Supplementary

The following data has been compiled from the StormTac Database, version v.2021-09-02, by extraction of data for the four selected substances TP, Cu, Zn and TSS as well as the land uses that exist in the two case studies. A CV-value <0.5 indicates a low uncertainty (green), a CV between 0.50-1.25 (yellow) an average uncertainty and a CV>1.25 a high uncertainty (red), according to Burton G.A. and Pitt R.E. 2002. Stormwater Effects Handbook. A toolbox for watershed managers, scientists, and engineers. Lewis Publishers, Boca Raton, Florida.

Table S1. Stormwater concentrations (TP, Cu and Zn in µg/L, TSS in mg/L) and statistics for different land uses considered in the case studies.

	TP	Cu	Zn	TSS
Residential				
Typical value	230	20	80	45
Coefficient of variation, CV	0.58	1.2	0.76	1.1
Number of values	93	94	96	98
Median value	340	13	73	71
Mean value	390	20	97	120
Standard deviation	230	25	74	130
Standard error	23	2.6	7.5	13
Relative standard error (%)	6.0	13	7.8	11
Downtown area				
Typical value	290	32	160	100
Coefficient of variation, CV	0.58	1.1	0.69	1.3
Number of values	47	49	48	56
Median value	320	20	160	95
Mean value	370	32	210	160
Standard deviation	220	35	150	200
Standard error	32	5.0	21	27
Relative standard error (%)	8.5	16	9.9	17
Industrial				
Typical value	310	42	240	100
Coefficient of variation, CV	0.70	1.0	0.72	1.2
Number of values	58	59	60	60
Median value	310	27	240	100
Mean value	410	42	300	170
Standard deviation	290	44	220	190
Standard error	37	5.7	28	25
Relative standard error (%)	9.1	13	9.3	15
Freeways				
Typical value (ADT 13 000)	140	28	210	77
Typical value (ADT 7 000)	110	18	150	67
Coefficient of variation, CV	0.78	0.85	1.1	0.98
Number of values	38	59	62	57
Median value	270	41	210	100
Mean value	310	53	300	130
Standard deviation	240	45	340	130
Standard error	39	5.8	43	17
Relative standard error (%)	13	11	14	13
Agricultural property				
Typical value	250	11	70	100
Coefficient of variation, CV	0.84	0.92	0.66	1.4
Number of values	16	4	4	11
Median value	250	22	160	55

Mean value	330	38	170	150
Standard deviation	280	35	110	210
Standard error	69	17	55	63
Relative standard error (%)	21	46	33	43
Forest				
Typical value	17	9.0	30	40
Coefficient of variation, CV	1.4	0.29	0.99	0.54
Number of values	22	6	6	9
Median value	24	9.0	30	40
Mean value	56	8.0	69	46
Standard deviation	78	2.3	68	25
Standard error	17	0.94	28	8.3
Relative standard error (%)	30	12	40	18
Multi-family area				
Typical value	260	30	100	100
Coefficient of variation, CV	0.37	1.2	0.76	1.2
Number of values	18	13	13	13
Median value	310	80	140	130
Mean value	310	140	170	160
Standard deviation	110	170	130	190
Standard error	27	46	35	53
Relative standard error (%)	8.8	33	21	33
Park grounds				
Typical value	200	11	60	24
Coefficient of variation, CV	0.75	0.048	0.33	0.73
Number of values	6	2	2	3
Median value	90	11	60	12
Mean value	120	11	60	24
Standard deviation	92	0.50	20	17
Standard error	38	0.35	14	10
Relative standard error (%)	30	3.4	24	42
Parking				
Typical value	180	40	140	140
Coefficient of variation, CV	1.2	1.6	0.71	1.5
Number of values	25	27	27	18
Median value	180	30	210	150
Mean value	400	57	250	260
Standard deviation	500	89	180	380
Standard error	100	17	34	89
Relative standard error (%)	25	30	14	35
Terraced house area				
Typical value	250	20	85	5
Coefficient of variation, CV	0.65	0.85	0.43	0.33
Number of values	7	6	5	7
Median value	420	11	57	59
Mean value	390	21	64	58
Standard deviation	250	18	27	19
Standard error	96	7.2	12	7.2
Relative standard error (%)	25	35	19	12
Meadows				
Typical value	250	11	30	90
Coefficient of variation, CV	0.75	0.57	0.27	0.97
Number of values	5	3	3	4
Median value	310	10	30	120
Mean value	350	17	30	210

Standard deviation	270	9.4	8.2	200
Standard error	120	5.4	4.7	100
Relative standard error (%)	34	33	16	48

Table S2. Baseflow concentrations (TP, Cu and Zn in µg/L, TSS in mg/L) and statistics for different land uses considered in the case studies. For the land uses where no statistics are given, there is no data, and the typical values are thus based on data from similar land uses. For land uses where there was only one case study, this data was presented, but no statistics.

	TP	Cu	Zn	TSS
Residential				
Typical value	58	5.5	27	10
Coefficient of variation, CV	0.83	0.53	0.46	0.63
Number of values	8	7	7	6
Median value	220	9.1	37	14
Mean value	300	11	38	16
Standard deviation	240	5.8	17	10
Standard error	86	2.2	6.5	4.1
Relative standard error (%)	29	20	17	26
Downtown area				
Typical value	81	8	47	13
Coefficient of variation, CV	0.67			0.053
Number of values	2	1	1	2
Median value	1 600			12
Mean value	1 600			12
Standard deviation	1 000			0.66
Standard error	740			0.46
Relative standard error (%)	47			3.8
Industrial				
Typical value	87	12	90	15
Coefficient of variation, CV	1.0	0.60	0.61	0.78
Number of values	5	4	4	3
Median value	160	27	100	15
Mean value	260	27	100	22
Standard deviation	260	16	63	17
Standard error	120	8	31	9.9
Relative standard error (%)	45	30	30	45
Freeways				
Typical value	52	13	55	25
Salt Lake City (1999)*	350	8	3	9.6
Agricultural property				
Typical value	39	14	20	19
Coefficient of variation, CV	0.54			
Number of values	2			1
Median value	85			
Mean value	85			
Standard deviation	46			
Standard error	32			
Relative standard error (%)	38			
Forest				
Typical value	15	3.5	10	1.5
Coefficient of variation, CV	0.56			
Number of values	2	1	1	1
Median value	18			

Mean value	18			
Standard deviation	10			
Standard error	7.1			
Relative standard error (%)	39			
Multi-family area				
Typical value	87	8.3	33	17
Park grounds				
Typical value	35	4.1	8.4	12
Parking				
Typical value	29	11	47	35
Terraced house area				
Typical value	73	6.9	28	11
Myhrman (2020)**	19	5.9	17	81
Meadows				
Typical value	30	4.5	20	2.0

*) Salt Lake City. 1999. Storm water management plan. Stormwater NPDES Permit. 1999 Annual report. Forest Dale Base Flow Samples 1995-1998.

**) Myhrman G. 2020. Estimated concentrations compared to measured concentration from flow proportional sampling. Mälarenergi. v. 2020-09-15. (In Swedish).

Table S3. Reduction efficiencies (%) and statistics of different facilities used in the case study.

	TP	Cu	Zn	TSS
Wet pond				
Reduction efficiencies (%)	55	60	60	80
Number of values	77	60	68	51
Median value	53	53	63	79
Mean value	35	46	54	72
Standard deviation	100	43	37	21
Standard error	11	5.5	4.5	3.0
Relative standard error (%)	33	12	8.3	4.2
Bioretention filter				
Reduction efficiencies (%)	65	65	85	80
Number of values	77	41	44	32
Median value	37	48	79	76
Mean value	-21	36	72	68
Standard deviation	200	61	25	47
Standard error	23	9.6	3.8	8.3
Relative standard error (%)	-110	27	5.2	12

Table S4. Rain depth (mm) and passed water volume (m^3) from Ladbrodammen per sampling period during 2008-05-08 to 2008-05-20. Data from Alm, H.; Banach, A.; Larm, T. The Occurrence and Reduction of Priority Substances, Heavy Metals and Other Substances in Storm Water; Swedish Water, report No. 2010-06; 2010. (In Swedish)

Start sampling	End sampling	Passed volume [m^3]	Rain depth [mm]
08.05.2008	22.05.2008	4800	18.2
23.05.2008	06.05.2008	400	0
06.06.2008	19.06.2008	7600	11.9
20.06.2008	03.07.2008	5800	33.5
04.07.2008	17.07.2008	3400	23.5
18.07.2008	31.07.2008	600	3.6
01.08.2008	28.08.2008	30900	153.1
29.08.2008	10.09.2008	7300	22.7
11.09.2008	24.09.2008	900	0
25.09.2008	22.10.2008	13300	46.8
23.10.2008	06.11.2008	8600	25.7
07.11.2008	19.11.2008	1100	51.9
20.11.2008	16.12.2008	13300	68.2
18.12.2008	21.01.2009	98700	19.8
22.01.2009	11.02.2009	25700	24.9
12.02.2009	12.03.2009	20300	32
13.03.2009	08.04.2009	13000	16.1
09.04.2009	06.05.2009	5400	6.7

Table S5. Rain depth (mm) from Ladbrodammen during the sampling period 2009-05-07 to 2010-08-31. 2 samples/month.

	Rain depth [mm]
May 2009	20.7
June 2009	101.4
July 2009	70
Aug. 2009	59.4
Sep. 2009	42
Oct. 2009	67.1
Nov. 2009	58.9
Dec. 2009	42.1
Jan. 2010	25.2
Feb. 2010	38.3
Mar. 2010	31.2
Apr. 2010	26.3
May 2010	45
June 2010	43.2
July 2010	66.3
Aug. 2010	106.2

Fitting the lognormal distribution to TP and Cu data (concentrations)

Examples of fitting the lognormal distribution to concentrations of TP and Cu, for a large dataset for residential lands, are shown in Figures S1 and S2, respectively. The first case represented the best fit, the second case the worst fit. In the latter case, low R^2 value of the fitted distribution was caused by outliers, identified in both examples. Outliers in the upper tail of the distribution are particularly important when assessing non-exceedance of high concentrations (e.g., when assessing compliance with water quality criteria), but less important when dealing with the central part of the distribution (e.g., choosing median concentrations for load estimates) as applied here.

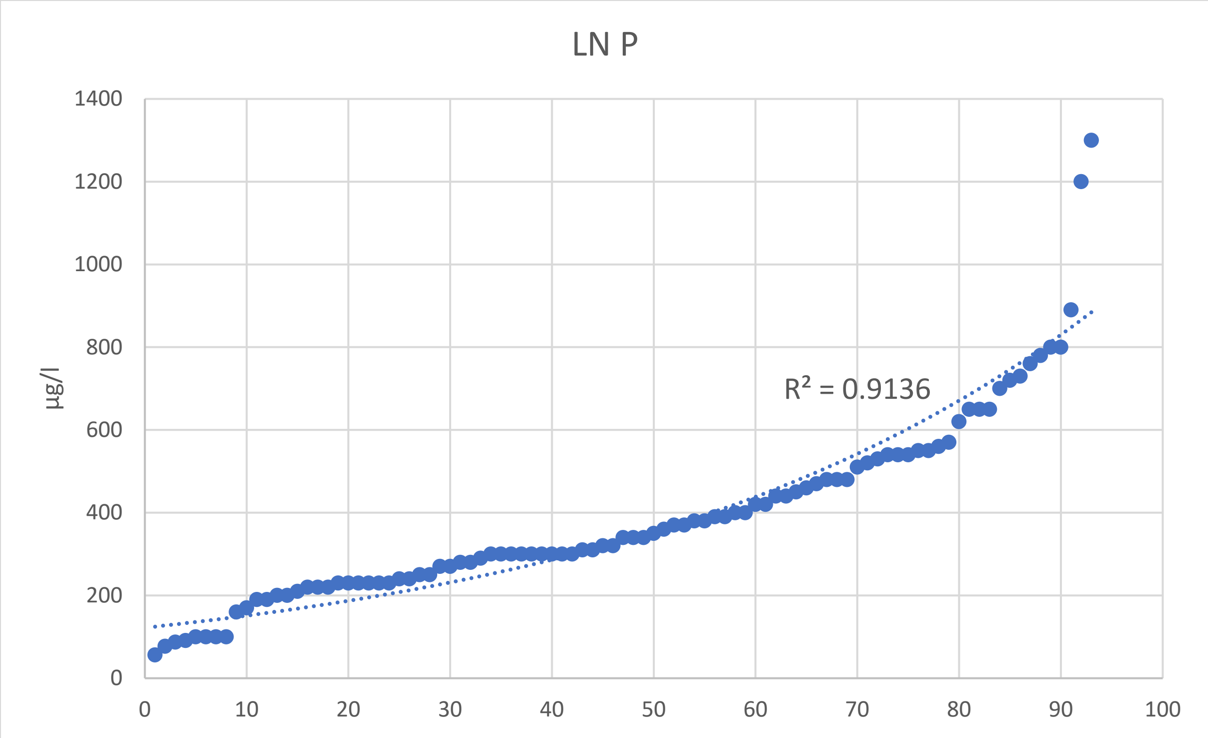

Figure S1. Lognormal distribution of phosphorus (TP) concentrations from the StormTac Database, for residential land use.

Figure S2. presents the lognormal distribution of copper (Cu) concentrations from the StormTac Database (residential land use). Among the four studied constituents, Cu had the worst fit (R^2=0,64) to a lognormal function.

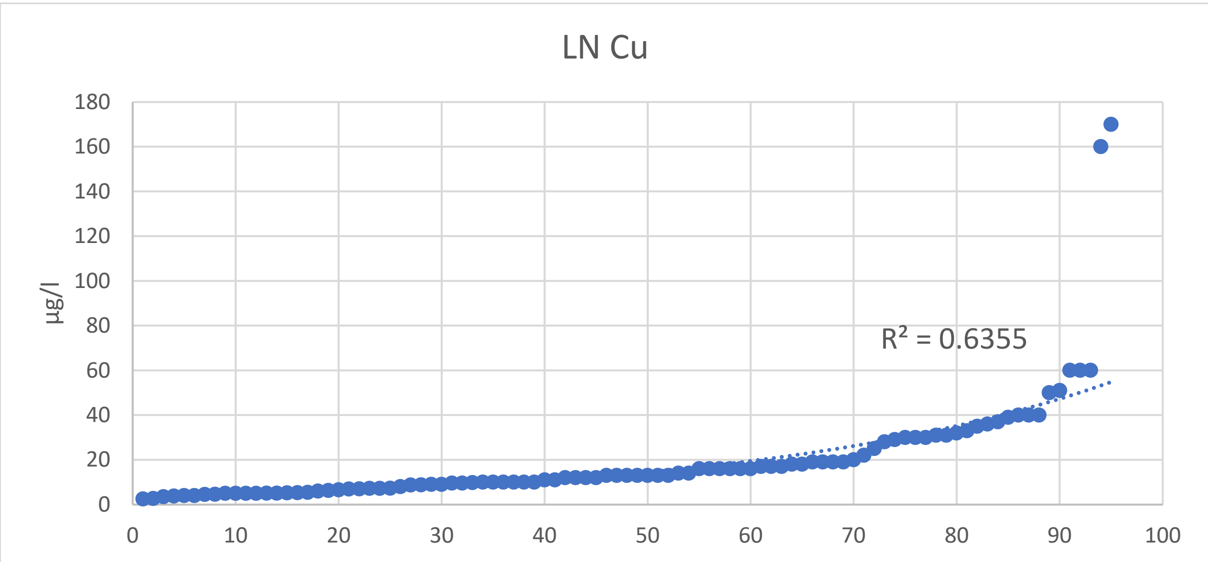

Figure S2. Lognormal distribution fitted to copper (Cu) concentrations from the StormTac Database (residential land use).