J O I N T   A N N U A L   R E P O R T
on environment monitoring
in 2013

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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PREFACE

Antecedents

The current Joint Report on Environment Monitoring in 2013 is the nineteenth joint report since signing the Agreement concerning certain temporary technical measures and discharges in the Danube and Mosoni branch of the Danube by the Governments of the Slovak Republic and the Republic of Hungary on April 19, 1995[1] (Appendix A.1) - hereinafter the Agreement. The Agreement prescribes 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. 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] (Appendix A.2).

The Agreement was originally intended to expire just after the declaration of the judgement of the International Court of Justice in the Haag in the case concerning the Gabčíkovo -Nagymaros Project. On October 23, 1997 the Slovak Republic, through the Ministry for Foreign Affairs, informed the Republic of Hungary of its readiness to prolong the validity of the Agreement from April 19, 1995 until an agreement on implementation of the Judgement of International Court of Justice, declared on September 25, 1997, is reached. The Republic of Hungary has accepted the proposed prolongation by the Resolution of Hungarian Government from December 17, 1997.

On April 25, 2007 the Nominated Monitoring Agents have agreed on 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.

In the Agreement the Slovak Party has undertaken to release an annual average discharge of 400 $m^3.s^{-1}$ into the Danube downstream of Čunovo dam and another 43 m^3s^{-1} into the Mosoni branch of the Danube and the right-side seepage canal. Both discharges depend on 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 Hungarian territory. The water discharged into the Mosoni branch of the Danube ensures the water supply of Mosoni Danube and river branches in the Hungarian flood-protected area.

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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.

According 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 are necessary to assess the impacts of the increased flow rate in the Danube and the water supply on the Hungarian side. 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 forms, 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.

This Joint Annual Report on environmental monitoring gives an evaluation concerning the year 2013. The evaluation of Slovak side is based on data collected by the Slovak Hydrometeorological Institute (SHMÚ), Faculty of Natural Sciences of the Comenius University (PriF UK), Slovak Academy of Sciences, National Forest Centre (NLC-LVÚ), Soil Science and Conservation Research Institute (VÚPOP), West Slovakia's Waterworks Company (ZsVS), Bratislava's Waterworks Company (BVS), Slovak Water Management Authority (SVP-BA), Water Research Institute (VÚVH) 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.

The evaluation of Hungarian side is based on data collected by the North-Transdanubian Inspectorate of Environment and Water (ÉDUKTVF), North-Transdanubian Water Directorate (ÉDUVIZIG), Regional Waterworks Companies, Forest Research Institute (ERTI), West Hungarian University, Museum of Natural Sciences, Hungarian Academy of Sciences and Eötvös Lóránd University. The data exchange and the evaluation of monitoring were co-ordinated by the State secretary for the Environment and Water at the Ministry of Rural Development of Hungary.

Goals of Joint Monitoring

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 water supply. The water supply into the right-side river branches on the Hungarian territory is assured by the submerged weir, which increases the water level in the Danube upstream of the weir.

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, about development of parameters included in the data exchange, and about environmental changes in the influenced area of both Parties. The basic condition of data exchange is the usage of equal or similar methods of measurements and analysis 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 2013

Monitoring activities in the year 2013 on both sides continued in accordance with the intergovernmental Agreement and the Statute, modified on April 25, 2007. Monitoring in 2013 consisted of surface and ground water regime observations, surface- and ground- water quality monitoring, measurements of soil moisture content, monitoring of forest stands and biological observations. In case of soil moisture content measurements only two measurements were carried out on the Hungarian side, which was not sufficient to evaluate the soil moisture development in the year 2013.

On January 14, 2013 approval and signing of the Joint Annual Report on environment monitoring in 2011 was realized in Bratislava. On April 3, 2013, in accordance with the Statute on monitoring, both Parties, Slovak and Hungarian, mutually handed over the monitoring data for the year 2012 in Győr, except the data on surface water levels and flow rates. The data on surface water levels and flow rates, which are subject to mutual agreement on the level of Working Groups of the Slovak-Hungarian Transboundary Water Commission, were not completed by the date of monitoring data exchange under the intergovernmental Agreement. These data, subsequently after being agreed, were mutually exchanged on April 24, 2013 in Győr. National Annual Reports on environmental monitoring in 2012 had been mutually handed over on October 17, 2013 in Budapest. Approval and signing of the Joint Annual Report on environment monitoring in 2012 was done on January 23, 2014 in Budapest.

In the period from April 26 to May 6, 2013 partial artificial flooding of the right-side river branch system had been realized by increasing the water amount discharged into the Danube old riverbed to 800 $m^3.s^{-1}$.

Concerning the elaboration of the current Joint Annual Report the Slovak and the Hungarian Parties mutually exchanged the monitoring data for the year 2013 on April 15, 2014 in Győr. The mutual exchange of the electronic version of National Annual Reports on environmental monitoring in 2013 was realized on August 13, 2014 in Győr.

Fulfilment of recommendations in Joint Annual Report 2012

1. <u>Taking into account the agreement of Nominated Monitoring Agents of the Slovak and Hungarian Parties on the evaluation of long-term monitoring results, with the</u>

aim to optimize the monitored parameters and frequency of monitoring, experts of the Slovak Party propose to perform the evaluation of long-term monitoring results by the end of 2014 and optimization of monitoring the end June 2015.

At the meeting of Monitoring Agents of the Slovak and Hungarian Parties, held on January 23, 2014 in Budapest, representatives of Parties confirmed the intention to perform the long-term evaluation of monitoring results with the aim to optimize the monitored parameters and the frequency of monitoring. The Monitoring Agents have agreed that on further progress will decide after May 15, 2014 on the occasion of mutual exchange of National Annual Reports on monitoring in 2013 (Appendix A.4). Based on this decision the experts of both Parties should adjust the work schedule and the estimated budget and submit them for approval. Since no meeting was held until the elaboration of this Joint Report the work schedule and the estimated budget could not be prepared.

2. Experts of the Hungarian Party in connection with the surface water quantity evaluation propose to held negotiations on the harmonization of methodology on quantification and rounding of flow rates.

Experts of the Slovak and Hungarian Parties held negotiations in connection with harmonization of methodology on quantification and rounding of flow rate data. Negotiations were held on March 24, 2014 in Győr, on April 4, 2014 in Bratislava and on April 15, 2014 again in Győr. Experts have agreed as follows:

Since the rounding of flow rates calculated by the Slovak and the Hungarian Parties is given by the software used for data processing the current methodology for quantification and rounding of flow rates on both sides, and also the data providing within the joint monitoring under the intergovernmental Agreement, remain unchanged. Flow rates in the National Annual Reports and in the Joint Annual Report will be rounded to 3 digits as follows: 10420, 6785, 520, 25.3, 2.45, 0.234.

The experts also agreed that the calculation of monthly and annual averages will be based on the average daily data, and the monthly and yearly minima and maxima will be based on the actual minimal and maximal water levels or flow rates (not on the average daily values). If the specified background data were not available the minima and maxima will be based on average daily values, this fact shall be explicitly mentioned in the text. When counting flow rates from two stations, rounding according to the above principle will be performed after the calculation.

PART 1

Surface water levels and flow rates

Surface water levels and flow rates in the year 2013 were observed without changes, as in previous years. Measurements have been performed in the same extent. Taking into account the agreement of surface water monitoring experts from April 15, 2014 the evaluation of surface water regime in the present Joint Report covers both, the hydrological (the period from November 1 of the previous year to October 31 of the evaluated year) and the calendar year (period from January 1 to December 31 of the evaluated year). Surface water level observations were carried out at 28 gauging stations on the Slovak side and 29 gauging stations on the Hungarian side (**Table 1-1**). Flow rate measurements and calculations were performed for 10 gauging stations on each side. For the purpose of evaluation of surface water level and flow rate regimes data from the stations listed in Table 1-1 the Parties mutually exchange. The observation network is presented in **Fig. 1-1a, b**.

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 station
12	**Slovakia**	**2850**	tail-race canal, Gabčíkovo Power station
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
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

At selected gauging stations common flow rate measurements were performed and time series data of surface water levels and flow rates were compiled. Mutually agreed data form the basis for joint evaluation of measures and water supply taken under Articles 1-3 of the Agreement.

The intergovernmental Agreement, signed on April 19, 1995 set up a temporary water management regime. The Parties has agreed that in case of 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 weir. 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 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 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 amount of water over 600 $m^3.s^{-1}$ discharged through the Čunovo weir 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 weir during maintenance works. In such cases the higher flow rates will be reduced for the annual average calculation purposes to an amount corresponding to flow rates as defined in the Annex 2 of the Agreement. In addition, another 43 $m^3.s^{-1}$ of water was agreed in the Agreement to be discharged into the Mosoni branch of the Danube and 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 current amount of water to be released into the Danube old riverbed downstream of Čunovo weir. The basic monthly characteristics of flow rate in the Danube for the hydrological year 2013 are given in **Table 1-2a** and for the calendar year 2013 in **Table 1-2b**. 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 1-2a: Monthly characteristics of flow rate in the Danube at Bratislava-Devín gauging station in the hydrological year 2013

Year	**2012**		**2013**										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Minimum	1101	1140	1453	1662	1633	1699	1960	3117	1464	1143	1243	1392	**1101**
Avg. min	1139	1168	1480	1706	1658	1716	2053	3218	1522	1188	1260	1426	**1139**
Average	1565	1996	2713	2635	2116	2535	2826	5406	2208	1582	2115	1707	**2444**
Maximum	2715	4993	6002	4663	2905	3783	5080	10640	3451	3094	4873	2411	**10640**
Avg. max	2461	4484	5745	4472	2839	3696	3612	10520	3351	2808	4511	2380	**10520**

Table 1-2b: Monthly characteristics of flow rate in the Danube at Bratislava-Devín gauging station in the calendar year 2013

Year	**2013**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	1453	1662	1633	1699	1960	3117	1464	1143	1243	1392	1405	1081	**1081**
Avg. min	1480	1706	1658	1716	2053	3218	1522	1188	1260	1426	1427	1121	**1121**
Average	2713	2635	2116	2535	2826	5406	2208	1582	2115	1707	1896	1360	**2417**
Maximum	6002	4663	2905	3783	5080	10640	3451	3094	4873	2411	2902	1720	**10640**
Avg. max	5745	4472	2839	3696	3612	10520	3351	2808	4511	2380	2587	1688	**10520**

In case of the hydrological year 2013 (**Table 1-2a**) the minimal annual flow rate of 1101 $m^3.s^{-1}$ occurred on December 26, 2012, the lowest average daily flow rate of 1139 $m^3.s^{-1}$ was recorded on following day December 27, 2012. The highest annual flow rate occurred on June 6, 2013, when it reached 10640 $m^3.s^{-1}$ at culmination, and the highest average daily flow rate was 10520 $m^3.s^{-1}$. The average annual flow rate at this station in hydrological year 2013 reached 2444 $m^3.s^{-1}$, which represents the third highest average annual flow rate (**Table 1-3**). Higher average annual flow rates were recorded only in 1999 (2582 $m^3.s^{-1}$) and 2002 (2458 $m^3.s^{-1}$).

In case of the calendar year 2013 (**Table 1-2b**) the minimal annual flow rate of 1081 $m^3.s^{-1}$ occurred on December 24, 2013, when also the lowest average daily flow rate of 1121 $m^3.s^{-1}$ was recorded. Values for the highest annual flow rate and the highest average daily flow are the same as in case of the hydrological year. The average annual flow rate in calendar year 2013 reached 2417 $m^3.s^{-1}$, which is the second highest average annual flow rate (**Table 1-3**) Higher average annual flow rate was recorded only in 2002 (2683 $m^3.s^{-1}$).

Table 1-3: Average annual flow rates

Station No.	Period	Average annual flow rate in hydrological year ($m^3.s^{-1}$)	% of average flow rate	Average annual flow rate in calendar year ($m^3.s^{-1}$)	% of average flow rate
	1901-2001	**2051**	**-**	**2052**	**-**
1250	**1990-2012**	**2035**	**-**	**2037**	**-**
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**

The hydrologic regime of the Danube in the year 2013 was rather similar as in the previous year. Similarly unusual high flow rates occurred during winter months (December 2012, January and February 2013) exceeding 4000 $m^3.s^{-1}$, in January even 6000 $m^3.s^{-1}$. Also in March, April and May higher flow rates occurred, almost reaching or exceeding 3000 $m^3.s^{-1}$. Similarly to the previous year a large flood wave occurred in June, but in 2013 the flow rate exceeded all previously recorded flow rates for more than 100 years. The flood wave peaked on June 6, 2013 at 10640 $m^3.s^{-1}$. Bigger flood wave was recorded only in 1899 (10870 $m^3.s^{-1}$). In late June another discharge wave occurred, which exceeded 5000 $m^3.s^{-1}$. From mid-July the flow rate fell below 2000 $m^3.s^{-1}$ and low flow rates lasted almost until the end of August, while at the beginning and the middle of August the flow rate values were approaching the lowest values recorded in this period. In mid-September one more discharge wave occurred exceeding 4800 $m^3.s^{-1}$. The flow rate during October and November decreased, however three less significant discharge waves exceeding 2400 $m^3.s^{-1}$, were recorded. In the third decade of December the flow rate dropped below 1100 $m^3.s^{-1}$. In the hydrological year 2013 August was an extremely dry month, dry month did not occurred. November 2012, March, April and May 2013 belonged to moderately wet month, while October 2013 was characterized as a wet month. Extremely wet months were December 2012, January, February, June and September 2013. Last two months, November and December 2013 belonged to wet and moderately wet months.

As mentioned above, the flow rate regime on the Danube in the year 2013 was more or less typical, however in winter months relatively high discharge waves occurred. Regarding the water stages an extraordinary hydrological situation occurred in early June 2013, when extremely large flood wave occurred.

After a relatively steady flow rate (1400 $m^3.s^{-1}$) at the beginning of the hydrological year a discharge wave occurred due to heavy rain in the German and Austrian Danube catchment area, which culminated on November 6, 2012 at 2715 $m^3.s^{-1}$. After the culmination the Danube flow rate decreased rapidly and until mid-December it fluctuated between 1100 and 1500 $m^3.s^{-1}$ (the annual minimum for the hydrological year 2013 occurred on November 26, 2012 with a flow rate of 1101 $m^3.s^{-1}$). At the end of the second decade of December the flow rate due to hearty and intense rainfall and strong warming again exceeded 2400 $m^3.s^{-1}$, but the most significant increase occurred on December 24, 2012, when the flow rate peaked at 4993 $m^3.s^{-1}$ (average daily flow rate was 4484 $m^3.s^{-1}$). In early January the flow rate again temporarily fell below 2000 $m^3.s^{-1}$, but due to intensive rainfall in the German and Austrian Danube catchment area, which was accompanied by melting of the snow cover, the flow rate rose sharply and peaked on January 7, 2013 at 6002 $m^3.s^{-1}$. Subsequently the Danube flow rate gradually declined and before the end of the month it decreased below 1500 $m^3.s^{-1}$. At the end of the month it got warmer again and the flow rate on January 31, 2013 increased almost to 4200 $m^3.s^{-1}$. The warming combined with weaker precipitation caused that the flow rate in the first week of February ranged mostly above 4000 $m^3.s^{-1}$, culminating on February 3, 2013 at 4663 $m^3.s^{-1}$. The flow rate from the beginning of the second decade of February gradually decreased and almost until the end of first decade of March it ranged around 1900 $m^3.s^{-1}$. In the second decade of March, under the influence of snow melting and weaker precipitation, a small discharge wave occurred (culminating at 2905 $m^3.s^{-1}$), but until the beginning of the second decade of April the flow rate again fluctuated mostly below 2000 $m^3.s^{-1}$, which significantly lagged behind the long-term average flow rate in this period. The Danube flow rate in the second decade of April began to rise due to continued snow melting and relatively heavy rainfall especially in the Austrian Danube catchment area. The flow rate from mid-April to mid-May ranged between 2800 and 3800 $m^3.s^{-1}$. From mid-May the flow rate gradually declined below 2100 $m^3.s^{-1}$. But at the end of the third decade of May the flow rate began rise sharply due to intense rains into the saturated catchment in the upper section of the Danube. Extreme rainfall in the German and Austrian Danube catchment area induced a significant increase of flow rate and caused a large flood wave, which peaked on June 6, 2013 at 10640 $m^3.s^{-1}$ (average daily flow rate of 10520 $m^3.s^{-1}$). After the culmination the flow rate initially declined sharply, the decrease in the second decade of June was gradual and lasted until the half of the third decade of June. Under the influence of new precipitations in the mid of the third decade of June the flow rate again rose sharply and peaked on June 27, 2013 at 5358 $m^3.s^{-1}$. After this culmination the gradual decrease of flow rate continued until the end of the second decade of August, when it declined below 1200 $m^3.s^{-1}$. Since the end of first decade of July the flow rates ranged well below the average daily flow rate in this period and in August it was close to the lowest long-term average daily values. In the second half of the August the flow rate temporarily increased due to rich precipitations and at the end of the month, August 29, 2013 it peaked at 3094 $m^3.s^{-1}$. Subsequently the flow rate dropped sharply and at the end of the first decade of

September it fluctuated below 1300 $m^3.s^{-1}$. After heavy rainfall in the second decade of September the flow rate at the end of decade a discharge wave occurred, culminating on September 20, 2013 at 4873 $m^3.s^{-1}$. After a strong decline of flow rate below 2000 $m^3.s^{-1}$, the flow rate in October ranged mostly between 1400 and 1700 $m^3.s^{-1}$, only in the second decade of October, due to more significant rainfall, a small discharge wave occurred, culminating on October 18, 2013 at 2411 $m^3.s^{-1}$. The flow rate in the middle of the first decade of November again temporarily increased due to richer precipitation (culminating on November 7, 2013 at 2902 $m^3.s^{-1}$), but from mid-November to late December it declined gradually. The lowest flow rate in 2013 was recorded on December 24, 2013, when it dropped to 1081 $m^3.s^{-1}$ (annual minimum for the calendar year 2013).

The course of flow rates during the year 2013 at gauging station No. 1250 – Bratislava-Devín is shown in **Fig. 1-2**.

1.1. Discharge into the Danube downstream of Čunovo weir

The determination of average daily amount of water released into the Danube downstream of Čunovo weir was based on average daily flow rates determined at gauging stations Doborgaz and Helena (**Fig. 1-3**). At these stations joint flow rate measurements were performed to determine the flow rate supplied into the Danube old riverbed. The basic monthly characteristics of flow rate in the Danube downstream of the Čunovo weir (consisting of the sum of flow rates at gauging stations at Doborgaz and Helena) for the hydrological year 2013 are given in **Table 1-4a** and for the calendar year 2013 in **Table 1-4b**. 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 1-4a: Monthly characteristics of flow rate in the Danube downstream of the Čunovo weir in the hydrological year 2013

Year	2012		2013										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Minimum	123	193	196	200	228	249	217	556	450	353	253	222	**123**
Avg. min	215	201	213	225	254	347	224	573	458	383	271	233	**201**
Average	247	279	430	359	348	531	530	1816	538	428	424	275	**517**
Maximum	345	629	2000	589	511	825	818	7300	618	726	937	434	**7300**
Avg. max	369	526	1735	561	505	804	804	6860	596	593	672	387	**6860**

In case of the hydrological year 2013 (**Table 1-4a**) the average annual flow rate released into the Danube downstream of the Čunovo weir was 517 $m^3.s^{-1}$. The minimal annual flow rate of 123 $m^3.s^{-1}$ occurred on November 2, 2012, with the lowest average daily flow rate of 183 $m^3.s^{-1}$. The highest annual flow rate occurred on June 7, 2013, when it reached 7300 $m^3.s^{-1}$ at culmination, and the highest average daily flow rate was 6860 $m^3.s^{-1}$. Taking into consideration the obligations envisaged in the intergovernmental Agreement, the Slovak Party, in case of the average annual flow rate of 2444 $m^3.s^{-1}$ at Bratislava-Devín, was obliged to release an average annual discharge of 483 $m^3.s^{-1}$ into the Danube riverbed downstream of Čunovo weir. The total average annual discharge released to the Danube downstream of Čunovo was 517 $m^3.s^{-1}$.

Table 1-4b: Monthly characteristics of flow rate in the Danube downstream of the Čunovo weir in the calendar year 2013

Year	2013												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	196	200	228	249	217	556	450	353	253	222	211	208	**196**
Avg. min	213	225	254	347	224	573	458	383	271	233	217	214	**213**
Average	430	359	348	531	530	1816	538	428	424	275	271	228	**513**
Maximum	2000	589	511	825	818	7300	618	726	937	434	460	251	**7300**
Avg. max	1735	561	505	804	804	6860	596	593	672	387	400	239	**6860**

In case of the calendar year 2013 (**Table 1-4b**) the average annual flow rate released into the Danube downstream of the Čunovo weir was 513 $m^3.s^{-1}$. The minimal annual flow rate of 196 $m^3.s^{-1}$ occurred on January 21, 2013, when also the lowest average daily flow rate of 213 $m^3.s^{-1}$ was recorded. Values for the highest annual flow rate and the highest average daily flow rate were the same as in case of the hydrological year. Taking into consideration the obligations envisaged in the intergovernmental Agreement, the Slovak Party, in case of the annual average flow rate of 2417 $m^3.s^{-1}$ at Bratislava-Devín, was obliged to release an average annual discharge of 477 $m^3.s^{-1}$ into the Danube riverbed downstream of Čunovo weir. The total average annual discharge released to the Danube downstream of Čunovo was 513 $m^3.s^{-1}$.

During the evaluated year 2013 discharges over 600 $m^3.s^{-1}$ due to higher flow rates in the Danube (over 5400 $m^3.s^{-1}$) were released in January 2013 (January 6-8, three days) and in June 2013 (June 2-10, nine days and on June 26, one day). Higher discharges were released also in the period from April 25 to May 6 on the request of the Hungarian Party, aiming partial artificial flooding of the right-side river branch system. According to the modified methodology of average annual discharge calculation, accepted in the Joint Annual Report on the environment monitoring in 2011, reduction of discharge released to the Danube old riverbed for the above-mentioned periods was done (**Table 1-5**).

Table 1-5: Reduced flow rates for the modified average annual discharge calculation

Date	Q Bratislava-Devín	Original Q ($m^3.s^{-1}$)	Reduced Q ($m^3.s^{-1}$)
6.1.2013	5745	1421	600
7.1.2013	5714	1735	600
8.1.2013	5511	1653	600
2.6.2013	5649	1540	600
3.6.2013	6929	2387	600
4.6.2013	8723	3464	600
5.6.2013	9868	5283	600
6.6.2013	10520	6444	600
7.6.2013	9974	6860	600
8.6.2013	8585	5412	600
9.6.2013	6813	3929	600
10.6.2013	5630	2125	600
26.6.2013	5511	1851	600

When the reduced discharges (**Table 1-5**) are applied in the average annual discharge calculation the Slovak Party in 2013 released an average annual discharge of 418 $m^3.s^{-1}$ in case of the hydrological year and 414 $m^3.s^{-1}$ in case of the calendar year.

Some deficiencies were encountered as regards the compliance with the minimal discharges, especially during the non-vegetation period, when the deficit of discharge exceeded the acceptable deviation of ± 7 %. Based on the jointly accepted flow rate data the deficit was higher than the acceptable deviation in November 2012 for eleven days, during December 2012 for eight days, in January 2013 for eleven days, in February 2013 for six days, during November 2013 for nine days and in December 2013 for eighteen days. In case of the minimal values in the vegetation period it can be stated that in the year 2013 flow rate less than 400 $m^3.s^{-1}$ occurred for nine days – one day in April 2013 and eight days in May 2013, however in May the lower discharge was released due to works in ferry wharf. Based on the above it can be concluded that the flow regime in the summer has been followed. The deficiencies in the winter period had not significant impact on the biota of the area affected. To remedy these deficiencies negotiation with stakeholders is proposed.

Based on the above evaluation of water amount released into the Danube old riverbed, it can be stated that 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 in 63 cases (difference max to 14.8 $m^3.s^{-1}$); flow rate below 400 $m^3.s^{-1}$ in the summer period occurred once, if not taking into account lower discharges due to works in the ferry wharf. In the period from April 25 to May 6, 2013 during the artificial flooding, flow rates above 600 $m^3.s^{-1}$ were released at the request of the Hungarian Party.

1.2. Discharge into the Mosoni branch of the Danube

According to the intergovernmental Agreement from April 1995 the flow rate into the Mosoni branch of the 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 $m^3.s^{-1}$. Discharge measurements are carried out downstream of the intake structure on Slovak territory at 0.160 rkm and also upstream of the lock No. I on 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 the intake structure were considered in this evaluation (**Fig. 1-4, Table 1-6a, 1-6b**).

Table 1-6a: Monthly characteristics of water amount released into the Mosoni branch of the Danube through the intake at Čunovo in the hydrological year 2013

Year	2012		2013										
Month	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Year
Minimum	18.7	30.7	13.3	28.8	25.3	26.2	31.1	14.1	25.0	28.4	29.2	17.5	**13.3**
Avg. min	24.9	31.8	19.5	42.6	40.1	39.8	41.5	14.1	37.6	40.0	39.6	20.8	**14.1**
Average	30.4	39.0	32.6	43.5	43.0	42.9	42.5	25.2	42.3	41.8	41.2	35.9	**38.3**
Maximum	36.1	45.3	44.2	44.9	44.6	45.7	44.5	44.6	44.2	43.7	43.5	42.5	**45.7**
Avg. max	33.6	44.9	43.7	44.7	44.2	45.3	44.4	44.0	43.6	43.0	43.1	42.0	**45.3**

In case of the hydrological year 2013 (**Table 1-6a**) the average annual discharge released into the Mosoni branch of the Danube downstream through the intake at Čunovo was 38.3 $m^3.s^{-1}$. The minimal annual discharge of 13.3 $m^3.s^{-1}$ occurred on January 21, 2013, while the lowest average daily discharge of 14.1 $m^3.s^{-1}$ was recorded during June 15-17, 2013. The highest annual discharge of 45.7 $m^3.s^{-1}$ occurred on April 28, 2013, when the highest average daily discharge of 45.3 $m^3.s^{-1}$ was recorded as well.

Table 1-6b: Monthly characteristics of water amount released into the Mosoni branch of the Danube through the intake at Čunovo in the calendar year 2013

Year	**2013**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	13.3	28.8	25.3	26.2	31.1	14.1	25.0	28.4	29.2	17.5	24.0	28.1	**13.3**
Avg. min	19.5	42.6	40.1	39.8	41.5	14.1	37.6	40.0	39.6	20.8	24.0	41.5	**14.1**
Average	32.6	43.5	43.0	42.9	42.5	25.2	42.3	41.8	41.2	35.9	41.2	42.9	**39.6**
Maximum	44.2	44.9	44.6	45.7	44.5	44.6	44.2	43.7	43.5	42.5	44.0	44.6	**45.7**
Avg. max	43.7	44.7	44.2	45.3	44.4	44.0	43.6	43.0	43.1	42.0	44.0	44.3	**45.3**

In case of the calendar year 2013 (**Table 1-6b**) the minimal annual discharge, the lowest average daily discharge, the highest annual discharge and the highest average daily discharge were the same as in case of the hydrological year. The average annual discharge released into the Mosoni branch of the Danube was 39.6 $m^3.s^{-1}$.

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 at Lock No. II. In this evaluation the data observed at Lock No. II were considered (**Table 1-7a, 1-7b**).

Table 1-7a: Monthly characteristics of flow rate determined at Lock No. II in the hydrological year 2013

Year	**2012**		**2013**										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Minimum	1.13	0.706	0.706	0.706	1.20	0.768	1.20	1.13	2.33	2.22	1.13	1.13	**0.706**
Avg. min	1.23	0.712	0.750	0.727	1.24	0.825	1.31	1.15	2.34	2.27	1.99	1.15	**0.712**
Average	1.60	1.44	1.33	1.41	1.48	1.84	1.56	4.02	2.90	2.56	2.63	2.52	**2.10**
Maximum	2.22	2.01	2.54	2.33	1.92	3.56	1.92	10.5	4.16	3.02	5.28	4.69	**10.5**
Avg. max	2.03	1.79	2.20	2.09	1.79	3.33	1.85	9.95	3.76	2.91	4.80	3.83	**9.95**

In case of the hydrological year 2013 (**Table 1-7a**) the average annual flow rate in the right-side seepage canal at Lock. No. II was 2.10 $m^3.s^{-1}$. The minimal annual flow rate of 0.706 $m^3.s^{-1}$ occurred on December 25, 2012, and also at least on January 6, 2013 and February 3, 2013. The lowest average daily flow rate of 0,712 $m^3.s^{-1}$ was determined on December 25, 2012. The highest annual flow rate of 10.5 $m^3.s^{-1}$ occurred on June 7, 2013, when the highest average daily flow rate of 9.95 $m^3.s^{-1}$ was recorded as well.

Table 1-7b: Monthly characteristics of flow rate determined at Lock No. II in the calendar year 2013

Year	2013												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	0.706	0.706	1.20	0.768	1.20	1.13	2.33	2.22	1.13	1.13	2.11	1.82	**0.706**
Avg. min	0.750	0.727	1.24	0.825	1.31	1.15	2.34	2.27	1.99	1.15	2.25	1.98	**0.727**
Average	1.33	1.41	1.48	1.84	1.56	4.02	2.90	2.56	2.63	2.52	2.64	2.17	**2.30**
Maximum	2.54	2.33	1.92	3.56	1.92	10.5	4.16	3.02	5.28	4.69	3.56	2.54	**10.5**
Avg. max	2.20	2.09	1.79	3.33	1.85	9.95	3.76	2.91	4.80	3.83	3.55	2.49	**9.95**

In case of the calendar year 2013 (**Table 1-7b**) the average annual flow rate in the right-side seepage canal at Lock. No. II was 2.30 $m^3.s^{-1}$. The minimal annual flow rate of 0.706 $m^3.s^{-1}$ occurred at least on January 6, 2013 and February 3, 2013. The lowest average daily flow rate of 0.727 $m^3.s^{-1}$ was determined on February 3, 2013. Values for the highest annual flow rate and the highest average daily flow rate were the same as in case of the hydrological year

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.

Table 1-8a: Monthly characteristics of flow rate released into the Mosoni Danube in the hydrological year 2013 (average daily values)

Year	2012		2013										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Avg. min	26.2	33.3	20.8	43.5	41.4	42.2	42.8	16.7	40.7	42.6	41.6	22.3	**16.7**
Average	32.0	40.4	33.9	44.9	44.4	44.7	44.1	29.2	45.2	44.3	43.9	38.4	**40.5**
Avg. max	35.6	46.5	45.0	46.3	45.9	47.1	46.1	46.6	46.9	45.6	47.5	44.4	**47.5**

In case of the hydrological year 2013 (**Table 1-8a**) the average annual discharge released into the Mosoni Danube was 40.5 $m^3.s^{-1}$. The lowest average daily flow rate of 16.7 $m^3.s^{-1}$ was recorded on June 4, 2013, during the flood wave. The highest average daily flow rate of 47.5 $m^3.s^{-1}$ occurred on September 26, 2013.

Table 1-8b: Monthly characteristics of flow rate released into the Mosoni Danube in the calendar year 2013 (average daily values)

Year	2013												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Avg. min	20.8	43.5	41.4	42.2	42.8	16.7	40.7	42.6	41.6	22.3	27.6	43.5	**16.7**
Average	33.9	44.9	44.4	44.7	44.1	29.2	45.2	44.3	43.9	38.4	43.8	45.0	**41.8**
Avg. max	45.0	46.3	45.9	47.1	46.1	46.6	46.9	45.6	47.5	44.4	46.9	46.4	**47.5**

In case of the calendar year 2013 (**Table 1-8b**) the average annual discharge released into the Mosoni Danube was 41.8 $m^3.s^{-1}$. Values for the lowest and the highest average daily flow rates were the same as in case of the hydrological year.

In the hydrological year 2013, due to the maintenance works on turbines and the intake structure, reduced amount of water was released for 81 days. Reduced amount of water was also released during the flood wave in the first half of June and during the discharge wave at the end of June; altogether for 22 days. Despite these limitations it can be concluded that the water amount prescribed in the intergovernmental Agreement was fulfilled. The average annual discharge into the Mosoni Danube in the hydrological year 2013 was 40.5 $m^3.s^{-1}$, which is 94.2 % of the agreed amount. In case of the calendar year the average annual discharge reached 41.8 $m^3.s^{-1}$, which is 97.2 % of the agreed amount.

1.3. Water distribution on the Hungarian territory

Goal of the water distribution on the Hungarian side is to ensure the continuous water supply of river branches in the inundation area, river branches on the flood-protected area and the Mosoni Danube. The Hungarian Party determined the actual water distribution on the basis of incoming flow rate in the Bratislava-Devín cross-section and depending on the season, as described in the Operation rules for water distribution.

1.3.1. Water supply into the inundation area

River branches in the inundation area on Hungarian side can be supplied with water from two sources:

a) Through three openings in the Danube riverbank by manipulating the water level impounded by the submerged weir and the Dunakiliti dam. The total inflowing discharge is measured at Helena gauging station.

b) From the right-side seepage canal through lock No. V.

These two sources are summed to determine the total amount.

The criteria for water distribution were set up when planning the revitalization of the right-side river branch system. The reference status was determined at the end of the nineties with participation of stakeholders. Taking various needs into consideration the water distribution reflects the hydrological regime of the fifties. Water levels characteristic for this period were targeted in the river branches in the inundation area. The actual daily flow rate was determined as a function of flow rate entering the Bratislava - Devín cross-section. 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. This is fully in line with recommendations of the Water Framework Directive and goals of the River Basin Management.

The total water amount inflowing through the three openings in the Danube riverbank upstream of the submerged weir is determined at 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 1-9a, 1-9b**).

Table 1-9a: Monthly characteristics of flow rate determined at Helena gauging station in the hydrological year 2013

Year	2012		2013										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Minimum	26.0	17.6	20.6	17.8	25.5	36.1	77.4	65.0	86.6	51.5	38.2	18.9	**17.6**
Avg. min	28.2	18.4	23.2	23.2	37.3	54.2	80.4	79.1	89.5	55.2	42.7	21.5	**18.4**
Average	39.0	40.7	66.7	59.8	58.1	106	127	268	113	71.1	78.2	43.7	**89.1**
Maximum	75.1	110	226	136	90.5	222	203	1060	129	119	143	74.4	**1060**
Avg. max	68.9	87.4	195	124	88.1	213	201	1030	127	115	140	68.2	**1030**

In case of the hydrological year 2013 (**Table 1-9a**) the average annual discharge into the right-side river branches at Helena gauging station was 89.1 $m^3.s^{-1}$. The minimal annual flow rate of 17.6 $m^3.s^{-1}$ and also the lowest average daily flow rate of 18.4 $m^3.s^{-1}$ was determined on December 16, 2012. The highest annual flow rate of 1060 $m^3.s^{-1}$ occurred on June 7, 2013, when the highest average daily flow rate of 1030 $m^3.s^{-1}$ was recorded as well.

Table 1-9b: Monthly characteristics of flow rate determined at Helena gauging station in the calendar year 2013

Year	**2013**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	20.6	17.8	25.5	36.1	77.4	65.0	86.6	51.5	38.2	18.9	19.5	16.5	**16.5**
Avg. min	23.2	23.2	37.3	54.2	80.4	79.1	89.5	55.2	42.7	21.5	20.5	17.3	**17.3**
Average	66.7	59.8	58.1	106	127	268	113	71.1	78.2	43.7	36.4	21.2	**87.2**
Maximum	226	136	90.5	222	203	1060	129	119	143	74.4	60.5	29.5	**1060**
Avg. max	195	124	88.1	213	201	1030	127	115	140	68.2	53.5	26.7	**1030**

In case of the calendar year 2013 (**Table 1-9b**) the average annual flow rate at Helena gauging station was 87.2 $m^3.s^{-1}$. The minimal annual flow rate of 16.5 $m^3.s^{-1}$ and the lowest average daily flow rate of 17.3 $m^3.s^{-1}$ was determined on December 29, 2013. Values for the highest annual flow rate and the highest average daily flow rate were the same as in case of the hydrological year.

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 1-10a: Monthly characteristics of flow rate determined at Lock No. v in the hydrological year 2013

Year	**2012**		**2013**										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Minimum	2.30	9.40	0.00	2.00	8.6	0.00	0.00	0.00	0.00	0.20	0.50	3.60	**0.00**
Avg. min	2.58	13.1	0.00	4.24	13.3	0.00	0.00	0.00	0.00	0.50	4.51	4.72	**0.00**
Average	16.1	21.0	10.1	18.2	17.8	13.4	8.46	0.82	0.81	3.96	9.88	18.7	**11.6**
Maximum	24.0	29.7	29.1	27.3	27.3	22.4	19.2	9.10	3.00	7.60	15.0	27.3	**29.7**
Avg. max	23.8	29.5	28.7	27.3	21.2	21.6	18.3	3.72	2.51	7.43	14.4	27.3	**29.5**

In case of the hydrological year 2013 (**Table 1-10a**) the average annual flow rate through the Lock. No. V was 11.6 $m^3.s^{-1}$. The minimal annual flow rate and also the lowest average daily flow rate was 0.00 $m^3.s^{-1}$ and it occurred several times in January, April, May, June and July 2013. The highest annual flow rate of 29.7 $m^3.s^{-1}$ and the highest average daily flow rate of 29.5 $m^3.s^{-1}$occurred on December 18, 2012.

Table 1-10b: Monthly characteristics of flow rate determined at Lock No. V in the calendar year 2013

Year	**2013**												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Minimum	0.00	2.00	8.6	0.00	0.00	0.00	0.00	0.20	0.50	3.60	8.30	28.1	**0.00**
Avg. min	0.00	4.24	13.3	0.00	0.00	0.00	0.00	0.50	4.51	4.72	11.4	28.2	**0.00**
Average	10.1	18.2	17.8	13.4	8.46	0.82	0.81	3.96	9.88	18.7	22.1	28.9	**12.7**
Maximum	29.1	27.3	27.3	22.4	19.2	9.10	3.00	7.60	15.0	27.3	28.4	29.6	**29.6**
Avg. max	28.7	27.3	21.2	21.6	18.3	3.72	2.51	7.43	14.4	27.3	28.4	29.6	**29.6**

In case of the calendar year 2013 (**Table 1-10b**) the average annual flow rate through the Lock. No. V was 12.7 $m^3.s^{-1}$. The minimal annual flow rate and the lowest average daily flow rate and also their occurrence was the same as in case of the hydrological year 2013. The highest annual flow rate and the highest average daily flow rate, both of 29.6 $m^3.s^{-1}$, occurred on December 18, 2013.

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 1-10a, 1-10b**).

Table 1-11a: Monthly characteristics of total water amount released into the inundation area in hydrological year 2012 (average daily values)

Year	2012		2013										
Month	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Year**
Avg. min	49.4	47.2	47.0	48.3	57.8	74.8	98.1	81.1	91.2	61.5	55.3	48.3	**47.0**
Average	55.0	61.6	76.8	77.9	75.8	119	136	269	113	75.0	88.1	62.4	**101**
Avg. max	72.7	101	195	128	103	213	210	1030	127	116	145	88.6	**1030**

Concerning the total flow rate in the right-side river branch system in the hydrological year 2013 (**Table 1-11a**) the average annual value was 101 $m^3.s^{-1}$. The lowest average daily flow rate of 47.0 $m^3.s^{-1}$ was recorded on January 21, 2013. The highest average daily flow rate of 1030 $m^3.s^{-1}$ occurred on June 7, 2013, during the culmination of flood wave.

Table 1-11b: Monthly characteristics of total water amount released into the inundation area in the calendar year 2013 (average daily values)

Year	2013												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Year**
Avg. min	47.0	48.3	57.8	74.8	98.1	81.1	91.2	61.5	55.3	48.3	48.9	46.8	**46.8**
Average	76.8	77.9	75.8	119	136	269	113	75.0	88.1	62.4	58.5	50.2	**100**
Avg. max	195	128	103	213	210	1030	127	116	145	88.6	73.4	54.9	**1030**

In case of the calendar year 2013 (**Table 1-8b**) the average annual of the total flow rate in the right-side river branch system was 100 $m^3.s^{-1}$. The lowest average daily flow rate of 46.8 $m^3.s^{-1}$ was recorded on December 29, 2013. The highest average daily flow rate was the same as in case of the hydrological year 2013.

In the year 2013 from April 25 to May 6 artificial flooding of the right-side river branch system was realized. At the request of the Hungarian Party higher discharges were released into the Danube old riverbed. During the flood wave in June the inundation area on both side of the Danube was naturally flooded from 3 to 16 days, depending on the terrain altitude.

Concerning the water stages in the Hungarian river branch system it can be stated that water levels in the upper part of the inundation area (Tejfaluszigeti river branch system) were slightly behind the reference status during the low and mid water periods. In the middle part of the inundation area (Cikolai and Bodaki river branch systems) the water levels for the low and mid water periods corresponded to the reference status, and during high water periods were slightly above. The corresponding water stages in the lower part of inundation area (Ásványi river branch system) cannot yet be achieved due to missing technical measures. However, after completion of the ongoing construction works, aimed at rehabilitation of the river branches, the opportunity to achieve the reference status opens.

Based on the above mentioned it can be concluded that the reference water levels in the upper and middle part of the inundation area were quite well achieved. Achieving the reference water levels in the lower part of the river branch system becomes possible after completion the ongoing construction works.

1.3.2. 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 1-12a, 1-12b**).

Table 1-12a: Monthly characteristics of flow rate discharged into the Mosoni Danube through the Lock No. VI in the hydrological year 2013

Year	2012		2013										
Month	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Year
Minimum	10.3	10.3	13.8	16.5	17.4	19.5	21.7	4.11	30.3	30.3	27.7	13.0	**4.11**
Avg. min	10.5	10.5	14.9	17.1	19.5	22.0	24.5	6.06	30.4	30.6	28.8	14.4	**6.06**
Average	15.5	18.6	21.5	24.9	25.4	27.2	28.8	19.8	33.4	34.6	33.5	18.4	**25.2**
Maximum	22.2	32.5	37.2	34.8	33.0	43.5	38.2	43.5	40.9	37.2	37.2	36.0	**43.5**
Avg. max	21.6	31.1	33.9	33.9	32.1	42.0	36.8	38.3	38.6	37.0	37.2	35.6	**42.0**

In case of the hydrological year 2013 (**Table 1-12a**) the average annual discharge released through the Lock No. VI into the Mosoni Danube was 25.2 $m^3.s^{-1}$. The minimal annual flow rate of 4.11 $m^3.s^{-1}$ occurred on June 3, 2013 and the lowest average daily flow rate of 6.06 $m^3.s^{-1}$ was recorded on June 4, 2013. The highest annual flow rate of 43.5 $m^3.s^{-1}$ occurred on April 28, 2013 and June 26, 2013. The highest average daily flow rate of 42.0 $m^3.s^{-1}$ occurred on April 28, 2013.

Table 1-12b: Monthly characteristics of flow rate discharged into the Mosoni Danube through the Lock No. VI in the calendar year 2013

Year	2013												
Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Minimum	13.8	16.5	17.4	19.5	21.7	4.11	30.3	30.3	27.7	13.0	11.3	10.5	**4.11**
Avg. min	14.9	17.1	19.5	22.0	24.5	6.10	30.4	30.6	28.8	14.4	16.1	13.2	**6.10**
Average	21.5	24.9	25.4	27.2	28.8	19.8	33.4	34.6	33.5	18.4	21.4	14.1	**25.2**
Maximum	37.2	34.8	33.0	43.5	38.2	43.5	40.9	37.2	37.2	36.0	26.9	16.5	**43.5**
Avg. max	33.9	33.9	32.1	42.0	36.8	38.3	38.6	37.0	37.2	35.6	26.1	15.7	**42.0**

In case of the calendar year 2013 (**Table 1-12b**) the average annual discharge released into the Mosoni Danube was also 25.2 $m^3.s^{-1}$. Values for the minimal and maximal annual flow rate and the lowest and highest average daily flow rates were the same as in case of the hydrological year 2013.

The water supply regime is controlled by the rules of operation and follows the Danube's water regime. During the flood wave in June the water supply of the Mosoni Danube was reduced due high water level in the inland area. 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

According to the prevailing influence the Danube stretch between Čunovo and Vámosszabadi may be divided into four different sections. These sections can be characterised by data obtained from following gauging stations: Rajka and Hamuliakovo, Dunakiliti, Doborgaz and Dobrohošť, Dunaremete and Gabčíkovo. Vámosszabadi and Medveďov.

Characteristics of the four sections on Čunovo - Vámosszabadi stretch in the hydrological year 2013 are as follows:

a) Section Čunovo - Dunakiliti. Since construction the submerged weir the water level in this section is impounded. This impounded section provides water into the right-side river branch system. The amount of water released into the river branch system is determined by water level regulation at the Dunakiliti dam. Since introducing the submerged weir into operation the water level is maintained in the mid-water riverbed. However, the water level and the flow velocity in June was strongly influenced by the extreme flood wave. Flow velocities measured during flow rate measurements in 2013, except measurements during flood waves in January and June, fluctuated in the range between 0.28-0.83 $m.s^{-1}$ (234-808 $m^3.s^{-1}$). Flow velocities during flood waves reached values from 1.14 to 2.80 $m.s^{-1}$ (1093-6238 $m^3.s^{-1}$). In the hydrological year 2013 flow rates exceeding 600 $m^3.s^{-1}$ were released into the Danube old riverbed on four occasions: during flood waves in January and June and during the artificial flooding of the right-side river branch system in late April and early May.
In the hydrological year 2013 the average daily water level at the Hamuliakovo gauging station (rkm 1850) fluctuated from 122.72 to 129.52 m a. s. l. (122.70-129.52 m a. s. l. in the calendar year 2013) and the average annual water level was 123.21 m a. s. l (123.19 m a. s. l. in the calendar year 2013). The average daily water level in the Rajka profile (rkm 1848.4) fluctuated from 122.69 to 128.91 m a. s. l. (122.65-128.91 m a. s. l. in the calendar year 2013) and the average annual water level was 123.15 m a. s. l. (123.13 m a. s. l. in the calendar year 2013) (**Fig. 1-7**). Compared with the previous year the minimal water levels in the hydrological year 2013 were higher by 0.13 m and lower by 0.03 m respectively, and the maximal water levels were higher by 5.59 m and 5.09 m respectively. The average annual water levels were higher by 0.11 m and 0.08 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 hydrological year 2013 the average daily water level at the Dobrohošť gauging station (rkm 1838.6) fluctuated in the range from 116.82 to 124.49 m a. s. l. (the same range for the calendar year 2013) and the average annual water level was 117.85 m a. s. l. (117.86 m a. s. l. in the calendar year 2013). The average daily water level at the Dunaremete profile (1825.5) fluctuated from 113.29 to 120.41 m a. s. l. (the same range for the calendar year 2013) and the average annual water level was 114.14 m a. s. l. (114.15 m a. s. l. in the calendar year 2013) (**Fig. 1-8**). Flow velocities, except measurements during flow waves in January and June, fluctuated in the range between 0.65-1.23 m.s^{-1} (204-525 m^3.s^{-1}). Flow velocities during flood waves reached values from 0.73 to 2.36 m.s^{-1} (922-5102 m^3.s^{-1}). Compared with the previous year the minimal water level at Dobrohošť was lower by 0.29 m, at Dunaremete lower by 0.12 m. The maximal water levels were higher by 5.32 m and 4.67 m respectively. The average annual water levels were higher by 0,16 m and 0,23 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 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 hydrological year 2013 the average daily water level at Gabčíkovo gauging station (rkm 1819) fluctuated in the range from 111.61 to 119.15 m a. s. l. (the same range for the calendar year 2013) and the average annual water level was 112.50 m a. s. l. (112.48 m a. s. l. in the calendar year 2013) (**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 water level was lower by 0.05 m and the maximal water level was higher by 4.35 m. The average annual water level was higher by 0.23 m.

d) Section Sap - Vámosszabadi. The flow rate in this section approximately equals to flow rate at Bratislava and is additionally influenced by the Gabčíkovo hydropower plant operation. Daily water level fluctuation at 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 hydrological year 2013 was 2323 m^3.s^{-1}. In the hydrological year 2013 the average daily water level at Medveďov profile (rkm 1806.3) fluctuated in the range from 108.50 to 117.11 m a. s. l. (the same range for the calendar year 2013) and the average annual water level was 110.52 m a. s. l. (110.49 m a. s. l. in the calendar year 2013) (**Fig. 1-10**). Flow velocities measured during flow rate measurements, except measurements during flow waves in January and June, fluctuated in the range between 1.09-1.49 m.s^{-1} (1235-3001 m^3.s^{-1}). Flow velocities during flood waves reached values from 1.14 to 1.68 m.s^{-1} (7033-9400 m^3.s^{-1}). Compared with the previous year the minimal water level was higher by 0.80 m and the maximal water level was higher by 3.70 m. The average annual water level was higher by 0.49 m.

Fig. 1-1a

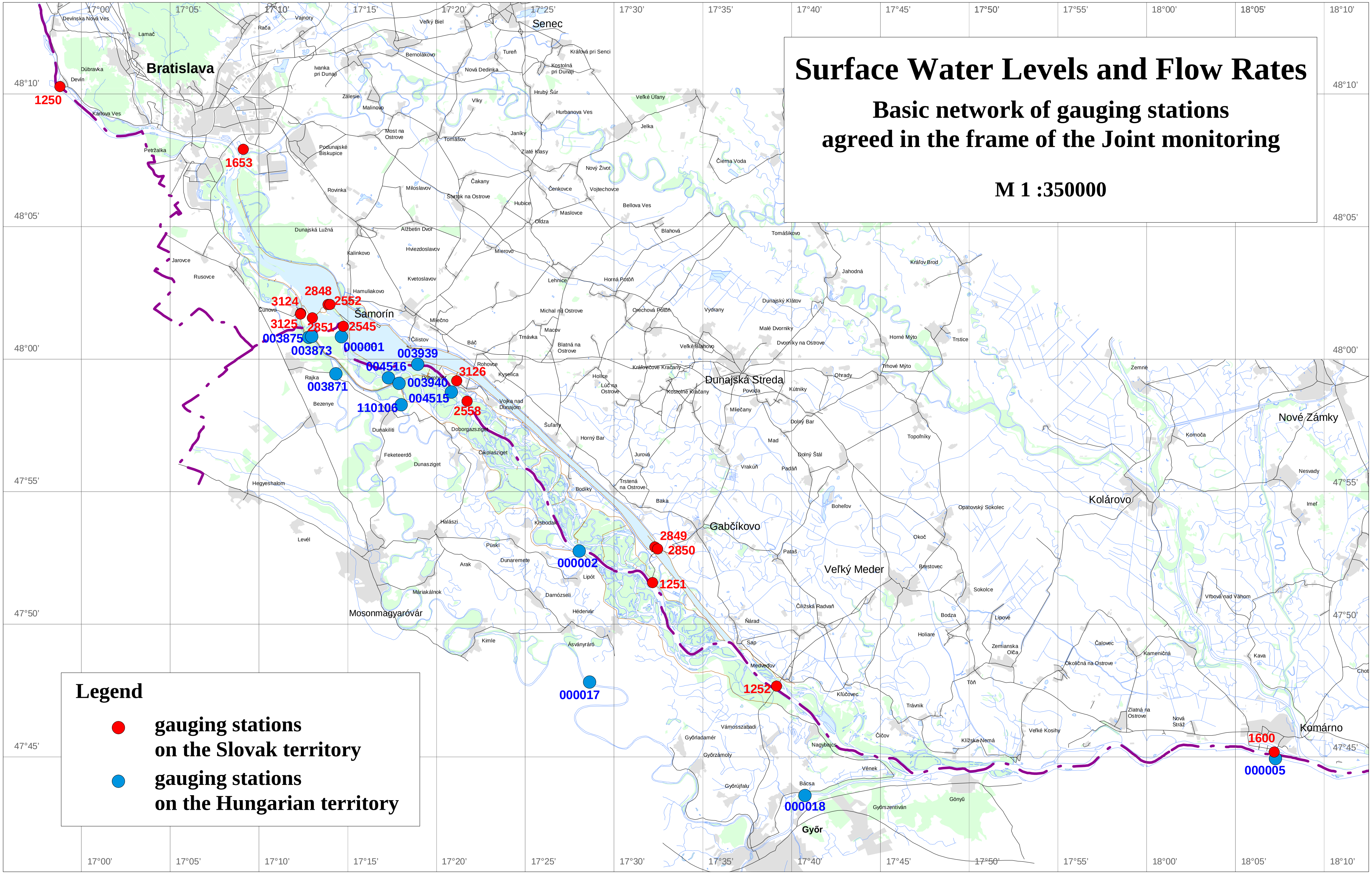
Surface Water Levels and Flow Rates
Basic network of gauging stations
agreed in the frame of the Joint monitoring
M 1 :350000
Legend
gauging stations on the Slovak territory
gauging stations on the Hungarian territory
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
1250
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Fig. 1-1b

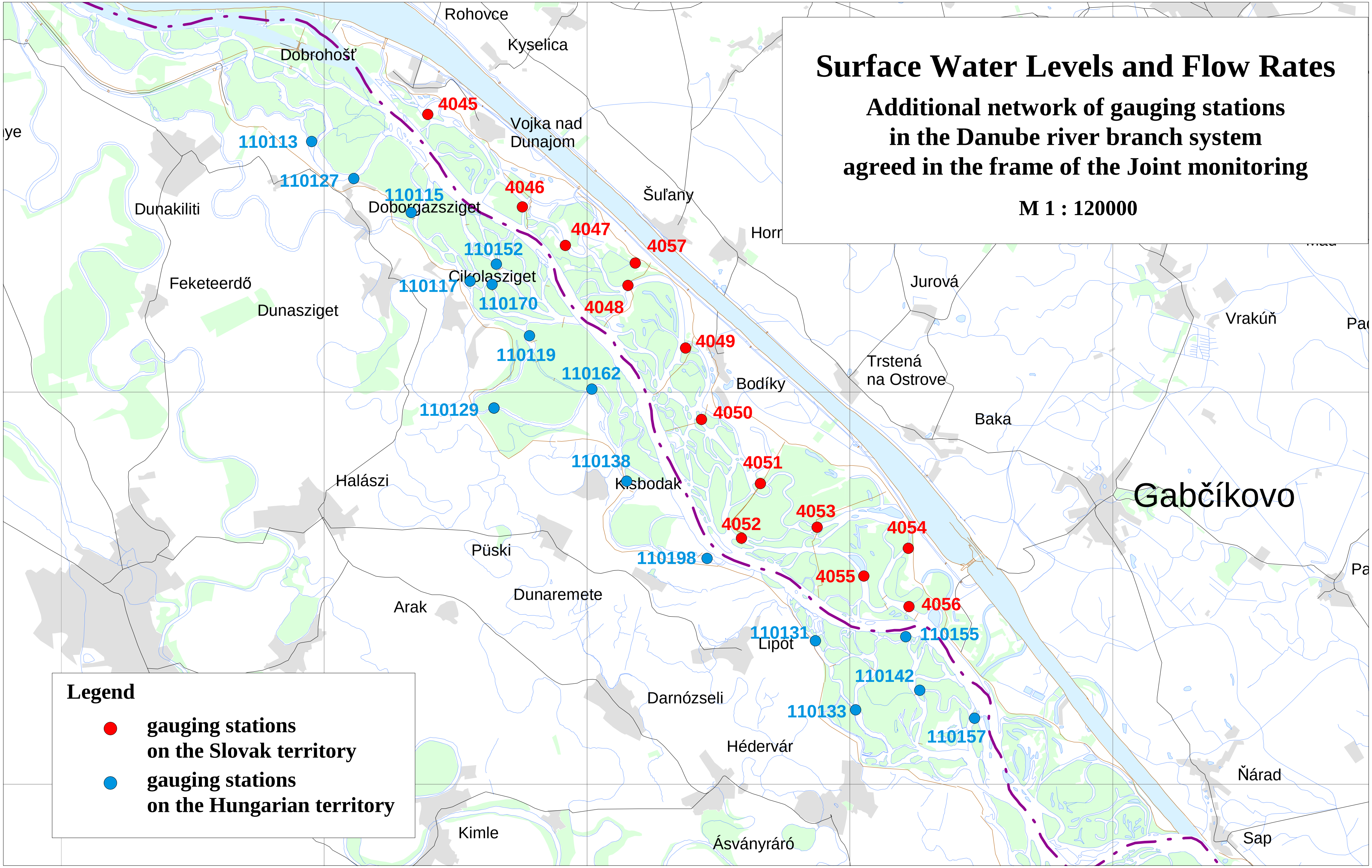
Surface Water Levels and Flow Rates
Additional network of gauging stations
in the Danube river branch system
agreed in the frame of the Joint monitoring
M 1 : 120000
Legend
gauging stations
on the Slovak territory
gauging stations
on the Hungarian territory
Rohovce
Kyselica
Dobrohošť
Vojka nad
Dunajom
Šuľany
Jurová
Vrakúň
Trstená
na Ostrove
Bodíky
Baka
Gabčíkovo
Ňárad
Sap
Dunakiliti
Feketeerdő
Dunasziget
Doborgazsziget
Cikolasziget
Halászi
Kisbodak
Püski
Dunaremete
Arak
Lipót
Darnózseli
Hédervár
Kimle
Ásványráró
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Fig. 1-2 **Surface Water - Flow Rate**

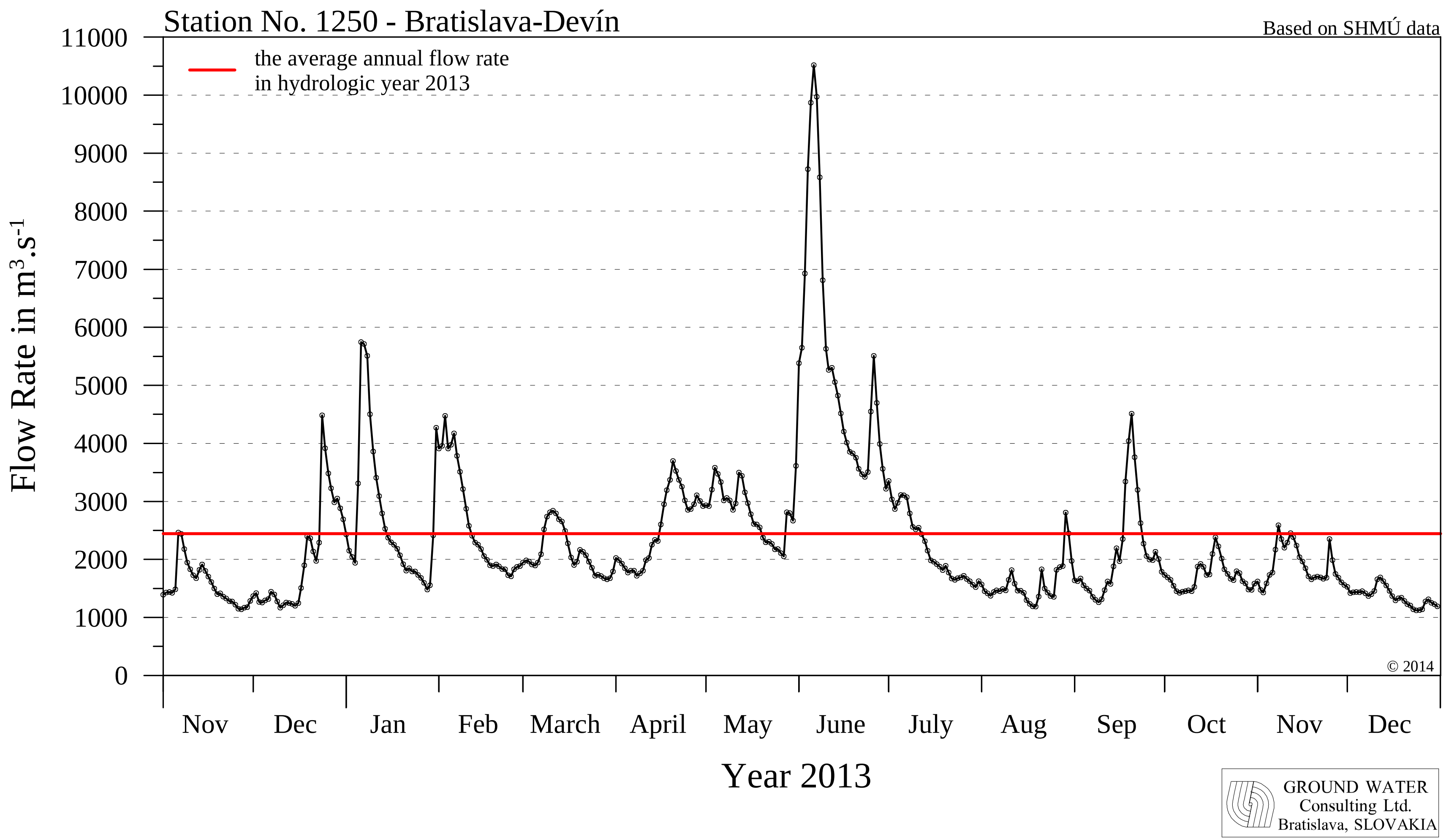

Fig. 1-3

Surface Water - Flow Rate

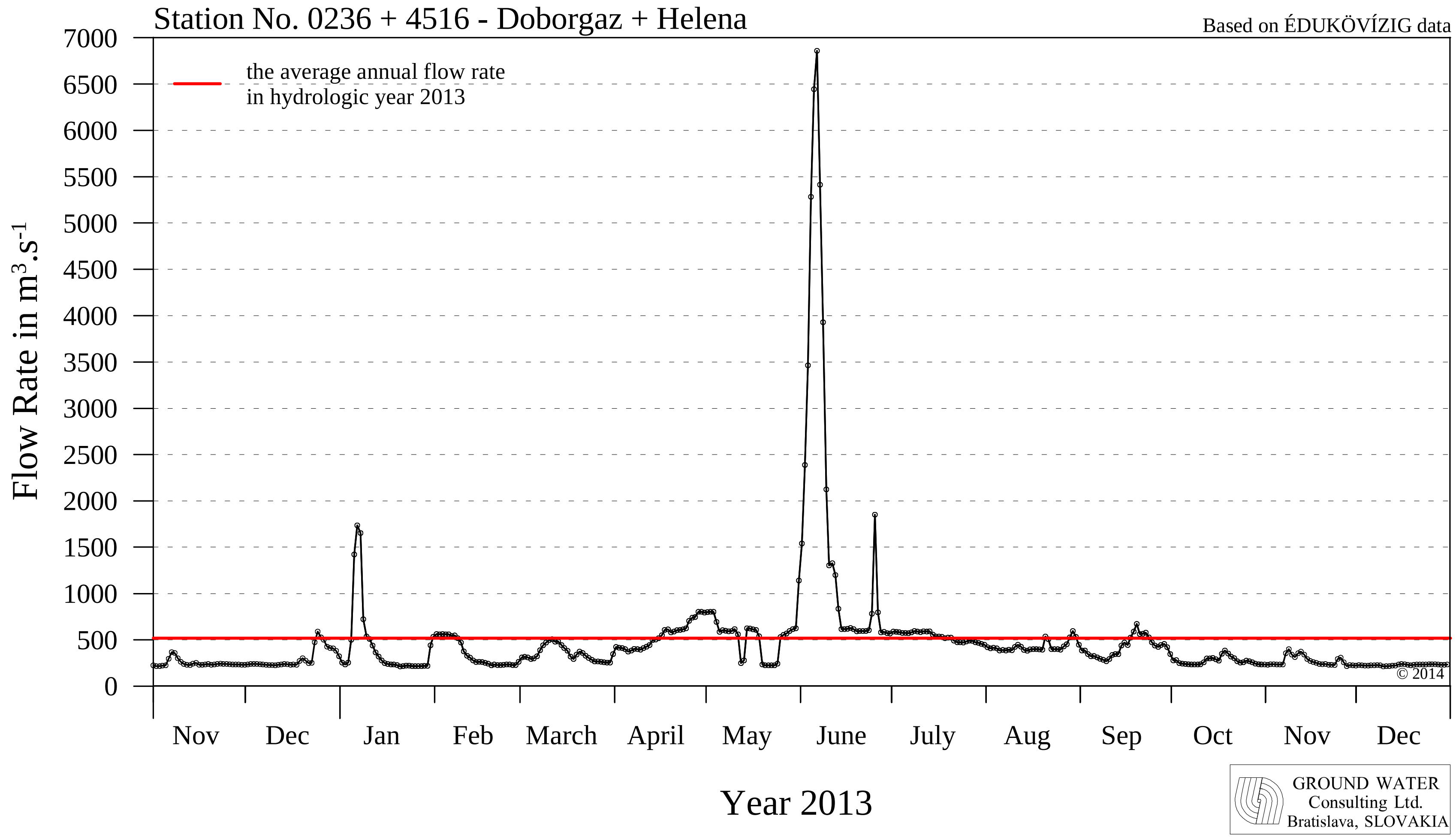

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Fig. 1-4

Surface Water - Flow Rate

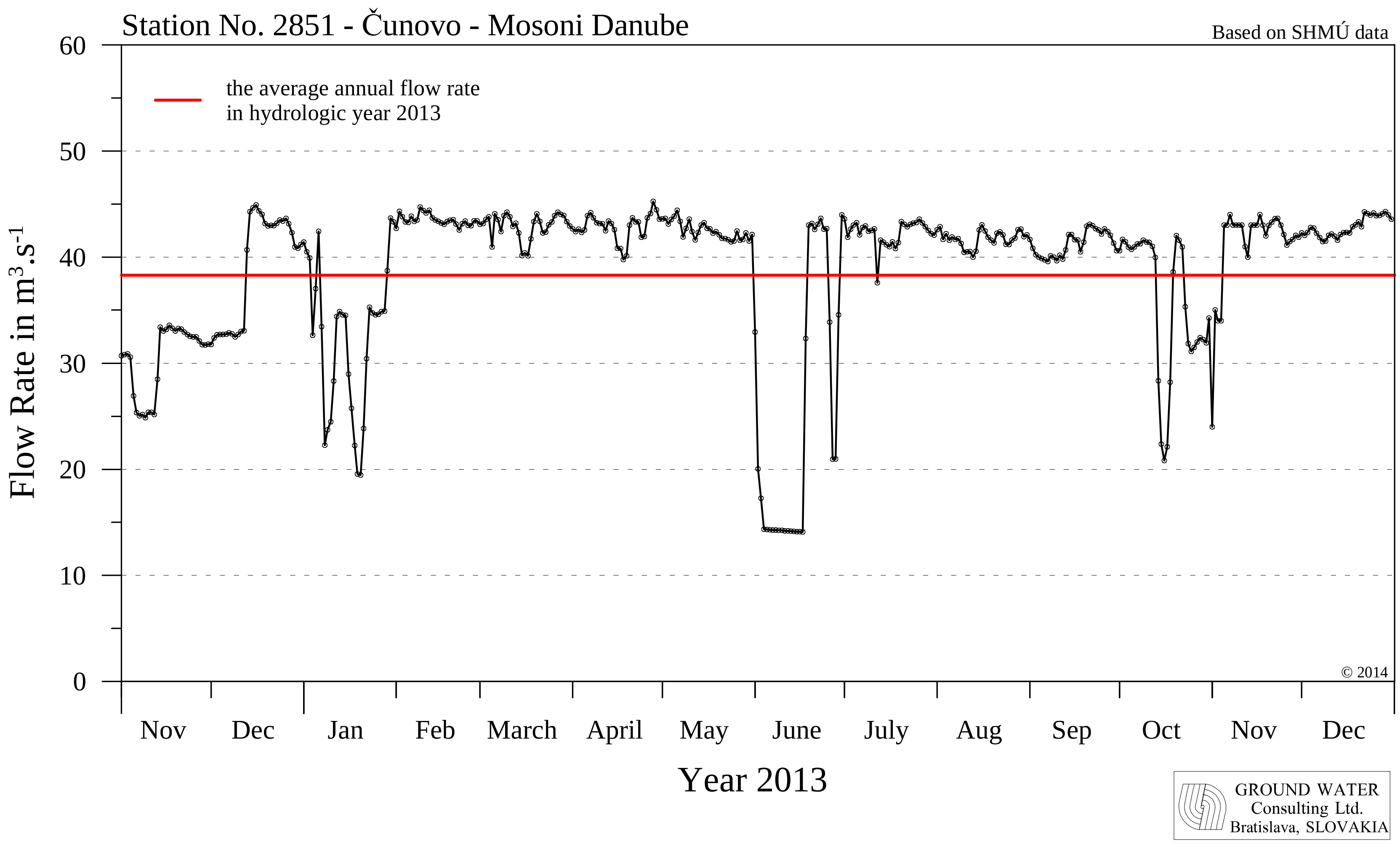

Fig. 1-5

Surface Water - Flow Rate

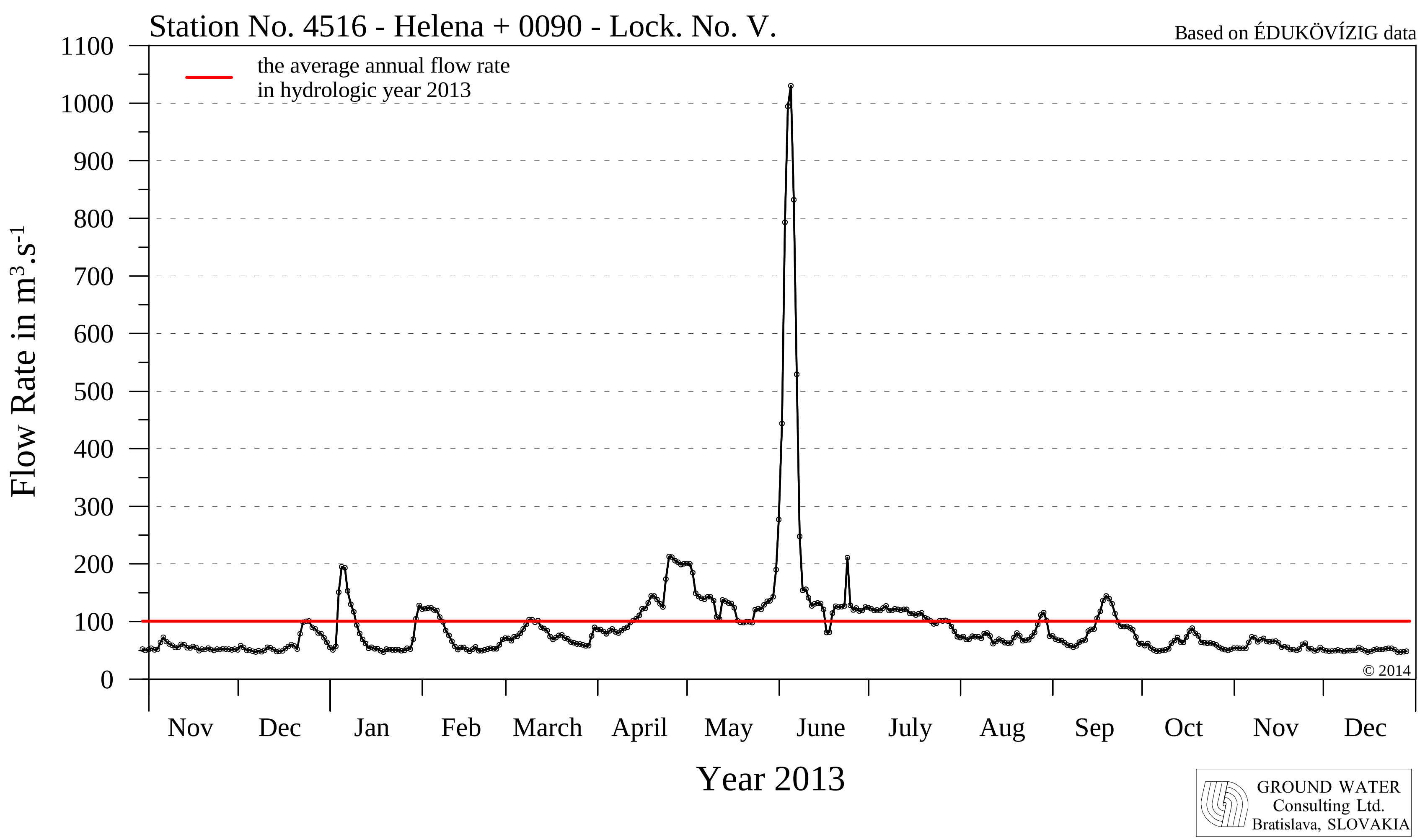

Fig. 1-6

Surface Water - Flow Rate

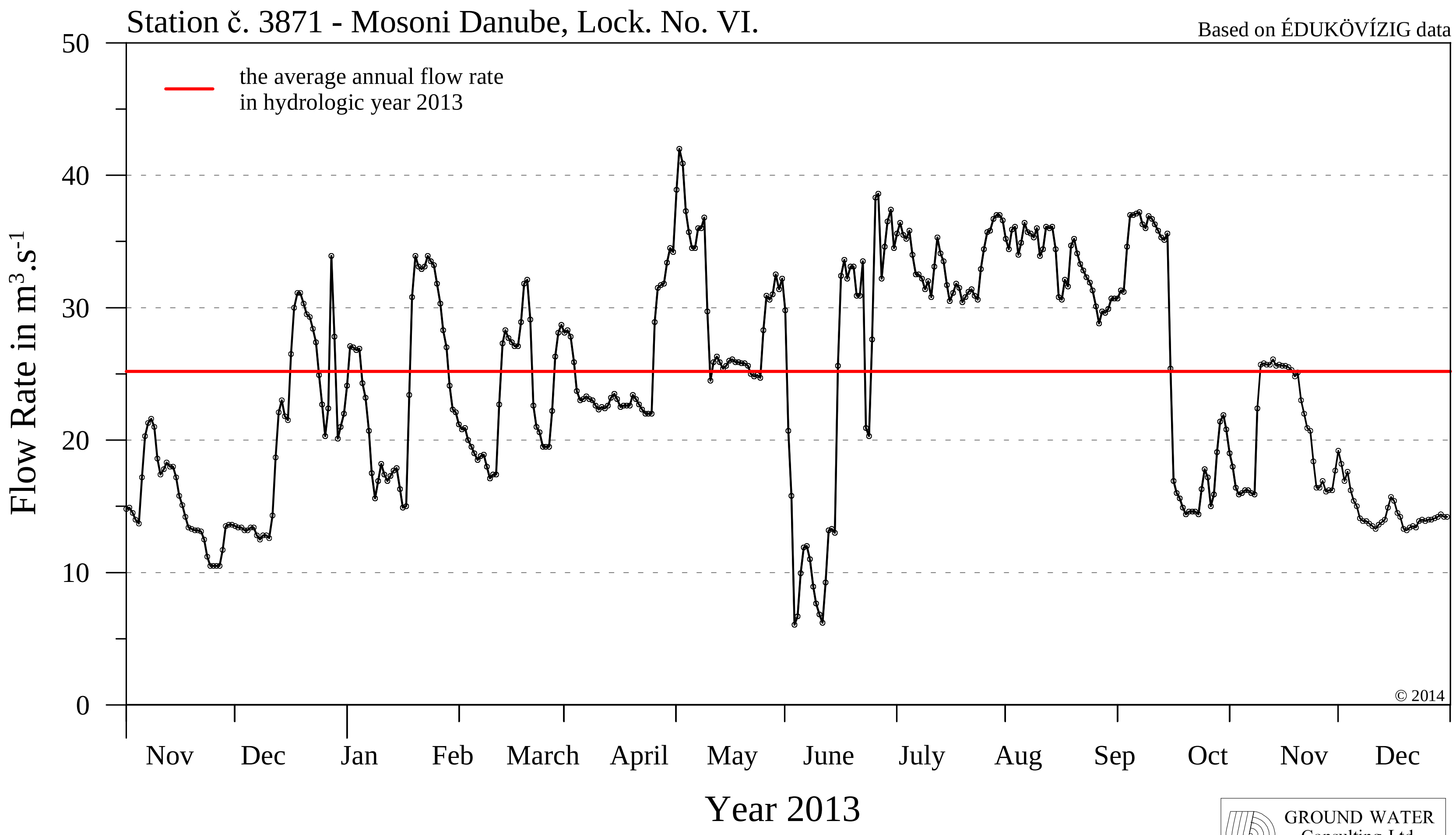

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Fig. 1-7

Surface Water Level

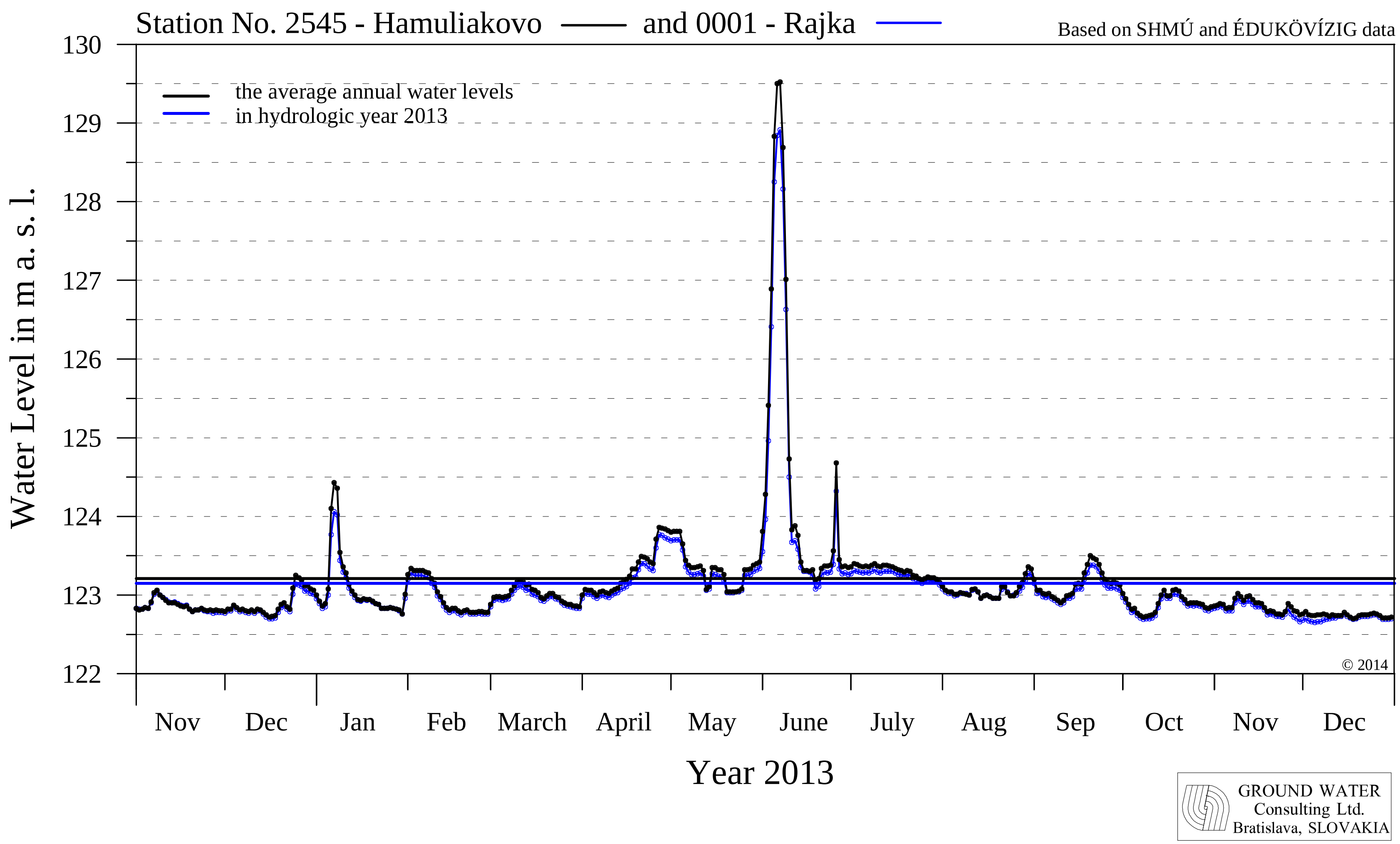


Fig. 1-8

Surface Water Level

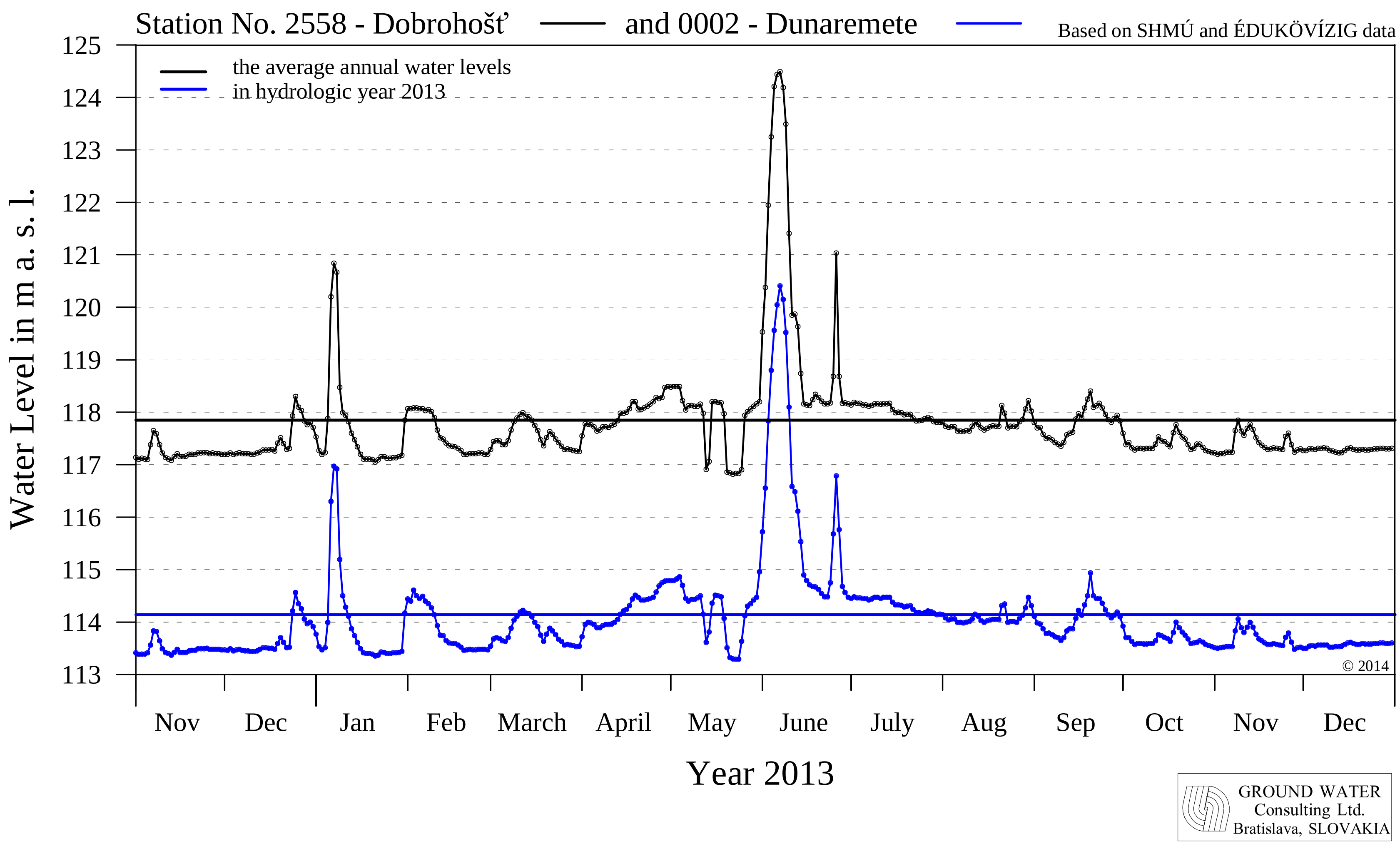


Fig. 1-9

Surface Water Level

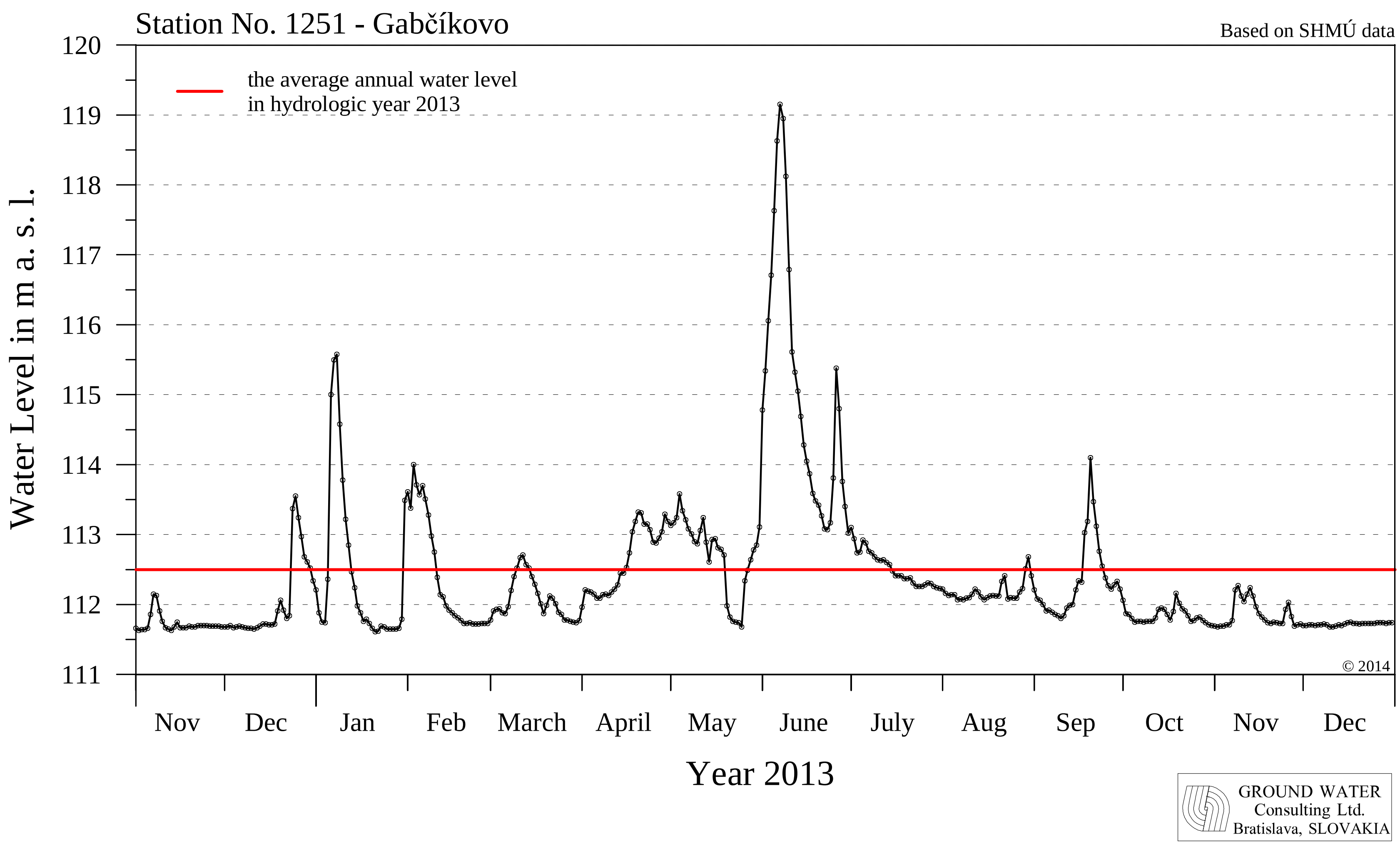
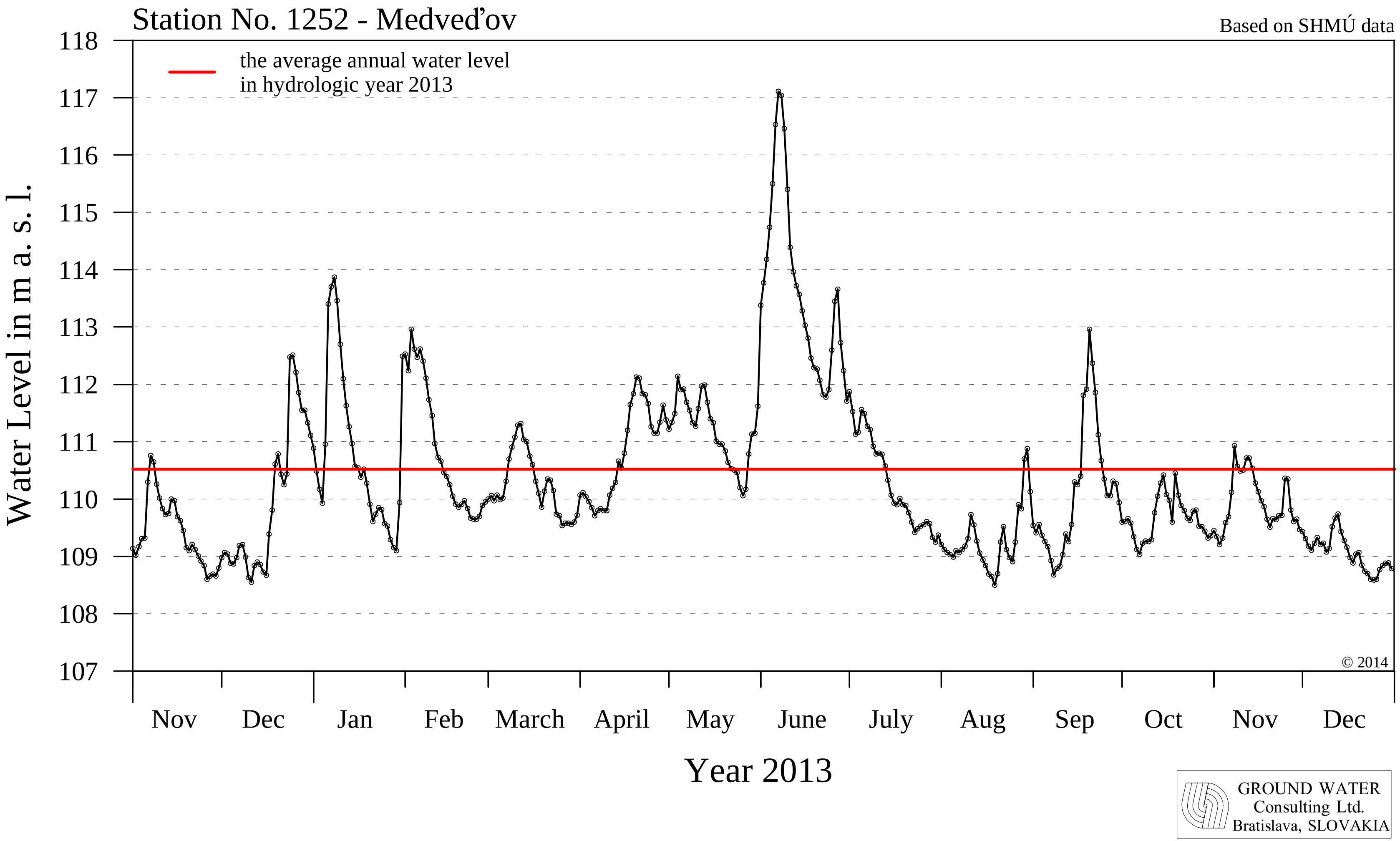


Fig. 1-10

Surface Water Level



PART 2

Surface Water Quality

The surface water quality in the year 2013 was monitored at 15 sampling sites on the Slovak territory and at 11 sampling sites on the Hungarian territory. The list of sampling sites is given in **Table 2-1**, and their location is presented in **Fig. 2-1**.

At all monitoring sites the influence of measures, described in the Agreement, on surface water quality was observed. The main factors that could influence the water quality, are: the backwater effect upstream of the submerged weir, increased discharges into the Danube downstream of Čunovo dam and into the Mosoni branch of the Danube, the water supply into the right-side river arm 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
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 time series diagrams of individual surface water quality parameters, are given in the Slovak and Hungarian National Reports on the Environment Monitoring in 2013 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
Saprobe index of biosestone	-	<1.8	2.3	2.7	3.2	>3.2
Saprobe index of macrozoobenthos	-	<1.8	2.3	2.7	3.2	>3.2
Saprobe index of phytobenthos	-	<1.5	2.0	2.5	3.0	>3.0
Chlorophyll-a	$mg.m^{-3}$	<10	35	75	180	>180

The surface water quality monitoring results at selected sampling sites evaluated according to these limits are given in **Table 2-2** at the end of this chapter**.**

2.1. General evaluation of the actual year

In the year 2013 a lot of rainfall, often very intensive, occurred in the German and Austrian Danube catchment area, which affected the flow rate regime on the Danube. The year 2013, compared with the previous year, was more water bearing and several waves of higher flow rate occurred. In early January 2013 a flood wave occurred, culminating on January 6 at 6002 $m^3.s^{-1}$. At the end of the month the Danube began to rise again and it culminated on February 3 at 4663 $m^3.s^{-1}$. Flow rates during March 2013 increased only slightly, but over the next two months, April and May, three significant discharge waves occurred, from which the highest culminated on April 20 at

3783 $m^3.s^{-1}$. The most significant rise of flow rate was registered at the beginning of June during extremely large flood wave, which culminated on June 6 at 10640 $m^3.s^{-1}$. Subsequently the Danube flow rates declined, but at the end of the month they increased again and culminated on June 26 at 5358 $m^3.s^{-1}$. Flow rates in July and August ranged below the long-term average daily values. July was characteristic by a gradual descent of flow rates, while flow rates in August were more fluctuating with several rises, the highest of which occurred on August 28 reaching 3094 $m^3.s^{-1}$. More significant discharge wave occurred even in the second half of September, when it culminated on September 20 at 4873 $m^3.s^{-1}$. From the water bearing point of view September, October and November were slightly above the average, while December slightly below the average. Flow rates in last three months have been volatile, but till the end of the year they did not exceed 3000 $m^3.s^{-1}$, and in December they gradually decreased below 1100 m^3s^{-1}. (Flow rates refer to the Bratislava-Devín gauging station.)

Average daily air temperatures most of the year was above the long-term daily averages. Values significantly above the long-term average occurred in the second half of April and at the turn of July and August. Relatively high above the long-term average the air temperature ranged also at the beginning of January, at the beginning of March, in June and in October. Air temperatures significantly below the long-term averages occurred in the second half of March, at the beginning of April, at the end of May and at the turn of September and October. Other average daily values over the year were slightly above the long-term daily average, or fluctuated around that level.

Monthly amount of precipitation was low in April, July, October and December, when it ranged up to 20 mm. In other months the monthly amount of precipitation exceeded 50 mm and the highest monthly amount of precipitation in 2013 was recorded in August (125.35 mm). The lowest monthly amount of precipitation was registered in April (13.7 mm). (Rainfall data refer to the station Bratislava-airport.).

2.2. Basic physical and chemical parameters

Water temperature

The course of measured water temperature values shows a seasonal character and the fluctuation of its values is similar, except sampling sites in seepage canals. Water temperatures in the winter period are low and maximal values occurs in the summer period. In the context of a long cold period in the evaluated year (until mid April) the water temperature till end of March or till early April ranged maximally up to 5 °C and the lowest values occurred in the period from January to March, depending on the location of sampling sites. Contrary to the year 2012 no minus water temperatures were recorded. The lowest water temperature value of 0.7 °C was recorded in January at sampling site No. 308 in the reservoir. Development of water temperature during the year is closely related to climatic and hydrological conditions. Maximal temperatures were recorded during the hottest time of the year, at the turn of July and August. The highest temperature of 27.5 °C was measured in the Danube on sampling site No. 112 at Medveďov, however this extremely high value was not confirmed by the measurement of Hungarian Party which measured 23.8 °C. In contrast to these high values, unusually low water temperatures for the summer period were recorded in early July, just above 15 °C, reflecting the strong cooling down at the end of June. Water temperature in the Danube and in the reservoir ranged from 1.0 to 23.8 °C. Water temperature in the Mosoni Danube reached higher values at sampling site No. 1141 at

Vének (3.8-25.5 °C) than at sampling site No. 3529/0082 at Čunovo/Rajka (3.9-23.1 °C). Values in the river branch system were slightly lower than in the Danube water and fluctuated in a range from 2.0 to 22.9 °C. The most balanced water temperature was characteristic for water in the left-side seepage canal at Hamuliakovo (sampling site No. 317), where it fluctuated from 6,4 to 14.6 °C (**Fig. 2-3**). In the right-side seepage canal the water temperature reached slightly higher values, but maximally up to 17,2 °C. The water temperature in comparison with the previous year mostly reached higher maxima and also higher minima. Exceptions were the sampling sites in the seepage canals (No. 3531/0084 and 317), in the Danube old riverbed upstream and downstream of the submerged weir (No. 0043 and 0042) and at the beginning of right-side river branch system at Helena (No. 112), where slightly lower maximal values of water temperature were registered in comparison with the previous year.

pH

The quality indicator pH is closely related to the development of phytoplankton. Higher values occur in seasons corresponding to periods of increased assimilation activity of phytoplankton. In the year 2013 higher values of pH were registered in March and April in connection with the first wave of phytoplankton development. In early May two smaller discharge waves occurred on the Danube and subsequently it cooled down, which resulted in decrease of phytoplankton development. The phytoplankton abundance at all sampling sites sharply declined, what was reflected in significant drop of pH values. The highest pH values were registered in the hottest time of the year, in late July early August, when the highest values of phytoplankton abundance were also documented. In late August the pH values significantly decreased on all observation sites, and at most of them the pH fluctuated in a narrow range till end of the year. Only on sampling sites in the river branch system and in the Danube old riverbed higher pH values were registered also in September. Overall, the pH in the year 2013 fluctuated in the range from 7.15 to 8.68. In the Danube main riverbed the pH ranged from 7.92 to 8.53. The highest pH values were measured in the right-side river branch system and in the Danube old riverbed (Hungarian sampling sites), where the pH fluctuated from 7.79 to 8.68. The highest pH in the year 2013 (8.68) was recorded in the sample taken on sampling site No. 1112 at Helena. The pH in the reservoir fluctuated in a similar range as in 2012, from 8.03 to 8.58. The only exception was a value of 7.15 recorded on sampling site No. 307 at the beginning of July, which represents the lowest pH value in the year 2013. At this sampling site also the biggest spread of pH values in 2013 was documented (7.15-8.40). The narrowest range in 2013 is again characteristic for the left-side seepage canal (sampling site No. 317 at Hamuliakovo), where the pH values fluctuated from 7.86 to 8.12. Differences in pH values measured at jointly monitored sampling sites were slightly bigger in comparison with the previous year. The development of pH values at selected sampling sites is shown on **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, in seepage canals less pronounced. Values are higher in winter months, lower values occurs during summer. The conductivity values in January 2013, due to significant warming up and not typical discharge wave, were relatively low. The highest values were found at the end of the month at some sampling sites at the end of February or early in March. At three sampling sites (No. 0001 at Rajka, No. 1114 at Szigeti river arm and No. 1126 at

Ásványi river arm) maximums occurred even at the beginning of April. The lowest conductivity values were recorded in May or in September. Only at the sampling site in Bratislava the lowest value occurred in the first half of June, during the flood wave decline. On most of sampling sites no samples were taken during the flood wave. The specific conductivity at sampling sites in the Danube, Mosoni Danube at Čunovo/Rajka and in the reservoir fluctuated in similar ranges, from 30.2 to 51.0 $mS.m^{-1}$. In the river branch system it fluctuated in a narrower range, on the left side of the Danube from 33.8 to 51.0 $mS.m^{-1}$ and on the right side of the Danube from 30.0 to 45.5 $mS.m^{-1}$. The highest conductivity values over the year are characteristic for the sampling site No. 1141 in the Mosoni Danube at Vének, where they fluctuated from 39.0 to 53.5 $mS.m^{-1}$, and were lower than in the year 2012 (33.8 to 59.0 $mS.m^{-1}$). The dissolved solids content in seepage canals does not have seasonal character and is rather stable over the year. The electric conductivity values again fluctuated in a narrow range and the lowest spread of values (42.2-46.8 $mS.m^{-1}$) was typical for water in the left-side seepage canal (sampling site No. 317). Similarly as in to the previous year, differences in values measured by the Slovak and Hungarian Parties at jointly monitored sites were registered over the whole year again (**Fig. 2-5**).

Suspended solids

The suspended solids content is closely related to the flow rate. It increases at flood/discharge waves and higher values are characteristic mainly for the summer period. In the year 2013, similarly as in the previous year, non-typical flood wave occurred in January, which. culminated on January 6 at 6002 $m^3.s^{-1}$. In samples taken in early January the highest content of suspended solids in 2013 were determined. Maximum of 363 $mg.l^{-1}$ was registered on sampling site No. 1203 at Rajka, however this was not confirmed by the Hungarian Party which at the same time recorded 311 $mg.l^{-1}$. High contents were measured also at Bratislava (349 $mg.l^{-1}$) and at Medveďov (280 $mg.l^{-1}$ by the Slovak Party and 235 $mg.l^{-1}$ by the Hungarian Party). The highest flow rate on the Danube occurred during the flood wave in June (culmination on June 6 at 10640 $m^3.s^{-1}$), but samples were taken either before or after the culmination, so the suspended solids contents did not belonged to highest ones. Contents in the Danube in June reached maximally 155 $mg.l^{-1}$ (sampling site No. 109 at Bratislava). Besides the flood waves in January and June several discharge waves occurred during the year. Samplings, however, were performed only during some of them. The suspended solids content in the Danube ranged from 2 to 144 $mg.l^{-1}$, except values recorded in January at the common sampling site at Rajka. In the reservoir it ranged in a narrower range from <2 to 51.8 $mg.l^{-1}$, with the maximum at sampling site No. 307 in early July. Higher contents of suspended solids in the river branch system were measured in late June or at the end of September, with a maximum of 124 $mg.l^{-1}$ on sampling site No. 1112 at Helena. The highest suspended solids content of 194 $mg.l^{-1}$ in the Mosoni Danube at common sampling site at Čunovo/Rajka (No. 3529/0082) was recorded by the Hungarian Party, however the Slovak Party at the same time measured only 16 $mg.l^{-1}$. In the Mosoni Danube at Vének (sampling site No. 1141) the highest content was recorded in April and reached 193 $mg.l^{-1}$, other values over the year fluctuated below 100 $mg.l^{-1}$. Regarding the origin of water low content of suspended solids is characteristic for seepage canals. Their content in the evaluated year fluctuated in a narrower ranges than in 2012, in the right-side seepage canal (sampling site No. 3531/0084) it fluctuated from <2 to 13 $mg.l^{-1}$, in the left-side seepage canal (sampling site No. 317) it varied from <2 to 3.2 $mg.l^{-1}$. In comparison with the previous year the content of suspended solids in 2013 was higher. Exceptions were the sampling sites in the Danube old riverbed and in the reservoir observed by the Slovak Party, where samples were taken during low flow rates. The content of suspended solids measured downstream of reservoir (sampling site No. 112 at Medveďov) during discharge waves was lower than in the Danube at Bratislava (**Fig. 2-6**), what reflects the settling effect of reservoir.

Iron

The amount of suspended solids influences the iron content in the surface water, therefore higher iron content occurs in samples taken during higher discharges. The highest iron concentrations in the evaluated year were recorded in samples taken in January, with the maximum of 10.9 $mg.l^{-1}$ on sampling site No. 109 in the Danube at Bratislava. Higher concentrations were recorded also in Danube at Medveďov (sampling site No. 2306) and in the Danube old riverbed at Rajka (sampling site No. 0001), where 3.12 $mg.l^{-1}$ and 3.03 $mg.l^{-1}$ were measured. Except mentioned high values the iron concentration in the Danube main riverbed varied from 0.04 to 1.59 $mg.l^{-1}$, and in the Danube old riverbed from 0.04 to 1.19 $mg.l^{-1}$. In the right-side river branch system the iron concentration fluctuated from 0.04 to 1.17 mg.l-1, and maximums were recorded in September, similarly as in case of suspended solids. There was small difference between maximums registered on sampling sites in the Mosoni Danube, 1.85 $mg.l^{-1}$ at Rajka and 2.09 $mg.l^{-1}$ at Vének, but in the lower part of the river (at Vének) several higher iron concentrations were recorded over the year. The iron content in the reservoir were low in the evaluated year, similarly also in the Danube old riverbed at Slovak sampling sites and in the tail-race canal. Samples were taken out of the occurrence of flood or significant discharge waves. The iron concentrations at these sampling sites ranged maximally up to 0.38 $mg.l^{-1}$ and therefore they were lower than in the previous year, while on the others they were higher. The lowest iron concentrations are characteristic for the seepage water. In the evaluated year the iron content in the seepage canals varied in a narrow range from 0.01 to 0.27 $mg.l^{-1}$.

Manganese

As in the case of iron and suspended solids also the manganese contents were higher in the evaluated year, especially in samples taken in January. On the sampling site in the Danube at Bratislava (No. 109) the highest value reached 0.424 $mg.l^{-1}$, at Medveďov (No. 2306) it was 0.200 $mg.l^{-1}$, and in the Danube old riverbed at Rajka (No. 0001) 0.250 $mg.l^{-1}$. The manganese at jointly observed sampling sites was not determined by the Slovak Party. Higher concentration of 0.290 $mg.l^{-1}$ was recorded also at the beginning of May on sampling site No. 3530 in the tail-race canal at Sap. Other manganese concentrations in the Danube ranged up to 0.139 $mg.l^{-1}$, in the river branch system and in the reservoir they were lower, maximally up to 0.062 $mg.l^{-1}$. Except one higher value of 0.180 $mg.l^{-1}$ the manganese content on sampling site No. 0082 in the Mosoni Danube at Rajka fluctuated from <0.02 to 0.05 $mg.l^{-1}$ and on sampling site No. 1141 at Vének it ranged up to 0.12 $mg.l^{-1}$. Similarly to the previous year the manganese content in the left-side seepage canal at Hamuliakovo fluctuated in a wider range (0.022-0.108 $mg.l^{-1}$) than in the right-side seepage canal at Čunovo (<0.02-0.063 $mg.l^{-1}$).

Basic physical and chemical parameters - summary

Basic physical and chemical parameters in the Danube and in the river branch system connected to the Danube main riverbed show seasonal variations and some of them predominantly depend on the flow rate. The fluctuation of basic physical and chemical 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 sampling site at Vének by its affluents and wastewater from Győr. The water in the seepage canals is influenced mainly by the leaking groundwater. Peculiar to this water are fairly balanced time series data of quality indicators, which fluctuate only in narrow ranges.

In comparison with the previous year the water temperature and the electric conductivity reached higher minimal and maximal values at most of observed sampling sites. The pH values fluctuated in similar or slightly wider ranges. The content of suspended solids, iron and manganese was influenced by the actual hydrological regime. Higher number of discharge waves resulted in occurrence of several higher values of these parameters. Iron concentrations and the suspended solids contents at most sampling sites fluctuated in wider range and reached higher values than in the previous year. Exceptions were the sampling sites in the Danube old riverbed and in the reservoir observed by the Slovak Party, where lower values of suspended solids content and iron and manganese concentrations were recorded in comparison with the previous year, because samples were taken out of the occurrence of flood or significant discharge waves.

2.3. Cations and Anions

The quantitative ratio of the surface water ionic composition in the evaluated year 2013 showed high stability, just as in previous years. The seasonal fluctuation of individual ions content followed the changes of 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 due to its affluents and cleaned wastewater from Győr. The average values of sodium, potassium, chlorides and sulphates at Vének exceeded the average values registered at the other sampling sites. The most stable ionic composition is characteristic for seepage water. In comparison with the year 2012 higher highs and lows in the content of basic cations and anions were recorded in the evaluated year, and greater differences of values at jointly observed sampling sites.

2.4. Nutrients

Ammonium ion

The ammonium ion contents in the year 2013 were low and except the Mosoni Danube they ranged from 0,026 to 0,131 mg.l^{-1}. In the Mosoni Danube at Čunovo/Rajka (common sampling site No. 3529/0082) the highest ammonium ion concentration in the year 2013 was recorded, 0,219 mg.l^{-1} by the Slovak Party and

0,180 mg.l^{-1} by the Hungarian Party. These values were measured in the first half of June during the sharp decline of flood wave. The highest values at other sampling sites were mostly recorded at the end of January or in early February. Exception was the sampling site in the Danube old riverbed downstream of submerged weir at Dunakiliti (No. 0042), where the maximum was recorded at the end of August, and the sampling site in the right-side river branch system in the Ásványi river arm (N. 1126), where the maximum occurred in late October. The highest values of ammonium ion were recorded at sampling site No. 1141 in the Mosoni Danube at Vének, where they varied from 0.02 to 0.19 mg.l^{-1}. In March, after a significant warming and along with development of phytoplankton, the ammonium ion content significantly decreased. After this decline its content at sampling sites observed by the Slovak Party (in the reservoir, in the Danube old riverbed, in the tail-race canal and in the left-side river branch system) ranged below the detection limit (0,051 mg.l^{-1}) or just above it until the end of the year. On other sampling sites higher concentrations of ammonium ion were recorded also in late August, at the end of September and in the river branch system also in October. In connection with the cooling down and the flood wave in early June higher concentrations were measured also in the Danube on sampling site at Bratislava (No. 09) and at Medveďov (No. 112), however they were lower than concentrations recorded in February. These samples were taken after the sharp decline of the flood wave on June 10 and 11. Concentrations of ammonium ion in the seepage water varied in a narrower range from <0.02 to 0.08 mg.l^{-1}.

Nitrates

In case of nitrates seasonal fluctuation of measured values is characteristic, which is less remarkable in seepage canals. The seasonal fluctuation is related to the vegetation period and the consumption of nutrients in the water. In the vegetation period the nutrients content usually falls to a half of the winter amount. The highest concentrations of nitrates in the evaluated year were mostly recorded in late February or in March, depending on the sampling site location. The highest value of 9,2 mg.l^{-1} determined on the common sampling site No. 3531/0084 in the right-side seepage canal by the Slovak Party in December was not confirmed by the Hungarian Party, because in the same time they measured concentration of 5,7 mg.l^{-1} (**Fig. 2-7**). During the substantial part of March and at the beginning of April the average daily air temperatures were significantly below the long-term averages, what resulted in the fact that the content of nitrates on observed sampling sites started to decrease significantly only in May. In June and early in July at some sampling site temporarily increased the content of nitrates, what was probably connected with the cooling down and high discharges in June (**Fig. 2-7**). The lowest concentrations of nitrates were recorded mostly in the second half of July or in August. This was the hottest period of the year, when the average daily air temperature values ranged significantly above the long-term average temperatures and when the major development of phytoplankton was documented. Towards the end of the year the content of nitrates gradually increased and in December it varied between 8-9 mg.l^{-1}. Except the seepage canals, the time course of the development of nitrates concentrations was very similar on all sampling sites. Measured values ranged from 4,3 mg.l^{-1} to 18,9 mg.l^{-1}. The highest concentrations were, unlike in 2012, again recorded at the sampling site No. 1141 in the Mosoni Danube at Vének (5.6-18.9 mg.l^{-1}). On other sites they fluctuated up to 15.2 mg.l^{-1}. The lowest nitrates content was characteristic for the seepage water, where the seasonality is not as pronounced. The content of nitrates in seepage canals varied from 3.0 to 9.2 mg.l^{-1}. Generally it can be stated that nitrate concentrations in the evaluated year achieved higher minimum and higher maximum values in comparison with the previous year.

Nitrites

The nitrite ion concentrations are considered as a temporary product of nitrification and denitrification processes. In the evaluated year the course of nitrites showed moderate seasonal variation, similar to nitrates. As in the case of nitrates, higher concentrations of nitrites occurred in June or in early July, which were related to higher flow rates and cooling down. The highest concentration of nitrites in the evaluated year was recorded on the common sampling site No. 3529/0082 in the Mosoni Danube at Čunovo/Rajka, where 0.131 mg.l^{-1} was determined by the Slovak Party and 0.139 mg.l^{-1} by the Hungarian Party. On the sampling site No. 1141 in the Mosoni Danube at Vének relatively high concentrations were registered over the year, ranging from 0.043 to 0.129 mg.l^{-1}. On all other sampling sites the nitrites concentration fluctuated from 0.01 to 0.104 mg.l^{-1}. In the seepage canals the content of nitrites varied in a narrow range (0.007-0.066 mg.l^{-1}). Generally, higher nitrite contents occurred in colder months (January, February and March) and during flood and discharge waves (June and early July, and in the right-side river branch system and Danube old riverbed also in late September). Compared to the year 2012 the nitrites content in the Danube main riverbed, in the Mosoni Danube and in the seepage canals was slightly higher, on the other sampling sites it was similar or slightly lower.

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. Maxima are reached in colder months and minima in warmer months and during the vegetation period. Maximal values in the year 2013 were recorded mainly in January, February or in early March, in the river branch system on sampling site No. 1112 at Helena as late as December (**Fig. 2-8**). Similarly to nitrates and nitrites, higher concentrations of total nitrogen occurred in June or in early July, which were related to higher flow rates and cooling down. Except the seepage canals the total nitrogen content fluctuated mostly in the range 1.25-3.86 mg.l^{-1}. In the Danube old riverbed slightly higher values were recorded, up to 4,16 mg.l^{-1}, and in the river branch system one higher value of 4,24 mg.l^{-1} was documented on sampling site No. 1112 at Helena. The highest contents of total nitrogen in 2013 were registered on sampling site No. 1141 in the Mosoni Danube at Vének, where they ranged from 1,52 to 5.23 mg.l^{-1} (**Fig. 2-8**), and were significantly higher than in the year 2012. 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) the total nitrogen in the evaluated year fluctuated in a narrow range from <1.0 to 2.1 mg.l^{-1}. In the right-side seepage canal at Čunovo/Rajka (common sampling site No. 3531/0084) the differences in values determined by the Slovak and Hungarian Parties were not as big as in the year 2012. The total nitrogen content fluctuated here from 0.83 to 3.25 mg.l^{-1}. Generally, the total nitrogen contents in 2013 were mostly similar or slightly lower than in the year 2012. Higher contents were documented on sampling site No. 109 in the Danube at Bratislava, on sampling site No. 1112 in the right-side river branch system at Helena and especially on the sampling site No. 1141 in the Mosoni Danube at Vének.

Phosphates

Higher concentrations 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. There is an inversely proportional relationship between the phosphates content and the phytoplankton abundance. Low contents of phosphates in the evaluated year occurred in April, July and August, in the reservoir, in the left-side river branch system and in the Danube old riverbed at Dunaremete also in May. In these months development of phytoplankton was documented. The main wave of its development took place in late July and in August, when at some sampling sites the phytoplankton abundance values exceeded the level of mass development and the concentrations of phosphates decreased to the level of detection limit. Higher concentrations of phosphates in June and early in July, at the end of August or in September correlate with the decrease of phytoplankton abundance in these periods. Maximal contents at individual sampling sites occurred in different months. The highest concentration of 0.368 $mg.l^{-1}$ was recorded on sampling site No. 109 at Bratislava in May. The highest contents over the year are characteristic for the sampling site No. 1141 in the Mosoni Danube at Vének, where values ranged from 0.14 to 0.30 $mg.l^{-1}$ (**Fig. 2-9**). On sampling sites in the Danube old river bed and in the Mosoni Danube at Čunovo/Rajka they fluctuated from <0.03 to 0.25 $mg.l^{-1}$, and in the reservoir, in the tail-race canal and in the river branch system up to 0.18 $mg.l^{-1}$. The development of phosphates content in seepage canals was more balanced and concentrations fluctuated in a range from <0.03 $mg.l^{-1}$ to 0.12 $mg.l^{-1}$ (**Fig. 2-9**).

Total phosphorus

Changes of the total phosphorus content in 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. In connection with the fact, that in the evaluated year there have been several flood or discharge waves, several higher concentrations of total phosphorus were recorded. The highest value in 2013 was recorded in the Mosoni Danube on sampling site No. 1141 at Vének, where 0.59 mg.l-1 was measured in April. High values were recorded also in January on common sampling site No. 112/2306 in the Danube at Medveďov, where the Slovak Party recorded 0.34 $mg.l^{-1}$, while the Hungarian Party only 0.16 $mg.l^{-1}$, in the Danube old riverbed at Rajka (sampling site No. 0001), where the Slovak Party measured 0.37 $mg.l^{-1}$ and the Hungarian Party 0.34 $mg.l^{-1}$, on sampling site No. 4025 downstream of the submerged weir at Dunakiliti 0.31 $mg.l^{-1}$, and also on the common sampling site No. 3529/0082 in the Mosoni Danube at Čunovo/Rajka, where the Slovak Party recorded 0.36 $mg.l^{-1}$ and the Hungarian Party 0.39 $mg.l^{-1}$. Except these high values the total phosphorus content in the Danube water ranged from 0.03 to 0.22 $mg.l^{-1}$. In the right-side river branch system it fluctuated in a similar range (0.04-0.21 $mg.l^{-1}$). The most polluted water regarding the total phosphorus content was in the Mosoni Danube at Vének, where concentrations ranged from 0.10 to 0.32 $mg.l^{-1}$ (**Fig. 2-10**). The lowest contents were measured in seepage canals (0.01 to 0.08 $mg.l^{-1}$). In comparison with the year 2012 the total phosphorus contents in the Danube, Danube old riverbed, Mosoni Danube and in the right-side river branch system were higher. On sampling sites in the reservoir, left-side river branch system, tail-race canal and in the seepage canals its contents were similar or slightly lower, what may reflect the fact, that samples were taken during lower flow rates. Similarly to the previous year several differences in values measured by the Slovak and the Hungarian Parties at jointly monitored sampling sites were registered. The time course of total phosphorus concentrations in the year 2013 at selected sampling sites is shown in **Fig. 2-10**.

Nutrients - summary

Individual 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. Seasonality in the evaluated period was more remarkable in case of nitrates, nitrites and total nitrogen, less remarkable in case of ammonium ions. The content of phosphates and total phosphorus can increase at higher flow rates, what was documented by higher concentrations during flood and discharge waves. Low values of phosphates are typical for the vegetation period, when intensive growth of algae going on. The highest contents of nutrients in the evaluated year were recorded mostly in January and February. On several sampling sites high concentrations occurred in June or early July, what was connected with the cooling down and high discharges in June.

Generally it can be stated, that contents of nitrates in the evaluated year achieved higher minima and maxima than in the previous year. Contents of other nutrients were higher mainly in the Danube at Bratislava and Medveďov and in the Mosoni Danube. Values of total phosphorus content were higher also on sampling sites in the Danube old riverbed and in the right-side river branch system observed by the Hungarian party. At sampling sites observed only by the Slovak party the total phosphorus concentrations were lower, which can be related to the fact, that samples were taken during low flow rates.

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 during the year more frequently and disrupt the seasonal fluctuation. In comparison with the year 2012 concentrations of nitrates, total nitrogen and total phosphorus were significantly higher in the evaluated year. 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.

The nutrient content in the Danube water is potentially sufficient for development of eutrophic processes under other suitable conditions.

2.5. Oxygen regime parameters

Dissolved oxygen

Dissolved oxygen content in the surface water is besides the decay processes of organic pollution influenced by hydro-meteorological conditions and by assimilation activity of phytoplankton. Dissolved oxygen content proportionally decreases with increasing water temperature. Low values in the year 2013 were recorded from May to September, depending on the sampling site location and the lowest oxygen concentrations occurred mainly in July and August. The highest values were recorded mostly in January. Time series data of dissolved oxygen on sampling sites in the

Danube main flow and on sampling sites observed by the Slovak Party in the Danube old riverbed, in the left-side river branch system, in the tail-race canal and in the reservoir were fairly balanced, without major fluctuations. The dissolved oxygen concentration here did not decreased below 7 $mg.l^{-1}$, which is the limit for the I. quality class according to the **Table 2-2**. On several sampling sites slight increase was observed after cooling down in late May. The highest dissolved oxygen concentration of 16.8 $mg.l^{-1}$ was recorded in late January on sampling site No. 308 in the upper part of the reservoir. Similarly high concentration of 16.6 $mg.l^{-1}$ was recorded also on sampling site No. 1112 at the beginning of the right-side river branch system at Helena. The dissolved oxygen content on other sampling sites ranged up to 15 $mg.l^{-1}$. The oxygen concentrations in the right-side river branch system and in the Mosoni Danube were more volatile over the year. In the Mosoni Danube on common sampling site No. 3529/0082 at Čunovo/Rajka and on sampling site No. 1126 in the right-side river branch system (Ásványi river arm) the oxygen content dropped also below 7 $mg.l^{-1}$. The lowest value of 4 $mg.l^{-1}$ was recorded in the Mosoni Danube at Čunovo/Rajka in early September by the Hungarian Part; the Slovak Party carried out the sampling in a different time. Major part of dissolved oxygen concentrations in the year 2013 varied in a range from 6.5 to 15.0 $mg.l^{-1}$. The narrowest range was characteristic for the sampling site No. 317 in the left-side seepage canal, where values fluctuated from 9.2 to 12.1 $mg.l^{-1}$. The development of oxygen concentrations on common sampling site No. 3531/0084 in the right-side seepage canal differed from the other sampling sites. The oxygen content in June sharply decreased from 11.6 to 5.6 $mg.l^{-1}$, until October it varied in a range from 4.8 to 7.4 $mg.l^{-1}$, and it increased in last two months of the year. The dissolved oxygen concentration on sampling site No. 1141 in the Mosoni Danube at Vének fluctuated in a range from 6.7 to 12.7 $mg.l^{-1}$, similarly as in the year 2012 (6.4-12.7 $mg.l^{-1}$), and only one value was lower than 7. $mg.l^{-1}$. Generally it can be stated, that the oxygen conditions in the year 2013 were mostly good and similar as in the year 2012. Partial deterioration of oxygen conditions was registered in the right-side seepage canal in the period from June to October.

COD_{Mn} and BOD_5

COD_{Mn} and BOD_5 parameters are used for expression of organic contamination of water, they indicate the chemically and biologically degradable organic matter content. Higher values of COD_{Mn} and BOD_5 usually occur at periods with higher flow rates in the Danube, when the water contains higher amount of natural organic matter. On jointly observed sampling sites the Slovak Party did not determined the COD_{Mn} parameter.

The highest values of COD_{Mn} in the year 2013 were recorded at the beginning of the year and were related to the flood wave in January. On the sampling site No. 2306 in the Danube at Medveďov value of 10.6 $mg.l^{-1}$ was determined, in the Danube old riverbed at Rajka (No. 0001) 12.2 $mg.l^{-1}$ and in the Mosoni Danube at Rajka (No. 0082) 8.4 $mg.l^{-1}$. But the highest value of 12,4 $mg.l^{-1}$ in 2013 was recorded in the Mosoni Danube at Vének (No. 1141). At this sampling site also the other values recorded during the year were higher than in 2012. Increased COD_{Mn} values occurred also in June and September, but they ranged up to 5.3 $mg.l^{-1}$. Maximal values on sampling sites in the right-side river branch system and in the Danube old riverbed observed by the Hungarian Party were registered at the end of September and values varied from 1.4 to 4.9 $mg.l^{-1}$. On sampling sites in the reservoir the COD_{Mn} values fluctuated in a narrower range from 0.9 to 3.4 $mg.l^{-1}$, but samples were taken out of high flow rates. The poorest water in terms of organic contamination was the water in seepage canals, where the COD_{Mn} values fluctuated in a narrow range, from <0.8 to 2.0 $mg.l^{-1}$ (sampling sites No. 317 and 0084). Compared to the previous year higher maxima were recorded and also the values determined during the year were mostly higher. This is most reflected on the sampling site in the Mosoni Danube at Vének. At sampling sites, where samples were taken out of high flow rates the maxima were lower than in 2012.

While in the case of COD_{Mn} only data measured by the Hungarian Party were available at common sampling sites (the Slovak Party did not analyze this parameter), in case of BOD_5 data from both Parties were available. Differences in BOD_5 data measured by the Hungarian and Slovak Party persist in long-term, and this is true also for the evaluated year 2013 (**Fig. 2-11**). Higher values are usually determined by the Hungarian Party. The highest values of BOD_5 in the evaluated year were recorded by the Hungarian Party on sampling site No. 2306 in the Danube at Medveďov, where they ranged from 2.4 to 10.6 $mg.l^{-1}$, on sampling sites in the Danube old riverbed up to 9.0 $mg.l^{-1}$, in the Mosoni Danube and in the right-side seepage canal at Rajka (No. 0082 and 0084) up to 8.5 $mg.l^{-1}$. The BOD_5 values in the right-side river branch system also varied in rather wide range from 0.4 to 7.7 $mg.l^{-1}$, and slightly lower values were registered in the Mosoni Danube at Vének, where they fluctuated from 2.1 to 6.6 $mg.l^{-1}$. The highest value recorded by the Slovak Party was 3.8 $mg.l^{-1}$ and it was determined in the Danube on sampling sites No. 109 at Bratislava and No. 112 at Medveďov. The BOD_5 values on other sampling sites observed by the Slovak party ranged from <0.9 to 2.2 $mg.l^{-1}$, when the narrowest range was characteristic for the left-side seepage canal at Hamuliakovo (sampling site No. 317) and the BOD_5 values fluctuated from <0.85 to 1.1 $mg.l^{-1}$. In comparison with the year 2012 the contamination by organic substances expressed by BOD_5 indicator in the evaluated year was higher on common sampling sites and sampling sites monitored only by the Hungarian Party. On sampling sites, which are observed only by the Slovak Party the determined values were mostly similar to those in 2012.

<u>Oxygen regime and organic carbon parameters - summary</u>

Oxygen conditions in the year 2013 can be classified as very good. The dissolved oxygen content remained preserved at the level of previous years and, except the right-side seepage canal, only four concentrations lower than 7 $mg.l^{-1}$ (which is the limit value for I. quality class according to the **Table 2-2**) occurred at different sampling sites. In the right-side seepage canal low dissolved oxygen concentrations were recorded in the period from June to October, what may indicate deterioration of oxygen conditions at this sampling site.

The organic pollution in the year 2013 was higher in comparison with the previous year, what probably can by associated with the frequent occurrences of high flow rate. The COD_{Mn} values determined on sampling sites observed only by the Slovak Party were lower, because samples were taken during periods with lower flow rates. Also in the year 2013 significant differences in BOD_5 values were registered between the Slovak and Hungarian Party at jointly monitored sampling sites. Values obtained by the Hungarian Party were higher.

The water in the left-side seepage canal remained the cleanest. The organic pollution in the right-side seepage canal expressed with COD_{Mn} was low, however in case of BOD_5 several high values occurred and in the summer period deterioration of oxygen conditions was registered. The oxygen conditions on sampling site in the Mosoni Danube at Vének were good and the organic pollution expressed by BOD_5 was lower than in the Danube or in the Mosoni Danube at Rajka, but the COD_{Mn} values belonged to the highest in the evaluated year and were significantly higher than in the previous year.

In general it can be stated that the organic pollution in long-term (1992-2013) indicates a downward tendency in the organic load at the Bratislava section of the Danube. However, last four years the organic load expressed by BOD_5 has increased, which may be related to measures in the riverbed taken on the Austrian stretch of the Danube.

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 2013 the Slovak Party did not observed heavy metals on sampling site: No. 3376 in the left-side river branch system at Dobrohošť, on sampling site No. 3529 in the Mosoni Danube at Čunovo and on sampling site No. 3531 in the right-side seepage canal at Čunovo. Generally, the contents of heavy metals in the evaluated year were low. In case of lead, mercury, cadmium, chromium, arsenic and zinc most of values ranged below the detection limit values.

The highest zinc content of 23 $\mu g.l^{-1}$ in 2013 was recorded by the Hungarian Party on the common sampling site No. 112/2306 in the Danube at Medveďov. The Slovak Party at the same time determined a concentration less than 20 $\mu g.l^{-1}$. Except the abovementioned one value all other contents of zinc were lower than 20 $\mu g.l^{-1}$, what is the detection limit in case of analyses made by VÚVH. At sampling sites observed by two other organizations the measured values ranged from 1.7 to 17.9 $\mu g.l^{-1}$, similarly to the year 2012 (1.4-17.0 $\mu g.l^{-1}$). Many concentrations were lower than the detection limit values, so lower than 10 $\mu g.l^{-1}$ in case of Hungarian data and lower than 1 $\mu g.l^{-1}$ in case of analyses carried out by SVP-BA.

In case of mercury one higher value of 0.35 $\mu g.l^{-1}$ was recorded by the Slovak Party on the common sampling site No. 112/2306 in the Danube at Medveďov, the Hungarian Party at the same time determined a concentration below the detection limit (<0.02 $\mu g.l^{-1}$). All other values were below the detection limit values, so lower than 0.05 $\mu g.l^{-1}$ in case of Slovak data or lower than 0.02 $\mu g.l^{-1}$ in case of Hungarian data.

Also in case of arsenic one higher concentration of 9.3 $\mu g.l^{-1}$ was recorded on sampling site No. 0084 in the right-side seepage canal at Rajka. All other values ranged below 5.0 $\mu g.l^{-1}$, what is the detection limit value in case of analyses made by SVP-BA. On sampling sites observed by VÚVH or Hungarian Party arsenic concentrations fluctuated in the range from <0.9 to 4.1 $\mu g.l^{-1}$. Measured values occurred only at some of sampling sites, with a frequency 1-7 times. The most frequent occurrence of values above the detection limit value was found on sampling site No. 1141 in the Mosoni Danube at Vének.

In case of chromium only 3 concentrations were higher than the detection limit. The highest value of 14.7 $\mu g.l^{-1}$ was recorded at common sampling site No. 1203/0001 in the Danube old riverbed at Rajka in early January, however the concentration determined by the Slovak Party was less than 2.0 µg.l^{-1}. All other concentrations fluctuated below 2 µg.l^{-1} for analyses made by VÚVH, below 0.5 µg.l^{-1} for analyses made by SVP-BA, or below 1.7 µg.l^{-1} in case of Hungarian data.

Cadmium concentrations, except three values, were lower than 0.08 µg.l^{-1} on sampling sites observed by SVP-BA, and lower than 0.1 µg.l^{-1} in case of the other sampling sites. From among the three measured concentrations two achieved 0.1 µg.l^{-1} and the highest one was 0.3 µg.l^{-1}.

Low concentrations in the evaluated year were characteristic also for lead. Also in this case three concentrations slightly exceeded the detection limits, 1.0 µg.l^{-1} in case of Slovak data, and 0.7 µg.l^{-1} in case of Hungarian data. The highest value achieved 1.4 µg.l^{-1}.

The highest frequency of concentrations above the detection limit is characteristic for copper. In the year 2013 the copper concentrations fluctuated from <0.5 to 14.4 µg.l^{-1}. The maximal value was recorded in early January by the Hungarian Party on sampling site No. 0042 in the Danube old riverbed downstream of submerged weir. The highest value recorded by the Slovak Party on sampling site No. 311 in the reservoir achieved only 3.25 µg.l^{-1}. Similarly to previous years there were significant differences in concentrations measured by the Hungarian and the Slovak Party on jointly observed sampling sites at the same dates.

The content of nickel in the surface water in the year 2013 was similar as in the previous year. It varied in the range from <0.7 to 7.1 µg.l^{-1} (in 2012 up to 8.1 µg.l^{-1}). Maximum was measured in November at sampling site No. 0084 in the right-side seepage canal at Rajka. On the Slovak territory its content ranged up to 2 µg.l^{-1}.

In summary it can be concluded that heavy metal concentrations, which were determined from filtered samples, were low during the evaluated year, with occasional occurrence of higher values. Sporadic higher concentrations occurred in case of arsenic, mercury and chromium. Great part of measured values was below the detection limits of applied analytical methods. Low concentrations were characteristic mainly for cadmium, lead and mercury. The highest frequency of concentrations above the detection limit was characteristic for nickel and especially for copper. Compared to the previous year, the concentrations of observed heavy metals were similar. Slight difference was the occurrence of higher concentration in case of arsenic and mercury, while in the previous year it occurred only in case of copper and chromium.

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 differ 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 (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 concluded, that in the year 2013 all concentrations of heavy metals were in full compliance with environmental quality standards.

2.7. Chlorophyll-a

Chlorophyll-a concentrations indicate the amount of phytoplankton and provide information about the eutrophic status of water. The amount of chlorophyll-a is affected by the flow rate and temperature conditions of the evaluated year and by the fluctuation of nutrients content. In connection with different hydrological and climatic conditions, the development of chlorophyll-a in the evaluated year differed in comparison with the previous year. Chlorophyll-a concentrations in the year 2013 ranged from <2.0 to 47.3 $mg.m^{-3}$. The rise of chlorophyll-a began already in March, but higher values were achieved in April and May, when the portion of green algae increased in the phytoplankton. Low values in early May, in June, early July and late August were related with climatic and hydrological conditions in a given period (cooling, heavy rainfall and high flow rates). The main development of phytoplankton was observed at the end of July and beginning of August, when also the highest chlorophyll-a concentrations were recorded. Besides the maximum of 47.3 $mg.m^{-3}$ on sampling site No. 311 in the reservoir, high values were registered also on sampling site No. 112 in the Danube at Medveďov (45.2 $mg.m^{-3}$), No. 0042 in the Danube old riverbed downstream of the submerged weir (43.8 $mg.m^{-3}$) and No. 1205 in the Danube at Komárno (41.9 $mg.m^{-3}$). Other concentrations fluctuated up to 40 $mg.m^{-3}$. In the right-side river branch system and in the Mosoni Danube at Čunovo/Rajka the chlorophyll-a content ranged from <2 to 34.3 $mg.m^{-3}$. Contrary to the previous year, when the highest chlorophyll-a value was recorded on sampling site No. 1141 in the Mosoni Danube at Vének (74.6 $mg.m^{-3}$), values in 2013 belonged to the lowest and fluctuated in a range from <2 to 13,0 $mg.m^{-3}$. Even lower concentrations were observed in the seepage water. In the right-side seepage canal at Čunovo/Rajka (common sampling site No. 3531/0084) they varied from <2 to 10.7 $mg.m^{-3}$ and in the left-side seepage canal at Hamuliakovo (No. 317) all values were below the detection limit, so less than 2 $mg.m^{-3}$. The development of chlorophyll-a at selected sampling sites is shown in **Fig. 2-12**.

2.8. Other biological indicators

Evaluation of biological quality indicators in 2013 at 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 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 the year 2013 at jointly monitored sampling sites were evaluated within the ecological status of surface water and in accordance with the methodology agreed in the frame of the Transboundary Water Commission (in "Assessment of water quality status of Slovak-Hungarian boundary flows in 2013 - Slovak results", May 2014 and the Hungarian National Annual Report in 2013). Overall ecological status of surface water is determined by the biological quality elements together with supporting hydromorphological, physico-chemical and chemical elements. The evaluation of ecological status in the year 2013 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 evaluation is the type specificity and the comparison of changes in environment quality with reference values, which reflect the environment status without or with minimal anthropogenic influence. From among the biological quality elements the benthic invertebrates (macrozoobenthos), phytobenthos, phytoplankton and macrophytes were evaluated.

The evaluation of observation results for particular biological elements was performed according to the classification schemes, which include limit values for classification into the respective quality classes in the range I.-V. quality class together with corresponding 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 national level. 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. Phytoplankton is evaluated according to the proportional representation of the four groups (Cyanophyta, Chromophyta, Chlorophyta, Euglenophyta) and according to the abundance and biomass. Phytobenthos assessment is based on three indexes (CEE - the response of diatoms to overall pollution, EPI-D - detects the eutrophication processes in streams, IPS - overall water pollution) and macrophytes on IBMR index - biological index (more details in Government Regulation No. 269/2010 Z.z. as amended by later regulations). The basis for the Hungarian evaluation of phytoplankton is a multimetric index HRPI (Hungarian River Phytoplankton Index) that characterizes the quantitative and qualitative conditions of phytoplankton. Macrozoobenthos is assessed on the basis of the national evaluation system HMMI (Hungarian Multimetric Macroinvertebrate Index) developed during the year 2013. Evaluation of phytobenthos in case of the Danube is performed under the IPS index, or in case of other flows under IPSITI index (combination of three diatomaceous indexes: IPS - integrated pollution index, SID - saprobe index, TID - trophic index) and macrophytes under the German benchmark index (RI) (more details in the Hungarian National Annual Report in 2013).

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

Sampling site	**macro-zoobenthos**		**phyto-benthos**		**macro-phytes**		**phyto-plankton**	
	SK	**HU**	**SK**	**HU**	**SK**	**HU**	**SK**	**HU**
Danube, Bratislava	II	-	II	-	-	-	I	-
Danube old riverbed, Rajka	-	II	-	II	II	-	II	I
Danube, Medveďov	III	II	II	II	I	-	I	I
seepage canal, Čunovo/Rajka	-	II	-	I	-	I	I	II
Mosoni Danube, Čunovo/Rajka	-	II	-	II	-	III	I	III

SK - Slovak results, HU - Hungarian results

In **Table 2-3** the evaluation of ecological status according to particular biological quality elements is given separately for each country. The final quality class of the water body is determined the worst value of a biological element (the rule of "worst case approach").

The surface water quality

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

The ecological status of particular sampling sites was determined as follows:

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

Danube at Medveďov - according to the Slovak results it was classified into moderate status (III. class), but the Hungarian Party determined good ecological status (II. class).

Danube old riverbed at Rajka - results of both Parties classified this sampling site into good ecological status (II. class).

Right-side seepage canal at Čunovo/Rajka - according to the results of the Slovak it was classified into very good status (I. class) and according to the results of the Hungarian Parties it was classified into good status (II. class).

Mosoni Danube at Čunovo/Rajka - based on the Slovak results it was classified into very good status (I. class), but the Hungarian Party determined only moderate status (III. class). The different classification may results from the fact, that the Slovak Party assessed only one of the biological quality elements (phytoplankton), while the Hungarian Party assessed all four biological quality elements.

To determine the overall ecological status also the supporting elements were included in the evaluation. The Slovak Party, except the biological quality elements, considered the physico-chemical quality elements and synthetic and non-synthetic substances relevant for Slovakia. The overall ecological status according to the obtained results corresponds to the ecological status mentioned above. Good overall ecological status was achieved in the Danube at Bratislava and in the Danube old riverbed at Rajka. In the Danube at Medveďov moderate overall ecological status was determined, and in the right-side seepage canal and in the Mosoni Danube at Čunovo/Rajka very good overall ecological status was achieved. The level of reliability of the assessment in all cases reached the medium level.

The Hungarian Party considered the physico-chemical quality elements and other specific substances (heavy metals). According to results good overall ecological status was determined in the Danube at Medveďov, in the Danube old riverbed at Rajka and in the right-side seepage canal at Rajka, while in the Mosoni Danube at Rajka moderate ecological status was achieved.

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

From among the biological quality elements the Hungarian Party in the year 2013, 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. An overview of evaluation results of biological quality elements is given in **Table 2-4**. For the classification of biological quality elements limit values corresponding to the typological classification No. 23 (Danube, upper Hungarian section) were used for the Danube old riverbed and the river branch system. In case of Mosoni Danube limit values corresponding to the typological classification No. 14 (SV-Me-D-nn) should be used. However, the evaluation of samples taken in the Mosoni Danube at Vének was performed according to the type No. 23, as the evaluation by type No. 14 can not be considered relevant.

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

Sampling site	macro-zoobenthos	phyto-benthos	phyto-plankton
Danube old riverbed, Dunakiliti, upstream of the submerged weir - 0043	II	II	II
Danube old riverbed, Dunakiliti, downstream of the submerged weir - 0042	II	II	II
Danube old riverbed, Dunaremete - 0002	II	II	I
river branch system, Helena - 1112	I	II	I
river branch system, Szigeti river arm - 1114	II	II	I
river branch system, Ásványi river arm - 1126	II	II	I
Mosoni Danube, Vének - 1141	III	II	II

Based on results obtained from the monitoring of biological quality elements it can be concluded that according to the phytoplankton high ecological status (I. class) was determined at three sampling sites in the right-side river branch system and at one sampling site in the Danube old riverbed at Dunaremete. Good ecological status (II. class) was determined in the Danube old riverbed upstream and downstream of the submerged weir at Dunakiliti and in the Mosoni Danube at Vének.

According to phytobenthos good ecological status (II. class) was achieved on all sampling sites.

Based on macroinvertebrates high ecological status (I. class) was determined in the right-side river branch system on sampling site at Helena. On other six sampling sites in the Danube old riverbed and in the right-side river branch system good ecological status (II. class) was achieved. In the Mosoni Danube at Vének moderate ecological status (III. class) was determined.

Concerning the overall ecological status, when except the biological quality elements also the supporting elements (physico-chemical quality elements and other specific substances) were included in the evaluation, following results were achieved

(Hungarian National Annual Report in 2013). On six sampling sites in the Danube old riverbed and in the right-side river branch system good overall ecological status was determined. On sampling site in the Mosoni Danube at Vének moderate overall ecological status was achieved.

2.8.3. Biological indicators at sampling sites monitored 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 between March and October 2013 five phytoplankton samples were taken in seepage canals and ten samples on other sampling sites (**Table 2-5**). Sampling in June, due to extremely large flood and high flow rates until the end of month, was not carried out.

Increased values of phytoplankton abundance were registered already in March and April. In early May the abundance of phytoplankton sharply declined due to cooling down and increased discharges, but in the second half of the month it increased again. The main development of phytoplankton was registered in the second half of July and in August, after the June flood and decrease of high flow rates. In this period the highest values of phytoplankton abundance were achieved. The highest abundance in 2013, representing 13108 individuals.ml^{-1}, was detected in early August at sampling site No. 309 in the lower part of the reservoir at Šamorín. Compared to the previous year this value was significantly lower (the maximum in 2012 was 34556 individuals.ml^{-1} on sampling site No. 3739 in the Danube old riverbed). In late August, after cooling down, the phytoplankton abundance sharply declined. Moderate development of phytoplankton was observed at five sampling sites in September and at one sampling site even in October. The lowest values of phytoplankton abundance in the evaluated year were recorded at the beginning of July on most of sampling sites.

The phytoplankton abundance in the evaluated year ranged from 10 to 13108 individuals.ml^{-1}, while the lowest value was determined on sampling site No. 317 in the left-side seepage canal and the highest occurred on sampling site No. 309 in the reservoir. Compared to the previous year the phytoplankton abundance in 2013 was lower. The limit for mass development of phytoplankton was exceeded only once on four sampling sites (No. 109, 3529, 308 and 309), while in the year 2012 it was one to three times at ten sampling sites.

The annual average was on all sampling site lower than in the previous year. The highest value of annual average of phytoplankton abundance (4090 individuals.ml^{-1}) was determined on sampling site No. 309 in the lower part of the reservoir at Šamorín, like in years 2010 and 2011. Maximum in the year 2012 was registered on sampling site 3739 in the Danube old riverbed at Sap.

Similarly to the previous period, the largest portion in the phytoplankton composition in the evaluated year, except the left-side seepage canal, had the centric diatoms (*Bacillariophyceae - Centrales*). In the left-side seepage canal, on the sampling site No. 317 at Hamuliakovo, centric diatoms had low abundance. The highest share in the composition of phytoplankton on this site had pennate diatoms (*Bacillariophyceae - Pennales*). The abundance of cyanobacteria (*Cyanophyceae*), which in the years 2011 and 2012 had the highest share in the composition of phytoplankton in the left-side seepage canal, sharply declined in the evaluated year.

The phytoplankton composition significantly determines the saprobe index of biosestone. The saprobe index in 2013 varied from 0.95 to 2.44 (**Table 2-5**). It fluctuated in the range, which corresponds to β-mesosaprobity. Such environment offers suitable living conditions for a wide scale of organisms with high species diversity. The average values of saprobe indexes on most of observed sampling sites decreased, at two sampling sites they remained unchanged and only in the right-side seepage canal the average value slightly deteriorated (the value increased from 2.05 to 2.20). The level of saprobity has not changed.

Table 2-5: Values of saprobe index of biosestone in 2013

Sampling site	Min	Max	Yearly average		Saprobity level
			2013	*2012*	
Danube, Bratislava - 109	1.86	2.20	**2.07**	*2.21*	β-mesosaprobity
Danube, Medveďov - 112	1.84	2.31	**2.12**	*2.17*	β-mesosaprobity
Danube, Komárno - 1205	1.61	2.20	**2.04**	*2,16*	β-mesosaprobity
Danube, bottom weir - 4016	1.84	2.36	**2.14**	*2.20*	β-mesosaprobity
Danube, Dobrohošť - 4025	1.90	2.23	**2.13**	*2.21*	β-mesosaprobity
Danube, Sap - 3739	0.95	2.23	**1.98**	*2.18*	β-mesosaprobity
Mosoni Danube, Čunovo - 3529	2.05	2.31	**2.16**	*2.16*	β-mesosaprobity
reservoir - Kalinkovo - 307	1.88	2.22	**2.10**	*2.15*	β-mesosaprobity
reservoir - Kalinkovo - 308	1.96	2.22	**2.12**	*2.16*	β-mesosaprobity
reservoir - Šamorín - 309	1.81	2.21	**2.10**	*2.18*	β-mesosaprobity
reservoir - Šamorín - 311	1.81	2.21	**2.09**	*2.19*	β-mesosaprobity
tailrace canal - 3530	1.87	2.32	**2.14**	*2.16*	β-mesosaprobity
river branch system - 3376	1.84	2.20	**2.09**	*2.21*	β-mesosaprobity
right-side seepage canal - 3531	1.95	2.44	**2.20**	*2,05*	β-mesosaprobity
left-side seepage canal - 317	1.80	2.02	**1.91**	*1.91*	β-mesosaprobity

Concerning the phytoplankton abundance, as a key determinant of saprobe index, it can be concluded that the hydropower system even in 2013 have not had negative impact on saprobity level.

Macrozoobenthos

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 easily available and quickly processable. In the year 2013 the macroinvertebrate samples were collected in July and September/October on monitoring sites listed in **Table 2-6**. Sampling in May was not carried out due to unfavourable climatic and hydrological conditions. In sections with fast flowing water with gravely or stony bottom (sampling sites No. 109 at Bratislava, No. 112 at Medveďov in the Danube and No. 4025 in the Danube old riverbed at Dobrohošť) rheophillic and oxybiontic macroinvertebrate species prevail, indicating β-mesosaprobity. At these sampling sites the following species dominated in 2013: *Dikerogammarus villosus*, *Jaera istri*, *Echinogammarus ischnus*, *Corophium curvispinum*, *Theodoxus danubialis*, *Limnomysis benedeni*, *Plumatella repens* and also *Lumbriculida*e *g. sp. div.* and *Chironomidae g. sp. div.*. In sections with slow flowing water stagnophillic and oligooxybiontic species appear, which bear slight pollution. On these sections sandy or muddy bottom occurs – sampling sites in the Danube old riverbed No. 4016 upstream of the submerged weir and No. 3739 at Sap, where *Lumbricidae g. sp. div.*, *Simulium balcanicum*, *Lithoglyphus naticoides*, *Potamopyrgus antipodarum*, *Valvata piscinalis*, *Physella acuta* and *Chironomidae g. sp. div.* dominated in the evaluated year. In slowly flowing and lentic sections on sampling sites No. 3529 in the Mosoni Danube and No. 4025 in the Danube old riverbed macrovegetation developed strongly (especially *Elodea canadensis*), what determined the dominance of phytophilous species *Limnomysis benedeni* and *Radix peregra*.

In the reservoir there are places with different flow velocities. Depending on the flow velocity there exist different types of bottom substrates. 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 the reservoir in 2013 on muddy substrate were *Lumbricidae g. sp. div.*, *Pisidium casertanum*, *Hypania invalida*, *Corophium curvispinum*, *Sphaerium corneum*, *Plumatella repens*, *Pisidium sp.* and some species of the family *Chironomidae*. On sandy and gravely substrates (sampling sites No. 307 and 308) *Lumbriculidae g. sp. div.*, *Pisidium casertanum*, *Potamopyrgus antipodarum*, *Hypania invalida* and *Lithoglyphus naticoides* dominated. In the shallow lentic part of the reservoir on the sampling site No. 308 submersible macrophytes developed (especially *Elodea canadensis* and *Potamogeton spp.*), which was associated with the dominance of phytophilous species *Obesogammarus obesus*, *Katamysis warpachowskyi*, *Chironomidae g. sp. div.* and *Limnomysis benedeni*. In the river branch system *Lumbriculidae g. sp. div.*, *Radix peregra*, *Valvata piscinalis*, *Physella acuta* and *Chironomidae g. sp. div.* dominated.

Based on the determined species the saprobe indexes of macrozoobenthos were calculated, which varied in the range from 1.99 to 2.46 and corresponded to β-mesosaprobity (**Table 2-6**). The highest value of 2.46 occurred in the summer period on the sampling site No. 3739 in the Danube old riverbed at Sap. Contrary to previous years no one value of saprobe index exceeded the limit of 2.50, which correspond to α-mesosaprobity. The average values of saprobe indexes of macrozoobenthos at all sampling sites corresponded to β-mesosaprobity (**Table 2-6**).

Table 2-6: Values of saprobe index of macrozoobenthos in 2013

Sampling site	Saprobe index				Saprobity
	V.	*VII.*	*X.-XI.*	***Average***	
Danube, Bratislava - 109-left	-	2.16	2.11	**2.14**	β-mesosaprobity
Danube, Bratislava - 109-right	-	2.04	2.02	**2.03**	β-mesosaprobity
Danube, Medveďov - 112-left	-	2.25	2.26	**2.26**	β-mesosaprobity
Danube, bottom weir - 4016	-	2.12	1.99	**2.06**	β-mesosaprobity
Danube, Dobrohošť - 4025	-	2.30	2.29	**2.30**	β-mesosaprobity
Danube, Sap - 3739	-	2.46	2.28	**2.37**	β-mesosaprobity
Mosoni Danube, Čunovo - 3528	-	2.13	2.04	**2.09**	β-mesosaprobity
river branch system - 3376	-	2.14	2.07	**2.11**	β-mesosaprobity
reservoir, Kalinkovo - 307	-	2.20	2.10	**2.15**	β-mesosaprobity
reservoir, Kalinkovo - 308	-	2.19	2.06	**2.13**	β-mesosaprobity
reservoir, Šamorín - 309	-	2.37	2.33	**2.35**	β-mesosaprobity
reservoir, Šamorín - 311	-	2.33	2.29	**2.31**	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 a short-term changes in water quality (of 2-3 week character). Saprobe index of phytobenthos correlates with the through-flowing water quality, especially with organic pollution. Saprobe 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 each site two samplings were made. Sampling in the spring was not carried out due to unfavourable climatic and hydrological conditions. At monitoring sites mainly algal phytobenthos component, particularly benthic diatoms have been studied.

The value of saprobe index of phytobenthos at monitored sampling sites ranged from 1.42 to 1.95. The average values varied from 1.65 to 1.90. Concerning the documented values of saprobe index of phytobenthos in Bratislava the left bank seems to be worse in the long-term. In comparison with the year 2012 improvement of annual average can be stated at every sampling site, at Medveďov even significant improvement, whereas the annual average at this sampling site decreased from 1.88 to 1.65 (**Table 2-7**). It should be noted, however, that only two samplings were carried out in the evaluated year, so the comparison with the previous year is only informative. Saprobity of the observed sites according to the values of saprobe index of phytobenthos varied 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*) - 28 taxa. Other groups were represented by lower number of taxa. The dominant species at monitoring sites were *Diatoma vulgaris*, *Cymbella sp.*, *Navicula sp.*, *Nitzschia sp.*, *Tabellaria flocculosa*, *Aulacoseira granulata* and *Melosira varians* from among the diatoms group, *Phormidium autumnale* from cyanophyta, *Bangia atropurpurea* from the red algae group and *Cladophora glomerata* from filamentous green algae group *Chlorophyta*.

Table 2-7: Values of saprobe index of phytobenthos in 2013

Sampling site	spring	summer	autumn	Yearly average	
				2013	*2012*
Danube, Bratislava - 109-left	-	1.95	1.69	**1.82**	***1,92***
Danube, Bratislava - 109-right	-	1.92	1.85	**1.90**	***1,90***
Danube, Medveďov - 112-left	-	1.88	1.42	**1.65**	***1,88***
Mosoni Danube, Čunovo - 3528	-	1.71	1.76	**1.74**	***1,82***
river branch system - 3376	-	1.83	1.69	**1.76**	***1,86***

Note: left - left bank; right - right bank

2.9. Quality of sediments

In the evaluated year 2013, similarly to previous years, the Slovak and Hungarian Parties have realized unified evaluation of sediment quality 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 Joint Monitoring by the Slovak Party was performed in October 2013 at six sampling sites. The Hungarian Party sampled the sediments in April and May and the autumn sampling has been performed in September or October 2013 at seven sampling sites. The situation of sampling sites is illustrated in **Fig. 2-2**. The list of analysed parameters was the same as in the year 2012. Besides the inorganic and organic micro components the Hungarian Party has analysed also the contents total phosphorus and total nitrogen.

Concentrations of heavy metals in sediments collected at sampling sites on the Slovak territory were low. The lowest content was characteristic for mercury and lead, since in case of mercury not a single value reached the threshold effect level (TEL) and in case of lead only one value on sampling site No. 309 slightly exceeded the TEL. At such concentrations adverse effect on biological life occurs rarely, and they corresponds to uncontaminated natural environment. Contents of other monitored heavy metals have exceeded only the limit value for TEL (chromium at three sampling sites, zinc at four sampling sites, and copper, arsenic and cadmium on six observed sampling sites). Concentrations of heavy metals being in the range >TEL and <PEL were closer to the lower TEL limit, except one value of arsenic, thus the exceeding of the threshold level has been only slight. The only higher concentration of arsenic exceeding the midpoint of the given range was recorded on sampling site No. 309 in the reservoir and achieved 12.2 $mg.kg^{-1}$. Concentrations from the range >TEL and <PEL represent the level, when the adverse effects on biological life can be observed occasionally, in more than 25 % of cases, and represent a potential eco-toxicological effects.

In sediment samples collected on the Hungarian territory smaller number of concentrations above the threshold values for heavy metals occurred, but concentrations were higher. The lowest contents (lower than TEL) were documented in case of chromium, arsenic and lead in the spring, and in the autumn in case of cadmium and lead. Similarly to the year 2012 the highest number of TEL exceedances and the highest concentrations were recorded in case of zinc. The zinc content exceeded the threshold effect level (TEL) on all sampling sites both, in the spring and also in the autumn. Zinc concentrations in four cases achieved values, that were higher than the probable effect level (PEL) - in the right-side river branch system on sampling sites No. 1114 and 1126 in the spring, and in the Mosoni Danube on sampling site No. 1141 at Vének in the spring and in the autumn. However, in comparison with the previous year the zinc concentrations decreased. Contrary to the year 2012 PEL exceedances were registered in the spring in case of mercury in the Danube old riverbed on two sampling sites, No. 0042 and 0043, downstream and upstream of the submerged weir at Dunakiliti. Concentrations exceeding the probable effect level (PEL), represent the level, when the adverse effect on biological life occurs frequently, in more than 50 % of cases.

Organic pollution of sediments was very low in 2013. One concentration of acenaphthylene and one concentration of dibenzo(a,h)anthracene on sampling site No. 1141 in the Mosoni Danube at Vének slightly exceeded the limit value for TEL and on the Slovak territory slight exceedances of TEL limit value occurred on five sampling sites in case of benzo(a)pyrene. Other concentrations of monitored organic micropollutants were lower the threshold effect level and corresponded to an uncontaminated environment, when the adverse effect on biological life is not expected.

The highest concentrations of inorganic and organic micro-pollution were registered by the Slovak Party at sampling site No. 309 in the reservoir at Šamorín, and by the Hungarian Party at sampling sites No. 1141 in the Mosoni Danube at Vének. The lowest sediment contamination in 2013 was documented in on sampling site No. 3739 in the Danube old riverbed at Sap on Slovak territory and on sampling site No. 0084 in the right-side seepage canal at Rajka on Hungarian territory.

Hungarian Party also analysed the total phosphorus and total nitrogen content in sediments. Total phosphorus content in 2013 varied in the range from 264 to 1765 $mg.kg^{-1}$ and the concentrations of total nitrogen varied in the range from 207 to 2942 $mg.kg^{-1}$. The lowest content of total phosphorus was recorded on sampling site No. 0084 in the right-side seepage canal at Rajka and the maximum on sampling site No. 1141 in the Mosoni Danube at Vének, both in samples taken in the spring. The lowest concentration of total nitrogen occurred on sampling site No. 0042 in the Danube old riverbed downstream of the submerged weir and the highest was recorded on sampling site No. 1126 in the right-side river branch system in the Ásványi river arm, both in autumn samples. Compared to the year 2012 the total phosphorus and total nitrogen contents were higher at all sampling sites in the spring and on sampling site in the right-side river branch system and in the right-side seepage canal in the autumn.

Overall, the sediment pollution in the evaluated year on the Slovak territory was lower than in 2012, when in the case of several parameters the highest concentrations were recorded since beginning the sediment monitoring. In 2013 only the cadmium content slightly increased. Contents of PAH compounds significantly decreased. On the Hungarian territory decrease of zinc content was registered, but in case of mercury concentrations higher values occurred, which at two sampling sites exceeded the probable effect level according to the Canadian standard.

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 given 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 case that a range is given (e.g. I-II), this means natural seasonal fluctuation of particular parameters or their dependence on climatic conditions. The quality class in brackets means that measured value occurred only once or two times in the evaluated period (mostly during higher discharges or flood waves). 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.

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

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 (II)		I (II,-IV)	I (II)	I (II, III)	I	I (II)
pH	II (I)	II (I, III)	II (I)	II (I)	II-I	I-II	II-I (III)
conductivity	I-II			I-II	II (I)	II-I	I-II
suspended solids	I-V	II-I (III,IV,V)	I-III (IV,V)	I-III (IV, V)	II-IV (I, V)	I	I-II (III, IV, V)
Cl^-	I			I		I	I
SO_4^{2-}	I			I		I	I
NO_3^-	II (III)	II (I)		II	II-III	II-I	II
NH_4^+	I			I		I	I
NO_2^-	II	II-I		II-I	II	II-I	II-I
total nitrogen	II	II (I, III)	II (I)	II-I	II	II-I	II-I
PO_4^{3-}	II-I (III)	I-II		I-II	II (I)	I	I-II
total phosphorus	II-I (III)	I-II (III)		I-II (III)	II-III (IV)	I	I-II (III)
O_2	I			I (II, IV)	I (II)	I-III (IV)	I (II)
COD_{Mn}	-	I (II)		I-II	I-II (III)	I	I
BOD_5	I (II)	I-III	I-III (IV)	I-III	I-II (III)	I-III	I-III
chlorophyll-a	II-I	I-II (III)		I-II	I (II)	I (II)	I-II
Fe	I-II (V)	I (II, IV)		I (III)	I (II,III,IV)	I	I (II, III)
Mn	I-II (III,IV)	I (II, III)		I (II, III)	I-II (III)	I (II)	I (II)
Zn	IV*	III*-IV**		III* (IV)	III*	III*	III* (IV)
Hg	I*		I* (IV)	I*		I*	I*
As	II*-III			II* (III,IV)	II**-III (IV)	II** (III,IV,V)	II*
Cu	II**	II**--III (I,IV)		II-III (I, IV)		I-II (III,IV)	II-IV (I, V)
Cr	II*	II* (V)	II*	II* (III)	II*)	II* (V)	II*
Cd	II*			II*	II* (III)	II* (III)	II* (IV)
Ni	II* (III, IV)	II**-III (IV)		II**-III (IV)	III-IV (II*, V)	II**-III (V)	II*-III (IV)
Pb	II* (III)	II*	II* (III)	II*	II**	II**	II*

* all the data below the detection limit

** most of the data below the detection limit

Fig. 2-1

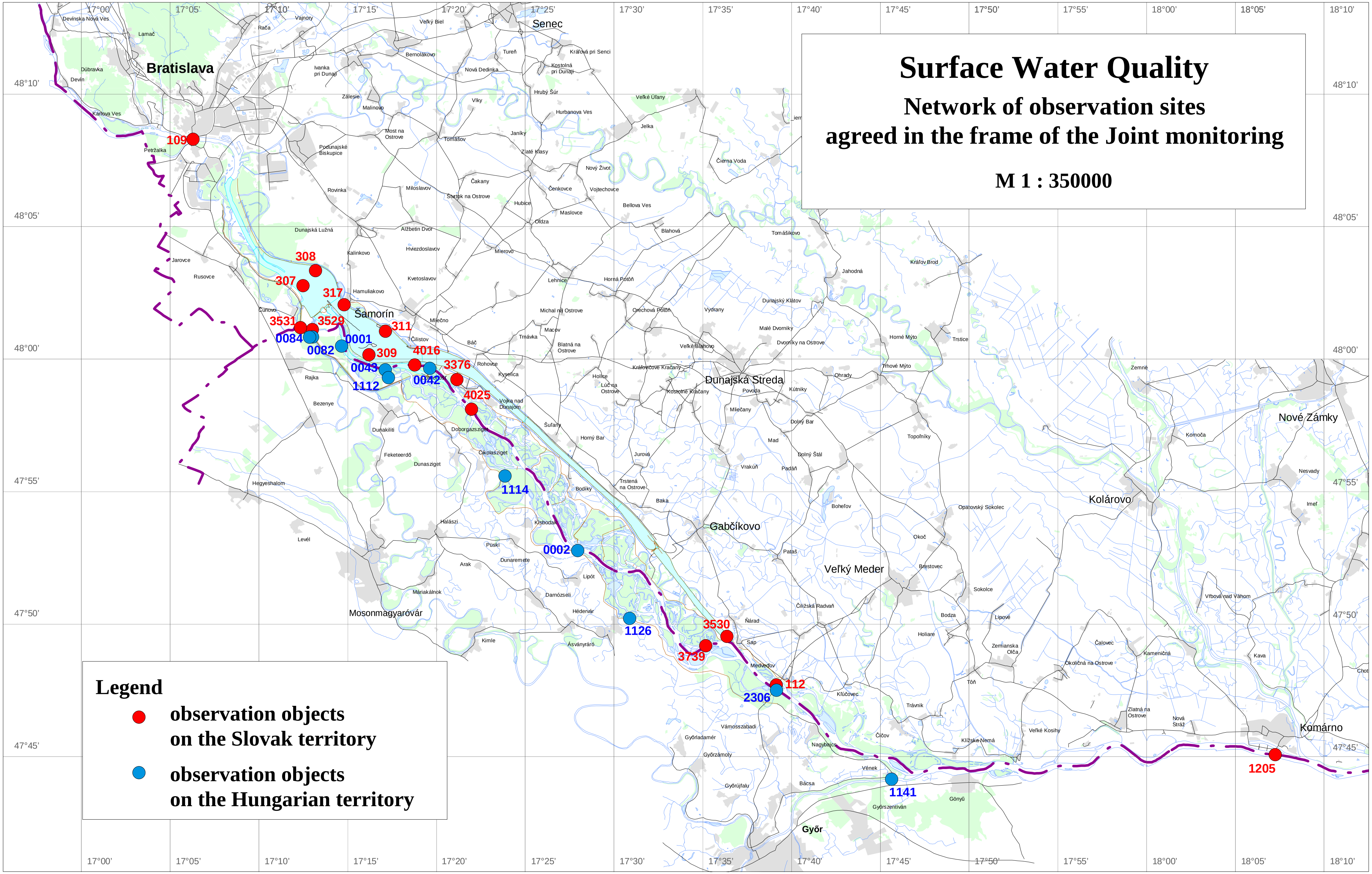

Surface Water Quality
Network of observation sites
agreed in the frame of the Joint monitoring
M 1 : 350000
Legend
observation objects on the Slovak territory
observation objects on the Hungarian territory
109
308
307
317
3531
3529
311
309
4016
3376
4025
3530
3739
112
1205
0084
0082
0001
0043
1112
0042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

Fig. 2-2

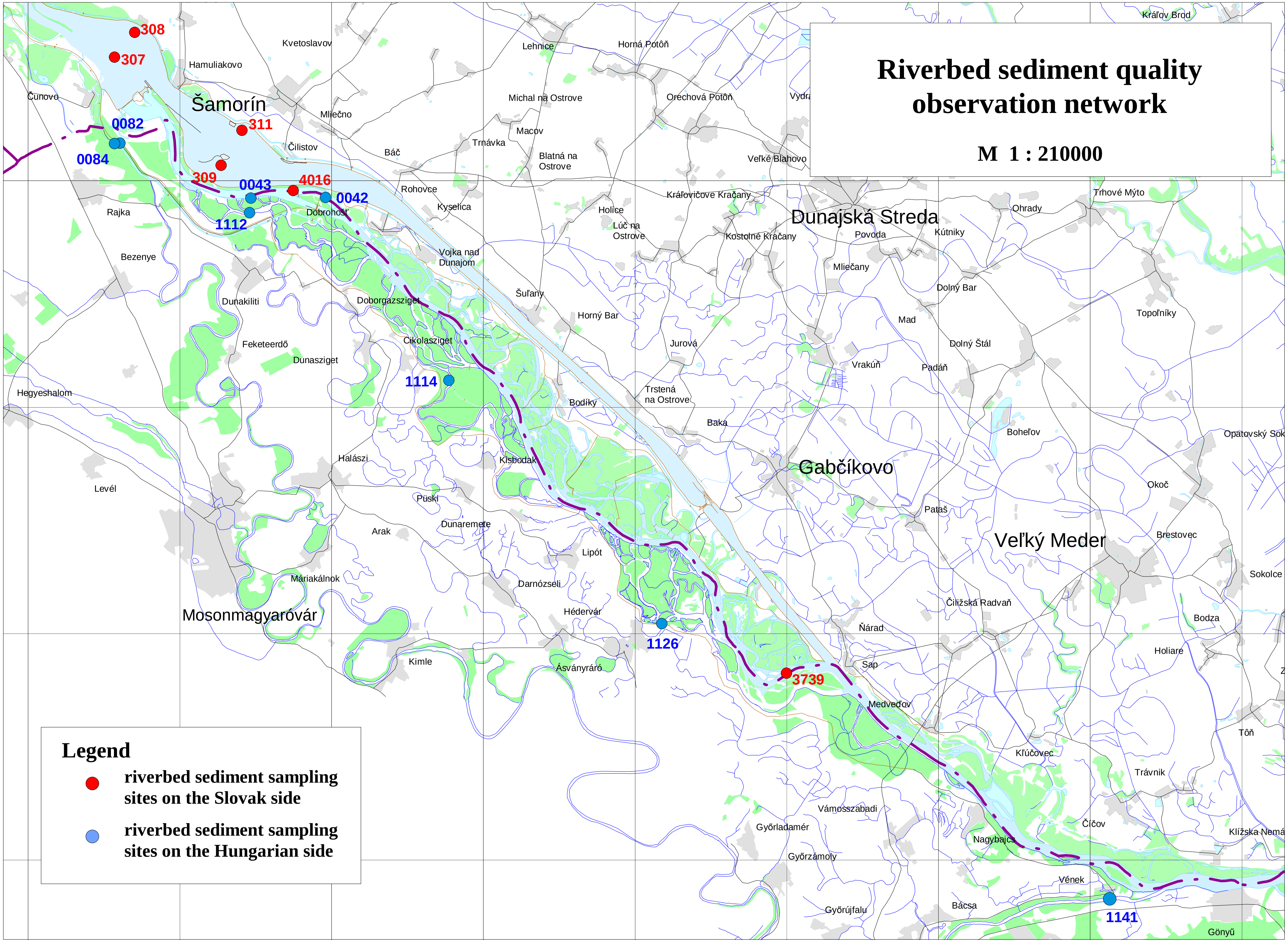

Riverbed sediment quality observation network
M 1 : 210000
Legend
riverbed sediment sampling sites on the Slovak side
riverbed sediment sampling sites on the Hungarian side
308
307
311
309
4016
3739
0082
0084
0043
0042
1112
1114
1126
1141
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Mosonmagyaróvár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

Fig. 2-3

Surface water quality

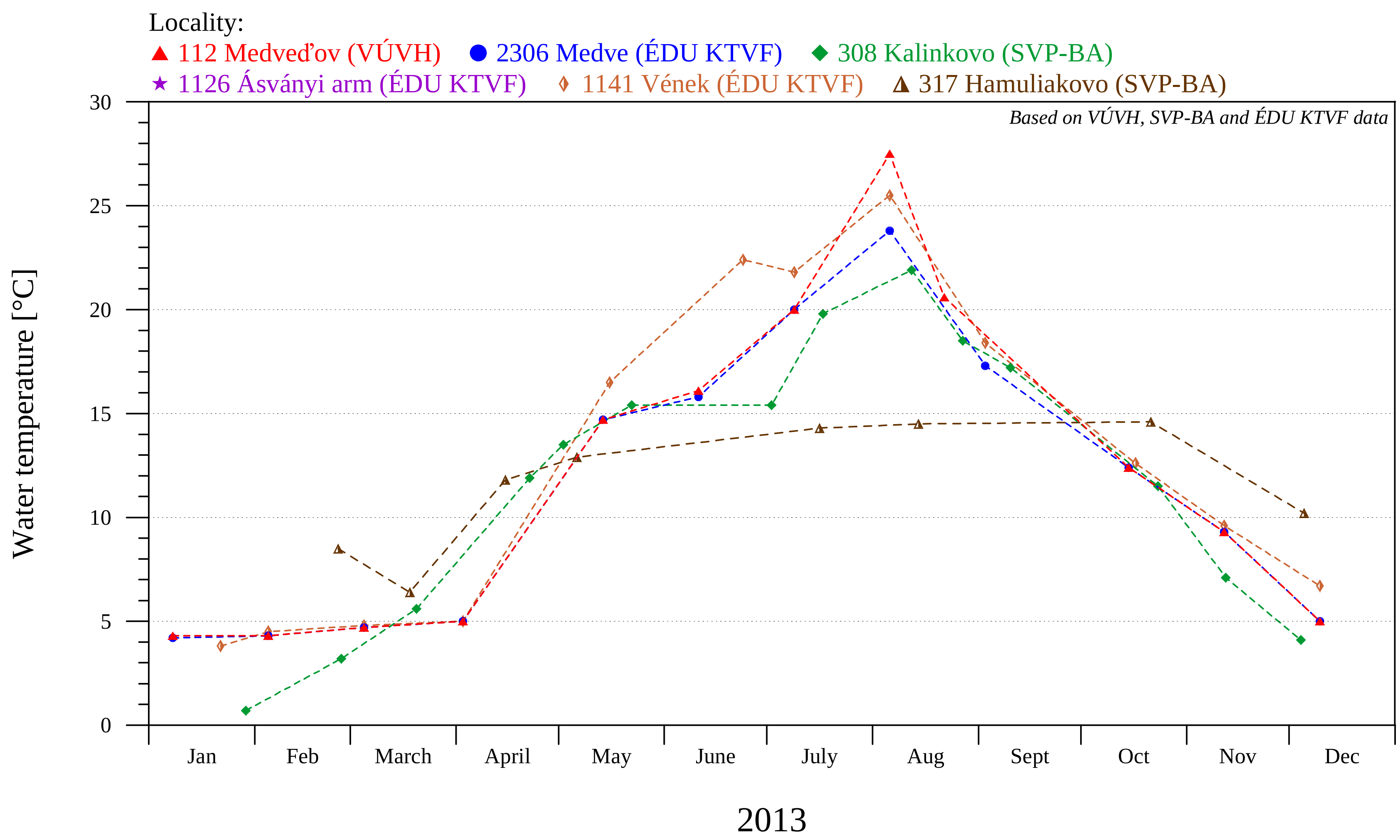


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Fig. 2-4

Surface water quality

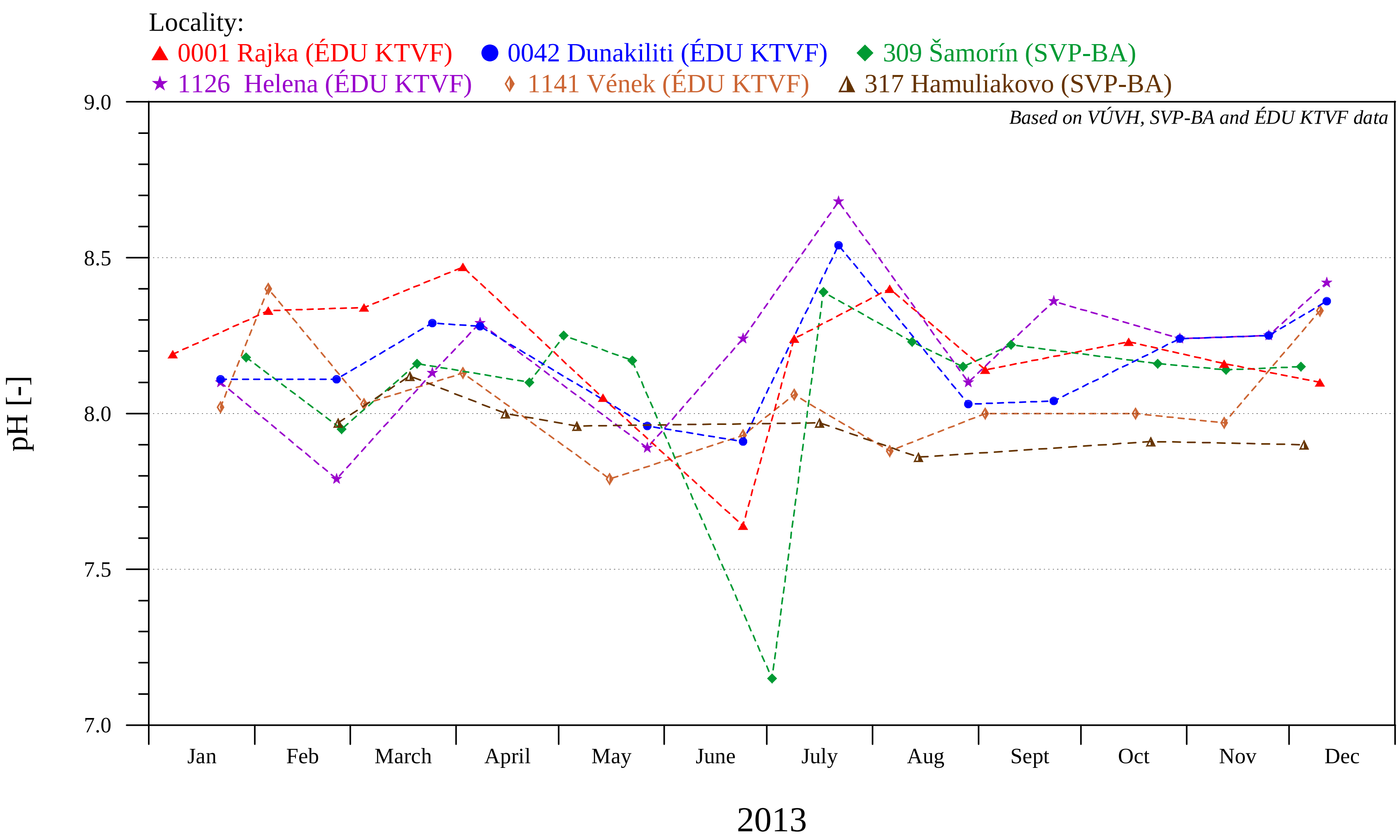

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Fig. 2-5

Surface water quality

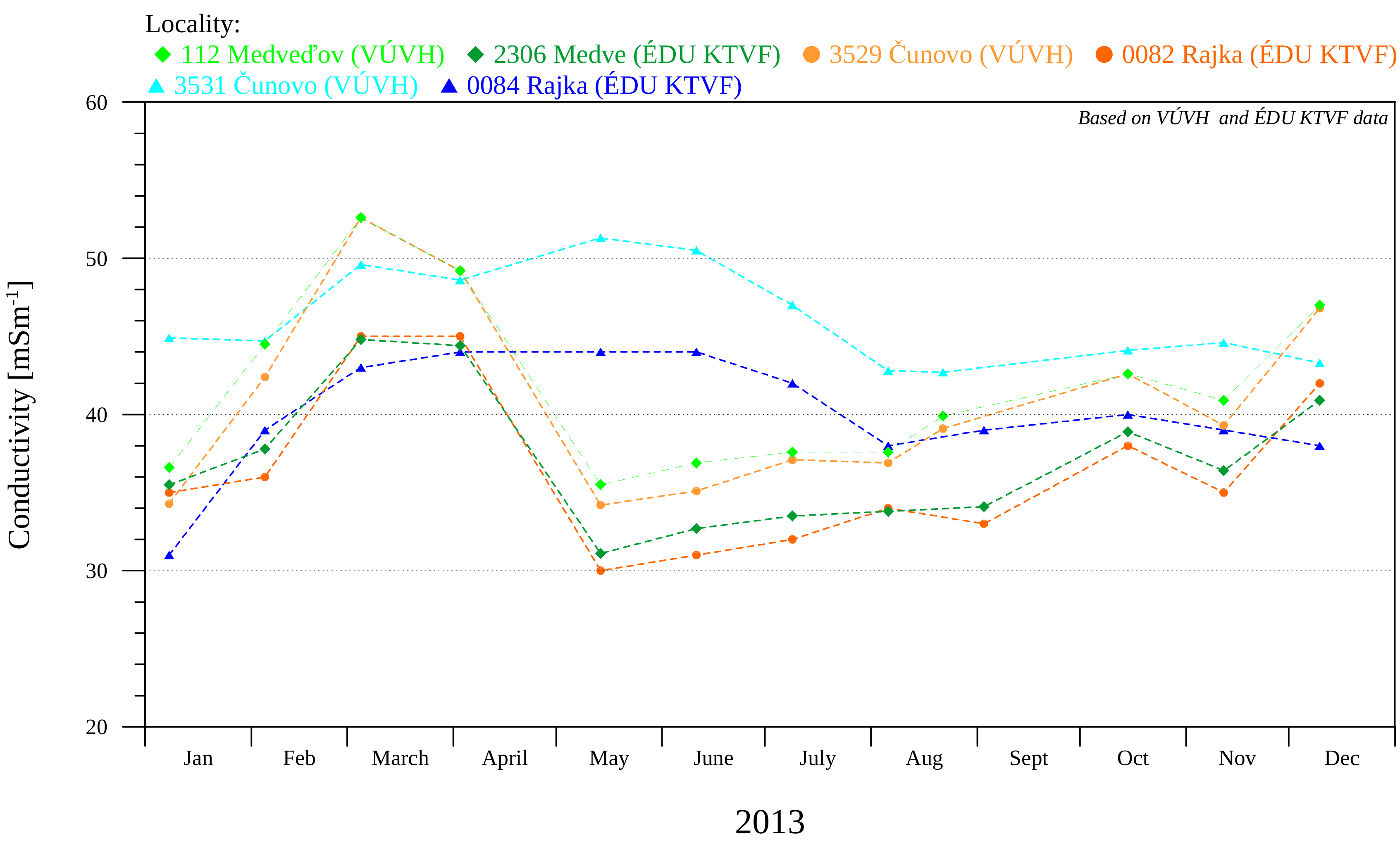

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Fig. 2-6

Surface water quality

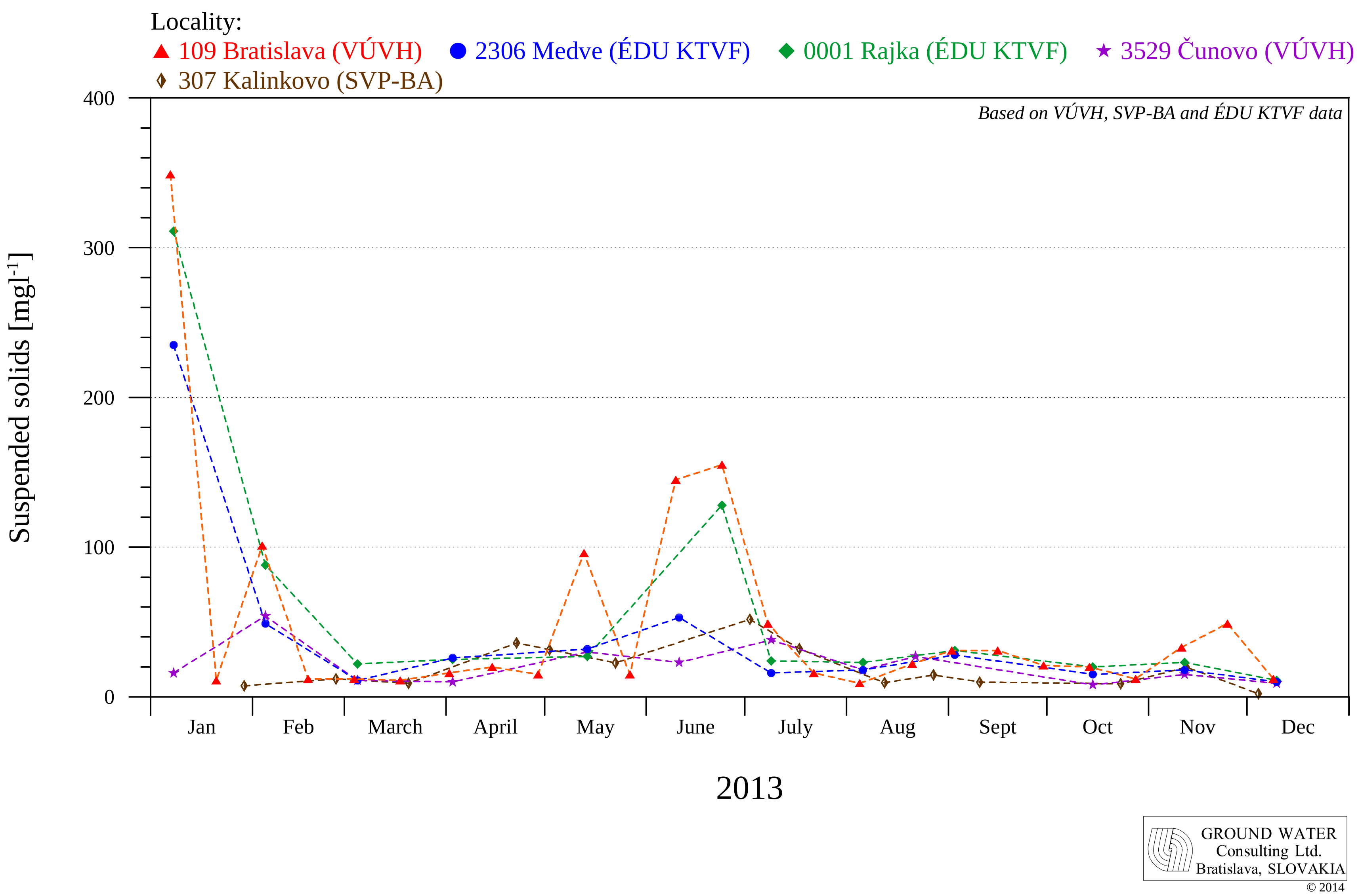

Fig. 2-7

Surface water quality

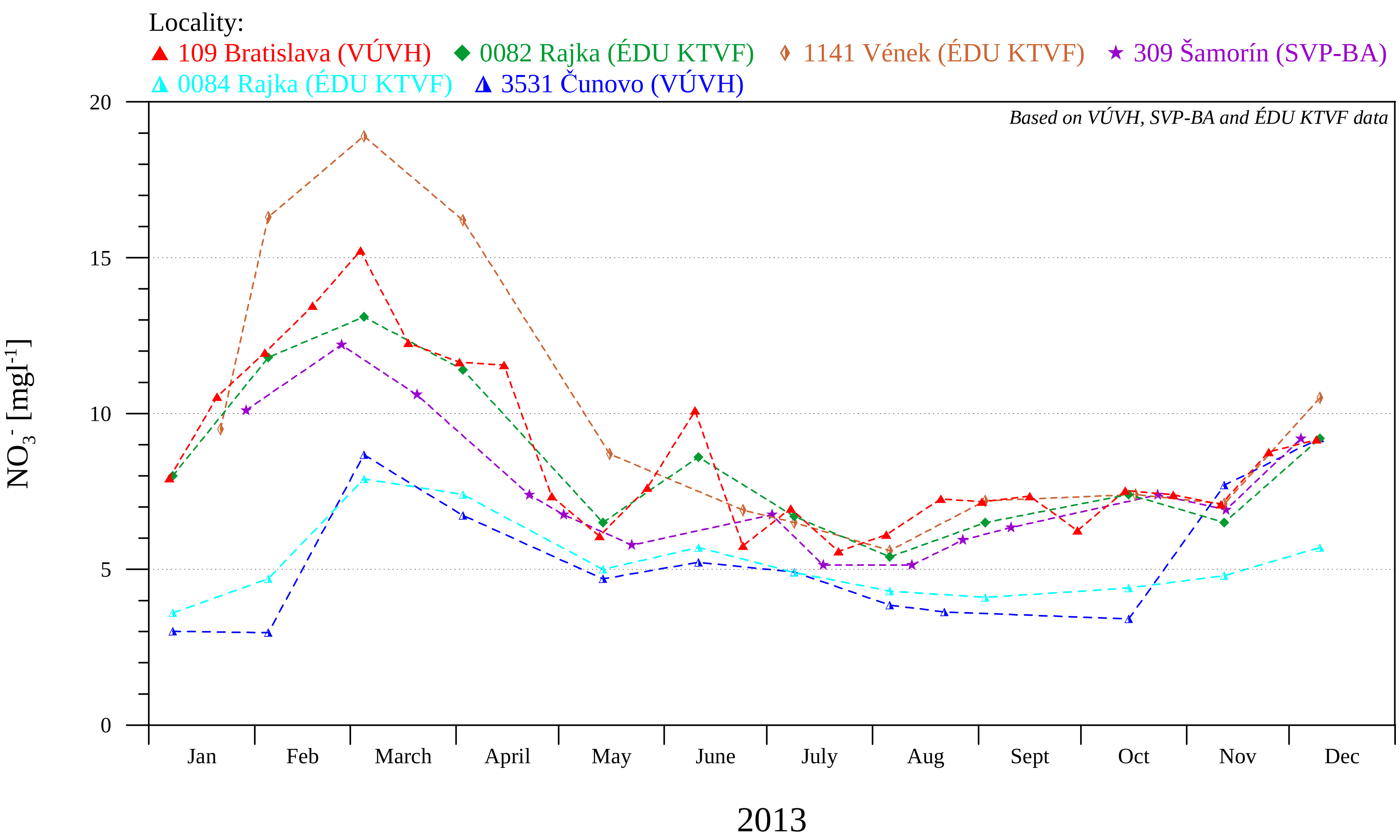

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Fig. 2-8

Surface water quality

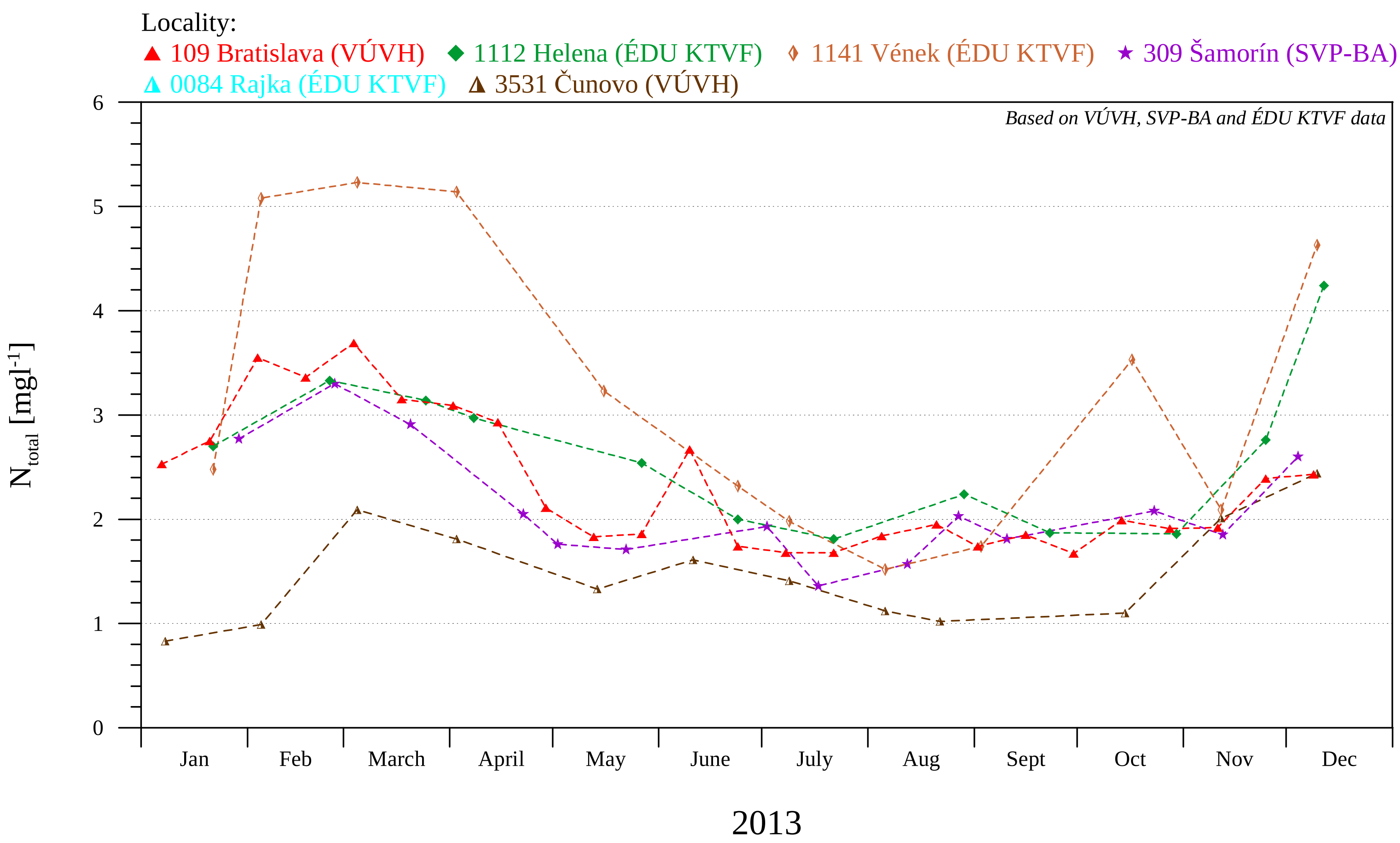

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Fig. 2-9

Surface water quality

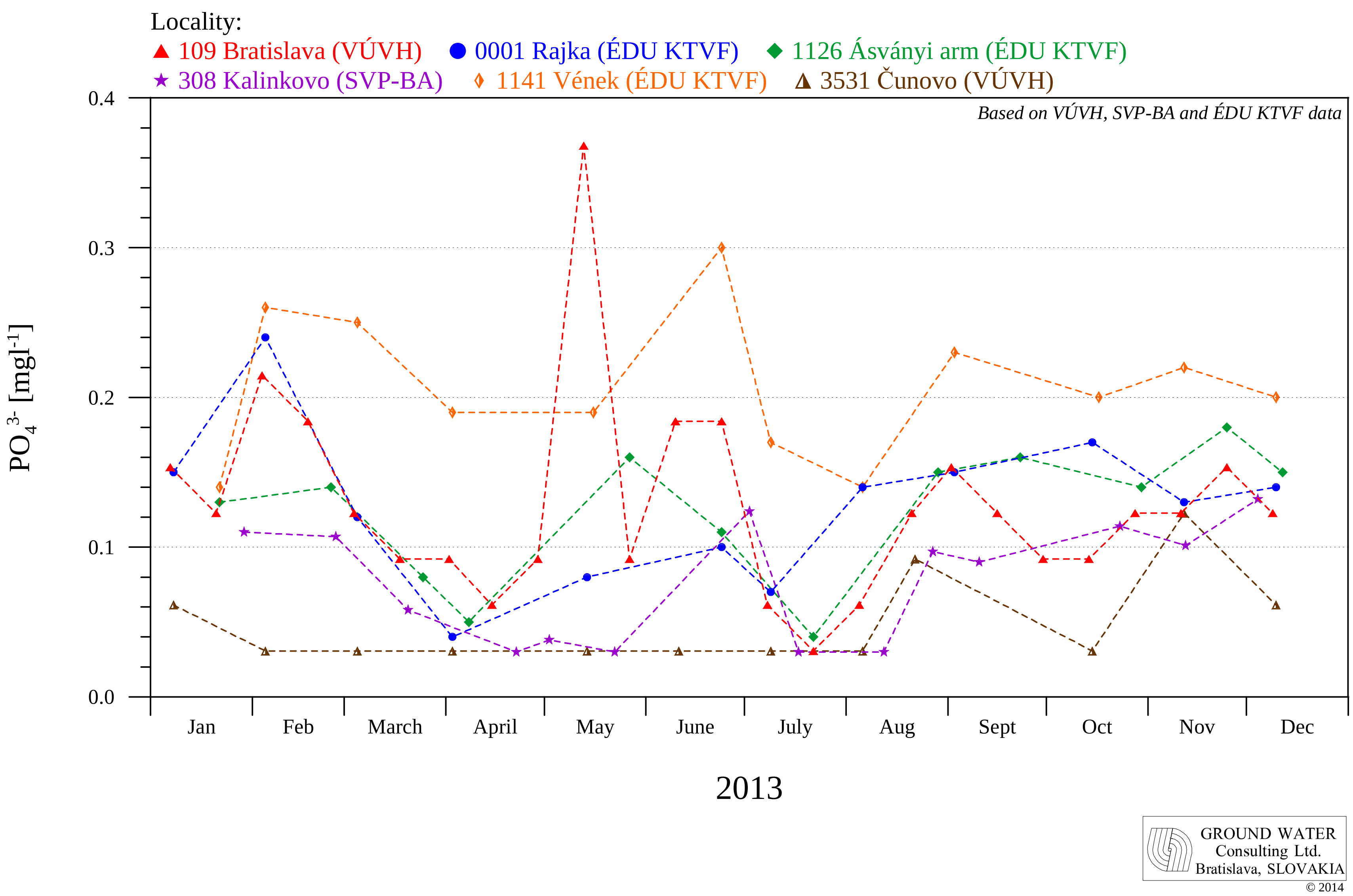

Fig. 2-10

Surface water quality

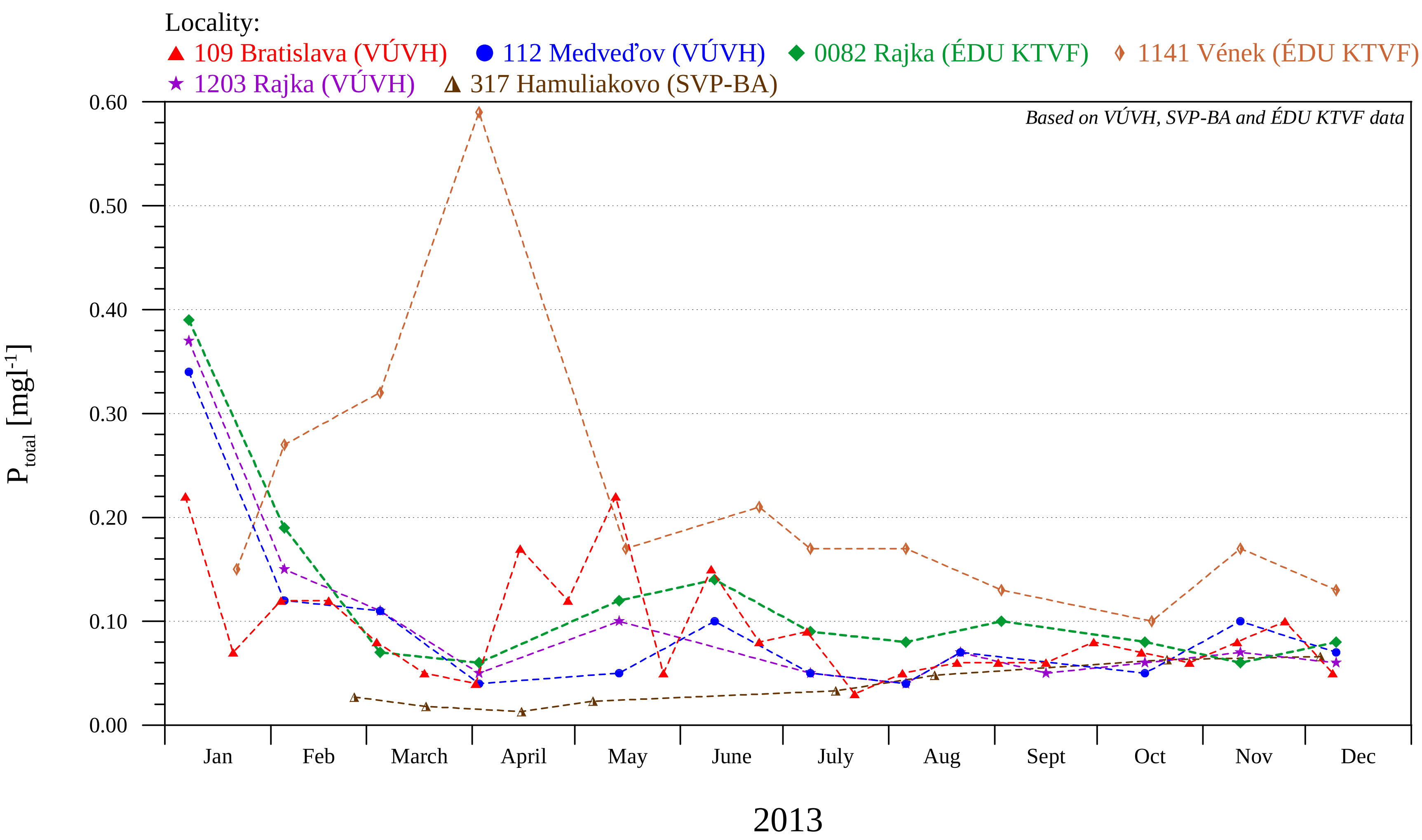

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Fig. 2-11

Surface water quality

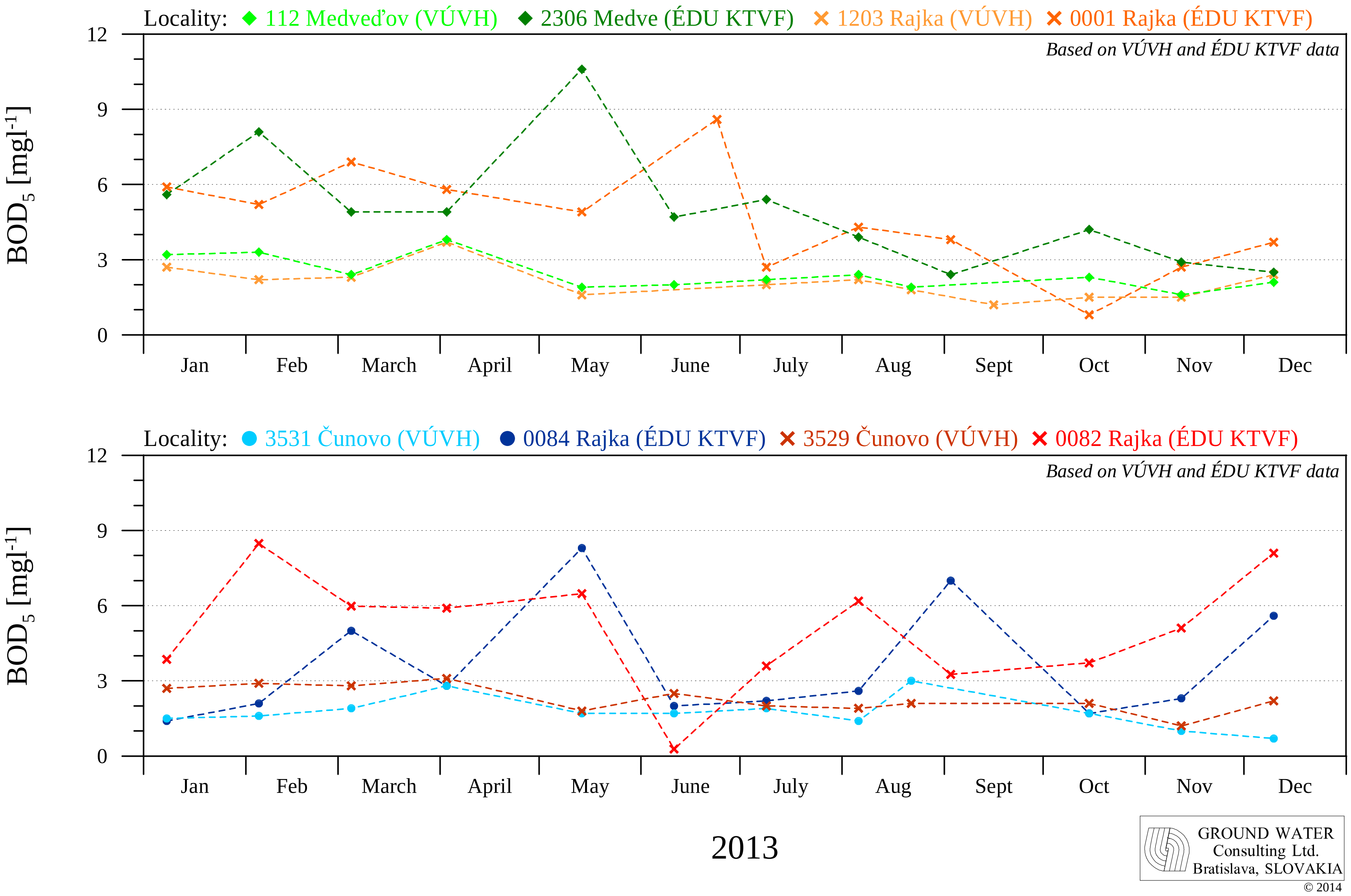
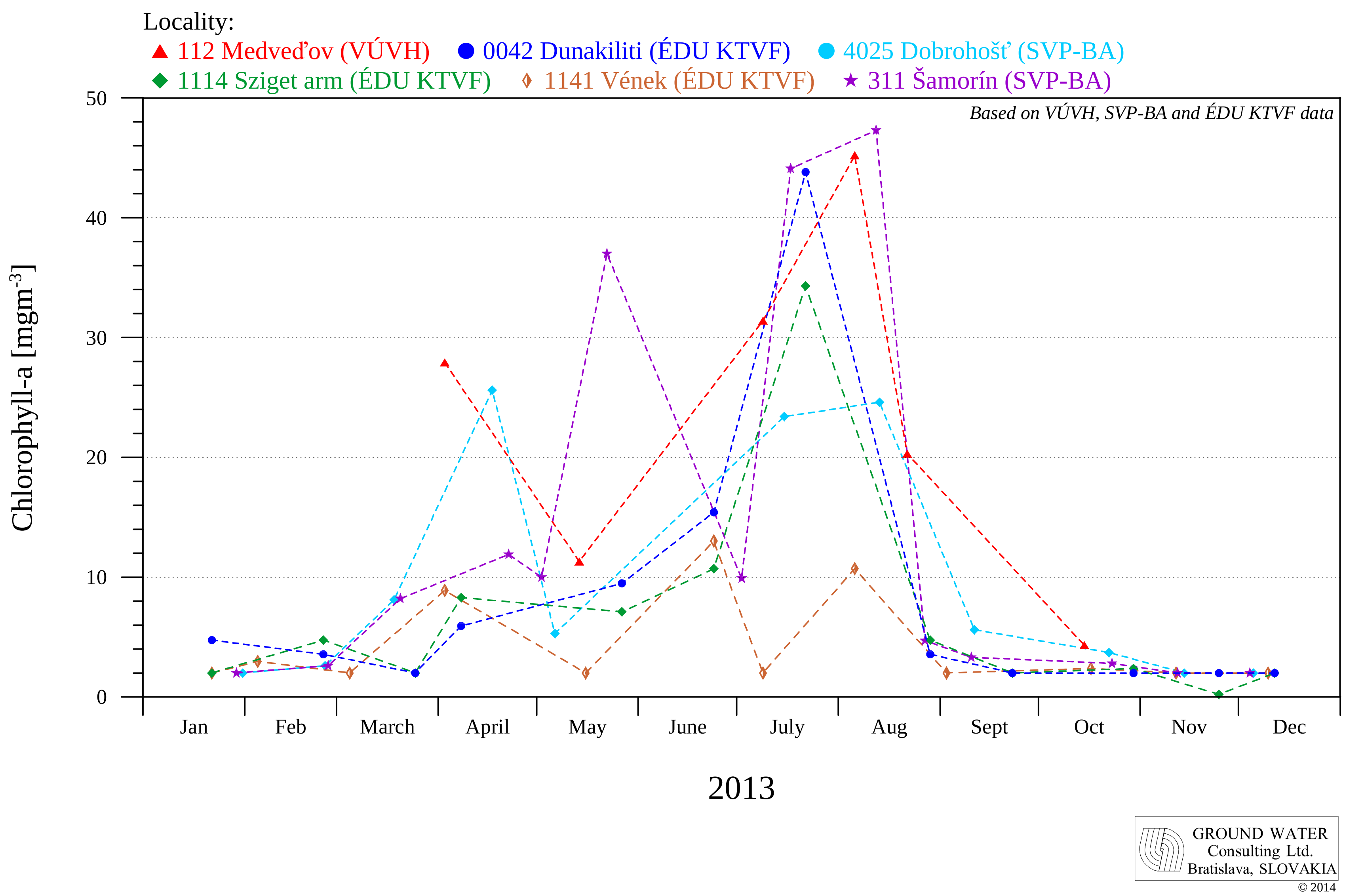


Fig. 2-12

Surface water quality



PART 3

Groundwater Regime

Monitoring of groundwater levels in the year 2013 continued in full extent. Based on the observed data impacts of technical measures and discharges into the Danube and the Mosoni branch of the Danube and the impact of water supply on the groundwater regime can be evaluated. Groundwater levels were monitored on 264 observation wells on the Slovak and the Hungarian territories (136+128). Monitoring objects are situated in the area of Žitný ostrov and in the Szigetköz region. List of observation wells is given in respective National Annual Reports on environmental monitoring. The situation of the observation networks on both sides is shown in **Fig. 3-1**.

The evaluation of groundwater level data in 2013 in a local scale was done by the Parties themselves and is given in their National Annual Reports. The jointly elaborated regional evaluation given in this report was prepared according to the jointly constructed groundwater level equipotential lines. The equipotential lines were constructed for comparison of groundwater levels in the influenced area in the current year and groundwater levels before construction of submerged weir and introducing the water supply into the river branches on Hungarian side. Corresponding to the agreement of groundwater monitoring experts the evaluation is extended, to cover also the calendar year 2013.

3.1. Joint evaluation of groundwater regime

As it is stated in previous reports, groundwater levels in the observed area are primarily influenced by surface water levels in the Danube and in the reservoir. Hydrological regime of the Danube was more or less typical in the year 2013, however in the winter period unusually high flow rates occurred, as in the previous year. Moreover an extremely big flood wave occurred in June. Groundwater levels at the beginning of hydrological year mostly fluctuated slightly below the long-term average daily values. In late December 2012 and during January and February 2013 relatively significant discharge waves occurred (exceeding 4000 $m^3.s^{-1}$), but they influenced only objects close to the Danube. In the area around the reservoir and away from the Danube their impact was not reflected. During the winter period the lowest groundwater levels were registered, mostly from late December 2012 till end of February 2013, depending on the position of the observation object. On some observation objects, along the Little Danube, behind the Mosoni Danube and in the lower part of the Žitný ostrov and Szigetköz area, the lowest groundwater levels were observed in November 2012 or during August 2013. Increased flow rates in April and May contributed to a gradual increase of groundwater level. However, the most significant rise of groundwater levels was evoked by the extreme flood wave in June, when also the highest groundwater levels were recorded on most objects. Only at observation objects behind the Mosoni Danube, in the lower part of Szigetköz area and in the lower part of Žitný ostrov the highest groundwater levels were recorded in April. After passing the flood wave groundwater levels continuously decreased on all observation objects till the end of the year, except those being under the direct influence of the Danube water level fluctuation. In general it can be stated that groundwater levels at the end of the year were higher than at the beginning. Discharge waves in September, October and November 2013 had no greater impact on groundwater levels due to their short duration.

As in previous years, three hydrological situations were chosen in the period before introducing the water supply and in the hydrological year 2013 for computing the groundwater level differences. 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: The 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 2013	
	date	Q ($m^3.s^{-1}$)	date	Q ($m^3.s^{-1}$)
low flow rate	09.03.1993	975.5	10.12.2012	1168
average flow rate	09.05.1993	1937	27.05.2013	2053
high flow rate	25.07.1993	2993	07.07.2013	3071

Low flow rate period had to be chosen at the beginning of winter period, even though that flow rates dropped only to approximately 1150 $m^3.s^{-1}$. In spite of this the hydrological and climatic situation can be regarded comparable to that in 1993. The period for average flow rate was chosen in May, similarly as in the year 1993. The compared date was chosen at the end of the month, just before the increase of flow rate before the flood. Also in this case the hydrological and climatic situation can be regarded comparable to the situation in 1993. In case of high flow rate similar hydrological condition as in 1993 was found in July, when the decreasing flow rate achieved the desired value about 3000 $m^3.s^{-1}$, after the discharge wave at the end of June . Since both of the chosen dates in 1993 and 2013 were in July, the hydrological and climatic situation can be regarded comparable.

Maps of equipotential lines were jointly constructed for the selected dates using the measured groundwater levels (**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. The altitudes of groundwater levels are given on maps for each observation object used for the equipotential line construction. For construction of equipotential lines computed surface water level data in the Danube was used as well. This level was 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 construction of the equipotential lines. The constructed 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 2012 are expressed in **Figs. 3-7 and 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 Hungarian side. In this sense the inundation and the flood-protected area on the Hungarian side, and partly the inundation area on the Slovak side, represent the influenced area.

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

When comparing hydrological situations at low flow rate (about 1000 $m^3.s^{-1}$) in the period prior the implementation of technical measures and discharges according to the Agreement and in the year 2013 (2013 versus 1993), it can be stated that slight decrease can be seen in the vicinity of the lower part of the reservoir and in the upper part of the inundation area. The decrease around the lower part of the reservoir is caused by the decrease of permeability of the reservoir bottom between the compared periods. The decrease in the upper part of the inundation area can be assigned to the fact that in December 2012 very low amount of water was discharged into the inundation area (from 10 to 15 $m^3.s^{-1}$), simulating low water period. Water levels in the Szigetköz inland area and in the area behind the Mosoni Danube remained unchanged. The middle part of the Szigetköz area is characteristic with unchanged groundwater levels in the compared periods. Slight increase of groundwater levels occurred in the inundation area at Kisbodak and in the inland area between Halászi and Novákpuszta. In the lower part of Szigetköz, downstream from Ásványráró and around the Bagoméri river branch system the groundwater levels were lower than in 1993. The groundwater level in this area is adversely influenced by the riverbed erosion in the tailrace canal and downstream the confluence of the tailrace channel and the Danube old riverbed. Unfavourable is also the fact, that the water supply system in this part of the inundation area is still incomplete. After completion the constructing works increase of groundwater level can be expected. Lower groundwater levels were recorded also on the left side of the reservoir, in the upper part of Žitný ostrov, due to the difference in permeability of the reservoir bottom. Groundwater levels, however, are at present much higher than before the construction of the dam. In the middle part of the Žitný ostrov area on the Slovak side there were no changes in groundwater levels observed. A slight decrease in the lower part of the Žitný ostrov area reflects the different water levels maintained in the channel system.

In general the change of the average groundwater levels mostly ranged between +0.7 and -0.7 m in comparison to groundwater levels in 1993. The decrease occurred mainly in the upper part of inundation area and in the lower part of Szigetköz area, while the increase was observed in the middle part of Szigetköz, both in the inundation and in the inland area. An increase of groundwater levels occurred also in the inundation area on the Slovak side, which has been evoked by the water supply on the Slovak side. Groundwater levels in the middle part of Žitný ostrov area and in the rest of upper and middle part of Szigetköz area remained unchanged. The decrease of groundwater levels around the lower part of the reservoir, reflecting the decrease in permeability of the reservoir bottom, reached -1.2 m. Decline in groundwater level around the confluence of the Danube old riverbed and the tail-race canal ranged mostly from -0.25 to -1.2 m. The groundwater flow direction in the upper part of the river to Dunakiliti still shows infiltration from the river and the reservoir into the surrounding area. Along the Danube old riverbed from Dunakiliti to the confluence with the tailrace canal the groundwater is drained and the flow direction turn towards the Danube old riverbed. Groundwater in the inland area is flowing mostly parallelly with the Danube (**Fig. 3-4**).

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

Comparing groundwater levels in the period prior to the implementation of technical measures and after increasing the discharges into the Danube according to the Agreement and introducing the water supply on the Hungarian side, at average flow rate conditions in the Danube (about 2000 $m^3.s^{-1}$), the actual results show an increase of groundwater levels on a large part of the Szigetköz area. The groundwater level increase in the upper part of the Szigetköz area is slightly reduced by the groundwater level decrease in the area around the reservoir, due to decreased permeability of the reservoir bottom. Therefore the average groundwater levels show no change in this part of the Szigetköz. Slightly lower groundwater level can be seen only in the immediate vicinity of the Danube riverbed. The groundwater level increase in the middle part of Szigetköz area (including inundation) reaches 0.7-1.2 m. Slight decrease of the groundwater level can be seen in the lower part of the Szigetköz along the Danube stretch between Ásványráró and Medveďov, what includes the lower part of the Ásványi river branch system and the Bagoméri river branch system. Decrease in groundwater levels is caused by riverbed erosion. It is expected that this decrease will be eliminated after completion of ongoing construction works on the water supply system in this region. On the Slovak territory no impact of technical measures according to the Agreement appears. Higher groundwater levels in the left-side inundation area reflect the different water supply regime in the river branch system in 1993 and 2013. Decrease in groundwater levels, which appears particularly on the left side of the reservoir, is due to the decrease of permeability of the reservoir bottom. In general, however, groundwater levels are higher than before damming the Danube. On a large part of the upper and lower Žitný ostrov area no change in groundwater levels were observed. In the middle part of the Žitný ostrov area slight increase can be seen. The groundwater flow direction in the upper part of the river to Dunakiliti shows infiltration from the river and the reservoir into the surrounding area. Along the Danube from Dunakiliti to Gabčíkovo groundwater flows into the riverbed and the river is draining the adjacent area, but outside the floodplain groundwater flows into the inland area (**Fig.3-5**).

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

In case of high flow rate conditions in the Danube (around 3000 $m^3.s^{-1}$) it is possible to see lower groundwater levels in the vicinity of the reservoir and along the Danube old riverbed, including the inundation area on both sides (**Fig. 3-9**). The decline in the vicinity of the reservoir, particularly on its left side and in the upper part of the Szigetköz, is caused by decreased permeability of the reservoir bottom. The decrease along the Danube old riverbed partially results from the difference in flow rates discharged into the Danube old riverbed in 1993 (approximately 760 $m^3.s^{-1}$) and in 2013 (approximately 450 $m^3.s^{-1}$). Groundwater levels in inland areas central and lower part of the Szigetköz, approximately between the Mosoni Danube and the inundation area, for high flow rate conditions have not changed. The groundwater level along the Mosoni Danube was higher from about +0,25 to +0,75 m in 2013. On the most part of the Žitný ostrov area, except the decrease around the reservoir, no changes in groundwater levels can be seen. The groundwater flow direction in the upper part of the river to Dunakiliti shows water supply from the Danube into the adjacent area (**Fig. 3-6**). The groundwater flow direction in the inland area also documents the water supply from the Danube. In the inundation area along the Danube section from Dunakiliti to Ásványráró the groundwater is drained by the Danube old riverbed.

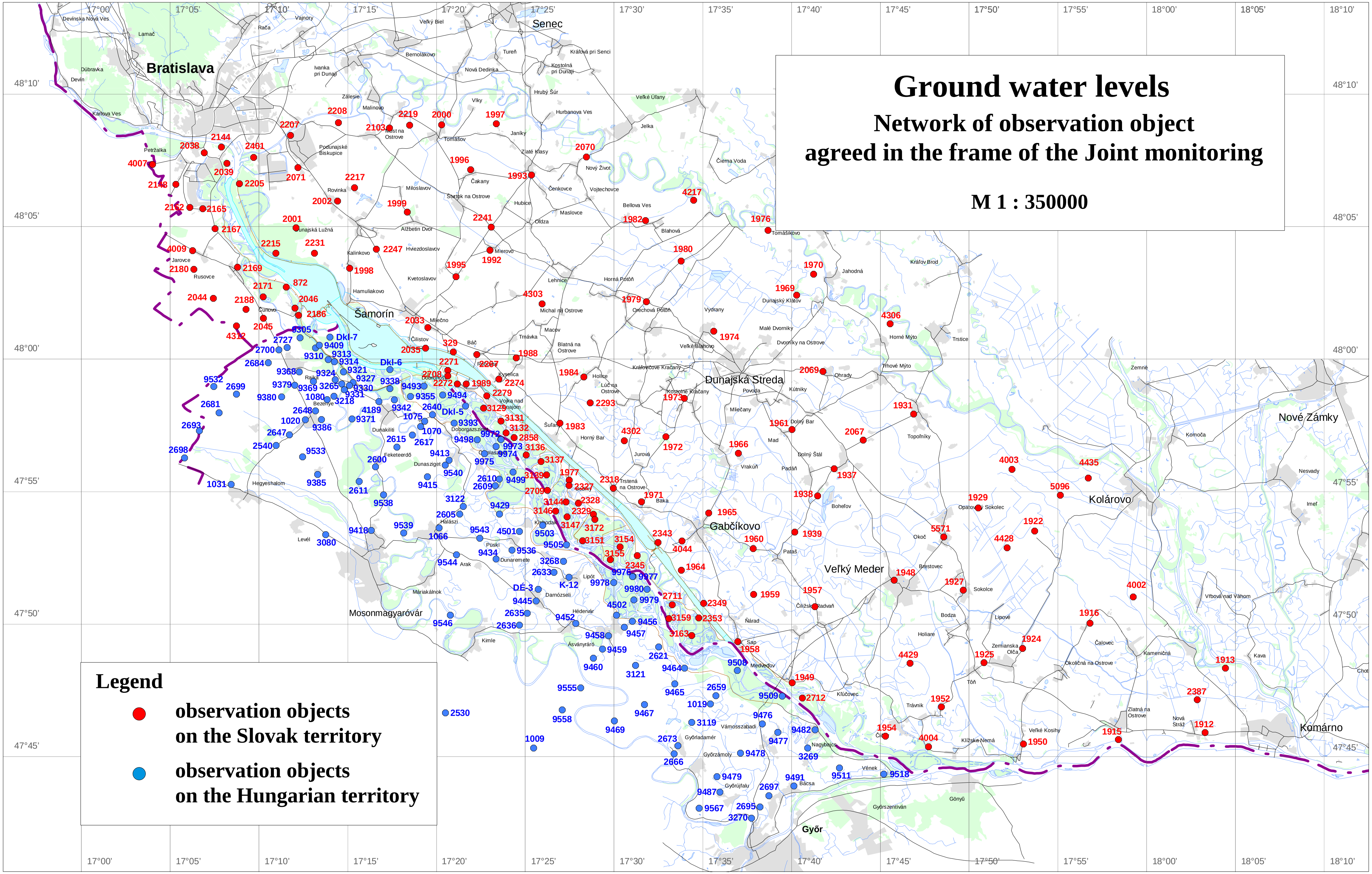
3.2. Conclusion

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. As a result of measures taken according to the intergovernmental Agreement, a significant increase in the groundwater levels occurred in case of average flow rate conditions in the Danube. The increase in the upper part of Szigetköz region and around the reservoir is reduced due to decrease of permeability of the reservoir bottom. Certain effect also have the adverse changes in sediment transport regime of the Danube, which are probably related to measures in the Austrian section of the Danube just upstream of Bratislava implemented in recent years. In case of low flow rates in the Danube the average groundwater levels remained mostly unchanged. The decrease in the lower part of Szigetköz reflects the adverse effect of the riverbed erosion in the tailrace canal and downstream the confluence of the tailrace channel and the Danube old riverbed. Improvement of this situation is expected after completion of constructing works on the water supply system in this part of the inundation area. For high flow rate conditions decline in the groundwater levels in the vicinity of the reservoir and along the Danube riverbed can be registered, but at some distance from the Danube old riverbed no changes were observed in the inundation area. The groundwater level along the Mosoni Danube was higher from about +0,25 to +0,75 m in 2013.

Monitoring results still confirm the need of solving the water supply in the lower part of the inundation area on both sides. On the Hungarian side construction works going on and after their completion groundwater levels increase in the lower part of Ásványi river branch system and in the Bagoméri river branch systems is expected. The positive influence of the water supply could be effectively supported by measures applied in the Danube old riverbed upstream of the confluence with the tail race channel. Such measures may improve the overall situation in the lower part of Szigetköz area and in the region of Istragov island on the Slovak side.

The increase in groundwater levels in the strip along the Danube old riverbed on both sides could be ensured only by increasing the water level in the Danube by measures implemented in the riverbed.

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
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

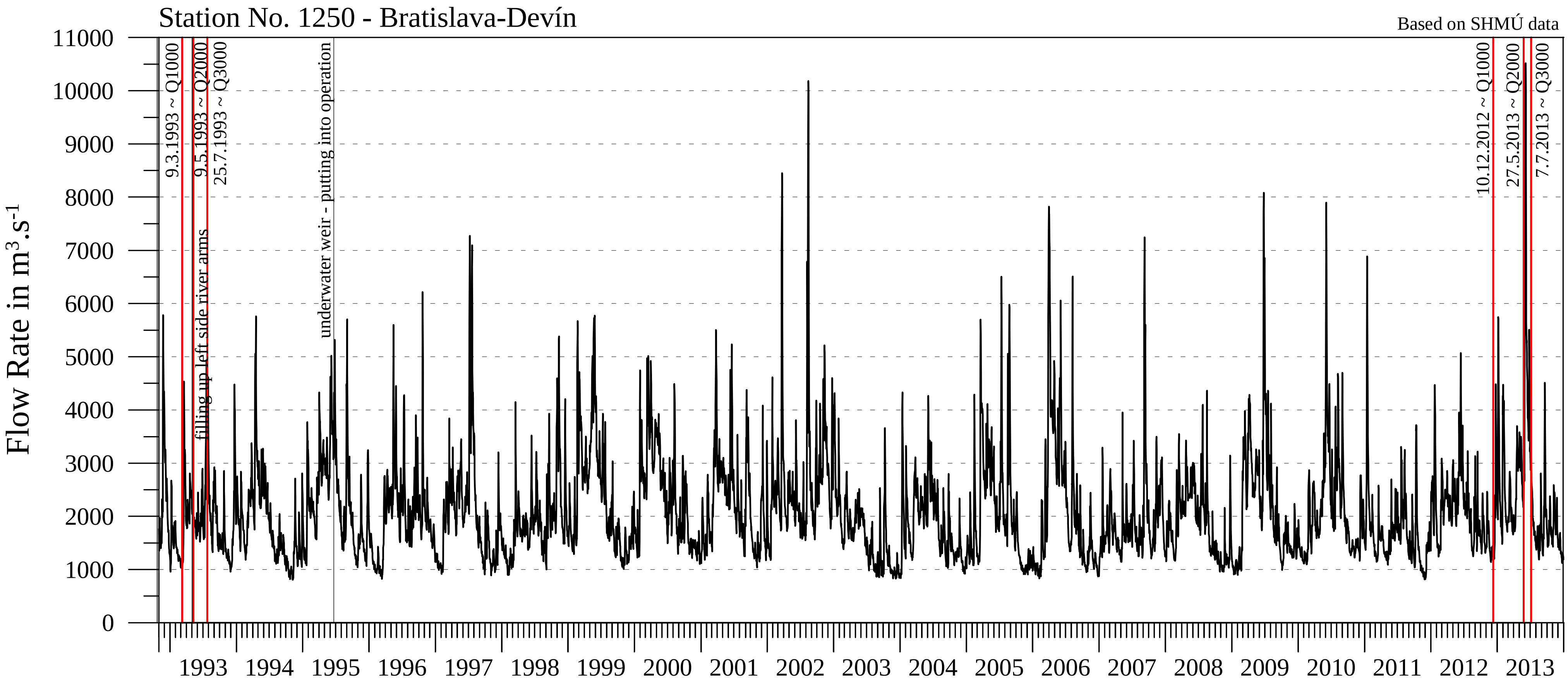


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Fig. 3-3a

Surface water flow rate

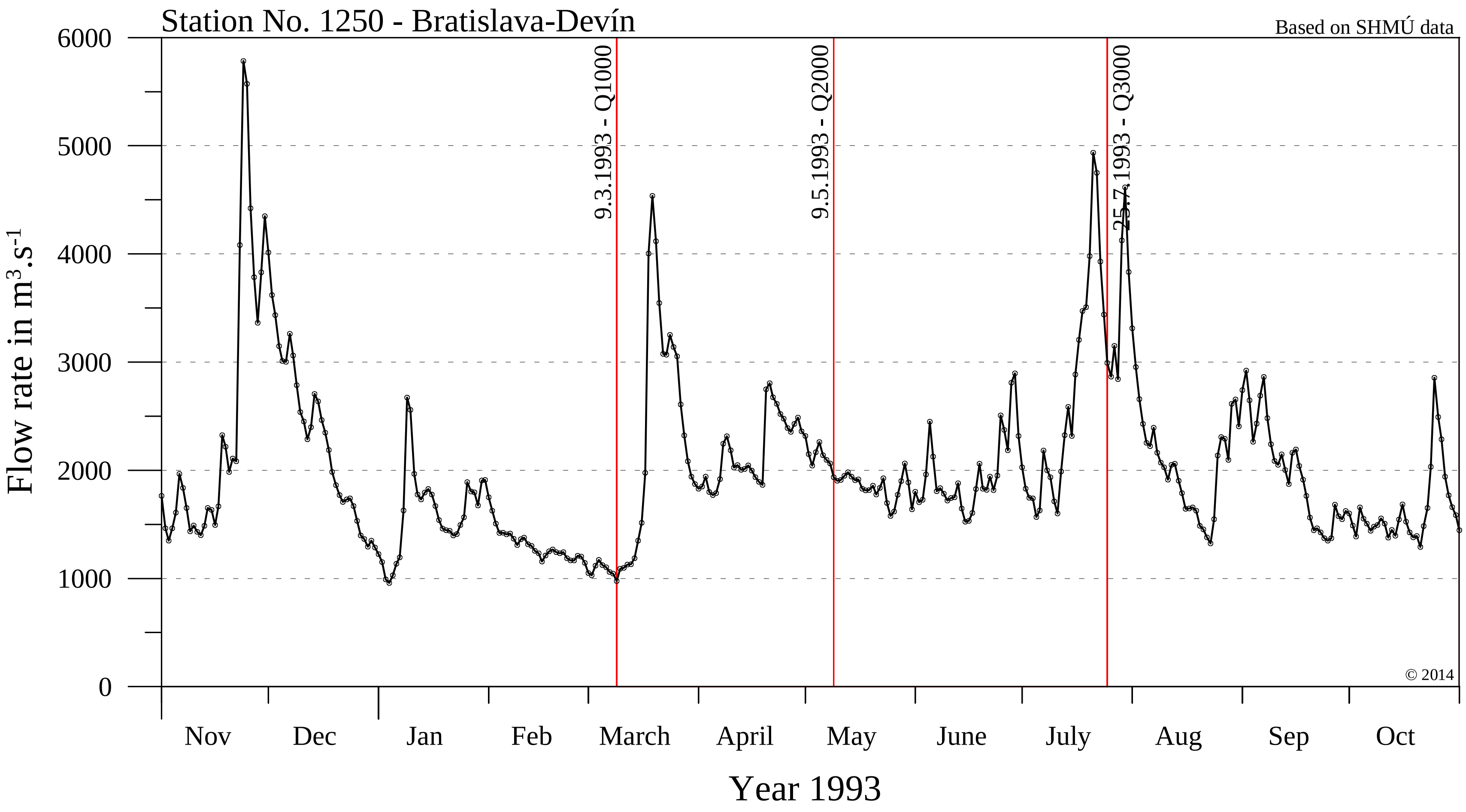


Fig. 3-3b **Surface water flow rate**

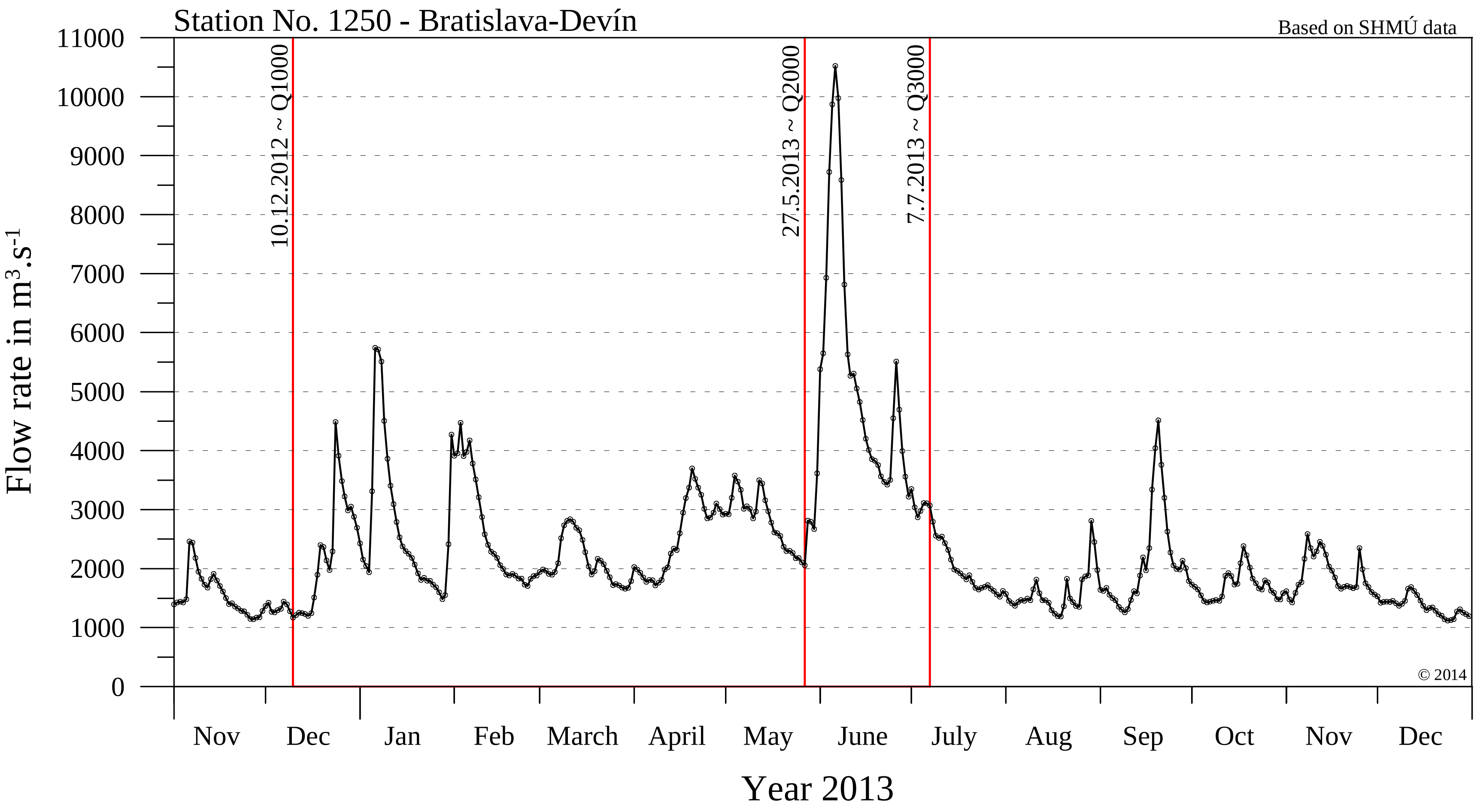
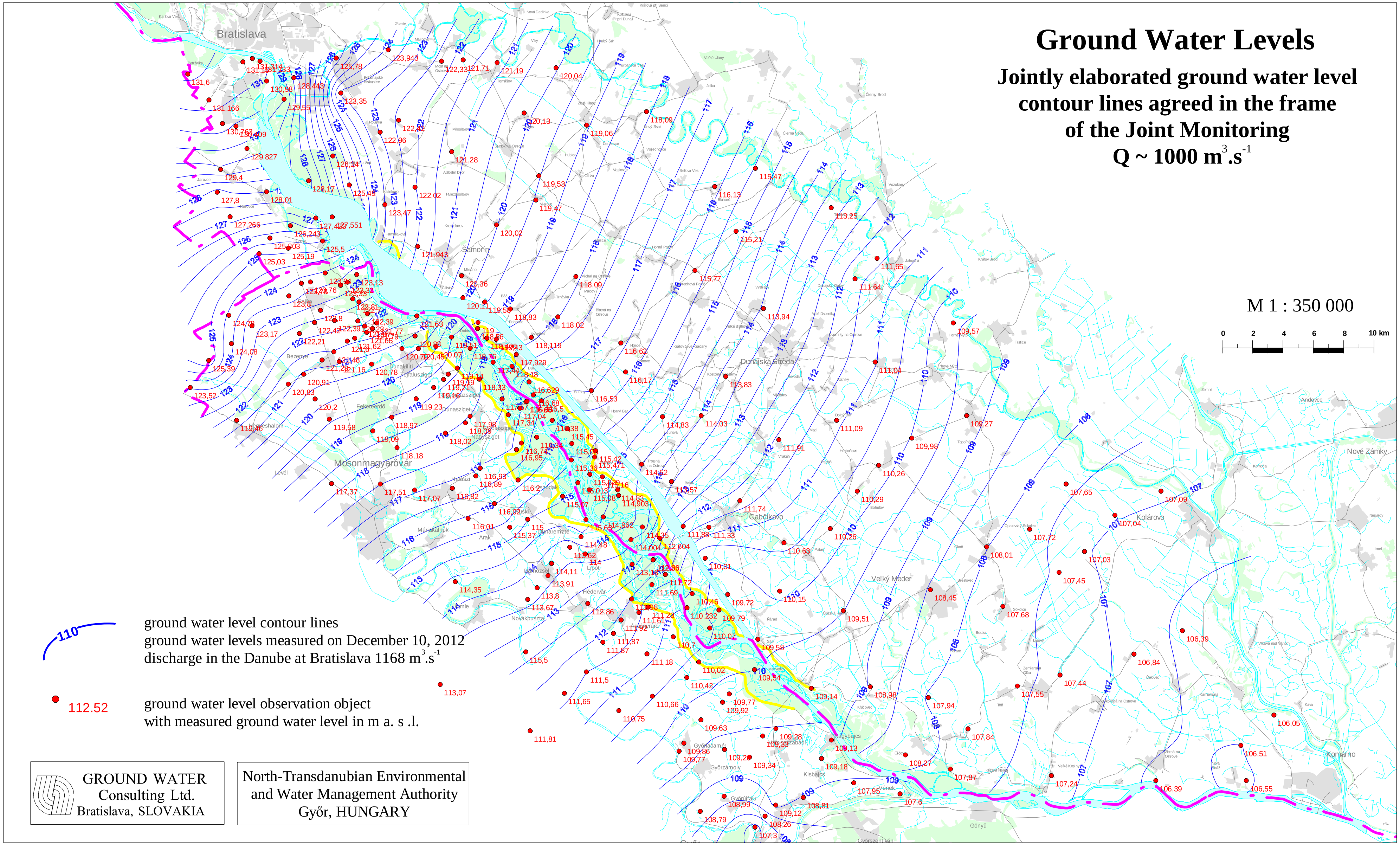


Fig. 3-4



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
Bratislava
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Komárno
Nové Zámky
Mosonmagyaróvár
ground water level contour lines
ground water levels measured on December 10, 2012
discharge in the Danube at Bratislava 1168 m³.s⁻¹
112.52
ground water level observation object
with measured ground water level in m a. s .l.
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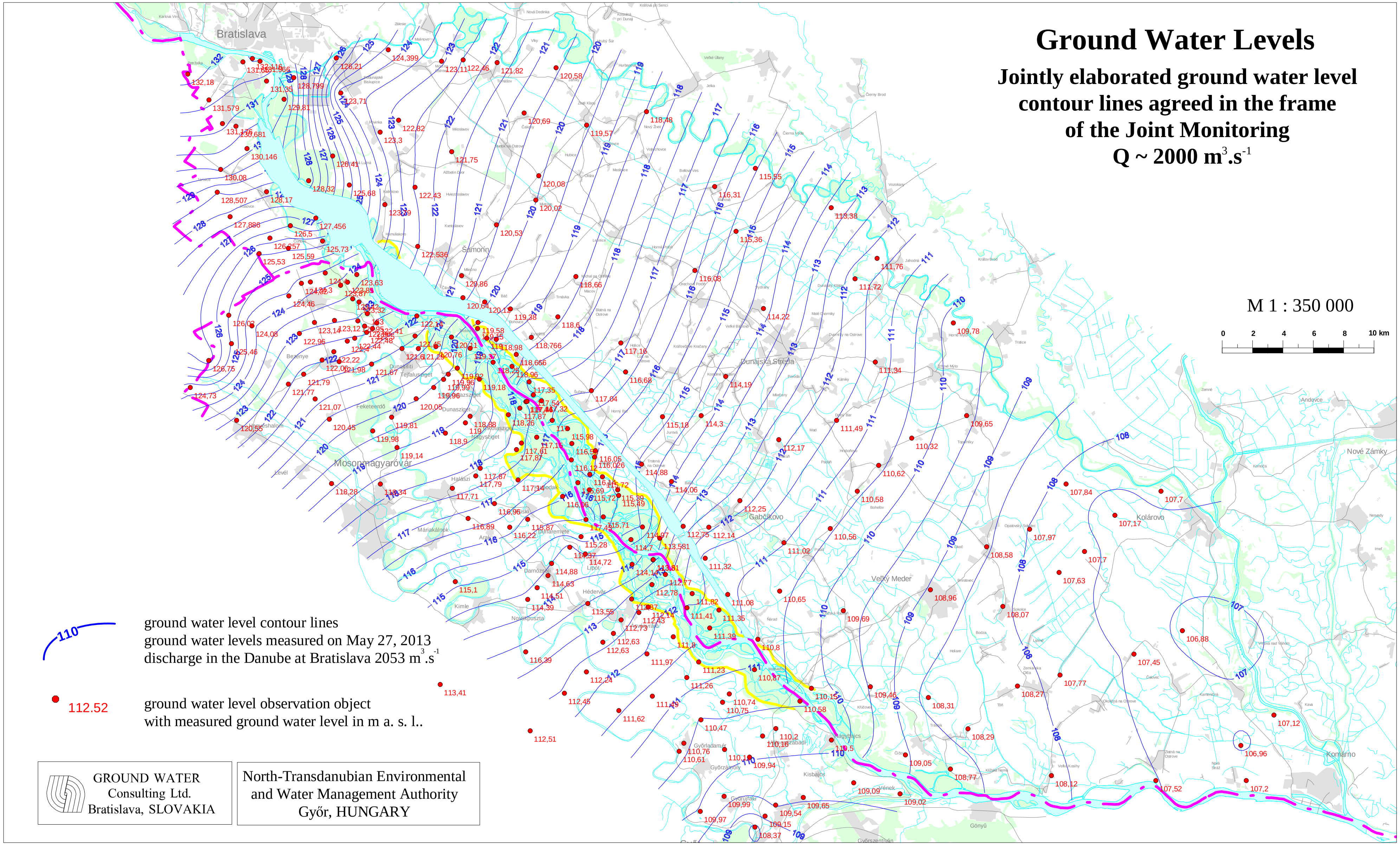
North-Transdanubian Environmental and Water Management Authority Győr, HUNGARY

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
Bratislava
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Komárno
Kolárovo
Nové Zámky
Mosonmagyaróvár
110
ground water level contour lines
ground water levels measured on May 27, 2013
discharge in the Danube at Bratislava 2053 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 Environmental
and Water Management Authority
Győr, HUNGARY

Fig. 3-6

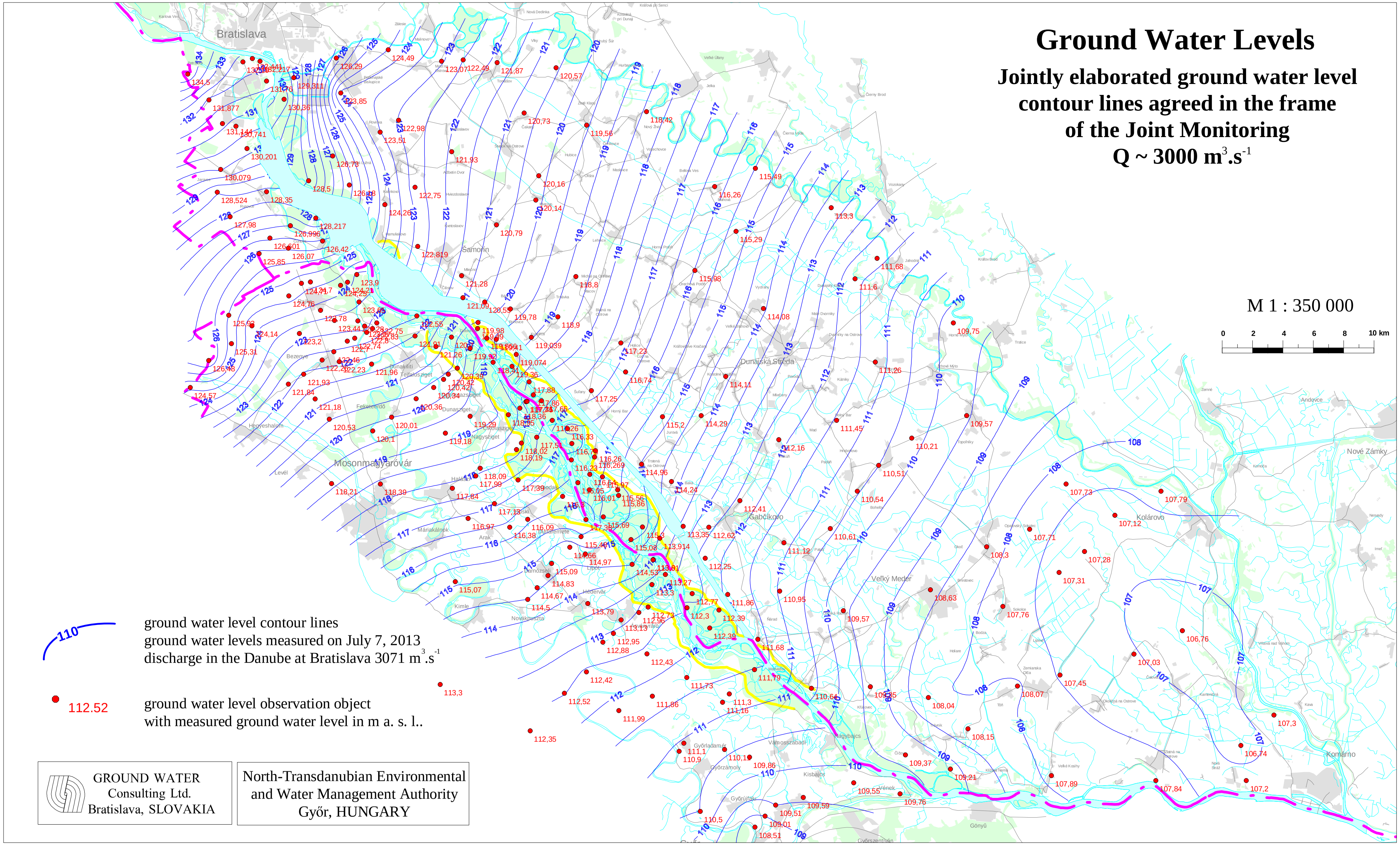
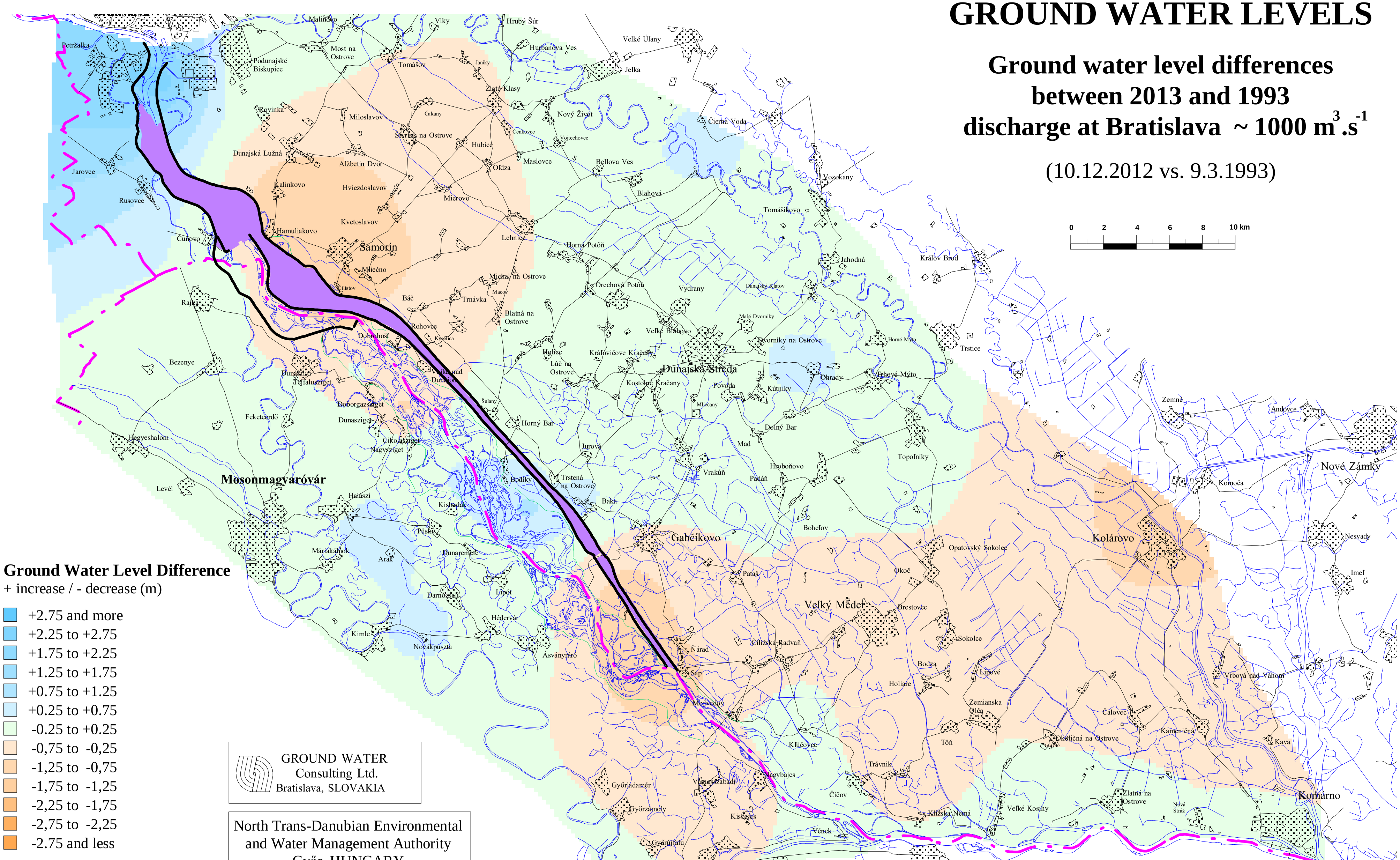

Ground Water Levels
Jointly elaborated ground water level contour lines agreed in the frame of the Joint Monitoring
Q ~ 3000 m^3.s^{-1}
M 1 : 350 000
0 2 4 6 8 10 km
ground water level contour lines
ground water levels measured on July 7, 2013
discharge in the Danube at Bratislava 3071 m^3.s^{-1}
112.52
ground water level observation object
with measured ground water level in m a. s. l..
GROUND WATER Consulting Ltd. Bratislava, SLOVAKIA
North-Transdanubian Environmental and Water Management Authority Győr, HUNGARY
Bratislava
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Komárno
Nové Zámky
Mosonmagyaróvár

Fig. 3-7

GROUND WATER LEVELS

Ground water level differences between 2013 and 1993 discharge at Bratislava ~ 1000 $m^3.s^{-1}$

(10.12.2012 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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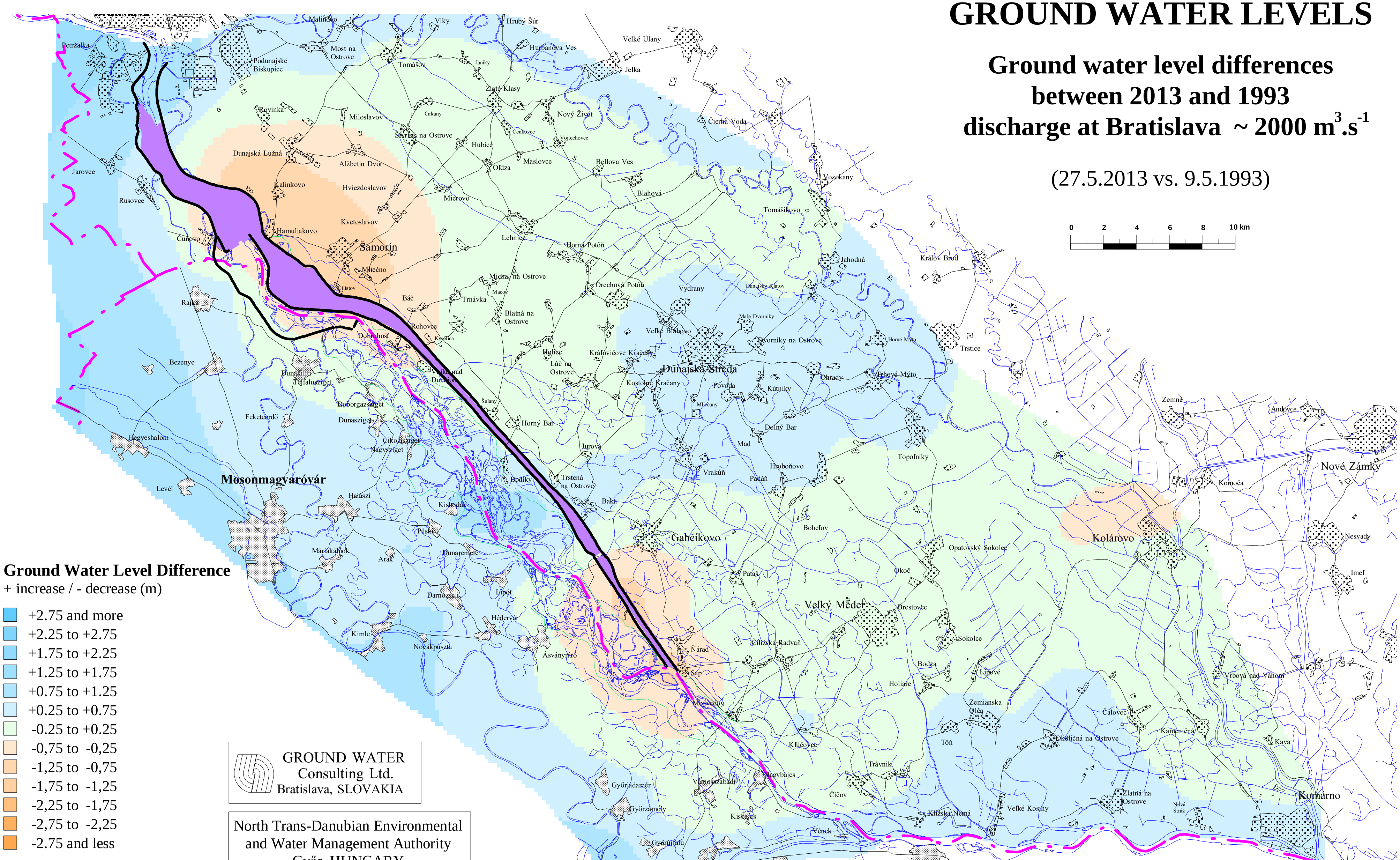
Fig. 3-8

GROUND WATER LEVELS

Ground water level differences between 2013 and 1993 discharge at Bratislava ~ 2000 $m^3.s^{-1}$

(27.5.2013 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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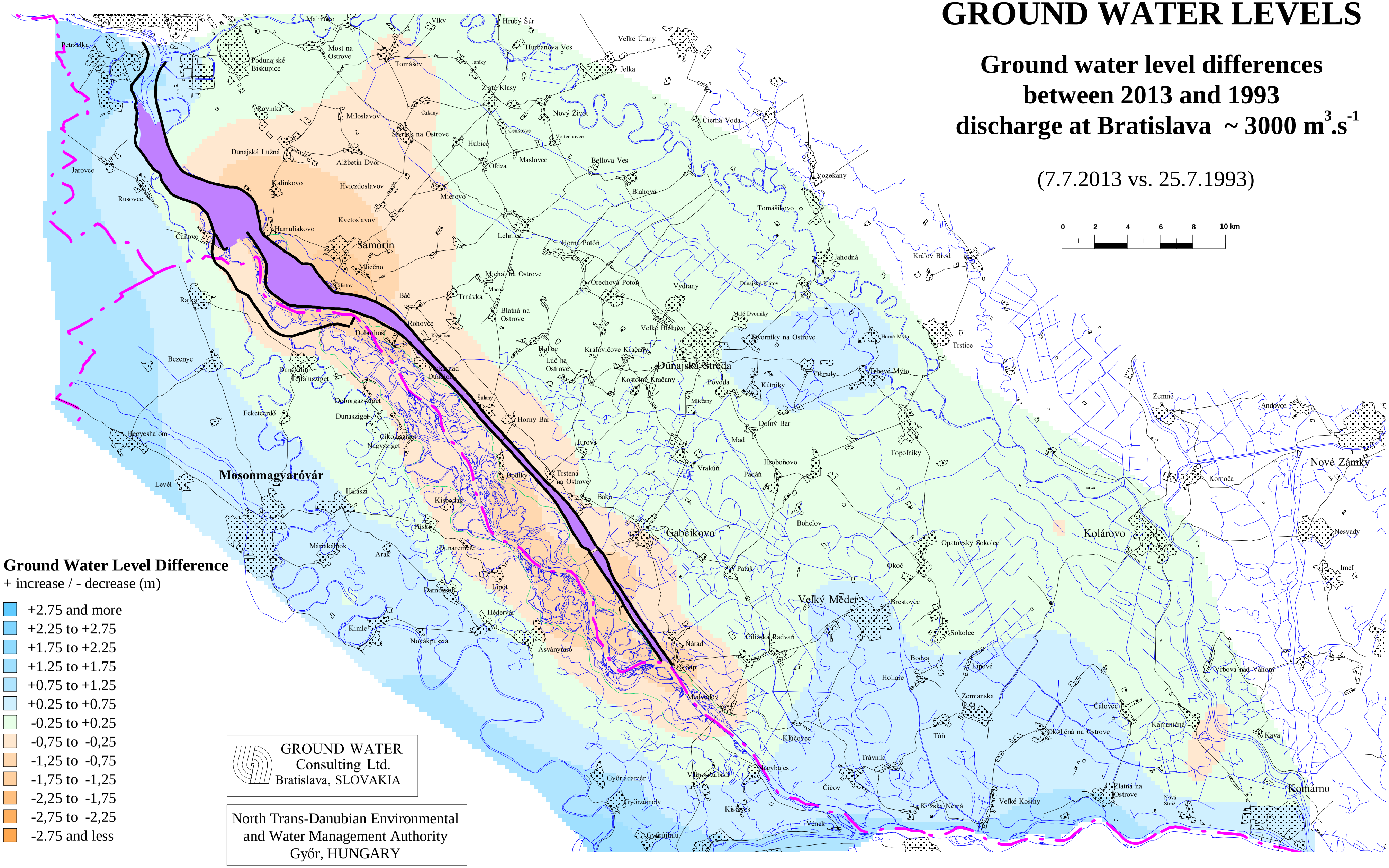
Fig. 3-9

GROUND WATER LEVELS

Ground water level differences between 2013 and 1993 discharge at Bratislava ~ 3000 $m^3.s^{-1}$

(7.7.2013 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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PART 4

Groundwater Quality

The groundwater quality on the Hungarian and Slovak territory is evaluated separately. The list of objects included in the joint monitoring is listed in **Table 4-1** and **Table 4-2** and their situation is shown in **Fig. 4-1**. From among the monitored objects representative objects for groundwater quality observation have been selected on both sides for evaluation in the Joint Report. Detailed groundwater quality evaluation for each object included in the joint monitoring was done in the Slovak and Hungarian National Annual Reports on environmental monitoring in 2013. Monitoring data for the year 2013 in tabular form and the long-term graphical development of observed quality parameters for the period 1992-2013 form a part of National Reports. Data from monitored objects are interpreted in relation to agreed limits for groundwater quality evaluation in the frame of intergovernmental Agreement from 1995. Due to changes in national legislations these limits have been modified in 2011. The new limits are listed in **Table 4-3**.

4.1. Hungarian territory

The subject of joint groundwater quality monitoring on the Hungarian side consists of 22 objects, consisting of 16 observation wells and 6 wells that are used for drinking water supply (waterworks). While the observation wells have the screens located in the upper part of the gravel sediments, the wells in waterworks draw water from deeper horizons. The list of monitored objects is given in **Table 4-1**.

Data from wells that are used for drinking water supply are provided by Regional Waterworks Companies. The groundwater quality monitoring in observation wells is carried out by the North-Transdanubian Inspectorate of Environment Protection, Nature Conservation and Water. Monitoring frequency on waterworks 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 4-1: 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

	Country	Object No.	Locality
12	**Hungary**	**9458**	Ásványráró
13	**Hungary**	**9475**	Győrzámoly
14	**Hungary**	**9480**	Győrzámoly
15	**Hungary**	**9484**	Vámosszabadi
16	**Hungary**	**9536**	Püski
17	**Hungary**	**Du-I**	Dunakiliti waterworks
18	**Hungary**	**T-II**	Feketeerdő waterworks
19	**Hungary**	**Da-I**	Darnózseli waterworks
20	**Hungary**	**K-5**	Győr - Révfalu waterworks
21	**Hungary**	**6-E**	Győr - Szőgye waterworks
22	**Hungary**	**25-E**	Győr - Szőgye waterworks

Observation well No. 9327, site: Dunakiliti

Based on long-term data seasonal, periodical variation of some water quality parameters is clearly observed in the object No. 9327. Periodicity primarily appears in 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 (in the evaluated year once), but it has never reached the highest limit value (25 °C). Pollution by organic matter is rather balanced in last five years and the measured concentrations meet the agreed limits in long-term. In the evaluated year significant decrease of ammonium ions, nitrates and phosphates was registered. Manganese concentrations in last three years increased and in the year 2013 the highest concentration of 0.40 $mg.l^{-1}$ occurred from the beginning of monitoring. In autumn the content decreased to 0.19 $mg.l^{-1}$, but compared to the limit value (0.05 $mg.l^{-1}$) it was still high. Except the water temperature and manganese also iron content exceeded the limit value. Other observed parameters occurred in quantities below particular 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 have increased in last three years, and higher contents were recorded also in case of nitrates, chlorides, sulphates and calcium. In the long-term the content of calcium quite often exceeds 100 $mg.l^{-1}$, what is the limit value for this parameter. Concentration of nitrates in years 2011 and 2012 exceeded the limit value (50 $mg.l^{-1}$), but in the evaluated year it decreased and only one concentration (51.9 $mg.l^{-1}$) was higher than the limit value. In this object high concentrations of manganese are characteristic, that in long-term exceed the limit value 0.05 $mg.l^{-1}$. In comparison with the previous year they slightly decreased. Concentrations of ammonium and phosphate ions and the pollution by organic matter were low and they are below the limit values. Also the iron content in last five years fluctuates below the limit value. Based on the data from 2013 it can be concluded that from among the observed groundwater quality parameters the manganese, calcium, magnesium and in one case also nitrates exceeded the agreed limit values.

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). The electric is relatively balanced since 2002, without significant changes. The organic matter content show seasonal fluctuations, and it is below the limit value (3 mg.l^{-1}) in long-term. Low concentrations are characteristic for phosphates and nitrates in long-term. Ammonium ions content show a slight increase within the limit value. Conversely the content of sulphates decreased and in the evaluated year the lowest values were recorded from the beginning of monitoring (8.2 mg.l^{-1} and 13.4 mg.l^{-1}). Iron and manganese concentrations are permanently high in this object and significantly exceed the limit values. In terms of long-term development slight decline can be observed in the manganese content. In the year 2013 exceedances of limit values were registered for manganese and iron and in one case also for the water temperature.

<u>Observation well No. 9456, site: Ásványráró</u>

The groundwater is of medium mineralization and has stable water temperature with a slight seasonal fluctuation. The conductivity values are balanced in last two years. The organic matter content expressed by COD_{Mn} does not show significant changes and is below the limit value in long-term. The upward trend in the concentrations of ammonium ion stopped in 2008 and after a slight decrease stabilized at concentrations higher than the limit value for this parameter. The high ammonium ion content in the water in this object is considered to be background pollution from agricultural activities. From among other observed nutrients the content of nitrates and phosphates is low 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. From the observed quality data in 2013 results that ammonium ion, manganese and iron concentrations significantly exceeded the agreed limit values and the calcium content fluctuated just above the limit value. Concentrations of other observed parameters varied below the respective limit values.

The above results show that the groundwater in 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 persistently exceed the limit values.

Increased contents of nutrients and organic pollutants mostly relate to local contamination, 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 did not changed significantly in comparison with the previous year. High contents exceeding the limit values are recorded only at some objects. For example the water quality at Object No. 9368 at Rajka is still affected by local contamination. High ammonium ion contents occur here in long-term, which exceed the limit value a hundredfold. Phosphates also fluctuate above the limit value and only the content of nitrates decreased below the limit value (except the only one value in 2013). Concentrations of ammonium ions occur above the limit value in long-term also on object No. 9475 at Győrzámoly. Obsolete animal breedings are gradually disposed of, which is reflected in groundwater quality improvement, e.g. on object No. 9458 at Ásványráró, where no signs of fresh pollution were found. The content of nitrates and ammonium ions decreased, but the content of phosphates is still ten times higher than the limit.

The organic pollution usually meets the limit value. During the monitoring in some objects time-to-time occurred values exceeding the limit value, but since 2008 it was only once on the object No. 9457 at Ásványráró. At this object in the past two years the organic pollution slightly increased. 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 2013 it was found in concentrations below the limit values for groundwater quality evaluation (**Table 4-3**). From among the inorganic micro-pollutants the concentrations of arsenic, copper, nickel and zinc at some objects indicate slight pollution. Concentrations of lead, mercury, cadmium and chromium in the evaluated 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 waterworks. 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. The concentrations are lower in wells where the water is drawn from a greater depth. The water extracted in waterworks 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.

4.2. Slovak territory

The groundwater quality monitoring on the Slovak territory is carried out at 18 objects (10 observation objects and 8 waterworks). Their list is given in **Table 4-2**. For the purposes of the Slovak-Hungarian monitoring data of the Western Slovakia's Waterworks Company (ZsVS), the Waterworks Company Bratislava (BVS), Slovak Hydrometeorological Institute (SHMÚ) and Ground Water Consulting Ltd. (GWC) were used. Evaluation in the Joint Report is focused mainly on groundwater quality in waterworks, which are more representative because of their continual pumping. The object No. 103 in Gabčíkovo was for technical reasons in 2012 replaced by the object No. 353.

Table 4-2: 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**	Rusovce waterworks
12	**Slovakia**	**2559**	Čunovo waterworks
13	**Slovakia**	**119**	Kalinkovo waterworks
14	**Slovakia**	**105**	Šamorín waterworks

	Country	Object No.	Location
15	**Slovakia**	**467**	Vojka waterworks
16	**Slovakia**	**485**	Bodíky waterworks
-	**Slovakia**	**103**	Gabčíkovo waterworks *(monitoring terminated)*
17	**Slovakia**	**353**	Gabčíkovo waterworks *(new object)*
18	**Slovakia**	**907**	Bratislava – Petržalka waterworks

From among waterworks 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 canal. The groundwater quality in waterworks is stable in long-term. Waterworks Bratislava - Pečniansky les (No. 907) is influenced by the water quality in the Danube. Unlike the other waterworks most parameters here fluctuate and show seasonality. Groundwater quality on waterworks at Rusovce (No. 102) and Čunovo (No. 2559) improved since damming the Danube. The quality on waterworks at Kalinkovo (No. 119) and Šamorín (No. 105) is influenced by infiltration of surface water from the Danube and from the reservoir. The groundwater quality in waterworks at Gabčíkovo (No. 353) differs due to prevailing direction of groundwater flow, coming from the inland area. In waterworks at Vojka (No. 467) and Bodíky (No. 485) the groundwater quality is significantly influenced by local conditions.

Right side of the Danube

Waterworks at Rusovce – No. 102 and at Čunovo – No. 2559

The groundwater quality has improved after damming the Danube, mainly in the waterworks at Rusovce. Currently it is similar to water quality in the waterworks at Čunovo. The concentrations of cations, anions and conductivity values on both waterworks fluctuate in a narrow range. More significant differences in measured values are recorded in case of hydrogen carbonates, which are higher at Rusovce, and in case of nitrates, which are higher at Čunovo. Small differences and slightly higher contents are registered in case of calcium, magnesium, chlorides and sulphates at Rusovce. Higher concentrations of nitrates in the waterworks at Čunovo can be seen during the whole observation period, with decreasing tendency in the period 2009-2011. In the last two years content of nitrates again slightly increased. The contents of ammonium ions and phosphates are low in long run at both waterworks and mostly fluctuates below their detection limits. Similarly low contents are recorded in case of manganese. The organic contamination , expressed by COD_{Mn}, in the period 2009-2013 is lower than in the previous period. The dissolved oxygen content fluctuates and it slightly increased in last seven years. In the evaluated year at Rusovce it reached the highest value (7.77 $mg.l^{-1}$) for the whole period of observation and at Čunovo the second highest value (6.94 $mg.l^{-1}$). The upward trend in chloride contents (particularly in the waterworks at Rusovce) has not been proved in last two years. The time series of other groundwater quality parameters in waterworks at Rusovce and at Čunovo are similar, without significant changes. The groundwater quality parameters in long run meet the agreed limits for groundwater quality on both waterworks.

Waterworks at Bratislava No. – 907

With regard to the location of the waterworks 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. Values of individual parameters, particularly cations, anions, water temperature, dissolved oxygen content and nitrates concentration considerably fluctuate during the year. The dissolved oxygen content, nitrates concentrations and COD_{Mn} values are higher than at other observed objects. Unlike the temporary increase of iron content in the period between 2006 and 2011, its content in last two years varies below the detection limit (0,007 $mg.l^{-1}$). In the evaluated year the second highest concentration of nitrates (18.2 $mg.l^{-1}$) were recorded since the beginning of monitoring, when the highest value of 21.7 $mg.l^{-1}$ was recorded in the year 2009. Concentrations of manganese, ammonium ions and phosphates are below the detection limits of the applied analytical methods, or just above them in long-term.. In the year 2013 in case of manganese one higher value (0,042 $mg.l^{-1}$) occurred, however it did not exceeded the agreed limit value (0,05 $mg.l^{-1}$). The contents of all monitored groundwater quality parameters in the evaluated year meet the agreed limits for groundwater quality.

Left side of the Danube

Waterworks at Kalinkovo No. – 116 and at Šamorín – No. 105

The groundwater quality in waterworks situated on the left side of the Danube was not influenced by damming as much as the quality of the waterworks on the right side. The groundwater chemistry in the waterworks at Kalinkovo (No. 119) and at Šamorín (No. 105) is similar since the beginning of monitoring and the course and changes of majority of groundwater quality parameters are also similar. Slightly higher values in the waterworks at Kalinkovo occur in case of potassium, manganese and ammonium ions. In comparison with the previous year the pH values on both waterworks slightly increased and in last six years vary above the value of 7,5. Phosphates occur at concentrations lower than the limit of detection (0.1 $mg.l^{-1}$). An exception is one higher value of 0.42 $mg.l^{-1}$ recorded in the evaluated year at Šamorín, however which did not exceeded the agreed limit value. Contrary to the year 2011, when the dissolved oxygen concentration achieved a maximum on both waterworks (at Kalinkovo 9,22 $mg.l^{-1}$ and at Šamorín 8,59 $mg.l^{-1}$), its content significantly decreased in last two years to values between 2.1 and 4.6 $mg.l^{-1}$. In the year 2013 at the Kalinkovo waterworks did not occurred similarly high concentrations of several groundwater quality parameters as in 2012 (maximal concentrations of nitrates, hydrogen-carbonates and manganese, COD_{Mn} values and high concentrations of ammonium ions and iron). Two concentrations of manganese exceeded the agreed limit, but the exceedance was only slight. The other monitored groundwater quality parameters meet the agreed limit values on both waterworks.

Waterworks at Gabčíkovo – No. 103 and 353

The groundwater quality in the Gabčíkovo waterworks differs from groundwater quality in waterworks at Kalinkovo and Šamorín due to the different groundwater flow direction. The water temperature at this waterworks is more balanced. The pH values after a temporary increase in the period 2006-2008 decreased and they fluctuate above the value of 7.5. The dissolved oxygen contents are among the lowest ones. Nitrates concentrations in last six years are quite balanced and oscillate around 4 $mg.l^{-1}$. The concentrations of sodium (about 5 $mg.l^{-1}$), potassium (about 1 $mg.l^{-1}$) and chlorides (about 10 $mg.l^{-1}$) are among the lowest from among all other observed objects. The sodium and potassium concentrations reach only half of the values recorded in waterworks at Šamorín or Kalinkovo. The organic pollution, expressed by COD_{Mn}, is below the detection limit (0.5 $mg.l^{-1}$) since 2002.

The object No. 103, which is no longer used due to technical reasons since 2012, was replaced by object. No. 353. The groundwater in the new object has slightly lower conductivity, what is associated with lower content of basic cations and anions (sodium, calcium, magnesium, bicarbonates, chlorides and also sulphates). Other monitored groundwater quality parameters are similar. 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. In the evaluated year two higher concentrations of phosphates (0.07. and 0.15 $mg.l^{-1}$) occurred, but they did not exceeded the agreed limit value. All monitored parameters meet the agreed limits for ground water quality listed in **Table 4-3**.

Waterworks at Vojka – No. 467 and Bodíky – No. 485

The groundwater quality in waterworks at Vojka and Bodíky is strongly influenced by local conditions. The groundwater chemical composition on these waterworks noticeably differs in few components only. Slight differences occur in sulphates, nitrates, and occasionally chlorides, which are higher in the waterworks at Vojka. For the waterworks at Bodíky higher concentrations of ammonium ions, hydrogen carbonates and water temperature values are characteristic. Significantly higher in long-term are the concentrations of manganese. These exceed the agreed limit in each determination, which was confirmed also in the year 2013. The manganese content varied up to 0.92 $mg.l^{-1}$. The dissolved oxygen content is low in long-term on both waterworks. In the waterworks at Bodíky it is the lowest from among all evaluated waterworks. Slight improvement in redox conditions was registered in the period 2007-2013 on waterworks at Vojka (No. 467), where the dissolved oxygen content has slightly increased and vary up to 3.61 $mg.l^{-1}$. Concentrations of manganese, ammonium ions, phosphates, iron and since 2003 also the values of COD_{Mn} are low at Vojka and mostly fluctuate below the detection limits. Such low values at Bodíky are characteristic only for phosphates and since 2013 also for COD_{Mn} and occasionally for iron. Nitrate concentrations at Vojka oscillates around 3 $mg.l^{-1}$, at Bodíky they decreased and since 2008 varies below the detection limit (1 $mg.l^{-1}$). In the evaluated year in case of phosphates higher concentrations were recorded (above the detection limit): at Bodíky (0.09 $mg.l^{-1}$) and at Vojka (0.12 and 0.062 $mg.l^{-1}$). Exceedance of the agreed limits in 2013 was registered only in case of manganese on the waterworks at Bodíky.

Based on the above assessment it can be concluded that the quality of groundwater in the monitored waterworks is stable in long-term and generally complies with the agreed limits for drinking water (**Table 4-3**). Exceedances of limits occurs in case of manganese and iron. The manganese content exceeds the agreed limit in the waterworks at Bodíky in each determination, and occasionally also in the waterworks at Kalinkovo. In the year 2013 at Kalinkovo two concentrations above the limit value were recorded. Except the manganese no other exceedances of agreed limit values occurred in waterworks in the evaluated year.

Based on long-term measurements it can be stated that the organic pollution, expressed by COD_{Mn}, decreased during the observed period. From among 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 at Bodíky and Kalinkovo the ammonium ions fluctuate above the detection limit, but do not exceed the limit value agreed for this groundwater quality parameter. During the evaluated year, unusually, several higher concentrations of phosphates occurred (at Šamorín and Bodíky one value, and at Gabčíkovo and Vojka two values), but they still meet the limit value. The highest contents of nitrates (up to 21.7 $mg.l^{-1}$), with strong seasonal variation, are registered on waterworks Pečniansky les, due to its location near the Danube. On the other objects the nitrate content recently varies at low level, from 3 to 8 $mg.l^{-1}$ or lower (at Rusovce and Bodíky).

The groundwater quality in observation objects that are evaluated in the National Report is more influenced by local conditions. Monitoring results show that the agreed limits are exceeded more frequently compared to the waterworks. Exceedances occur in case of ammonium ions, manganese and iron. Concentrations of all other analysed components of groundwater quality in observation objects in the year 2013 meet the agreed limits for drinking water quality.

Inorganic and organic micro-pollution is monitored at selected observation objects (No. 888, 872, 329, 170, 234, 262 and 265). In 2013 the organic and inorganic micro-pollution was found in concentrations below the limit values for groundwater quality evaluation (**Table 4-3**). From among the inorganic micro-pollutants the zinc, copper, cadmium, chromium, nickel and lead concentrations indicate slight pollution at some observation objects. The arsenic and mercury contents in the evaluated year did not reached the level of detection limit.

Table 4-3: Groundwater quality limits for drinking purposes

Basic parameters - physical and chemical parameters

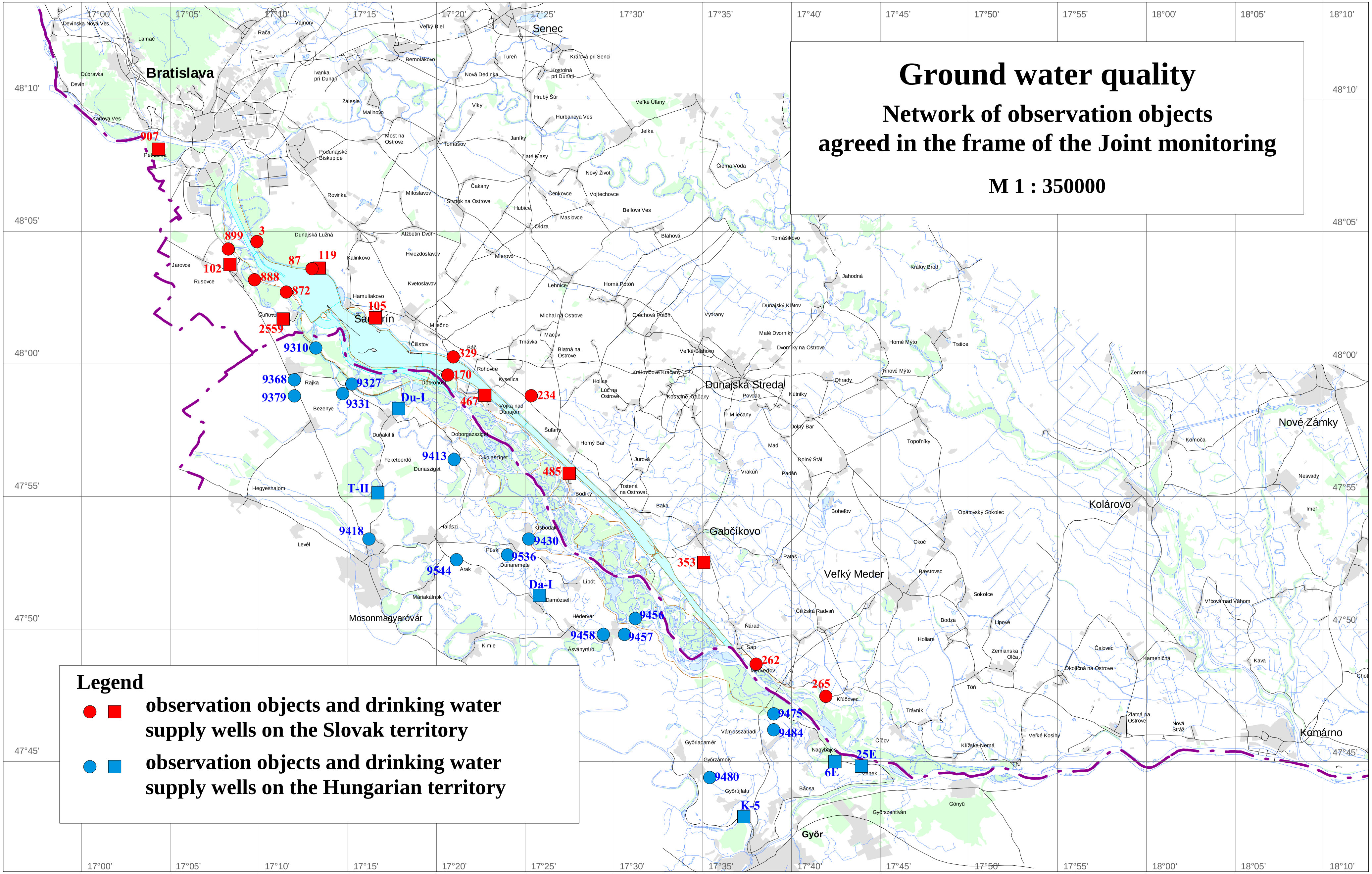
parameter	unit	limit value	highest limit value
temperature	°C	12	25
pH	-	6.5-9.5	
conductivity at 25 °C	$mS.m^{-1}$	250	
O_2	$mg.l^{-1}$	-	
COD_{Mn}	$mg.l^{-1}$	3	5
NH_4^+	$mg.l^{-1}$	0.5	
NO_3^-	$mg.l^{-1}$	50	
PO_4^{3-}	$mg.l^{-1}$	0.5	
Mn	$mg.l^{-1}$	0.05	
Fe	$mg.l^{-1}$	0.2	
Na^+	$mg.l^{-1}$	200	
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	$\mu g.l^{-1}$		Σ ≤0.03
dieldrin	$\mu g.l^{-1}$		
heptachlor	$\mu g.l^{-1}$		0.03
heptachlor epoxide	$\mu g.l^{-1}$		0.03
trichloroethylene	$\mu g.l^{-1}$		Σ ≤10
tetrachloroethylene	$\mu g.l^{-1}$		
DDT/DDD/DDE	$\mu g.l^{-1}$	1	5
HCH – sum	$\mu g.l^{-1}$		Σ ≤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
9480
K-5
6E
25E

PART 5

Soil Moisture Monitoring

5.1. Data collection methods

Soil moisture monitoring during the whole period of observation is carried out without changes. Slovak Party measures the soil moisture by a neutron probe to a prescribed depth or to the depth of the groundwater level. The Hungarian Party measures the soil moisture with a capacity probe to a maximum depth of 3 m. Soil moisture is expressed by the total soil moisture content in volume percentage. Measurements are performed at 10 cm depth intervals. There are 20 monitoring areas on the Slovak side (12 forest monitoring areas, 5 biological monitoring areas and 3 agricultural areas) – **Table 5-1**. On the Hungarian side there are 14 monitoring areas (6 forest monitoring areas and 8 agricultural areas) – **Table 5-2**. In the year 2013 only two measurements of soil moisture were carried out on the Hungarian side, therefore the soil moisture development in 2013 could not be evaluated. The situation of observation objects is shown in **Fig. 5-1**.

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

	Country	Station No.	Locality and position
1	**Slovakia**	**2703**	Dobrohošť, inundation area (not monitored in2012)
2	**Slovakia**	**2704**	Bodíky, inundation area (not monitored in2012)
3	**Slovakia**	**2705**	Bodíky, inundation area (not monitored in2012)
4	**Slovakia**	**2706**	Gabčíkovo, inundation area (not monitored in2012)
5	**Slovakia**	**2707**	Kľúčovec, inundation area (not monitored in2012)
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 (not monitored in2012)
20	**Slovakia**	**3805**	Kľúčovec, inundation area

Table 5-2: List of monitoring stations on the Hungarian side

	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

	Country	Station No.	Location
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

5.2. Data presentation methods

The mode of presentation of soil moisture content 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. In case of Hungarian data the value for a depth interval under 110 cm may represent the average value for less than 10 measured values. At selected sampling sites the exact soil moisture measurements are presented in colour charts with soil moisture time distribution for the entire monitoring period and for the entire measured depth. Monitoring data are processed completely in the National Annual Reports on environmental monitoring and the graphical presentation of each of the monitoring sites is given in Annexes. In the year 2013 Hungarian data were not evaluated due to small number of measurements.

5.3. Evaluation of results on the Hungarian side

In the year 2013 only two soil moisture measurements were carried out on the Hungarian side. Measurements were carried out at forest monitoring sites in the floodplain area and at agricultural sites in the flood-protected area (**Fig. 5-1**). In general the moisture conditions of soils are essentially influenced by rainfall conditions, thickness and composition of the soil layer, as well as by the position of the groundwater table. Due to low number of measurements it was not possible to evaluate the soil moisture development or to compare results with previous years.

5.4. Evaluation of results on the Slovak side

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

Monitoring sites located in the agricultural area

The soil moisture at monitoring sites located behind the derivation channel in the agricultural area (sites No. 2716, 2717, 2718) is stable during the entire observation period. Since 2004, slight increase in the soil moisture content can be seen, while the groundwater level position and fluctuation remained mostly unchanged. In the last three years (2011-2013), however, slight decrease of groundwater level can be seen, especially on sites No. 2716 and 2718 (**Fig. 5-2**). At the monitoring site No. 2716 the groundwater level fluctuated in depths of 2.8-4.3 m. Contrary to the years 2011 and

2012 it rose above 3.0 m, however the water level at the end of the year reached the lowest values since 1990 (**Fig. 5-2**). The groundwater level at site No. 2717 fluctuated in depths of 2.0-3.4 m, and contrary to the two other monitoring sites the water level fluctuates in the same range in long-term (**Fig. 5-3**). At monitoring site No. 2718 the groundwater level fluctuated in depths of 2.0-3.2 m, and similarly to the site No. 2716 slight decrease can be seen in last three years. At all three monitoring sites the flood wave in June had a significant influence on groundwater level.

In the year 2013 the fluctuation of soil moisture content in both depth intervals depended on climatic conditions, however during the flood in June layers in the depth around 2 m were partially influenced by the groundwater level (**Fig. 5-2, 5-3**). The average soil moisture content in the depth to 1 m in the year 2013 fluctuated in the range from 4.80 to 20.17 % at monitoring site No. 2716, in the range from 19.91 to 30.99 % at monitoring site No. 2717, and in the range from 24.46 to 34.09 % at monitoring site No. 2718. By comparing these values with the previous year, it can be stated that the minimal soil moisture contents in 2013 were lower, except the site No. 2718. Regarding the maximal values it can be stated that the soil moisture content at all three sites was similar or higher. Soil layers were well supplied during the winter period. The soil moisture content started to decrease significantly in April and the decline continued without major fluctuations until the end of August, when the lowest soil moisture contents in 2013 were recorded. The soil moisture content began to rise in September and the increase continued till the end of the year. Maximal average values were recorded in February 2013. In the depth between 1 and 2 m, the soil moisture content varied from 10.48 to 20.85 % at monitoring site No. 2716, in the range from 23.86 to 28.77 % at monitoring site No. 2717, and in the range from 8.23 to 28.34 % at monitoring site No. 2718. When comparing these values with the previous year it can be stated that the minimal and maximal values were higher, except the maximal value at site No. 2717. The minimal average values on sites No. 2716 and 2718 were recorded at the beginning of the year in January, on the site No. 2717 it was at the end of the year in December. Maximal average value on the site No. 2716 occurred at the end of March, on the site No. 2717 in February and on the site No. 2718 during the flood wave in June.

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	4.80	20.17	10.48	20.85
2717	19.91	30.99	23.86	28.77
2718	24.46	34.09	8.23	28.34

Monitoring sites located in the inundation area

The soil moisture in the inundation area, along with the groundwater level and precipitation, is highly dependent on natural or artificial floods. In the year 2013 extremely large flood occurred in June, when the inundation area was flooded from 3 to 16 days. Except this big flood another small flood occurred in January and several discharge waves occurred during the year. In general the soil moisture content started to rise at the beginning of the year, thanks to the small flood wave in January. The decrease started in April, but it was interrupted by flooding of the inundation area. After the flood wave the soil moisture sharply decreased. The soil moisture in July and August was adversely affected by low flow rates in the Danube, which, together with high air temperatures caused the decrease of its content. On most of monitoring sites minimal values occurred in August and September. The maximal average values occurred just after the flood wave in June, but high values were registered also during the winter period in February and March. Concerning the minimal and the maximal average values it can be generally stated that they were higher than in the previous year on most of monitoring sites.

The thickness of soil profile at monitoring sites No. 2703, 2764, 2763, 2762 and 2761 in the upper part of the inundation area is low, similarly to the Hungarian side. The groundwater level at these places fluctuates only in the gravel layer. In 2013 the groundwater level on area No. 2703 fluctuated from 3.3 to 5.2 m, on areas No. 2764, 2763, 2762 and 2761 it changed from 1.6 to 4.6 m. However, it have to be mentioned, that during the flood in June these sites were covered by water for 3-6 days. Layers to 1 m depth are strongly dependent on climatic conditions, however the flood wave had a great influence on groundwater level and the soil moisture content. Layers below 1 m depth were also influenced by the groundwater at the time of the flood wave. Maximal average soil moisture contents occurred after flooding the area, minimal average values occurred in August or at the end of the year (October and November).

The thickness of the soil profile in the middle part of the inundation area is higher. In general the groundwater regime in this region is influenced by the water supply of the river branch system, introduced in May 1993. Moreover, the natural or artificial floods have significant influence on the groundwater level. The groundwater level in 2013 fluctuated slightly above the boundary between the soil profile and gravel layers - monitoring sites No. 2704, 2705, 2757, 2758, 2759, 2760 (**Fig. 5-5**) and partially supplied the soils with water in the vegetation period. During the year the groundwater level on area No. 2704 fluctuated from 2.5 to 4.0 m, on areas No. 2705, 2757, 2758, 2759 and 2760 it changed from 1.4-3.3 m (**Fig. 5-4a, Fig. 5-5**). Also this part of inundation was flooded during June and monitoring sites were covered by water 6-12 days. The maximal values of average soil moisture content in both, in the layer down to 1 m depth and in the layer below 1 m depth occurred just after the flood wave in June, but high values were registered also in February and March. Minimal values were mostly reached in October and December 2013 (**Fig. 5-4b**).

In the lower part of 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. 5-6**). Monitoring sites were flooded during the flood wave in June for about 16 days. Due to riverbed erosion the groundwater level, except the flood wave, fluctuated in the depth between 1.0 and 4.3 m. As a result of this, the soil moisture in the second half of the vegetation period was mostly dependent on precipitation and the soil moisture content at the end of August significantly decreased. Minimal values in the depth below 1 m occurred in October. The soil moisture content on these monitoring sites significantly fluctuate during the year, due to significant fluctuation of groundwater level (**Fig. 5-6a,b**).

The soil moisture contents at monitoring sites No. 2712, 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 maximum average values in 2013 in both, the layer down to 1 m depth and in the layer between 1 and 2 m depth, occurred in June, while the minimum values occurred at the end of August and early September. The groundwater level at monitoring sites No. 2707, 3804 and 3805 fluctuated in the depth 0.7-3.7 m, but during the flood wave in June the monitoring sites were covered by water. The riverbed erosion negatively influences also these monitoring areas. During low flow rates 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	9.42	26.16	15.26	30.45
2704	13.68	35.34	20.60	37.23
2705	34.47	46.64	37.15	42.34
2706	9.26	35.40	22.45	37.55
2707	8.92	25.23	14.28	28.71
2755	16.11	51.69	8.25	42.13
2756	18.22	34.87	30.54	45.52
2757	21.46	46.17	14.58	41.18
2758	36.08	43.95	20.62	45.02
2759	16.46	39.53	28.66	38.70
2760	15.76	36.79	10.51	24.56
2761	10.99	30.70	4.77	8.18
2762	21.92	33.99	24.97	41.52
2763	9.07	24.95	3.59	11.64
2764	17.17	32.00	6.22	24.41
3804	33.92	38.64	37.57	38.84
3805	27.46	43.98	18.42	41.30

Fig. 5-1

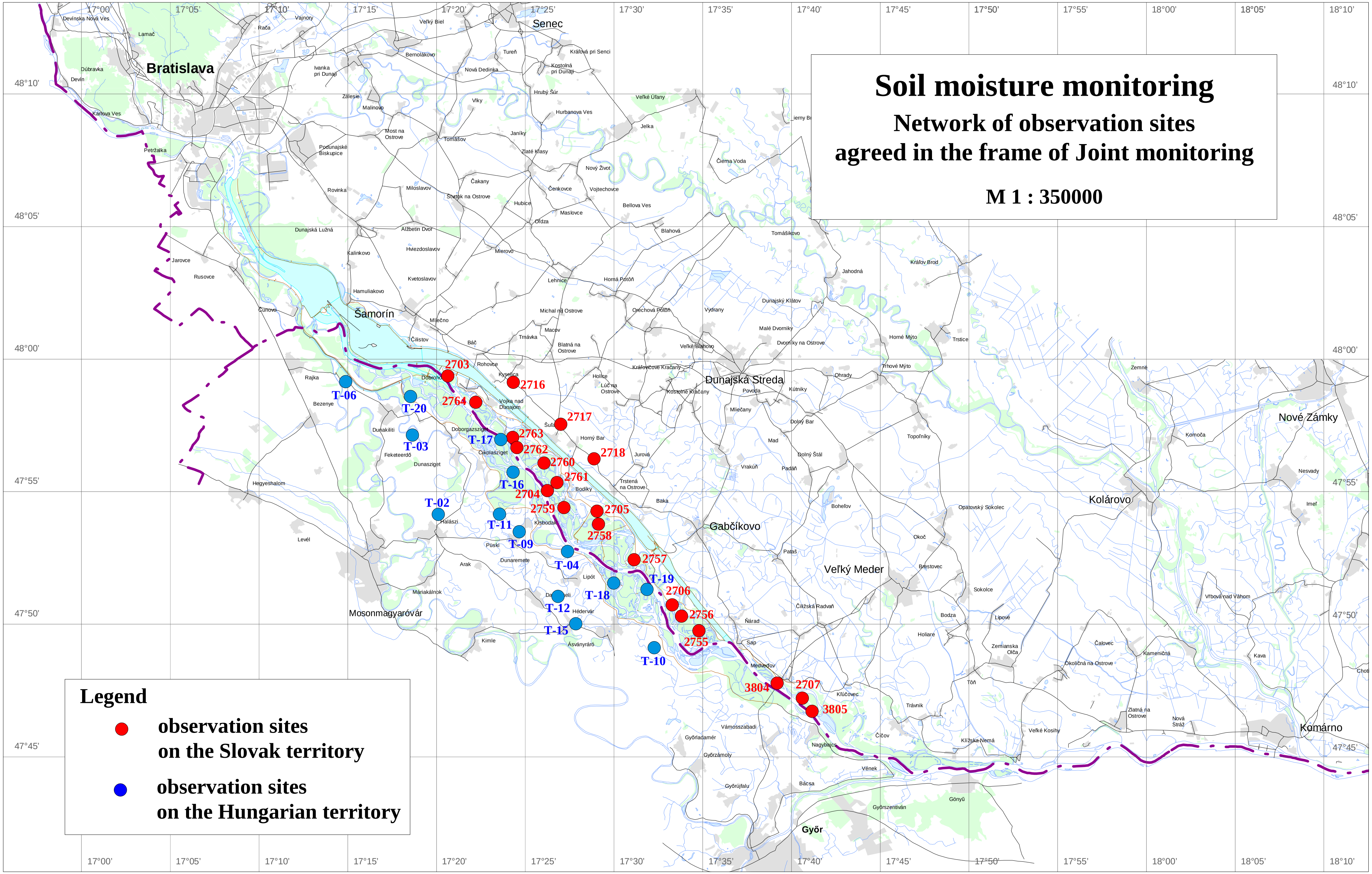
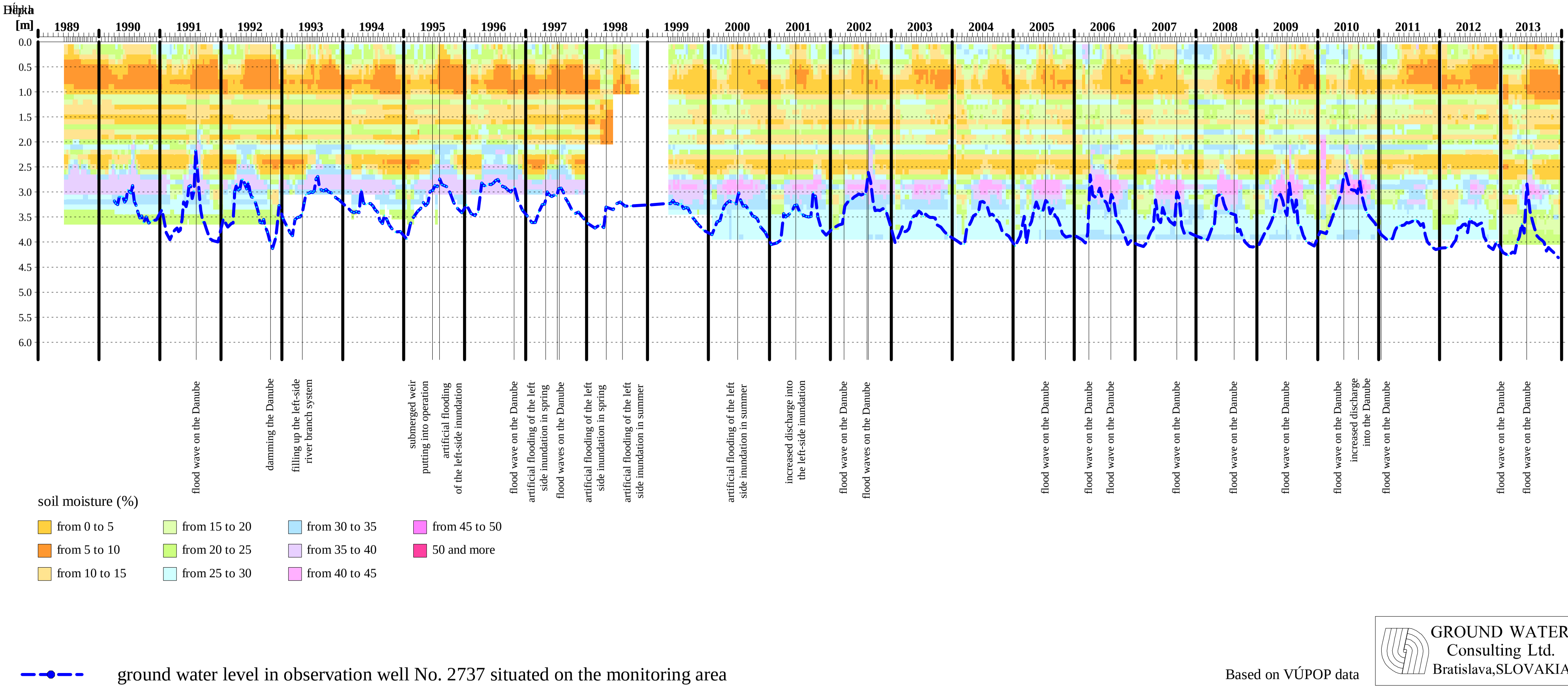

Soil moisture monitoring
Network of observation sites
agreed in the frame of Joint monitoring
M 1 : 350000
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
2703
2716
2764
2717
2763
2762
2760
2718
2761
2704
2759
2705
2758
2757
2706
2756
2755
3804
2707
3805
T-06
T-20
T-03
T-17
T-16
T-02
T-11
T-09
T-04
T-18
T-19
T-12
T-15
T-10
Legend
observation sites on the Slovak territory
observation sites on the Hungarian territory

Fig. 5-2 Soil moisture monitoring

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



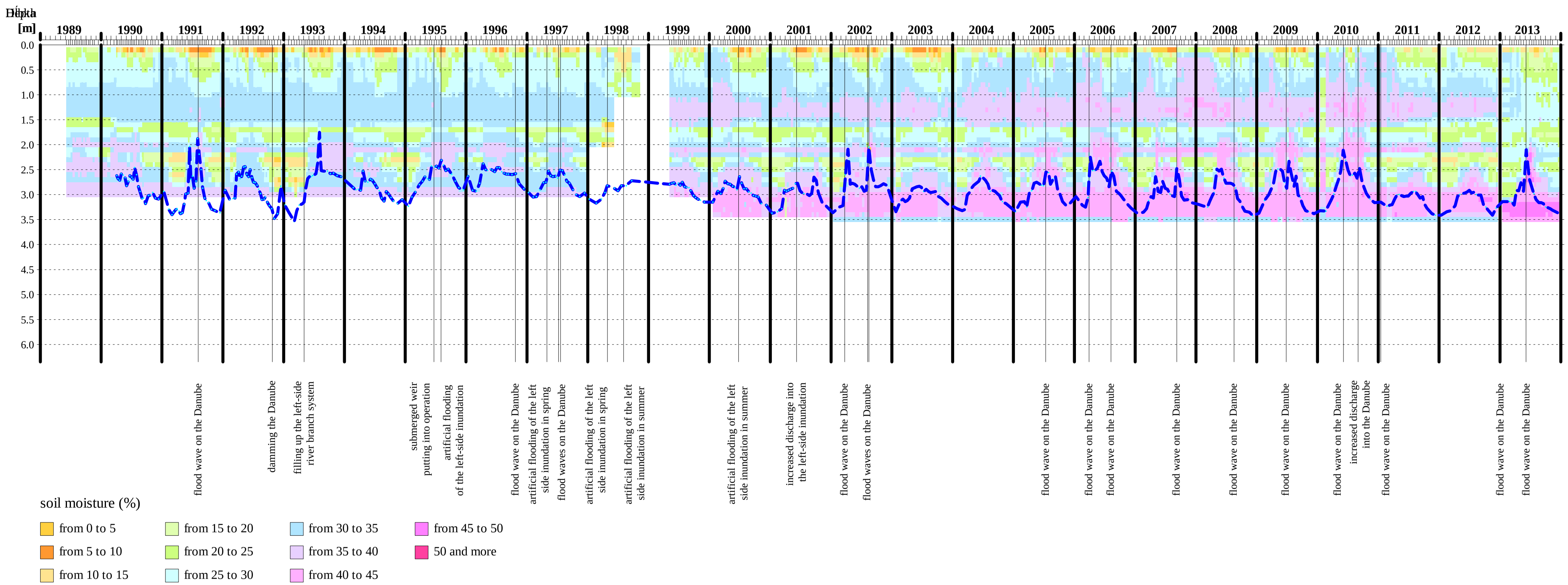
Based on VÚPOP data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-3

Soil moisture monitoring

Locality: **2717 - Horný Bar - Šuľany, MP-5**



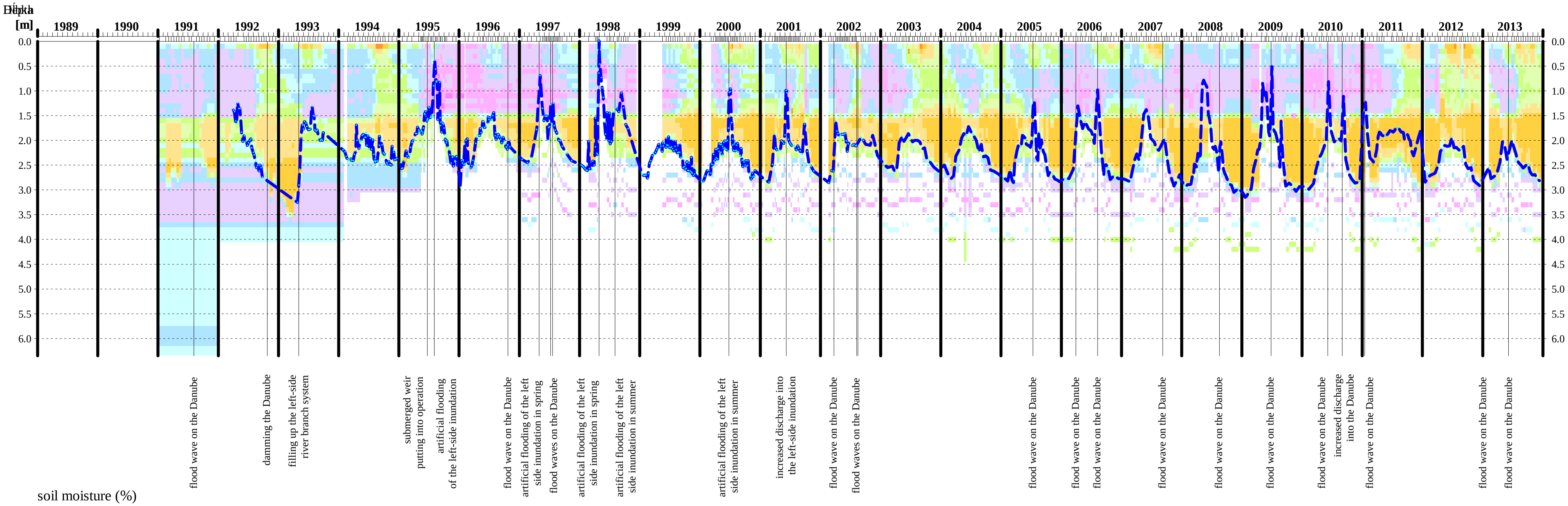
ground water level in observation well No. 2737 situated on the monitoring area

Based on VÚPOP data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-4a Soil moisture monitoring

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



soil moisture (%)

- from 0 to 5
- from 5 to 10
- from 10 to 15
- from 15 to 20
- from 20 to 25
- from 25 to 30
- from 30 to 35
- from 35 to 40
- from 40 to 45
- from 45 to 50
- 50 and more

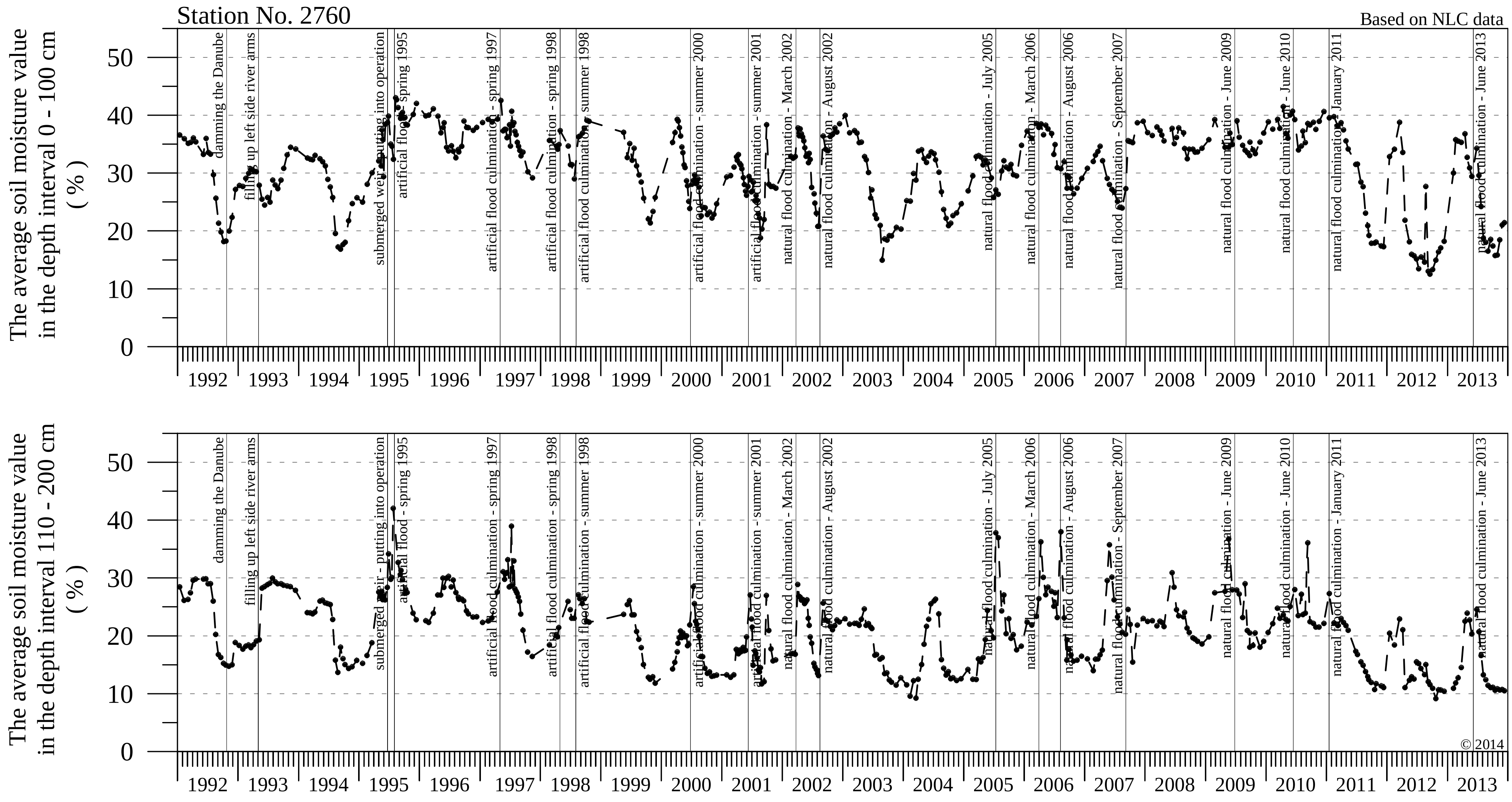
ground water level in observation well No. 2784 situated on the monitoring area

Based on NLC-LVÚ data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-4b

Soil moisture

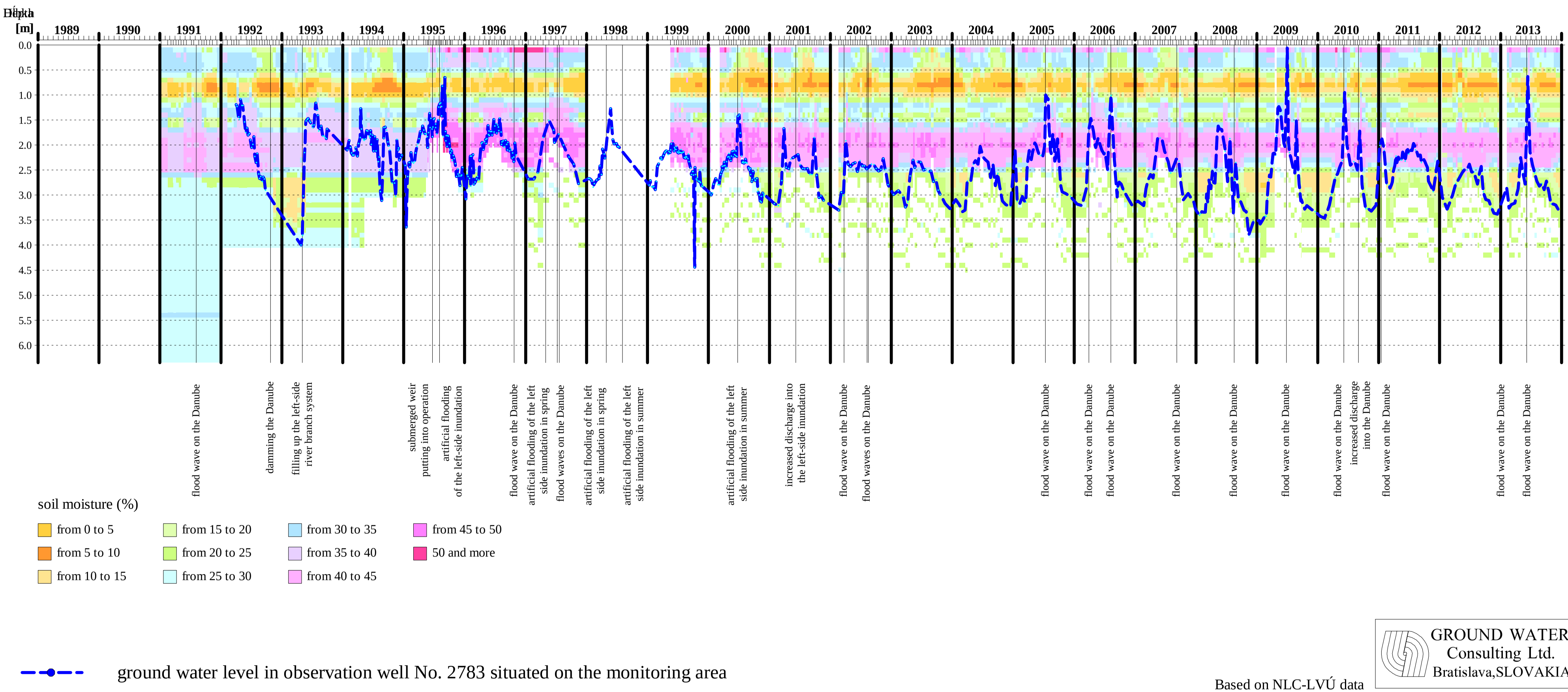


GROUND WATER
Consulting Ltd.
Bratislava, SLOVAKIA

Fig. 5-5

Soil moisture monitoring

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



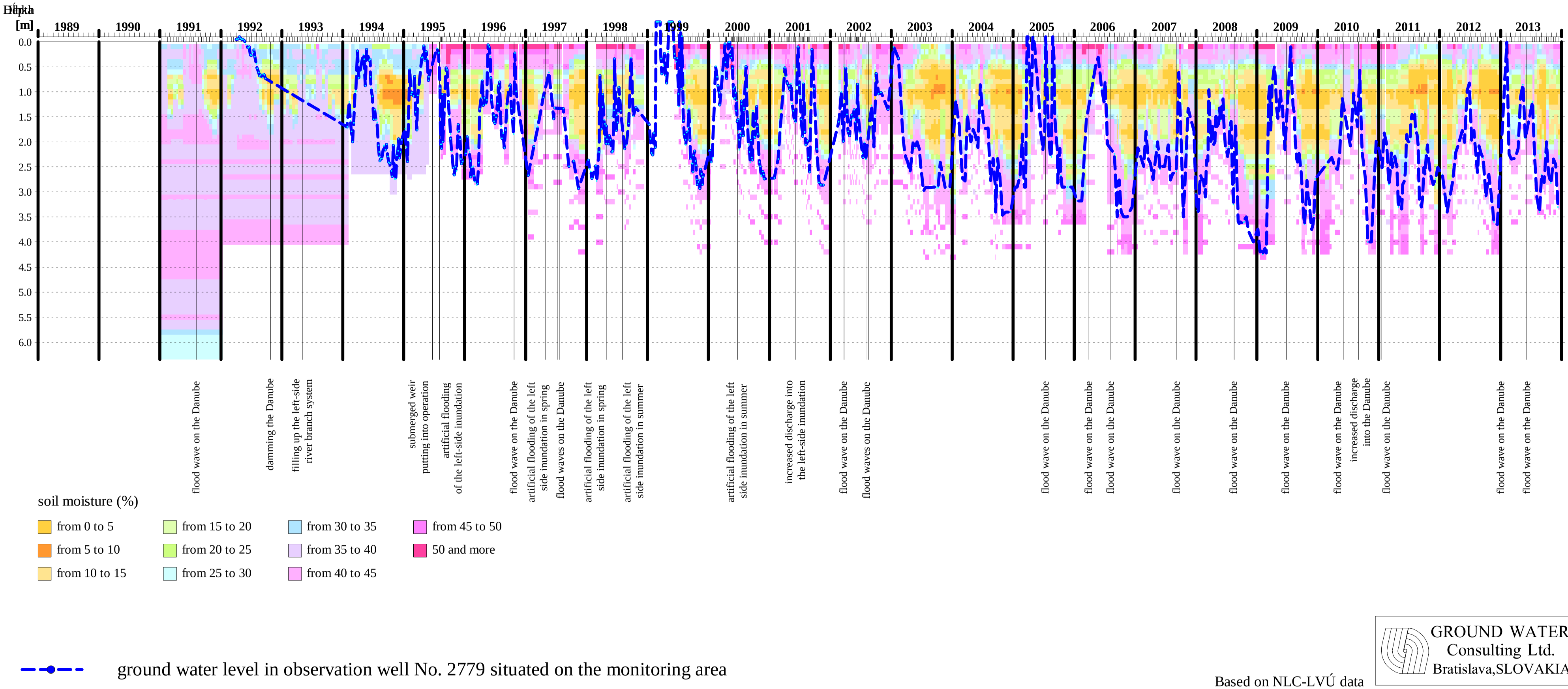
Based on NLC-LVÚ data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-6a

Soil moisture monitoring

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

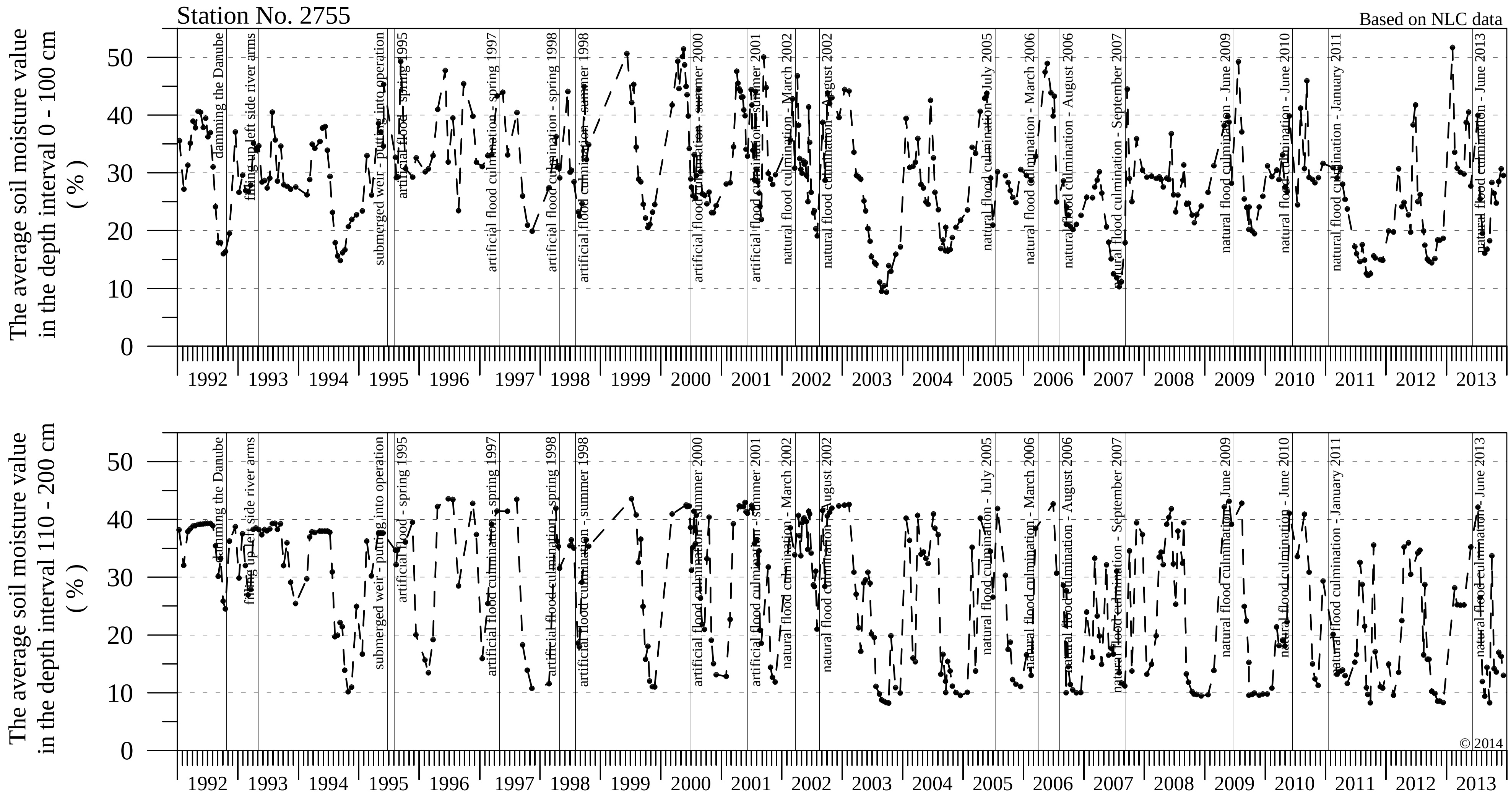


Based on NLC-LVÚ data

GROUND WATER Consulting Ltd. Bratislava,SLOVAKIA

Fig. 5-6b

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



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PART 6

Forest Monitoring

The development of forest communities, as well as plant and animal communities evaluated in Part 7 – Biological Monitoring, was influenced by under-mentioned hydrological and climatic conditions:

- The flow rate regime of the Danube was typical, during the year several flood and discharge waves occurred, from which the June flood was extremely large and it flooded the whole inundation area from approximately 3 to 16 days. Very low flow rates occurred at a turn of March and April and for longer time in July and August. Additionally, in summer months low total precipitation and very high air temperatures occurred simultaneously. The evaluated year as a whole was very warm. Air temperatures approximately from mid-April until the end of September were almost continuously above the daily averages, with an exception of the period from late May to mid-June.
- The soil moisture content during the year was very positively influenced by the extreme flood in June, but also by discharge waves at the beginning or at the end of the vegetation period, and furthermore by precipitation amounts well above the average during the winter period, at the end of the spring and at the end of the vegetation period.

6.1. Evaluation of the Slovak territory

Monitoring sites on the Slovak side are situated 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 2013 observed the development of basic growth parameters, weekly girth growth and the health state of trees by terrestrial way.

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

Area No.	Area label	River km	Locality	Tree species	Age of the trees
2681	L-3	1812	Sap	poplar - *Populus x euroamericana Pannonia*	11
2682	L-4	1816	Gabčíkovo	poplar - *Populus x euroamericana Pannonia*	6
2683	L-5	1821.5	Baka	poplar - *Populus x euroamericana Pannonia*	7
2684	L-6	1824.5	Trstená na Ostrove	poplar - *Populus x euroamericana Pannonia*	10-(12)
2685	L-7	1828.5	Horný Bar – Bodíky	poplar - *Populus x euroamericana Pannonia*	15
2686	L-8	1831.5	Horný Bar – Šuľany	poplar - *Populus x euroamericana Pannonia*	8
2687	L-9	1830	Horný Bar – Bodíky	poplar - *Populus x euroamericana Pannonia*	14
2688	L-10	1834	Vojka nad Dunajom	last unsuccessful reforestation done in 2008	-
5573	L-10a*	1834	Vojka nad Dunajom	poplar - *Populus x euroamericana I-214*	cca 20
2689	L-11	1834.5	Vojka nad Dunajom	poplar - *Populus x euroamericana Pannonia*	(12)-14
2690	L-12	1838	Dobrohošť	last unsuccessful reforestation done in 2006	-
4436	L-12b*	1838	Dobrohošť	poplar - *Populus x euroamericana I-214*	cca 41
3802	L-25	1806	Medveďov	poplar - *Populus x euroamericana Pannonia*	19
3803	L-26	1803	Kľúčovec	poplar - *Populus x euroamericana Giant*	17

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

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

The development of forest stands in the evaluated year did not show significant differences in comparison with the previous years.

The height increment quality classification in most of observed forest stands remains basically unchanged. Majority of stands is characterized by intensive or moderate growth increment, however on several monitoring stands slight gradual decrease in increment intensity can be seen, probably because of achieving the peak age. The most significant decline in growth increment was registered in a young poplar stand on area No. 2682, where the intensity of height increment in last two years have decreased from the quality level 40 to 36 for poplar I-214.

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 increment values of young poplars at individual areas are moderately high. The development of weekly girth growth increments clearly demonstrated that the diameter increment intensity significantly increased after the subsidence of the June flood. Throughout July the most intensive growth was registered. The monitoring areas No. 2688 and 2690, after unsuccessful attempts on reforestation, were not planted yet and the girth growth measurements are carried out on substitutive areas No. 5573 and 4436. When the observation has started on substitutive areas the cumulative increments were relatively high. In following 3-4 years they decreased significantly, but in the evaluated year the girth growth was again intensive. The reason of this fluctuation has not yet been revealed. In general, the growth of trees in 2013 was intensive in first months of the vegetation period. During the flood the growth slowed down significantly, but after the flood in July it achieved very high values. Values in August and September were already at the level of previous years. The occurrence of zero weekly girth growth increments during the vegetation period were not recorded on most of observed stands. The growth period was quite long again in the evaluated year. The initiation of growth in all stands was recorded in early or mid April. The growth on several trees ended in the second half of September, but many of them have grown even at the time of resuming the observation at the end of September. At the evaluated year a clear growth peak could be identified in July, after the long-lasting flooding of the inundation area, but higher values were recorded also in August.

The monitored cultivated poplar stands (Pannonia and Giant clones) were without changes healthy and vital. Stronger attack by diseases and pests was not registered, also thanks to favourable weather conditions in the evaluated year.

The current problem is the wide spreading of invasive plant species (Himalayan balsam (*Impatiens glandulifera*), Giant goldenrod (*Solidago gigantea*) and Common ragweed (*Ambrosia artemisiifolia*)) on the large part of the observed inundation area. Besides the statutory methods of their removal, which can be inefficient or unusable due to the large-scale spreading or higher degree of protection of the area, it can be confirmed, based on the monitoring results in the evaluated year, that flooding significantly reduces or even eliminates the spreading of these invasive plants.

At the end it should be noted again that the overall tendency in groundwater levels at most of observed sites is decreasing in long-term. For this reason it is necessary to emphasize the efficient use of existing weirs in the river branch system to mitigate the effects of groundwater level decline and to ensure annual artificial flooding of the area. It is also necessary to ensure the an earlier increase of discharges to the river branch system, before the start of growing season. Results of forest monitoring have to be taken into account in proposals of hydrotechnical, silvicultural or ecological measures, or they may be useful for their efficiency improvement.

6.2. Evaluation of the Hungarian territory

In the year 2013 the forest monitoring in the Szigetköz continued. Dendrometric characteristics and the health status of the forest stands were observed on 14 monitoring plots on the Hungarian side, which are situated in the inundation area (**Fig. 6-1**) and listed in **Table 6-2**. The dendrometric characteristics consist of diameter measurement at breast height and height measurement within the observed plot. In addition, weekly girth growth increments were observed during the vegetation period (plots Dunasziget 16A, Dunasziget 22C - two sub-areas).

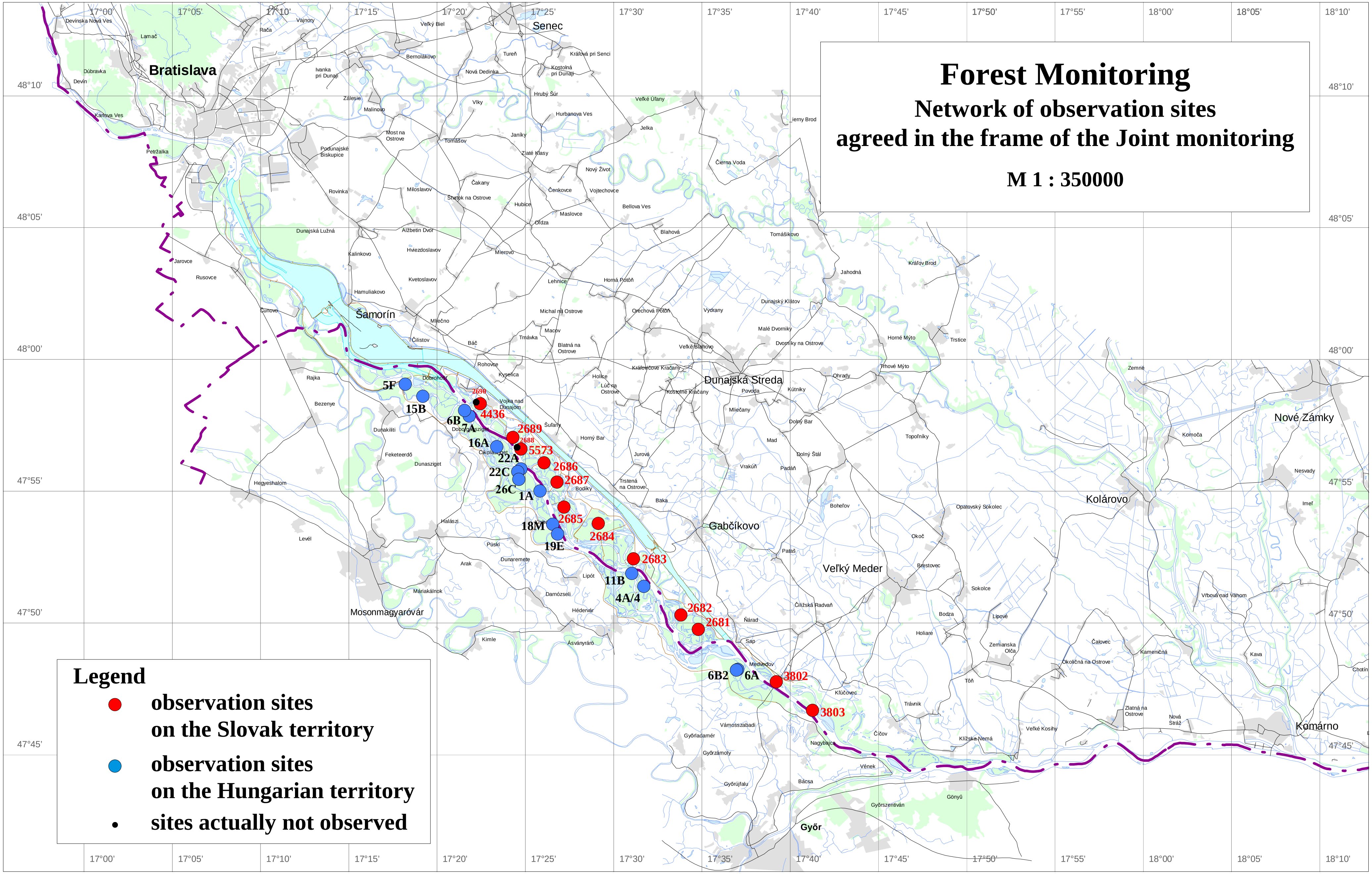
Table 6-2: List of the forest monitoring areas on the Hungarian side

No.	Observation object	Location	Tree species	Age
1	9994B	Dunasziget 22C	oak-ash mixed stand	58
2	9980	Lipót 4A/4	poplar “I-214”	28
3		Dunakiliti 15B	poplar “Pannonia”	26
4		Dunakiliti 5F	poplar “I-58/57”	25
5	9994A	Dunasziget 22A	poplar “Pannonia”	25
6	9500	Dunasziget 26C (25C)	poplar “Pannonia”	24
7		Dunasziget 7A (4A)	poplar “Pannonia”	23
8		Dunasziget 6B (5B)	poplar “Pannonia”	17
9	9508	Győrzámoly 6A (7A)	poplar “Robusta”	33
10		Győrzámoly 6B2	poplar “Pannonia”	17
11		Kisbodak 18M (15I)	poplar “Kornik”	18
12		Kisbodak 19E (16T)	white willow	24
13		Kisbodak 1A	poplar “Pannonia”	20
14		Lipót 11B	poplar “I-58/57”	25
15		Dunasziget 16A	poplar „Pannonia“	28

Based on the current growth characteristics of forest stands it can be stated that no new phenomenon have been registered in terms of forest stand development, which would differ from the trends of previous years. Growth characteristics of forest stands developed in accordance with the expected growth, the occurrence of dead trees was negligible.

Poplar stands dominate on monitoring plots, what correspond to the current tree composition in the Szigetköz area. Cultivated poplar “Pannonia” forms the largest portion of forest stands.

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
observation sites
on the Hungarian territory
sites actually not observed
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr
5F
15B
6B
7A
16A
22A
22C
26C
1A
18M
19E
11B
4A/4
6B2
6A
2690
4436
2689
2688
5573
2686
2687
2685
2684
2683
2682
2681
3802
3803
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 7

Biological Monitoring

In the year 2013 the monitoring of agreed groups of plants and animals was carried out on both, Slovak and Hungarian territory. An exception is the monitoring of macrophytes and dragonfly community, which was suspended or evaluated with different methodology (under WFD) on the Hungarian territory. The biological monitoring on the Slovak territory was performed on six complex monitoring areas (**Fig. 7-1**). The same groups of fauna and flora, agreed in the frame of joint monitoring, were observed on 23 monitoring sites on the Hungarian territory (**Fig. 7-1**). List of complex monitoring areas on the Slovak territory and monitoring sites on the Hungarian territory is given in **Table 7-1**.

Table 7-1: The list of monitoring areas in the year 2013

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													
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 channel						▪				
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 channel						▪				
22		GAZ	Gázfűi Danube, Galambos					x	x	x	x		
23		MOS	Mosoni Danube, Szilos					x	x	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 (Kohler, on the Slovak side 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)

Regarding the tendency of development in observed groups it should be noted however, that the biological monitoring on the Hungarian territory has been suspended in 2012, so data from this year missing.

A short description of climatic and hydrological conditions in the year 2013, 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

Phytocoenoses on monitoring plots No. 2600, 2604 and 2612 can be regarded as stabilised in recent years. Significant changes on other areas have been caused by forestry interventions.

On the area No. 2600 community of the driest type of floodplain forest occur. In the evaluated year the moisture conditions of the area were improved by restoration measures. The peripheral river arm and also the central depression is permanently supplied with water from the supply canal at Dobrohošť. Furthermore, a significant impact in terms of vegetation also had the extraordinary flood in June. The tree layer slowly dries up; the shrub layer dominates. Although the herb layer was closed in the spring, its partial destruction has been observed in the summer by flood and excavation works. After this disturbance several synanthropic species appeared, but their survival in the following years is not expected.

Phytocoenosis on the monitoring area No. 2604 is basically stabilised, significant changes are not obvious in terms of species composition, or tree and shrub layer coverage. Closure of the herb layer appeared later due to the flood in June. In terms of species composition it was created by native nitrophilous and strongly hydrophilic species. Invasive species were again eliminated by flooding.

The species composition and the coverage values of individual layers of soft-wood forest on the area No. 2612 are mostly similar in recent years. In the evaluated year more significant change was registered in the herb layer coverage due to the extreme flood. In terms of species composition it can be stated, that native nitrophilous species better survived the flood in June and the periodic flooding contributes to long-term absence of invasive species.

In the poplar stand on area No. 2603 thinning was realised in the previous year, what almost eliminated the shrub layer. The vegetation in the evaluated year was disturbed by pulling strains, thereby the herb layer coverage was significantly reduced during the summer. In terms of species diversity of this layer a gradual retreat of synanthropic and invasive species, which appeared after thinning, is registered. Furthermore, a positive fact is that the flood in June contributed to the strong decline of the invasive Himalayan balsam (*Impatiens glandulifera*), which has dominated in the spring.

On areas No. 2608 and 2609 there are young stands, which gradually closes. The planted cultivated poplars on area No. 2608 still creates only the shrub layer, which has very low coverage. Poplars on the area No. 2609 has already been gradually reassigned from the shrub to the tree layer since the previous year, and the tree layer currently achieves a relatively high coverage, therefore, the shrub layer ceased to exist. In the herb layer on area No. 2608 the persistence of current trends can be confirmed; the dominance of native nitrophilous species and the retreat of ruderal species. A positive fact is the appearance of hydrophytes. In the plant undergrowth on the area No. 2609 the neophytic aster (*Aster lanceolatus*) and the indigenous marshy summer snowflake (*Leucojum aestivum*) and the nitrophilous dewberry (*Rubus caesius*) species dominate again. Spreading of invasive species is still not noticeable.

The right-side river branch system

In recent years a group of trees of ash-leaved maple (*Acer negundo*) gradually grow wider and wider on the site No. 28b (Dunasziget - meadow), thereby the meadow area decreases. Without anthropogenic intervention the former homogeneous meadow gradually transforms into maple forest. In terms of herbaceous species in the meadow the giant goldenrod (*Solidago gigantea*) dominated also in the evaluated year. The herb layer was closed, but its height was lower due to flooding and the following dry period. Tree layer on the site No. 28a (Dunasziget - forest) do not show significant changes in recent years. The herb layer was flooded in June and the coverage in July reached only 30-40 %. The poplar stand on the site No. 30 was clear-cut in 2011 and the area was subsequently planted with oak seedlings (*Quercus robur*). Their coverage in the evaluated year already achieved 20 %, trees reached up to 1.5 to 2 meters. After the clear-cut two years ago, a complete transformation of the plant undergrowth has been observed, currently weed and ruderal species still continues to dominate. In the oak-hornbeam forest area on the site No. 31 strengthening of the shrub layer continued. Clearings, which were created after dying out of trees in the neighbouring forest stand, are currently overgrown with dense shrub layer, formed mainly by field maple (*Acer campestre*). The retreat of herbaceous species is already significant.

7.2. Terrestrial molluscs

The left-side river branch system

The terrestrial mollusc's communities are stabilized on areas No. 2600, 2604 and 2612, and in the evaluated year they were favourably affected by the flooding. The malacocoenosis of the area No. 2600 has a character of the driest type of soft (or transitional) lowland forest. Its structure is stable with slight inter-annual fluctuations; species of degraded habitats and an euryoecious representative dominate at present.

Hygrophilous species still survive and the penetration of alien species is insignificant in long-term. Changes evoked by the flow restoration in the adjacent river arm and subsequent water supply in a part of the monitoring area has not yet appeared, due to the location of the observed site. The community on the area No. 2604 still has a significant wetland character and represents the wettest variant of a floodplain forest, with high species richness and dominance of forest hygrophilous and polyhygrophilous species and presence of rare and precious wetland species. Even after forestry interventions realised in previous years the presence of forest mesohygrophilous and euryoecious representatives remained low; signs of ruderalisation did not appeared. On the area No. 2612 stabilised malacocoenosis is registered, however in terms of the species composition it is not typical for softwood floodplain forest. Thanks to the flood in June two polyhygrophilous and one hydrophilic species, which are pioneer species, dominated in the evaluated year.

The malacocoenoses on areas No. 2603, 2608 and 2609 were significantly degraded in previous years, due the clear-cutting of the forest stand. After subsequent reforestation their malacocoenoses are in various stages of regeneration. The stand on the area No. 2603 is the oldest one, its rich in species malacocoenosis currently already approaches the typical community of softwood floodplain forest. After a significant reduction of the malacocoenosis by the flood in June, the area was subsequently colonized by several polyhygrophilous and hygrophilous species. Signs of degradation in the malacocoenosis on the area No. 2608 are significant even five years after the reforestation. The malacocoenosis is poor in species (meso-hygrophilous, synanthropic and euryoecious species); most of hygrophilous species has disappeared. It is assumed, however, that in the gradually closing young poplar forest the malacocoenosis may regenerate. Its current development results from the conducted forestry intervention, not from the changed moisture conditions in the area. The regeneration of the malacocoenosis on the area No. 2609 seems again optimistic in the evaluated year. Although a typical species for anthropogenically influenced habitats dominates on the area after 6-7 years since reforestation (similarly as in the previous year), an forest hygrophilous slug also achieves high abundance, and after the flood in June also a polyhygrophilous representative and a colonising species of bare damp substrates were registered.

The right-side river branch system

Monitoring of terrestrial molluscs in the evaluated year was carried out only on two, instead of four sites on the Hungarian territory (Pálfi island in the inundation at Dunaremete and Felső forest in the flood-protected area at Rajka). Inundation area was flooded in June, sediments on the Pálfi island contained a large number of shells and live specimens. Number of registered species exceeded the total number of species found on this site throughout the observation period. Very high abundance of several representatives reflected the proportional representation of forest species living here, which was basically stable in recent years. Shells of gastropods, which were found only in a small number testified the presence of these species in the wider surroundings of the monitored site. The relatively poor in species malacocoenosis on the monitoring site in Felső forest proves the stability of the undisturbed forest in the flood-protected area. The community of gastropods shows a stable composition and significant changes are not registered even in terms of species' abundance. However, the negligible presence of anthropotolerant representatives indicates the impact of human intervention on forest land.

7.3. Aquatic macrophytes

The Danube and the right-side river branch system

Monitoring 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. However, the observation of these sites is suspended since 2011. The macrophyte monitoring in the Hungarian inundation area (sites No. 4 and 9) and in the flood-protected area (sites No. 6 and 8) have been interrupted in the year 2012. At present the observation of macrophytes is performed in the Mosoni Danube and in the right-side seepage canal at lock No. I and II. within the hydrobiological evaluation of the surface water quality according to the WFD methodology. These results are presented in Part 2 of this report named Surface water quality.

The left-side river branch system

The usually aquatic vegetation in the through-flowing river arm on the area No. 2603 have been decimated by the strong flood in June and the species of true aquatic vegetation and wetland species achieved only a negligible coverage. The development of aquatic vegetation in dead arm on the area No. 2604 was slowed down at the beginning of the summer. Later, thanks to favourable conditions hydrophytes increasingly developed, but population of wetland plants remained also preserved. This area is still rich in rare species. The observed river branch sections on the area No. 2608 were also significantly influenced by the strong flood wave. Thanks to the favourable water regime, in the sections, that have been usually uncovered in previous years, marshy species dominated and terrestrial plants occurred only sporadically. In the section leading into the Danube, which had been usually overgrown with macrophytes, only two species sporadically occurred due to the flood. The water stage in the river arm on the area No. 2612 was relatively favourable in the evaluated year, the bottom was uncovered only for a short time in the mid of summer. In the deepest part mainly the species of true aquatic vegetation occurred, with the strong dominance of hornwort (*Ceratophyllum demersum*) and along with a retreat of the invasive species *Elodea nuttallii*. Shallower sections were again richly inhabited by wetland species or annual herbs, including several protected species.

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 below the confluence of the tail-race canal and the Danube old riverbed) has been characterized by poor malacofauna in recent years, while 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. At present only the above mentioned invasive species has got regular and abundant occurrence in the Danube, although its abundance in the evaluated year was significantly decreased due to flood flow rates. The malacofauna of the Danube is regularly represented also by the ubiquistic zebra mussel (*Dreissena polymorpha*) and in the evaluated year another indifferent species was registered.

The left-side river branch system

Aquatic mollusc communities in the river branch system on the Slovak side are monitored at areas No. 2603 and 2604. On both areas destruction of malacocoenosis, disappearance of populations of large species, and significant decline in abundance of smaller species can be registered in recent years. The destruction of community on the area No. 2603 is registered despite of suitable conditions for its development, however the malacocoenosis in the evaluated year was more rich in species and abundance. The community consisted of stagnicolous and indifferent species, and a number of them were present all over the year. The main reason of the long-term gradual destruction of the malacocoenosis on the area No. 2604 is probably the frequent decrease of water level and the impact of invasive fish species. However, in the evaluated year multiple increase in species number and their abundance was registered after the flood in June. The ubiquistic mollusc species retain their dominance.

The right-side river branch system

Monitoring of aquatic malacofauna in the evaluated year continued in a single area in the Danube inundation. Samples were collected from the temporary lake in the central part of the Pálfi island and surrounding marshes and depressions. All of these water bodies dried out till autumn. Aquatic molluscs did not colonized the lake even during the flood. The malacofauna in marshes and depressions showed relatively high species diversity, but the abundance of representatives was relatively low due to the short time being wet (the summer heat started shortly after the June flood).

Further findings about the development of aquatic malacocoenoses in the Danube inundation provide the macrozoobenthos samples taken from Gázfűi Danube and Mosoni Danube, which are, however, evaluated under the methodology set out in the WFD for the purpose of hydrobiological evaluation of surface water quality.

7.5. Dragonflies (Odonata)

The left-side river branch system

The monitoring of dragonfly communities on areas No. 2600 and 2608 in recent years is carried out in the coastal zone of the Danube old riverbed, which was overgrown with macrophytes providing suitable habitat for dragonflies. The odonatocoenosis on the area No. 2600 is very poor in species and abundance in long-term, with frequent absence of representatives in the individual samples. In the evaluated year two species were registered (imagines of eurytopic and stagnicolous species). In the diverse habitats on the area No. 2608 rather rich community was found in the spring and summer, consisting of rheophilous, semirheophilous and stagnicolous species. Also the abundance of representatives was rather high. Diverse and rich community has been registered again in the river branch on the area No. 2603, proving the diversity of the habitat. After flooding the dead river arm on the area No. 2604 in June the odonatocoenosis was rich in species again, and species included in the Red List of Slovakia prove the high value of habitat. The community consists mainly of species typical for overwarmed water. Diverse habitats (periodic water, smaller and larger river branches) on the area No. 2612 provide favourable conditions for dragonfly species with different ecological demands, including a number of protected and endangered species.

The right-side river branch system

Monitoring of odonatocoenoses on existing monitoring sites was suspended in the previous year. Some findings on the development of odonatocoenoses of the Danube inundation provide the macrozoobenthos samples taken from Gázfűi Danube and Mosoni Danube, which are, however, evaluated under the methodology set out in the WFD for the purpose of hydrobiological evaluation of surface water quality.

7.6. Crustaceans (Cladocera, Copepoda)

The Danube

Evaluation of the development of cladocerans and copepods communities is based on results of the Slovak Party at monitoring areas No. 2600 and 2608, which are situated on the diverted stretch of the Danube. The cladocerans and copepods communities are unstable in last years, and are poor in species and abundance. But after the flood in June slight improvement has been observed. From the reservoir and from the river branch system euplanktonic cladocerans and copepods species were flushed into the Danube old riverbed. Thus the total portion of this ecological group has also increased within the present communities. Species preferring eupotamal also appeared in samples.

The left-side river branch system

In terms of development of cladocerans and copepods communities in the river arm on area No. 2603 the trend of previous years continues. Communities are poor in species and abundance, the tychoplanktonic species dominate, that are rinsed out of the richer inhabited littoral. Although the cladocerans community was slightly richer in the evaluated year, it can be stated that in the through-flowing river arm there are not optimal conditions for the development of planktonic crustaceans.

The tendency in development of cladocerans and copepods communities in the dead arm on the area No. 2604 indicated a deterioration of trophic conditions in recent years due to isolation. The flooding of the area in June had a positive effect in interrupting the decreasing tendency in species diversity (especially in case of cladocerans) and in decline of species preferring paleopotamal, which were replaced with species preferring eupotamal, as well as in decline of presence of tychoplanktonic species. In both communities the true planktonic species dominated. The monitoring area is considered as faunistic important habitat in terms of planktonic crustaceans.

The cladocerans and copepods communities on the area No. 2608 also in the evaluated year were rich in species and abundant, whilst the increasing tendency in number of littoral species was interrupted. These species retreated when the littoral macrovegetation was flushed out during the flood in June and as the result of restored connectivity with the main flow several pelagic species appeared. Non-native species were not registered in the evaluated year.

Planktonic crustacean communities on the area No. 2612 in the evaluated year were rich in species and abundant thanks to favourable water stages, and the positive impact of restored connectivity with the main flow were clearly manifested. The long-term decline in species number was interrupted and the number of euplanktonic species increased. Species preferring eupotamal appeared, while a decrease in number of phytophilous species was registered due to poor macrovegetation.

The right-side river branch system

Sampling of planktonic crustaceans in the evaluated year was carried out only in autumn. The sample from the Schisler river arm proved the persistence of weak presence of typical species bound to macrophytes. The relatively high abundance of benthic copepod (*Canthocamptus staphylinus*) indicate lower water depth and higher sediment content in the arm. Stable ecological conditions of the Lipóti marsh reflects the relatively balanced number of species of planktonic crustaceans in long-term. In the evaluated year 12 species were registered. The most abundant occurrence achieve species typical for stagnant water bound to macrophytes. The long-term weak inhabitancy of the Csákányi Danube may be associated with a stronger flow of water as the river arm forms a part of the water supply system into the inundation area. In the evaluated year the occurrence of one benthic cladoceran and one benthic copepod was registered. The presence of these species may indicate higher sediment content in the river arm. At the monitoring site in the Zátonyi Danube, which is located in the flood-protected area, no cladocerans or copepods species were registered in the autumn sample. However, the long-term results indicate the stability of the habitat, communities consist mostly of species typical for stagnant water bound to macrophytes and samples confirm the occurrence of several rare species.

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

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) according to the Water Framework Directive has been implemented within the monitoring of the quality of surface waters (Part 2 - Surface water quality). The Hungarian Party carries out the sampling of macroinvertebrates under the WFD methodology since 2006 on two sites: in the Gázfűi Danube at Dunasziget - Galambos, and in the Mosoni Danube at Dunaszeg. Both observed sections can be classified according to their hydrological character to the type of water body: side river branches directly connected to the Danube. Samples are evaluated according to the national assessment methodology for macroinvertebrates - Hungarian Macroinvertebrate Multimetric Index (HMMI). The evaluation of ecological status of water bodies is based on the total number of species, estimation of their density, and also on the number and abundance of type-specific characteristic species. Within the monitoring of surface water quality (Part 2 of this report), the macrozoobenthos samples on the Hungarian side are collected in another 11 water bodies (in the Danube and in river branches), whose ecological status, according to the results, is mostly good.

The Danube

The Danube, according to the long-term results of the Slovak Party (monitoring areas No. 2600, 2603, 2608 and 2612), is inhabited by caddisflies and mayflies sporadically, however, in last two years enrichment of the caddisfly community may be seen. The presence of caddisflies in samples was basically all year round, the community was formed mostly by 2-6 rheophilous species. Mayflies in a number of samples again absented, mostly 1-2 rheophilous species were recorded in autumn with low abundance. Results obtained by the Hungarian Party in the frame of surface water quality monitoring show that the ecological status of the whole observed section of the Danube is good.

The left-side river branch system

In terms of mayfly and caddisfly communities, all observed river branches in the left-side inundation area (monitoring areas No. 2603, 2604 and 2612) are very poor in long-term. Mayfly community in the evaluated years consisted of 1-4 species, that showed almost all year round presence. In some samples increase of abundance of one stagnicolous species was registered. The caddisfly community is even more poor in long-term, in the evaluated year only 1-2, mostly stagnicolous species inhabited the observed sites, with irregular occurrence during the year.

The right-side river branch system

Based on the macrozoobenthos evaluation results on observed site in the Mosoni Danube in the period between 2006-2013 it can be stated that no significant differences can be observed in terms of total number of species, or in terms of their abundance. In samples high number of type-specific characteristic fauna species were registered, however, the comparison between data from individual years indicates a gradual decrease in their number. Similar tendency in terms of density of these species is not noticeable. Based on the calculated type-specific evaluation index the ecological status of observed section of the Mosoni Danube during the seven-year period is good (with the exception of 2007, when it was very good).

The results of the seven-year period on observed site in the Gázfűi Danube show different values of the total number of macrozoobenthos species and their abundance in individual years. Similarly developed also the number of type-specific characteristic species and their density values. However, unambiguous development tendency of these parameters has not been identified. Ecological status of the observed river section according to the calculated index in 2013 was bad, while in the period 2007-2012 it was moderate and in the year 2006 good. Deterioration of the ecological status in the evaluated year probably does not indicate the degradation macrozoobenthos community, but it may reflect the improper date of sampling, when this community in late autumn was already very poor in species.

7.8. Fish (Osteichthyes)

The Danube

The evaluation of ichthyofauna in the Danube is based on Slovak observation results at monitoring areas No. 2600 and 2608, and Hungarian observation results at monitoring sites No. 10 and 11. In general it can be stated that the ichthyocoenoses of the diverted stretch of the Danube is stable in recent years, with relatively low species diversity and abundance, along with the dominance of eurytopic and non-native invasive species. However, the long-term results confirm the survival of species-rich ichthyocoenoses, which is composed also by several native rheophilous species. Results of both Parties indicate that the registered ichthyocoenosis is probably underestimated due to the small size of the sampled area (the medial part is not sampled) and low frequency of sampling.

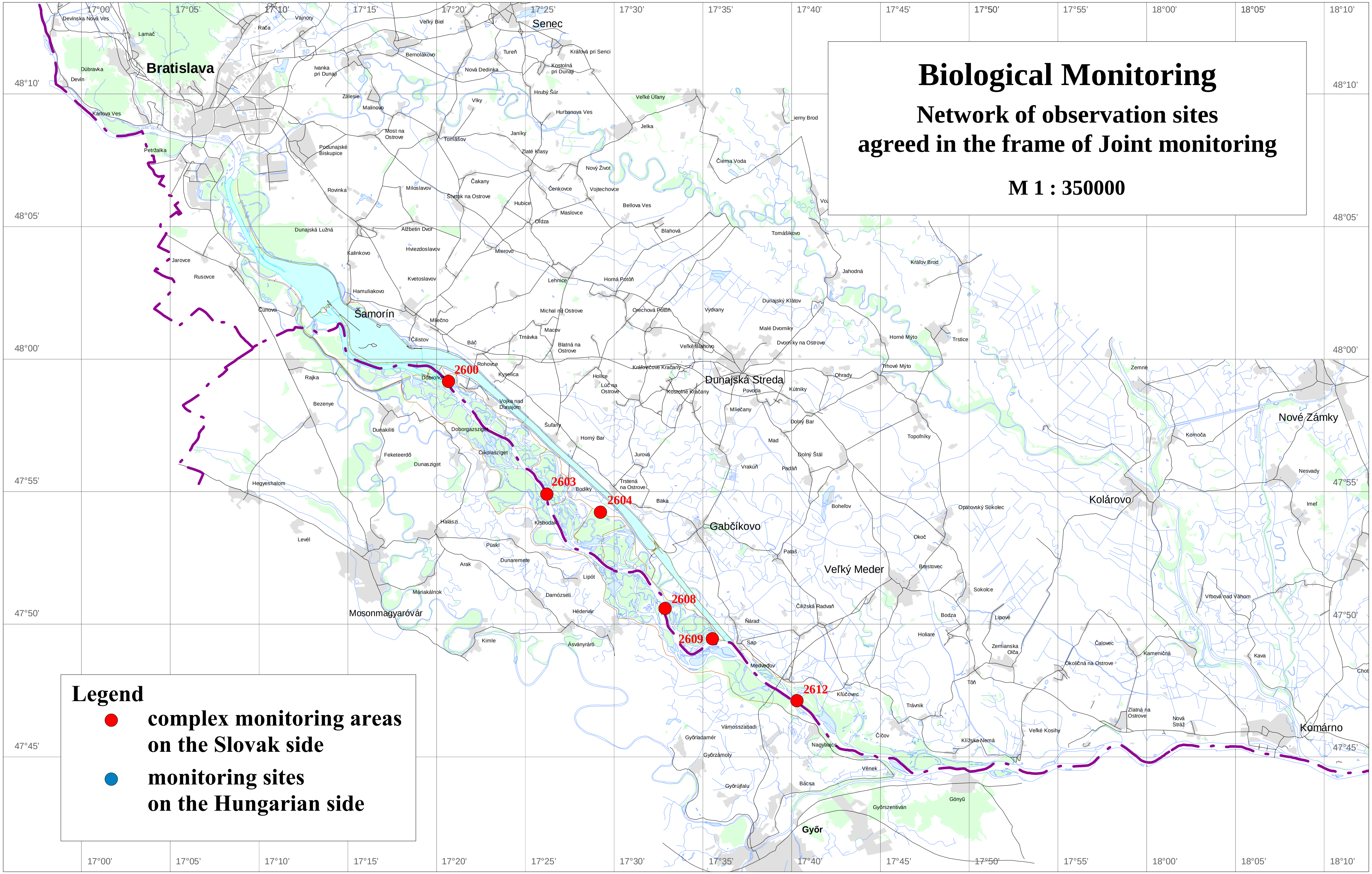
The left-side river branch system

Development of the ichthyocoenoses in the left-side inundation area in the evaluated year was positively influenced by the flood in June, when all observed river arms have been flushed out. Restoration of connectivity between river arms and the main flow and other parts of the inundation area resulted in increase of species number and their abundance, only on the area No. 2612 this was not proved. In the stable ichthyocoenoses on the area No. 2603 eurytopic and indifferent species dominate in long-term, with rather abundant occurrence of non-native goby species (*Neogobius sp.*). In the usually poor ichthyocoenosis on monitoring area No. 2604 slight increase of species number have been registered already in the previous year. Species difficult to catch by electrofishing were also recorded and in the evaluated year their abundance increased as well. However, the dominant position is retained by the expansive black catfish (*Ameiurus melas*) and the non-native sun perch (*Lepomis gibosus*). Majority of present species can survive even at higher water temperature and lack of oxygen. Part of the river arm upstream of the Foki weir on the area No. 2608 has been in contact with the main flow of the Danube for quite a long time and the present ichthyocoenosis was rich in species with occurrence of several rheophilous species. However, the abundance of representatives was only a half in comparison with the previous year. Continuous tendency of silting in this part of the river arm is supposed. Also the downstream part of the river arm on the area No. 2608 was flushed out during the flood in June. The fish species diversity substantially increased after flooding, but the abundance of species remained average. Expansive behaviour of invasive goby species (*Neogobius sp.*) is still not observed in this part of the river arm. The ichthyocoenosis of the shallow muddy river arm on the monitoring area No. 2612 remained poor in species and abundance, probably also due to fish-eating birds.

The right-side river branch system

The observation of ichthyofauna on the Hungarian territory was carried out on monitoring sites No. 4 and 9 in the inundation and on monitoring sites No. 5 and 12 in the flood-protected area, but sampling of the site No. 5 was not realised in the evaluated year due to technical reasons. The ichthyofauna on the sampling site No. 4 in the Schisler river arm do not show significant changes in species composition in recent years. The abundance of invasive black catfish (*Ameiurus melas*) was low also in the evaluated year, the increasing tendency was interrupted. Ichthyocoenosis on the sampling site No. 9 in the Csákányi Danube is rich in species. Atypical is the occurrence of two rheophilous species in the stagnant water. The indifferent and undemanding species still achieve high abundance. Ichthyocoenosis on the sampling site No. 12 in the Zátonyi Danube is relatively rich in species, although no new species was registered in the evaluated year. Noteworthy is the reoccurrence of the catfish (*Silurus glanis*).

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
2600
2603
2604
2608
2609
2612
Bratislava
Senec
Šamorín
Dunajská Streda
Gabčíkovo
Veľký Meder
Kolárovo
Nové Zámky
Komárno
Mosonmagyaróvár
Győr

PART 8

8.1. Conclusion statements

Based on the results of environmental monitoring in the year 2013 the Nominated Monitoring Agents conclude:

1. The gauging station Bratislava-Devín plays a key role in determining the current amount of water to be released into the Danube old riverbed downstream of Čunovo weir. Taking into account the agreement of surface water monitoring experts from April 15, 2014 the evaluation of surface water regime in the present Joint Report covers both, the hydrological and the calendar year 2013. In case of the hydrological year 2013 the average annual flow rate at Bratislava-Devín gauging station reached 2444 $m^3.s^{-1}$. In case of the calendar year 2013 the average annual flow rate at this gauging station reached 2417 $m^3.s^{-1}$. In both cases this flow rate belongs to highest average annual flow rates on the Danube. Considering the course of water levels and flow rates during the year 2013 it can be stated that similarly to the year 2012 unusually high flow rates occurred in the winter period. Regarding the water stages an extraordinary hydrological situation occurred in early June 2013, when extremely large flood wave occurred.

   Taking into consideration obligations envisaged in the intergovernmental Agreement, the Slovak Party was obliged to release into the Danube riverbed downstream of Čunovo weir an average annual discharge of 483 $m^3.s^{-1}$ in case of the hydrological year and 477 $m^3.s^{-1}$ in case of the calendar year. According to observations carried out at the Doborgaz and Helena gauging stations, the total average annual discharge released to the Danube downstream of Čunovo in the hydrological year 2013 was 517 $m^3.s^{-1}$, in the calendar year it was 513 $m^3.s^{-1}$. According to the modified method of average annual flow rate calculation, adopted in the Joint Annual Report on the environment monitoring in 2011, the reduction of discharge released into the Danube old riverbed was done for a period of 13 days. The average annual flow in the Danube old riverbed was then in the hydrological year 418 $m^3.s^{-1}$ and in the calendar year 414 $m^3.s^{-1}$, which means that the Slovak Party fulfilled the average annual discharge jointly agreed in the intergovernmental Agreement. According to the jointly accepted flow rate data the flow rate in the winter period was lower than the acceptable deviation for 36 days in the hydrological year or 44 days in the calendar year. The deficiencies in the winter period had not significant impact on the biota of the area affected. To remedy these deficiencies negotiation with stakeholders is proposed.

   Concerning the water amount released into the Mosoni Danube the average annual discharge in the hydrological year 2013 was 40.5 $m^3.s^{-1}$, in case of the calendar year it was 41.8 $m^3.s^{-1}$. In the hydrological year 2013, due to the maintenance works on turbines and the intake structure, reduced amount of water was released for 81 days. Reduced amount of water was also released for 22 days during high discharges in June. Despite these limitations it can be concluded that the water amount prescribed in the intergovernmental Agreement was fulfilled.

2. In comparison with previous years there were no significant changes of surface water quality registered in the year 2013. Specific hydrological and climatic

conditions in 2013 resulted in several higher values of parameters, which are influenced by flow rates. Observed parameters mostly achieved similar or higher values than in the year 2012. Only in case of sampling sites, which were sampled out of the occurrence of flood or significant discharge waves, values of parameters were similar or lower than in the previous year. In comparison with the previous year the water temperature and the electric conductivity achieved higher lows and highs. The pH values fluctuated in similar or slightly wider ranges. Higher number of discharge waves resulted in occurrence of several higher values content of suspended solids, iron and manganese. Higher maximums were recorded also in case of basic cations and anions. Regarding nutrients, higher contents occurred mainly in the Danube at Bratislava and Medveďov and in the Mosoni Danube. The most polluted water in terms of concentration of nutrients appears to be the surface water in the Mosoni Danube at Vének. Oxygen conditions in the year 2013 can be classified as very good. except the right-side seepage canal, where low oxygen content in summer indicated the deterioration of oxygen conditions at this sampling site. The organic pollution in the year 2013 was higher in comparison with the previous year, what probably can by associated with the frequent occurrence of high flow rates. The COD_{Mn} values were higher especially in the main riverbed and in the Mosoni Danube, while the BOD_5 values were higher also in the Danube old riverbed, in the right-side river branch system and in the right-side seepage canal at sampling sites monitored by the Hungarian party. The organic pollution documented by the Slovak Party was lower. When analysing 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 demonstrates the settling effect of reservoir. Inorganic pollution of surface water was low, with sporadic occurrence of higher concentrations of arsenic, mercury and chromium. Major part of analysed concentrations was below the detection limits of applied analytical methods. Based on the evaluation of surface water pollution by heavy metals under the current rules on the Slovak and Hungarian side it can be concluded that the heavy metal concentrations in 2013 complied with the limits for surface water quality.

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 water quality in the Mosoni Danube differs in the upper and lower section of the river. The water quality at the sampling site at Čunovo/Rajka follows the water quality in the Danube, while the water quality in the lower section of Mosoni Danube at Vének (upstream of the confluence with the Danube) is formed by its affluents and local pollution from settlements. In terms of long-term development the pollution at this sampling site decreased, although the content of nutrients and the COD_{Mn} values still reach the highest values in comparison with other sampling sites. The cleanest water is characteristic for seepage canals, what results from its groundwater origin.

In connection with different hydrological and climatic conditions, the development of chlorophyll-a in the evaluated year differed in comparison with the previous year. Values were more volatile during the year, and depending on the sampling site location they were higher or lower. The biggest difference was found in the Mosoni Danube at Vének, where the chlorophyll-a values were significantly lower than in the year 2012. The monitoring of biological quality elements of the surface water in 2013 at jointly observed sampling sites and sampling sites monitored by the Hungarian Party, was carried out according to national methodologies and quality schemes for particular biological quality elements, in accordance with the Water Framework Directive. Phytoplankton, phytobenthos, macrozoobenthos, and at two sites also macrophytes were assessed. According to Slovak results of biological quality elements observation, and taking into account the evaluation of supporting elements (the physico-chemical quality elements and synthetic and non-synthetic substances relevant for Slovakia), the ecological status of the surface water in the Danube at Bratislava and in the Danube old riverbed at Rajka was good. In the Danube at Medveďov it was moderate and in the right-side seepage canal and in the Mosoni Danube at Čunovo it was very good. According to Hungarian results of biological quality elements observation, and taking into account the evaluation of supporting elements (the physico-chemical quality elements and other specific substances), good ecological status of the surface water was determined in the Danube at Medveďov, in the Danube old riverbed at Rajka and in the right-side seepage canal at Rajka. In the Mosoni Danube at Rajka moderate ecological status was achieved. From among the other seven sampling sites, which are monitored by the Hungarian Party, good ecological status was determined on six sampling sites in the Danube old riverbed and in the right-side river branch system, while in the Mosoni Danube at Vének the ecological status was moderate.

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. Saprobe indexes varied in the range corresponding to β-mesosaprobity, thus an environment which provides suitable living conditions for a wide scale of organisms. Unlike the previous years, in the year 2013 in no case α-mesosaprobity occurred. The phytoplankton abundance in the evaluated year was lower than in the previous year and the limit for mass development was exceeded only once at four sampling sites (in the year 2012 it was one to three times at ten sampling sites). Also the annual average abundance was lower at all sampling sites. The highest abundance of phytoplankton, and also the highest value of the annual average was recorded at sampling site in the reservoir at Šamorín. Considering the abundance of phytoplankton, as a key determinant of saprobe index of biosestone, it can be concluded that water works even in 2013 had no negative impact on the level of saprobity.

The sediment quality was assessed according to Canadian standard CSQG. According to the evaluation results in 2013 it can be stated that the amount of analysed micropollutants in the influenced area is low and the majority of measured values of inorganic and organic micro-pollutants was below the Threshold Effect Level (TEL). At such values the adverse effects on biological life occur rarely seen and concentrations correspond to an uncontaminated natural environment. Number of exceedances of the TEL was lower than in 2012. Concentrations that varied in the range >TEL - <PEL, corresponded to a status when the adverse effects on biological life occur sporadically. As in the previous year also in the evaluated year concentrations above the Probable Effect Level (PEL) limit value occurred; in case of zinc at three sampling sites and in case of mercury at two sampling sites. Beyond this level, the adverse effects on biological life may occur frequently. These concentrations were recorded in the Mosoni Danube at Vének and in the Szigeti and

Ásványi river arms in case of zinc and in the Danube old riverbed upstream and downstream of the submerged weir at Dunakiliti in case of mercury. The highest concentrations of inorganic and organic micro-pollution on the Slovak territory was documented in the lower part of the reservoir at Šamorín, and on the Hungarian territory at sampling site in the Mosoni Danube at Vének. The lowest sediment pollution has been documented in the Danube old riverbed at Sap on the Slovak territory and in the right-side seepage canal at Rajka on the Hungarian territory.

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

3. Groundwater levels in the assessed area are primarily influenced by surface water levels in the Danube and in the reservoir. At the beginning of hydrological year groundwater levels mostly fluctuated slightly below the long-term average daily values and during the winter period the lowest groundwater levels were registered on most objects. Increased flow rates in April and May contributed to a gradual increase of groundwater levels. The most significant rise of groundwater levels was evoked by the extreme flood wave in June, when also the highest groundwater levels were recorded on most objects. In general it can be stated that groundwater levels at the end of the year were higher than at its beginning.

   Concerning the water supply into the right-side river branch system and into the Mosoni Danube it can be stated that, according to the evaluation of groundwater regime, it plays an important role in influencing groundwater levels over the Szigetköz region. As a result of measures taken according to the intergovernmental Agreement, a significant increase in the groundwater levels occurred in case of average flow rate conditions in the Danube. The increase in the upper part of Szigetköz region and around the reservoir is reduced due to decrease of permeability of the reservoir bottom. Certain effect also have the adverse changes in sediment transport regime of the Danube, which are probably related to measures in the Austrian section of the Danube just upstream of Bratislava implemented in recent years. In case of low flow rates in the Danube the average groundwater levels remained mostly unchanged. The decrease in the lower part of Szigetköz reflects the adverse effect of the riverbed erosion in the tailrace canal and downstream the confluence of the tailrace channel and the Danube old riverbed. Improvement of this situation is expected after completion of constructing works on the water supply system in this part of the inundation area. For high flow rate conditions decline in the groundwater levels along the Danube riverbed can be registered, but at some distance from the Danube old riverbed no changes were observed in the inundation area and the groundwater level along the Mosoni Danube was higher.

   Monitoring results still confirm the need of solving the water supply in the lower part of the inundation area on both sides. On the Hungarian side construction works going on and after their completion groundwater levels increase in the lower part of Ásványi river branch system and in the Bagoméri river branch systems is expected. The positive influence of the water supply could be effectively supported by measures applied in the Danube old riverbed upstream of the confluence with the tail race channel. Such measures may improve the overall situation in the lower part of Szigetköz area and in the region of Istragov island on the Slovak side. The increase in groundwater levels in the strip along the Danube old riverbed on both sides could be ensured only by increasing the water level in the Danube by measures implemented in the riverbed.

4. Based on the results of long-term groundwater quality monitoring on Hungarian territory it can be concluded that the groundwater in the upper part of gravel sediments in Szigetköz is characterised by higher iron and manganese content. The iron and manganese contents persistently exceed the groundwater quality limits on most of observation objects. On these objects also the concentrations of parameters that reflect local pollution are higher. The local pollution is of agricultural origin, or it originates from sewage ponds. In general it can be stated that the content of nutrients and organic matter have not changed significantly in comparison with the previous year. Higher contents, which exceed the limit value, are registered in long-term only at several observation objects. Higher contents in case of nitrates mostly decreased and exceedances of the limit value occur only occasionally. Phosphates and ammonium ions on several objects fluctuate above the limit value in long-term. Exceedances are occasionally recorded also in case of water temperature, calcium, magnesium, potassium and sulphates. The organic pollution usually meets the limit value. During the monitoring in some objects time-to-time occurred values exceeding the limit value, but since 2008 it was only once.

   The groundwater quality in deeper horizons in Szigetköz is monitored by wells used for drinking water supply. Iron and manganese concentrations are lower in wells, where the water is drawn from greater depth. In the region at Győr the iron and manganese contents exceed the drinking water quality limit values or oscillates around them. In these wells also the concentrations of ammonium ion and organic matter contents are higher, which however fluctuate below the agreed limit values. The water extracted in the northern part of 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.

   Based on the results of long-term groundwater quality observation on the Slovak territory it can be concluded that the observed groundwater quality parameters in waterworks mostly meet the agreed groundwater quality limits. The exceptions are the waterworks at Bodíky and Kalinkovo. In waterworks at Bodíky the manganese exceeds the quality limit in each sampling and occasionally also higher concentration of iron occurs. In waterworks at Kalinkovo occasionally occurs manganese content, that does not meet the relevant limit (in 2013 two slight exceedances). In case of observation objects exceedances of limit values is more frequent and they occur at more objects. Besides manganese and iron, also ammonium ions exceedances occurs. The groundwater chemical composition in observation objects is similar to chemical composition in waterworks in their vicinity. The groundwater quality in observation objects mostly reflects local influences. Based on long-term measurements it can be stated that the organic pollution decreased during the observation period. Nutrients occur in low concentrations on monitored objects in long-term. In the evaluated year 2013 no significant changes in groundwater quality were registered.

   Inorganic and organic micro-pollution of groundwater in 2013, monitored at selected observation objects on the Hungarian and Slovak territory, was found in concentrations below the limit values for groundwater quality evaluation.

5. In the year 2013 only two soil moisture measurements were carried out on the Hungarian side. Measurements were carried out at forest monitoring sites in the floodplain area and at agricultural sites in the flood-protected area. In general the moisture conditions of soils were positively influenced by precipitation amount in the winter period, in May and June and by the big flood wave in June. On the other side the soil moisture content was adversely influenced by high air temperatures and draught in July. Due to low number of measurements it was not possible to evaluate the soil moisture development or to compare results with previous years.

   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 is stable during the entire observation period. Since 2004, slight increase in the soil moisture content could be seen, while the groundwater level position and fluctuation remained mostly unchanged. In the last three years, however, slight decrease of groundwater level can be seen, especially on two of observed sites. In the year 2013 the fluctuation of soil moisture content in both depth intervals depended on climatic conditions, however during the flood in June layers in the depth around 2 m were partially influenced by the groundwater level. Soil layers were well supplied during the winter period, maximal average values were recorded in February 2013. The soil moisture content started to decrease significantly in April and the decline continued without major fluctuations until the end of August, when the lowest soil moisture contents in 2013 were recorded.

   The soil moisture in the inundation area, along with the groundwater level and precipitation, is highly dependent on natural or artificial floods. In the year 2013 extremely large flood occurred in June, when the inundation area was flooded from 3 to 16 days. Except this big flood another small flood occurred in January and several discharge waves occurred during the year. In general the soil moisture content started to rise at the beginning of the year, thanks to the small flood wave in January. The decrease started in April, but it was interrupted by flooding of the inundation area. After the flood wave the soil moisture sharply decreased. The soil moisture in July and August was adversely affected by low flow rates in the Danube, which, together with high air temperatures caused the decrease of soil moisture content. On most of monitoring sites minimal values occurred in August and September. The maximal average values occurred just after the flood wave in June, but high values were registered also during the winter period in February and March. Concerning the minimal and the maximal average values it can be generally stated that they were higher than in the previous year on most of monitoring sites.

6. The development of forest stands according to the results of the Slovak Party did not show significant differences in comparison with the previous years. The height increment quality classification in most of observed forest stands remains basically unchanged. Majority of stands is characterized by intensive or moderate growth increment, however on several monitoring stands slight gradual decrease in increment intensity can be seen, probably because of achieving the peak age. In general, the growth of trees in 2013 was intensive in first months of the vegetation period. During the flood the growth slowed down significantly, but after the flood it achieved very high values in July. Values in August and September were already at the level of previous years. The occurrence of zero weekly girth growth increments during the vegetation period were not recorded on most of observed stands. The growth period was quite long again in the evaluated year. The initiation of growth in

all stands was recorded in early or mid April. The growth on several trees ended in the second half of September, but many of them have grown even at the time of resuming the observation at the end of September. At the evaluated year a clear growth peak could be identified in July, after the long-lasting flooding of the inundation area, but higher values were recorded also in August. The health state of observed cultivated poplar stands is still good.

In the year 2013 the forest monitoring in the Szigetköz continued. Dendrometric characteristics and the health status of the forest stands were observed on 14 monitoring plots on the Hungarian side, which are situated in the inundation area. Based on the current growth characteristics of forest stands it can be stated that no new phenomenon have been registered in terms of forest stands development, which would differ from the trends of previous years. Growth characteristics of forest stands developed in accordance with the expected growth, the occurrence of dead trees was negligible. Poplar stands dominate on monitoring plots, what correspond to the current tree composition in the Szigetköz area. Cultivated poplar "Pannonia" forms the largest portion of forest stands.

7. In the year 2013 the monitoring of agreed groups of plants and animals was carried out on both, Slovak and Hungarian territory. An exception is the monitoring of macrophytes and dragonfly community, which was suspended or evaluated under WFD methodology on the Hungarian territory. Flooding of the inundation area in June significantly influenced the monitoring results, when partial destruction of the herb layer has been observed. Phytocoenoses on most of the Slovak monitoring plots can be regarded as stable. Invasive species were eliminated by flooding. Restoration of the water supply in the upper part of the inundation area on the Slovak side improved the moisture conditions, however destruction of the herb layer has been observed in the summer due to the flood and excavation works. After this disturbance several synanthropic species appeared, but their survival in the following years is not expected. On previously disturbed monitoring areas gradual retreat of synanthropic and invasive species is registered. On other areas the persistence of current trends can be confirmed; the dominance of native nitrophilous species and the retreat of ruderal species. Regarding the monitoring sites on the Hungarian territory it can stated, that the herb layer was similarly destroyed after the June flood and its coverage in July reached only 30-40 %. The meadow area on the monitoring site at Dunasziget gradually decreases and without anthropogenic intervention the former homogeneous meadow will gradually transform into maple forest After the clear-cut on the site No. 30 two years ago, a complete transformation of the plant undergrowth has been observed, currently weed and ruderal species dominate.

   The terrestrial mollusc communities were favourably affected by the flooding in the evaluated year. On monitoring areas on the Slovak side, which were clear-cut, malacocoenoses in various stages of regeneration were found. Malacocoenoses on other monitoring areas are stabilised at levels typical for different variants of lowland forest. Most of areas were colonized by several polyhygrophilous and hygrophilous species after the flood in June. The malacocoenosis on reforested area is poor in species and most of hygrophilous species has disappeared. It is assumed, however, that in the gradually closing young poplar forest the malacocoenosis may regenerate. The positive influence of flood was proved also on monitoring site in the Hungarian inundation. The number of registered species exceeded the total number of species found throughout the whole observation period. The malacocoenosis on the monitoring site in Felső forest proves the stability of the undisturbed forest in the flood-protected area.

The aquatic vegetation in the in the inundation area on the Slovak side have been decimated by the strong flood in June. The species of true aquatic vegetation and wetland species achieved only a negligible coverage. Later, thanks to favourable conditions hydrophytes increasingly developed. Shallower sections were again richly inhabited by wetland species or annual herbs, including several protected species. Monitoring of macrophytes in the Danube old riverbed was carried out only on Hungarian monitoring sites, however, the observation of these sites is suspended since 2011. The macrophyte monitoring in the Hungarian inundation area and in the flood-protected area have been interrupted in the year 2012.

According to the monitoring data the entire stretch of the Danube is characterized by poor aquatic malacofauna in recent years. 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. At present only the invasive species *Theodoxus fluviatilis* and the ubiquistic species *Dreissena polymorpha* has got regular and abundant occurrence in the Danube, although their abundance in the evaluated year was significantly decreased due to flood flow rates. In the river branch system on the Slovak side destruction of malacocoenosis can be registered in recent years. Decline of populations and decrease of abundance in river arms is recorded despite suitable conditions for their development. In the evaluated year, however, the malacocoenosis was more rich in species and abundance. Limiting factor in dead arms is probably is probably the frequent decrease of water level and the impact of invasive fish species. However, in the evaluated year multiple increase in species number and their abundance was registered after the flood in June. The ubiquistic mollusc species retain their dominance. Monitoring of aquatic malacofauna in the evaluated year on the Hungarian side continued in a single area in the inundation area. Samples were collected from the temporary lake in the central part of the Pálfi island and surrounding marshes and depressions. All of these water bodies dried out till autumn. Aquatic molluscs did not colonized the lake even during the flood. The malacofauna in marshes and depressions showed relatively high species diversity, but the abundance of representatives was relatively low due to the short time being wet.

Results of the Slovak party show the presence of rather rich dragonfly communities. They were found in the spring and summer and consisted of rheophilous, semirheophilous and stagnicolous species. Also the abundance of representatives was rather high. Most of the observed river arms and the overgrown riparian zone of the main flow provide a variety of habitat types, which are inhabited by species with various ecological demands, including a number of protected and endangered species. Monitoring of odonatocoenoses on monitoring sites on the Hungarian territory was suspended in the previous year. Some findings on the development of odonatocoenoses of the Danube inundation provide the macrozoobenthos samples taken from Gázfűi Danube and Mosoni Danube, which are evaluated under the methodology set out in the WFD for the purpose of hydrobiological evaluation of surface water quality.

The observed stretch of the Danube is according to the Slovak results poorly inhabited by cladocerans and copepods communities. The cladocerans and copepods communities are unstable in last years and are poor in species and abundance. But after the flood in June slight improvement has been observed, when euplanktonic cladocerans and copepods species were flushed into the Danube old riverbed from the reservoir and river branches. The cladocerans and copepods communities in the inundation area were mostly rich in species and abundant. Thanks to the June flood the connectivity with the main flow have been restored and several pelagic species appeared. In the dead river arms decline of species preferring paleopotamal was recorded, which were replaced with species preferring eupotamal. Sampling of planktonic crustaceans in the evaluated year on the Hungarian side was carried out only in autumn. The sample from the Schisler river arm proved the persistence of weak presence of typical species bound to macrophytes. At the monitoring site in the Zátonyi Danube, which is located in the flood-protected area, no cladocerans or copepods species were registered in the autumn sample. However, the long-term results indicate the stability of the habitat, communities consist mostly of species typical for stagnant water bound to macrophytes and samples confirm the occurrence of several rare species.

Slovak Party performs the monitoring of mayflies and caddisflies in accordance with the methodology set out in the Agreement 1995. According to the Slovak results the Danube is inhabited by caddisflies and mayflies sporadically, however, in last two years enrichment of the caddisfly community may be seen. All observed river branches in the left-side inundation area are very poor in long-term. The mayfly community in the evaluated years consisted of 1-4 species, the caddisfly community was represented only by 1-2 species, with irregular occurrence during the year. The Hungarian Party carries out the sampling under the WFD methodology since 2006. Results obtained by the Hungarian Party in the frame of surface water quality monitoring show that the ecological status of the whole observed section of the Danube is good. The results of the seven-year period on observed site in the Gázfűi Danube show different values of the total number of macrozoobenthos species and their abundance in individual years. However, unambiguous development tendency of these parameters has not been identified.

In general it can be stated that the ichthyocoenosis of the diverted stretch of the Danube is stable in recent years, with relatively low species diversity and abundance, along with the dominance of eurytopic and non-native invasive species. However, the long-term results confirm the survival of species-rich ichthyocoenosis, which is composed also by several native rheophilous species. Results of both Parties indicate that the registered ichthyocoenosis is probably underestimated due to the small size of the sampled area and low frequency of sampling. Development of the ichthyocoenoses in the left-side inundation area in the evaluated year was positively influenced by the flood in June, when all observed river arms have been flushed out. Restoration of connectivity between river arms and the main flow and other parts of the inundation area resulted in increase of species number and their abundance. At some monitoring areas dominant position is retained by the non-native invasive black catfish (*Ameiurus melas*) and sun perch (*Lepomis gibosus*). The observation of ichthyofauna on the Hungarian territory was carried out on two monitoring sites in the inundation and on one monitoring site in the flood-protected area. The ichthyofauna in the inundation area is relatively rich in species and do not show significant changes in species composition in recent years. The ichthyocoenosis on the sampling site in the flood-protected area in the Zátonyi Danube is relatively rich in species, although no new species was registered in the evaluated year. Noteworthy is the reoccurrence of the catfish (*Silurus glanis*).

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. In the winter period during low flow rates on the Danube often occurs deficit of discharge higher than acceptable deviation of ±7% (daily average discharges lower than 250 $m^3.s^{-1}$). For this reason, the Hungarian experts propose to undertake negotiations with stakeholders to remove this deficiency.
2. Experts on monitoring of surface and groundwater of the Slovak and Hungarian Parties on the basis of the evaluation of the year 2013 propose to modify the evaluation period from the hydrological year to calendar year. Modification of the evaluation period is proposed to be applied for the year 2015, with the recommendation that the evaluation in 2014 will be carried out as in 2013, i.e. the evaluation shall cover as the hydrological as well as the calendar year. Experts propose the modification of the evaluation period in order to harmonize the evaluation of surface and groundwater with the evaluation of other components of the natural environment (water quality, soil moisture, forest and biota).

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 20 m^3/sec up to 43 m^3/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 m^3/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.

Annex No.2

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]00	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.

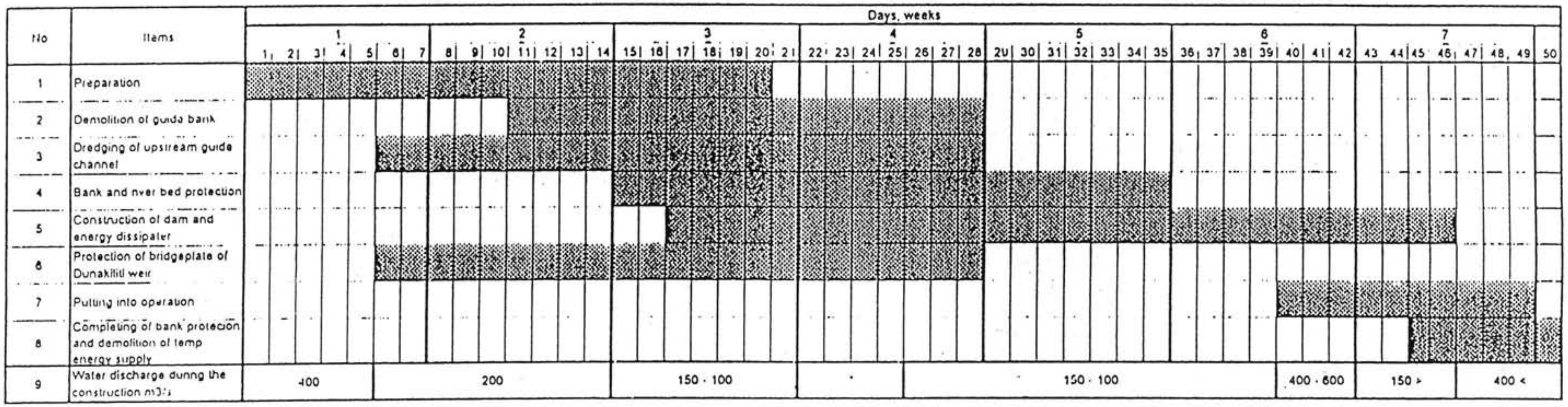
The possible differences in discharges which will be ascertained through monitoring by 31 Oct. will be adjusted within the shortest possible period by the end of the same year so that the average of 400 m^3/sec is attained.

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



* 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.

A P P E N D I X 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 Gabčikovo on 29th May, 1995.

....

Kovács Árpád
Nominated Monitoring Agent
of the Republic of Hungary

....

Dominik Kocinger
Nominated Monitoring Agent
of the Slovak Republic

ANNEX 1

Monitoring areas, objects and items

of Slovak Republic

Contents

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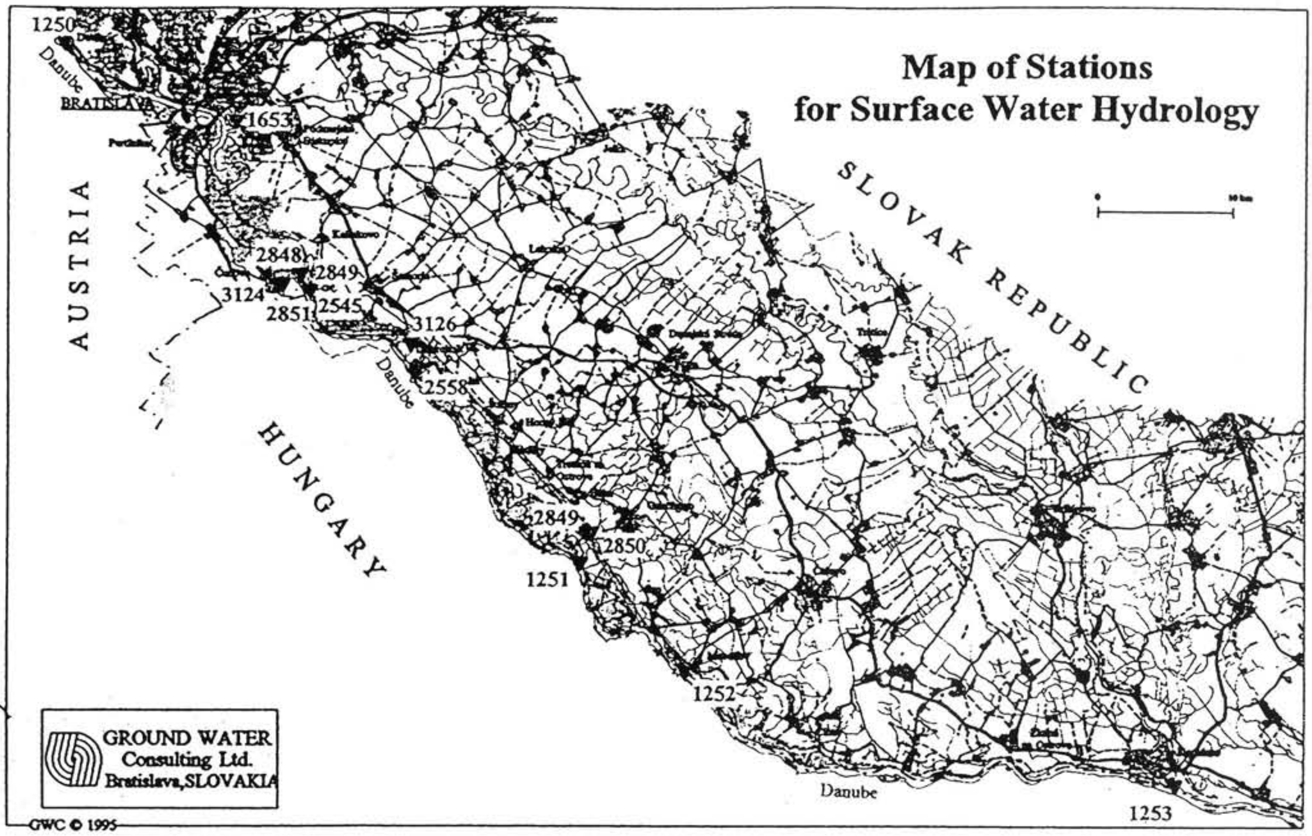

Map of Stations
for Surface Water Hydrology
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
BRATISLAVA
Danube
1250
1653
2848
2849
3124
2851
2545
3126
2558
2849
2850
1251
1252
1253
GROUND WATER
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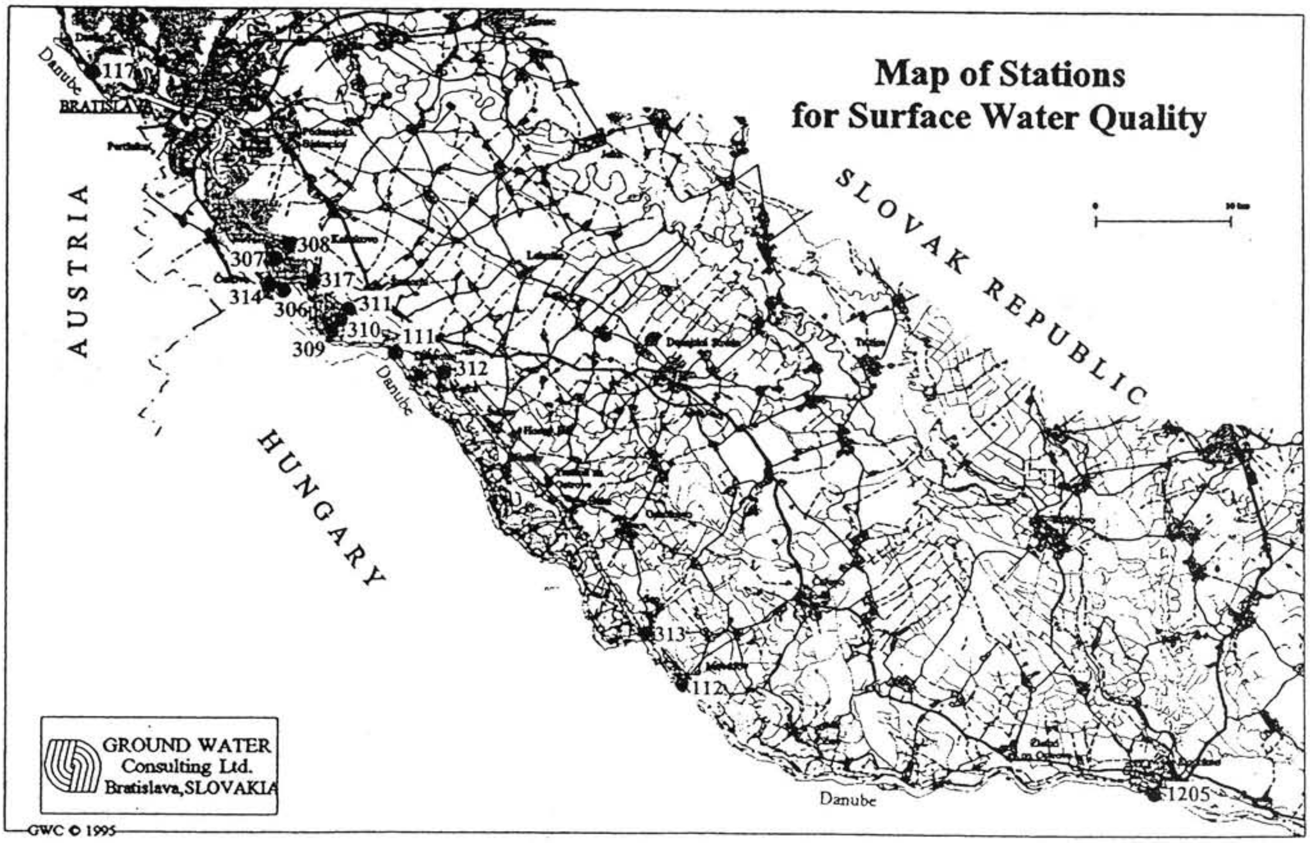

Map of Stations
for Surface Water Quality
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
BRATISLAVA
Danube
117
308
307
317
314
306
311
310
111
309
312
313
112
1205
GROUND WATER
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List of Stations for Surface Water Hydrology

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	Medvedov	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

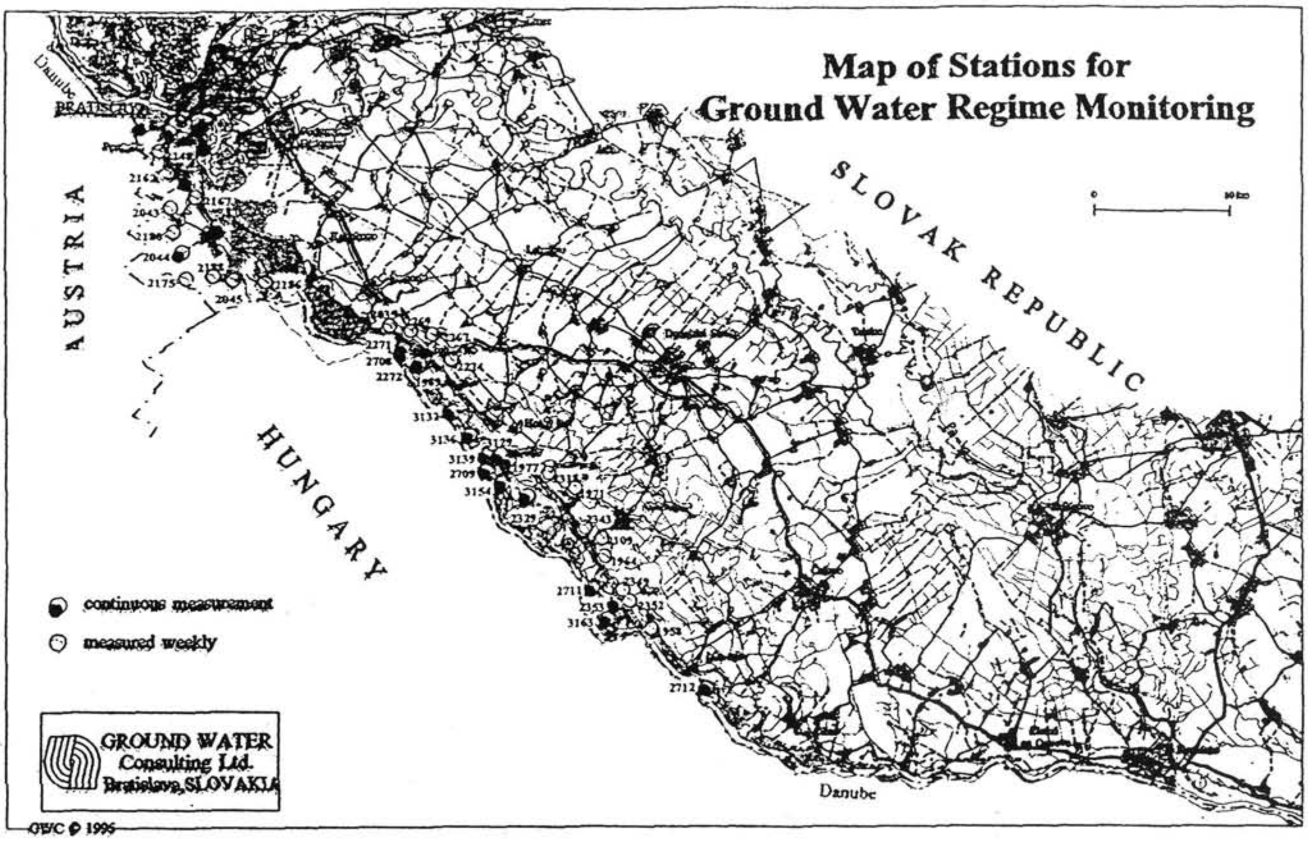
Joint Monitoring Data

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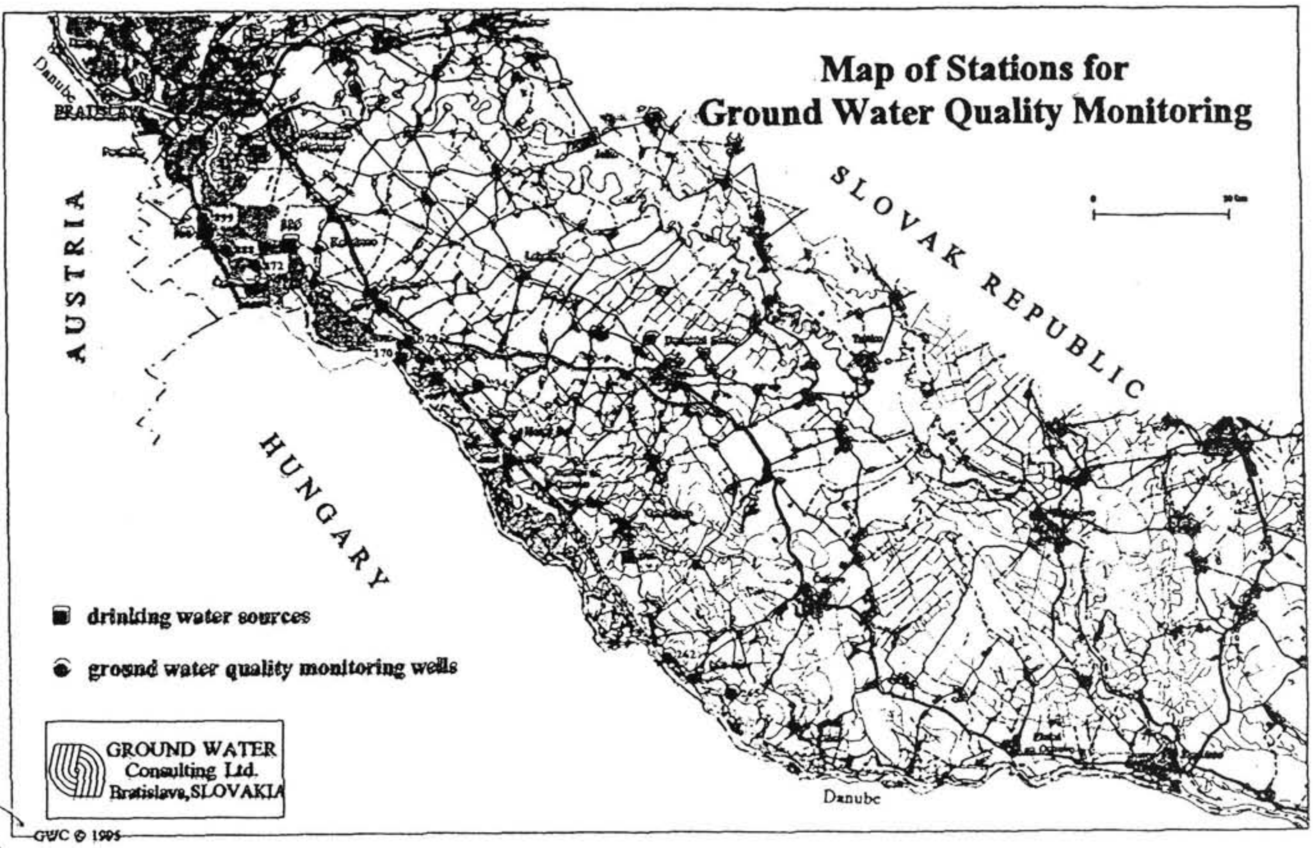
Map of Stations for
Ground Water Quality Monitoring
SLOVAK REPUBLIC
AUSTRIA
HUNGARY
Danube
drinking water sources
ground water quality monitoring wells
GROUND WATER
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List of Stations for Ground Water Regime Monitoring

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	Klfčovec	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

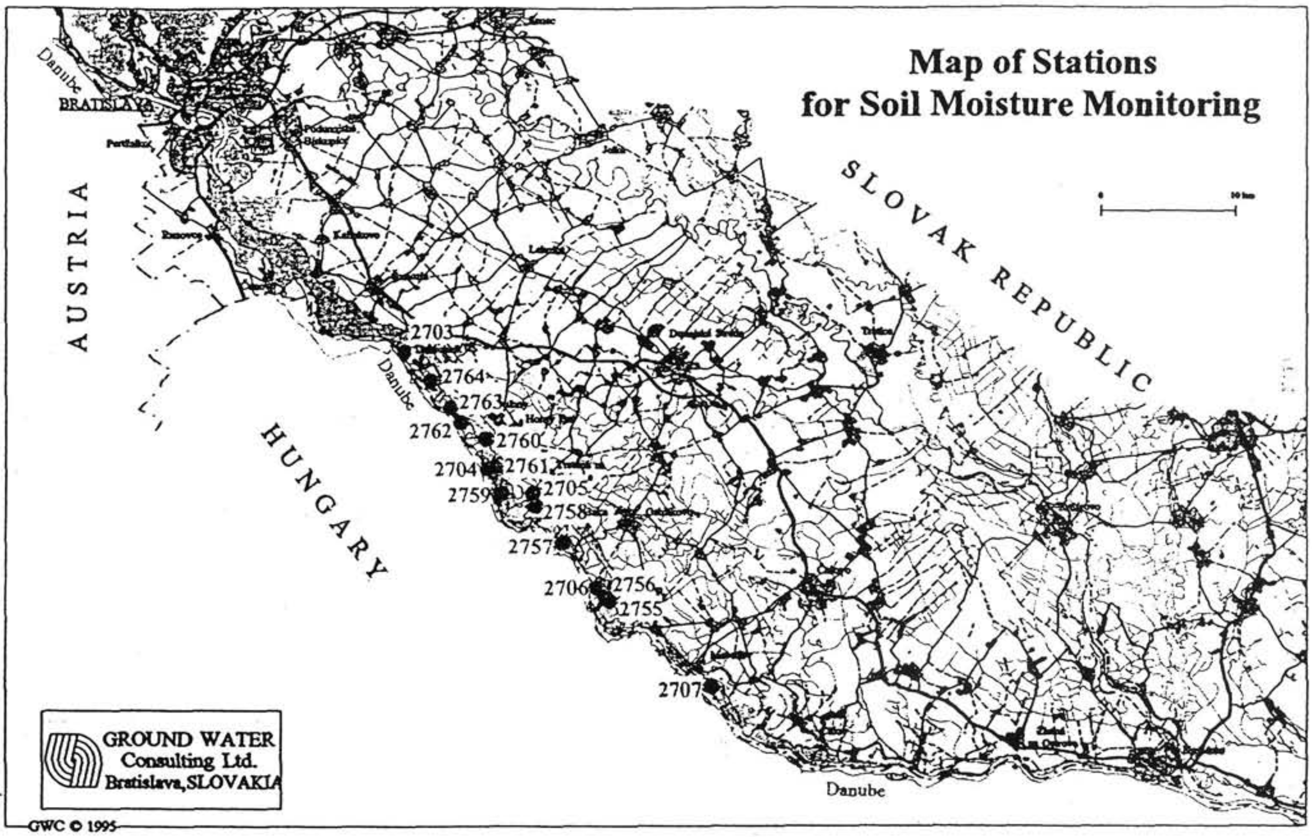
Dominik Kocinger
Nominated Monitoring Agent for Slovak republic

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
AUSTRIA
SLOVAK REPUBLIC
HUNGARY
Danube
BRATISLAVA
Danube
Danube
2703
2764
2763
2762
2760
2704
2761
2759
2705
2758
2757
2706
2756
2755
2707
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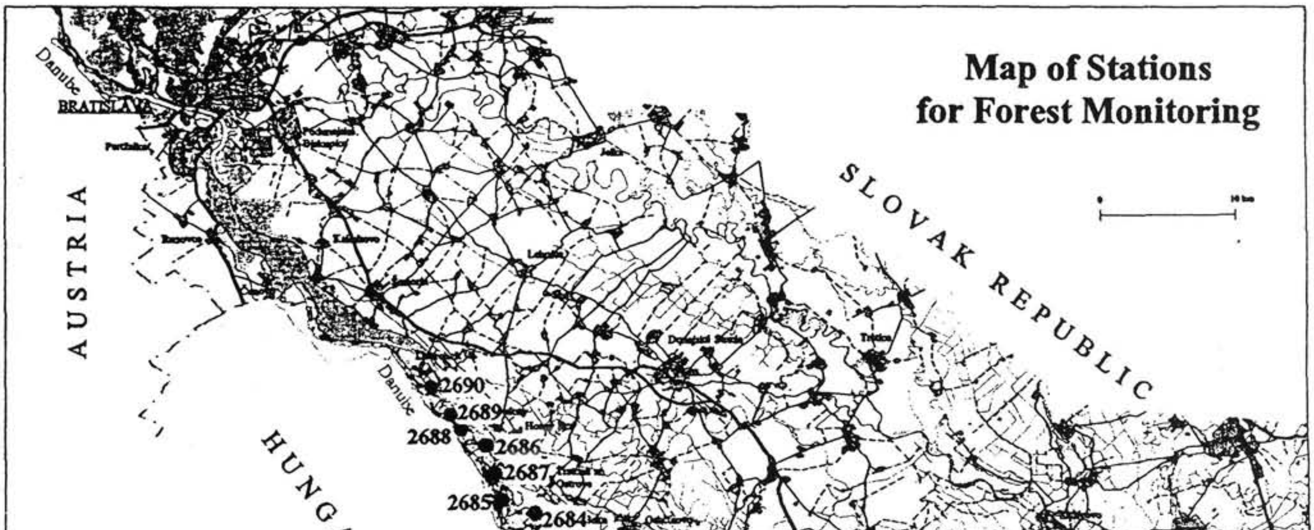
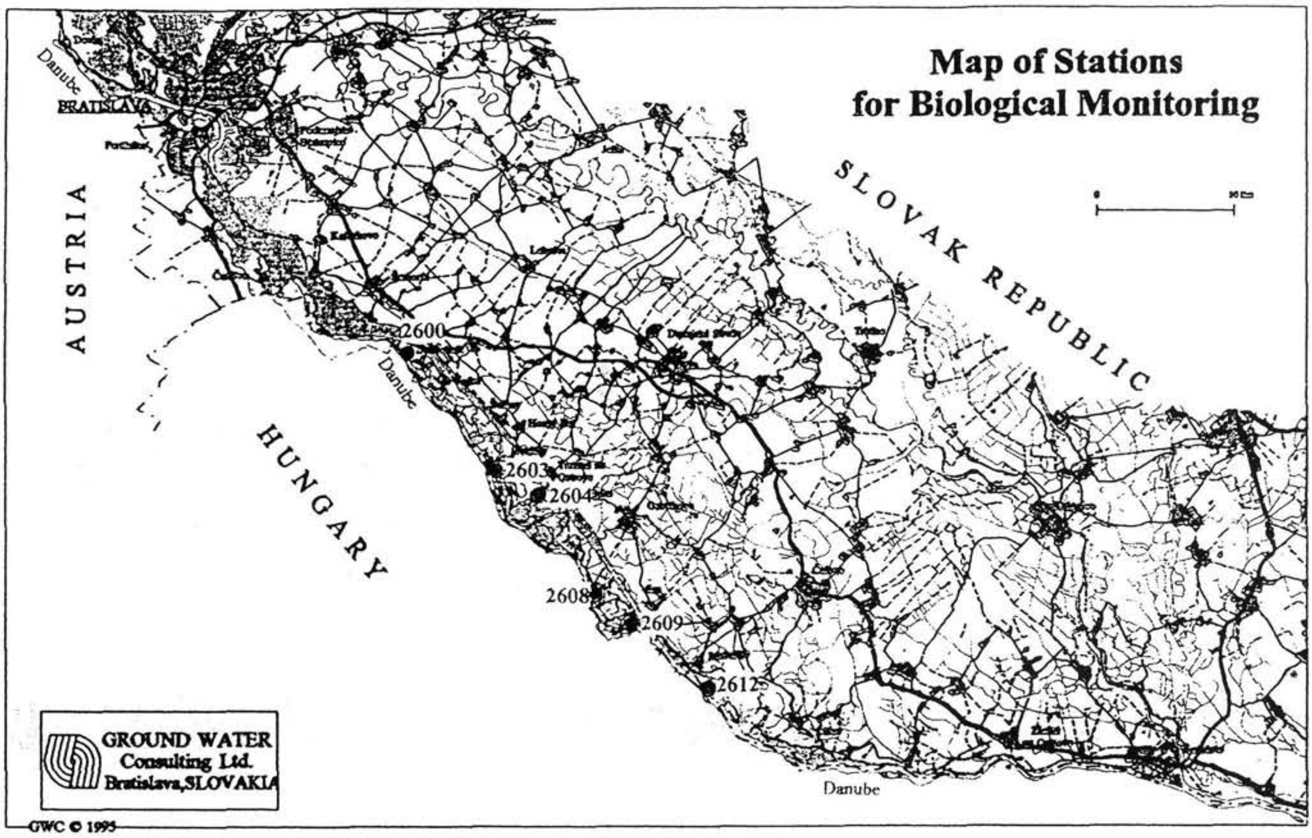

Map of Stations
for Forest Monitoring
AUSTRIA
SLOVAK REPUBLIC
HUNGARY
Danube
BRATISLAVA
Danube
Danube
2690
2689
2688
2686
2687
2685
2684
2683
2682
2681
GROUND WATER
Consulting Ltd.
Bratislava,SLOVAKIA
GWC © 1995


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	Klúčovec
2764	L-12	Dobrohošť
2763	L-11	Vojka nad Dunajom
2762	L-10	Vojka nad Dunajom
2761	L-9	Horný Bar - Bodiky
2760	L-8	Horný Bar - Šuľany
2759	L-7	Horný Bar - Bodiky
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 - Bodiky	Poplar "I214"
2686	L-8	Horný Bar - Šulany	Poplar "Robusta", "I214"
2685	L-7	Horný Bar - Bodiky	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

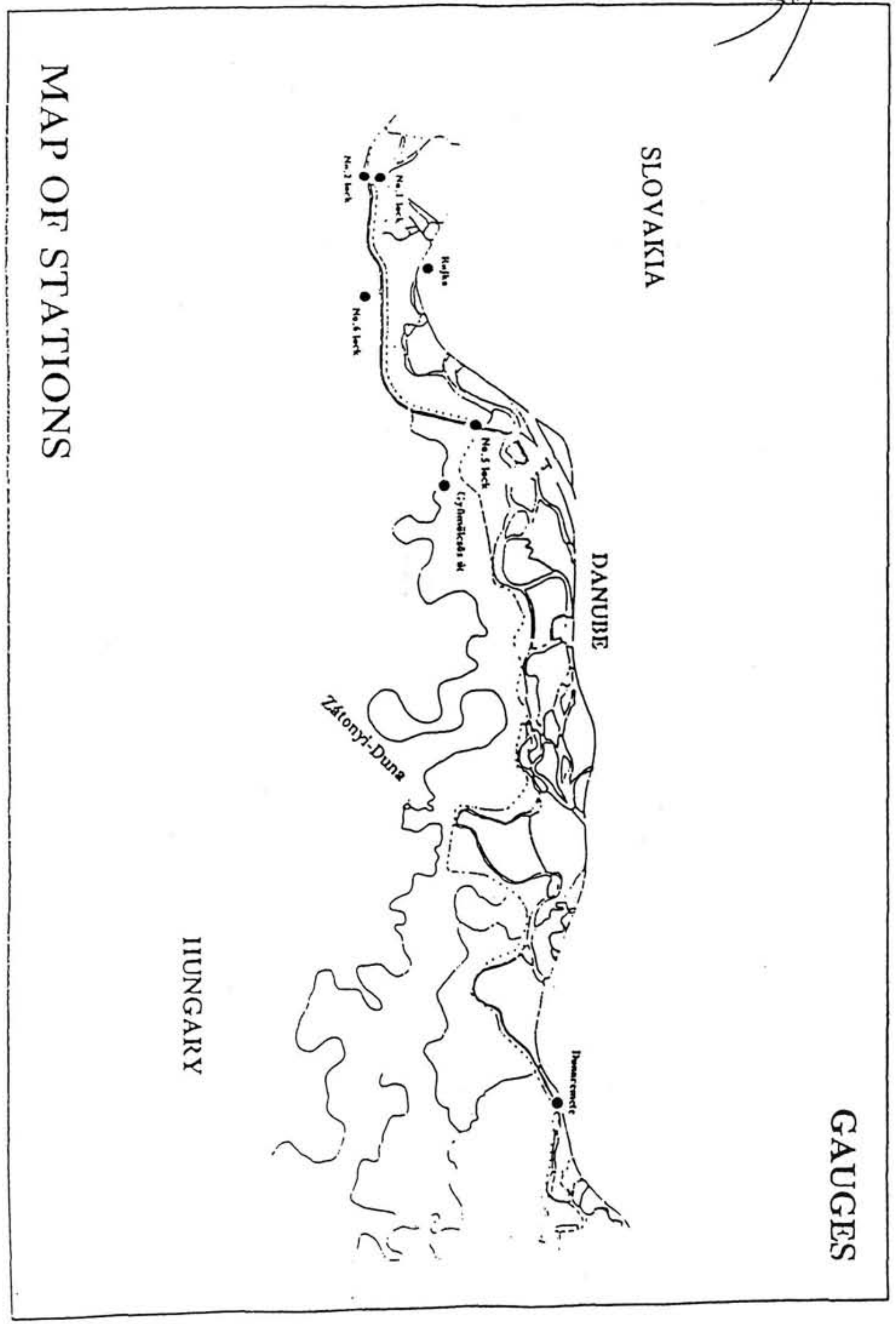
Station No.	Location	Situated
2600	Dobrohošť	Inundation area
2603	Bodiky	Inundation area
2604	Bodiky	Inundation area
2608	Gabčíkovo	Inundation area
2609	Sap	Inundation area
2612	Kľúčovec	Downstream confluence of Old Danube and Tail-race Canal

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

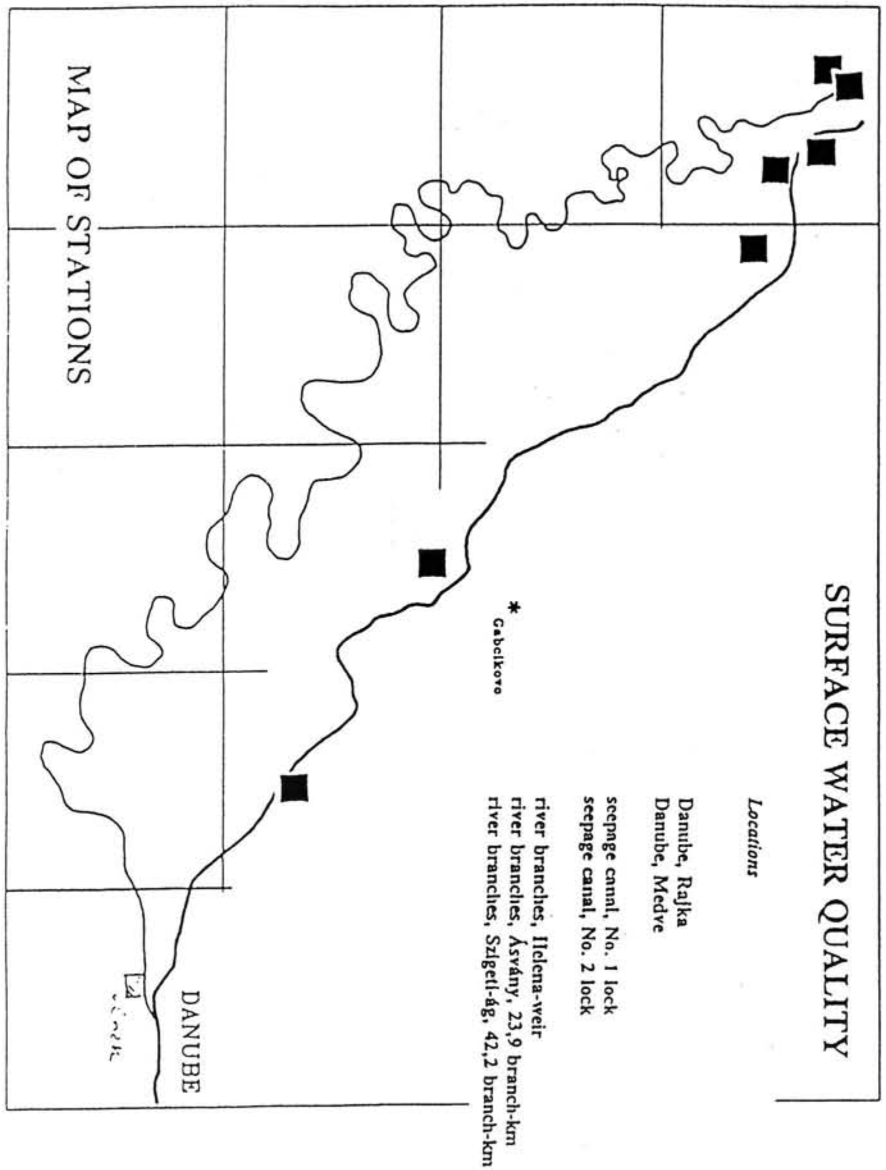


GAUGES (Daily Data)

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

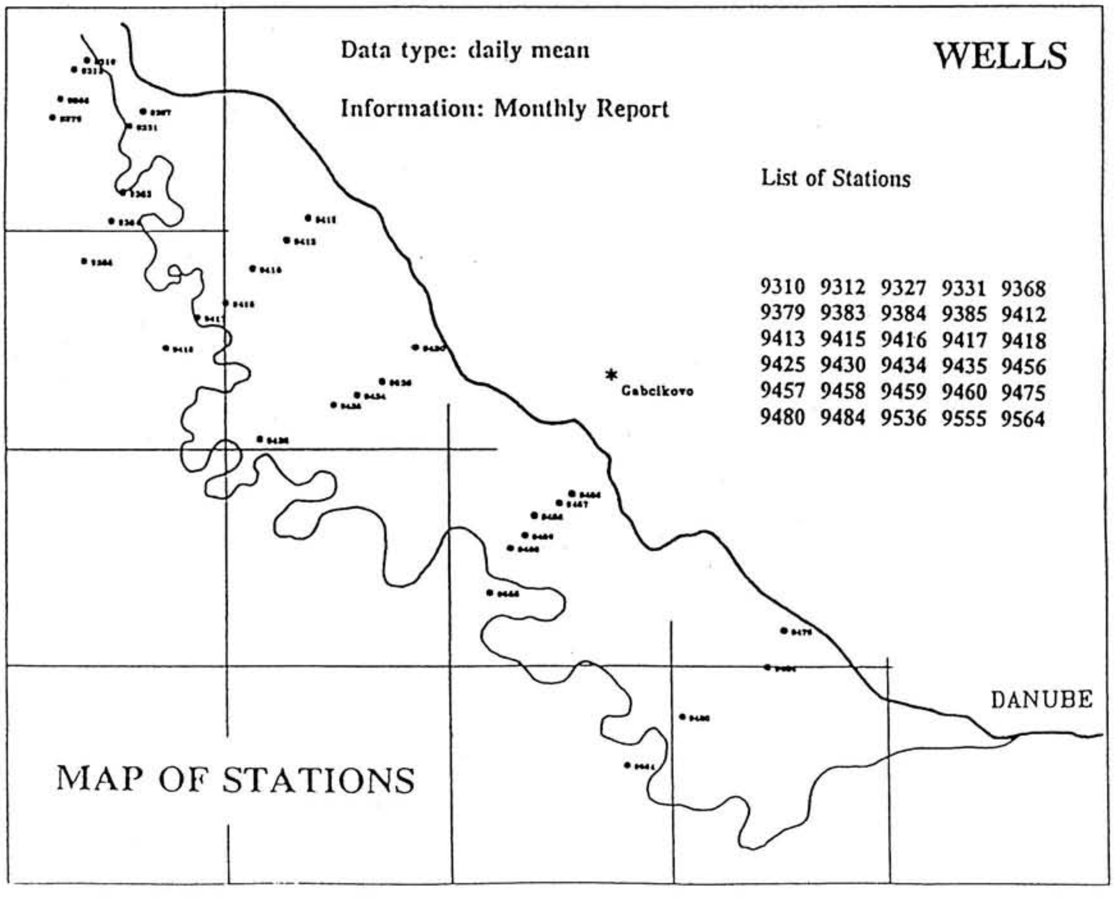
SEDIMENTS

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
WELLS
Information: Monthly Report
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

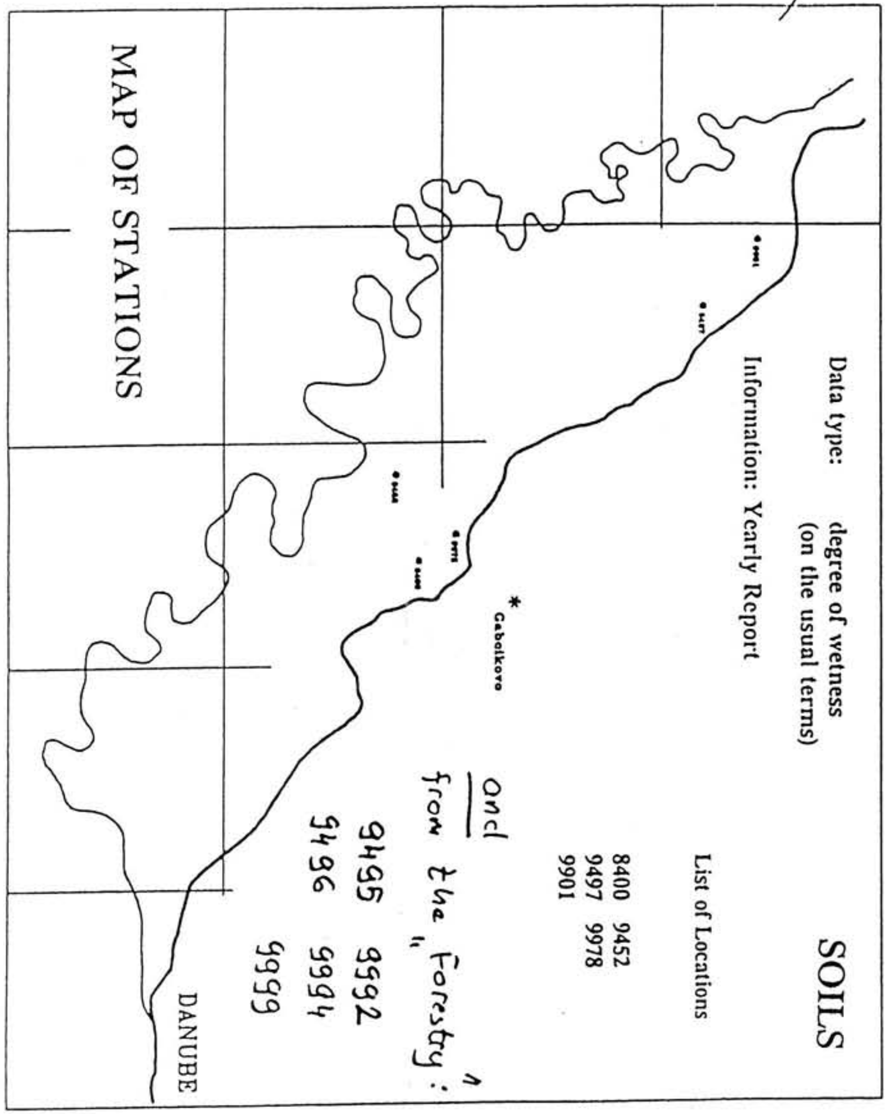
Árpád Kovács
Deputy Secretary of State

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

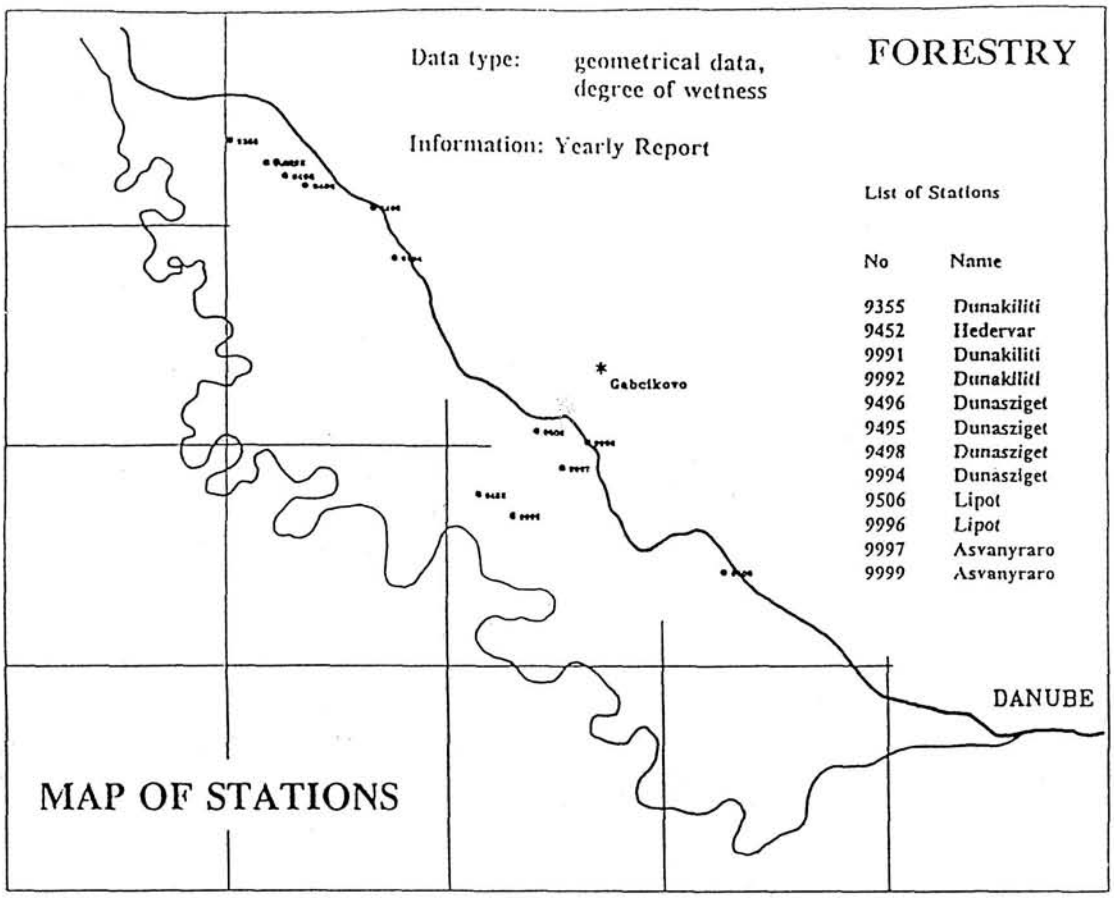
HCO_3, Cl, SO_4, NO_3, NO_2, PO_4

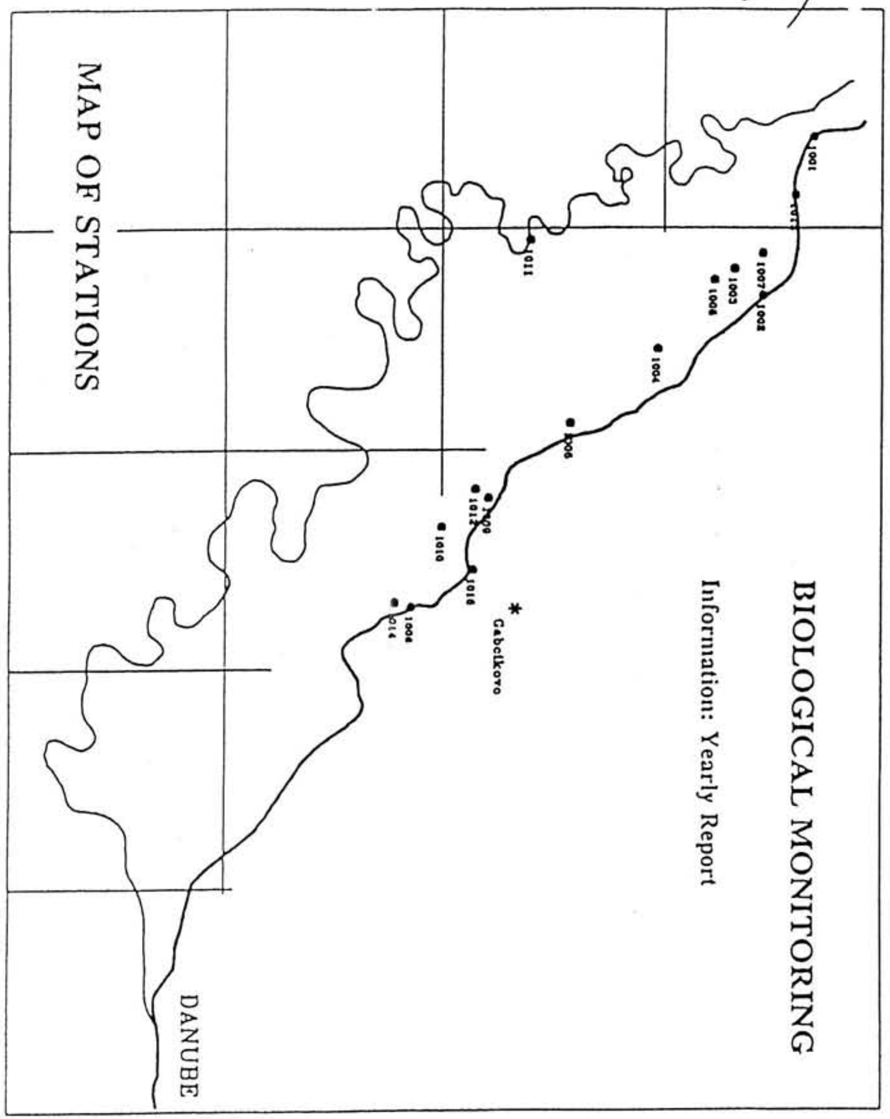
COD, TOC

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*


Data type: geometrical data, degree of wetness
FORESTRY
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

Rozsah sledovaných ukazovateľov, frekvencia mesačne:
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 2012 zo spoločného slovensko-maďarského monitorovania, stanoveného medzivládnou Dohodou z 19. apríla 1995

Prítomní:

za maďarskú stranu:

Dr. Zoltán Illés, PhD.	štátny tajomník Ministerstva rozvoja vidieka pre otázky životného prostredia, zástupca pre monitorovanie
Dr. István Teplán	hlavný radca, Sekretariát štátneho tajomníka pre otázky životného prostredia, Ministerstvo rozvoja vidieka
Mária M. Galambos	hlavný radca pre verejnú správu, Ministerstvo rozvoja vidieka, Odbor medzinárodných vzťahov
Péter Kovács,	riaditeľ odboru, Ministerstvo vnútra, Odbor vodného hospodárstva
Dorottya Illés	expert, Ministerstvo vnútra, Odbor vodného hospodárstva
Krisztina Koczka	pozorovateľ, Ministerstvo rozvoja vidieka, Odbor ochrany prírody
Pál Benyó,	tlmočník

za slovenskú stranu:

Ing. Ladislav Lazár,	splnomocnenec vlády pre výstavbu a prevádzku Sústavy vodných diel Gabčíkovo - Nagymaros, zástupca pre monitorovanie
Ing. Peter Panenka	expert, vedúci Odboru stratégie, Vodohospodárska výstavba š.p.
Dr. Zoltán Hlavatý, PhD.,	expert, Konzultačná skupina Podzemná voda
Ing. Daniela Horanská	vedúca sekretariátu

1. Zástupcovia oboch strán pre monitorovanie, Ing. Ladislav Lazár a Dr. Zoltán Illés vyhodnotili plnenie odporúčaní uvedených v správe za rok 2011.
2. Zástupcovia oboch strán prerokovali a prijali Spoločnú výročnú správu za rok 2012.
3. Strany sa dohodli, že Národné ročné správy z monitorovania za rok 2013 vypracujú do 15. mája 2014.

4. Strany potvrdili zámer uskutočniť dlhodobé hodnotenie výsledkov doterajšieho monitorovania s cieľom optimalizácie sledovaných ukazovateľov a frekvencie ich monitorovania. Splnomocnenci sa dohodli, že o ďalšom postupe prác rozhodnú po 15. máji 2014, pri príležitosti výmeny Národných ročných správ za rok 2013. Ďalej sa dohodli aj na tom, že posúdia možnosť a spôsob prepojenia tejto práce s blížiacim sa 20. výročím medzivládnej zmluvy o spoločnom monitorovaní (2015). Odborníci strán na základe toho upravia harmonogram prác a predpokladaný rozpočet a predložia ich na schválenie.

Budapešť, 23. januára 2014.

....
Dr. Zoltán Illés, PhD.
za maďarskú stranu

....
Ing. Ladislav Lazár
za slovenskú stranu

Jegyzőkönyv

az 1995. április 19-i kormányközi megállapodásban meghatározott közös magyar- szlovák monitoring 2011-évi Közös Éves Jelentésének megtárgyalásáról és aláírásáról

Résztvevők:

A magyar fél részéről:

Dr. Illés Zoltán, PhD.	környezetügyért felelős államtitkár, Vidékfejlesztési Minisztérium, monitorozással megbízott képviselő,
Dr. Teplán István	főtanácsadó, Környezetügyért felelős Államtitkár Titkársága, Vidékfejlesztési Minisztérium
M. Galambos Mária	közigazgatási főtanácsadó, Vidékfejlesztési Minisztérium, Nemzetközi Kapcsolatok Főosztálya
Kovács Péter	főosztályvezető, Belügyminisztérium, Vízgyűjtő-gazdálkodási Főosztály
Illés Dorottya	szakértő, Belügyminsiztérium, Vízgyűjtő-gazdálkodási Főosztály
Koczka Krisztina	megfigyelő, Vidékfejlesztési Minisztérium, Természetmegőrzési Főosztály
Benyó Pál,	tolmács

A szlovák fél részéről:

Ing. Lazár Ladislav	a Bős-Nagymarosi Vízlépcsőrendszer építésével és működtetésével megbízott kormánymeghatalmazott, monitorozással megbízott képviselő
Ing. Panenka Peter	szakértő, Stratégiai osztály vezetője, Vodohospodárska výstavba š.p.
Dr. Hlavatý Zoltán, PhD.	szakértő, Ground Water Consulting
Ing. Horanská Daniela	titkárságvezető

1. A két Fél monitoing felelőse, Ing. Lazár Ladislav és Dr. Illés Zoltán kiértékelte a 2011-évi jelentésben szereplő javaslatok teljesítését.
2. A két Fél képviselője megtárgyalta és elfogadta az 2012-évi Közös Éves Jelentést.
3. A Felek megegyeztek abban, hogy a 2013-évi megfigyelésekről szóló Éves Nemzeti Jelentéseket 2014. május 15-ig készítik el.

4. A Felek megerősítették azt a szándékukat, hogy elvégzik az eddigi monitorozás eredményeinek hosszú távú értékelését azzal a céllal, hogy optimalizálják a megfigyelt paramétereket és azok monitorozási gyakoriságát. A Meghatalmazottak megállapodtak abban, hogy a munka tovább előrehaladásáról a 2013. évi nemzeti jelentések cseréjének alkalmával, 2014. május 15. után döntenek. Megállapodtak továbbá abban is, hogy mérlegelik ennek a munkának összekapcsolási lehetőségét és módját a közös monitoringról szóló kormányközi megállapodás közelgő 20. évfordulójával (2015). A Felek szakértői ennek alapján módosítják a munkatervet valamint a becsült költségvetést és benyújtják jóváhagyásra.

Budapest, 2014. január 23.

....
Dr. Illés Zoltán, PhD.
a magyar fél részéről

....
Ing. Lazár Ladislav
a szlovák fél részéről

A P P E N D I X A.5.

Zápisnica z rokovania odborníkov na monitorovanie povrchových a podzemných vôd uskutočňovaného podľa medzivládnej Dohody z 19. apríla 1995

Dátum:	24. marec 2014, 4. apríl 2014 a 15. apríl 2014
Miesto:	Severo-zadunajské vodohospodárske riaditeľstvo (*ÉDUVIZIG*), Árpád utca 28-32, Győr Slovenský hydrometeorologický ústav (*SHMÚ*), Jeséniova 17, Bratislava
Maďarská strana:	József Katona, ÉDUVIZIG Gabriella Simon Mohácsné, ÉDUVIZIG
Slovenská strana:	Zoltán Hlavatý, Konz. sk. PODZEMNÁ VODA Ondrej Tausberík, SHMÚ
Predmet rokovania:	1. Zosúladenie metodiky vyčísľovania a zaokrúhľovania prietokov 2. Hodnotenie podzemných vôd za rok 2013 3. Rôzne

V zmysle bodu 2 kapitoly 8.2 Odporúčania Spoločnej výročnej správy z monitorovania životného prostredia v roku 2012 sa na základe návrhu maďarskej strany 24.3.2014 v Győri, 4.4.2014 v Bratislave a 15. apríla 2014 opäť v Győri uskutočnili rokovania v súvislosti s hodnotením kvantity povrchových vôd.

K bodu 1.

Keďže zaokrúhľovanie prietokov vyčísľovaných slovenskou (4 číslice) a maďarskou stranou (3 číslice) je dané softvérom používaným na spracovanie údajov, odborníci oboch strán sa dohodli nasledovne:

- doterajšia metodika vyčísľovania a zaokrúhľovania prietokov na oboch stranách zostáva nezmenená;
- poskytovanie údajov v rámci spoločného monitorovania podľa medzivládnej Dohody z roku 1995 zostáva nezmenené;
- v Národných správach a v Spoločnej správe pri výpočte mesačných a ročných priemerov sa bude pod 1000 zaokrúhľovať na 3 číslice, nad na 4 číslice (t.j. 10420; 6785; 520; 25,3; 2,45; 0,234).

Odborníci sa ďalej dohodli, že:

- výpočet mesačných a ročných priemerov bude vychádzať z priemerných denných údajov;
- mesačné a ročné minimá a maximá budú vychádzať zo skutočne stanovených minimálnych a maximálnych vodných stavov alebo prietokov (nie z priemerných denných hodnôt). Pokiaľ by uvedené podklady neboli k dispozícii a minimá alebo maximá budú vychádzať z priemerných denných hodnôt, táto skutočnosť sa výslovne uvedie v texte.

- pri sčítavaní prietokov z dvoch staníc (napr. Mošonský Dunaj a pravostranný priesakový kanál, resp. staré koryto Dunaja a pravostranná ramenná sústava) sa zaokrúhlenie podľa vyššie uvedenej zásady uskutoční až po sčítaní údajov;
- pri hodnotení plnenia prietokov v zmysle medzivládnej Dohody z roku 1995 zatiaľ ostáva v platnosti hodnota 7 % prijateľnej odchýlk, avšak pre objektívne hodnotenie prepúšťaných denných prietokov odborníci zostavia tabuľku denných odchýliek.

K bodu 2.

Pre hodnotenie podzemných vôd za hydrologický rok 2013 sa odborníci dohodli nasledovne:

- pre porovnanie období s nízkymi prietokmi (Q1000) bol predbežne zvolený termín 10.12.2012 (prípadná alternatíva 27.11.2012);
- pre porovnanie období s priemernými prietokmi (Q2000) bol predbežne zvolený termín 22.3.2013. Ďalšou alternatívou je termín 27.5.2013 alebo 16.2.2013;
- pre porovnanie období s vysokými prietokmi bol (Q3000) bol predbežne zvolený termín 12.1.2013. Ako alternatíva môže byť termín 6.7.2013 alebo 2.7.2013.

K bodu 3.

Odborníci pre monitorovanie povrchových a podzemných vôd sa dohodli, že pri hodnotení roku 2013 uskutočnia aj vyhodnotenie pre obdobie kalendárneho roka. Pokiaľ sa pri hodnotení nevyskytnú problémy, v záujme zosúladenia hodnotenia povrchových a podzemných vôd s hodnotením ostaných zložiek prírodného prostredia (kvalita vôd, pôdna vlhkosť, les a biota) navrhnú zmenu hodnoteného obdobia z hydrologického roka na kalendárny rok.

Výmenu údajov za rok 2013 odborníci predbežne dohodli na 15.4.2013.

Zápisnica bola vyhotovená v slovenskom a maďarskom jazyku v dvoch vyhotoveniach.

Győr, 15. apríl 2014.

....	....	....
József Katona	Gabriella Simon Mohácsi	Zoltán Hlavatý
ÉDUVIZIG	ÉDUVIZIG	KS PODZEMNÁ VODA

Jegyzőkönyv
az 1995. április 19-ei kormányközi Megállapodás alapján történő felszíni és felszínalatti vizek monitoring szakértői tárgyalásról

Időpont:	2014. március 24., 2014. április 4. és 2014. április 15.
Helyszín:	Észak-dunántúli Vízügyi Igazgatóság (*ÉDUVIZIG*), Árpád út 28-32, Győr Szlovák Hidrometeorológiai Intézet (*SHMÚ*), Jeséniova 17, Bratislava
Magyar fél:	Mohácsiné Simon Gabriella, ÉDUVIZIG Katona József, ÉDUVIZIG
Szlovák fél:	Hlavatý Zoltán, Ground Water Consulting Tausberík Ondrej, SHMÚ
Tárgy:	1. Vízhozamok számítási és kerekítési metodikájának összehangolása 2. Felszín alatti vizek 2013. évi értékelése 3. Egyebek

A 2012. évi környezeti monitoring Közös Éves Jelentés, 8.2 Javaslatok fejezete 2. pont értelmében a Magyar fél javaslata alapján 2014. március 24-én Győrött, 2014. április 4-én Pozsonyban és 2014. április 15-én ismét Győrött egyeztetésekre került sor a felszíni vizek mennyiségi értékelésével kapcsolatában.

<u>1. pont.</u>

Mivel a vízhozamok számításánal a kerekítés a szlovák (4 számjegy) és a magyar oldalon (3 számjegy) az adatok feldolgozásához használt szoftverből adódik, a két fél szakértői következőképpen állapodtak meg:

- a vízhozamok számszerűsítésének és kerekítésének eddigi munkamódszere mindkét félnel változatlan marad;
- az 1995. évi kormányközi Megállapodás szerinti közös monitoring adatszolgáltatás változatlan marad;
- a Nemzeti Jelentésekben és a Közös Jelentésben a havi és az éves átlagok számításakor a kerekítés 1000 alatt 3 számjegyre, afölött 4 számjegyre történik (azaz 10420; 6785; 520; 25,3; 2,45; 0,234).

A szakértők továbbá megállapodtak, hogy:

- a havi és az éves átlagok számítása a napi átlag adatokon alapul;
- a havi és az éves minimumok és maximumok a ténylegesen megállapított vízszint vagy vízhozam minimumokon és maximumokon alapulnak (nem az átlagos napi értéken). Amennyiben a fenn említett alapadatok nem állnak rendelkezésre és a minimumok és a maximumok átlagos napi adatokon alapulnak, ennek ténye a szövegben feltüntetésre kerül.

- két állomás vízhozamainak összeadásakor (pl. a Mosoni Duna és a jobboldali szivárgó csatorna, ill. az Öreg-Duna meder és a jobboldali ágrendszer) fenti elv szerint történő kerekítése az adatok összeadása után történik;
- az 1995. évi kormányközi Megállapodás szerinti vízhozamok értékelésének teljesítésénél egyelőre érvényben marad a 7 %-os elfogadható eltérés értéke, azonban az átadott napi vízhozam értékek objektív értékelése céljából a szakértők összeállítják a napi eltérések táblázatát.

2. pont.

A 2013-as hidrológiai év felszínalatti vizek értékelésénél a szakértök következőképpen állapodtak meg:
- az alacsony vízhozamú (Q1000) időszakok összehasonlításához előzetesen a 2012.12.10-i időpont volt kiválasztva (lehetséges változat 2012.11.27);
- a közepes vízhozamú (Q2000) időszakok összehasonlításához előzetesen a 2013.3.22-i időpontot választották ki. További lehetséges változat a 2013.5.27. vagy 2013.2.16.
- a magas vízhozamú (Q3000) időszakok összehasonlításához előzetesen a 2013.1.12-i időpont lett kiválasztva. Alternatív változat a 2013.7.6-i illetve 2013.7.2-i időpont lehet.

3. pont.

A felszíni és a felszínalatti vizek monitoring szakértői megállapodtak abban, hogy a 2013. év értékelésénél naptári évre kiterjedő értékelést is végrehajtanak. Amennyiben az értékelésnél nem lépnek fel problémák a többi természeti környezet összetevő (vízminőség, talajnedvesség, erdő és az élőlények) értékelésével, a felszíni és a felszínalatti vizek értékelésének összehangolása érdekében javasolni fogják az értékelési időszak változtatását hidrológiai évről naptári évre.

A szakértők az adatcserét előzetesen 2014.4.15-re beszélték meg.

A jegyzőkönyv szlovák és magyar nyelven készült 2-2 példányban.

Győr, 2014. április 15.

....	Mohácsiné S. Gabriella	....
Katona József	Mohácsiné Simon Gabriella	Hlavatý Zoltán
ÉDUVIZIG	ÉDUVIZIG	GROUND WATER Consulting