplars, that reach relatively high coverage. The coverage value, after breaking of several specimen by a summer storm, dropped slightly. The shrub layer has long been missing on this area, but in the assessed year the shoots of the wind broken trees appeared in it. The developed herb layer in the stabilised stand was again formed by the monodominant aster (*Aster lanceolatus*), which was slightly thinned after stronger light got into the stand. These places were occupied by huge bunch of hydrophytes. Populations of invasive plants have been eliminated by the flooding.

The species composition, as well as the coverage values of the particular layers on the area No. 2612 are at similar level in recent years. Like in the last year, the coverage value of the herb layer and also the number of species decreased at the end of the summer. In the undergrowth the original nitrophilous herbs continue to dominate, but in all three layers the invasive woody plant achieves rather significant spreading.

The right-side river branch system

Phytocoenological observations were not carried out.

7.2. Terrestrial molluscs

The left-side river branch system

Compared to the previous year the terrestrial mollusc's communities on areas No. 2600, 2603, 2604 and 2612 did not show significant changes. On areas No. 2608 and 2609 currently regeneration of malacocoenoses going on after a strong anthropic intervention.

The malacocoenosis on the area No. 2600 still has a character of the driest type of soft (or transitional) lowland forest. Its structure is stable with slight inter-annual fluctuations; in recent years an euryoecious representative, along with high portion of forest mesohygrophilous and euryhygric species, dominates. It is true, however, that in terrain depressions hygrophilous species survive for a long period, some of which have reached increased abundance in the assessed year. Probably due to a greater distance and higher position of the location, the effects of revitalization interventions in the malacocoenosis have not yet been demonstrated.

The terrestrial malacocoenosis on the area No. 2603, which is observed in a young poplar stand, is profiled into a taxocoenosis of dryer type soft lowland forest. The hygrophilous species, that dominated after the flood in 2013, later receded and currently dominates together with mesohygrophilous representatives. The terrestrial malacocoenosis on the area No. 2604 continues to have a significant wetland character. It represents the wettest variant of a floodplain forest, with high species richness and dominance of forest hygrophilous and polyhygrophilous species, along with the presence of rare and scarce wetland species.

The malacocoenoses on areas No. 2608 and 2609 are significantly affected by the clear-cut of forest stands in previous years. Their development at present reflects the impacts of forest management interventions and the subsequent regeneration of vegetation, not the possible changes in moisture conditions in the area. Signs of the malacocoenosis degradation on the area No. 2608 are significant even after eight years after the reforestation of the area. In the malacocoenosis the euryecious and mesohygrophilous species dominate, but under the influence of the closure of stand increase of the abundance of forest hygrophilous representatives and retreat of light demanding species already occurs. However, reappearance of hygrophilous species continues not to be observed. Regeneration of malacocoenosis was not recorded either after the flood in 2013, or after the revitalization measures (the supplied amount of water is still insufficient). Despite this, it is expected that the community can recover in 5-10 years. The situation in terrestrial malacocoenosis on the area No. 2609 since the strong flood in 2013 appears to be much more favourable. Moisture-demanding pioneer species, that were floated here, have settled, and at present they have dominant representation. In the assessed year polyhygrophilous species also appeared in the community. At the same time the abundance of the previously dominant forest steppe species decreased (also due to increasing shading of the stand). It can be stated that the hygrophillic to polyhygrophillic structure of the community is being gradually recovered.

The malacocoenosis on the area No. 2612, due to regular flooding, in long-term consists of mixture of hygrophilous, mesohygrophilous and euryecious species. The dominant position in the assessed year was achieved by hygrophilous species, the abundance of polyhygrophilous species was increased.

The right-side river branch system

The monitoring of terrestrial molluscs was not carried out.

7.3. Aquatic macrophytes

The Danube and the right-side river branch system

The observation of macrophytes in the Danube old riverbed was carried out only on Hungarian monitoring sites No. 2 (at rkm 1839) and No. 7 (at rkm 1828), but the monitoring of these sites has been suspended since 2011.

The left-side river branch system

Usually rich vegetation in the through-flowing river arm on the area No. 2603 have been decimated by the strong flood in the year 2013. The development of macrovegetation was weak in the following years, macrophytes at present are richer in species and abundance. The vegetation consisted mainly of hydrophytes with persistent presence of rare species.

The development of aquatic vegetation in the dead arm on the area No. 2604 proceeded mostly in aquatic environment. Thanks to the favourable water stage hydrophytes have developed significantly again, but populations of wetland plants remained also preserved. This area is still rich in scarce species.

Although the observed river arm sections No. 1 and 2 on the area No. 2608 were characterized by relatively favourable moisture conditions, macrophytes in the section No. 2 absented. In the section No. 1 rich vegetation was recorded again, consisting mainly of marshy species, abundant was the occurrence of shrubs, as this section is often uncovered. The final section of the river arm (No. 3), where the permanent hydroecophase remains maintained due to revitalisation measures and the backwater, was richly inhabited by species of the true aquatic vegetation also this year.

In all three observed sections of the river arm on the area No. 2612 rich in species and abundant macrophyte vegetation was registered again. In the deepest section No. 1 two species of the true aquatic vegetation dominated, while the vegetation on the other two shallower sections still consisted of mostly wetland species. Protected species also survive in the river arm.

The right-side river branch system

The observation of macrophyte vegetation in the Hungarian inundation (on locations No. 4 and 9) and in the flood-protected area (on locations No. 6 and 8) has been interrupted since 2012. Monitoring of macrophytes at present is carried out in the seepage canal at the Locks No. I and II. in the framework of hydrobiological assessment of surface water quality according to the methodology of the Water Framework Directive. Macrophytes in the assessed year has absented at the Lock No. I, the quality of the water based on the samples taken at the Lock No. II continues show good ecological status.

7.4. Aquatic molluscs

The Danube

The evaluation of aquatic malacocoenoses in the Danube is based on data provided by the Slovak Party (Slovak observation areas No. 2600, 2608 and 2612). Based on these data the entire stretch of the Danube (derived section and the section downstream of the confluence of the tail-race canal and the Danube old riverbed) in previous years has been characterized by poor malacofauna, when the turning point of decline in species number and abundance was registered in 2005 after an extraordinary expansion of the non-native, invasive river nerite (*Theodoxus fluviatilis*). The gradual disappearance of most species in the following years was probably caused by interaction of several factors (hydrological, trophic, physical and chemical). The malacofauna of the Danube has been regularly composed only by the ubiquistic zebra mussel (*Dreissena polymorpha*).

After the flood in 2013, the communities were enriched with species that were flushed out from the arms in the inundation (species dependent on stagnant of slowly flowing water). Persistence of this state on the area No. 2600 is documented by the data of the assessed year only partially. The number of species present has decreased to six, from among the non-native species dominate. Similar species diversity persists also on the area No. 2612 below the confluence, while the particular species irregularly appear in the samples. The malacocoenosis is the poorest on the area No. 2608, where the sings of the community enrichment are already negligible.

The left-side river branch system

Aquatic mollusc communities in the river arm system on the Slovak side are monitored at areas No. 2603 and 2604. In the previous period signs of destruction of the malacocoenosis were registered on both areas, but after the strong flood in 2013 positive changes have been observed in the development of communities. More significantly it applies for the area No. 2603, which is characterized with suitable conditions for the development of a stabilized mollusc community. The community is currently rich in species, while some non-native, eurytopic and ubiquistic species achieve also high abundance. Most of species have multiple presence in samples throughout the year. The gradual destruction of malacocoenosis on the area No. 2604 is probably caused by the frequent significant decrease of water level and the impact of invasive fish species. However, after the flood in 2013, it was possible to see temporary enrichment of the community in terms of the number of species and the abundance of representatives. The malacocoenosis at present is composed by species typical for dead arms, as well as by ubiquistic species.

The right-side river branch system

The monitoring of aquatic molluscs was not carried out.

7.5. Dragonflies (Odonata)

The Danube

The macrophyte vegetation in the coves of the riparian zone of the Danube old riverbed on areas No. 2600 and 2608 provide suitable habitat for the occurrence of dragonfly communities. However, the odonatocoenoses are very poor in species and abundance in long-term, with frequent absence of representatives, or whole community in individual samples. In the assessed year the dragonfly community on the site No. 2600 was represented by imagoes of semirheophilous and rheophilous species, which had a year-long presence. The odonatocoenosis on the area No. 2608 absented.

The left-side river branch system

Diverse and rich dragonfly community was again registered in the river arm on the area No. 2603, what testifies the diversity of the habitat. In the odonatocoenosis in the evaluated year eurytopic and stagnicolous species dominated, but rheophilous and semirheophilous representatives continue to be present.

After flushing of the dead arm on the area No. 2604 in 2013 the odonatocoenosis was enriched and the high number of species has been retained also in the assessed year. The community is rich in species, with abundant occurrence of stagnicolous species demanding overwarmed waters with plenty of macrophytes. The river arm belongs to valuable habitats.

The monitoring of dragonflies at Foki weir on the area No. 2608 after almost a ten-year break was restored in 2014. Current monitoring results document the presence of rich in species and abundant odonatocoenosis, in which eurytopic, stagnicolous and semirheophilous species dominate.

Diverse habitats (periodic waters, smaller and larger river arms) on the area No. 2612 provide favourable conditions for the occurrence of dragonflies with different ecological demands, including several protected and endangered species. In the species rich odonatocoenosis, imagoes arriving from the surrounding area are also captured, with the dominance of stagnicolous species and species of overwarmed waters.

The right-side river branch system

The monitoring of odonatocoenoses was not carried out.

7.6. Crustaceans (Cladocera, Copepoda)

The Danube

The evaluation of the development of cladocerans and copepods communities is based on results of the Slovak Party on the monitoring areas No. 2600 and 2608, which are situated on the diverted stretch of the Danube. The cladocerans and copepods communities were unstable and poor in species and abundance in the recent period, but after the strong flood in 2013 they have been temporarily enriched. Increased number of species and higher abundance of representatives (especially for cladocerans) in 2015 and 2016 were recorded only in the upper part of the diverted stretch of the Danube (are No. 2600). In the lower part (area No. 2608) the cladocerans community was poor and the copepods for the first time during the monitoring absented. Similarly to the previous year, tychoplanktonic species dominated in the communities, what is not typical for the Danube.

The left-side river branch system

In terms of the development of cladocerans and copepods communities in the river arm on the area No. 2603 the tendency of slow enrichment continues, which was more significant in the assessed year. More significant was also the dominance of tychoplanktonic species, which in the assessed year completely suppressed the euplanktonic species. Also in the case of copepods the tychoplanktonic species dominate, which are rinsed out of the richer inhabited overgrown littoral.

After discontinuing the isolation of the dead river arm on the area No. 2604, as a result of the flood in 2013, the cladocerans and copepods communities were enriched and this change is observable also in the evaluated year. The current composition of the cladocerans and copepods communities correspond to the conditions of plesiopotamal, although the euplanktonic species prevail. In terms of planktonic crustaceans the site is considered as faunistic important habitat.

The cladocerans and copepods communities on the area No. 2608 were rich in species and abundant also in the evaluated year, conditions in the river arm are suitable for planktonic crustaceans. The current species composition of both communities corresponds rather to plesiopotamal. The prevalence of true planktonites was preserved only in copepods, in the case of cladocerans the number of littoral species increased, what is related to the development of macrophytes that were decimated by the flood in 2013. The occurrence of rare species is also registered here.

After the intensive flushing of the river arm on the area No. 2612 in 2013 and the probable communication of the river arm with the inundation the cladocerans and copepods communities have been enriched. The persistence of this state was recorded also in the assessed year, but species indicating the connectivity of river arms with the other part of inundation were not captured already. The communities were composed mainly by species adapted to the environment of old wetland river arms with the domination of tychoplanktonic species.

The right-side river branch system

The monitoring of planktonic crustaceans was not carried out.

7.7. Mayflies and Caddisflies (Ephemeroptera, Trichoptera) and other groups of Macrozoobenthos

The Slovak Party performs the monitoring of mayflies and caddisflies in accordance with the methodology set out in the Agreement 1995. The monitoring methodology for macroinvertebrates (mayflies, caddisflies, dragonflies and aquatic molluscs) under the Water Framework Directive has been implemented within the monitoring of the surface water quality (Part 2 - Surface water quality). The Hungarian Party has not carried out the observation of these groups of biota in the assessed year, some results, however, were available from the monitoring of surface water quality.

The Danube

According to the long-term results of the Slovak Party (monitoring areas No. 2600, 2603, 2608 and 2612), the Danube is inhabited by caddisflies and mayflies sporadically and irregularly, however particularly in the upper part of the river enrichment of the caddisfly community can be observed in the last 5-6 years. On the area No. 2600 both communities showed an all-year presence. The caddisflies community was richer in terms of species diversity (up to 6 mostly rheophilous species), some of them in autumn achieved also higher abundances.

Mayflies on the monitoring area No. 2608 were present only in the spring, but the caddisflies community developed similarly as on the area No. 2600. Like in the previous year, on the area No. 2612 only one rheophilous caddisfly species was captured, while mayflies has absented again. It can be concluded again that the samples on the diverted stretch are richer than on the area No. 2612 below the confluence.

In the frame of surface water quality monitoring (Part 2 of this Report) the macrozoobenthos in the Danube is sampled at five profiles on the Hungarian side. In the evaluated year all profiles showed a moderate environmental status.

The left-side river branch system

In terms of mayfly and caddisfly communities, the observed river arms in the left-side inundation area (monitoring areas No. 2603, 2604 and 2612) are very poor in long-term, the presence of representatives is irregular in individual samples and years. The communities most often consist of 1-3 species, achieving mostly low abundance. In recent years, however, on the area No. 2603 slight enrichment of the caddisfly community can be observed, what is manifested mainly by the year-round presence of species in samples. In the assessed year the situation was similar also in the case of mayfly community, while both communities are composed mainly stagnicolous species.

A similar situation has been seen in the last two years in the dead arm on the area No. 2604. Both communities had a year-long presence in the samples of the assessed year, while some of representatives achieved also higher abundance. Species of diverse ecological demands (eutrophic, stagnicolous mayflies, semirheophilous and phytophillic caddisfly) were present.

On the area No. 2612 only one euryecious mayfly has more regular occurrence, which at some samplings reaches also higher abundance. Caddisflies in the assessed year were captured only in the spring.

The right-side river branch system

Communities of mayflies, caddisflies and the other groups of macrozoobenthos on the Hungarian side were not observed in the frame of the joint monitoring of biota. As part of the monitoring of surface water quality (Part 2 of this Report) the macrozoobenthos of the inundation area in the assessed year was sampled on four water bodies and at two profiles in the right-side seepage canal. The ecological status in three water bodies was assessed as good, at the three other sites as moderate (Mosoni Danube and the right-side seepage canal).

7.8. Fish (Osteichthyes)

The Danube

The evaluation of ichthyofauna in the Danube use to be based on the results of the Slovak observation at monitoring areas No. 2600 and 2608, and the results of the Hungarian observation at monitoring sites No. 10 and 11, but the Hungarian Party in years 2012, 2014, 2015 and 2016 did not carried out the monitoring. Based on the results from Slovak monitoring areas (which partially already do not correspond to eupotamal) it can be stated that the ichthyocoenoses of the diverted Danube section is stabilized in recent years, with relatively low species diversity (6-7 species), and with comparable (also relatively low) abundance in particular years. Rheophilous and semirheophilous species regularly also appear in the Danube even nowadays, however, dominant representation is achieved by eurytopic and non-native invasive species, which until now do not behave invasively.

The left-side river branch system

In stabilized, rich in species and abundant ichthyocoenoses on the area No. 2603 (water supplying river arm) eurytopic and indifferent fishes dominate in long-term. Along with them the occurrence of several non-native invasive species has became regular in recent years. The relatively considerable abundance of some of them is alarming.

The ichthyocoenosis of the dead arm on the area No. 2604, after a temporary status improvement after flushing out in 2012 and 2013, gradually has became poorer in last two or three years in terms of species number and also abundance of species that are present. An unfavourable fact is the dominance of invasive fish species. Majority of present species can survive even at higher water temperature and lack of oxygen.

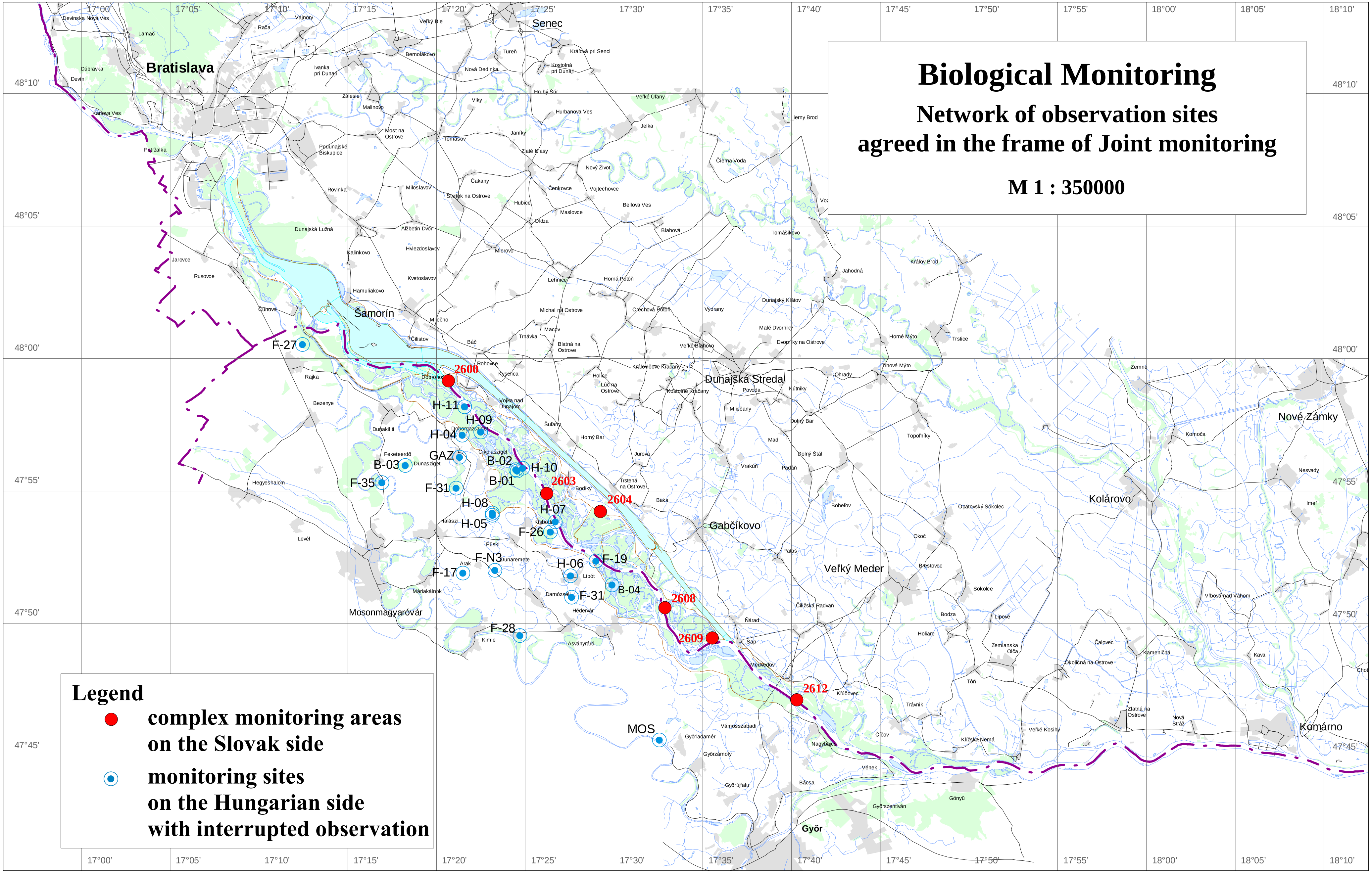
The development of ichthyocoenosis in river arms on two sub-sites on the area No. 2608 (upstream and downstream of the Foki weir) is significantly affected by the current water regime. If the observed parts of the river arm communicate with the main riverbed, the number of species and the abundance of fishes is stable and high. When the water level decreases, fishes retreat and also the influence of fish-eating birds is stronger. In last years enrichment of the species diversity can be assumed during increased (or almost flood) water stages. The part of the river arm upstream of the Foki weir is connected with the main riverbed by a shallow, filled-up connection channel. The part of the river arm downstream of the Foki weir communicates with the Danube through its lower end. Both fish communities also in the assessed year were rich in species, and the abundance of species was also quite significant, with persistent presence of rheophilous representatives. Invasive species occur in both parts of the river arm with a relatively low abundance, their expansive behaviour continues to be not observed.

The ichthyocoenosis of the shallow muddy river arm on the monitoring area No. 2612 also in the evaluated year was poor in species and abundance, probably due to fish-eating birds. Over the past few years only 2-4 species that are not oxygen-demanding have been recorded, which reach extremely low abundance. Temporary enrichment usually occurs after flushing the river arm.

The right-side river branch system

The observation of ichthyofauna on the Hungarian territory was not carried out.

Fig. 7-1


Biological Monitoring
Network of observation sites
agreed in the frame of Joint monitoring
M 1 : 350000
Legend
complex monitoring areas
on the Slovak side
monitoring sites
on the Hungarian side
with interrupted observation
2600
2603
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F-27
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H-04
GAZ
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F-35
F-31
B-02
B-01
H-10
H-08
H-05
H-07
F-26
F-N3
F-17
H-06
F-19
B-04
F-28
MOS
Bratislava
Senec
Šamorín
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Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
17°00'
17°05'
17°10'
17°15'
17°20'
17°25'
17°30'
17°35'
17°40'
17°45'
17°50'
17°55'
18°00'
18°05'
18°10'
48°10'
48°05'
48°00'
47°55'
47°50'
47°45'

PART 8

8.1. Conclusion statements

Based on the results of environmental monitoring in 2016 the following conclusions can be stated.:

1. The average annual flow rate in the year 2016 at the gauging station Bratislava-Devín, that plays a key role in determining the current amount of water to be released into the Danube old riverbed downstream of Čunovo weir, reached 1944 $m^3.s^{-1}$. This represents a flow rate slightly below the average. The flow regime of the Danube in 2016 was closer to a typical one than in 2015. Atypical were the two discharge waves in February and low flow rates during most of the spring period. Increased flow rates occurred from the second half of May to the end of the first half of August and they are typical for late spring and summer months. Since the second half of August until the end of the year, the flow rates on the Danube moved well below the long-term average values occurring in these months. The discharge waves occurring over the year did not cause significant flooding of the floodplain. Exceptions were the flood waves at the beginning of February and in mid-July, during which the lower part of the inundation was partially flooded. The annual minimum was recorded on January 2, 2016 at 812 $m^3.s^{-1}$, the annual maximum occurred on July 15, 2016 culminating at 5645 $m^3.s^{-1}$.

   Considering the obligations mentioned in the intergovernmental Agreement, the Slovak Party was obliged to release into the Danube riverbed downstream of Čunovo dam an average annual discharge of 384 $m^3.s^{-1}$. Based on measurements carried out at the Doborgaz and Helena gauging stations, the total average annual discharge released to the Danube downstream of Čunovo in the year 2016 was 397 $m^3.s^{-1}$. A situation, when it was necessary to release increased discharges (over 600 $m^3.s^{-1}$) into the Danube old riverbed due to higher flow rates in the Danube (over 5400 $m^3.s^{-1}$) occurred only once in 2016. However, during the discharge wave in February 2016 the flow rate exceeded the 600 $m^3.s^{-1}$ for one day, and higher flow rate was also released during six days in September due to technical maintenance of the Gabčíkovo Hydropower Plant. If reduction of flow rate, in terms of methodology for calculating the average annual discharge, is applied in connection with the higher amount of water released into the Danube old riverbed, an average annual discharge of 383 $m^3.s^{-1}$ (99,2 %) is obtained, what means that the Slovak Party fulfilled the average annual discharge jointly agreed in the intergovernmental Agreement. Some deficiencies regarding the minimal discharges during the non-vegetation period were registered again, however in a significantly smaller extent (37 days). Certain deficiencies as regard the minimal values have been recorded also in the vegetation period (10 days). Neither the deficiencies during the non-vegetation period, nor in the summer period had significant impact on the biota of the area affected. Since the hydrological conditions in 2016 were rather favourable, increased flow rate (800 $m^3.s^{-1}$) was discharged into the Danube old riverbed in the second half of May, to realize a partial flooding of the right-hand branch system.

   Concerning the water amount released into the Mosoni Danube the average annual discharge in 2016 was 35.0 $m^3.s^{-1}$. Technical maintenance of turbines in the year 2016 was carried at the beginning of April for three days and in the first half of December for six days. Besides this, construction works were finalized from the beginning of the year until mid August, due to what the discharge ranged mostly from 14 to 32 $m^3.s^{-1}$. With respect to the above mentioned limitations, the total amount of water discharged into the Mosoni Danube was lower than the water amount set out in the intergovernmental Agreement. The Hungarian Party have been informed about the exceptional water discharge into the Mosoni Danube during the construction works by Slovak party at the negotiations of the Nominated Monitoring Agents on December 11, 2014 and in letters dated January 27, March 30, June 13 and November 10, 2016.

2. Compared to previous years, the surface water quality at sampling sites observed in the frame of the Joint monitoring has not changed significantly in 2016 and in long-term is balanced. The increase or decrease of the concentrations of individual parameters during the observed period appears already in Bratislava, where the quality of water entering the Slovak territory is monitored. Some observed parameters of surface water quality show seasonal changes, some parameters predominantly depend on the flow rate, others are affected by biochemical processes in the surface water.

   The year 2016 was more water bearing year than the previous one, there occurred several discharge waves, what resulted in higher maxima of parameters that are influenced by flow rates (suspended solids, iron, manganese, phosphates, total phosphorus and COD_{Mn}). Due to the rapid cooling in the warmest months of the year, as well as the high precipitation total in July and relatively high summer flow rates, the water temperature reached lower maxima than in 2015. The content of nutrients in the Danube is potentially sufficient for development of eutrophication processes. In the assessed year, the nutrients content was mostly higher or similar than in the previous year, the decrease was registered only in the case of the total nitrogen at jointly observed and Hungarian sites. In the case of phosphates and total phosphorus, at the beginning of September, significant maxima were recorded by the Slovak Party on the sampling site in the Danube at Bratislava and on the common sampling sites, which were not confirmed by the Hungarian Party. The oxygen conditions in the year 2016 can be classified as good. A slight deterioration was registered on some locations in the summer period, when the oxygen content decreased to lower minima than in the previous year. The contamination by organic substances expressed by COD_{Mn} increased slightly and the BOD_5 was mostly similar. Higher maxima were also reached in the case of dissolved solids and manganese, and significantly higher values on the most of sampling sites were recorded in the case of iron. When analysing the changes in suspended solids content at sampling sites in the Danube, generally it can be stated that the suspended solids content downstream of the reservoir (at Medveďov sampling site) during flood waves is lower than in the Danube at Bratislava, which indicates the settling effect of reservoir.

   The fluctuation of surface water quality parameters in the right-side river branch system since introducing the water supply in 1995 follows their fluctuation in the Danube. The fluctuation of quality indicators in the Mosoni Danube and in the seepage canals reflects the different characteristics of these water bodies. The water quality in the Mosoni Danube on the sampling site at Čunovo/Rajka is influence by the Danube water, while the water quality in the lower section of Mosoni Danube at Vének (upstream of the confluence with the Danube) is formed by its tributaries and local pollution from settlements. From the long-term development point of view, the pollution on this sampling site has decreased, but the content of nutrients and the COD_{Mn} values still reach the highest values compared to other sampling sites. A significant difference is mostly in the case of ammonium ions and the total phosphorus. For this sampling site the highest content salts is characteristic and average contents of sodium, potassium, chlorides and sulphates are higher than the average values recorded on other sampling sites. The oxygen conditions at this sampling site were good in the assessed year, although the COD_{Mn} values belonged to the highest, but the organic pollution expressed by the BOD_5 was lower than on the right bank of the Danube old riverbed. The dissolved oxygen content in the summer period decreased to the lowest value recorded in 2016.

The water in seepage canals is influenced mainly by the leaking groundwater. It has the most stable ionic composition and typical for this water are the relatively balanced time series of the quality indicators, which fluctuates only in narrow ranges. Seasonality here is not as distinctive as elsewhere. The water temperature reaches lower maxima and higher minima. The content of nutrients (mainly nitrates, total nitrogen and total phosphorus), suspended solids, iron and chlorophyll-a is also low. The oxygen regime is characterized by a low value of organic pollution. The surface water quality in the seepage canals has a good basic physico-chemical composition. In the right-side seepage canal on the common sampling site higher values recorded by one of the Parties occasionally occur, which are not confirmed by measurements of the other Party. For the left-side seepage canal, higher values of manganese contents were characteristic also in 2016.

Concentrations of monitored heavy metals in the assessed year were in compliance with the environmental quality standards. Their content was similar as in 2015 and only slightly higher concentrations were occasionally found in the case of lead, nickel, zinc and copper.

The monitoring of biological elements of the surface water quality in 2016, at jointly observed sampling sites and on sampling sites monitored by the Hungarian Party, was carried out according to the national methodologies and quality schemes for particular biological quality elements, in accordance with the Water Framework Directive. Based on the assessment of phytoplankton, phytobenthos, macrozoobenthos and macrophytes in 2016, the surface water quality at individual sampling sites was classified into the II. or III. quality class, what corresponds to good or moderate ecological status. Good status was determined on sampling sites in the right-side river branch system and in the Danube at Bratislava. On other localities (in the Danube, in the Mosoni Danube and in the right-side seepage canal) moderate status was achieved.

The evaluation of sampling sites observed only by the Slovak Party was carried out according to the methodology used in previous years. Macrozoobenthos, phytoplankton and phytobenthos were evaluated. The average values of saprobic indexes varied in the range corresponding to β-mesosaprobity, thus to an environment which provides suitable living conditions for a wide scale of organisms. The phytoplankton development in the evaluated year was weaker, especially in the summer period. Except the seepage canals, the average abundance values of phytoplankton decreased significantly. The limit for mass development was not exceeded in either case (in 2015 it was three times). Considering the abundance of phytoplankton, as the key determinant of saprobic index of biosestone, it can be stated that the hydropower plant neither in 2016 had any adverse impact on the level of saprobity.

The contamination of sediments in the affected area, assessed according to Canadian standard CSQG, on the Slovak territory was slightly lower than in the year 2015, in the case of organic matter mainly the contents of substances from the group of PAHs decreased. The organic pollution on the Hungarian territory increased only in the river branch system. The contamination with heavy metals in the assessed year increased on both, the Slovak and the Hungarian territories. The content of arsenic was high, which on several localities approached the probable effect level (PEL) and in the Mosoni Danube at Vének exceeded this level in autumn sampling. Upon exceeding this level, the adverse effects on biological life may occur frequently. The highest concentrations of organic micro-pollution were recorded by the Slovak Party in the upper part of the reservoir and the highest concentrations of heavy metals in the lower part of the reservoir. On the Hungarian territory, the highest inorganic sediment pollution was found in the Mosoni Danube at Vének and the highest concentrations of organic matter were in the river branch system. The lowest sediment pollution in 2016 was documented in the Danube old riverbed at Sap and in the right-side seepage canal at Rajka.

Based on the long-term observations of the water quality entering the affected area and the water quality, which leaves this territory, it can be stated that the physico-chemical composition of the Danube water, passing through the Gabčíkovo Waterworks, basically does not change.

3. Also in 2016 the monitoring of groundwater levels continued without changes. The groundwater levels in the whole observed area are primarily influenced by surface water levels in the Danube and in the reservoir. In the inundation area the groundwater level is strongly influenced by drainage effect of the Danube old riverbed. This adverse effect is being mitigated by the water supply into the river branch system on both sides of the Danube. Groundwater levels in 2016 started from a relatively low position, due to low discharges in the Danube in last three months of the previous year. On a greater part of the Szigetköz area, in the inundation area on the Slovak territory and in the inland area along the derivation channel the lowest groundwater levels in 2016 were recorded. The groundwater level started to increase after discharge waves and above-average precipitations in February, what was reflected in highest groundwater levels in the lower part of the Szigetköz and on the greater part of the inland area of Žitný ostrov, that were recorded in February and March. After a temporary decrease the groundwater levels started to increase again after the series of discharge waves in June and especially after the largest discharge wave in July, when the highest groundwater levels were recorded in the upper and middle part of Szigetköz and in the vicinity of the lower part of the reservoir. However, the highest groundwater levels in the Hungarian inundation were recorded mainly during the artificial flooding of this area, mostly in May. The highest groundwater levels in the Slovak inundation area were related to the higher discharge released into the Danube old riverbed during the technical maintenance of the Gabčíkovo Hydropower Station in September. Due to the gradually decreasing and in general very low flow rates in the second half of the year, the groundwater level on observation objects under the influence of the Danube gradually declined. The lowest groundwater levels on objects in the upper part of the Žitný ostrov, in the area between the Mosoni Danube ant the Lajta river and partially in the upper part of the Szigetköz occurred at the end of the year in December.

   Based on the evaluation of groundwater regime it can be stated that the water supply into the right-side river branch system and into the Mosoni Danube plays an important role in influencing groundwater levels over the Szigetköz region. The measures implemented under the intergovernmental Agreement, as well as the measures made in the right-side inundation, caused a significant rise in groundwater levels in the upper, middle, and after completion the modifications of the water supply system also in the lower Szigetköz. The most significant increase in groundwater levels can be seen in the middle and lower part of floodplain area, for both, low and average flow rate conditions in the Danube. The groundwater level increase in the upper part of the Szigetköz region and around the reservoir is reduced due to the decrease of permeability of the reservoir bottom. Adverse effect on groundwater levels also have changes in sediment transport regime of the Danube, due to measures taken on the Austrian section of the Danube just upstream of Bratislava in recent years. Observation results in recent years show that the decline of groundwater levels almost stopped and the area with groundwater level decrease does not change significantly. Compared to previous years, the most significant change, in relation to the groundwater level, is the completion of the water supply system in the lower part of the Hungarian inundation area. Since completion the water supply system, in the case of low and average flow rate conditions, a significant increase in ground water levels can be seen in the Ásványi river arm system, which had previously been characterized by decrease. Increase or restoration of groundwater levels to the level of 1993 is also visible in the Bagoméri river arm system, and to a considerable extent this influence is also reflected on the Slovak territory in the Istragov area. The decrease in groundwater levels on the Slovak territory remained along the tail-race canal and below its confluence with the Danube old riverbed. The groundwater level is adversely affected by the erosion of the riverbed in this area. The groundwater level decline around the reservoir is caused by decreased permeability of the reservoir bottom. The groundwater level decline along the Danube old riverbed is due to a different flow rate discharged into the Danube in the compared dates. This is also the reason, why the groundwater level decline in 2016 also appears in the inland area behind the flood protective dikes.

Monitoring results in 2016 show that appropriate technical interventions in the river branch system and the application of effective water supply can significantly affect groundwater levels in the floodplain area. The results, on the other side, point to the fact that the water supply in the lower part of the inundation area on the Slovak territory should be resolved, particularly in the case of low and average flow rate conditions. The positive impact of water supply can be further efficiently supported by measures implemented in the Danube old riverbed (increase of water level by bottom weirs), which would ensure the increase of groundwater levels in the strip along the Danube old riverbed on both sides. Such measures may improve the overall situation in the whole inundation area on the Hungarian and Slovak territory.

4. The chemical composition of groundwater in water supply sources on the Slovak territory indicates stable conditions for development of groundwater quality. The quality of groundwater in the monitored water supply sources mostly satisfies the agreed limits for drinking water. Exceedances of limits occur only on some objects in the case of water temperature, manganese and in some years also in the case of iron. In 2016 the limit value for the water temperature was exceeded one to three times on four water supply sources. The manganese content on two water supply sources exceeded the limit value in each determination. Except the water temperature and manganese, other exceedances of limit values on water supply sources have not occurred in 2016. Exceedances of limit values in the case of observation objects are more frequent and occur on more objects. The groundwater quality in these objects mostly reflects local influences. Exceedances occur in the case of ammonium ions, manganese, iron and

water temperature. Concentrations of all other analysed components of groundwater quality in observation objects, including the organic and inorganic micro-pollutants, in the year 2016 meet the agreed limits for drinking water quality.

The groundwater quality monitoring on the Hungarian territory confirmed the long-term results. The groundwater in the shallow horizons of gravel sediments in Szigetköz is enriched with iron and manganese. Iron and manganese concentrations in most observation wells permanently exceed the limit values. On observation objects are higher also concentrations of parameters reflecting local pollution, which is of agricultural origin or it originates from sewage ponds. High contents exceeding the limit value are registered only at certain observation objects in the case of ammonium ions, phosphates and occasionally also nitrates. The organic pollution mostly meets the limit value. During the monitoring in some objects time-to-time occurred values exceeding the limit value. Over the past two years, increase of organic pollution has been recorded four times on three objects, while in three cases the COD_{Mn} values were higher than the highest limit value for this parameter. Exceedances on some objects are recorded also in the case of water temperature, calcium and magnesium. The groundwater quality in deeper horizons in the Szigetköz is monitored by wells used for drinking water supply. Iron and manganese concentrations are lower in wells where the water is pumped from greater depth. In the region at Győr the iron and manganese contents exceed the drinking water quality limit values or oscillate around them. The water pumped in the northern part of the Szigetköz is of satisfactory quality and the groundwater quality is characteristic by high stability. In general, the groundwater quality in wells producing potable water (occasionally after pre-treatment) is suitable for drinking water supply.

Inorganic and organic micro-pollution of groundwater is monitored at selected observation objects on the Hungarian and Slovak territory. In 2016 all observed indicators of micro-pollution were found in concentrations below the groundwater quality limit values, except one concentration of atrazine in observation well on the Hungarian territory.

5. The soil moisture monitoring on the Slovak side in 2016 continued without changes. Monitoring of soil moisture on the Hungarian side is not carried out since 2013. The measurements were performed in the floodplain area and at agricultural sites in the flood-protected area. In 2016, the creation of soil moisture reserves was affected mainly by rainfall in the first two months of the year and in the area along the Danube also by a relatively large discharge wave at the beginning of February. Thanks to this, relatively good conditions for the start of vegetation were created before the growing period. Since March, the soil moisture content began to decline and except the lower part of the inundation area it declined almost continuously until mid-October, in deeper layers and in the inland area until the end of the year. A short interruption of the soil moisture content decrease occurred at the turn of April and May during the artificial flooding in the right-side river branch system and during the July discharge wave, when the increased groundwater level moisturized the deeper soil layers. The soil moisture content in the upper soil layers on most of observation sites has been influenced only by climatic conditions.

   Regarding the soil moisture development at monitoring sites located on agricultural area on the Slovak side, it can be stated that the soil moisture content on these sites throughout the observation period runs similarly. Since 2004, a slight increase in soil moisture content has been observed, while the position and fluctuation of groundwater level remained mostly unchanged. However, a slight decrease of groundwater levels is apparent from 2011, what was reflected in a decline of soil moisture content, especially in the depth interval 1-2 m below the surface. In the last two years, the decline in soil moisture content more significantly appears also in the depth interval 0-1 m, what probably relates to the absence of larger and longer-lasting flood or discharge waves. As in the previous year, the fluctuation in soil moisture content in 2016 at both depth intervals were depended on climatic conditions. The groundwater level, even during discharges waves on the Danube, did not influenced the soil moisture in the layers to a depth of 2 m. The minimal values occurred during October, in deeper layers during November and December, maximal soil moisture values in the whole soil profile occurred at the end of February or early March.

The soil moisture in the inundation area, in addition to the groundwater level and precipitations, is highly dependent on natural or artificial floods. Since no flood or significant discharge waves occurred in the last three years, this has been reflected in a significant decline in moisture content in the soil, especially at sites that were previously influenced by ground water level. In 2016, the creation of soil moisture reserves was affected mainly by rainfall in the first two months of the year and a relatively large discharge wave at the beginning of February. Thanks to this, relatively good conditions for the start of vegetation were created before the growing period. Since March, the soil moisture content began to decline and at locations in the upper and middle part of inundation it declined almost continuously until the end of autumn, in deeper layers until the end of the year. On locations near the Danube, the increase of discharge into the Danube old riverbed during the artificial flooding in the right-side river branch system at the turn of April and May, was reflected. An interruption of the soil moisture content decline occurred during the July discharge wave, when the increased groundwater level moisturized the soil layers, especially in the depth interval of 1-2 m, but heavy rainfall contributed to the increase of soil moisture content also in the upper layers. The occurrence of minimal and maximal values differed according to the prevailing influence (flow rates, precipitations, water supply), but in general it can be stated that the maximal values occurred a at the end of February and in deeper layers during March, at the beginning of May or in July and the minimal values in the dept to 1 m occurred in October, while in deeper layers at the beginning of the year or in November and December.

6. In accordance with the intergovernmental Agreement the Slovak Party also in the year 2016 observed the development of basic growth parameters, weekly girth growth and the health state of trees by terrestrial way. The monitoring of forest stands in the Szigetköz area was not carried out. Aerial imagery of the health state of forest stands is carried out in three-year intervals, in the evaluated year was not carried out. The development of forest stands under relatively favourable hydrometeorological conditions did not go beyond the trend of previous years. The height increment quality classification in the majority of observed stands remains basically stable or shows only slow changes. A substantial part of the stands is characterized by intense or moderately intense growth. The cumulative girth growth values of young poplars are rather low during the whole observation period. Due to the relatively favourable distribution and plenty of precipitation, as well as the absence of exceptionally warm and dry periods, the occurrence of zero weekly girth growth occurred expressly occasionally. The observed cultivated poplar stands were without changes healthy and vital. It is still

observed only sporadic infestation of trees by diseases and pests. Due to the presence of more humid summer climatic conditions overall increase of spreading of two fungal diseases along with retreat of leaf and technical pests has been registered on most areas in the assessed year.

7. Monitoring of agreed groups of plants and animals in the year 2016 was performed only on the Slovak territory. The Hungarian side has not realized the monitoring, similarly as in 2012, 2014 and 2015.

   Although in the uppermost part of the Slovak inundation area the slow disintegration of the poorly developed tree layer continues to be registered, after the revitalization interventions positive changes can be observed in recent years. The character of the stand is represented by the shrub layer, under which a dense herb layer, consisting mostly of nitrophilous species, can be found. Synanthropic species, that appeared after disruption with restoration works, are gradually receding, but the moisture-demanding species also recede. Phytocoenoses on other monitoring areas can be considered as stabilized. On areas where forestry interventions have been carried out, a tree layers has been created, which is gradually being closed. In the herb layers mostly nitrophilous species dominate, on the site at the confluence of the Danube old riverbed with the tail-race channel, the monodominant aster plant prevailed.

   The terrestrial mollusc’s communities do not show significant changes compared to previous years. On the monitoring areas in the uppermost part of the inundation communities typical for the dry and the driest type of soft lowland forest occur. In the middle part of the inundation area a number of hygrophilous, polyhygrophilous and wetland species have significant share in the malacocoenosis. The malacocoenosis on areas with young poplars in the lower part of the inundation are still affected by the clear-cut more than eight years ago. As a result of the closure of stands, increase in abundance of forest moisture-demanding species occur and decline in light-demanding species. However, the return of hygrophilous species has not yet been recorded.

   The development of macro-vegetation in the through-flowing river arm, which was decimated by the flood wave in 2013, was weak in the coming years. In the assessed year, however, macrophytes were already species richer and more abundant. Stands consisted mainly of hydrophytes, along with the persistent presence of rare species. The development of aquatic vegetation in the dead arm proceeded in aquatic environment. Thanks to the favourable water stages, hydrophytes increasingly developed again, but the population of wetland plants remained also preserved. This area is still rich in scarce species. Also in the lower part of the inundation area, rich in species and abundant macrophyte vegetation was registered, consisting of the true aquatic vegetation, but mainly of the marshy species.

   According to data of the Slovak Party, the entire stretch of the Danube is characterized by poor aquatic malacofauna in recent years. A break in species number and abundance was registered in 2005 after an extraordinary expansion of the non-native, invasive river nerite (*Theodoxus fluviatilis*). The gradual disappearance of most species in the following years was probably caused by interaction of several factors. Regular and abundant occurrence in the Danube has only the ubiquistic species *Dreissena polymorpha*. In the community of aquatic molluscs in the river branch system, positive changes were observed after the flood in 2013. At present, communities are rich in species, while some non-native, eurytopic and ubiquistic species reach high abundance. Most species have multiple occurrence in samples throughout the year.

The dragonfly communities in the Danube old riverbed are very poor in species and abundance in long-term, with frequent absence of representatives in the individual samples. In the assessed year, however, imagines of a semirheophilous and rheophilous species were recorded, which had a year-long presence. In the river branch system the dragonfly community is diverse and very rich, which indicates the diversity of habitats. In the evaluated year stagnicolous species and species of overwarmed water dominated.

The cladocerans and copepods communities in the observed stretch of the Danube, according to the Slovak results, were unstable and poor in species and abundance in the last few years, but they have been temporarily enriched after the flood in 2013. Increased numbers of species and higher abundance of representatives in the past two years have been recorded only in the upper part of the diverted section of the Danube. Both communities were characterized by the dominance of tychoplanktonic species, what is not typical for the Danube. The development of cladocerans and copepods communities in the river branch system continues similarly to the previous years. The species compositions of communities does not change significantly, mostly the tychoplanktonic species dominate.

The mayflies and caddisflies in the observed stretch of the Danube, based on the Slovak results, occur sporadically and irregularly. In the upper part of the river, richer caddisfly community cay be observed in recent years, while both communities had a year-long presence. In the left-side river branch system these communities have been very poor in long-term. The presence of their representatives in particular samples and years is irregular. The communities most often consist of 1-3 species and achieve low abundance.

Based on the results of the Slovak Party it can be stated that the ichthyocoenoses of the diverted stretch of the Danube is stabilized in recent years, with the occurrence of 6-7 species and with a relatively low abundance of individual representatives. Rheophilous and semi-rheophilous species occur, but dominant species are eurytopic and non-native invasive species. The development of ichthyocoenoses in the left-side inundation area is stable, with the dominance of eurytopic and indifferent species in long-term. In recent years the occurrence of non-native invasive species have became also regular. The ichthyocoenosis of the observed dead arm become gradually poorer after the flushing in 2013. The dominant position achieve the invasive fish species. The ichthyocoenosis at the Foki weir is significantly affected by the actual water regime. In the assessed year, the community was rich in species, the abundance of particular species was also considerable, with persistent presence of rheophilous species. The invasive species occur with a relatively low abundance.

8.2. Proposals

Proposals given in this chapter will be obligatory for both Parties and do not require further approval when the actual Joint Annual Report is approved and signed by Nominated Monitoring Agents.

1. Experts of both Parties have prepared the optimisation of monitoring, carried out under the Intergovernmental Agreement of 1995. After approval by the Nominated Monitoring Agents it is suggested to perform the monitoring according to the optimisation starting from 2018.

APPENDIX A.1.

AGREEMENT
BETWEEN THE GOVERNMENT OF THE SLOVAK REPUBLIC AND GOVERNMENT OF THE REPUBLIC OF HUNGARY CONCERNING CERTAIN TEMPORARY TECHNICAL MEASURES AND DISCHARGES IN THE DANUBE AND MOSONI BRANCH OF THE DANUBE

The Government of the Slovak Republic

and

the Government of the Republic of Hungary

have agreed as follows:

Article 1

1. Immediately following the conclusion of this Agreement, the Slovak Party will increase the discharge of water through the intake structure at Čunovo into the Mosoni branch of the Danube to 43 m3/s subject to hydrological and technical conditions specified in Annex 1 to this Agreement. This value includes the flow of water through the seepage canal on the right side of the reservoir from Slovak territory into Hungarian territory.

2. The competent Slovak and Hungarian authorities shall take all necessary measures on their respective territories to enable the continuous flow of the increased discharge of water from Slovak territory into Hungarian territory.

3. The water will be distributed, on Hungarian territory, between the branch system on the right side of the Danube, the protected area and the Mosoni branch of the Danube.

Article 2

1. The day following the conclusion of this Agreement the discharge into the main riverbed of the Danube below the Čunovo weir will be increased to an annual average of 400 m3/s, in accordance with the rules of operation contained in Annex 2 to this Agreement. Discharges entering the main riverbed of the Danube through the inundation weir are excluded from the average calculation.

2. During the construction of the weir pursuant to Article 3 the discharge into the main riverbed of the Danube below the Čunovo weir will be regulated in accordance with Annex 3 to this Agreement.

Article 3

1. There will be a weir partly overflowed by water and constructed by the Hungarian Party in the main riverbed of the Danube, at rkm 1843. The main parameters of the weir are specified in Annex 4 to this Agreement.

2. The Parties undertake to ensure the issuance, without delay, of the administrative authorization required by their respective national legislation for the construction and maintenance of the weir in accordance with this Agreement.

3. The costs of the construction and maintenance of the weir will be borne by the Republic of Hungary.

4. The construction of the weir will begin not later that 10 days following the conclusion of this Agreement and is anticipated to be completed within a period of 50 days from the commencement of works.

Article 4

The Parties undertake to exchange those data of their environmental monitoring systems operating in the area that are necessary to assess the impacts of the measures envisaged in Articles 1-3. Collected data will be regularly exchanged and jointly and periodically evaluated with a view to making recommendations to the Parties. The observation sites, parameters observed, periodicity of data exchange, the methodology and periodicity of joint assessment are contained in Annex 5 to this Agreement.

Article 5

1. In the event that either Party believes the other Party is not complying with this Agreement, and f[illegible] to persuade the other Party that it is in breach, the Party may invoke the good offices of the Commission of the European Union and both Parties agree to give close cooperation to the Experts of the Commission and to take duly into consideration any opinion rendered by them.

2. If, for whatever reason, the good offices are not provided or are unsuccessful and the material breach continues to exist, the Party affected will be entitled to terminate this Agreement with a one month notice.

Article 6

This Agreement has a temporary character, pending the judgment of the International Court of Justice in the case concerning the Gabčíkovo-Nagymaros Project and is without prejudice to existing rights and obligations of the Parties as well as to their respective positions in the dispute before the Court and, in any event, unless otherwise agreed, it shall terminate 14 days after the judgment of the International Court of Justice in the case concerning the Gabčíkovo-Nagymaros Project.

Article 7

On the termination of this Agreement and unless otherwise agreed or decided, Hungary shall at its own expense remove the weir referred to in Article 3.

Article 8

This Agreement shall enter into force on the date of its signature.

Done at Budapest on the .19.. day of April, 1995, in duplicate, in the Slovak, Hungarian and English languages, the English text to prevail in the event of any discrepancy.

For the Government
of the Slovak Republic

For the Government
of the Republic of Hungary

Annex No. 1

Hydrological and technical conditions for the increase of the discharges into the Mosoni Danube

1/ The increase of the discharge into the Mosoni Danube and into the right side seepage canal of the Hrušov reservoir from 20m³/sec up to 43 m³/sec will be ensured subject to the following hydrological and technical conditions:

1.1 Provided that minimum difference between the water-level of the Mosoni Danube and the Hrušov reservoir is 5.10 m.

1.2 Provided that the minimum water level of the Hrušov reservoir is 130.40 m above sea level.

1.3 Provided that the water-level of the Mosoni Danube does not exceed 125.30 m above sea level.

1.4 Provided that the entrances to the intake structure are unobstructed. Whenever the discharges of the Danube exceed 4000 m³/sec (involving the inundation of the flood-plain), the water-borne materials will move to a greater extent this may restrict the amount of water which can be provided.

1.5 Provided that there is no failure in the electricity network system. If the network system is damaged or in the event of any other failure of the generating capacity, the energy system will turn off automatically and the capacity of the intake structure will be reduced to half of the original.

2/ At the request of the Hungarian party the Slovak party will moderate the discharge for a period specified by the Hungarian party.

The selected site for the measuring of the discharge of the Mosoni Danube is a gauge at 0.160 km on the left bank of the canal on the territory of the Slovak Republic. The selected site for the measuring of the discharge of the right side canal of the Hrušov reservoir is on the regulating weir at 1.100 km on the territory of the Hungarian Republic.

Rules of operation

The volume of water discharged through the Čunovo weir into the main river bed of the Danube to correspond to the annual average of 400 m^3/sec.

The annual average discharge in Bratislava corresponds to 2025 m^3/sec. The annual average discharge into the main Danube river bed in each specific year will correspond to the formula:

$$V_{Danube} = \frac{(V_{Devin} \times 400)}{2025}$$

where V_{Devin} is the average yearly discharge in the Devín profile in the specific year.

V_{Danube} is the average yearly discharge to the main Danube river bed in the specific year.

- During the growing season the discharge into the main river bed will be higher than during the dormant season.
- The discharge into the main river bed of the Danube will correspond to actual discharges in the Devin profile.
- The discharges released through the inundation weir during flood will not be included in the calculation.

The discharges in the Devin profile together with the corresponding discharges at the Čunovo weir.

January		February		March		April		May		June	
600	250	600	250	600	250	600	400	600	400	600	400
2200	250	2000	250	1500	250	1100	400	700	400	700	400
2300	251	2100	258	1600	250	1200	400	800	400	800	400
2400	273	2200	280	1700	271	1300	400	900	400	900	400
[illegible]	295	2300	301	1800	392	1400	400	1000	400	1000	418
2600	317	2400	323	1900	314	1500	400	1100	400	1100	440
2700	339	2500	345	2000	336	1600	400	1200	400	1200	462
2800	360	2600	367	2100	358	1700	400	1300	400	1300	483
2900	382	2700	389	2200	380	1800	400	1400	405	1400	505
3000	404	2800	410	2300	401	1900	414	1500	427	1500	527
3100	426	2900	432	2400	423	2000	436	1600	449	1600	549
3200	448	3000	454	2500	445	2100	458	1700	471	1700	571
3300	469	3100	476	2600	467	2200	480	1800	592	1800	592
3400	591	3200	498	2700	489	2300	501	1900	514	1900	600
3500	513	3300	519	2800	510	2400	523	2000	536	4600	600
3600	535	3400	541	2900	532	2500	545	2100	558		
3700	557	3500	563	3000	554	2600	567	2200	580		
3800	578	3600	585	3100	576	2700	589	2300	600		
3900	600	3700	600	3200	600	2800	600	4600	600		
4600	600	4600	600	4600	600	4600	600				

July		August		September		October		November		December	
600	400	600	400	600	250	600	250	600	250	600	250
700	400	900	400	1100	250	1500	250	1800	250	2000	250
800	400	1000	400	1200	262	1600	250	1900	264	2100	258
900	400	1100	400	1300	283	1700	271	2000	286	2200	280
1000	400	1200	400	1400	305	1800	292	2100	308	2300	301
1100	400	1300	400	1500	327	1900	314	2200	330	2400	323
1200	400	1400	400	1600	349	2000	336	2300	351	2500	345
1300	400	1500	400	1700	371	2100	358	2400	373	2600	367
1400	405	1600	400	1800	392	2200	380	2500	395	2700	389
1500	427	1700	421	1900	414	2300	401	2600	417	2800	410
1600	449	1800	442	2000	436	2400	423	2700	439	2900	432
1700	471	1900	464	2100	458	2500	445	2800	460	3000	454
1800	492	2000	486	2200	480	2600	467	2900	482	3100	476
00	514	2100	508	2300	501	2700	489	3000	504	3200	498
2000	536	2200	530	2400	523	2800	510	3100	526	3300	519
2100	558	2300	551	2500	545	2900	532	3200	548	3400	541
2200	580	2400	573	2600	567	3000	554	3300	569	3500	563
2300	600	2500	595	2700	589	3100	576	3400	591	3600	585
4600	600	2600	600	2800	600	3200	600	3500	600	3700	600
		4600	600	4600	600	4600	600	4600	600	4600	600

The capacity of the by-pass weir when open under conditions of a minimum water level in the reservoir (which is 128.2 m above sea level), is 290 m^3/sec. The discharge of 400 m^3/s can be assured under the condition that the water level in the reservoir is 128.45 m above sea level, and 600 m^3/sec under conditions of a water level of 129.05 m above sea level.

The water level in the reservoir is lowered only when required for construction or reparation works or when the discharge in Devín is below 925 m^3/s.

The possible differences in discharges which will be ascertained through monitoring by 31 Oct. will be adjusted within the shortest possible period by the end of the same year so that the average of 400 m^3/sec is attained.

The changes in the discharges through the Čunovo weir will occur at intervals of 200 m^3/sec. measured at the Devín site. Thus for instance at 800, 1000, 1200, 1400.... 2000, 2200 m^3/sec.

This distribution of the water resources shall be in force for 1995 and will be adjusted before the 1996 growing season on the basis of the results of a joint evaluation of the monitoring.

Annex No III.

Time table of planned underwater weir's construction at rkm 1843

No	Items	Days, weeks
1	Preparation	1–20
2	Demolition of guide bank	11–28
3	Dredging of upstream guide channel	6–28
4	Bank and river bed protection	15–35
5	Construction of dam and energy dissipater	17–46
6	Protection of bridgeplate of Dunakiliti weir	6–28
7	Putting into operation	40–50
8	Completing of bank protection and demolition of temp energy supply	46–50

Weeks: 1 = days 1–7; 2 = days 8–14; 3 = days 15–21; 4 = days 22–28; 5 = days 29–35; 6 = days 36–42; 7 = days 43–49; day 50.

No	Items	Days 1–5	Days 6–14	Days 15–21	Days 22–25	Days 26–39	Days 40–42	Days 43–46	Days 47–50
9	Water discharge during the construction m3/s	400	200	150 - 100	*	150 - 100	400 - 600	150 >	400 <

* ecological minimum 50 m3/s

* Main parameters of the weir to be constructed at rkm 1843 of the Danube·

1. The weir which is partly overflowed by water will be constructed at rkm 1843 of the Danube.

2. Main parameters of the weir:

width between banks	300 m
width of the crest	5 m
width of the overflowed section	100 m
height of the center point of the overflowed section	121.80 B.s.l.
gradient of the downstream slope	1 : 10
gradient of the upstream slope	1 : 3

3. The elevation of the weir crest will be established in such a way that at the discharge of 600 m^3/s, the backwater at rkm 1851.7 of the Danube and elevation of 124.00 Bsl would not exceed.

4. The water level regulation at rkm 1843 take place when the discharge of the Danube is between 250-1300 m^3/s.

5. A maximum quantity of 150 m^3/s will be discharged into the right side branch system on the Hungarian side.

Based on the documentation approved under the number
No. VOD 161/A 28/1993-V
No. 21.663/17/1993

Annex No. 5

Matters relating to monitoring of environmental impacts .

Monitoring is divided into the following monitoring items:

Monitoring of surface water levels and discharges

the Danube:
profile at Devín
profile at Medveďov
profile at Komárno - Komárom
profile at Štúrovo - Esztergom
p file at Rajka
profile at Dobrohošť
profile at Dunaremete
profile downstream and upstream of overflowed weir at rkm 1843, (water level only)
Reservoir at Čunovo and the Danube downstream and upstream of the by-pass weir (water level only)
Reservoir at Gabčíkovo (water level only)
Tailrace canal downstream of Gabčíkovo (water level only)

Malý Danube:
at Bratislava
at Trstice

Mosoni Duna:
downstream of the intake structure at Čunovo
at Mecser
at Györ

Structures at Rajka
Seepage canal at Čunovo (on the Slovak territory)
No. 1. Lock of the outlet
No. 2. Lock of the water level control
No. 6. Lock of the water level control - Mosoni Duna
No. 1. Lock of the side branch Kility - Cikolai, Zátonyi Duna
No. 5. Lock at the seepage canal

Frequency of measurements: continuous on a daily basis

Monitoring of surface water quality

the Danube:
- upstream Bratislava *
- at Dobrohošt

at Gabčíkovo
at Medveďov *
at Gönyü
at Komárno - Komárom
at Štúrovo - Esztergom

Reservoir, bypass canal, seepage canals, river branches:

- upper part of the reservoir at Rusovce *
- the reservoir at Kalinkovo (left and right side)
- downstream of Mosoni Danube the intake structure
- the profile at Šamorín (left, middle and right side)
- the power canal at the ferry station
- the tailwater canal downstream of Gabčíkovo *
- the seepage canal at Čunovo *
- the seepage canal at Hamuliakovo
- the Mosoni Duna at Rajka
- the Mosoni Duna at Mecser
- the Mosoni Duna at Vének
- the Malý Dunaj at Kolárovo
- the river branches Helena and Doborgaz
- the Šulianske river branch

Frequency of measurement:
- stations marked by * - 12 times per year, between the 10th and 20th of each month,
- all other stations in: January, March, April, May, June, July, September, November, between the 10th and 20th of each month.

List of parameters:
- temperature, pH value, conductivity at 25°C, O_2
  cations: Li, Na, K, Ca, NH4, Mn, Mg, Fe
- anions: HCO3, Cl, SO4, NO3, NO2, PO4, P
- trace elements: Hg, Zn, As, Cu, Pb, Cr, Cd Ni, Vanadium
- COD, BOD, dissolved materials (mineralization)
- biological parameters: Saprobility index, bioseston, chlorophyll,
- number of algae, zooplancton, macrobenthos, according to the decision of the monitoring group,
- microbiological parameters, coliform bacteria, mezophilic bacteria, psychrophilic bacteria
- organic matters, TOC, Nonpolar extractable - UV, - IR, EOX, AOX, phenols, humic acids,
- organic micropollutants, polyaromatic hydrocarbons, - polychlorobiphenyls (and others, to be agreed)

Sediments:
- at jointly selected stations, e.g. at places of surface water quality sampling,
- three places in the Slovak and three in the Hungarian flood plain

Extent of parameters:

granulometric curves, organic matters and other selected parameters

Frequency of measurement: once per year in autumn

Monitoring of ground water levels

Monitoring of ground water levels will be carried out on wells between the Malý Danube and the Lajta - Mosoni Danube. Wells to be chosen in profiles based on maps containing all observation wells. [At least at 150 wells on the Slovak territory and at least at 100 wells on the Hungarian territory to be chosen.]

Frequency of measurement: once per week

Monitoring of ground water quality

Ground water quality will be monitored on the municipal water supply [and ground water] wells between the Malý Danube and the Laita - Mosoni Danube, [at least 10 localities on each territory. In addition to this other at least 10 selected ground water quality wells on each territory] should be monitored. These wells should be those which satisfy hygiene criteria for drinking water wells and sampling should be commonly agreed.

Frequency of measurement: once per month.

Quality should be evaluated according to the standards for drinking water in force in both countries.

Monitoring of soil moisture (aeration zone)

[At least 10] monitoring areas to be selected on each territory from among the localities already monitored.

Frequency of measurement: once every 10 days, but in winter (November, December, January and February) twice a month. Each locality should also include a ground water level monitoring well.

Monitoring of biota:

- microbenthos and macrobenthos in the Danube and river branches at places of water level measurements
- fish, in all surface waters
- [Forestry, on at least 8 selected places from among existing monitoring localities on each side]
- Special water related organisms as for example: Odonata, Ephemeroptera, Trichopetra, Braconidea and others, jointly selected.

Special monitoring

For the estimation of the impact of the overflowed weir special monitoring to be carried out. This will include measurements of flow velocities, water levels, water quality, micro and macro benthos, sediments, ground water quality in the impounded reach etc.

Submitting of data and reports:

Both sides will use data jointly agreed and will use jointly agreed methods of evaluation. All monitoring items and locations, and methods of measurements to be jointly agreed. Annual reports will include only measured data in tabulated, graphical and map forms with short explanations.

Joint and verification measurements will be carried out at any location where a discrepance occurs.

Data exchange will be carried out at three month intervals. Annual reports to be submitted as joint reports by the end of each calendar year and covering a period of a hydrological year.

Annual reports will be issued in English language with standardised graphical annexes in Hungarian or Slovak languages.

Statute

Monitoring will be carried out in accordance with the Statute of nominated Monitoring Agents.

Statute will be prepared by: Ing Arpád Kovács, Ministry of Environment (Hungary), Ing. Dominik Kocinger, Government plenipotentiary for the GNP (Slovakia)

Draft statute will be prepared jointly following the signing of this document and before 31.May 1995.

Text in square brackets [] contains Slovak proposals subject to agreement by the Monitoring Agents.

APPENDIX A.2.

STATUTE
on the activities of the Nominated Monitoring Agents
envisaged in the

*"Agreement
between the Government of Republic of Hungary and
the Government of the Slovak Republic
concerning Certain Temporary Technical Measures and
Discharges in the Danube and the Mosoni Branch of the Danube",
signed on April 19, 1995*

According to the Article 4 of the "Agreement between the Government of Republic of Hungary and the Government of the Slovak Republic concerning Certain Temporary Technical Measures and Discharges in the Danube and the Mosoni Branch of the Danube", signed on April 19, 1995 (in the following Agreement) the Parties undertake to exchange data of their environmental monitoring systems operating in the affected area which are necessary to assess the environmental impacts of the measures envisaged in Articles 1-3 of the Agreement.

According to the assignment contained in the Article 4 and Annex 5 of the Agreement, Nominated Monitoring Agents (Representatives of Parties):

Árpád Kovács, Deputy State Secretary of the Ministry for Environment and Regional Policy of Hungary

and

Dominik Kocinger, Plenipotentiary of Government of Slovak Republic for Construction and Operation of Gabčíkovo-Nagymaros Waterworks

agreed on the Statute concerning the exchange of data and joint periodical evaluation thereof (in the following Statute).

Article 1

1. Nominated Monitoring Agents are responsible for the exchange and evaluation of data from the environmental monitoring systems of the Parties which are necessary to assess the environmental impacts of the measures envisaged in Articles 1-3 of the Agreement.

2. The Nominated Monitoring Agents will submit the joint evaluations and proposals prepared periodically to their respective Governments.

Article 2
Data from the environmental monitoring system

1. The monitoring sites, objects and items based on Annex 5 of the Agreement are specified in the Annexes to this Statute. Annex 1 contains monitoring sites, objects and items for the Slovak Republic, and Annex 2 contains monitoring sites, objects and items for Hungary, both Annexes specifying the dates of data exchange.

2. The in situ survey of monitoring sites and objects or joint measurements will be carried out where a discrepancy occurs to measured data, or through agreement by the Nominated Monitoring Agents.

3. The Nominated Monitoring Agents are entitled to change or add a monitoring site, object or item by mutual consent.

4. Exchange of the data is made through the Nominated Monitoring Agents in writing and on magnetic media. The Nominated Monitoring Agents undertake to put at each other's disposal necessary topographical maps (M 1:10000) and any other maps in other scale under mutual agreement.

Article 3
Monitoring evaluation

1. The joint evaluation of exchanged data refers to one hydrological year. The Joint Annual Report will be carried out four months following the respective hydrological year. The Joint Annual Report will be prepared in Slovak, Hungarian and English languages, the English text shall prevail in the event of any discrepancy.

2. The National Annual Report will include the measured data in tabular, graphical and map forms with short explanations. The Parties will exchange National Annual Report three months following the respective hydrological year, and Nominated Monitoring Agents will call a meeting to carry out the joint evaluation of presented data.

Article 4
Activity of Nominated Monitoring Agents

1. Meetings will be held according to need, but at least two times in a calendar year. Meetings are called by both sides alternately. All necessary conditions for a meeting have to be secured by the receiving Party, and the meeting is chaired by the Nominated Monitoring Agent of the receiving Party. Minutes from the meeting will be prepared and will be signed by both Nominated Monitoring Agents.

2. Nominated Monitoring Agents have the right to invite experts to the meetings.

3. When a joint measurements or an in situ site survey will be carried out the receiving Party is obliged to secure all necessary conditions for measurement and access to the monitored site or object, subject to mutual agreement.

4. Meetings of the Nominated Monitoring Agents are to be held in the Slovak and Hungarian languages. Minutes from the meetings are prepared in the Hungarian, Slovak and English languages, the English text will prevail in the event of any discrepancy.

Article 5
Miscellaneous Provisions

1. All expenses connected to the activity of Nominated Monitoring Agents and meetings are covered by the Parties independently. Expenses connected to the preparation of the English version of the Joint Annual Report are covered by the Parties equally.

2. The Nominated Monitoring Agents begin their activities upon the approval of this Statute.

3. This Statute shall terminate with the termination of the Agreement.

4. This Statute is prepared in duplicate, in the Slovak, Hungarian and English languages, the English text will prevail in the event of any discrepancy.

Agreed at Gabčíkovo on 29th May, 1995.

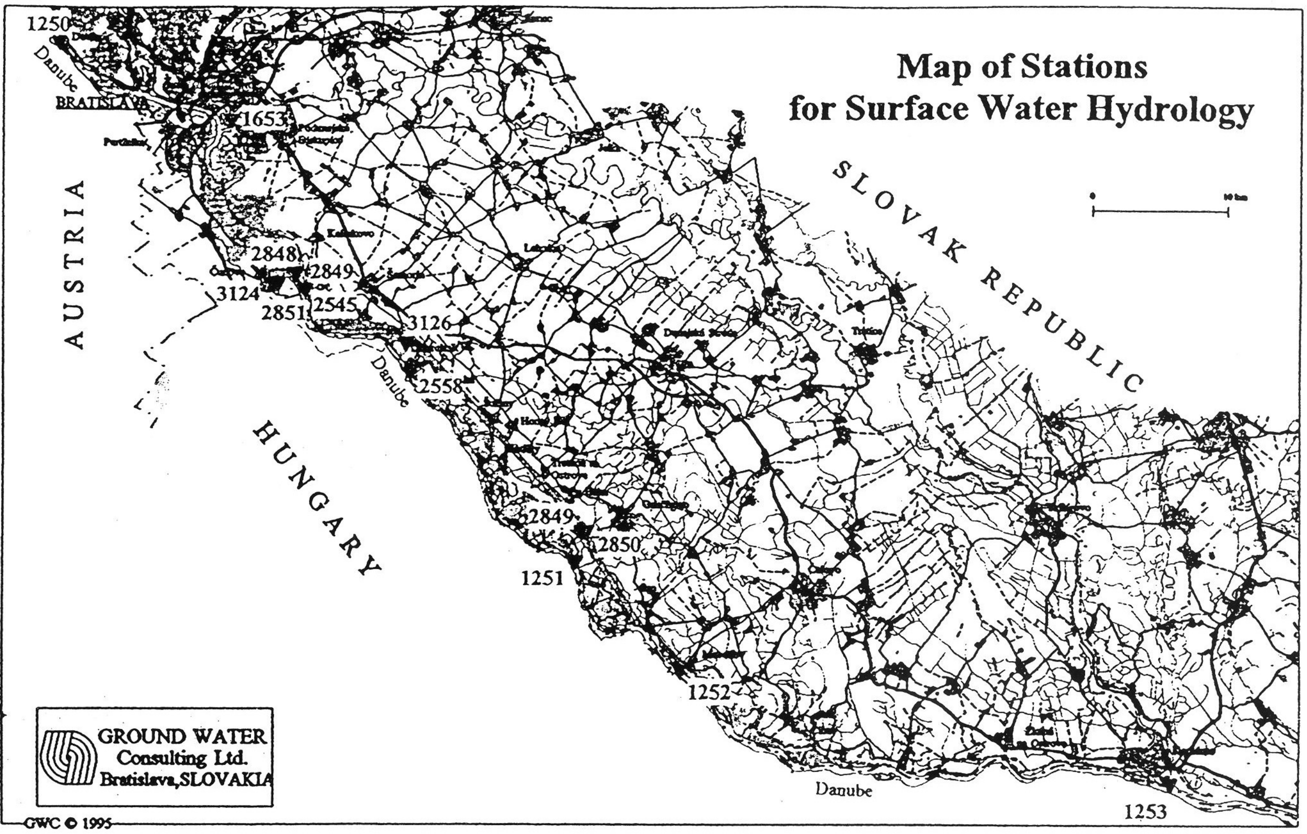
....	....
Kovács Árpád	**Dominik Kocinger**
Nominated Monitoring Agent	*Nominated Monitoring Agent*
of the Republic of Hungary	*of the Slovak Republic*

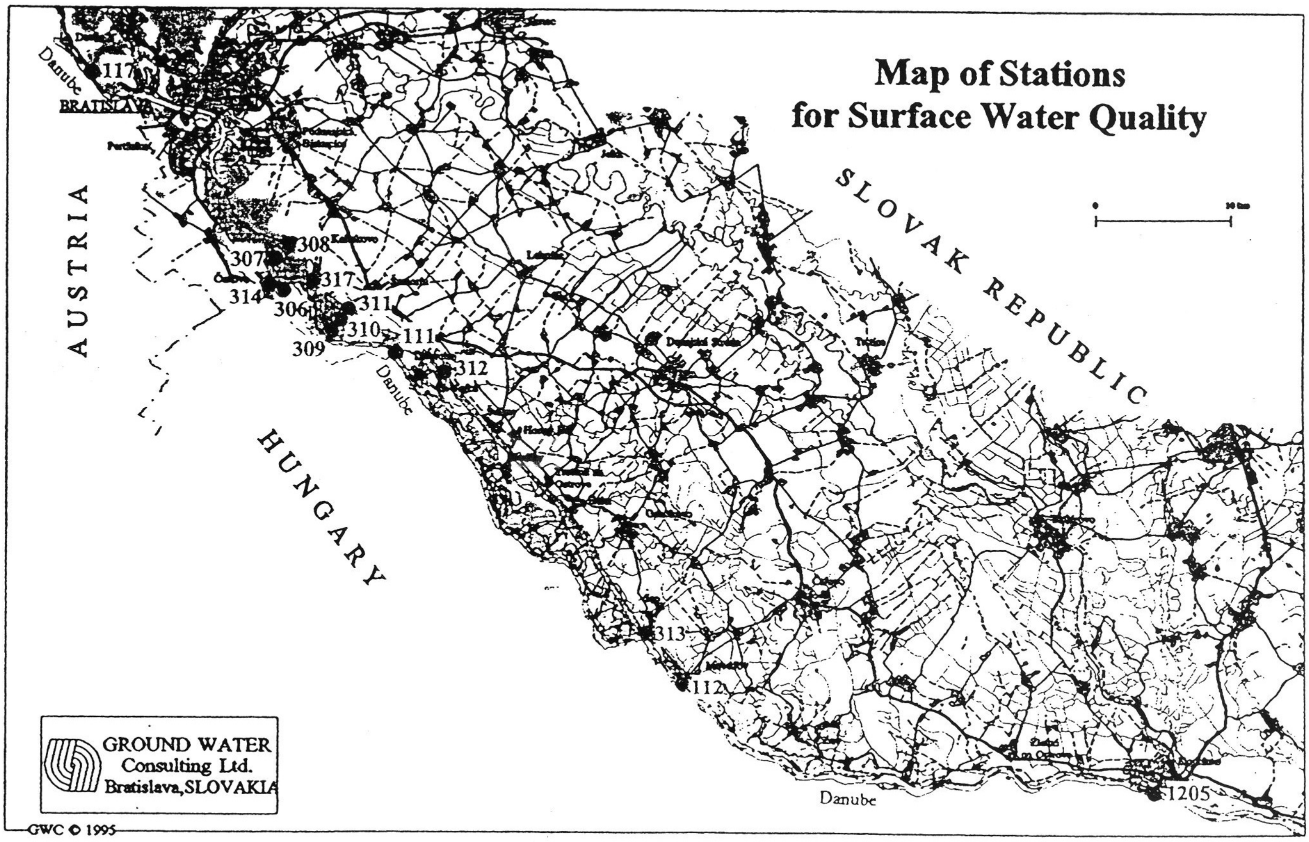
ANNEX 1

Monitoring areas, objects and items

of Slovak Republic

Contents


Map of Stations
for Surface Water Hydrology
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
BRATISLAVA
Danube
1250
1653
2848
2849
3124
2851
2545
3126
2558
2849
2850
1251
1252
1253
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
GWC © 1995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for Surface Water Quality
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
BRATISLAVA
Danube
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308
317
314
306
311
310
111
309
312
313
112
1205
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
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List of Stations for Surface Water Hydrology

Station No.	Situated on	Location	H	Q	Q - daily average
1250	Danube	Bratislava-Devín	H	Q	Q - daily average
2545	Danube	Hamuliakovo	H	-	
2558	Danube	Dobrohošť	H	Q	Q - daily average
1251	Danube	Gabčíkovo	H	-	
1252	Danube	Medveďov	H	Q	Q - daily average
1253	Danube	Komárno	H	Q	Q - daily average
2848	Danube - Reservoir	By-pass Weir upstream	H	-	
2849	Danube - Old river bed	By-pass Weir downstream	H	Q	
2851	Mosoni Danube	Intake structure at Čunovo	H	Q	Q - daily average
3126	Danube - Power channel	Intake structure at Dobrohošť	H	Q	Q - daily average
2849	Danube - Power channel	Gabčíkovo upstream	H	-	
2850	Danube - Outlet channel	Gabčíkovo downstream	H	Q	
3124	Seepage canal	Čunovo	H	Q	
1653	Malý Danube	Malé Pálenisko	H	Q	Q - daily average

Frequency of measurements:
H - surface water level, measured daily at 7.00 a.m.
Q - surface water discharge, corresponding to measured surface water level at 7.00 a.m.
Q daily average - surface water discharge, evaluated from continuous surface water level measurements

Data exchange:
H,Q - daily
Q daily average - quarterly

Data sheet for Surface Water Hydrology

Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

Joint Monitoring Data

Date: DD.MM.YYYY

Station No.	Situated on	Location	Surface Water level (m a.s.l.)	Discharge (m^3s^{-1})
1250	Danube	Bratislava-Devín	***.**	*****.**
2545	Danube	Hamuliakovo	***.**	-
2558	Danube	Dobrohošť	***.**	*****.**
1251	Danube	Gabčíkovo	***.**	-
1252	Danube	Medveďov	***.**	*****.**
1253	Danube	Komárno	***.**	*****.**
2848	Danube - Reservoir	By-pass Weir upstream	***.**	-
2849	Danube - Old river bed	By-pass Weir downstream	***.**	*****.**
2851	Mosoni Danube	Intake structure at Čunovo	***.**	*****.**
3126	Danube - Power channel	Intake structure at Dobrohošť	***.**	*****.**
2849	Danube - Power channel	Gabčíkovo upstream	***.**	-
2850	Danube - Outlet channel	Gabčíkovo downstream	***.**	*****.**
3124	Seepage canal	Čunovo	***.**	*****.**
1653	Malý Danube	Malé Pálenisko	***.**	*****.**

Data exchanged on a daily basis.
Daily average discharge exchanged quarterly.

List of Stations for Surface Water Quality

Station No.	Situated on	Location	Sample taken from
117	Danube	Bratislava - Karlova Ves	Left bank
111	Danube	Hrušov	Left bank
112	Danube	Medveďov	Middle
1205	Danube	Komárno	Middle
307	Danube - Reservoir	Kalinkovo	Navigation channel
308	Danube - Reservoir	Kalinkovo	Left side
309	Danube - Reservoir	Šamorín	Right side
310	Danube - Reservoir	Šamorín	Navigation channel
311	Danube - Reservoir	Šamorín	Left side
312	Danube - Power channel	Vojka	Left bank
313	Danube - Outlet channel	Sap	Left bank
306	Mosoni Danube	Čunovo	Middle
314	Seepage canal	Čunovo	Middle
317	Seepage canal	Hamuliakovo	Middle
	River arm	Dobrohošť	Left bank

Frequency of measurements, List of parameters:

12 times per year (monthly)
Temperature, pH, Conductivity, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, Mn, Fe, NH_4^+
HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{2-}
total P, total N
Hg, Zn, As, Cu, Cr, Cd, Ni
COD_{Mn}, BOD_5
Suspended silts (dried at 105°C)
Saprobity index, Clorophyll-a, Coliform Bacteria
Fecalcoli, Streptococcus, Number of Bacteria
TOC, UV oil, total dissolved solids (dried at 105°C)

4 times per year
Number of Algae, Zooplancton, Macrobenthos

Once per year
Sediments
total P, total N, organic and anorganic micropollutants

Data exchange: quarterly, yearly

Data sheet for Surface Water Quality

Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

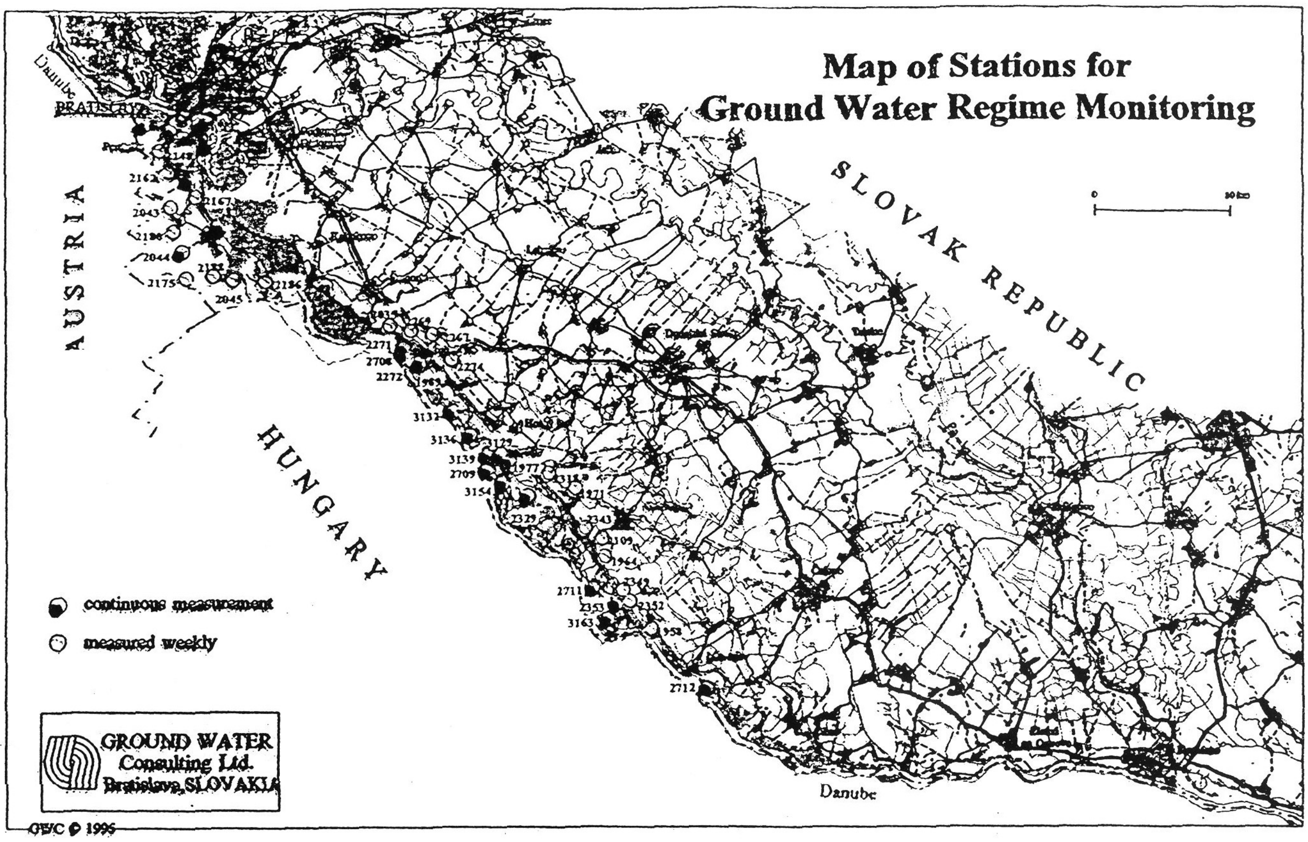
Joint Monitoring Data

Station No.: ****
Date: DD.MM.YYYY

Item	Value	Unit
Temperature	**.*	°C
pH	*.*	-
Conductivity	***.**	
O_2	***.**	
Na^+	***.**	
K^+	***.**	
Ca^{2+}	***.**	
Mg^{2+}	***.**	
Mn	***.**	
Fe	***.**	
NH_4^+	***.**	
HCO_3^-	***.**	
Cl^-	***.**	
SO_4^{2-}	***.**	
NO_3^-	***.**	
NO_2^-	***.**	
PO_4^{2-}	***.**	
total P	***.**	
total N	***.**	
Hg	***.**	
Zn	***.**	
As	***.**	
Cu	***.**	
Cr	***.**	
Cd	***.**	
Ni	***.**	

Item	Value	Unit
COD_{Mn}	***.**	
BOD_5	***.**	
suspended silts	***.**	
Saprobity index	***.**	-
Clorophyll-a	***.**	
Coliform Bacteria	***.**	
Fecalcoli	***.**	
Streptococcus	***.**	
Number of Bacteria	***.**	
TOC	***.**	
UV oil	***.**	
total dissolved solids	***.**	

Data exchanged quarterly.


Map of Stations for
Ground Water Regime Monitoring
AUSTRIA
HUNGARY
SLOVAK REPUBLIC
Danube
BRATISLAVA
Danube
continuous measurement
measured weekly
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
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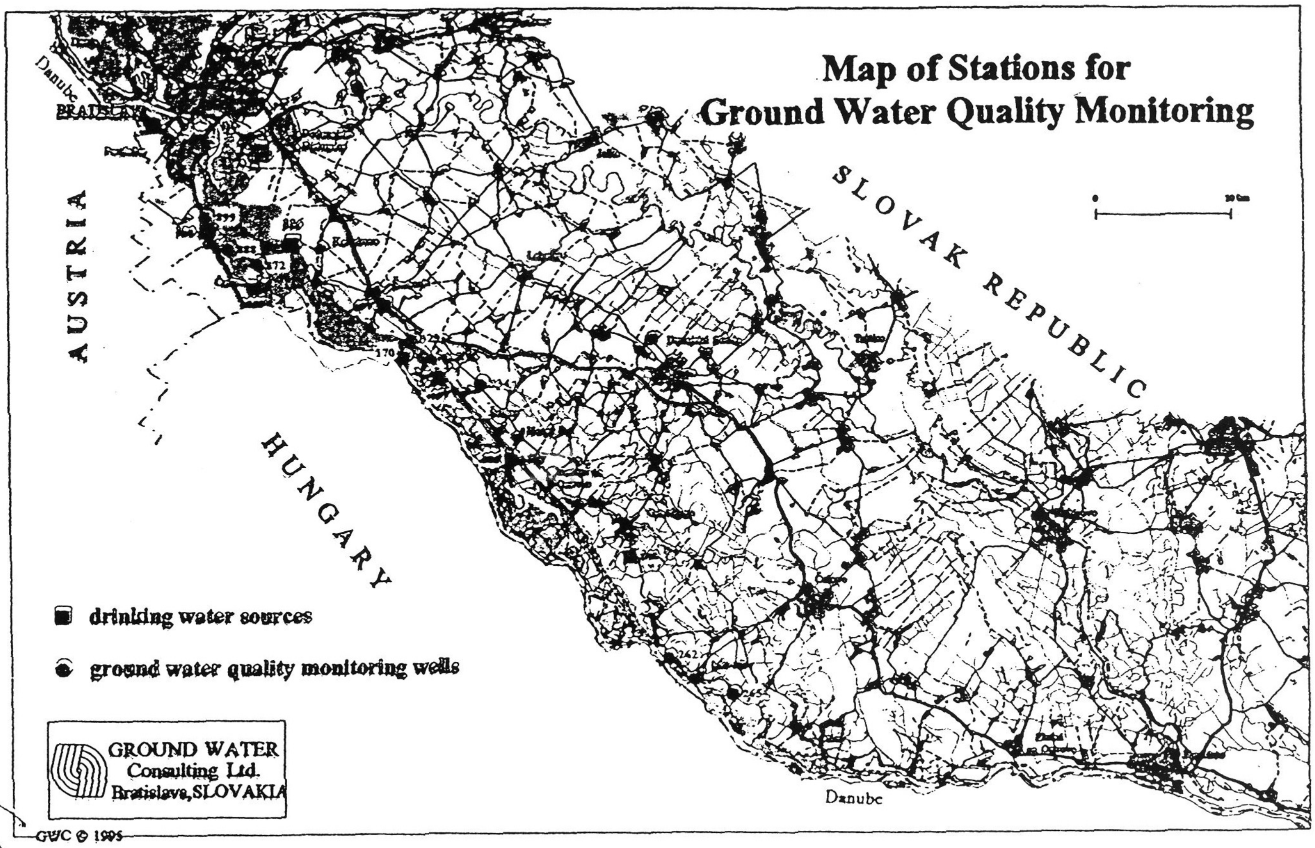
Map of Stations for
Ground Water Quality Monitoring
AUSTRIA
HUNGARY
SLOVAK REPUBLIC
Danube
BRATISLAVA
Danube
drinking water sources
ground water quality monitoring wells
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
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List of Stations for Ground Water Regime Monitoring

Station No.	Measured
Right side of the Danube	
2148	weekly
2162	weekly
2167	weekly
2043	weekly
2180	weekly
2044	continuously
2175	weekly
2188	weekly
2045	weekly
2186	weekly
2169	weekly
2165	weekly
2041	weekly
2039	weekly
2144	weekly
Left side of the Power Channel	
2035	weekly
2269	weekly
2267	weekly
2274	weekly
2318	weekly
1971	weekly
2343	weekly
2109	weekly

Station No.	Measured
1964	weekly
2349	weekly
2352	weekly
1958	weekly
2712	weekly
Inundation area	
2271	continuously
2708	continuously
2272	weekly
1989	continuously
3132	continuously
3136	continuously
3139	continuously
3129	continuously
1977	continuously
2709	continuously
3154	continuously
2329	continuously
2711	continuously
2353	continuously
3163	continuously

Frequency of measurements:
measured continuously - measured every hour
measured weekly - measured once a week (on Wednesday)

Data exchange: monthly

Data sheet for Ground Water Regime Monitoring

Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

Joint Monitoring Data

Station No.: ****
Date: DD.MM.YYYY

Date dd.mm.yy	Ground Water Level (m a.s.l.)
01.06.95	***.**
02.06.95	***.**
03.06.95	***.**
04.06.95	***.**
05.06.95	***.**
.	.
.	.
27.06.95	***.**
26.06.95	***.**
27.06.95	***.**
28.06.95	***.**
29.06.95	***.**
30.06.95	***.**

Data exchanged on a monthly basis.

List of Stations for Ground Water Quality

Station No.	Location	Situated	Sampled
Municipal Wells for Drinking Water Supply			
102	Rusovce	Right side of the Reservoir	monthly
2559	Čunovo	Right side of the Reservoir	monthly
116	Kalinkovo	Left side of the Reservoir	monthly
457	Šamorin	Left side of the Reservoir	monthly
467	Dobrohošť	Inundation area	monthly
485	Bodiky	Inundation area	monthly
103	Gabčikovo	Left side of the Outlet channel	monthly
	Bratislava-Petržalka	Right side of the Danube	monthly
Ground Water Quality Observation Wells			
899	Rusovce	Right side of the Reservoir	quarterly
888	Rusovce	Right side of the Reservoir	quarterly
872	Čunovo	Right side of the Reservoir	quarterly
329	Šamorin	Left side of the Reservoir	quarterly
170	Dobrohošť	Inundation area	quarterly
234	Rohovce	Left side of the Power channel	quarterly
262	Sap	Left side of the Danube	quarterly
265	Kľúčovec	Left side of the Danube	quarterly

Frequency of measurements, List of parameters:

4 times per year
Temperature, pH, Conductivity, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, Mn, Fe, NH_4^+
HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{2-}
COD_{Mn}, TOC
SiO_3^-

Data exchange: quarterly

Data sheet for Ground Water Quality

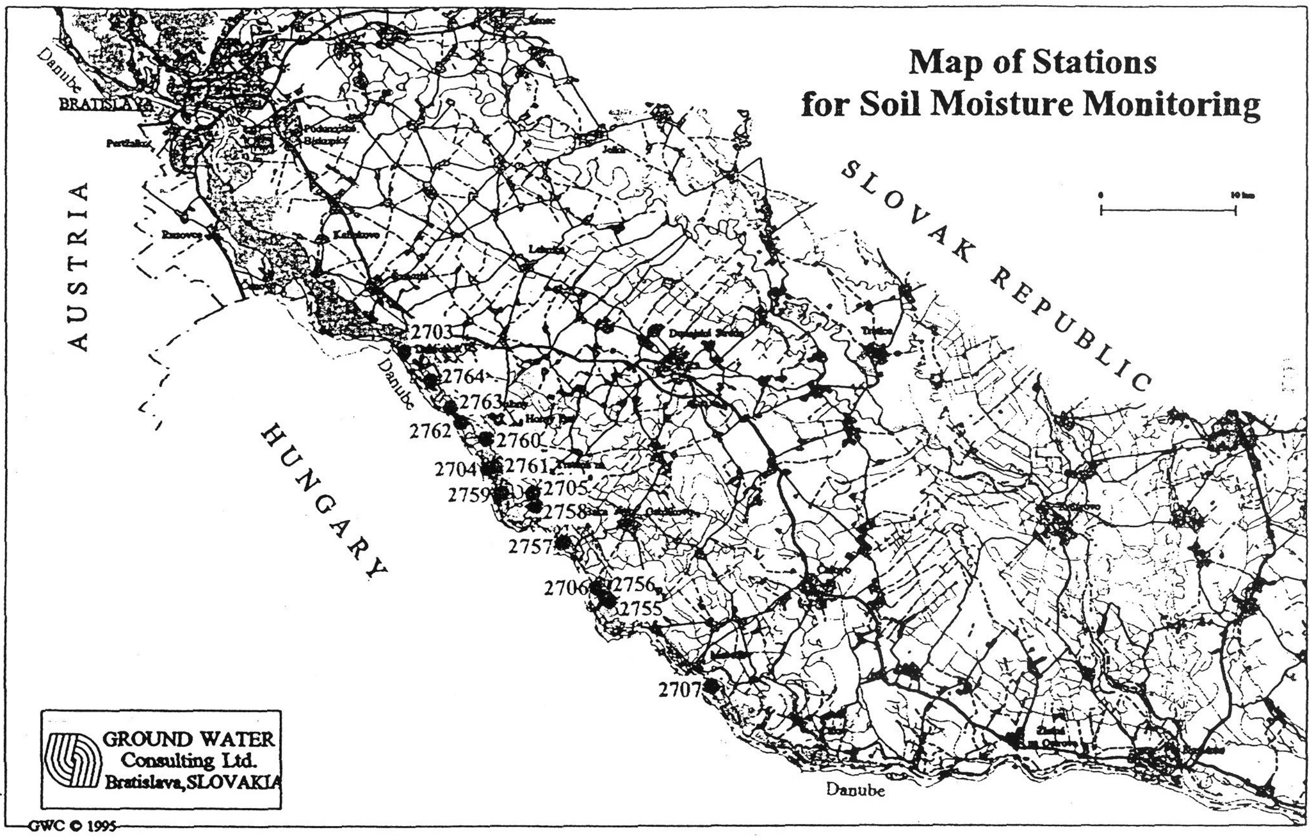
Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

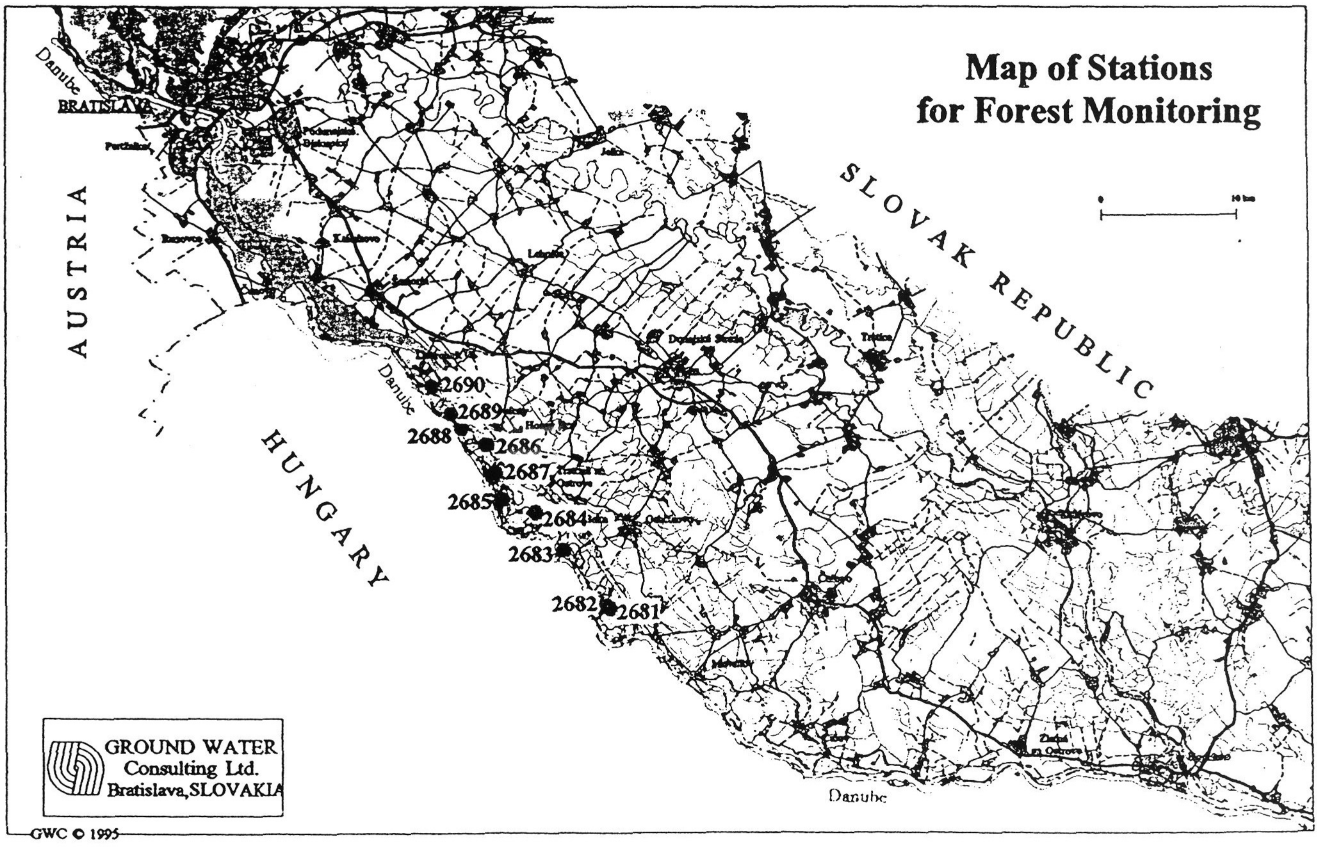
Joint Monitoring Data

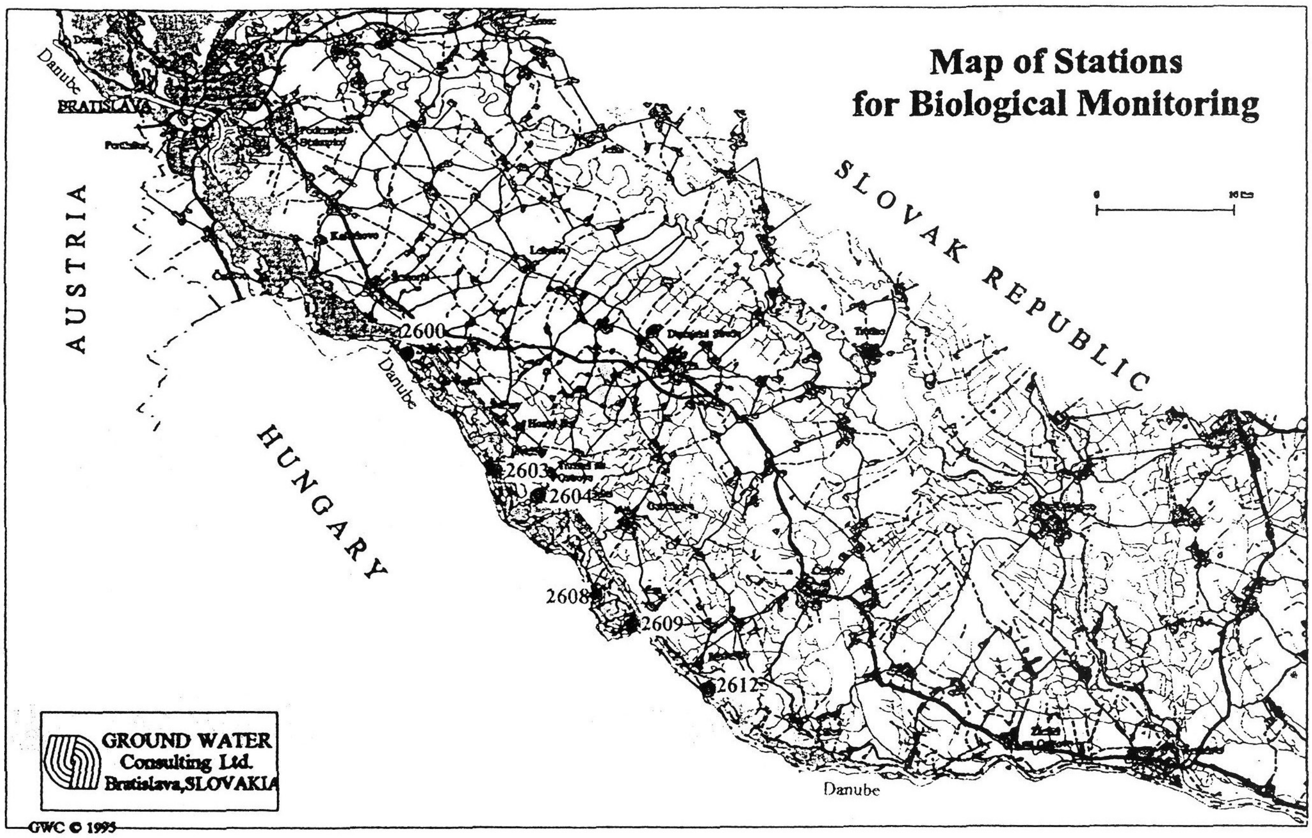
Station No.: ****
Date: DD.MM.YYYY

Item	Value	Unit
Temperature	**.*	°C
pH	*.*	-
Conductivity	***.**	
O_2	***.**	
Na^+	***.**	
K^+	***.**	
Ca^{2+}	***.**	
Mg^{2+}	***.**	
Mn	***.**	
Fe	***.**	
NH_4^+	***.**	
HCO_3^-	***.**	
Cl^-	***.**	
SO_4^{2-}	***.**	
NO_3^-	***.**	
NO_2^-	***.**	
PO_4^{2-}	***.**	
COD_{Mn}	***.**	
TOC	***.**	
SiO_3^-	***.**	

Data exchanged quarterly.


Map of Stations
for Soil Moisture Monitoring
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
Danube
BRATISLAVA
Danube
Danube
2703
2764
2763
2762
2760
2704
2761
2759
2705
2758
2757
2706
2756
2755
2707
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
GWC © 1995


Map of Stations
for Forest Monitoring
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
Danube
BRATISLAVA
Danube
Danube
2690
2689
2688
2686
2687
2685
2684
2683
2682
2681
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
GWC © 1995


Map of Stations
for Biological Monitoring
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
BRATISLAVA
Danube
Danube
Danube
2600
2603
2604
2608
2609
2612
GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA
GWC © 1995

List of Stations for Soil Moisture Monitoring

Station No.	Name of Station	Location
2703	MP-6	Dobrohošť
2704	MP-9	Bodiky
2705	MP-10	Bodiky
2706	MP-14	Gabčíkovo
2707	MP-18	Kľúčovec
2764	L-12	Dobrohošť
2763	L-11	Vojka nad Dunajom
2762	L-10	Vojka nad Dunajom
2761	L-9	Horný Bar - Bodíky
2760	L-8	Horný Bar - Šuľany
2759	L-7	Horný Bar - Bodíky
2758	L-6	Trstená na Ostrove
2757	L-5	Baka
2755	L-4	Gabčíkovo
2755	L-3	Sap

Frequency of measurements, List of parameters:

Measured in vertical profile each 10 cm until ground water level is reached.
In the period March - Octobre measured with frequency 10 days.
In the period Novembre - February measured once per month.

Data exchange: quarterly

Data sheet for Soil Moisture Monitoring

Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

Joint Monitoring Data

Station No.: ****
Date: DD.MM.YYYY

Depth (m b.s.)	Water content (%)
0.10	**.**
0.20	**.**
0.30	**.**
0.40	**.**
0.50	**.**
0.60	**.**
0.70	**.**
0.80	**.**
0.90	**.**
1.00	**.**
.	.
.	.
.	.

Data exchanged quarterly.

List of Stations for Forest Monitoring

Station No.	Name of Station	Location	Prevailing Type of Forest
2690	L-12	Dobrohošť	Poplar "I214"
2689	L-11	Vojka nad Dunajom	Poplar "Robusta, Alder
2688	L-10	Vojka nad Dunajom	Poplar "I214"
2687	L-9	Horný Bar - Bodíky	Poplar "I214"
2686	L-8	Horný Bar - Šuľany	Poplar "Robusta", "I214"
2685	L-7	Horný Bar - Bodíky	Poplar "Robusta"
2684	L-6	Trstená na Ostrove	Poplar "Robusta"
2683	L-5	Baka	Poplar "I214"
2682	L-4	Gabčíkovo	Poplar "Robusta"
2681	L-3	Sap	Willow

List of items: increase of diameter, (loss of leaves - proposed).

Frequency of measurements: Twice per year.

List of Stations for Biological Monitoring

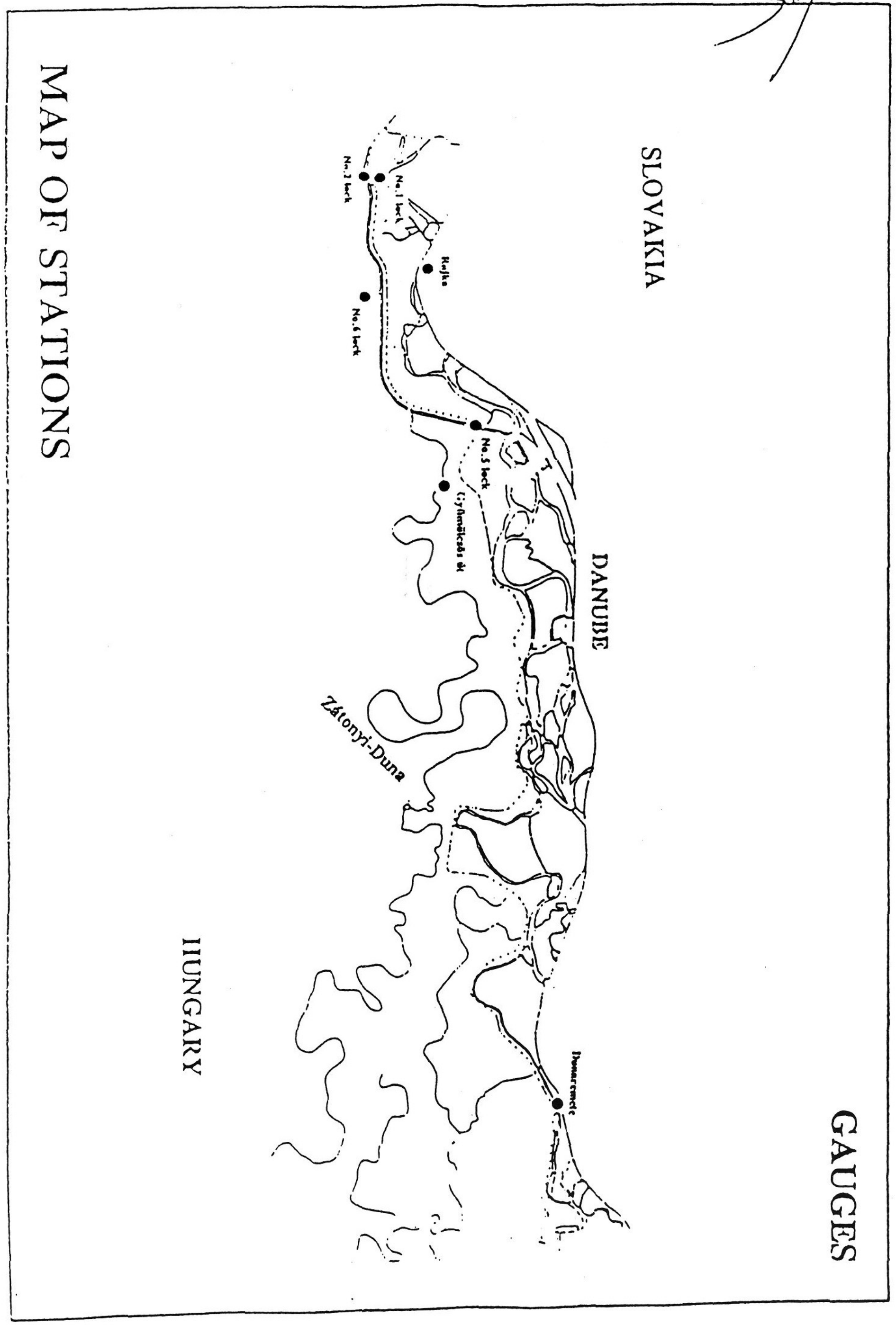
Station No.	Location	Situated
2600	Dobrohošť	Inundation area
2603	Bodíky	Inundation area
2604	Bodíky	Inundation area
2608	Gabčíkovo	Inundation area
2609	Sap	Inundation area
2612	Klúčovec	Downstream confluence of Old Danube and Tail-race Canal

Frequency of measurements, List of parameters:

Twice or Three times per year
Planctonic crustacea (Cladocera, Copepoda)
Macrophyton
Mollusca
Pisces
Odonata
Ephemeroptera
Trichoptera
(Heteroptera, Coleoptera-Curculionidae - proposed)
(Phytocenoses - proposed)

Monitored data:
Species, dominance

Data exchange: yearly



GAUGES (Daily Data)

List of Stations

Danube, Rajka *(water level only)*
Danube, Dunaremete (water level only)
Danube, Komárom
Mosoni-Duna, Mecsér*
Mosoni-Duna, Győr (Bácsa) (water level only)
Seepage canal, No.1 lock upstream
Seepage canal, No.1 lock downstream
Seepage canal, No.2 lock upstream
Seepage canal, No.2 lock downstream
Seepage canal, No.5 lock upstream
Seepage canal, No.5 lock downstream
Seepage canal, No.6 lock upstream
Seepage canal, No.6 lock downstream
Zátonyi-Duna, lock of the side branch upstream
Zátonyi-Duna, lock of the side branch downstream
upstream and downstream of weir at 1843 rkm (planned)
Helena-weir (planned)

Information: *Daily Report*
* *Monthly Report*

MONITORING OF SURFACE WATER QUALITY

List of parameter

Temperature, pH, conductivity, O_2

Na, K, Ca, Mg, Mn, Fe, NH_4

Hg, Zn, As, Cu, Cr, Cd, Ni, X

HCO_3, Cl, SO_4, NO_3, NO_2, PO_4, total P, total N

COD, BOD, suspended silts

saprobity index, clorophyll-a, coliform bacteria,
fecalcoli, streptococcus, number of bacteria,
number of algae*, zooplancton*, macrobenthos*

TOC, UV oil, total dissolved-salt -

Frequency of measurements: 12 times per year
** : 4 times per year*

Methodology: on basis of the Statutes of the Hungarian-Slovak Boundary Waters Commission, Statute of the Water Quality Subcommission, Annex 5

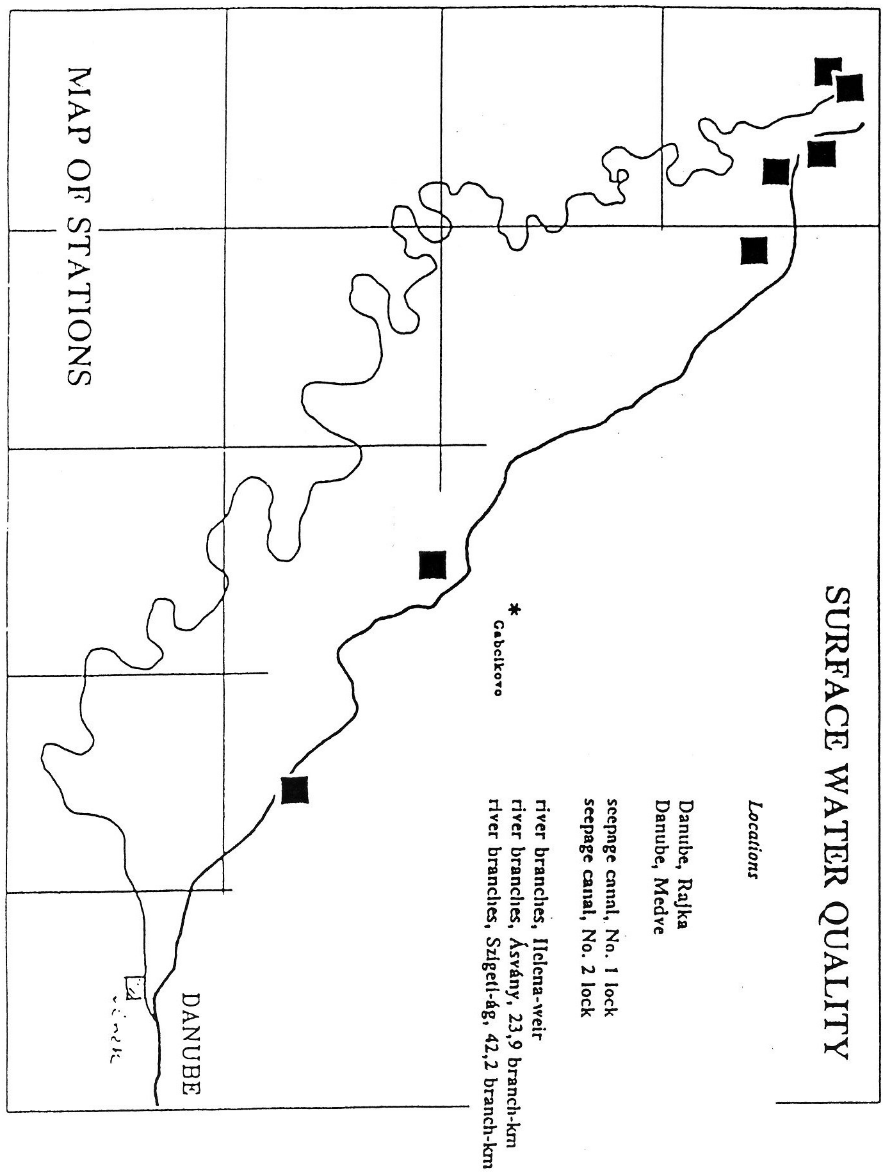
SEDIMENTS

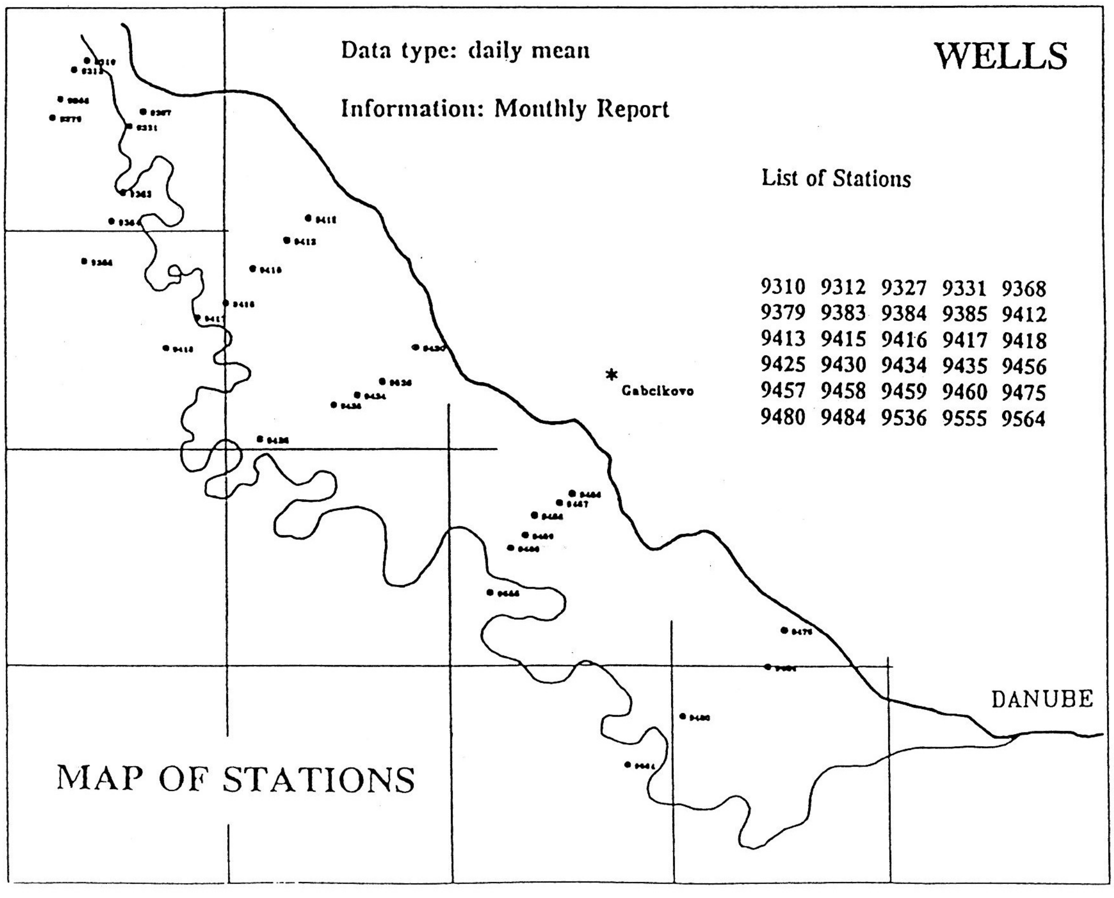
list of parameters

total P, total N, organic and anorganic micropollutant

Frequency of measurements: once per year

Methodology: on basis of the Statutes of the Hungarian-Slovak Boundary Waters Commission, Statute of the Water Quality Subcommission, Annex 5




Data type: daily mean
Information: Monthly Report
WELLS
List of Stations
9310 9312 9327 9331 9368
9379 9383 9384 9385 9412
9413 9415 9416 9417 9418
9425 9430 9434 9435 9456
9457 9458 9459 9460 9475
9480 9484 9536 9555 9564
Gabcikovo
DANUBE
MAP OF STATIONS

Ministry of Environment
and Regional Policy
HUNGARY

Árpád Kovács
Deputy Secretary of State

Szigetköz Monitoring Data

DATE ****

Location	surface water level [m asl]	discharge [m³/s]
Danube, Rajka	****	
Danube, Dunaremete	****	
Danube, Komárom	****	****
Mosoni-Duna, Győr (Bácsa)	****	
Seepage canal, No.1 lock upstream	****	****
Seepage canal, No.1 lock downstream	****	
Seepage canal, No.2 lock upstream	****	****
Seepage canal, No.2 lock downstream	****	
Seepage canal, No.5 lock upstream	****	****
Seepage canal, No.5 lock downstream	****	
Seepage canal, No.6 lock upstream	****	****
Seepage canal, No.6 lock downstream	****	
Zátonyi-Duna, lock of the side branch upstream	****	****
Zátonyi-Duna, lock of the side branch downstream	****	

Ministry of Environment
and Regional Policy
HUNGARY

Árpád Kovács
Deputy Secretary of State

Szigetköz Monitoring Data

GROUND WATER LEVEL

Number of well : ****

Date	m a.s.l.
1995.06.01	***.**
1995.06.02	***.**
1995.06.03	***.**
1995.06.04	***.**
1995.06.05	***.**
1995.06.06	***.**
1995.06.07	***.**
1995.06.08	***.**
1995.06.09	***.**
1995.06.10	***.**
1995.06.11	***.**
1995.06.12	***.**
1995.06.13	***.**
1995.06.14	***.**
1995.06.15	***.**
1995.06.16	***.**
1995.06.17	***.**
1995.06.18	***.**
1995.06.19	***.**
1995.06.20	***.**
1995.06.21	***.**
1995.06.22	***.**
1995.06.23	***.**
1995.06.24	***.**
1995.06.25	***.**
1995.06.26	***.**
1995.06.27	***.**
1995.06.28	***.**
1995.06.29	***.**
1995.06.30	***.**

COMPONENTS OF GROUND WATER QUALITY MONITORING

Temperature, pH, conductivity, DO_2,

Na, K, Ca, Mg, Mn, Fe, NH_4

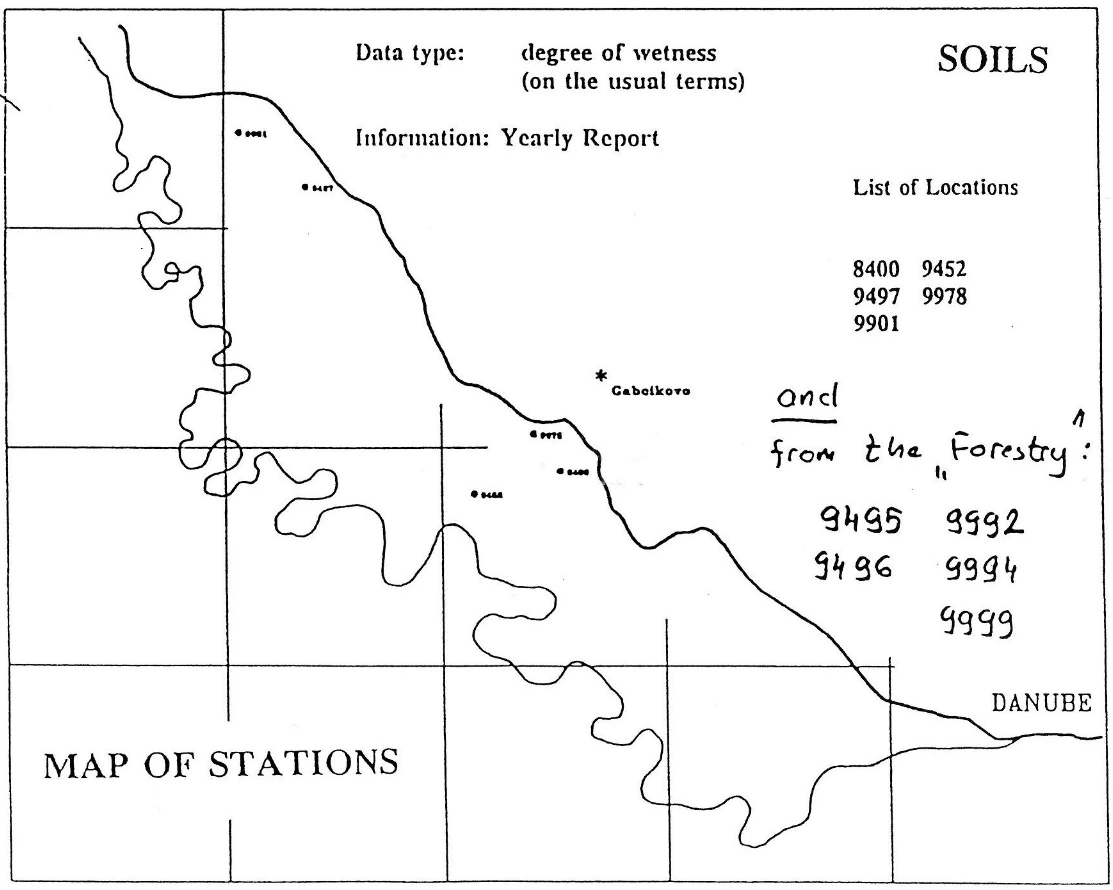
HCO_3, Cl, SO_4, NO_3, NO_2, PO_4

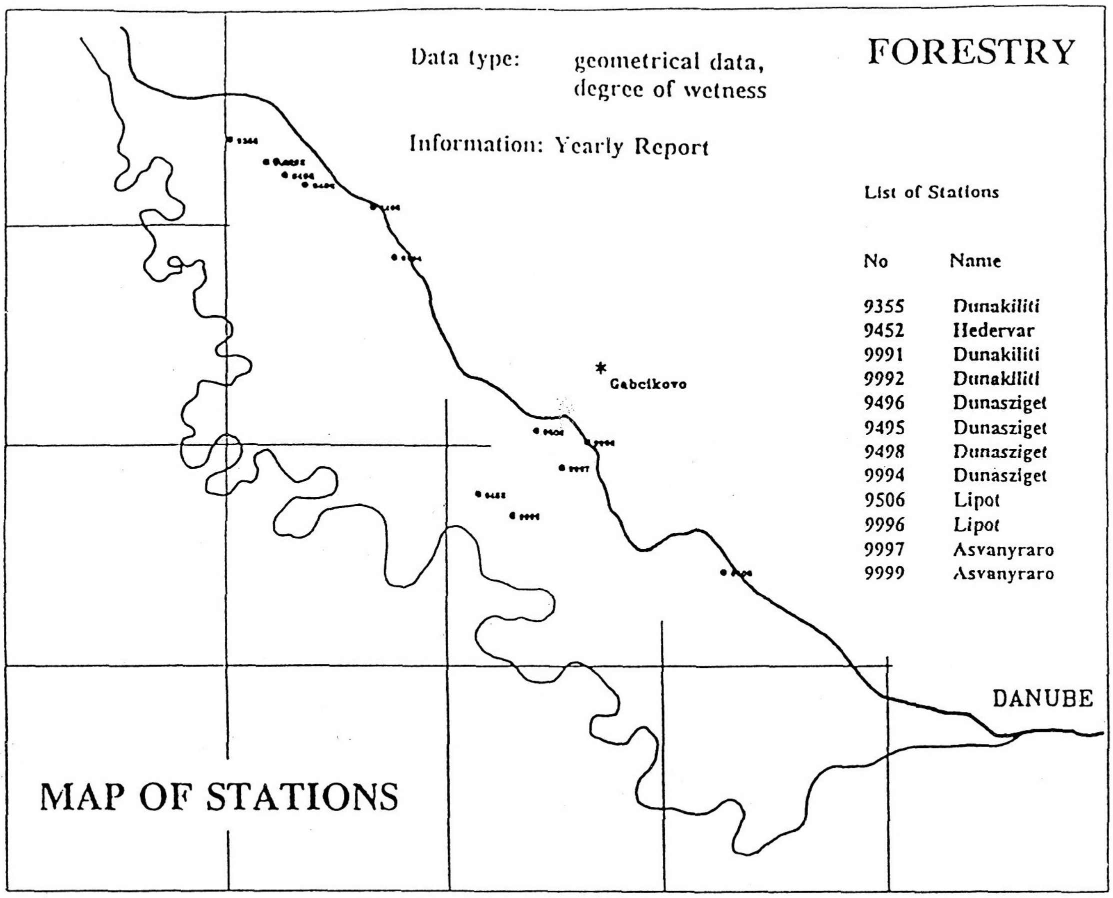
COD, TOC

silicates

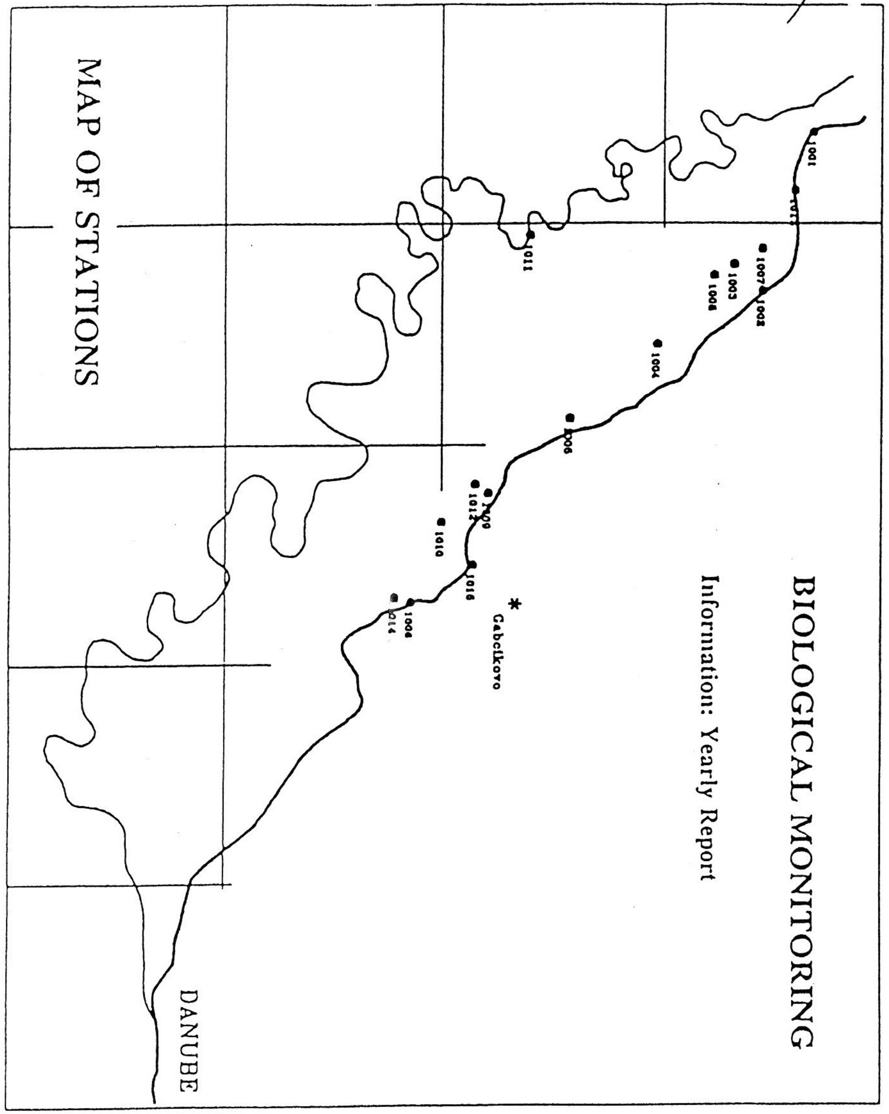
Frequency of measurements: 4 times per year

Methodology: on basis of the Statutes of the Hungarian-Slovak Boundary Waters Commission, Statute of the Water Quality Subcommission, Annex 5





FORESTRY
Data type: geometrical data, degree of wetness
Information: Yearly Report
List of Stations
No Name
9355 Dunakiliti
9452 Hedervar
9991 Dunakiliti
9992 Dunakiliti
9496 Dunasziget
9495 Dunasziget
9498 Dunasziget
9994 Dunasziget
9506 Lipot
9996 Lipot
9997 Asvanyraro
9999 Asvanyraro
Gabcikovo
DANUBE
MAP OF STATIONS



BIOLOGICAL MONITORING

AQUTIC ORGANISMS

Planctonic crustacea (Cladocera, Copepoda)

Location
- **Main channel : 1001, 1009**
- **Side arms: 1003, 1010,**
- **Mosoni-Duna: 1011**

Sampling: May, July, September
Biological data: species and specimen number / l (calculated from 100 l)

Macrophyton

Location
- **Main channel : 1001, 1009**
- **Side arms: 1002**
- **Protected area: 1012**

Sampling: May, July, September
Biological data: floristics, cenology (Braun-Blanqet method)

Mollusca

Location

Main channel : 1001, 1015
Side arms: 1003

Sampling: once/year
Biological data: species and specimen number / sample

Pisces

Location
- Main channel : 1013, 1006
- Side arms: 1014, 1007
- Mosoni-Duna: 1011

Sampling: bi-monthly
Biological data: species dominance (400 * 6 * 3 meter cubic water)

SEMIAQUTIC ORGANISMS

Odonata

Location
- **Main channel :** 1001
- **Side arms:** 1005, 1008
- **Mosoni-Duna:** 1011

Sampling: May, July, August
Biological data: species, dominance

Ephemeroptera

Location
- **Main channel :** 1001
- **Side arms:** 1004, 1010

Sampling: May, June, August, September

Biological data: species, dominance

Trichoptera

Location
- **Main channel :** 1001
- **Side arms:** 1004, 1010

Sampling: May, July, August
Biological data: species, dominance

\+ Heteroptera, Coleoptera – Curculionidae
– after the agreement of the Experts

APPENDIX A.3.

Zápisnica
z rokovania zástupcov pre monitorovanie,
konaného 25. apríla 2007 v Győri

Prítomní: podľa prezenčnej listiny
Miesto: úradná miestnosť Severozadunajského riaditeľstva pre ochranu životného prostredia a vodné hospodárstvo (ÉDUKÖVIZIG)
Dátum: 25. apríl 2007

Rokovanie za maďarskú stranu viedol zástupca pre monitorovanie Emil Janák, riaditeľ ÉDUKÖVIZIG; za slovenskú stranu zástupca pre monitorovanie Dominik Kocinger, splnomocnenec vlády Slovenskej republiky pre výstavbu a prevádzku Sústavy vodných diel Gabčíkovo - Nagymaros.

Body programu:

1. Prerokovanie návrhu maďarskej strany na zmeny Štatútu o činnosti zástupcov pre monitorovanie v zmysle medzivládnej Dohody z roku 1995
2. Detailné prerokovanie návrhu maďarskej strany na zmeny, týkajúce sa miest monitorovania, okruhu sledovaných ukazovateľov a frekvencie meraní, ktoré sú uvedené v prílohe Štatútu.
3. Rôzne.

K bodu 1

Zástupcovia pre monitorovanie sa na rokovaní dohodli na nasledovnom:

a) V preambule Štatútu sa doplní nasledovná veta:
Pri prevádzkovaní environmentálneho monitorovacieho systému budú uplatnené aj Smernice Európskej únie, vrátane Smernice 2000/60/ES Európskeho parlamentu a Rady určujúcej rámec opatrení Európskeho spoločenstva v oblasti vodnej politiky (Rámcová smernica o vode) prijatej 23. októbra 2000, a Aarhuskej dohody o prístupe k informáciám, o účasti verejnosti na rozhodovacom procese a o zabezpečení práva na spravodlivosť v záležitostiach životného prostredia.

b) V Článku 1 bod 1 sa doplní nasledovná veta:
Prevádzkovaný environmentálny monitoring je v súlade s operatívnym monitoringom podľa Rámcovej smernice o vode.

c) V Článku 2 bod 4 sa mení prvá veta nasledovne:
Výmena údajov sa uskutočňuje prostredníctvom poverených zástupcov pre monitorovanie v písomnej a digitálnej forme.

d) V Článku 3 sa bod 1 mení nasledovne:
Spoločné vyhodnotenie vymenených údajov sa vzťahuje na jeden kalendárny rok. V prípade prietokov a hladín povrchových vôd sa hodnotenie bude vzťahovať na hydrologický rok. Spoločná výročná správa bude vyhotovená šesť mesiacov po

ukončení kalendárneho roka.

e) V Článku 3 bod 2 sa druhá veta mení nasledovne:
Národné ročné správy si strany vymenia štyri mesiace po ukončení kalendárneho roka a poverení zástupcovia pre monitorovanie zvolajú poradu na spoločné vyhodnotenie predložených údajov.

f) Článok 3 sa doplní o nasledovný bod 3:
Po schválení a výmene Národných ročných správ budú tieto zverejnené na webových stránkach. Adresa slovenskej webovej stránky je www.gabcikovo.gov.sk, adresa maďarskej webovej stránky je www.kvvm.hu.

g) V Článku 4 bod 4 sa druhá veta mení nasledovne:
Zápisnice z rokovaní sa vyhotovujú v slovenskom a maďarskom jazyku.

K bodu 2

Zástupcovia pre monitorovanie sa na rokovaní dohodli na nasledovných zmenách miest monitorovania, okruhu sledovaných ukazovateľov a frekvencie meraní.

a) Hydrológia povrchových vôd
V miestach monitorovania prietokov a hladín povrchových vôd, v meraných ukazovateľoch ani vo frekvencii meraní neboli navrhnuté žiadne zmeny.

b) Morfológia povrchových vôd
Zástupcovia pre monitorovanie sa zhodli na tom, že posudzovanie zmien morfológie je dôležité a k novému systému hodnotenia je potrebné. Vypracovanie metodiky stanovili po roku 2007, frekvencia meraní bude raz za tri roky. Zástupcovia pre monitorovanie sa dohodli na tom, že prvé meranie sa uskutoční najneskôr v roku 2009. Sledovanie morfologických zmien je potrebné skoordinovať s aktivitami prebiehajúcimi v rámci slovensko-maďarskej Komisie hraničných vôd.

c) Fyzikálno-chemické prvky
V prípade kvality povrchových vôd sa zástupcovia pre monitorovanie dohodli, že sledovanie kvality povrchových vôd bude prebiehať na rovnakých miestach pozorovania (profiloch) ako doteraz s frekvenciou 12-krát ročne, t.j. raz za mesiac. Zo zoznamu stanovovaných ukazovateľov boli vynechané baktérie a zooplanktón. Riasy a makrozoobentos boli presunuté medzi hydrobiologické prvky. Zástupcovia pre monitorovanie sa dohodli, že v záujme zosúladenia monitorovania podľa Dohody z roku 1995 a programu monitorovania hraničných vôd na vybraných profiloch sa obrátia na slovensko-maďarskú Komisiu hraničných vôd.

d) Hydrobiologické prvky
Zástupcovia pre monitorovanie sa dohodli nasledovne:
- fytoplanktón: maďarská strana 4-krát za rok v období apríl-september
slovenská strana 12-krát v období marec-október, so zahustením v letných mesiacoch
- fytobentos: 2-krát za rok
- bentické bezstavovce (makrozoobentos): 2-krát za rok
- makrofyty: 2-krát za rok
- ryby: raz za tri roky
Monitorovanie sa bude uskutočňovať v súlade s metodikou dohodnutou v rámci Komisie hraničných vôd.

e) Kvalita sedimentov
Analýza kvality sedimentov na maďarskej strane bude uskutočňovaná na 7 monitorovacích miestach (2x staré koryto Dunaja, 3x ramenná sústava, 1x pravostranný priesakový kanál, 1x Mošonský Dunaj). Na slovenskej strane sa kvalita sedimentov bude uskutočňovať na 6 monitorovacích miestach (2x staré koryto Dunaja, 4x zdrž). Analýzy budú zamerané na stanovenie obsahu anorganických mikropolutantov (Cu, Cr, Zn, Pb, Cd, Ni, Hg, As), obsahu živín (celkový fosfor, celkový dusík) a obsah organických mikropolutantov PAH (suma, resp. 10 vybraných zložiek). Frekvencia odberov bude raz ročne, pri nízkych vodných stavoch, spravidla na jeseň.

f) Kvantita podzemných vôd
Pri sledovaní hladín podzemných vôd vo frekvencii meraní neboli navrhnuté žiadne zmeny. Na maďarskej strane v rámci optimalizácie mierne klesol počet sledovaných studní na 126. Na slovenskej strane sa zmeny v počte studní nepredpokladajú. Presný zoznam objektov je v prílohe zápisnice.

g) Kvalita podzemných vôd
Sledovanie kvality podzemných vôd bude prebiehať na rovnakých objektoch ako doteraz. Zo sledovaných ukazovateľov boli vynechané dusitany, TOC a kremičitany. Na vybraných lokalitách na maďarskej strane (pozorovacie objekty č. 9379, 9413, 9536, 9456 a 9480) bolo navrhnuté sledovanie ťažkých kovov (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr) a organických mikropolutantov (pesticídy a tetrachlóretylén) s frekvenciou raz za rok. Na slovenskej strane sú ťažké kovy a vybrané organické mikropolutanty (okrem tetrachlóretylénu) merané takmer na všetkých studniach.

h) Pôdna vlhkosť
Meranie pôdnej vlhkosti sa bude uskutočňovať bez zmeny, podľa doterajšej metodiky. Frekvenciu meraní je potrebné prispôsobiť nasledovnej schéme: v zimných mesiacoch raz mesačne (január, február, november, december), vo vegetačnom období približne raz za dva týždne (marec-október), to jest cca 20-21 meraní.

i) Les
Zástupcovia pre monitoring sa zhodli, že dôležitou súčasťou hodnotenia zdravotného stavu lesov je plošné hodnotenie na základe leteckého snímkovania. Je potrebné dohodnúť spoločnú metodiku a spôsob hodnotenia na základe skúseností slovenskej strany. Spoločné letecké snímkovanie sa má uskutočniť v roku 2008.
Ohľadom ostatných monitorovaných ukazovateľov sa vzhľadom na budúci monitoring musia odborníci oboch strán dohodnúť do konca roka 2007. Slovenská strana informovala maďarskú stranu, že sledovanie základných dendrometrických charakteristík, spolu s podpornými údajmi (hladina podzemnej vody a pôdna vlhkosť) považuje naďalej za nevyhnutné.

j) Ostatné biologické skúmania
V rámci biologického monitoringu sa monitorovanie makrozoobentosu presunulo medzi hydrobiologické prvky. Hodnotenie bude prebiehať na základe metodiky RSV. Aj monitoring rýb bol presunutý medzi hydrobiologické prvky, s frekvenciou raz za tri roky. Hodnotenie bude prebiehať na základe metodiky RSV. Naďalej bude prebiehať monitoring doteraz sledovaných vybraných skupín zooplanktónu (Cladocera a Copepoda), bentických bezstavovcov - makrozoobentosu (Mollusca, Odonata, Ephemeroptera a Trichoptera) a suchozemských rastlín a suchozemských slimákov v doterajšom rozsahu. V tejto oblasti skúmania je potrebné ďalšie zosúlaďovanie miest, skupín a metodiky pozorovania.

Odborníci oboch strán zmeny uvedené v tabuľkách v prílohe tejto zápisnice do konca roka 2007 zapracujú do komplexnej prílohy štatútu.

K bodu 3

a) Slovenská strana informovala maďarskú stranu, že prevádzkové údaje poskytované v rámci dennej výmeny údajov budú k dispozícii na internetovej stránke. Navrhla maďarskej strane, aby sa po sprístupnení internetovej stránky denné zasielanie údajov zastavilo a údaje by sa mailom alebo faxom zaslali len v prípade poruchy pri prístupe na internet, alebo na základe telefonickej požiadavky. Slovenská strana navrhla archiváciu údajov na internete na dobu 40 dní. Maďarská strana poukázala na súvislosť problematiky poskytovania prevádzkových údajov s dohodami v rámci Komisie hraničných vôd. Prisľúbila, že sa k požiadavke slovenskej strany vyjadrí neskôr.

b) Slovenská strana zopakovala svoju skoršiu požiadavku na rozšírenie výmeny údajov o údaje spred roku 1992, tam kde sú takéto údaje k dispozícii. Maďarská strana v zásade s takýmto rozšírením súhlasí, avšak k obdobiu, na ktoré sa takáto výmena bude vzťahovať, sa vyjadrí neskôr.

V Győri, 25. apríla 2007.

Emil Janák
zástupca pre monitoring
za maďarskú stranu

Dominik Kocinger
zástupca pre monitoring
za slovenskú stranu

a) Hydrológia povrchových vôd

Slovenská strana

Číslo profilu	Tok	Lokalita
1250	Dunaj	Bratislava - Devín
2848	Dunaj	zdrž - Čunovo
2552	Dunaj	Čunovo - staré koryto
2545	Dunaj	Hamuliakovo
2558	Dunaj	Dobrohošť
1251	Dunaj	Gabčíkovo
1252	Dunaj	Medveďov
1600	Dunaj	Komárno
1653	Malý Dunaj	Bratislava - Malé Pálenisko
2851	Mošonské rameno Dunaja	Čunovo
3126	Dobrohošťský kanál	Dobrohošť - napustný objekt
2849	prívodný kanál	Gabčíkovo - horná hladina
2850	odpadový kanál	Gabčíkovo - dolná hladina
3124	pravostranný priesakový kanál	Čunovo - horná hladina
3125	pravostranný priesakový kanál	Čunovo - dolná hladina
4045	ramenná sústava	línia A
4046	ramenná sústava	línia B1
4047	ramenná sústava	línia B2
4048	ramenná sústava	línia C
4049	ramenná sústava	línia D
4050	ramenná sústava	línia E
4051	ramenná sústava	línia F1
4052	ramenná sústava	línia F3
4053	ramenná sústava	línia G
4054	ramenná sústava	línia H1
4055	ramenná sústava	línia H3
4056	ramenná sústava	línia J
4057	ramenná sústava	materiálová jama B

Maďarská strana

Číslo profilu	Tok	Lokalita
000001	Dunaj	Rajka
000002	Dunaj	Dunaremete
000005	Dunaj	Komárom
000017	Mošonský Dunaj	Mecsér
000018	Mošonský Dunaj	Bácsa
003871	Mošonský Dunaj	stavidlo VI - horná voda
003872	Mošonský Dunaj	stavidlo VI - dolná voda
003873	Mošonský Dunaj	stavidlo I - horná voda
003874	Mošonský Dunaj	stavidlo I - dolná voda

Číslo profilu	Tok	Lokalita
003875	priesakový kanál	stavidlo II - horná voda
003876	priesakový kanál	stavidlo II - dolná voda
003939	Dunaj	Hať Dunakiliti - horná voda
003940	priesakový kanál	stavidlo V - horná voda
003941	priesakový kanál	stavidlo V - dolná voda
004516	ramenná sústava	Helena
110092	chránená strana	stavidlo VII - horná voda
110106	Zátoňský Dunaj	Gyümölcsös út - horná voda
110144	Zátoňský Dunaj	Gyümölcsös út - dolná voda
110161	Dunaj	Hať Dunakiliti - dolná voda
110113	ramenná sústava	Z-1, horná voda
110127	ramenná sústava	Dobrorgaz 15
110115	ramenná sústava	B-2, horná voda
110114	ramenná sústava	B-2, dolná voda
110117	ramenná sústava	B-3, horná voda
110116	ramenná sústava	B-3, dolná voda
110170	ramenná sústava	Z-6, horná voda
110171	ramenná sústava	Z-6, dolná voda
110152	ramenná sústava	Z-8, horná voda
110153	ramenná sústava	Z-8, dolná voda
110119	ramenná sústava	B-4, horná voda
110118	ramenná sústava	B-4, dolná voda
110129	ramenná sústava	B-5, horná voda
110128	ramenná sústava	B-5, dolná voda
110162	ramenná sústava	B-6, horná voda
110138	ramenná sústava	B-7, horná voda
110198	ramenná sústava	B-8, horná voda
110131	ramenná sústava	B-9, horná voda
110133	ramenná sústava	B-11, horná voda
110132	ramenná sústava	B-11, dolná voda
110142	ramenná sústava	Z-12, horná voda
110141	ramenná sústava	Z-12, dolná voda
110155	ramenná sústava	Z-10, horná voda
110157	ramenná sústava	uzáver Gatya,horná voda

b) Morfológia povrchových vôd

Metodika meraní bude stanovená po roku 2007, frekvencia meraní bude raz za tri roky.

c) Fyzikálno-chemické prvky

Slovenská strana

Číslo profilu	Tok	Lokalita
109	Dunaj	Bratislava - Nový most, stred
4016	Dunaj	Dobrohošť, rkm 1843, nad prehrádzkou
4025	Dunaj	Dobrohošť, rkm 1839,6 - ľavá strana
3739	Dunaj	Sap, staré koryto, nad rkm 1812
112	Dunaj	Medveďov - most, stred
1205	Dunaj	Komárno - most, stred
307	Dunaj - zdrž	Kalinkovo - kyneta
308	Dunaj - zdrž	Kalinkovo - ľavá strana
309	Dunaj - zdrž	Šamorín - pravá strana
311	Dunaj - zdrž	Šamorín - ľavá strana
3530	Dunaj - odpadový kanál	Sap - ľavá strana
3529	Mošonské rameno Dunaja	Čunovo - stred
3531	pravostranný priesakový kanál	Čunovo
317	ľavostranný priesakový kanál	Hamuliakovo
3376	Dobrohošťský kanál	Dobrohošť - ľavá strana

Maďarská strana

Číslo profilu	Tok	Lokalita
0001	Dunaj	Rajka, rkm 1848
0043	Dunaj	nad prehrádzkou, rkm 1843
0043	Dunaj	pod prehrádzkou, rkm 1843
0002	Dunaj	Dunaremete
2306	Dunaj	Medve
1141	Mošonský Dunaj	Vének
0082	priesakový kanál	stavidlo I
0084	priesakový kanál	stavidlo II
1112	ramenná sústava	Helena
1114	ramenná sústava	Szigetské rameno, km 42,2
1126	ramenná sústava	Ásváňske rameno, km 23,9

<u>Rozsah sledovaných ukazovateľov, frekvencia mesačne:</u>
teplota, pH, merná vodivosť, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, NH_4^+, Mn, Fe (nefiltrované)
Hg, Zn, As, Cu, Cr, Cd, Ni, Pb (všetko filtrované)
HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{3-}, celkový P, celkový N
$CHSK_{Mn}$, BSK_5, nerozpustené látky (sušené pri 105°C)
TOC, NEL-UV, rozpustené látky (sušené pri 105°C)
index saprobity biosestónu , chlorofyl-a

d) Hydrobiologické prvky

fytoplanktón: maďarská strana 4-krát za rok v období apríl-september
slovenská strana 12-krát v období marec-október,
so zahustením v letných mesiacoch

fytobentos: 2-krát za rok

bentické bezstavovce (makrozoobentos): 2-krát za rok

makrofyty: 2-krát za rok

ryby:
maďarská strana 5 monitorovacích miest (2x staré koryto Dunaja, 2x ramenná sústava, 1x Mošonský Dunaj))
slovenská strana 6 monitorovacích miest (2x staré koryto Dunaja, 4x ramenná sústava)
Frekvencia: raz za tri roky

e) Kvalita sedimentov

maďarská strana: 7 monitorovacích miest (2x staré koryto Dunaja, 3x ramenná
slovenská strana: 6 monitorovacích miest (2x staré koryto Dunaja, 4x zdrž)

anorganické mikropolutanty: Cu, Cr, Zn, Pb, Cd, Ni, Hg, As
obsah živín: celkový fosfor, celkový dusík
organické mikropolutanty: PAH (suma, resp. 10 vybraných zložiek)

Frekvencia: 1 krát ročne, spravidla na jeseň

f) Kvantita podzemných vôd

Slovenská strana

Studňa č.	Lokalita
1912	Nová Stráž
1913	Kameničná - Hadovce
1915	Zlatná na Ostrove
1916	Štúrová-Stará lúka
4002	Kameničná - Piesky
1922	Bodza - Lúky
1924	Zemianska Olča
1925	Tôň
1927	Sokolce
1928	Okoč
1929	Okoč - Goliáš
1931	Topoľníky
4435	Kolárovo
1937	Dolný Štál
1938	Boheľov
1939	Padáň - Majer
4428	Bodza - Maderét
1943	Kolárovo
4003	Okoč - Aszod
1948	Veľký Meder
1949	Medveďov
1950	Veľké Kosihy
4004	Kližská Nemá
1952	Trávnik
1954	Číčov
4429	Číčov - Kec
1957	Čiližská Radvaň
1958	Sap
1959	Ňárad
1960	Gabčíkovo - Čierny Les
1961	Mad
4306	Trhové Mýto
1964	Gabčíkovo
1965	Gabčíkovo
1966	Vrakúň
1969	Dvorníky
1970	Jahodná
1971	Baka
1972	Kračany - Dobor
1973	Kostolné Kračany
1974	Vydrany
1976	Veľké Blahovo - Lúky
1977	Bodíky

Studňa č.	Lokalita
4302	Lúč na Ostrove - Antónia Dvor
1979	Michal na Ostrove - Kolónia
1980	Michal na Ostrove - Lúky
4217	Blahová - Sever
1982	Blahová
1983	Horný Bar- Šuľany
1984	Holice
1988	Rohovce
1989	Dobrohošť
4303	Macov
1992	Mierovo
1993	Zlaté Klasy - Rastice
1995	Kvetoslavov
1996	Čakany
1997	Janíky - Búštelek
1998	Kalinkovo
1999	Miloslavov - Alžbetin Dvor
2000	Tomášov
2001	Podunajské Biskupice - Topoľové
2002	Rovinka
2003	Most na Ostrove
2033	Šamorín - Mliečno
2035	Šamorín - Čilistov
2038	Bratislava - Petržalka
2039	Petržalka - Ovsište
4007	Bratislava - Petržalka - Colnica Berg
4009	Bratislava - Jarovce
2044	Rusovce
2045	Čunovo - hranica
2046	Čunovo
2067	Hroboňovo
2069	Ohrady
2070	Nový Život - Eliášovce
2071	Podunajské Biskupice
4044	Gabčíkovo
872	Čunovo (len zmena čísla objektu z 2123)
2144	Bratislava - Petržalka
2148	Petržalka - Kopčianska ul.
2162	Petržalka
2165	Petržalka
2167	Petržalka
2169	Rusovce
2171	Čunovo
4312	Čunovo
2180	Jarovce
2186	Čunovo
2188	Rusovce - Dolné pole

Studňa č.	Lokalita
2205	Bratislava - Vlčie hrdlo (Slovnaft)
2207	Bratislava - Podunajské Biskupice
2208	Bratislava-Vrakuňa
2215	Bratislava - Podunajské Biskupice - Lieskovec
2217	Rovinka
2219	Malinovo
2231	Kalinkovo
2241	Mierovo
2247	Dunajská Lužná - Nová Lipnica
2267	Báč
329	Šamorín - Mliečno (len zmena čísla objektu z 2269)
2271	Dobrohošť - Dunajské kriviny
2272	Dobrohošť
2274	Kyselica
2279	Vojka
2293	Holice - Stará Gala
2318	Trstená na Ostrove
2327	Bodíky
2328	Bodíky
2329	Bodíky - Kráľovská lúka
2343	Gabčíkovo
2345	Malé Vranie - Dekanské
2349	Gabčíkovo
2353	Sap - Čiližská sihoť
2387	Nová Stráž
2401	Bratislava - Vlčie hrdlo (Slovnaft)
2708	Dobrohošť - Dunajské kriviny
2709	Bodíky - Malá sihoť, línia D
2711	Gabčíkovo - Dunajský ostrov
2712	Kľúčovec - Sporná sihoť
3129	Vojka nad Dunajom - Dolné mačacie
3132	Vojka nad Dunajom - Vrbiny
3136	Vojka nad Dunajom - Vrbiny
3139	Šuľany - Dunajské sihote
3147	Bodíky - Mlynské
3154	Baka - Obecný ostrov
3163	Sap - Riečina
2710	Bodíky - Kráľovská lúka
3172	Bodíky - Kráľovská lúka
2858	Vojka nad Dunajom - Dolné vrbiny
3131	Vojka nad Dunajom - pri Veľkej Žofín
3137	Šuľany - Dunajské sihote
3144	Bodíky - línia E
3146	Bodíky - Malá sihoť
3151	Bodíky - Malobodícke
3155	Baka - Nová trieda, Ostrov Orliaka morského
3159	Gabčíkovo - Dunajský ostrov, Istragov

Maďarská strana

Studňa č.	Ozn.	Lokalita
000062	1019	Győrladamér
000066	2659	Vámosszabadi
000072	2666	Győrladamér
000119	2681	Hegyeshalom
000134	2647	Bezenye
000135	2648	Bezenye
000140	2640	Dunakiliti
000143	2600	Feketeerdő
000144	2611	Feketeerdő
000147	2615	Feketeerdő
000148	2617	Feketeerdő
000151	2609	Cikolasziget
000152	2610	Cikolasziget
000159	2605	Halászi
000188	1009	Lébény
003470	1020	Bezenye
003473	1031	Hegyeshalom
003476	2698	Hegyeshalom
003509	2694	Győrladamér
003587	1066	Halászi
003592	1075	Tejfalusziget
003593	1080	Bezenye
003621	2695	Győr-Kisbácsa
003623	2697	Győr-Kisbácsa
003624	2693	Rajka
003625	2699	Rajka
003626	2700	Rajka
003627	2727	Rajka
003682	3080	Mosonmagyaróvár
003815	3119	Győrladamér
003817	3121	Ásványráró
003818	3122	Halászi
003878	4189	Dunakiliti
003882	4501	Kisbodak
003887	4502	Ásványráró
003936	2530	Lébény
003937	2540	Hegyeshalom
004121	3270	Győr
004122	3269	Kisbajcs
004123	3268	Dunaremete
004126	3265	Rajka
004129	3218	Bezenye
004322	2635	Magyarkimle
004323	2636	Magyarkimle
004327	2684	Rajka

Studňa č.	Ozn.	Lokalita
004328	2633	Dunaremete
110328	2621	Ásványráró
110502	8440	Lipót
110503	8444	Darnózseli
110504	8500	Rajka
110610	9310	Rajka
110619	9327	Dunakiliti
110621	9330	Dunakiliti
110628	9355	Dunakiliti
110634	9368	Rajka
110637	9379	Rajka
110638	9380	Rajka
110643	9385	Bezenye
110657	9409	Rajka-Dunakiliti
110660	9413	Sérfenyősziget
110661	9415	Halászi
110664	9418	Mosonmagyaróvár
110675	9434	Püski
110676	9435	Püski
110685	9456	Ásványráró
110686	9457	Ásványráró
110687	9458	Ásványráró
110688	9459	Ásványráró
110689	9460	Ásványráró
110700	9478	Győrzámoly
110702	9479	Győrzámoly
110714	9493	Dunakiliti
110715	9494	Dunakiliti
110716	9495	Dunakiliti
110719	9498	Dunasziget
110720	9499	Dunasziget
110723	9502	Kisbodak
110724	9503	Kisbodak
110729	9508	Győrzámoly
110749	9536	Püski
110758	9546	Kimle
110771	9555	Mecsér
110772	9558	Mecsér
110784	9567	Győrújfalu
110800	9972	Dunasziget
110802	9974	Dunasziget
110803	9975	Dunasziget
110806	9978	Ásványráró
110807	9979	Ásványráró
110808	9980	Ásványráró
110814	Dkl-5	Doborgaz
110815	Dkl-6	Dunakiliti

Studňa č.	Ozn.	Lokalita
110816	Dkl-7	Rajka
110622	9331	Dunakiliti
110609	93051	Rajka
110612	93131	Rajka
110616	93211	Rajka
110617	93241	Rajka
110623	93381	Dunakiliti
110624	93421	Dunakiliti
110636	93711	Dunakiliti
110644	93861	Bezenye
110649	93931	Dunasziget
110673	94291	Püski
110682	94451	Darnózseli
110684	94521	Hédervár
110690	94641	Ásványráró
110691	94651	Dunaszeg
110693	94671	Dunaszeg
110695	94691	Dunaszentpál
110699	94761	Vámosszabadi
110701	94771	Vámosszabadi
110705	94821	Nagybajcs
110709	94871	Győrújfalu
110712	94911	Bácsa
110730	95091/B	Győrzámoly
110732	95111	Kisbajcs
110737	95181	Vének
110748	95321	Rajka
110751	95381	Mosonmagyaróvár
110753	95402	Dunasziget
110755	95431	Halászi
110757	95451	Mosonmagyaróvár
110801	99731/B	Cikola
110804	99761/B	Ásványráró
110805	99771/B	Ásványráró

g) Kvalita podzemných vôd

Slovenská strana

Studňa č.	Lokalita
102	Rusovce - vodný zdroj
2559	Čunovo - vodný zdroj
119	Kalinkovo - veľkozdroj, S-10
105	Šamorín - veľkozdroj, S-2
467	Vojka - vodný zdroj, HV-1
485	Bodíky - vodný zdroj, HB-2
103	Gabčíkovo - veľkozdroj, HAŠ-5
907	Bratislava-Petržalka, veľkozdroj Pečenský les, PL-4
899/1	Rusovce - pozorovací vrt PZO-26/I
888/1	Rusovce - pozorovací vrt PZO-23/I
872/1	Čunovo - pozorovací vrt PZO-19/I
329/1	Šamorín - pozorovací vrt 7265/I
87/7	Kalinkovo - pozorovací vrt PZ-13/7
170/2	Dobrohošť - pozorovací vrt PV-3/2
234/1	Rohovce - pozorovací vrt HGP/A-18/1
262/1	Sap - pozorovací vrt HGZ-26/1
265/1	Kľúčovec - pozorovací vrt 7366/1
3/3	Kalinkovo - pozorovací vrt PZ-1/3

Maďarská strana

Studňa č.	Lokalita
110610	Rajka
110619	Dunakiliti
110622	Dunakiliti
110634	Rajka
110637	Rajka
110660	Dunasziget
110664	Mosonmagyaróvár
110674	Kisbodak
110676	Arak
110685	Ásványráró
110686	Ásványráró
110687	Ásványráró
110698	Győrzámoly
110703	Győrzámoly
110706	Vámosszabadi
110749	Püski

Rozsah sledovaných ukazovateľov, frekvencia 2 krát za rok:
teplota vody, pH, merná vodivosť, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, Mn, Fe, NH_4^+, HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, PO_4^{3-}, $CHSK_{Mn}$

raz ročne:

maďarská strana:	vo vybraných studniach ťažké kovy (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr) organické mikropolutanty (pesticídy a tetrachlóretylén)
slovenská strana:	vo vybraných studniach ťažké kovy (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr) organické mikropolutanty (pesticídy a iné)

h) Pôdna vlhkosť

Slovenská strana

Číslo objektu	Monitorovacia plocha	Lokalita
2703	MP-6	Dobrohošť
2704	MP-9	Bodíky
2705	MP-10	Bodíky
2706	MP-14	Gabčíkovo
2707	MP-18	Kľúčovec
2716	MP-4	Rohovce
2717	MP-5	Horný Bar - Šuľany
2718	MP-6	Horný Bar
2755	L-3	Sap
2756	L-4	Gabčíkovo
2757	L-5	Baka
2758	L-6	Trstená na Ostrove
2759	L-7	Horný Bar - Bodíky
2760	L-8	Horný Bar - Šuľany
2761	L-9	Horný Bar - Bodíky
2762	L-10	Vojka nad Dunajom
2763	L-11	Vojka nad Dunajom
2764	L-12	Dobrohošť
3804	L-25	Medveďov
3805	L-26	Kľúčovec

Maďarská strana

Číslo objektu	Lokalita
9355	Dunakiliti 15E
9452	Hédervár 11B

Číslo objektu	**Lokalita**
9498	Dunasziget 11D
9972	Dunasziget 15D
9994	Dunasziget 22B
9995	Lipót 4A
9996	Lipót 27C
9997	Ásványráró 6G
9998	Ásványráró 6D
2605	Halászi
2630	Püski
2653	Rajka
7920	Ásványráró
9443	Lipót

Frekvencia meraní:
zimné mesiace (január, február, november, december): raz mesačne
vegetačné obdobie (marec-október): raz za dva týždne

i) Les

Plošné hodnotenie zdravotného stavu lesov na základe leteckého snímkovania.
Frekvencia: raz za tri roky
Spoločné snímkovanie v roku 2008

Ostatné monitorované ukazovatele a monitorované plochy dohodnúť do konca roka 2007.

j) Ostatné biologické skúmania

Vybrané skupiny zooplanktónu (Cladocera a Copepoda), bentických bezstavovcov - makrozoobentosu (Mollusca, Odonata, Ephemeroptera a Trichoptera) a suchozemských rastlín a suchozemských slimákov budú uskutočňované v rozsahu doterajšieho monitoringu. Je potrebné ďalšie zosúlaďovanie miest, skupín a metodiky pozorovania.

Jegyzőkönyv
a monitoringgal megbízottak
2007. április 25.-én, Győrben megtartott tárgyalásáról

Jelenlevők: jelenléti ív szerint
Helyszín: ÉDUKÖVIZIG hivatalos helyisége
Dátum: 2007. április 25.

A tárgyalást a magyar fél részéről a monitoringgal megbízott képviselő, Janák Emil, az ÉDUKÖVIZIG igazgatója; szlovák oldalról monitoringgal megbízott képviselő, Dominik Kocinger, a Szlovák Köztársaság Bős-Nagymaros vízierőmű rendszer kiépítésének és üzemelésének kormánymeghatalmazottja vezette.

Programpontok:

1. A magyar fél javaslatának megtárgyalása a monitoringgal megbízott képviselők tevékenységéről szóló Alapszabály változtatására az 1995. évi kormányközi megállapodás értelmében.
2. A magyar fél változtatásokra vonatkozó javaslatának részletes megtárgyalása, a monitorozás helyeit illetően, a figyelt mutatók körére és a mérési gyakoriságra, amelyek az alapszabály mellékletében vannak feltüntetve.
3. Egyéb.

Az 1. ponthoz

A tárgyaláson a monitoringgal megbízottak a következőkben állapodtak meg:

a) Az alapszabály preambuluma a következő mondattal egészül ki:
A környezeti monitoring rendszer üzemeltetésében alkalmazva lesznek az EU irányelvei, beleértve a Európai Parlament és a Tanács, 2000. október 23.-án elfogadott 2000/60/EK irányelvét a vízvédelmi politika terén a közösségi fellépés kereteinek meghatározásáról (Vízkeretirányelv), és az Aarhusi egyezmény a környezeti ügyekben az információhoz való hozzáférésről, a nyilvánosságnak a döntéshozatalban történő részvételéről és az igazságszolgáltatáshoz való jog biztosításáról.
b) Az 1. cikk 1. pontja a következő mondattal egészül ki:
Az üzemeltetett környezeti monitoring összhangban van a Vízkeretirányelv szerinti operatív monitoringgal.
c) A 2. cikk 4. pontjának az első mondata a következőképpen változik:
Az adatok cseréjére monitoringgal megbízott képviselők útján valósul meg, írásos és digitális formában.
d) A 3. cikk 1. pontja a következőképpen változik:
A kicserélt adatok közös értékelése egy naptári évre vonatkozik. A felszíni vízhozam és vízszintek esetében az értékelés hidrológiai évre vonatkozik. A közös éves jelentés hat hónappal a naptári év vége után kerül elkészítésre.

e) A 3. cikk 2. pontjának második mondata a következőképpen változik:
A nemzeti éves jelentéseket a felek a naptári év vége után négy hónappal kicserélik és a monitoringgal megbízott képviselők tanácskozást hívnak össze az előterjesztett adatok közös kiértékelésére.

f) A 3. cikk kiegészül egy 3. ponttal:
A nemzeti éves jelentések jóváhagyása és cseréje után a weboldalakon ezeket nyilvánosságra hozzák. A szlovák weboldal címe www.gabcikovo.gov.sk, a magyar weboldal címe www.kvvm.hu.

g) A 4. cikk 4. pontjának második mondata a következőképpen változik:
A tárgyalások jegyzőkönyve szlovák és magyar nyelven kerül elkészítésre.

A 2. ponthoz

A monitoringgal megbízott képviselők a tárgyaláson a következő változtatásokban állapodtak meg a monitorozási helyek, a figyelt mutatók körét és a mérési frekvenciák vonatkozóan.

a) Felszíni víz hidrológia
A felszíni vizek vízhozamainak és vízszintjeinek monitorozási helyszínek, mért paraméterek, valamint a mérések gyakoriságára vonatkozó semmilyen változtatást nem javasolnak.

b) Felszíni víz morfológia
A monitoring képviselői megegyeztek abban, hogy a meder morfológiájának elbírálása fontos, és az új értékelési rendszerhez szükséges. A módszer kidolgozása 2007. év után kerül megállapításra, a mérési gyakorisága háromévente lesz. A monitoring képviselői megállapodtak abban, hogy az első mérést legkésőbb 2009-ben elvégzik. A morfológiai változások megfigyelését koordinálni kell a Szlovák-Magyar Határvízi Bizottság kereteiben történő tevékenységekkel.

c) Fiziko-kémiai elemek
A felszíni vizek minősége esetében a monitoring képviselői megállapodtak, hogy a felszíni vizek minőségének figyelése ugyanazokon a helyeken (szelvényekben) történik mint eddig, 12-szer évente, vagyis havonta egyszer. A vizsgált paraméterek listájából a baktériumok és a zooplankton lett kihagyva. Az algák, illetve a makrozoobenton átkerült a hidrobiológiai elemek közé. A monitoring képviselői megállapodtak abban, hogy az 1995 évi megállapodás szerinti monitoring és a határvízi monitoring program összehangolása érdekében a Szlovák-Magyar Határvízi Bizottsághoz fordulnak.

d) Hidrobiológiai elemek
A monitoring képviselői a következőkben állapodtak meg:
- fitoplankton: magyar fél 4-szer, az április-szeptember időszakban
szlovák fél 12-szer, március-október időszakban, a nyári hónapokban sűrűbben
- fitobenton: évente 2-szer
- bentikus gerinctelenek (makrozoobenton): évente 2-szer
- makrofiták: évente 2-szer
- halak: 3 évente egyszer
A monitorozás a Határvízi Bizottság keretében megállapodott módszertannal összhangban történik meg.

e) Üledék minősége

Az üledékek minőségének elemzését a magyar fél részéről 7 monitorozási helyen fogják megvalósítani (2-szer az Öreg-Duna meder, 3-szor ágrendszer, 1-szer jobboldali szivárgó csatorna, 1-szer Mosoni-Duna). Szlovák oldalon az üledékek minőségének elemzését 6 monitorozási helyen fogják megvalósítani (2-szer az Öreg-Duna meder, 4-szer tározó). Az elemzések során az szervetlen mikroszennyezők tartalom kerül bemérésre (Cu, Cr, Zn, Pb, Cd, Ni, Hg, As), tápanyag tartalom (összes foszfor, összes nitrogén) és a szerves mikroszennyezők PAH tartalmát (összege, ill. 10 kiemelt összetevő). A mintavétel gyakorisága évente egyszeri, alacsony vízállásoknál, rendszerint ősszel.

f) Felszín alatti víz mennyisége

A felszín alatti vizek vízszintjeinek megfigyelésében a mérések gyakoriságában semmilyen változtatást nem javasoltak. A magyar oldalon az optimalizálás keretében mérsékelten csökkent a megfigyelt kutak száma 126-ra. Szlovák fél részéről a kutak számában nem várható változás. A kutak pontos jegyzéke a jegyzőkönyv mellékletét képezi.

g) Felszín alatti víz minősége

A felszín alatti vizek minőségének megfigyelése ugyanazokon a kutakon történik, mint eddig. A megfigyelt mutatók közül a nitrit, a TOC és a szilikátok voltak kihagyva. A kiválasztott helyszíneken a magyaroldalon (a 9379, 9413, 9536, 9456 és 9480 számú megfigyelési kutakon) javasolták a nehézfémek (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr) és szerves mikroszennyezők (peszticidek és tetraklór-etilén) figyelését is évente egyszer. A szlovák oldalon a nehézfémek és kiemelt szerves mikroszennyezőket (tetraklór-etilén kivételével) majdnem az összes kúton mérik.

h) Talajnedvesség

A talajnedvesség mérése változások nélkül fog történni, az eddigi módszertan alapján. A mérés gyakoriságát a következő sémához szükséges igazítani: a téli hónapokban havonta egyszer (január, február, november, december) a vegetációs időszakban megközelítőleg két hetente egyszer (március-október), ez kb. 20-21 mérés.

i) Erdő

A monitoring képviselői megegyeztek abban, hogy az erdők egészségi állapot értékelésének fontos része a légi felvételek alapján készült területi értékelés. Szükség van közös módszertanban és értékelési módszerben való megállapodásra a szlovák fél tapasztalatai alapján. A közös légi felvételezésnek a 2008-as évben kell megvalósulnia.

Tekintettel az egyéb monitorozási mutatókra a következő monitoringgal kapcsolatban, a két fél szakértőinek 2007. év végéig kell megállapodniuk. A szlovák fél tájékoztatta a magyar felet, hogy az alap dendrometrikus jellemzők megfigyelését, az alátámasztó adatokkal (a felszín alatti vízszintek és a talajnedvesség) együtt, továbbra is nélkülözhetetlennek tartja.

j) Egyéb biológiai vizsgálatok

A biológiai monitoring keretében a makrozoobenton monitoringja átkerült a hidrobiológiai elemek közé. Az értékelés a Víz Keretirányelv módszertan alapján történik. A halak monitoringja is átkerült a hidrobiológiai elemek közé, háromévenként egyszeri gyakorisággal. Az értékelés a Víz Keretirányelv módszertan alapján történik. Az eddigi zooplankton (Cladocera, Copepoda), bentikus gerinctelenek – makrozoobenton (Mollusca, Odonata, Ephemeroptera és Trichoptera) kiemelt csoportjai, és a szárazföldi növények és szárazföldi csigák monitoringja továbbra is az eddigi mértékben történik. Ebben a vizsgálati területben további egyeztetés szükséges a helyek, csoportok és megfigyelési módszertanok vonatkozóan.

A jelen jegyzőkönyv mellékletében a táblázatokban feltüntetett változtatásokat a két fél szakértői a 2007 év végéig beillesztik a szabályzat összetett mellékletébe.

A 3. ponthoz:

a) A szlovák fél tájékoztatta a magyar felet, hogy a napi adatcsere keretében szolgáltatott üzemelési adatok az internetes oldalon lesznek elérhetőek. Javasolta a magyar félnek, hogy az internetes oldal megnyitása után a napi adatküldést állítsák le, és az adatokat csak internet kapcsolat meghibásodás, vagy telefonos igény esetén küldjék e-mailen vagy faxon. A szlovák fél az interneten levő adatok archiválását 40 napra javasolja. A magyar fél rámutatott az üzemelési adatok szolgáltatásának problémája és a HVB keretében levő megállapodások összefüggéseire. Megígérte, hogy a szlovák fél igényével kapcsolatosan később nyilatkozik.

b) A szlovák fél megismételte korábbi kérelmét az 1992. év előtti adatok cseréjének bővítésére, ott ahol az ilyen adatok elérhetők. A magyar fél az ilyen bővítéssel elvileg egyetért, azonban az időszakra, amelyre ez a csere vonatkozna, később nyilatkozik.

Győr, 2007.04.25.

Janák Emil
monitoringgal megbízott képviselő
a magyar fél részéről

Dominik Kocinger
monitoringgal megbízott képviselő
a szlovák fél részéről

a) Felszíni víz hidrológia

Szlovák oldal

Szelvény száma	Vízfolyás	Helyszín
1250	Duna	Bratislava - Devín
2848	Duna	tározó - Čunovo
2552	Duna	Čunovo – öreg meder
2545	Duna	Hamuliakovo
2558	Duna	Dobrohošť
1251	Duna	Gabčíkovo
1252	Duna	Medveďov
1600	Duna	Komárno
1653	Kis Duna	Bratislava - Malé Pálenisko
2851	Mosoni Duna	Čunovo
3126	Doborgazi csatorna	Dobrohošť - vízpótló műtárgy
2849	felvízi csatorna	Gabčíkovo - felvíz
2850	alvízi csatorna	Gabčíkovo - alvíz
3124	jobboldali szivárgó csatorna	Čunovo - felvíz
3125	jobboldali szivárgó csatorna	Čunovo - alvíz
4045	mellékágrendszer	A küszöbvonal
4046	mellékágrendszer	B1 küszöbvonal
4047	mellékágrendszer	B2 küszöbvonal
4048	mellékágrendszer	C küszöbvonal
4049	mellékágrendszer	D küszöbvonal
4050	mellékágrendszer	E küszöbvonal
4051	mellékágrendszer	F1 küszöbvonal
4052	mellékágrendszer	F3 küszöbvonal
4053	mellékágrendszer	G küszöbvonal
4054	mellékágrendszer	H1 küszöbvonal
4055	mellékágrendszer	H3 küszöbvonal
4056	mellékágrendszer	J küszöbvonal
4057	mellékágrendszer	B kavics gödör

Magyar oldal

Szelvény száma	Vízfolyás	Helyszín
000001	Duna	Rajka
000002	Duna	Dunaremete
000005	Duna	Komárom
000017	Mosoni Duna	Mecsér
000018	Mosoni Duna	Bácsa
003871	Mosoni Duna	VI. zsilip - felvíz
003872	Mosoni Duna	VI. zsilip - alvíz
003873	Mosoni Duna	I. zsilip - felvíz
003874	Mosoni Duna	I. zsilip - alvíz

Szelvény száma	Vízfolyás	Helyszín
003875	szivárgó csatona	II. zsilip - felvíz
003876	szivárgó csatorna	II. zsilip - alvíz
003939	Duna	Dunakiliti duzzasztó - felvíz
003940	szivárgó csatona	V. zsilip - felvíz
003941	szivárgó csatorna	V. zsilip - alvíz
004516	mellékágrendszer	Helena
110092	mentett oldal	VII. zsilip - felvíz
110106	Zátonyi Duna	Gyümölcsös út - felvíz
110144	Zátonyi Duna	Gyümölcsös út - alvíz
110161	Duna	Hať Dunakiliti - alvíz
110113	mellékágrendszer	Z-1, felvíz
110127	mellékágrendszer	Dobrorgaz 15
110115	mellékágrendszer	B-2, felvíz
110114	mellékágrendszer	B-2, alvíz
110117	mellékágrendszer	B-3, felvíz
110116	mellékágrendszer	B-3, alvíz
110170	mellékágrendszer	Z-6, felvíz
110171	mellékágrendszer	Z-6, alvíz
110152	mellékágrendszer	Z-8, felvíz
110153	mellékágrendszer	Z-8, alvíz
110119	mellékágrendszer	B-4, felvíz
110118	mellékágrendszer	B-4, alvíz
110129	mellékágrendszer	B-5, felvíz
110128	mellékágrendszer	B-5, alvíz
110162	mellékágrendszer	B-6, felvíz
110138	mellékágrendszer	B-7, alvíz
110198	mellékágrendszer	B-8, felvíz
110131	mellékágrendszer	B-9, felvíz
110133	mellékágrendszer	B-11, felvíz
110132	mellékágrendszer	B-11, alvíz
110142	mellékágrendszer	Z-12, felvíz
110141	mellékágrendszer	Z-12, alvíz
110155	mellékágrendszer	Z-10, felvíz
110157	mellékágrendszer	Gatyai zárás, felvíz

b) Felszíni víz morfológia

A módszer kidolgozása 2007. év után kerül megállapításra, a mérési gyakorisága három évente lesz.

c) Fiziko-kémiai elemek

Szlovák oldal

Szelvény száma	Vízfolyás	Helszín
109	Duna	Bratislava - Nový most, közepe
4016	Duna	Dobrohošť, rkm 1843, fenékküszöb felett
4025	Duna	Dobrohošť, rkm 1839,6 - bal oldal
3739	Duna	Sap, staré koryto, nad rkm 1812
112	Duna	Medveďov - híd, közepe
1205	Duna	Komárno - híd, közepe
307	Duna - tározó	Kalinkovo – hajózási vonal
308	Duna - tározó	Kalinkovo - bal oldal
309	Duna - tározó	Šamorín - jobb oldal
311	Duna - tározó	Šamorín - bal oldal
3530	Duna - alvíz csatorna	Sap - bal oldal
3529	Mosoni Duna	Čunovo - közepe
3531	jobboldali szivárgó csatona	Čunovo
317	baloldali szivárgó csatorna	Hamuliakovo
3376	Doborgazi csatorna	Dobrohošť - bal oldal

Magyar oldal

Szelvény száma	Vízfolyás	Helyszín
0001	Duna	Rajka, rkm 1848
0043	Duna	fenékküszöb felett, rkm 1843
0043	Duna	fenékküszöb alatt, rkm 1843
0002	Duna	Dunaremete
2306	Duna	Medve
1141	Mosoni Duna	Vének
0082	szivárgó csatona	I. zsilip
0084	szivárgó csatorna	II. zsilip
1112	mellékágrendszer	Helena
1114	mellékágrendszer	Szigeti ág, km 42,2
1126	mellékágrendszer	Ásványi ág, km 23,9

Figyelt paraméterek terjedelme, gyakoriság havonta:
vízhőmérséklet, pH, vezetöképesség, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, NH_4^+, Mn, Fe (filtráció nélkül)
Hg, Zn, As, Cu, Cr, Cd, Ni, Pb (minden filtráció után)
HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, NO_2^-, PO_4^{3-}, összes P, összes N
$KOI_{Mn,}$ BOI_5, lebegő anyag (105°C-nál szárított)
TOC, NEL-UV, összes oldott anyag (105°C-nál szárított)
bioszeszton szaprobitása , klorofil-a

d) Hidrobiológiai elemek

<u>fitoplankton:</u> magyar oldal évente 4-szer, április-szeptember idöszakba
szlovák oldal 12-szer, március-október idöszakba,
nyári hónapokban sűrűbben

<u>fitobentosz:</u> évente 2-szer

<u>bentikusé gerinctelenek (makrozoobenton):</u> évente 2-szer

<u>makrofiták:</u> évente 2-szer

<u>halak:</u>
magyar oldal 5 monitorozási helyszín (2x a Duna öreg medre, 2x mellékágrendszer, 1x Mosoni Duna))
szlovák oldal 6 monitorozási helyszín (2x Duna öreg medre, 4x mellékágrendszer)

Gyakoriság: három évente egyszer

e) Üledék minősége

magyar oldal: 7 monitorozási helyszín (2x Duna öreg medre, 3x mellékágrendszer , 1x szivárgó csatorna, 1x Mosoni Duna)
szlovák oldal: 6 monitorozási helyszín (2x Duna öreg medre, 4x tározó)

szervetlen mikroszennyező: Cu, Cr, Zn, Pb, Cd, Ni, Hg, As
tápanyag tartalom: összes foszfor, összes nitrogén
szerves mikroszennyező: PAH (összege, illetve. 10 kiemelt össztevő)

Gyakoriság: évente 1-szer, rendszerint ősszel

f) Felszín alatti víz mennyisége

Szlovák oldal

Kútszám	Helyszín
1912	Nová Stráž
1913	Kameničná - Hadovce
1915	Zlatná na Ostrove
1916	Štúrová-Stará lúka
4002	Kameničná - Piesky
1922	Bodza - Lúky
1924	Zemianska Olča
1925	Tôň
1927	Sokolce
1928	Okoč
1929	Okoč - Goliáš
1931	Topoľníky
4435	Kolárovo
1937	Dolný Štál
1938	Boheľov
1939	Padáň - Majer
4428	Bodza - Maderét
1943	Kolárovo
4003	Okoč - Aszod
1948	Veľký Meder
1949	Medveďov
1950	Veľké Kosihy
4004	Kližská Nemá
1952	Trávnik
1954	Číčov
4429	Číčov - Kec
1957	Čiližská Radvaň
1958	Sap
1959	Ňárad
1960	Gabčíkovo - Čierny Les
1961	Mad
4306	Trhové Mýto
1964	Gabčíkovo
1965	Gabčíkovo
1966	Vrakúň
1969	Dvorníky
1970	Jahodná
1971	Baka
1972	Kračany - Dobor
1973	Kostolné Kračany
1974	Vydrany
1976	Veľké Blahovo - Lúky
1977	Bodíky

Kútszám	Helyszín
4302	Lúč na Ostrove - Antónia Dvor
1979	Michal na Ostrove - Kolónia
1980	Michal na Ostrove - Lúky
4217	Blahová - Sever
1982	Blahová
1983	Horný Bar- Šuľany
1984	Holice
1988	Rohovce
1989	Dobrohošť
4303	Macov
1992	Mierovo
1993	Zlaté Klasy - Rastice
1995	Kvetoslavov
1996	Čakany
1997	Janíky - Búštelek
1998	Kalinkovo
1999	Miloslavov - Alžbetin Dvor
2000	Tomášov
2001	Podunajské Biskupice - Topoľové
2002	Rovinka
2003	Most na Ostrove
2033	Šamorín - Mliečno
2035	Šamorín - Čilistov
2038	Bratislava - Petržalka
2039	Petržalka - Ovsište
4007	Bratislava - Petržalka - Colnica Berg
4009	Bratislava - Jarovce
2044	Rusovce
2045	Čunovo - hranica
2046	Čunovo
2067	Hroboňovo
2069	Ohrady
2070	Nový Život - Eliášovce
2071	Podunajské Biskupice
4044	Gabčíkovo
872	Čunovo (csak kútszám változás, 2123 helyett)
2144	Bratislava - Petržalka
2148	Petržalka - Kopčianska ul.
2162	Petržalka
2165	Petržalka
2167	Petržalka
2169	Rusovce
2171	Čunovo
4312	Čunovo
2180	Jarovce
2186	Čunovo
2188	Rusovce - Dolné pole

Kútszám	Helyszín
2205	Bratislava - Vlčie hrdlo (Slovnaft)
2207	Bratislava - Podunajské Biskupice
2208	Bratislava-Vrakuňa
2215	Bratislava - Podunajské Biskupice - Lieskovec
2217	Rovinka
2219	Malinovo
2231	Kalinkovo
2241	Mierovo
2247	Dunajská Lužná - Nová Lipnica
2267	Báč
329	Šamorín - Mliečno (csak kútszám változás, 2269 helyett)
2271	Dobrohošť - Dunajské kriviny
2272	Dobrohošť
2274	Kyselica
2279	Vojka
2293	Holice - Stará Gala
2318	Trstená na Ostrove
2327	Bodíky
2328	Bodíky
2329	Bodíky - Kráľovská lúka
2343	Gabčíkovo
2345	Malé Vranie - Dekanské
2349	Gabčíkovo
2353	Sap - Čiližská sihoť
2387	Nová Stráž
2401	Bratislava - Vlčie hrdlo (Slovnaft)
2708	Dobrohošť - Dunajské kriviny
2709	Bodíky - Malá sihoť, línia D
2711	Gabčíkovo - Dunajský ostrov
2712	Kľúčovec - Sporná sihoť
3129	Vojka nad Dunajom - Dolné mačacie
3132	Vojka nad Dunajom - Vrbiny
3136	Vojka nad Dunajom - Vrbiny
3139	Šuľany - Dunajské sihote
3147	Bodíky - Mlynské
3154	Baka - Obecný ostrov
3163	Sap - Riečina
2710	Bodíky - Kráľovská lúka
3172	Bodíky - Kráľovská lúka
2858	Vojka nad Dunajom - Dolné vrbiny
3131	Vojka nad Dunajom - pri Veľkej Žofín
3137	Šuľany - Dunajské sihote
3144	Bodíky - línia E
3146	Bodíky - Malá sihoť
3151	Bodíky - Malobodícke
3155	Baka - Nová trieda, Ostrov Orliaka morského
3159	Gabčíkovo - Dunajský ostrov, Istragov

Magyar oldal

Törzsszám	Kútszám	Helyszín
000062	1019	Győrladamér
000066	2659	Vámosszabadi
000072	2666	Győrladamér
000119	2681	Hegyeshalom
000134	2647	Bezenye
000135	2648	Bezenye
000140	2640	Dunakiliti
000143	2600	Feketeerdő
000144	2611	Feketeerdő
000147	2615	Feketeerdő
000148	2617	Feketeerdő
000151	2609	Cikolasziget
000152	2610	Cikolasziget
000159	2605	Halászi
000188	1009	Lébény
003470	1020	Bezenye
003473	1031	Hegyeshalom
003476	2698	Hegyeshalom
003509	2694	Győrladamér
003587	1066	Halászi
003592	1075	Tejfalusziget
003593	1080	Bezenye
003621	2695	Győr-Kisbácsa
003623	2697	Győr-Kisbácsa
003624	2693	Rajka
003625	2699	Rajka
003626	2700	Rajka
003627	2727	Rajka
003682	3080	Mosonmagyaróvár
003815	3119	Győrladamér
003817	3121	Ásványráró
003818	3122	Halászi
003878	4189	Dunakiliti
003882	4501	Kisbodak
003887	4502	Ásványráró
003936	2530	Lébény
003937	2540	Hegyeshalom
004121	3270	Győr
004122	3269	Kisbajcs
004123	3268	Dunaremete
004126	3265	Rajka
004129	3218	Bezenye
004322	2635	Magyarkimle
004323	2636	Magyarkimle
004327	2684	Rajka

Törzsszám	Kútszám	Helyszín
004328	2633	Dunaremete
110328	2621	Ásványráró
110502	8440	Lipót
110503	8444	Darnózseli
110504	8500	Rajka
110610	9310	Rajka
110619	9327	Dunakiliti
110621	9330	Dunakiliti
110628	9355	Dunakiliti
110634	9368	Rajka
110637	9379	Rajka
110638	9380	Rajka
110643	9385	Bezenye
110657	9409	Rajka-Dunakiliti
110660	9413	Sérfenyősziget
110661	9415	Halászi
110664	9418	Mosonmagyaróvár
110675	9434	Püski
110676	9435	Püski
110685	9456	Ásványráró
110686	9457	Ásványráró
110687	9458	Ásványráró
110688	9459	Ásványráró
110689	9460	Ásványráró
110700	9478	Győrzámoly
110702	9479	Győrzámoly
110714	9493	Dunakiliti
110715	9494	Dunakiliti
110716	9495	Dunakiliti
110719	9498	Dunasziget
110720	9499	Dunasziget
110723	9502	Kisbodak
110724	9503	Kisbodak
110729	9508	Győrzámoly
110749	9536	Püski
110758	9546	Kimle
110771	9555	Mecsér
110772	9558	Mecsér
110784	9567	Győrújfalu
110800	9972	Dunasziget
110802	9974	Dunasziget
110803	9975	Dunasziget
110806	9978	Ásványráró
110807	9979	Ásványráró
110808	9980	Ásványráró
110814	Dkl-5	Doborgaz
110815	Dkl-6	Dunakiliti

Törzsszám	Kútszám	Helyszín
110816	Dkl-7	Rajka
110622	9331	Dunakiliti
110609	93051	Rajka
110612	93131	Rajka
110616	93211	Rajka
110617	93241	Rajka
110623	93381	Dunakiliti
110624	93421	Dunakiliti
110636	93711	Dunakiliti
110644	93861	Bezenye
110649	93931	Dunasziget
110673	94291	Püski
110682	94451	Darnózseli
110684	94521	Hédervár
110690	94641	Ásványráró
110691	94651	Dunaszeg
110693	94671	Dunaszeg
110695	94691	Dunaszentpál
110699	94761	Vámosszabadi
110701	94771	Vámosszabadi
110705	94821	Nagybajcs
110709	94871	Győrújfalu
110712	94911	Bácsa
110730	95091/B	Győrzámoly
110732	95111	Kisbajcs
110737	95181	Vének
110748	95321	Rajka
110751	95381	Mosonmagyaróvár
110753	95402	Dunasziget
110755	95431	Halászi
110757	95451	Mosonmagyaróvár
110801	99731/B	Cikola
110804	99761/B	Ásványráró
110805	99771/B	Ásványráró

g) Felszín alatti víz minősége

Szlovák oldal

Kútszám	Helyszín
102	Rusovce – ivóvíz bázis
2559	Čunovo - ivóvíz bázis
119	Kalinkovo - ivóvíz bázis, S-10
105	Šamorín - ivóvíz bázis, S-2
467	Vojka - ivóvíz bázis, HV-1
485	Bodíky - ivóvíz bázis, HB-2
103	Gabčíkovo - ivóvíz bázis, HAŠ-5
907	Bratislava-Petržalka, ivóvíz bázis Pečenský les, PL-4
899/1	Rusovce - figyelő kút PZO-26/I
888/1	Rusovce - figyelő kút PZO-23/I
872/1	Čunovo - figyelő kút PZO-19/I
329/1	Šamorín - figyelő kút 7265/I
87/7	Kalinkovo - figyelő kút PZ-13/7
170/2	Dobrohošť - figyelő kút PV-3/2
234/1	Rohovce - figyelő kút HGP/A-18/1
262/1	Sap - figyelő kút HGZ-26/1
265/1	Kľúčovec - figyelő kút 7366/1
3/3	Kalinkovo - figyelő kút PZ-1/3

Magyar oldal

Kútszám	Helyszín
110610	Rajka
110619	Dunakiliti
110622	Dunakiliti
110634	Rajka
110637	Rajka
110660	Dunasziget
110664	Mosonmagyaróvár
110674	Kisbodak
110676	Arak
110685	Ásványráró
110686	Ásványráró
110687	Ásványráró
110698	Győrzámoly
110703	Győrzámoly
110706	Vámosszabadi
110749	Püski

Figyelt paraméterek terjedelme, gyakoriság évente 2-szer:
vízhőmérséklet, pH, vezetőképesség, O_2
Na^+, K^+, Ca^{2+}, Mg^{2+}, Mn, Fe, NH_4^+, HCO_3^-, Cl^-, SO_4^{2-}, NO_3^-, PO_4^{3-}, KOI_{Mn}

évente egyszer:
magyar oldla: kiválasztott kutakban
nehéz fémek (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr)
szerves mikroszennyezők (peszticidek a tetraklór-etilén)

szlovák oldal: kiválasztott kutakban
nehéz fémek (As, Ni, Zn, Pb, Hg, Cu, Cd, Cr)
szerves mikroszennyezők (peszticidek, egyebek)

h) Talajnedvesség

Szlovák oldal

Azonosító	Monitoring terület	Helyszín
2703	MP-6	Dobrohošť
2704	MP-9	Bodíky
2705	MP-10	Bodíky
2706	MP-14	Gabčíkovo
2707	MP-18	Kľúčovec
2716	MP-4	Rohovce
2717	MP-5	Horný Bar - Šuľany
2718	MP-6	Horný Bar
2755	L-3	Sap
2756	L-4	Gabčíkovo
2757	L-5	Baka
2758	L-6	Trstená na Ostrove
2759	L-7	Horný Bar - Bodíky
2760	L-8	Horný Bar - Šuľany
2761	L-9	Horný Bar - Bodíky
2762	L-10	Vojka nad Dunajom
2763	L-11	Vojka nad Dunajom
2764	L-12	Dobrohošť
3804	L-25	Medveďov
3805	L-26	Kľúčovec

Magyar oldal

Azonosító	Helyszín
9355	Dunakiliti 15E
9452	Hédervár 11B
9498	Dunasziget 11D

Azonosító	Helyszín
9972	Dunasziget 15D
9994	Dunasziget 22B
9995	Lipót 4A
9996	Lipót 27C
9997	Ásványráró 6G
9998	Ásványráró 6D
2605	Halászi
2630	Püski
2653	Rajka
7920	Ásványráró
9443	Lipót

Mérési gyakoriság:
téli hónapok (január, február, november, december): havonta
tenyészeti időszak (március-október): kéthetente

i) Erdő

Erdők egészségi állapot területi értékelése a légi felvételek alapján.
Gyakoiság: három évente egyszer
Közös felvételezés 2008-ban.

Egyébb monitorozási mutatók és monitorozási területek 2007 év végéig megállapodásra jutnak.

j) Egyéb biológiai vizsgálatok

Zooplankton (Cladocera, Copepoda), bentikus gerinctelenek – makrozoobenton (Mollusca, Odonata, Ephemeroptera és Trichoptera) kiemelt csoportjai, és a szárazföldi növények és szárazföldi csigák monitoringja továbbra is az eddigi monitorozás mértékben történik. További egyeztetés szükséges a helyek, csoportok és megfigyelési módszertanok vonatkozóan.

APPENDIX A.4.

Zápisnica

z prerokovania a podpísania Spoločnej výročnej správy za rok 2015 zo spoločného slovensko-maďarského monitorovania, stanoveného medzivládnou Dohodou z 19. apríla 1995

Prítomní:

<u>za slovenskú stranu:</u>

Ing. Stanislav Fialík,	splnomocnenec pre výstavbu a prevádzku SVD G-N, zástupca pre monitorovanie, Ministerstvo dopravy, výstavby a regionálneho rozvoja
RNDr. Zoltán Hlavatý, PhD.,	expert, Konzultačná skupina Podzemná voda, s.r.o.
Mgr. Maroš Nikolaj, PhD.,	expert
Mgr. Renáta Vadkertiová,	odborný referent, Ministerstvo dopravy, výstavby a regionálneho rozvoja
Enikő Bothová,	tlmočníčka

<u>za maďarskú stranu:</u>

Dr. András Rácz,	zástupca štátneho tajomníka pre otázky životného prostredia, zástupca pre monitorovanie, Ministerstvo pôdohospodárstva
Dr. Bálint Dobi,	vedúci odboru, Odbor ochrany životného prostredia, Ministerstvo pôdohospodárstva
Mária Galambos,	hlavný radca, Odbor medzinárodných vzťahov a vzťahov v Karpatskej kotline, Ministerstvo pôdohospodárstva
Dr. Zsolt Buday,	vedúci odboru, Odbor ochrany životného prostredia a ochrany prírody, Úrad vlády Győr-Moson-Sopronskej župy
Judit Pulai,	expert, Odbor ochrany životného prostredia a ochrany prírody, Úrad vlády Győr-Moson-Sopronskej župy
Ildikó Kiss,	referent, Odbor ochrany životného prostredia, koordinátor, Ministerstvo pôdohospodárstva
Pál Benyo,	tlmočník

1. Zástupcovia pre monitorovanie, Ing. Stanislav Fialík a Dr. András Rácz vyhodnotili plnenie odporúčaní uvedených v správe za rok 2014.
2. Zástupcovia oboch strán si vzájomne odovzdali tlačené verzie Národných ročných správ za rok 2015.
3. Zástupcovia oboch strán prerokovali a prijali Spoločnú výročnú správu za rok 2015.
4. Strany sa dohodli, že Národné ročné správy z monitorovania za rok 2016 vypracujú do 30. júna 2017.

5. Strany prerokovali otázku možnej optimalizácie monitorovania prírodného prostredia podľa Dohody 1995 a dohodli sa, že po rokovaní odborníkov, ktoré sa bude konať v posledný marcový týždeň na Úrade vlády s regionálnou pôsobnosťou v Győri, sa dohodnú o optimalizácii monitorovania prírodného prostredia.

Gabčíkovo, 12. januára 2017.

....

Ing. Stanislav Fialík
za slovenskú stranu

....

Dr. András Rácz
za maďarskú stranu

Jegyzőkönyv
az 1995. április 19-i kormányközi megállapodásban meghatározott közös magyar- szlovák környezeti monitoring 2015-évi Közös Éves Jelentésének megtárgyalásáról és aláírásáról

Résztvevők:

A szlovák fél részéről:

Ing. Fialík Stanislav	a Bős-Nagymarosi Vízlépcsőrendszer építésével és működtetésével megbízott kormánymeghatalmazott, monitorozással megbízott képviselő, Közlekedési, Építésügyi és Regionális Fejlesztési Minisztérium
Dr. Hlavatý Zoltán, PhD., szakértő, Ground Water Consulting Ltd.	
Mgr. Nikolaj Maroš, PhD., szakértő	
Mgr. Vadkertiová Renáta,	szakmai referens, Közlekedési, Építésügyi és Regionális Fejlesztési Minisztérium
Bothová Enikő,	tolmács

A magyar fél részéről:

Dr. Rácz András,	környezetügyért felelős helyettes államtitkár, monitorozással megbízott képviselő, Földművelésügyi Minisztérium
Dr. Dobi Bálint,	főosztályvezető, Környezetmegőrzési Főosztály, Földművelésügyi Minisztérium
Galambos Mária,	közigazgatási főtanácsadó, Nemzetközi és Kárpát medencei Kapcsolatok Főosztálya, Földművelésügyi Minisztérium
Dr. Buday Zsolt,	főosztályvezető-helyettes, Környezetvédelmi és Természetvédelmi Fősztály, Győr-Moson-Sopron Megyei Kormányhivatal
Pulai Judit,	szakértő, Környezetvédelmi és Természetvédelmi Fősztály, Győr-Moson-Sopron Megyei Kormányhivatal
Kiss Ildikó,	referens, Környezetmegőrzési Főosztály, koordinátor, Földművelésügyi Minisztérium
Benyó Pál,	tolmács

1. A két Fél monitoring felelőse, Ing. Fialík Stanislav és Dr. Rácz András kiértékelte a 2014-évi jelentésben szereplő javaslatok teljesítését.
2. A két Fél képviselői kölcsönösen átadták a 2015-évi Nemzeti jelentések nyomtatott változatait.
3. A két Fél képviselői megtárgyalták és elfogadták az 2015-évi Közös Éves Jelentést.
4. A Felek megegyeztek abban, hogy a 2016-évi megfigyelésekről szóló Éves Nemzeti Jelentéseket 2017. június 30-ig készítik el.

5. A Felek megtárgyalták az 1995. évi Megállapodás szerint végzett környezeti monitorozás optimalizálásának kérdését és megállapodtak abban, hogy a 2017. március utolsó hetében, a Győri Kormányhivatalban sorra kerülő szakértői egyeztetést követően hoznak döntést a környezeti monitorozás optimalizálásáról.

Gabčíkovo, 2017. január 12.

....	....
Ing. Fialík Stanislav	**Dr. Rácz András**
a szlovák fél részéről	a magyar fél részéről