

ANNEX 3.6:

SET OF AVAILABLE LESKOVAC WASTEWATER QUALITY AND QUANTITY DATA, 1990 - 2007



WATER QUALITY IN SEWER SYSTEM

Table 1 Analysis of wastewater quality in Leskovac in 1990

No	Analysed parameter	Unit	Results of analysis				Average value
			Winter	Spring	Summer	Autumn	C _{average}
1.	Water/air temperature	°C	8/0	14/15	20/28	16/18	
2.	pH		7,8	8	7,6	6,8	7,56
3.	Settled matter after 2h	sm ³ /dm ³	1,5	2	4	5	3,12
4.	Suspended matter	mg/dm³	350	276	276	502	351
5.	Dry residue – SS	mg/dm ³	184	80	187	152	151
6.	Total dry residue	mg/dm ³	1140	1108	1208	1470	1231
7.	Total residue (after incineration)	mg/dm ³	326	640	890	798	663
8.	Dry residue of dissolved matter	mg/dm ³	790	832	932	968	880
9.	Residue of dissolved matter (after incineration)	mg/dm ³	142	560	703	646	513
10.	COD	mgO ₂ /dm ³	760	768	1180	1413	1030
11.	BOD ₅	mgO ₂ /dm ³	306	318	540	680	461
12.	Phenols	mg/dm ³	0,08	0,129	0,022	0,082	0,078
13.	Detergents	mg/dm ³	1,4	1,043	2,8	3,52	2,191
14.	Oils and fats	mg/dm ³	36	64	48	122	68
15.	Nitrates	mg/dm ³	18	1,4	3,8	0,6	5,95
16.	Nitrites	mg/dm ³	0,5	0,15	0	0	0,16
17.	Sulphates	mg/dm ³	180	94	105	172	138
18.	Cyanides	mg/dm ³	0	0	0	0	0
19.	Cr	mg/dm ³	0	0	0	0	0
20.	Fe	mg/dm ³	0	0	0	0	0
21.	Cu	mg/dm ³	0	0	0	0	0
22.	Zn	mg/dm ³	0	0	0	0	0
23.	Phosphates	mg/dm ³	1,4	0,49	12	0	4,63
24.	Ammonia	mg/dm ³	3	5,2	3,8	10,3	5,57
25.	BOD ₅ /COD ratio	%	40	41	55	78	53

Q = 873 m³/h = 242 l/s



Table2 Communal wastewater quality in Leskovac based on 29 samples taken between 1997 and 2004

Parameter	Unit	Average	St. dev.
COD	mg/l	404	202
BOD	mg/l	162	110
NH ₄ -N	mg/l	23.0	26.7
Nitrate-N	mg/l	3.96	3.93
Total P	mg/l	2.36	0.96
TSS	mg/l	446	303

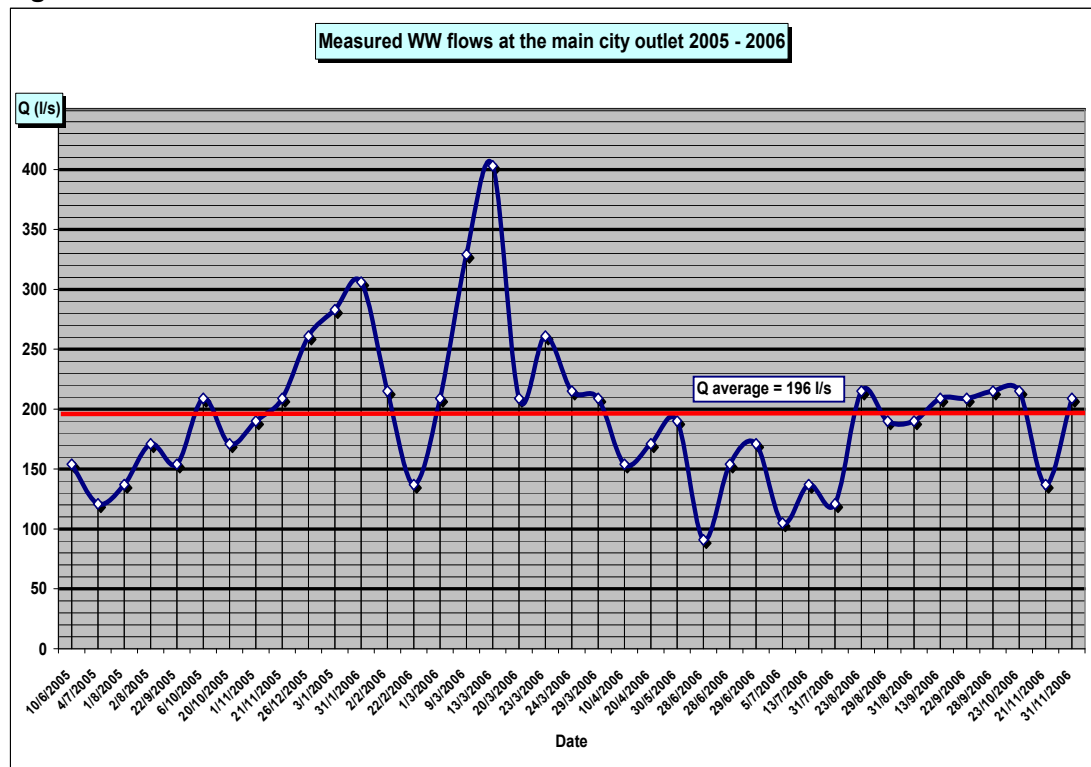
Table 3 Communal wastewater quality in Leskovac in 2004 – Institute for Public Health Leskovac

Parameter	Unit	Range
pH		7,7 – 7,8
SS	mg/l	50 – 550
BOD ₅	mg/l	57 – 137
COD	mg/l	181 - 311

Wastewater Quantity

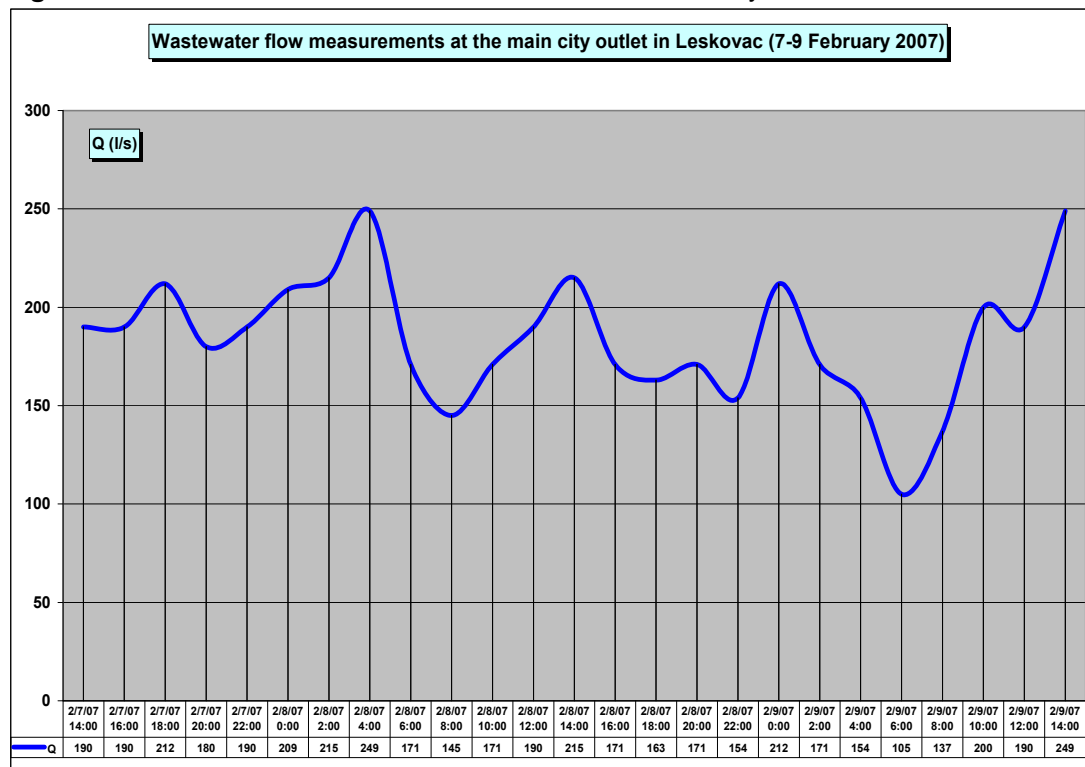
Since 2005 regularly intermittent measurements of the flow have been conducted (source – GP report 2007) and based on these a new series was carried out in the period June 2005 – November 2006 (39 individual measurements in total), resulting in an average flow of 196 l/s, somewhat higher than earlier results, see Figure below.

Figure 4 Intermittent flow measurements at the main outlet 2005 and 2006



Although the measurements shown in the GP 2007 cover much longer period and can be considered as more representative for assessment of the average annual discharge, with regard to the average flows recorded, the results appear to be comparable, and the average discharge of approximately 180 l/s can be adopted for further analysis in this study.

Figure 5 Short-term WW flow measurements in February 2007



A limited number of flow measurements of wastewater collected and discharged has been conducted and recorded, but on rather random basis, and therefore these measurements should be also cross-checked with the water consumption data in order to establish/confirm a correlation.

Therefore, current wastewater flows shall be estimated in relation to the recorded water supply consumption for consumers connected to the water supply, and at the same time to the sanitary sewerage system.

Table 6 Results of wastewater quality analysis carried out by the Institute “Jaroslav Černí“ concurrent with flow measurement

PARAMETER	UNIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		07.02.07. 14h	07.02.07. 18h	07.02.07. 22h	08.02.07. 02h	08.02.07. 06h	08.02.07. 10h	08.02.07. 14h	08.02.07. 18h	08.02.07. 22h	09.02.07. 02h	09.02.07. 06h	09.02.07. 10h	09.02.07. 14h	Max.	Min.	Ave. weighed	Stand. Dev.
KMnO ₄ consump.	mg/l	230,1	235,2	253,8	132,8	85,7	202,6	283,4	180,9	228,9	174,8	98,9	204,2	1093,7	1.093,7	85,7	284,3	256,7
COD (K ₂ Cr ₂ O ₇)	mgO ₂ /l	350	380	440	160	110	390	460	360	350	280	130	410	840	840,0	110,0	372,1	185,4
BOD ₅	mgO ₂ /l	159,8	148	154	57,7	28,5	130,6	159	129,8	140,6	110,2	32,9	89,1	751,2	751,2	28,5	175,9	183,3
Suspended matter	mg/l	510,0	405,0	360,0	156,0	70,0	277,0	530,0	400,0	277,0	140,0	60,0	255,0	1588,0	1.588,0	60	421,5	391,9
Settleable matter	ml/l	3,0	3,0	6,0	1,0	1,0	4,0	4,0	2,0	2,0	1,5	0,5	2,0	12,0	12,0	0,5	3,5	3,0
Cl	mg/l	86,49	124,25	82,32	39,71	45,43	90,6	75,6	91,9	72,8	59,3	39,6	68,6	94,8	124,3	39,6	75,4	24,5
SO ₄	mg/l	112,5	125,0	115,0	111,2	88,8	76,2	77,5	82,5	100,0	100,0	71,2	72,5	112,5	125,0	71,2	96,5	18,6
S-	mg/l	3,1	2,6	2,9	0,5	0,26	3,6	4,1	2,6	2,6	2,6	1,2	3,1	4,1	4,1	0,3	2,6	1,2
PO ₄ total	mgP/l	6,4	5,9	6,4	4,0	2,4	7,4	7,7	6,4	7,0	7,8	5,0	7,9	11,4	11,4	2,4	6,7	2,2
Nkjeldal	mgN/l	53,2	58,8	53,2	33,6	28,0	75,6	58,8	44,8	49	50,4	30,1	70	75,6	75,6	28,0	53,1	15,8
NH ₄ ⁺	mgN/l	36,4	42,0	33,6	19,6	14,0	47,6	33,6	37,8	30,8	30,8	25,2	47,6	30,8	47,6	14,0	33,0	9,8
NO ₂	mgN/l	0,010	0,011	0,010	0,035	0,015	0,010	0,014	0,012	0,012	0,011	0,030	0,012	0,027	0,035	0,010	0,017	0,009
NO ₃	mgN/l	1,00	1,10	0,30	0,60	0,40	0,86	0,34	0,18	0,20	0,20	0,15	1,38	0,26	1,38	0,15	0,55	0,41
Mineral oils	mg/l	0,68	3,31		1,38		6,94		4,89		5,05		12,61		12,6	0,7	5,5	4,0
Detergents	mg/l	0,7	0,8		0,3		0,8		0,6		0,4		0,6		0,8	0,3	0,6	0,2
Phenols	µg/l	20	32		15		18		26		14		42		42,0	14,0	24,8	10,2
Fe	mg/l	0,54	0,53	0,88	0,40	0,36	0,30	0,30	0,22	0,26	0,22	0,28	0,39	1,40	1,40	0,22	0,50	0,33
Mn	mg/l	0,18	0,14	0,13	0,20	0,16	0,14	0,13	0,11	0,12	0,09	0,10	0,12	0,18	0,20	0,09	0,14	0,03
Zn	mg/l	0,17	0,10	0,10	0,03	0,01	0,01	0,04	0,03	0,04	0,03	0,02	0,08	0,16	0,17	0,01	0,07	0,05
Cu	mg/l	0,03	0,02	0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	0,04	0,04	<0,01	n/a	n/a
Cr	µg/l	7,0	4,0	2,2	<1,0	<1,0	<1,0	<1,0	4,0	6,2	<1,0	6,5	6,2	44,0	44,0	<1,0	n/a	n/a
Cd	µg/l	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	0,80	0,8	<0,5	n/a	n/a
As	µg/l	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	<10,0	n/a	n/a
Q	l/s	190	212	190	215	171	171	215	163	154	171	105	200	249			190	

13 December 2007


Municipal Infrastructure Agency Support Programme
An EU-funded project managed by the European Agency for Reconstruction
9R5927/CvS/R2006_21/R001

Feasibility Study Leskovac
Final Report