Supporting Information

For

Occurrence and Source of Nitrosamines and Secondary Amines in Groundwater and its Adjacent Jialu River Basin, China

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This supporting information provides detailed descriptions of chemicals and standards used in the analysis, GC/MS Analysis for Secondary amines and LC-ESI-MS/MS Analysis for Acesulfame. Figures and tables addressing: correlation between nitrosamines and corresponding secondary amines in surface water of Jialu River basin (Figure S1); calculated contributions of domestic and industrial sources to the target pollutants load in the river samples based on the concentrations of acesulfame (Figure S2); Characteristics of groundwater (Table S1); absolute recoveries of deuterated nitrosamines and secondary amines in various types of aqueous matrices (Table S2); relative recoveries of eight secondary amines in various types of aqueous matrices (Table S3); concentrations of nitrosamines, secondary amines and acesulfame in groundwater, river water and discharging site samples in Jialu River Basin (Table S4).

Reagents. Standards of eight nitrosamines (NDMA (> 99%), NMEA (> 99%), NPYR (99%), NPIP (99 %), NMOR (99 %), NDEA (> 99%), NDPA (99 %), and NDBA (99%)) and eight secondary amines (DMA (> 99.0%), MEA (> 97%), PYR (> 99%), PIP (> 99%), MOR (> 99%), DEA (> 99.5%), DPA (99%), and DBA (> 99%)) were purchased from Supelco (USA). Acesulfame K (> 99%) and benzenesulfonyl chloride (> 99%) were purchased from Sigma (St Louis, MO, USA). The deuterated NDMA-d_6 (98%), NMEA-d_3 (98%), NPYR-d_8 (98%), NMOR-d_8 (98%), NDEA-d_{10} (98%), NPIP-d_{10} (98%), NDPA-d_{14} (98%), NDBA-d_{18} (98%) and DMA-d_6 (98%) were internal standards and obtained from Cambridge Isotope Laboratories (Andover, MA, USA). HPLC-grade hexane, dichloromethane, acetonitrile, methanol, and water were purchased from Fisher Chemical Co. (USA). HPLC-grade formic acid was provided by Dima Technology. Sodium bicarbonate, hydrochloric acid (37%), sodium sulfate, and sodium hydrogen carbonate were obtained from Beijing Chemical Co. (China). Stock solutions for all standard substances were stored at -20 °C.

GC/MS Analysis for Secondary amines. The amines were analyzed following the method reported previously (*1*) with some modifications. 20 μL of an aqueous solution of DMA-d_6 (50 μg/ml) as internal standard (I.S.) were added to 200 mL water sample in a 250 mL round bottomed flask. Then the water samples were derivatized with benzenesulfonyl chloride following the same procedures reported previously (*1*). After derivatization, the mixtures were extracted with dichloromethane, and the solvent was evaporated to 1 mL and 1μL was injected into the GC-MS.

GC-MS analysis was carried out on a GC-2010 gas chromatograph (SHIMADZM, Japan) equipped with a GCMS-QP2010 plus mass spectrometer and a split/splitless injector. A capillary column (30 m×0.32 mm I.D., 0.25 μm film thickness) of Rxi-5ms type (RESTEK, USA) was used, with helium (purity, 99.9990%) as the carrier gas at a flow rate of 1 mL/min. The GC oven temperature was programmed from 120 °C (3 min) to 200 °C at 5°C/min, and then from 200 °C to 290 °C (5min) at 20 °C/min. The injector and detector temperatures were set at 290 °C. Mass spectra were acquired at an ionization voltage of 70 eV. Data evaluation was done using a SHIMADZU GC/MS solution software.

LC-ESI-MS/MS Analysis for Acesulfame. The water samples were directly analyzed for acesulfame without concentration due to its high concentrations. The LC apparatus was an Acquity Ultra performance LC (Waters, USA). All analytes were separated using a Waters Acquity UPLC BEH C8 column (100 mm × 2.1 mm, 1.7 μm particle size) (Waters, USA). The column was maintained at 40 ^{o}C at a flow rate of 0.2 mL/min and the injection volume was 20 μL. Methanol (A) and water containing 0.1% ammonium acetic (B) were used as mobile phases. The following gradient was used: The initial 2% A hold for 0.5 min, followed by a linear increase to 10% A in 3 min, and then returned to the initial conditions of 2% A and equilibrated for 3 min for the next injection.

Mass spectrometry was performed using a Premier XE tandem quadrupole mass spectrometer (Waters) equipped with Z-Spray ionization (ESI) source. ESI-MS/MS detection were performed in the negative ion mode and the optimized parameters were as follows: source temperature, 110 °C; desolvation temperature, 350 °C; capillary voltage, 2.5 kV; cone voltage, 28 V; desolvation gas flow, 850 L/h; cone gas flow, 50 L/h; and multiplier voltage, 650 V. Argon (99.999%) was used as the collision gas, and the argon pressure in the collision cell was maintained at $3.5e^{-3}$ mbar. Quantitative analysis was performed in the multiple reaction monitoring (MRM) mode with the ion transitions *m/z* 162 > 82 with a collision energy of 19 eV and *m/z* 162 > 78 (40 eV). The method detection limit was 0.02 μg/L. All of the data were acquired and processed using MassLynx 4.1 software.

Recoveries were evaluated by spiking standard solutions (100 μg/L) to various water samples (surface water, groundwater and wastewater) in three replicates, and the original concentration was determined prior to the fortification experiment. Because no sample extraction steps were included in this method, the recovery data reflected the ion suppression. The mean recoveries (n = 3) of acesulfame in the spiked wastewater, river water and groundwater samples were 92±7%, 95±10%; and 95±10%, respectively, suggesting no apparent signal suppression in this study.

Literature Cited

(1) Sacher, F.; Lenz, S.; Brauch, H. J. Analysis of primary and secondary aliphatic amines in waste water and surface water by gas chromatography mass spectrometry after derivatization with 2,4-dinitrofluorobenzene or benzenesulfonyl chloride. *J. Chromatogr. A*. **1997,** *764* (1), 85-93.

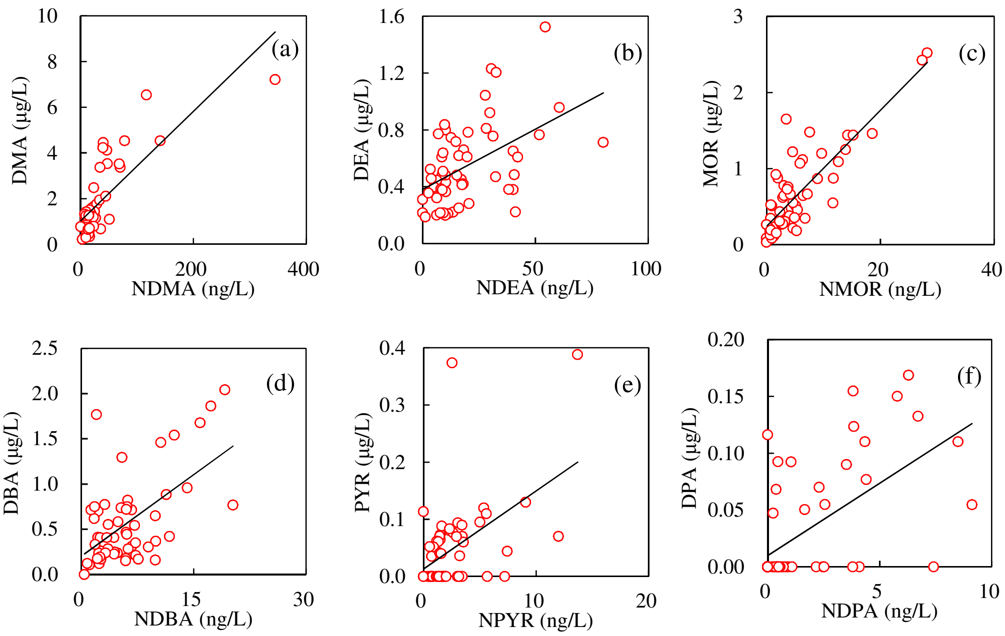

FIGURE S1. Correlation between nitrosamines and corresponding secondary amines in surface water of Jialu River basin: (a) NDMA: y = 0.024x + 1.02; R^2 = 0.618; $p < 0.001$; (b) NDEA: y = 0.0085x + 0.380; R^2 =0.248; $p < 0.001$; (c) NMOR: y = 0.0761x + 0.248; R^2 = 0.701, $p < 0.001$; (d) NDBA: y = 0.06x + 0.205; R^2 = 0.336; $p < 0.001$; (e) NPYR: y = 0.0137x + 0.013; R^2 = 0.246; $p < 0.001$; (f) NDPA; y = 0.015x + 0.007; R^2 = 0.488; $p < 0.001$.

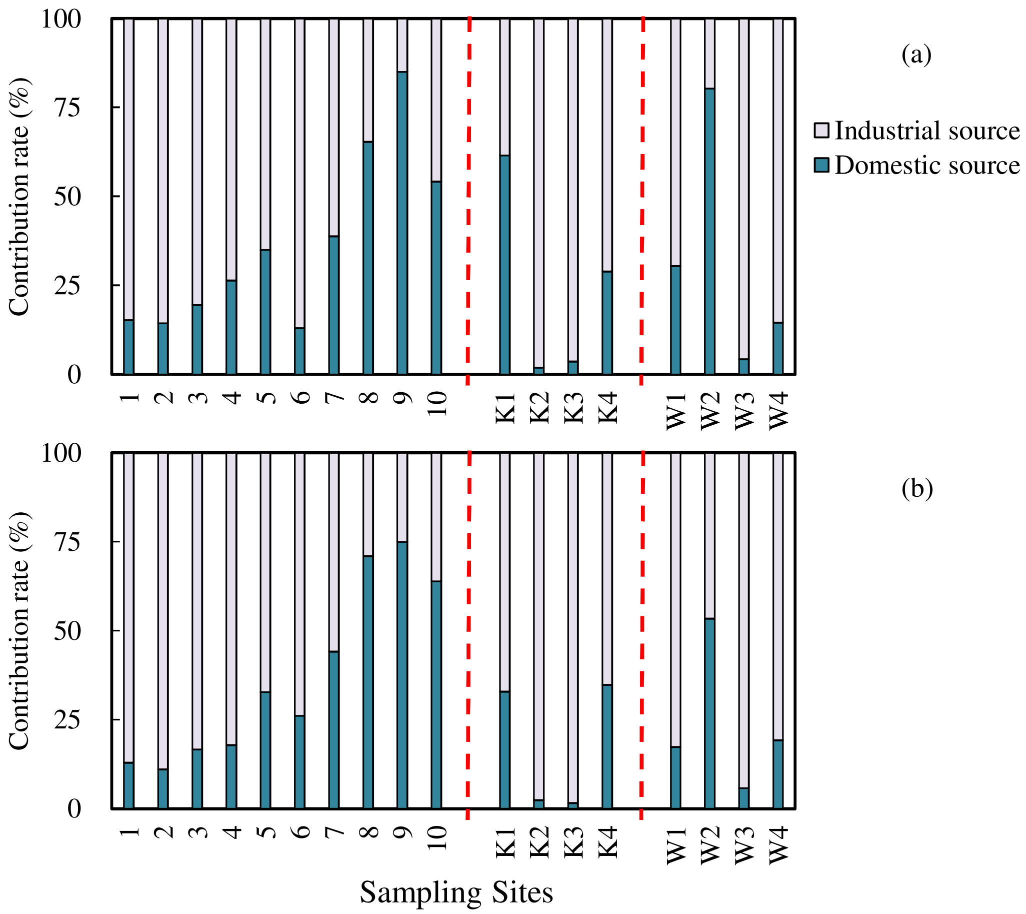

FIGURE S2. Calculated contributions of domestic and industrial sources to the target pollutants load in the river samples based on the concentrations of acesulfame. (a) nitrosamines; (b) secondary amines.

TABLE S1. Characteristics of groundwater

Sample ID	Depth (m)	Distance from river (m)
2	20	200
5	20	300
6	30	500
7	15	200
8	18	400
9	9	2000
10	8	200
K2	20	300
Q1	25	500
Q2	15	200
Q3	11	200
Q4	10	3

TABLE S2. Absolute recoveries of deuterated nitrosamines and secondary amines in various types of aqueous matrices[a]

Analytes		NDMA-d_6	NMEA-d_3	NPYR-d_8	NPIP-d_{10}	NMOR-d_8	NDEA-d_{10}	NDPA-d_{14}	NDBA-d_{18}	DMA-d_6
Absolute	WW	80±7	81± 9	71± 6	82± 3	85 ±14	76±11	73±12	52±6	85±6
Recover	RW	82±8	82±14	76±7	82±17	97±11	77±16	80±12	57±7	86±5
y (%)[b]	GW	78±8	80±9	78±12	85±5	89±4	78±9	74±6	61±12	88±8

WW: wastewater, RW: river water, GW: groundwater.

[a]Wastewater spiked with deuterated nitrosamines at 200 ng/L and DMA-d_6 at 20 μg/L; River water and groundwater spiked with deuterated nitrosamines at 50 ng/L and DMA-d_6 at 5 μg/L.

[b]n=3.

TABLE S3. Relative recoveries of eight secondary amines in various types of aqueous matrices[a]

Analytes		NDMA	NMEA	NPYR	NPIP	NMOR	NDEA	NDPA	NDBA
Relative	WW	93±7	104±12	89±5	101±5	102±9	97±7	93±10	102±5
recoverie	RW	100±6	109±10	92±4	104±7	94±12	94±8	111±9	105±12
s (%)[b]	GW	103±11	108±6	90±7	96±12	101±5	100±8	101±7	92±7

Analytes		DMA	MEA	PYR	PIP	MOR	DEA	DPA	DBA
Relative	WW	94±12	96± 4	93± 6	98± 6	101 ±9	92±11	87±13	92± 9
recoverie	RW	93±10	100±3	98±5	101±6	106±6	91±5	94±6	95±4
s (%)	GW	95±9	98±11	102±10	97±7	102±6	91±10	90±6	95±7

WW: wastewater, RW: river water, GW: groundwater.

[a]Wastewater spiked with nitrosamines at 200 ng/L and secondary amines at 20 μg/L; River water and groundwater spiked with nitrosamines at 50 ng/L and secondary amines at 5 μg/L.

[b]n=3.

TABLE S4. Concentrations of nitrosamines, secondary amines and acesulfame in groundwater, river water and discharging site samples in Jialu River Basin.

Location	**Type**	NDMA	NPYR	NMEA	NMOR	NDEA	NPIP	NDPA	NDBA	DMA	PYR	MEA	MOR	DEA	PIP	DPA	DBA	Acesulfame
LOD					ng/L								μg/L					μg/L
		0.8	0.4	0.6	0.3	0.5	0.5	0.2	0.2	0.1	0.04	0.1	0.05	0.06	0.05	0.05	0.05	0.02
Nov-2010																		
1	R	22.6	1.2	ND	18.6	17.3	ND	2.5	10.6	1.4	0.04	ND	1.46	0.45	0.05	0.05	1.46	5.76
2	R	22.8	2.3	ND	28.2	30.5	ND	9.1	19.2	1.65	0.08	ND	2.52	1.23	ND	0.15	2.04	6.58
3	R	47.5	1.5	ND	27.3	27.8	ND	5.8	15.8	3.53	0.06	ND	2.42	1.04	0.09	0.09	1.68	9.59
4	R	46.6	ND	ND	14.2	20.2	ND	1	2	4.12	0.11	ND	1.44	0.78	0.08	0.05	1.77	16.21
5	R	40.2	1.5	ND	15.2	18.3	ND	2.6	6.2	4.45	0.07	ND	1.44	0.66	0.07	0.05	0.82	15.25
6	R	344.9	1.4	ND	11.7	16.2	ND	1.7	9.9	7.21	0.07	ND	0.88	0.62	0.1	ND	0.37	15.68
7	R	23.2	1.2	ND	12.6	28.3	ND	2.2	11.3	2.48	0.06	ND	1.09	0.81	0.07	ND	0.88	19.35
JD3	W	10.6	ND	ND	4.4	5.9	ND	ND	65.9	10.47	8.68	ND	2.08	1.41	9.71	ND	4.02	37.52
8	R	12.1	0.4	ND	9.7	10.3	ND	2.5	9.9	1.4	ND	ND	1.2	0.43	ND	ND	0.65	24.32
9	R	19.1	0.8	ND	6.3	10.2	ND	4.1	12.4	1.55	ND	ND	1.12	0.48	ND	ND	1.54	27.18
10	R	20.5	0.7	ND	8.9	29.9	ND	7.4	17.3	1.59	ND	ND	0.87	0.92	ND	ND	1.86	22.11
K2	R	39.5	2.5	ND	11.6	80.1	256.7	ND	5.4	4.23	0.37	ND	0.55	0.71	0.59	ND	1.29	1.29
Q1	R	11.4	0.6	ND	1.3	8.7	ND	0.4	4.9	0.49	ND	ND	0.12	0.48	ND	ND	0.58	21.91
Q2	R	14.4	ND	ND	0.6	10.3	ND	ND	6	0.38	ND	ND	0.12	0.8	ND	ND	0.47	20.97
Q3	R	9.7	0.7	ND	4.3	12.7	ND	ND	6	0.6	ND	ND	0.48	0.75	ND	ND	0.47	27.62
Q4	R	14.5	0.6	ND	2.9	14.8	ND	ND	2.2	0.51	ND	ND	0.62	0.72	ND	ND	0.41	30.12
2-G	G	4.7	ND	ND	ND	ND	ND	ND	6.2	0.65	ND	ND	ND	ND	ND	ND	0.42	1.11
5-G	G	3.5	ND	ND	ND	3.2	ND	ND	0.9	1.48	ND	ND	ND	0.24	ND	ND	0.36	0.24
6-G	G	55.1	ND	ND	ND	15.3	ND	ND	15.8	3.34	ND	ND	ND	0.31	ND	ND	0.18	0.34
7-G	G	16.7	ND	ND	ND	0.9	ND	ND	3.2	1.82	ND	ND	ND	0.16	ND	ND	0.17	0.32
K2-G	G	26.2	ND	ND	1.2	68.4	ND	ND	5.3	2.17	ND	ND	0.09	1.04	ND	ND	1.08	ND
Q1-G	G	ND	0.5	ND	ND	16.3	ND	0.2	7.1	0.27	ND	ND	ND	0.47	ND	ND	0.18	1.27

Q2-G	G	ND	0.7	ND	1.2	4.6	ND	ND	8.2	0.3	ND	ND	0.07	0.64	ND	ND	0.3	ND
Q3-G	G	4.7	ND	ND	2.3	6.5	ND	ND	6.2	0.22	ND	ND	ND	0.06	ND	ND	0.08	1.08
Q4-G	G	13	ND	ND	0.8	12.5	ND	ND	6.4	0.26	ND	ND	ND	0.49	ND	ND	0.19	2.12
Jan-2011																		
1	R	28.7	5.4	ND	4.6	13.6	15.3	3.8	11.8	1.76	0.12	ND	1.22	0.22	0.13	0.09	0.42	6.35
2	R	10.2	3.5	ND	3	20.6	8.1	3.5	6.7	1.37	0.07	ND	0.78	0.28	0.07	0.11	0.31	7.24
3	R	14.1	3.6	ND	3.8	40.2	9.3	8.5	7.3	1.43	0.06	ND	0.76	0.65	0.09	0.07	0.21	10.24
4	R	33.5	5.6	ND	5.9	32.5	11.9	2.3	2.4	1.93	0.11	ND	1.07	0.47	0.12	0.11	0.12	12.1
5	R	51.1	3.1	ND	6.4	42.3	ND	4.3	7.6	1.1	0.09	ND	0.65	0.61	0.48	0.12	0.17	24.61
6	R	24.1	3.2	ND	5.1	40.7	10.7	3.8	4.8	1.26	0.04	ND	0.52	0.48	ND	0.08	0.24	13.6
7	R	26.6	7.4	ND	7.2	60.6	15.5	4.4	6.1	1.15	0.04	ND	0.67	0.96	0.05	0.15	0.44	25.48
JD3	W	48	2.8	ND	6.8	49.4	6.7	7.5	7.6	3.92	0.11	ND	1.39	1.74	0.13	0.38	1.02	49.97
8	R	35.5	2.6	ND	5.4	51.8	10	3.8	9.9	0.67	0.08	ND	0.46	0.76	0.42	0.17	0.16	36.66
9	R	24.6	1.7	ND	4.6	40.1	6.2	6.3	6	1.43	ND	ND	0.55	0.38	ND	0.13	0.18	33.3
10	R	18.5	3.3	ND	4	38.2	9.5	6.7	4.4	1.36	ND	ND	0.38	0.38	ND	0.12	0.25	28.75
KD1	W	122.9	51	ND	0.6	8	67.9	ND	5.4	10.15	1.25	ND	ND	0.52	0.52	ND	0.72	13.24
KD2	W	42.6	2.1	ND	4.7	22.9	ND	ND	9.6	2.64	ND	ND	1.35	1.05	ND	ND	0.21	0.25
KD3	W	92.6	15.8	ND	2.2	17.5	32.6	ND	7.6	6.95	0.24	ND	0.73	0.22	0.69	ND	0.36	9.44
K2	R	44.7	3	ND	2.6	11.3	ND	ND	7.1	2.1	ND	ND	0.27	0.21	0.3	ND	0.54	2.65
K4	R	11.1	1.9	ND	0.6	ND	ND	ND	2.6	1.41	ND	ND	0.21	0.31	ND	ND	0.26	7.21
W1	R	11.1	1.9	ND	0.6	ND	ND	ND	2.6	0.5	ND	ND	0.19	0.215	ND	ND	0.17	3.88
W2	R	10.2	3.5	ND	3	8.6	12.4	ND	6.7	1.1	ND	ND	0.65	0.61	0.08	ND	0.71	24.07
WD	W	498.3	ND	ND	20.2	86.8	ND	ND	2.6	40.53	ND	ND	1.92	10.53	ND	ND	0.2	0.28
W3	R	141	9.1	ND	13.9	54.5	24.5	ND	6.1	4.53	0.13	ND	1.25	1.52	0.11	ND	0.75	4.87
W4	R	70.2	1.6	ND	6.8	31.3	16.2	ND	4.4	3.36	0.09	ND	0.35	0.75	0.06	ND	0.41	8.91
Q1	R	15.9	0.7	ND	ND	10.1	ND	0.6	3.6	0.34	0.04	ND	0.09	0.2	ND	ND	0.55	22.51
Q2	R	15	1.6	ND	2.3	18	ND	0.9	2.5	0.49	ND	ND	0.31	0.42	0.21	ND	0.41	23.7
Q3	R	14.3	0.8	ND	0.8	19.8	ND	ND	2.2	0.43	ND	ND	0.08	0.61	ND	ND	0.7	23.11
Q4	R	22.5	1.1	ND	2.5	16.1	ND	0.8	2.3	1.2	ND	ND	0.32	0.25	ND	ND	0.24	27.98

5-G	G	5.9	ND	ND	ND	1.1	ND	ND	1	0.29	ND	ND	ND	0.59	ND	ND	0.6	2.45
6-G	G	6.3	ND	ND	ND	0.8	ND	ND	0.9	0.32	ND	ND	ND	0.6	ND	ND	0.81	1.86
8-G	G	3.5	ND	ND	ND	ND	ND	ND	0.9	0.36	ND	ND	ND	0.28	ND	ND	0.22	0.45
9-G	G	7.6	ND	ND	ND	2.5	ND	ND	3	1.48	ND	ND	ND	0.43	ND	ND	0.52	1.11
10-G	G	7.5	ND	ND	0.5	7.9	ND	ND	1.9	0.31	ND	ND	ND	0.63	ND	ND	1.15	0.97
K2-G	G	20.4	ND	ND	ND	6.7	ND	ND	3.3	2.08	ND	ND	ND	0.06	ND	ND	0.35	0.04
Q1-G	G	8	ND	ND	ND	ND	ND	ND	1.5	0.54	ND	ND	ND	0.51	ND	ND	0.52	1.06
Q2-G	G	9.6	1	ND	0.6	ND	ND	ND	3.9	2.01	ND	ND	ND	0.76	ND	ND	0.32	ND
Q3-G	G	5.9	0.4	ND	ND	1.5	ND	ND	2.1	0.9	ND	ND	ND	0.8	ND	ND	0.66	ND
Q4-G	G	8.7	ND	ND	0.3	7.9	ND	0.5	3.3	0.33	ND	ND	0.07	0.37	ND	ND	0.25	0.59
Mar-2011																		
JD1	W	73.3	9.2	ND	2.3	48.3	28.2	3.1	16.2	4.23	0.13	ND	1.400	0.82	0.08	ND	1.67	11.25
JD2	W	53.5	24.4	ND	0.6	55.4	20.6	ND	3.0	3.92	0.11	ND	1.388	1.74	0.13	0.38	1.02	8.46
1	R	11.4	5	ND	7.6	9.1	ND	1.1	20.2	1.4	0.1	ND	1.48	0.64	0.12	ND	0.77	10.99
2	R	8.6	2.3	ND	4.2	6.3	ND	0.7	1.7	1.07	0.08	ND	0.66	0.32	0.11	ND	0.62	6.05
3	R	11.6	1.3	ND	2	6.4	ND	ND	3.5	1.41	0.06	ND	0.88	0.45	0.07	ND	0.29	14.16
4	R	15.9	3.4	ND	3.5	9.8	ND	0.4	5.3	1.5	0.09	ND	1.65	0.84	0.11	0.09	0.74	12.85
5	R	8.3	7.2	ND	4.6	6.3	ND	0.5	3.1	1.25	ND	ND	0.22	0.2	ND	ND	0.77	17.87
6	R	14.6	1.8	ND	3.2	9.3	ND	0.3	8.9	1.31	ND	ND	0.31	0.22	ND	ND	0.3	19.32
7	R	10.5	3.1	ND	5.3	7.9	ND	0.5	1.3	1.22	ND	ND	0.19	0.22	ND	ND	0.71	21.07
8	R	9.8	2.9	ND	3.6	9.2	ND	0.2	1.8	1.42	0.07	ND	0.73	0.51	0.06	0.07	0.33	29.68
9	R	7.2	0.9	ND	2.3	3.2	ND	0.4	4.4	1.32	0.05	ND	0.44	0.37	0.05	0.05	0.23	38.09
10	R	ND	1.7	ND	2.8	5.1	ND	0.2	7.2	0.77	ND	ND	0.28	0.4	ND	ND	0.35	30.11
K1	R	3.1	1.3	ND	ND	1.3	ND	ND	6	0.22	ND	ND	0.05	0.19	ND	ND	0.72	5.16
KD1	W	73	3.3	ND	1.4	8.8	ND	ND	5.6	8.12	1.08	ND	1.1	0.26	0.17	0.13	0.53	8.05
KD2	W	41	5.1	ND	6.1	68.9	ND	ND	2.7	1.01	0.1	ND	0.38	0.41	0.12	ND	0.19	0.55
KD3	W	175.3	57.3	ND	5.2	127.2	ND	ND	10.2	10.52	ND	ND	0.21	0.38	ND	ND	0.25	10.26
K2	R	78	5.5	ND	1.7	3.5	ND	ND	1.8	4.53	2.09	ND	0.92	0.52	3.59	ND	0.75	3.47
K3	R	34.4	13.7	ND	0.7	2.7	ND	ND	3.4	3.36	0.39	ND	0.35	0.35	1.82	ND	0.41	1.44

K4	R	9.6	1.4	ND	0.9	41.2	ND	ND	14.1	0.29	ND	ND	0.09	0.22	ND	ND	0.96	10.14
W1	R	10.5	ND	ND	ND	3.9	ND	ND	0.4	1.15	ND	ND	0.27	0.46	ND	ND	ND	2.94
W2	R	9.6	1.4	ND	0.9	8.2	ND	ND	3.2	1.26	ND	ND	0.52	0.38	ND	ND	0.24	15.33
WD	W	215.3	ND	ND	5.1	19.4	ND	ND	3.2	20.74	ND	ND	0.81	1.76	ND	ND	0.45	1.24
W3	R	116.7	12	ND	2.3	32.7	ND	ND	5.9	6.54	0.07	ND	0.31	1.2	ND	ND	0.15	7.9
W4	R	68.7	5.7	ND	4.9	17.5	ND	ND	6.2	3.52	ND	ND	0.36	0.41	ND	ND	0.29	15.65
Q1	R	13.2	1.4	ND	0.6	15.2	ND	0.3	2.5	0.65	0.04	ND	0.13	0.48	ND	ND	0.19	25.72
Q2	R	14.3	2	ND	0.7	10.3	ND	ND	1.1	1.26	ND	ND	0.53	0.36	ND	ND	0.11	22.72
Q3	R	23.4	0.5	ND	0.7	7	ND	ND	2.1	0.79	0.05	ND	0.2	0.77	ND	ND	0.18	24.22
Q4	R	15.8	1.6	ND	1.7	8.8	ND	0.5	0.8	0.7	0.04	ND	0.15	0.38	ND	ND	0.12	24.37
5-G	G	13.3	ND	ND	ND	21.2	ND	ND	7.1	ND	ND	ND	ND	0.16	ND	ND	0.17	1.41
6-G	G	6.2	ND	ND	ND	3.9	ND	ND	3.2	0.14	ND	ND	ND	0.14	ND	ND	0.6	8.38
7-G	G	2.7	ND	ND	ND	1.5	ND	ND	4	0.11	ND	ND	ND	0.08	ND	ND	0.12	0.52
8-G	G	9.6	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	0.23	ND	ND	0.17	0.66
9-G	G	ND	ND	ND	ND	ND	ND	ND	4.5	0.21	ND	ND	ND	0.25	ND	ND	0.24	0.02
10-G	G	ND	ND	ND	ND	ND	ND	ND	7.2	0.18	ND	ND	ND	0.31	ND	ND	0.25	ND
K2-G	G	45.26	ND	ND	ND	1.04	ND	ND	1.34	2.45	ND	ND	0.16	0.27	ND	ND	0.67	0.12
Q1-G	G	ND	ND	ND	ND	ND	ND	ND	ND	0.58	ND	ND	ND	0.4	ND	ND	0.22	6.83
Q2-G	G	ND	ND	ND	ND	ND	ND	ND	4.6	0.61	ND	ND	0.11	0.46	ND	ND	0.14	ND
Q3-G	G	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.25	ND	ND	0.1	ND
Q4-G	G	5.5	ND	ND	ND	4.6	ND	0.3	3.9	0.13	ND	ND	ND	0.3	ND	ND	0.23	1.4

LOD: limit of detection; ND: under the method detection limit; R[a]: River water; W[b]:Wastewater; G[c]:groundwater.