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Performance of the A-01 Constructed Wetland over 20 Years

Anna Sophia Knox, Michael H. Paller, and John Mayer

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REVIEWS AND APPROVALS

AUTHORS:

____
Anna Sophia Knox, Energy and Biotechnology Projects Date

____
Michael H. Paller, Energy and Biotechnology Projects Date

____
John J. Mayer, Environmental and Biological Sciences Date

TECHNICAL REVIEW:

____
Alex J. Kugler, Energy and Biotechnology Projects Date

APPROVALS:

____
Christopher J. Bannochie Date
Manager, Environmental and Biological Sciences

____
Brady Lee, Environmental Materials and Energy Sciences Date
Director, Environmental Materials and Energy Sciences

____
Robert Backer, Date
NPDES Subject Matter Expert, Environmental Compliance

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EXECUTIVE SUMMARY

The A-01 wetland treatment system (WTS) was designed to remove metals from the effluent at the A-01 National Pollution Discharge Elimination System (NPDES) outfall at the Savannah River Site, Aiken, SC. The A-01 effluent flows from a retention basin to a splitter box, where it is distributed to four pairs of cells in series before discharge to a stream. Each treatment cell is a one-acre wetland that contains *Schoenoplectus californicus* (giant bulrush) and has a nominal 24-hour retention time. The purpose of this research was to investigate metal removal, distribution and retention in the A-01 WTS over a period of 20 years. During 20 years of operation, systematic water and sediment sampling validated the wetlands' performance. After passage through the treatment cells, Cu concentrations were well below permit limits (22 µg L^{-1}) during all years of operation, often falling below 10 µg L^{-1}. Cu removal has been consistent over time, averaging about 80% despite large changes in influent Cu concentrations. Most divalent metals were rapidly removed from the water and held in the sediments shortly after the water entered the treatment wetlands. Average removal of Pb from water by the wetland system was 67 and 74%, respectively, in 2004, and 2020. Comparable values for Zn were 52 and 65%, respectively.

Generally, the highest concentrations of Cu, Pb, and Zn were found in the sediment from the first cell in each pair of cells suggesting that most of the Cu, Pb, and Zn in the A-01 effluent was bound to the sediment quickly. Diffusive gradients in thin films (DGT) measurements of Cu and Zn in the sediments were much lower than bulk sediment concentrations. These results suggest that most of the Cu and Zn in the A-01 WTS sediments was not bioavailable, hence not toxic to aquatic organisms, as a likely consequence of adsorption to sediment particles and complexation with organic and inorganic substances.

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ANOVA	Analysis of variance
C	Centigrade
CEC	Cation exchange capacity
Cu	Copper
DGT	Diffusive gradients in thin films
DO	Dissolved oxygen
EC	Electrical conductivity
Eh	Redox potential
ELN	Electronic Laboratory Notebook
ICP-AES	Inductively coupled plasma atomic emission spectroscopy
ICP-MS	Inductively coupled plasma – mass spectrometry
ITRC	Interstate Technology & Regulatory Council
L	Liters
LSM	Least square mean
mV	Millivolts
n	Sample size
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric Turbidity Unit
OM	Organic matter
ORP	Oxidation reduction potential
ORP	Oxidation reduction potential
P	Probability
Pb	Lead
QA/QC	Quality assurance/quality control
$S\ m^{-1}$	Siemens per meter
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
T	Temperature
t	Student's t-distribution
USEPA	United States Environmental Protection Agency
WTS	Wetland Treatment System
Zn	Zinc

1.0 Introduction

Constructed wetland treatment systems (WTSs) for wastewater combine technology with nature to mimic natural processes of water purification (Reddy and DeLaune, 2008; Xu and Mills, 2018). They require the same energy input as conventional treatment systems but obtain it from a different source, relying largely on renewable, naturally occurring energies and inputs from solar radiation, wind, rainfall, surface water, groundwater, biomass, and soils. WTSs are land intensive, whereas conventional wastewater treatment systems are energy intensive. Because WTSs generally have longer residence times (3 - 200 days) than conventional treatment systems (<1-2 days), they are good at handling and dampening variable flow rates and quality. But because they are spread over a relatively large land mass and are outdoors, they are slower to respond to operational changes and may respond to natural events out of the control of the operator (Kadlec and Knight, 1996).

Natural wetland systems have historically served as water purification systems. The complex ecosystem of plants, microorganisms, and substrate in a wetland act as a biogeochemical filter, efficiently removing low levels of contamination from very large volumes of water and protecting natural resources such as rivers, lakes, estuaries and ground waters. More recently, artificial wetlands have been constructed for water purification. Constructed artificial wetlands are engineered wetlands designed and built to utilize the natural functions of wetland vegetation, soils, and their microbial populations to treat contaminants in surface water, groundwater, or waste streams (USEPA, 1988 and 1993; ITRC, 2003, Sheoran and Sheoran, 2006). Metals can be remediated from WTSs through physical settling and sedimentation, chemical removal, and phytoremediation (Sheoran and Sheoran, 2006). These processes occur primarily in three wetland components: sediment, hydrology, and macrophytes (Sheoran and Sheoran, 2006). These natural processes have been employed in many different forms in WTSs designed for water quality improvement (Hammer, 1989; Moshiri, 1993; Kadlec and Knight, 1996; Shutes, 2001).

WTSs are used to eliminate or reduce contaminants that cause adverse effects on humans or the receiving environment. They are an alternative to conventional treatment processes such as the addition of chemicals, reverse osmosis, ion exchange, and microfiltration that are quite costly and sometimes inefficient (Hammer, 1989; Odum et al., 2000). WTSs are man-made "ecosystems" that mimic their natural counterparts. This cost-effective, ecologically friendly, "passive" technology is used extensively worldwide to treat a range of wastewaters and effluents from a variety of sources, including mine drainage, landfill leachates, urban stormwater, and agricultural runoff (Mays and Edwards, 2001; Nelson et al. 2003a and 2003b, 2008; Knox at al., 2006 and 2010).

The way in which a wetland is constructed ultimately determines how wastewater treatment occurs and what mechanisms will be involved. WTs typically consist of four main components that participate in pollutant removal: substrates (soil/sediment), plants, water, and associated microbial populations (Kosolapov et al., 2004). WTSs come in two main types:

1) surface flow (aerobic) wetlands consisting of vegetation planted in shallow, relatively impermeable soil, clay or mine spoil, and
2) sub-surface (anaerobic) wetlands consisting of vegetation planted in a deep, permeable mixture of substrate such as soil, peat moss, spent mushroom compost, sawdust, straw/manure, hay bales and gravel, often underlain with limestone.

In aerobic WTSs, the dominant treatment processes occur mainly in the shallow surface layer of water, plants, and sediments. In anaerobic wetlands, the water primarily flows through the substrate and treatment involves major interactions within the substrate (Stottmeister et al., 2003).

Wetland sediments play an important role in maintaining water quality by removing contaminants from the water column. However, subsequent contaminant remobilization from the sediment may keep dissolved contaminant concentrations elevated after the initial source has been removed. The treatment of sediment contamination ultimately depends on its stability. Choosing the most appropriate treatment requires an understanding of how contaminants bind to the sediment and the conditions under which they will be released back into the water column.

The overall objective of this study was to investigate metal removal, distribution and retention in the A-01 Constructed Wetlands Treatment System (A-01 WTS) at the Savannah River Site (SRS) over a period of 20 years. Specific objectives include i) confirmation of contaminant removal (e.g., Cu, Pb, and Zn) from the A-01 wetland over 20 years, ii) evaluation of metal distribution in the wetland sediment profile after 20 years, iii) assessment of metal mobility and retention in the wetland sediment, and iv) syntheses of new data with previously collected data to assess changes in processes that affect long-term wetland performance.

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2.0 Experimental Procedure

2.1 Electronic laboratory notebook

The data and analyses presented in this report are recorded in SRNL Electronic Laboratory Notebook (ELN) T9632-00419-02

2.2 Study area

The A-01 WTS is a surface flow constructed wetland designed to remove metals (primarily copper) from the A-01 industrial effluent. It is permitted by the State of South Carolina as a National Pollution Discharge Elimination System (NPDES) wastewater treatment facility. Construction of the system began in January 2000 and began receiving A-01 effluent in July 2000. The treatment system consists of a stormwater retention basin, a splitter box, and four sets of two sequential treatment cells (i.e., cells designated A and B in each pair; Figure 1) with surface flow. Each treatment cell is a one-acre wetland planted with *Schoenoplectus californicus* (giant bulrush planted late in the growing season of 2000) and with about a 24 hour retention time, depending on flow rate. The A-01 effluent flows from the retention basin to the splitter box, where it is distributed to the four A-cells. The effluent flows through the A-cells into the B-cells, through the B-cells to the wetland outfall into the receiving stream, Tim's Branch (i.e., designated Waters of the State).

The hydrosoil for the A-01 WTS consisted of local Orangeburg Series soil. A layer (~20 cm) of this soil was added to the cells, then amendments were added, and an additional 20 cm layer of the soil was added. The following amendments were mixed with the soil when the wetland treatment cells were constructed: organic matter (primarily coarse wood chips), fertilizer (Osmocote, 14-13-14 formula) at the rate of 3920 kg hectare $^{-1}$ (1.75 tons acre^{-1}), and gypsum at the rate of 2240 kg hectare^{-1} (1 ton acre^{-1}) (Specht and Nelson, 2002).

2.3 Surface water sampling

Routine monitoring samples have been collected at the compliance point at the outfall for monthly reporting since the beginning of the A-01 WTS operation. Additional water samples have been collected at numerous locations from the inflow through the receiving stream discharge (Nelson et al., 2002; Knox et al., 2004, 2006, and 2010). The resulting data include samples from 2000-2004 (most months), 2005 (January and February), 2016 (July), and 2020 (January, February, March, June, and July). Samples for metal analysis were acidified with nitric acid to pH<2. Concentrations of Cu, Pb, and Zn were determined by inductively coupled plasma-mass spectrometry (ICP-MS) using a NexION 300 (Perkin Elmer, Inc.) according to QA/QC protocols in USEPA Method 6020B (USEPA, 2014). Surface water was monitored for dissolved oxygen, temperature, electrical conductivity (EC), pH, and turbidity with an Accumet XL600 meter.

2.4 Sediment sample collection and analytical methods

Sediment samples were collected and analyzed to provide baseline data on metal concentrations and general sediment chemistry early in the operational life of the treatment system in September, 2001 (Specht and Nelson, 2002). Additional sediment samples from two wetland cells (4A and 4B) were collected in June 2004, 2016, and 2020.

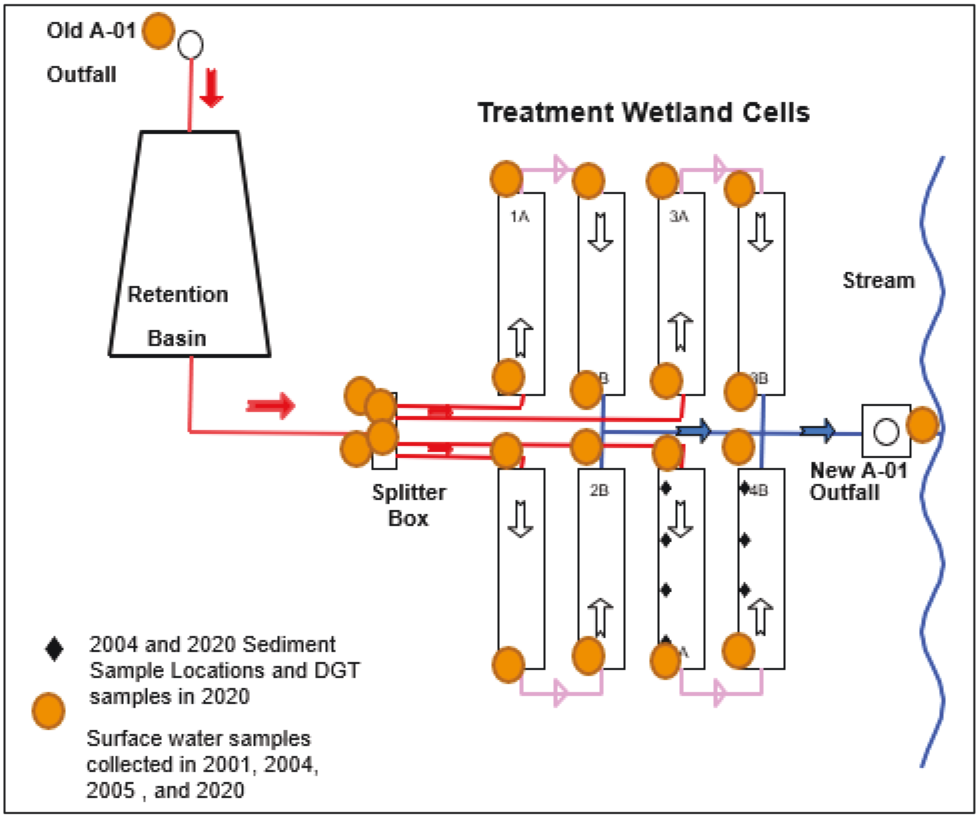

Figure 1. Diagram depicting sample stations and water flow within the A-01 WTS. Each wetland cell measures 130 m × 31 m.

Sixteen sediment core samples were taken from cells 4A and 4B in June 2004, July 2016 and July 2020. Each cell was spatially divided into 4 quarters (A, B, C, and D) along its long axis (Figure 1 and Figure 2), and two replicate cores were taken from each quarter. Each core collected in 2004 and 2020 was divided into four layers: floc (flocculent organic matter and particles of decaying vegetation overlying the sediment, organic sediment beneath the floc(0-5 cm), shallow inorganic sediment (5-10 cm), and deep inorganic sediment (10-20 cm). In 2016, only three layers were collected: floc, shallow inorganic, and deep inorganic. All layers were visually described and analyzed for organic matter content, pH, and total metal concentrations. Data from these analyses were used to assess the horizontal and vertical distribution of metals in the wetland sediment and metal retention in the wetland sediment. Percent organic matter was estimated by loss-on-ignition at a temperature of 375°C. The pH was determined from a 1:1 mineral/water equilibration solution. Total concentration of elements was determined by a total microwave digestion of 0.6 g of sediment material with concentrated acids (10 mL of HNO_3, 4 mL of H_2SO_4, and 2 mL of HCl). The resulting extract solutions form 2004 and 2016 were analyzed by inductively coupled plasma-atomic emission spectrometry (ICP-AES). Metals in the extracts from 2020 were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) using a NexION 300X mass spectrometer and standard QA/QC protocols including internal standards, duplicate samples, blanks, and certified reference materials (TORT-3: Lobster Hepatopancreas Reference Material for Trace Metals) following USEPA Method 6020A (USEPA, 2014). Duplicate samples differed by a maximum of 1.3%.

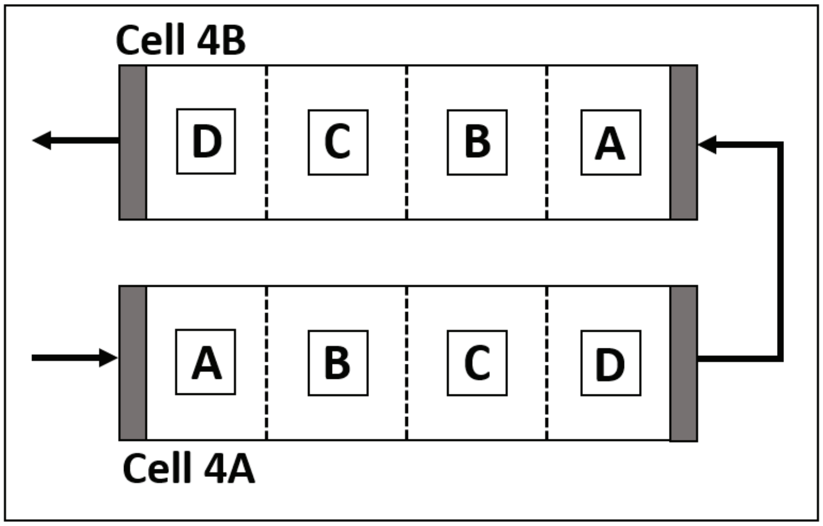

Figure 2. Locations of sediment samples in cells 4A and 4B in the A-01 WTS in 2004, 2016, and 2020 and DGT probes in 2016 and 2020.

2.5 Pore water sample collection and analytical methods

Pore water samples of the sediment collected from 4A and 4B cells in 2004, 2016, and 2020 were separated from three layers: organic (0-5 cm), inorganic (5-10 cm), and inorganic (10-20 cm). The pore water samples were taken from two sediment cores from each quarter of cell 4A and 4B. Pore water samples were collected within 24 hours of sediment collection. The separation of sediment and pore water was carried out using 50 mL centrifuge filter tubes, each fitted with a 20-mL capacity filter insert with a 45 µm polypropylene mesh (Vectaspin tubes). Next, the pore water samples were analyzed for metals by inductively coupled plasma – mass spectrometry (ICP-MS). Pore water redox potential and pH for each sample were measured immediately following separation from the sediment.

2.6 Evaluation of potential bioavailability of metals with diffusive gradient in thin film (DGT)

Diffusive gradient in thin films (DGT) probes include a collection gel-layer with a medium that selectively binds to the contaminant of interest and a diffusion gel-layer that selectively admits analyte molecules (Davison and Zhang, 1994). DGT tends to exclude non-bioavailable metals strongly bound to organic molecules and other ligands, thus providing a more accurate measure of potentially bioavailable metals than total or dissolved metal measurements (Paller et al., 2019). DGT has been successfully used in previous studies to assess metal bioavailability to bioturbating organisms in contaminated sediments (Amato et al., 2016).

DGT (Chelex 100) water and sediment probes were purchased from DGT Research Ltd (Lancaster, UK). In July 2016 and 2020 two replicate DGT water probes were suspended in the water with open side facing downward for 24 hr at four locations in each of cells 4A and 4 B (4 quarters - A, B, C, and D) (Figure 1 and Figure 2). Two replicates DGT sediment probes were deployed at the same locations as the water probes (Figure 2). The sediment DGT probes were vertically inserted into the sediment for 24 h. Water and sediment temperatures were recorded at the times of DGT deployment and retrieval. The sediment probes were deoxygenated before deployment.

All probes were rinsed and their Chelex collection gels removed upon retrieval. The sediment probes were divided into sections corresponding to three layers: organic (0-5 cm), inorganic (5-10 cm), and inorganic (> 10 cm). Collection-gels were immersed in 1 M HNO_3 for 24 h after which the eluent was removed and diluted with deionized water for ICP-MS analysis. The concentration in the aliquot was adjusted for dilution, and the mass of each metal accumulated in the resin gel layer (M) was calculated using equation 1:

$$M = \frac{Ce * (V_{NO_3} + V_{gel})}{f_e} \quad (1)$$

where

- Ce = concentration of metal in the 1M HNO_3 elution
- V_{NO3} = amount of nitrate added (based on the amount of nitric acid required to submerge the resin-gel layer),
- V_{gel} = volume of the resin gel, and
- f_e = elution factor of 0.8 (Zhang and Davison, 1995 and 2001).

The concentration of metal measured by each DGT probe (C_{DGT}) was calculated with equation 2:

$$C_{DGT} = \frac{M * \Delta g}{D * t * A} \quad (2)$$

where:

- Δg = thickness of the diffusive layer and filter layer (0.096 cm) (Zhang and Davison, 1995 and 2001),
- D = diffusion coefficient each metal at the retrieval temperature,
- t = deployment time (24 h = 86400 s), and
- A = exposed area of the DGT unit.

2.7 Statistical analysis

The significance of spatial differences in Cu concentrations in A-01 WTS surface water was assessed using three-way factorial analysis of variance (ANOVA) with year (2001, 2002, 2004/2005, and 2020), season (February representing winter and July representing summer), and location (influent, splitter box, A cell average, B cell average, effluent) as main effects. Three-way ANOVA was also used to assess the significance of year (2004, 2016, and 2020), sediment depth (surface layer, A layer, and B layer), and cell (4A, and 4B) related differences in Cu concentrations in the A-01 sediments. Cu was chosen for this analysis because of its regulatory significance. All two-way and three-way interactions were tested in both ANOVAs, and the significance of differences among individual group means was assessed by pair-wise Holm-Sidak tests following significant findings in the ANOVAs. Water and sediment Cu concentrations were $\log_{10}$ transformed to meet the assumptions of normality and homogeneity of variance. Test results are presented as geometric means calculated by back-transformation. The critical level for all statistical tests was $P \leq 0.05$. Statistical analyses were conducted with SigmaPlot (Systat Software, Inc, 2007).

3.0 Results and Discussion

3.1 Surface water properties

Measurements of pH in the A-01 WTS outfall from 2003-2020 showed that pH fluctuated intra-annually by as much as 2.0 (2005 and 2014), with the highest values in the winter and lowest in the summer (Figure 3, Table 1 and Table 2). Decreased pH during the summer was associated with decreased dissolved oxygen

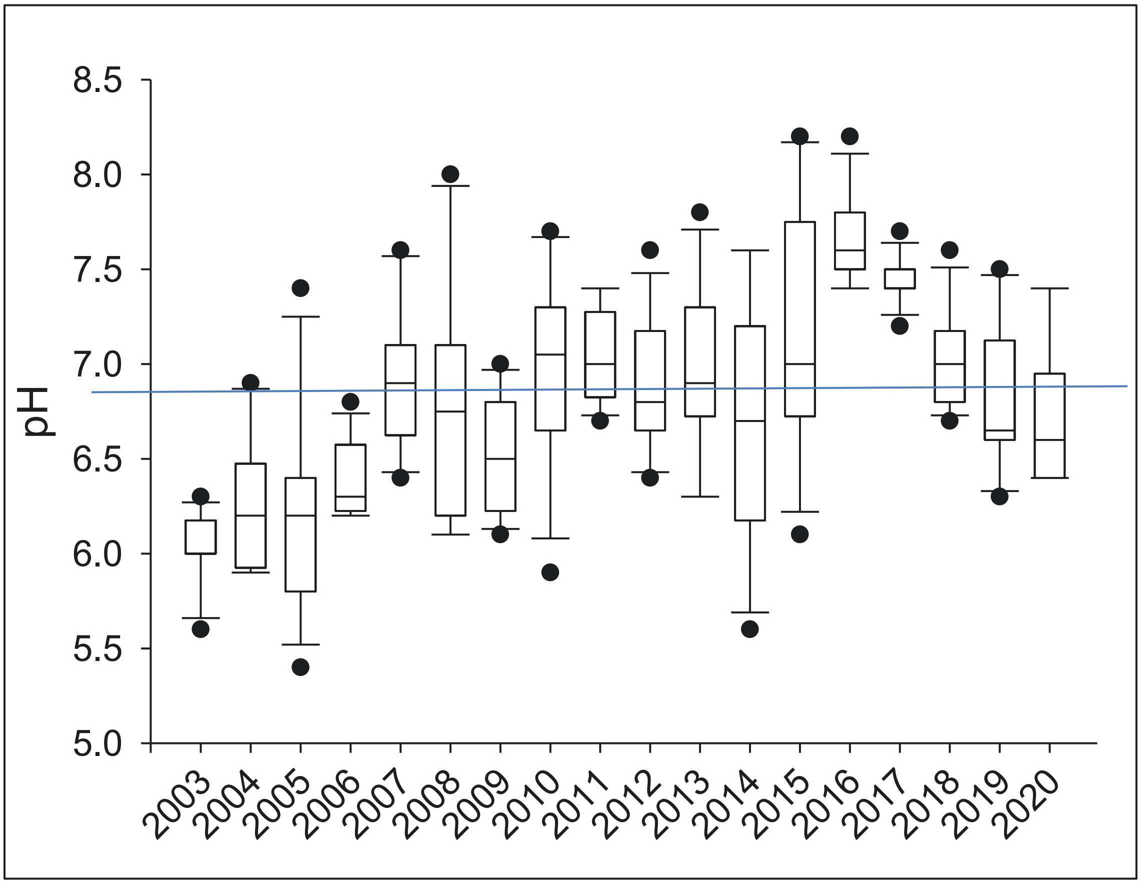

Figure 3. Surface water pH at the A-01 WTS discharge point from 2003 to 2020.

Table 1. Mean (standard deviation) of surface water dissolved oxygen (DO), electrical conductivity (EC), redox potential (ORP), pH, temperature (T), turbidity for surface water samples collected from the A-01 WTS in 2020, (n =22).

Variable	January	February	March	June	July
DO (%)	95.0 (11.9)	90.6 (8.6)	75.7 (22.9)	64.5 (31.7)	64.1 (23.6)
EC (µS cm^{-1})	32.6 (4.3)	28.0 (6.0)	38.0 (2.5)	35.6 (3.3)	28.5 (6.0)
ORP (mV)					53.7 (9.0)
pH	7.0 (0.2)	6.7 (0.2)	6.8 (0.2)	6.1 (0.2)	5.8 0.2)
Temp (^{o}C)	13.2 (1.4)	9.0 (1.1)	16.5 (1.6)	24.1 (0.6)	24.3 (0.5)
Turbidity (NTU)	3.5 (2.4)	7.9 (2.2)	5.1 (3.0)	5.5 (4.9)	7.5 (4.6)

concentrations (Table 1). Both were likely related to temperature driven increases in bacterial respiration and the resulting uptake of oxygen and release of carbon dioxide. Unlike ponds and lakes, where photosynthesis by algae and submerged plants increases pH during daylight due to consumption of carbon dioxide and release of hydroxyl ions through bicarbonate dissociation (Boyd 1990), respiration dominates in shallow wetland waters where emergent plants exchange gases directly with the atmosphere and abundant dead vegetation promotes bacterial growth. In support of this explanation, comparisons among sampling locations showed that surface water pH sometimes decreased by nearly 2.0 following passage through the A and B treatment cells where vegetation growth occurred (Table 1).

The pH at the A-01 WTS discharge point has also shown long-term changes unrelated to season. From approximately 2003 to 2016, median annual pH increased irregularly from about 6.0 to about 7.5 (Table 2, Figure 3), then progressively declined to about 6.5 in 2020. This decline may be related to the increasing prevalence of decomposition processes in the maturing wetland. Conversely, decreases in influent pH may have contributed to the reductions in outfall pH, although data are insufficient to verify this (Table 1).

Table 2. pH values in surface water of the A-01 WTS.

Year	Month	Influent*	Splitter Box*	A cell*	B cell*	Discharge (Effluent)*
2004	4	7.4	7.8	6.8	6.3	6.4
	5	7.1	8.5	6.7	6.3	6.5
	6	6.1	6.8	5.5	5.4	5.4
	7	6.3		5.7	5.6	5.4
	8	5.9	7.6	5.8	5.3	5.5
	9	7.4	7.0	6.0	5.9	6.0
	12	7.0	8.1	6.9	6.2	6.4
2005	1	7.1	8.1	6.6	6.2	6.2
	2	7.3	7.9	6.4	6.2	6.5
2016	7	-	-	7.1	6.8	-
2020	1	7.1	7.2	7.1	6.8	6.8
	2	6.8	6.9	6.8	6.6	6.7
	3	6.7	6.9	6.9	6.7	6.7
	6	6.3	6.3	6.2	5.9	6.1
	7	6.2	6.0	5.8	5.6	5.9

* Influent, n=2; Splitter, n=3; A cell, n=16; B cell, n=16; discharge, n=1.

Other surface water variables measured in the A-01 WTS during 2020 include electrical conductivity (EC) and turbidity (Table 1). The EC values ranged from the mid-20s to mid-30s at all sampling locations, reflecting EC in the influent waters. Turbidity was usually below 10 NTU indicating comparatively high clarity due to the removal of suspended solids in the treatment cells by settling and filtration by wetland plants. Except for a few brief excursions, these variables together with DO, pH, and suspended solids have consistently remained within regulatory limits at the WTS discharge point.

3.2 Removal of Metals from the Water Column

No NPDES permit exceedances, violations of metals limits, or toxicity have been recorded at the compliance point for the wetland since the WTS became operational in 2000. Metal removal efficiency of the treatment system improved as the wetland vegetation became established following construction. Wetland geochemistry and the maintenance of highly reduced conditions in the sediments attained equilibrium within two years of construction due to stable hydrological conditions and steady input of organic matter into the treatment cells (Specht and Nelson, 2002).

In twenty years of operation, total copper inflow to the system varied up to a maximum of 45.3 µg L^{-1} in 2001 (Table 3). Since then, average influent levels have declined from 45.3 µg L^{-1} in 2001 to 20.9 µg L^{-1} in 2020 due to source reductions as indicated by declining influent Cu levels (Table 3). After passage through the treatment cells, Cu concentrations were well below permit limits (22 µg L^{-1}) during all years of operation, often falling below 10 µg L^{-1}. Cu removal has been consistent over time, averaging about 80% despite large changes in influent Cu concentrations. Cu removal occurred rapidly in the wetland system, with most occurring before the water exited the A cells (Table 3). After passage through the B cells, Cu concentrations were generally near the detection limit (Figure 4). Results from previous studies of the A-01 WTS sediments, which indicated that most Cu was deposited in the first half of the A cells, paralleled these findings (Specht and Nelson, 2002; Knox et al., 2006 and 2010).

Three-way ANOVA was used to assess the significance of year, season (February representing winter and July representing summer), and location (influent, splitter box, A cell average, B cell average, effluent) related differences in Cu (log_{10} transformed) concentrations in the A-01 WTS. The main effects of year and location were statistically significant, and interactions among main effects were absent ($P<0.05$, Table 4). Multiple comparison tests indicated significant differences among all years as a result of a progressive decline in Cu concentrations at all locations within the WTS due to source reductions (Table 3). Multiple comparison tests also indicated significant differences among all locations within the WTS, reflecting the progressive removal of Cu as water passed from the WTS effluent to the discharge point in Tims Branch.

Table 3. Cu, Pb, and Zn concentrations (µg L^{-1}) in surface water from influent to discharge in the A-01 WTS.

Year	Influent*	Splitter Box**	A cell***	B cell***	Discharge (Effluent)*	Avg % removal
			Cu			
2001	45.3 (45.8)	25.1 (10.5)	10.9 (6.1)	7.7 (3.6)	8.2 (4.3)	82.0
2002	36 (19.2)	33.6 (19.2	11.9 (8.9)	7.0 (5.3)	8.4 (6.9)	76.5
2004/2005	25.8 (11.8)	23.4 (14.1)	9.8 (3.1)	4.7 (2.5)	4.4 (1.6)	83.0
2016			6.5 (1.3)	5.6 (1.3)		
2020	20.9 (11.2)	7.4 (3.4)	5.6 (2.5)	3.6 (1.2)	3.0 (0.9)	85.8
			Pb			
2004/2005	1.2 (1.0)	1.2 (1.7)	1.1 (1.5)	0.6 (0.6)	0.4 (0.6)	66.6
2016			0.1 (0.1)	0.1(0.1)		
2020	0.65 (0.4)	0.4 (0.2)	0.3 (0.1)	0.2 (0.1)	0.2 (0.1)	74.3
			Zn			
2004/2005	18.4 (7.5)	30.7 (14.2)	14.4 (6.7)	9.1 (7.5)	8.8 (6.4)	52.1
2016			42.5 (5.6)	39.8 (6.7)		
2020	27.8 (14.0)	24.8 (14.5)	18.1 (10.9)	11.6 (5.3)	9.8 (4.4)	64.8

* n=12 in 2001 and 2002, 9 in 2004/2005, and 5 in 2020.
** n=12 in 2001 and 2002, 36 in 2004/2005, and 20 in 2020.
*** n=48 n 2001 and 2002, 36 in 2004/2005, and 40 in 2020.

During 20 year of operation, systematic monthly water sampling validated the wetlands' performance including the fate of the larger suite of metals in the water (Appendices A, B, and C). Most divalent metals were rapidly removed from the water and held in the sediments shortly after the water entered the treatment wetlands. Average removal of Pb from water by the wetland system was 67 and 74%, respectively, in 2004, and 2020. Comparable values for Zn were 52 and 65%, respectively (Table 3). Most other metals either showed no trends during passage through the wetland cells or were present in such low concentrations that no pattern was discernable (Knox et al, 2004). When influent concentrations were higher, removal percentages of the metals were higher. This was illustrated by the Cu data: influent concentrations above about 40 µg L^{-1} were associated with 85% or greater removal while removal was often less at lower influent concentrations (Figure 5).

The A-01 WTS raised dissolved organic carbon in the water due to large amounts of organic matter in the system resulting from vegetation decomposition (Knox et al, 2006 and 2010). Dissolved organic carbon levels generally doubled during passage through the wetlands and contributed to effective removal of Cu and other elements from surface water (Knox et al., 2010). Hydraulic load and hydraulic residence time, is important for establishing permanent sequestration conditions within WTSs (Sheoran and Sheoran, 2006). Slower loading rates and longer residence times can promote anaerobic conditions and sedimentation of metal contaminants that are necessary for biogeochemical reactions that encourage more permanent sequestration of metals (Sheoran and Sheoran, 2006). Hydrology also allows for chemical binding to occur due to the presence of fulvic acid (FA) and humic acid (HA) and other heterogeneous polyligands that allow for the creation of colloidal complexes with bioavailable metals (Sheoran and Sheoran, 2006). The removal of metals is dependent on these interacting processes and reactions, creating a complex system dependent on many secondary factors for successful removal.

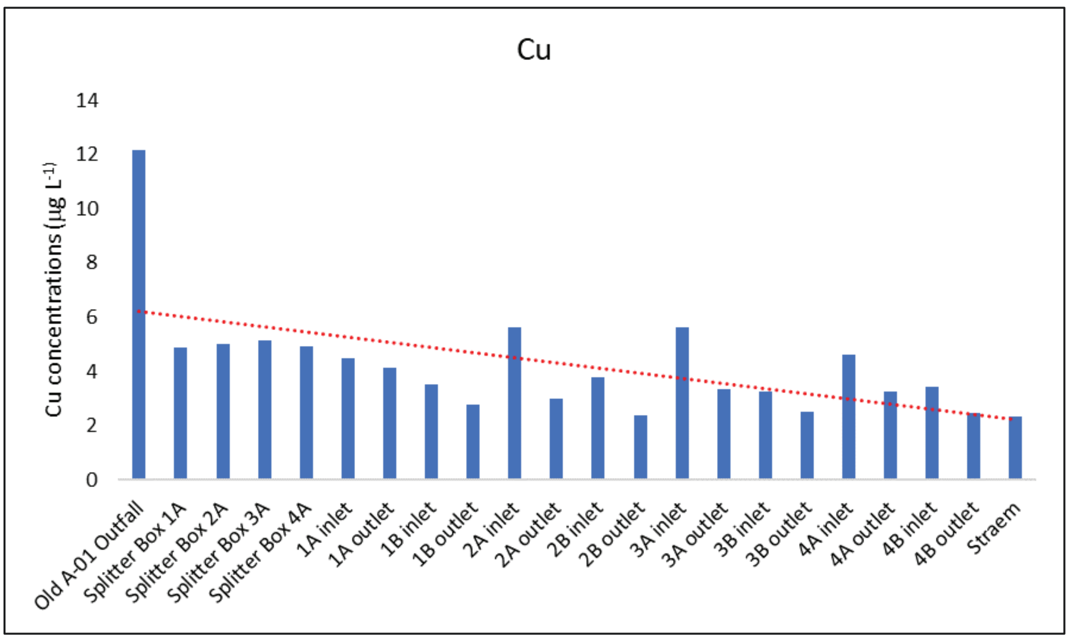

Figure 4. Cu removal from water column after passage through the A-01 WTS on January 27, 2020.

3.3 General Sediment Properties

Hydrosoil (sediment) added to the A-01 WTS during construction consisted of local soils typical of the southeast United States, with an acidic pH (5.7) and a cation exchange capacity (CEC) of 1.4 meq/100g. The particle size distribution was approximately 90% sand and 10% silt and clay. Organic matter content ranged from 1 to 2 percent (Murray-Gulde, 2003). The soils were amended during construction with pine mulch, agricultural lime to neutralize pH, gypsum as a source of sulfur, and Osmocote time release fertilizer. After 2 weeks of operation, organic matter content in the sediment remained at 2 to 3 %, CEC slightly increased to 5.6 meq/100g, and pH increased to 6.4 (Murray-Gulde, 2003). The sediment redox in the sediment wetland ranged from -17 to -261mV. Yu (1991) showed that the pH of acidic sediments increased from 4.5 to near 5.5 after they were submerged for one week and reached a final stable pH of 6.4 after about 2 weeks as a result of a number of reactions. The impact of these reactions on sediment pH changes as the redox status changes (Yu, 1991). In general, reduction reactions in aqueous systems take up protons, or make the sediment more basic.

Table 4. Three-way analysis of variance (ANOVA) of Cu concentrations in surface water (µm L^{-1}) of the A-01 WTS. Main effects are year (2001, 2002, 2004/2005, 2020), month (February, July), and location (old outfall, splitter box, A cell average, B cell average, stream). Also shown are multiple comparison tests among least square means (LSMs) conducted with the Holm-Sidak all pairwise comparison procedure (overall $P \leq 0.05$). Two and three-way interactions were not significant ($P \leq 0.05$). Multiple comparison results are shown for significant main effects. Least square means (LSMs) are $\log_{10}$ back-transformed.

Source of Variation	Degrees of freedom	Sum of squares	Mean squares	F ratio	P
Year	3	0.67	0.22	7.66	<0.001
Month	1	0.06	0.06	2.02	0.165
Location	4	3.10	0.78	26.56	<0.001
Residual	31	0.90	0.03		
Total	39	4.73	0.12		

Multiple comparison results for main effects of year and location.

Comparison	LSM #1	LSM #2	t	P
Effect of Year				
2002 vs. 2020	14.49	7.28	3.91	0.003
2001 vs. 2020	13.68	7.28	3.58	0.006
2002 vs. 2004/2005	14.49	8.43	3.08	0.017
2001 vs. 2004/2005	13.68	8.43	2.74	0.030
Effect of location				
Old outfall vs. stream	26.85	5.27	8.27	<0.001
Old outfall vs. B cells	26.85	6.05	7.57	<0.001
Splitter vs. stream	18.53	5.27	6.40	<0.001
Old outfall vs. A cells	26.85	8.04	6.14	<0.001
Splitter vs. B cells	18.53	6.05	5.69	<0.001
Splitter vs. A cells	18.53	8.04	4.26	<0.001

After four years of A-01 WTS operations, the pH of the sediment was lower in the organic layer at the sediment surface (5.0 to 5.4, respectively, for cell 4A and 4B) than deeper in the sediments (Figure 6). Two-way ANOVA of the pH data collected in 2004 indicated a significant difference among depths and a significant interaction between depth and cell (Knox et al. 2006). The latter indicated that the relationship between pH and sediment depth differed among cells: pH was significantly lower in the surface sediments (0-5 cm) than in the deeper sediments in cell 4A but not in cell 4B. Samples collected from cells 4A and 4B in 2016 showed that sediment pH changed little in the inorganic sediments (5-10 and 10-20 cm layers) but increased slightly in the organic-rich sediment overlying the inorganic sediments (A. S. Knox and M. H. Paller, SRNL, unpublished data).

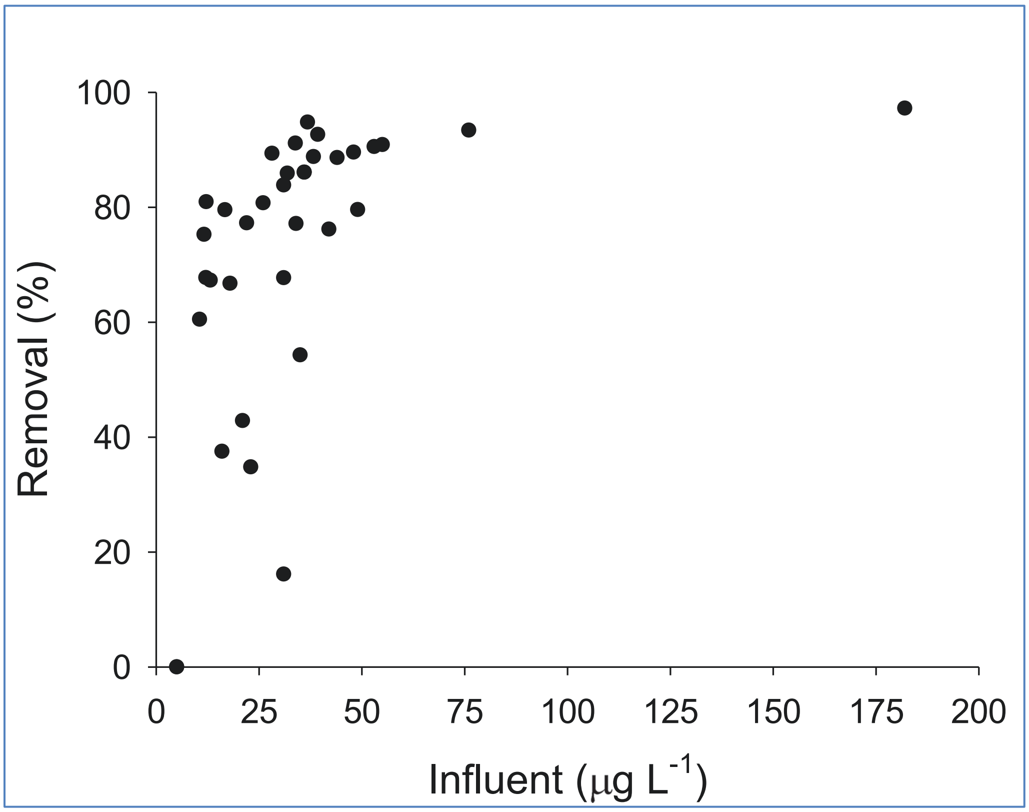

Figure 5. Relationship between influent Cu concentrations and percentage removal of Cu following passage through the A-01 WTS.

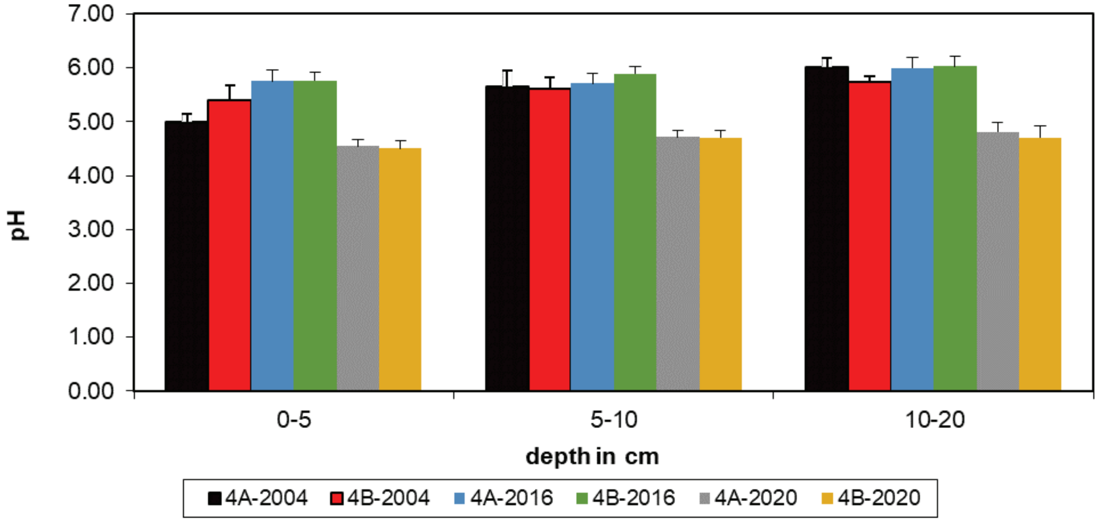

Figure 6. Sediment pH as a function of depth after 20 years of operation of the A-01 WTS (n = 8 for each cell and each sediment layer).

The 2020 data showed that pH decreased in the sediments of both cells 4A and 4B compared with earlier years, although the pattern of pH change with sediment depth was similar among years: lower in the shallow organic layer (4.5 in both cells - 4A and 4B) and slightly higher in the deeper sediments (4.81 and 4.71, respectively in cell 4A and 4B) (Figure 6). The reduction in sediment pH observed in 2020 was likely due to the build-up of organic matter around the dense root system of wetland plants that developed over time in the A-01 WTS. The pH values in sediment at the periphery of cells 4A and 4B, where vegetation was minimal (referred to as control sediment), averaged 5.7 compared with 4.9 in sediments with dense vegetation growth (Figure 7).

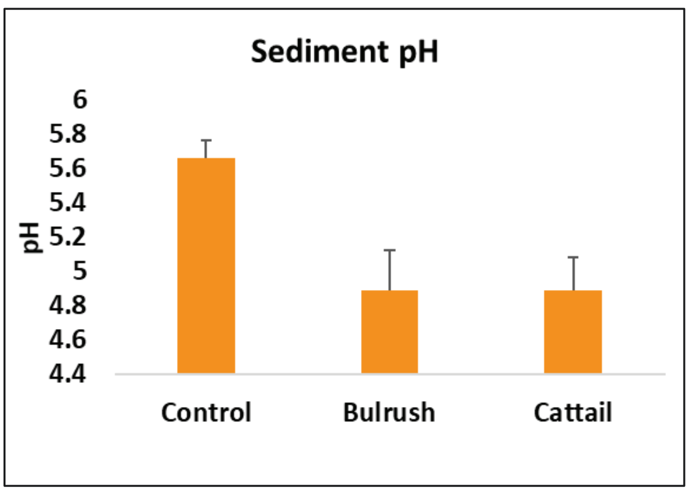

Figure 7. The pH of control sediment (areas near the bank with little vegetation) and sediment around bulrush and cattails (n = 6) in the A-01 WTS.

The initial organic content in the wetland sediment was about 2%. By 2004 loss-on-ignition measurements for cells 4A and 4B indicated that organic matter had increased to 35.3 and 17.9%, respectively, for the floc layer, 16.7 and 11.8%, respectively, for the organic matter layer (depth of 2-5 cm), about 3% for the inorganic layers at 5-10 cm, and less than 3% for the inorganic layer at 10-20 cm (Figure 8). Two-way ANOVA of the organic matter data collected in 2004 indicated that organic matter content significantly differed among sediment layers and was significantly greater in cell A than in cell B (Knox et al. 2006). A similar pattern was observed in 2020; however, there was more organic matter (more than 4%) in the deeper sediment profile (5 to 20 cm) in 2020 than in 2004 (Figure 8).

The role of organic matter in wetlands is to provide a carbon source for sulfate reducing bacteria as well as to provide organic ligands for binding Cu and other metals. Material collected in the sediment traps provides a conservative measure of the quantity and associated organic matter content of particulates settling from the water column (Knox et al., 2006). In general, the organic matter content measured in the A-01 wetland agreed with organic matter content observed in other wetlands (Fennessy et al., 1994).

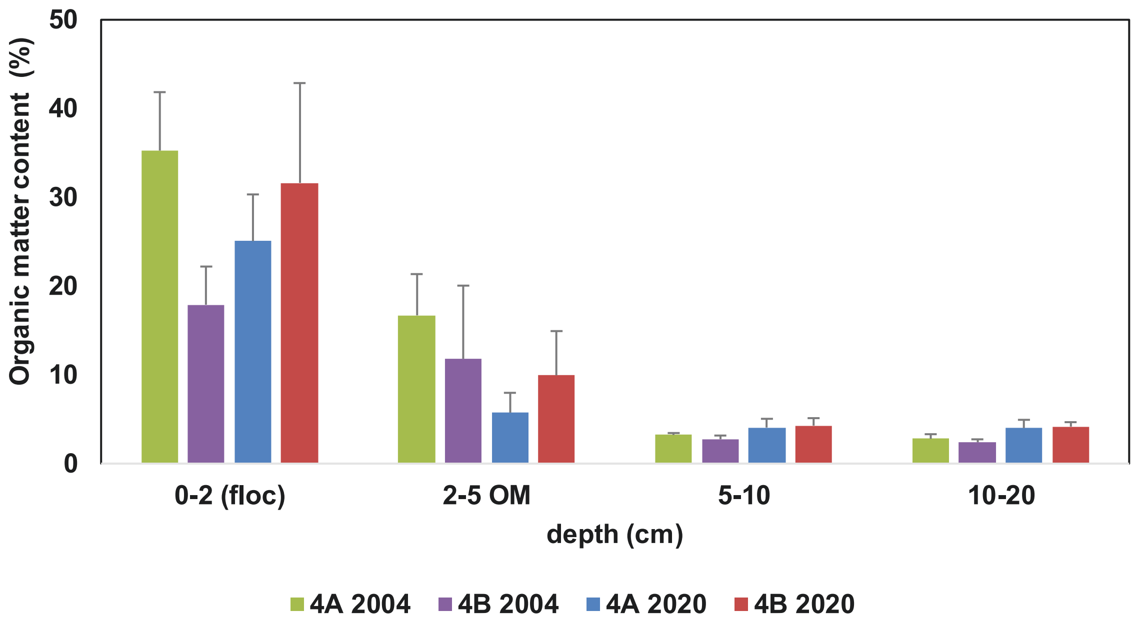

Figure 8. Sediment organic matter (OM) content as a function of depth after 20 years of operation of the A-01 WTS (n = 8 for each cell and sediment layer).

3.4 Vertical and horizontal distribution of metals in sediments during 20 years of operation

Sediment samples collected in 2001 provided information on the fate of metals removed from the water column during the initial period of A-01 WTS operation (Appendices D, E, and F). Copper concentrations were much higher in the surface sediments (0-1 cm) than overlying waters and exhibited a longitudinal gradient, averaging about 20 mg kg^{-1} near the inflow to Cell 4A; 10 mg kg^{-1} near the middle of Cell 4A, and 7 mg kg^{-1} near the discharge of Cell 4A. Surface sediment concentrations in Cell 4B were typically <5 mg/kg, except near the outflow, where slightly higher average concentrations (6 mg kg^{-1}) were due to one high value (18.1 mg kg^{-1}).

Sediment samples were divided into layers in subsequent years of sampling (2004, 2016, and 2020): floc (0-2 cm), organic matter (2-5 cm), A layer (5-10 cm), and B layer (10-20 cm). Organic matter consisted primarily of decaying vegetation overlying the mostly inorganic sediments in the A and B layers. Floc consisted of flocculent, primarily organic material at the sediment/water interface. Floc and organic matter were largely absent when the wetland was initially filled and increased over time as the wetland matured.

Cu concentrations in the floc were much higher than in the lower sediments and exhibited a strong longitudinal gradient in the 4A and 4B treatment cells (Figure 9). Cu concentrations in 2004 decreased from over 1200 mg kg^{-1} at the 4A inlet to about 460 mg kg^{-1} at the outlet (Figure 9). Concentrations in cell 4B were lower (210 – 308 mg kg^{-1}) and without clear spatial trends. Patterns in 2020 were similar, except that Cu concentrations were lower, especially in cell 4A, and decreased along the effluent flow path from the 4A inlet to the 4 B outlet (Figure 9). Floc Cu concentrations in cell 4A decreased markedly by 2020 as a consequence of source reductions and, in some locations, were lower in than in cell 4B.

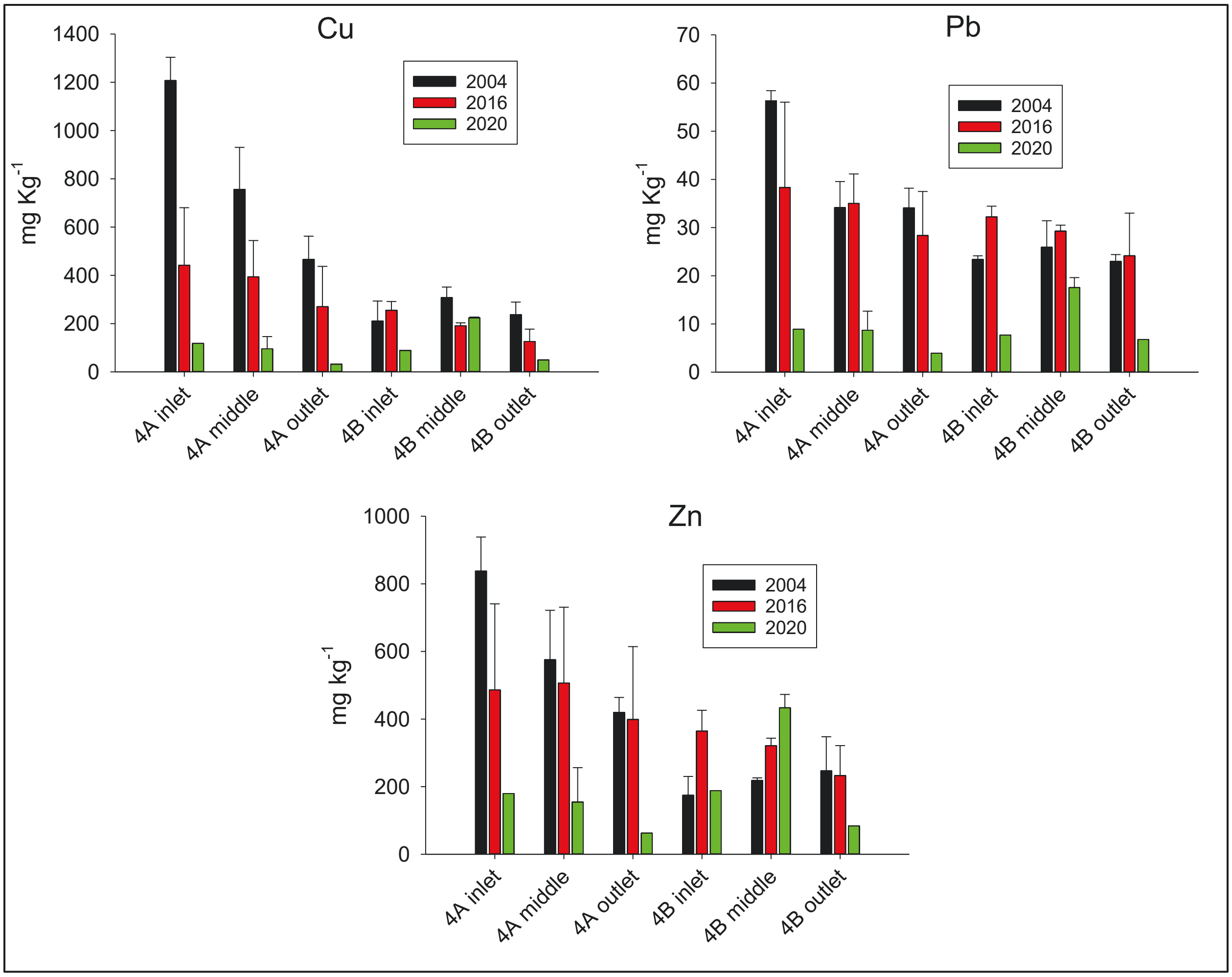

Figure 9. Spatial distribution of metals (mg kg^{-1}) in the floc layer of sediment (0-2 cm) in cells 4A and 4B of the A-01 WTS in 2004, 2016, and 2020 (n = 1-4 for each location). Error bars are standard deviations.

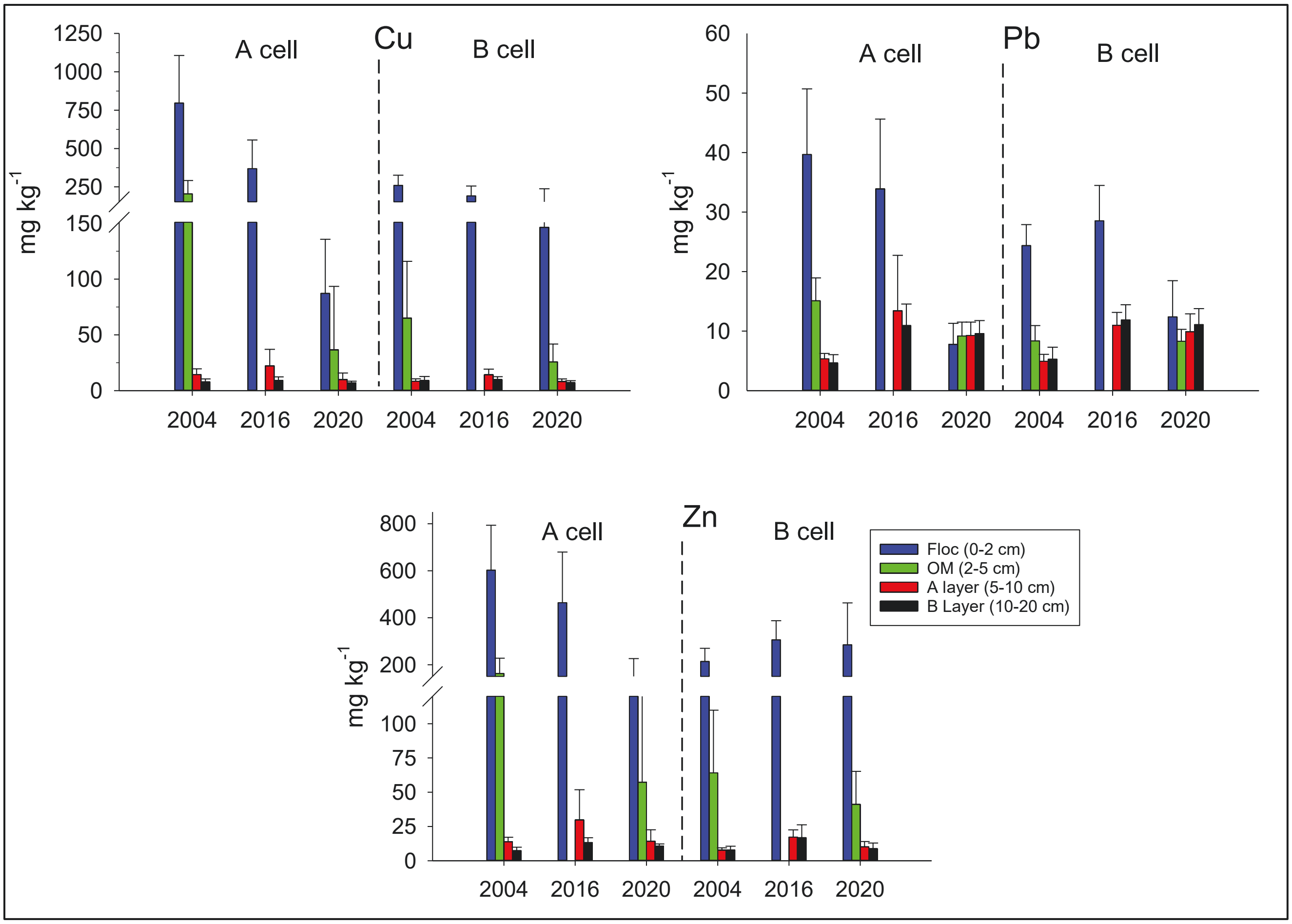

Figure 10. Metal distribution (mg kg^{-1}) in the sediment profile of cells 4A and 4B in the A-01 WTS in 2004, 2016, and 2020 (n = 8 for each location). Sediment layers in the profile included floc, organic matter (OM), inorganic sediment layer A, and inorganic sediment layer B. Error bars are standard deviations The OM layer was not sampled in 2016.

Samples collected from cell 4A in 2004 showed that Cu concentrations in the organic layer (average of about 200 mg kg^{-1}) were lower than in the floc (Figure 9 and Figure 10). Similar results were observed in 2020. However, Cu concentrations in the organic matter layer were much higher than in layers A and B, which represented deeper, largely inorganic sediments (Figure 10).

Cu concentrations measured in the deeper, inorganic sediments in 2001 averaged about 2.0 mg kg^{-1} and were representative of baseline concentrations in the wetland hydrosoil before A-01 effluent was discharged to the WTS (Specht and Nelson, 2002). Further sampling showed that Cu accumulated in the A inorganic sediment layer of cell 4A with time, averaging about 14 mg kg^{-1} in 2004 and 22 mg kg^{-1} in 2016 before decreasing to about 10 mg/kg in 2020 (Figure 10) The latter may reflect decreases in Cu inputs and vertical leaching of dissolved Cu below the depth of sampling. Cu concentrations in cell 4B were lower than in cell 4A (8-14 mg kg^{-1} but exhibited the same pattern of change with time. Deeper inorganic sediments represented by layer B had lower Cu concentrations (average of 7-9 mg kg^{-1}) than layer A that differed little between sampling locations and changed little with time. Cu changes in sediment layers A and B were relatively low and did not show the large decreases over time observed in the floc layer and organic matter layers (Figure 10). This paralleled the decreases in Cu concentrations that occurred in the A-01 influent due to source reductions, while the former was likely affected by the downward migration of Cu through the sediment following its removal from the water column and deposition in the surface sediments.

The statistical significance of year (2004 and 2020), sediment depth (floc, organic matter, A layer, and B layer), and cell (4A, and 4B) related differences in Cu concentrations within the A-01 wetland were assessed with three-way ANOVA. Data from 2016 were not included in this analysis because the organic matter layer was not represented. All main effects were significant ($P \leq 0.05$) reflecting large differences among years, sediment layers, and cells, as was the three-way interaction among cell, sediment depth, and year (Table 5). The latter showed that differences in Cu concentrations among sediment layers were inconsistent between cells and years (Table 5). Further investigation with post-hoc, pairwise Holm-Sidak tests showed that significant differences occurred in the floc and organic matter layers. Cu concentrations in the floc layer were significantly higher in cell 4A than cell 4B in 2004. Floc Cu concentrations subsequently diminished in cell 4A and by 2020 no longer differed significantly from those in cell 4B. Cu concentrations in the organic matter layer were higher in 2004 than 2020 in cells 4A and 4B; however, differences between cells were significant only in 2004. These results show that Cu concentrations in the upper sediment layers (floc and organic matter) decreased over time, especially in cell 4A, and remained low in the lower sediment layers (A and B).

Table 5. Three-way ANOVA of Cu concentrations (mg kg^{-1}) in sediments. Main effects are year (2004 and 2020), sediment depth (floc, organic matter [0-5 cm], A layer [5-10 cm], and B layer [10-20 cm]), and cell (4A and 4B). Also shown are multiple comparison tests among least square means (LSMs) conducted with the Holm-Sidak all pairwise comparison procedure (overall $P \leq 0.05$). Multiple comparison results are shown for significant interactions. LSMs are $\log_{10}$ back-transformed.

Source of Variation	Degrees of freedom	Sum of squares	Mean squares	F ratio	P
Year	1	4.19	4.19	95.33	<0.001
Cell	1	0.43	0.43	9.82	0.002
Sediment depth	3	36.13	12.04	274.15	<0.001
Year x cell	1	0.92	0.92	20.93	<0.001
Year x sediment depth	3	2.61	0.87	19.83	<0.001
Cell x sediment depth	3	0.32	0.11	2.44	0.068
Year x cell x sediment depth	3	0.64	0.22	4.89	0.003
Residual	109	4.79	0.044		
Total	124	55.36	0.45		

Multiple comparison results for year x sediment x depth interaction. Only significant test results are shown.

Comparison	LSM #1	LSM #2	t	P
2004 vs 2020: F layer in cell A	741.31	75.68	8.30	<0.001
2004 vs 2020: OM layer in cell A	188.36	19.86	9.32	<0.001
2004 vs 2020: OM layer in cell B	53.83	22.23	3.78	<0.001
Cell A vs cell B: F layer in 2004	741.31	251.77	4.33	<0.001
Cell A vs cell B: OM layer in 2004	188.36	53.83	5.19	<0.001

Zn exhibited spatial and temporal trends much like Cu. Floc samples from cell 4A not long after wetland construction (2002) showed that Zn averaged 29 mg kg^{-1} near the influent, about 15 mg kg^{-1} in the middle quadrants, and about 13 mg kg^{-1} near the outflow. Zn concentrations in samples from Cell 4B were lower than in 4A, averaging 7 to 11 mg kg^{-1}. Zinc concentrations in the deeper sediments of both the 4A and 4B cells were lower than in the surface sediments, averaging 5.5 to 9.4 mg kg^{-1}. The Zn concentrations in the deeper samples were representative of the baseline concentrations of the wetland hydrosoil before A-01 effluent began discharging to the treatment system.

Zn concentrations in the floc reached high levels near the 4A inlet in 2004, averaging about 800 mg kg^{-1}, before declining to about 500 mg kg^{-1} in 2016 and 180 mg kg^{-1} in 2020 as a likely consequence of source reductions, as explained for Cu Figure 9). As also observed for Cu, Zn concentrations decreased along the flow path from the 4A influent to the 4A effluent in 2004 and 2016 indicating that much of the Zn was removed soon after the A-01 effluent entered the treatment system (Figure 9). As with Cu, Zn concentrations in the cell 4A floc decreased markedly in 2020 and clear spatial patterns were no longer evident.

Like Cu, Zn initially accumulated in the 5-10 cm sediment layer over time, averaging about 14 mg kg^{-1} in cell 4A in 2004 and 30 mg kg^{-1} in 2016, before declining to 14 mg kg^{-1} in 2020 (Figure 10). Concentrations in the 5-10 cm layer were somewhat lower in cell 4B than cell 4A but showed a similar pattern with time. Zn concentrations in the 10-20 cm sediment layer (7-12 mg kg^{-1}) were lower than in the shallower inorganic sediments.

Pb concentrations in the floc were lower than Cu and Zn concentrations but followed the same spatial trend: highest near the 4A influent and lowest near the 4B effluent in 2004 and 2016. As with Cu and Zn, Pb concentrations in cell 4A declined in 2020 and were generally lower than in cell 4A (Figure 9). Pb concentrations were higher in the floc and organic layers than in the deeper sediments, although the differences were smaller than with Cu and Zn (Figure 10). Pb concentrations increased in the deeper sediment layers with time, likely because of the downward migration of Pb removed from the water column and deposited in the sediments.

The results for Cu, Zn, and Pb in the 4A cells indicate that the metals in the wetland influent were removed from the water column following entry into the cells, with much of the removal occurring within the upper (influent) part of the A cell and less occurring farther along the treatment path. This pattern changed little over the 20 years of wetland operation. Much of the metal removed from the water column was captured in the mixture of floc, organic detritus, and fine sediment at the sediment surface. However, gradual increases in metal concentrations in deeper sediment layers indicated the downward migration of metals as a likely consequence of diffusion and showed that deeper sediments will likely be the final repository of metals removed from the wetland influent.

The distribution of metals in the sediment profile of the A-01 WTS agrees with the findings of other researchers. For example, Ye et al. (2001) reported that the concentration of metals such as Co and Ni tended to be higher in the top 5 cm of sediment than in the 5 to 10-cm and 10 to 15-cm sediment layers in a Pennsylvania constructed wetland treating coal combustion by-product leachate. However, long-term metal sequestration of metals within a WTSs is dependent on a variety of factors, one being metal speciation. Cu can act as a soft acceptor or an intermediate acceptor of electrons dependent on its charge, (Cu^{+}, Cu^{2+}), respectively (Greger, 1999). Zn is primarily an intermediate acceptor of electrons, (Zn^{2+}; Greger 1999). Since metal ions are positively charged and sediment colloids are negatively charged, the amount of organic matter and clay within a WTS along with metal speciation influences the absorption of bioavailable metals, which are the toxic form (Greger, 1999; Reddy and DeLaune, 2008). Another factor to consider is metal adsorption. This occurs through chemisorption and ion exchange, which involves competition for adsorption sites and depends on the charges of other ions (Marchand et al., 2010).

Two other important factors for metal sequestration are the pH of the WTS sediment and the oxidization-reduction potential. The lower the pH within the WTS the more bioavailable the metals, since they are competing with an increased amount of active H^{+} for binding sites (Greger, 1999; Marchand et al., 2010).

The redox potential (Eh) measures the electron potential in milliVolts (mV) of a coupled reduction-oxidation reaction (Reddy and Delaune, 2008). The Eh is used to understand the bioavailability of measured trace metals and nutrients due to chemical interactions and microbial respiration (Xu and Mills, 2018). The Eh becomes more negative in anoxic or reducing layers and more positive in oxic or oxidizing layers of the sediment and can be displayed as a redox ladder with key redox couples and their corresponding redox potential in mV at standard state conditions (i.e., pH=7, 25°C, 1 atm; Langmuir, 1997).

3.5 <u>Sediment pore water</u>

Metal concentrations in the sediment pore water are more closely related than metal concentrations in bulk sediments to toxic effects on aquatic organisms (Luoma 1983). Much of the metal in sediments is bound to sediment particles and is unavailable for uptake by the respiratory surfaces of aquatic organisms; whereas metals in pore water are more bioavailable, although bioavailability is also influenced by other aspects of pore water chemistry (Luoma 1983).

Metal concentrations in sediment pore water were lower than in bulk sediments (Figure 10 and Figure 11) but higher than in the surface waters (Appendices G, H, I, J, and K). Pore water Cu concentrations in cell 4A surface sediment (0-5 cm) averaged nearly 45 µg L^{-1} in 2004 compared with about 10 µg L^{-1} in the overlying waters (Figure 11, Table 3). Even larger differences were observed for Pb and especially Zn, the latter of which averaged about 2000 µg L^{-1} in the surface sediment and underlying A layer (5-10 cm) in 2004 compared with less than 10 µg L^{-1} in the overlying water (Figure 11, Table 3).

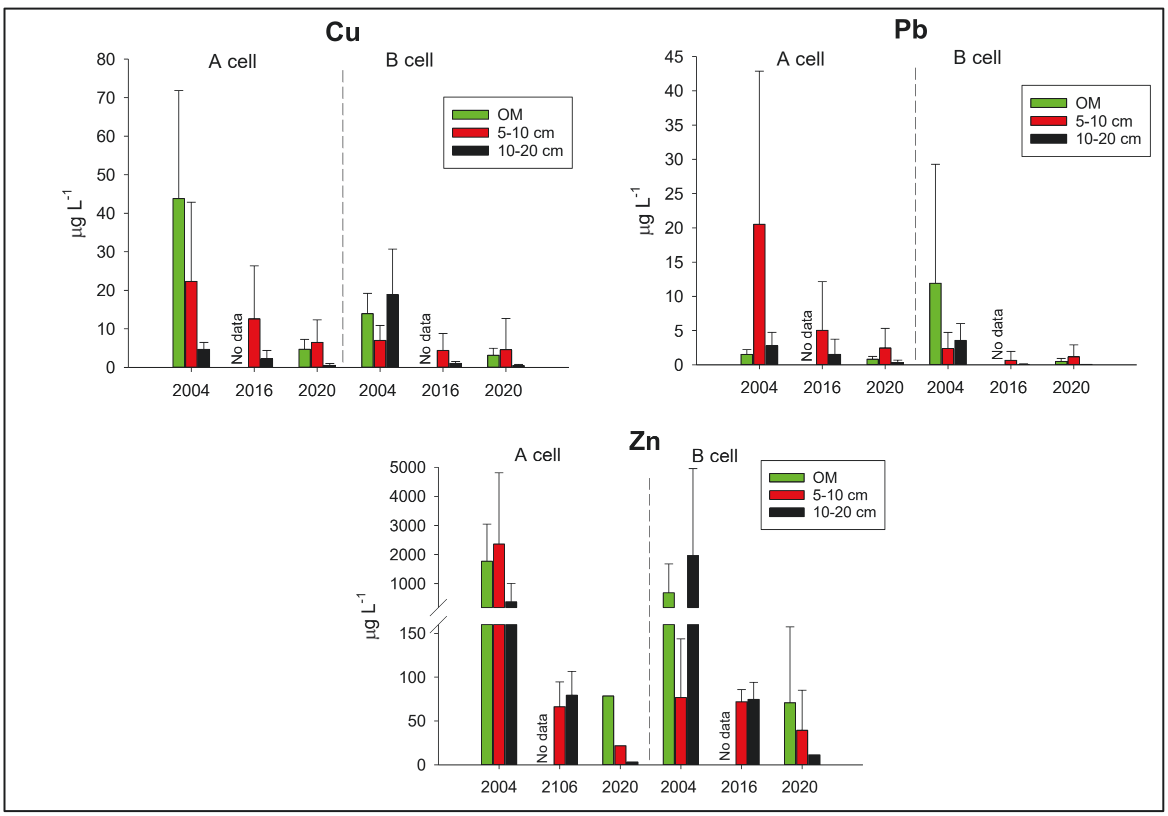

Figure 11. Metal distribution in sediment pore water from cells 4A and 4B of the A-01 WTS in 2004, 2016, and 2020.

Metal concentrations in the sediment pore waters followed the same trends observed in the surface waters. Pore water concentrations of Cu, Pb, and Zn decreased along the effluent flow path through cells 4A and 4B and decreased over time (Figure 11). Reductions from 2004 to 2020 averaged 80% for Cu, 88% for Pb, and 95% for Zn (all sediment layers combined), at least partly due to source reductions, as described for surface waters. Lastly, pore water metal concentrations exhibited the same tendency to decreased with depth exhibited by metal concentrations in the bulk sediments, although the pattern was less regular.

3.6 Evaluation of metal bioavailability in surface water with diffusive gradient in thin film (DGT) probes

Dissolved metals include free metal ions, metals bound to colloids, and metals associated with ligands, the latter of which are inorganic anions and organic molecules with functional groups that bind metals (Stumm and Morgan, 1996). Generally, the free metal ion is bioavailable, and metals bound to various ligands are not unless the association is labile permitting release of the metal ion (Meyer and Gorsuch, 2007). This recognition has created interest in methods that selectively measure the bioavailable metal fraction. One of these is DGT, which provides a more accurate indication of bioavailable metals than measurements of filtered or unfiltered metals in water (Davison and Zhang, 1994). For example, Paller et al. (2019) found that humic acids formed strong organic-Cu complexes that were measurable in filtered water samples. However, they were not toxic to *Ceriodaphnia dubia.* and not measured by DGT, which selected for free or weakly bound Cu and excluded non-toxic Cu fractions in this case.

Average DGT Cu concentrations in surface waters were about 50-75% lower that total Cu concentrations suggesting that half or more of the Cu in the A-01 surface waters was not bioavailable (Figure 12, Table 3). In contrast, DGT Zn concentrations were comparable to or higher than total Zn concentrations in the surface waters (Figure 12, Table 3, Appendices L, M, and N). Humic acids form strong organic-Cu complexes that are inaccessible for biological uptake and excluded by DGT, which selects for free or weakly bound Cu. In contrast, such complexes are not formed to the same degree with Zn DGT (Paller et al. 2019). Xu et al (2019) observed that Cu had a higher affinity than Zn for organic ligands in a WTS as indicated by a greater percentage of Cu-organic matter complexes than Zn-organic matter complexes. Differences in affinity for organic compounds between Cu and Zn may explain the different patterns shown by DGT Cu and DGT Zn relative to total water concentrations of these metals in the A-01 wetland.

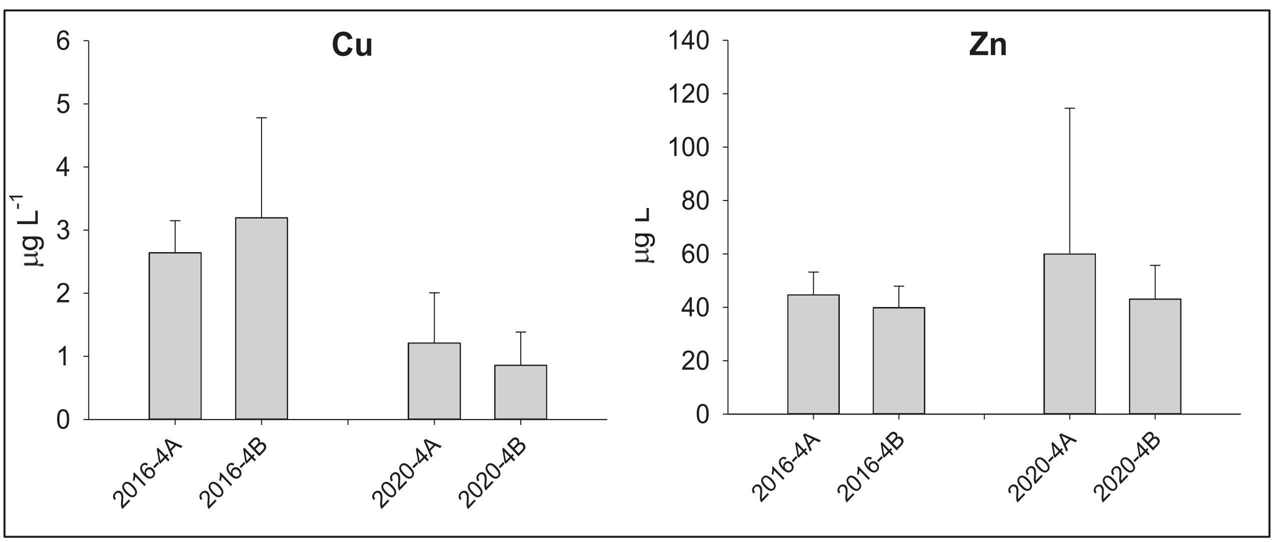

Figure 12. Concentrations of Cu and Zn measured in surface water by DGT in cells 4A and 4B of the A-01 WTS (n = 8 for each cell).

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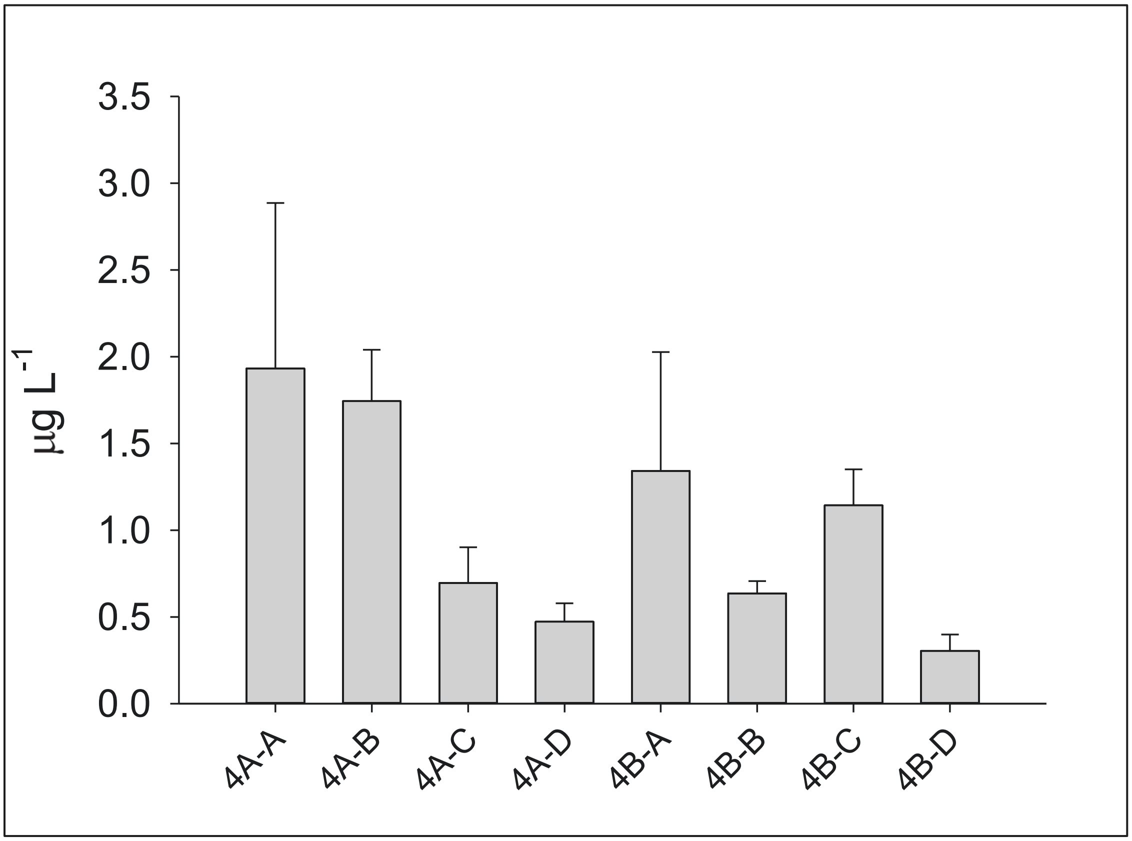

Figure 13. Surface water Cu concentrations measured by DGT at sample sites within cells 4A and 4B of the A-01 WTS during 2020. Sample site locations are shown in Figure 2 (n = 2 for each location).

DGT Cu concentrations in surface waters generally decreased along the flow path in the 4A and 4B treatment cells from the water entry at location 4A-A to the exit at 4B-D paralleling the pattern observed with total Cu concentrations in water (Figure 13 and Figure 2). DGT Cu concentrations near the exit of cell 4B (i.e., 4B-D) were over 80% lower than DGT Cu concentrations near the entrance of cell 4A (Figure 13) and less than 10% of the total Cu concentrations in the A-01 effluent (Table 3). Because DGT metal concentrations are more closely related than total metal concentrations to metal bioavailability, these results point to the success of the A-01 wetland at reducing potential Cu toxicity in water discharged to Tims Branch.

3.7 Evaluation of metal bioavailability in sediment water with diffusive gradient in thin film (DGT) probes

Bioavailability of Cu and Zn in A-01 WTS sediment was evaluated with sediment DGT probes in 2016 and 2020 (Appendices O, P, Q, and R). On average, DGT measurements for Cu (DGT Cu) and Zn (DGT Zn) in the sediments were much lower than bulk sediment concentrations during both years. These results suggest that most of the Cu and Zn in the A-01 WTS sediments was not bioavailable as a likely consequence of adsorption to sediment particles and complexation with organic and inorganic substances (Figure 10 and 14). Retention of metals in sediments strongly depends on their specific chemical and mineral forms and their binding characteristics. Knox et al. (2006) showed that the organic matter fraction was important for Cu retention in A-01 WTS in 2004. In support, results from 2020 showed higher DGT concentration of Cu in the organic layer than in the lower two inorganic layers (Figure 14).

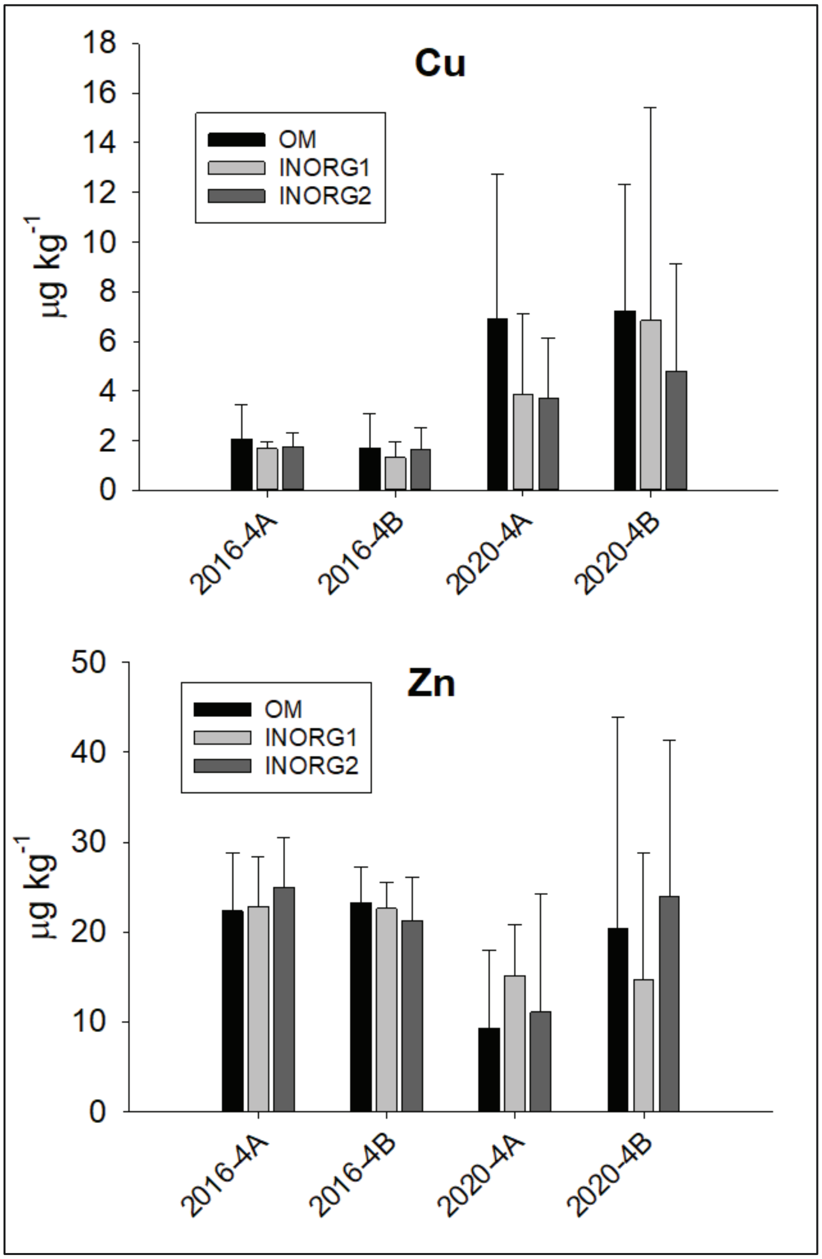

Figure 14. Concentrations of Cu and Zn measured in sediment layers by DGT in cells 4A and 4B of the A-01 WTS (OM – organic layer [0-5 cm], INORG1 – inorganic layer [5-10 cm], INORG2 – inorganic layer [10-20 cm]). There were eight replicates for each layer in each cell.

Organic ligands may have been particularly important in mitigating the toxicity of Cu sequestered in the surface sediments. De Schamphelaere and Janssen (2002) and Al-Reasi et al. (2012) indicated that some organic compounds, especially humic acids, have strong mitigating effects on Cu toxicity because they form stable complexes with Cu that are not bioavailable. Humic and fulvic acids are among the most common organic compounds in natural aquatic ecosystems and were likely present in the A-01 wetland surface sediments as a by-product of vegetation decomposition. Adsorption of metals to organic ligands is an important mechanism for metal immobilization in constructed wetlands, especially during the early years of wetland operation (Machemer and Wildeman 1992). The removal of metals by precipitation as sulfidic minerals becomes more important as wetlands mature and accumulating organic matter provides an energy source for bacterial metabolism (Murray-Gulde 2005, Huddleston and Rogers 2008). Knox et al. (2006) showed that in 2004 metals in A-01 WTS sediments were strongly bound by the sediment, especially in the form of crystalline oxides, sulfides or silicates, and aluminosilicates. In 2020, DGT Cu concentrations were lower in the inorganic layers than in the organic layer, especially in cell A4 (Figure 14) indicating that Cu was strongly bound to the deeper sediment and not available to the resident biota. DGT Zn concentrations were also significantly lower than total Zn concentrations in the A-01 WTS sediment (Figure 10 and Figure 14), and DGT Zn concentrations were lower in 2020 than 2016, suggesting decline of Zn sources, as described for surface water.

4.0 Conclusions

The A-01 WTS has very low operational and maintenance costs consisting mainly of assessing vegetation growth and ensuring free flow of water through the system. The system is entirely passive, relying on gravity as the power source for water flow. No reportable permit exceedances of metals have occurred since the wetland began treating the outfall discharge over 20 years ago. The A-01 WTS has met or surpassed all expectation and supports the selection of a biologically based solution to the industrial problem of wastewater discharge quality. Cu removal has been consistent over time, averaging about 80% despite large changes in influent Cu concentrations. Most divalent metals were rapidly removed from the water and held in the sediments shortly after the water entered the treatment wetlands. Average removal of Pb from water by the wetland system was 67 and 74%, respectively, in 2004, and 2020. Comparable values for Zn were 52 and 65%, respectively.

Generally, the highest concentrations of Cu, Pb, and Zn were found in the sediment from the first cell in each pair of cells suggesting that most of the Cu, Pb, and Zn in the A-01 effluent was bound to the sediment quickly. Cu concentrations in surface waters measured by DGT generally decreased along the flow path paralleling the pattern observed with total Cu concentrations in water. DGT Cu concentrations near the exit of cell 4B were over 80% lower than DGT Cu concentrations near the entrance of cell 4A and less than 10% of the total Cu concentrations in the A-01 effluent (Table 3). Because DGT metal concentrations are more closely related than total metal concentrations to metal bioavailability, these results point to the success of the A-01 WTS at reducing potential Cu toxicity in water discharged to Tims Branch. DGT measurements of Cu and Zn in the sediments were much lower than bulk sediment measurements. These results suggest that most of the Cu and Zn deposited in the A-01 WTS sediments over 20 years of operation was not bioavailable as a likely consequence of adsorption to sediment particles and complexation with organic and inorganic substances.

5.0 Recommendations, Path Forward or Future Work

The A-01 WTS has successfully maintained levels of Cu and other metals in the A-01 effluent below regulatory limits for over 20 years with minimal labor and maintenance costs. Its successful performance over this period validates the initial investment made by SRS in the A-01 WTS and shows that WTSs are a viable alternative for the long-term treatment of metals in wastewater. We recommend continued monitoring of the A-01 WTS to verify performance and identify possible changes in wetland function that have potential to affect treatment efficiency. Of particular importance is ensuring that flow does not become obstructed or channelized by the accumulation of vegetation debris resulting in stagnant areas, changes in water retention time, and possible impairment of metal removal. Also of possible importance are changes in pH or redox with potential to mobilize metals from the sediment to the water column. Lastly, the vertical zonation and speciation of metals within the sediments should be occasionally evaluated to ensure that metals deposited in the wetland sediments remain in stable forms that are unavailable to aquatic organisms and unlikely to be mobilized into the environment.

6.0 References

Amato, E.D., S.L. Simpson, T.M. Remaili, D.A. Spadaro, C.V. Jarolimek, D.F. Jolley. 2016. Assessing the effects of bioturbation on metal bioavailability in contaminated sediments by diffusive gradients in thin films (DGT). Environmental Science and Technology 50:3055-3064.

Al-Reasi, H.A., D.S. Smith, C.M. Wood. 2012. Evaluating the ameliorative effect of natural dissolved organic matter (DOM) quality on copper toxicity to Daphnia magna: improving the BLM. Ecotoxicology 21:524-537.

Boyd, C.E. 1990. Water quality in ponds for aquaculture. Alabama Agricultural Experiment Station, Auburn University, Auburn, Alabama. Birmingham Publishing Co., Birmingham, Alabama. 482 pp.

Davison, W., H. Zhang. 1994. In situ speciation measurements of trace components in natural waters using thin-film gels. Nature 367:546-548.

De Schamphelaere, K.A., C.R. Janssen. 2002. A biotic ligand model predicting acute copper toxicity for Daphnia magna: the effects of calcium, magnesium, sodium, potassium, and pH. Environmental Science and Technology 36:48-54.

Fennessy, M.S., C.C. Brueske, W.J. Mitsch. 1994. Sediment deposition patterns in restored freshwater wetlands using sediment traps. Ecological Engineering 3:409-428.

Greger, M. 1999. Water Relations in Heavy Metal Stressed Plants. In: Prasad MNV, Hagemeyer J (eds) Heavy Metal Stress in Plants: From Molecules to Ecosystems. Springer, Berlin, Heidelberg, pp 1-27.

Hammer, D. A. (Ed.). 1989. Constructed Wetlands for Wastewater Treatment. Lewis Publishers, Chelsea, MI.

Huddleston, III, G.M. J.H. Rodgers, Jr. 2008. Design of a constructed wetland system for treatment of copper-contaminated wastewater. Environmental Geosciences 15: 9–19.

Interstate Technology & Regulatory Council (ITRC). 2003. Technical and regulatory guidance document for constructed treatment wetlands. The Interstate Technology & Regulatory Council Wetlands Team: Washington, DC.

Kadlec, R. H., R. L. Knight (Eds.). 1996. Treatment Wetlands. Lewis Publishers, Boca Raton, FL.

Knox, A.S., D. Dunn, E. Nelson, W. Specht, J. Seaman. 2004. Wastewater treatment and heavy metals removal in the A-01 constructed wetland. Technical Report WSRC-TR-2004-00228. Westinghouse Savannah River Company, Aiken, SC.

Knox, A.S., M.H. Paller, E.A. Nelson, W.L. Specht, N.V. Halverson, J.B. Gladden. 2006. Metal distribution and stability in constructed wetland sediments. J. Environ. Qual. 35:1948-59.

Knox, A. S., E.A. Nelson, N.V. Halverson, J.B. Gladden. 2010. Long-term performance of a constructed wetland for metal removal. Soil and Sediment Contamination 19:667-685.

Kosolapov, D.B., P. Kuschk, M.B. Vainshtein, A.V. Vatosourina, A. Weibner, M. Kastner, R.A. Muller. 2004. Microbial processes of heavy metal removal from carbon-deficient effluents in constructed wetlands. Engineering in Life Sciences 4:403-411.

Langmuir, D. 19.) Aqueous Environmental Geochemistry. Prentice Hall. Upper Sadie River, NJ.

Luoma, S.N., 1983, Bioavailability of trace metals to aquatic organisms—A review: The Science of the Total Environment, v. 28, p. 1-22.

Marchand L, Mench M, Jacob DL, Otte ML. 2010. Metal and metalloid removal in constructed wetlands, with emphasis on the importance of plants and standardized measurements: A review. Environmental Pollution 158:3447–3461. https://doi.org/10.1016/j.envpol.2010.08.018

Mays, P. A., G. S. Edwards. 2001. Comparison of heavy metal accumulation in a natural wetland and constructed wetlands receiving acid mine drainage. Ecological Engineering 16:487-500.

Machemer, S.D., T.R. Wildeman. 1992. Adsorption compared with sulfide precipitation as metal removal processes from acid mine drainage in a constructed wetland. Journal of Contaminant Hydrology 9:115-131.

Meyer, J.S., J.W. Gorsuch. 2007. Effects of water chemistry on bioavailability and toxicity of waterborne cadmium, copper, nickel, lead, and zinc to freshwater organisms. Society of Environmental Toxicology and Chemistry (SETAC) Press, Pensacola, FL.

Moshiri, G. A. (Ed.). 1993. Constructed Wetlands for Water Quality Improvement. Lewis Publishers, Boca Raton, FL.

Murray-Gulde, C.L., G.M. Huddleston III, K.V. Garber, J.H. Rodgers Jr. 2005. Contributions of *Schoenoplectus californicus* in a Constructed Wetland System Receiving Copper Contaminated Wastewater. Water, Air, and Soil Pollution **163:** 355–378.

Nelson, E. A., W. L. Specht, J. A. Bowers, J. B. Gladden. 2002. Constructed wetlands for removal of heavy metals from NPDES outfall effluent. Technical Report WSRC-TR-2002-00600. Savannah River Technology Center, Westinghouse Savannah River Company, Aiken, SC.

Nelson, E. A., W. L. Specht, J. A. Bowers, J. B. Gladden. 2003a. Constructed wetlands for removal of heavy metals from NPDES outfall effluent. In: Uzochukwu, G., D. Schimmel, G. B. Reddy, S.-Y. Chang, and V. Kabadi, eds., Proceedings of the 2002 National Conference on Environmental Science and Technology, pp 13-22, Battell Press, Columbus Ohio.

Nelson, E. A., W. L. Specht, J. A. Bowers, J. B. Gladden. 2003b. Mercury and copper removal from effluent by constructed treatment wetlands. In: V.S. Magar and M.E. Kelley (Eds.), *In Situ and On-Site Bioremediation—2003.* Proceedings of the Seventh International In Situ and On-Site Bioremediation Symposium (Orlando, FL; June 2003). Paper L-13, Battelle Press, Columbus, OH.

Odum, H.T., W. Wojcik, L. Pritchard, Jr., S. Ton, J.J. Delfino, M. Wojcik, L. Leszczynski, J.D. Patel, S.J. Doherty, J. Stacik. 2000. Heavy metals in the environment: using wetlands for their removal. Lewis Publishing, Boca Raton, FL.

Paller, M. H., S.M. Harmon, A.S. Knox, W. Kuhne, N.V. Halverson. 2019. Assessing effects of dissolved organic carbon and water hardness on metal toxicity to Ceriodaphnia dubia using diffusive gradients in thin films (DGT). Science of the Total Environment: 697, 134107.

Reddy, K.R., Delaune, R.D. 2008. Biogeochemistry of Wetlands: Science and Applications. CRC Press. Boca Raton, FL, pp 88-92, 694.

Sheoran, A., V. Sheoran. 2006. Heavy metal removal mechanism of acid mine drainage in wetlands: a critical review. Minerals Engineering 19:105-116.

Shutes, R. B. E. 2001. Artificial wetlands and water quality improvement. Environment International 26:441-447.

Specht, W. L. and E. A. Nelson. 2002. Baseline hydrosoil chemistry of the A-01 wetland treatment system: September 2001. Savannah River Technology Center, WSRC-TR-2002-00174, 16 p.

Stottmeister, U., A. Weibnar, P. Kuschk, U. Kappelmeyer, M. Kastner, O. Bederski, R.A. Muller, H. Moorman. 2003. Effect of plants and micro-organisms in constructed wetlands for wastewater treatment. Biotechnology Advances 22:93-117.

Stumm, W., J. Morgan. 1996. Aquatic Chemistry. 3rd ed. John Wiley & Sons, New York.

SYSTAT Software, Inc. *SigmaPlot 13.0*; SYSTAT Software, Inc.: San Jose, CA, USA, 2007.

United States Environmental Protection Agency (USEPA). 1988. Design manual: constructed wetlands and aquatic plant systems for municipal wastewater treatment. EPA625-1-88-022. U.S. EPA Office of Research and Development, Center for Environmental Research Information: Cincinnati, OH.

United States Environmental Protection Agency (USEPA). 1993. Constructed wetlands for wastewater treatment and wildlife habitat: 17 case studies. EPA832-R-93-005. EPA Office of Water: Washington, D.C.

United States Environmental Protection Agency (USEPA), 2014. Method 6020B, Rev. 2. Inductively coupled plasma-mass spectrometry. In Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846). Washington, DC: Office of Solid Waste.

Xu X., G.L, Mills. 2018. Do constructed wetlands remove metals or increase metal bioavailability? Journal of Environmental Management 218:245–255. https://doi.org/10.1016/j.jenvman.2018.04.014

Xu, X, G. Mills, A. Lindell, E. Peck, A. Korotasz, E. Burgess. 2019. The performance of a free surface and metal-removing constructed wetland: How a young wetland becomes mature: Ecological Engineering13:32-38

Ye, Z.H., S.N. Whiting, Z.Q. Lin, C.M. Lytle, J.H. Qian, N. Terry. 2001. Removal and distribution of iron, manganese, cobalt, and nickel within a Pennsylvania constructed wetland treating coal combustion by-product leachate. Journal of Environmental Quality 30:1464-1473.

Yu, T.R. 1991. Characteristics of soil acidity of paddy soils in relation to rice growth. p. 107-112. In R.J. Wright et al. (ed.) Plant-soil interactions at low pH. Kluwer Academic Publishers, The Netherlands.

Zhang, H., Davison, W., 1995. Performance-characteristics of diffusion gradients in thin films for the in-situ measurement of trace-metals in aqueous-solution. Analytical. Chemistry 67, 3391–3400.

Zhang, H., Zhao, F.J., Sun, B., Davison, W., McGrath, S.P., 2001. A new method to measure effective soil solution concentration predicts copper availability to plants. Environmental Science and Technology 35, 2602–2607.

Appendix A. Copper concentrations in wetland surface waters (raw data).

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
12/6/2000	2000	12	1A	A cell	Cu	unfiltered	31	surface water
12/18/2000	2000	12	1A	A cell	Cu	unfiltered	15	surface water
12/6/2000	2000	12	1B	B cell	Cu	unfiltered	17	surface water
12/18/2000	2000	12	1B	B cell	Cu	unfiltered	18	surface water
12/6/2000	2000	12	2A	A cell	Cu	unfiltered	29	surface water
12/18/2000	2000	12	2A	A cell	Cu	unfiltered	14	surface water
12/6/2000	2000	12	2B	B cell	Cu	unfiltered	27	surface water
12/18/2000	2000	12	2B	B cell	Cu	unfiltered	14	surface water
12/6/2000	2000	12	3A	A cell	Cu	unfiltered	24	surface water
12/18/2000	2000	12	3A	A cell	Cu	unfiltered	10	surface water
12/6/2000	2000	12	3B	B cell	Cu	unfiltered	17	surface water
12/18/2000	2000	12	3B	B cell	Cu	unfiltered	13	surface water
12/6/2000	2000	12	4A	A cell	Cu	unfiltered	40	surface water
12/18/2000	2000	12	4A	A cell	Cu	unfiltered	14	surface water
12/6/2000	2000	12	4B	B cell	Cu	unfiltered	23	surface water
12/18/2000	2000	12	4B	B cell	Cu	unfiltered	18	surface water
12/6/2000	2000	12	Old A-01	old outfall	Cu	unfiltered	282	surface water
12/6/2000	2000	12	Splitter	splitter	Cu	unfiltered	122	surface water
12/18/2000	2000	12	Splitter	splitter	Cu	unfiltered	26	surface water
1/11/2001	2001	1	1A	A cell	Cu	unfiltered	16	surface water
1/11/2001	2001	1	1B	B cell	Cu	unfiltered	15	surface water
1/11/2001	2001	1	2A	A cell	Cu	unfiltered	22	surface water
1/11/2001	2001	1	2B	B cell	Cu	unfiltered	17	surface water
1/11/2001	2001	1	3A	A cell	Cu	unfiltered	13	surface water
1/11/2001	2001	1	3B	B cell	Cu	unfiltered	11	surface water
1/11/2001	2001	1	4A	A cell	Cu	unfiltered	15	surface water
1/11/2001	2001	1	4B	B cell	Cu	unfiltered	10	surface water
1/11/2001	2001	1	New A-01	stream	Cu	unfiltered	16	surface water
1/11/2001	2001	1	Old A-01	old outfall	Cu	unfiltered	35	surface water
1/11/2001	2001	1	Splitter	splitter	Cu	unfiltered	20	surface water
2/21/2001	2001	2	1A	A cell	Cu	unfiltered	12	surface water
2/21/2001	2001	2	1B	B cell	Cu	unfiltered	10	surface water
2/21/2001	2001	2	2A	A cell	Cu	unfiltered	14	surface water
2/21/2001	2001	2	2B	B cell	Cu	unfiltered	14	surface water
2/21/2001	2001	2	3A	A cell	Cu	unfiltered	10	surface water
2/21/2001	2001	2	3B	B cell	Cu	unfiltered	10	surface water
2/21/2001	2001	2	4A	A cell	Cu	unfiltered	14	surface water
2/21/2001	2001	2	4B	B cell	Cu	unfiltered	10	surface water
2/21/2001	2001	2	New A-01	stream	Cu	unfiltered	15	surface water
2/21/2001	2001	2	Old A-01	old outfall	Cu	unfiltered	23	surface water
2/21/2001	2001	2	Splitter	splitter	Cu	unfiltered	21	surface water
3/27/2001	2001	3	1A	A cell	Cu	unfiltered	10	surface water
3/27/2001	2001	3	1B	B cell	Cu	unfiltered	11	surface water
3/27/2001	2001	3	2A	A cell	Cu	unfiltered	16	surface water
3/27/2001	2001	3	2B	B cell	Cu	unfiltered	12	surface water
3/27/2001	2001	3	3A	A cell	Cu	unfiltered	12	surface water
3/27/2001	2001	3	3B	B cell	Cu	unfiltered	12	surface water
3/27/2001	2001	3	4A	A cell	Cu	unfiltered	18	surface water
3/27/2001	2001	3	4B	B cell	Cu	unfiltered	14	surface water
3/27/2001	2001	3	New A-01	stream	Cu	unfiltered	10	surface water
3/27/2001	2001	3	Old A-01	old outfall	Cu	unfiltered	31	surface water
3/27/2001	2001	3	Splitter	splitter	Cu	unfiltered	21	surface water
4/26/2001	2001	4	1A	A cell	Cu	unfiltered	19	surface water
4/26/2001	2001	4	1B	B cell	Cu	unfiltered	14	surface water
4/26/2001	2001	4	2A	A cell	Cu	unfiltered	21	surface water
4/26/2001	2001	4	2B	B cell	Cu	unfiltered	10	surface water
4/26/2001	2001	4	3A	A cell	Cu	unfiltered	14	surface water
4/26/2001	2001	4	3B	B cell	Cu	unfiltered	10	surface water
4/26/2001	2001	4	4A	A cell	Cu	unfiltered	27	surface water
4/26/2001	2001	4	4B	B cell	Cu	unfiltered	10	surface water
4/26/2001	2001	4	New A-01	stream	Cu	unfiltered	10	surface water
4/26/2001	2001	4	Old A-01	old outfall	Cu	unfiltered	16	surface water
4/26/2001	2001	4	Splitter	splitter	Cu	unfiltered	30	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
5/31/2001	2001	5	1A	A cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	1B	B cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	2A	A cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	2B	B cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	3A	A cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	3B	B cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	4A	A cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	4B	B cell	Cu	unfiltered	10	surface water
5/31/2001	2001	5	New A-01	stream	Cu	unfiltered	10	surface water
5/31/2001	2001	5	Old A-01	old outfall	Cu	unfiltered	31	surface water
5/31/2001	2001	5	Splitter	splitter	Cu	unfiltered	17	surface water
6/19/2001	2001	6	1A	A cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	1B	B cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	2A	A cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	2B	B cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	3A	A cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	3B	B cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	4A	A cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	4B	B cell	Cu	unfiltered	10	surface water
6/19/2001	2001	6	New A-01	stream	Cu	unfiltered	10	surface water
6/19/2001	2001	6	Old A-01	old outfall	Cu	unfiltered	36	surface water
6/19/2001	2001	6	Splitter	splitter	Cu	unfiltered	10	surface water
7/24/2001	2001	7	1A	A cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	1B	B cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	2A	A cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	2B	B cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	3A	A cell	Cu	unfiltered	12	surface water
7/24/2001	2001	7	3B	B cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	4A	A cell	Cu	unfiltered	13	surface water
7/24/2001	2001	7	4B	B cell	Cu	unfiltered	10	surface water
7/24/2001	2001	7	New A-01	stream	Cu	unfiltered	10	surface water
7/24/2001	2001	7	Old A-01	old outfall	Cu	unfiltered	44	surface water
7/24/2001	2001	7	Splitter	splitter	Cu	unfiltered	38	surface water
8/21/2001	2001	8	1A	A cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	1B	B cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	2A	A cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	2B	B cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	3A	A cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	3B	B cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	4A	A cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	4B	B cell	Cu	unfiltered	10	surface water
8/21/2001	2001	8	New A-01	stream	Cu	unfiltered	10	surface water
8/21/2001	2001	8	Old A-01	old outfall	Cu	unfiltered	76	surface water
8/21/2001	2001	8	Splitter	splitter	Cu	unfiltered	43	surface water
9/20/2001	2001	9	1A	A cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	1B	B cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	2A	A cell	Cu	unfiltered	14	surface water
9/20/2001	2001	9	2B	B cell	Cu	unfiltered	12	surface water
9/20/2001	2001	9	3A	A cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	3B	B cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	4A	A cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	4B	B cell	Cu	unfiltered	10	surface water
9/20/2001	2001	9	New A-01	stream	Cu	unfiltered	10	surface water
9/20/2001	2001	9	Old A-01	old outfall	Cu	unfiltered	182	surface water
9/20/2001	2001	9	Splitter	splitter	Cu	unfiltered	33	surface water
10/23/2001	2001	10	1A	A cell	Cu	unfiltered	11	surface water
10/23/2001	2001	10	1B	B cell	Cu	unfiltered	10	surface water
10/23/2001	2001	10	2A	A cell	Cu	unfiltered	15	surface water
10/23/2001	2001	10	2B	B cell	Cu	unfiltered	11	surface water
10/23/2001	2001	10	3A	A cell	Cu	unfiltered	12	surface water
10/23/2001	2001	10	3B	B cell	Cu	unfiltered	10	surface water
10/23/2001	2001	10	4A	A cell	Cu	unfiltered	12	surface water
10/23/2001	2001	10	4B	B cell	Cu	unfiltered	11	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
10/23/2001	2001	10	New A-01	stream	Cu	unfiltered	10	surface water
10/23/2001	2001	10	Old A-01	old outfall	Cu	unfiltered	26	surface water
10/23/2001	2001	10	Splitter	splitter	Cu	unfiltered	23	surface water
11/27/2001	2001	11	1A	A cell	Cu	unfiltered	13	surface water
11/27/2001	2001	11	1B	B cell	Cu	unfiltered	10	surface water
11/27/2001	2001	11	2A	A cell	Cu	unfiltered	15	surface water
11/27/2001	2001	11	2B	B cell	Cu	unfiltered	10	surface water
11/27/2001	2001	11	3A	A cell	Cu	unfiltered	17	surface water
11/27/2001	2001	11	3B	B cell	Cu	unfiltered	10	surface water
11/27/2001	2001	11	4A	A cell	Cu	unfiltered	26	surface water
11/27/2001	2001	11	4B	B cell	Cu	unfiltered	10	surface water
11/27/2001	2001	11	New A-01	stream	Cu	unfiltered	12	surface water
11/27/2001	2001	11	Old A-01	old outfall	Cu	unfiltered	21	surface water
11/27/2001	2001	11	Splitter	splitter	Cu	unfiltered	40	surface water
12/18/2001	2001	12	1A	A cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	1B	B cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	2A	A cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	2B	B cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	3A	A cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	3B	B cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	4A	A cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	4B	B cell	Cu	unfiltered	10	surface water
12/18/2001	2001	12	New A-01	stream	Cu	unfiltered	10	surface water
12/18/2001	2001	12	Old A-01	old outfall	Cu	unfiltered	22	surface water
12/18/2001	2001	12	Splitter	splitter	Cu	unfiltered	29	surface water
1/22/2002	2002	1	1A	A cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	1B	B cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	2A	A cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	2B	B cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	3A	A cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	3B	B cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	4A	A cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	4B	B cell	Cu	unfiltered	10	surface water
1/22/2002	2002	1	New A-01	stream	Cu	unfiltered	10	surface water
1/22/2002	2002	1	Old A-01	old outfall	Cu	unfiltered	10	surface water
1/22/2002	2002	1	Splitter	splitter	Cu	unfiltered	11	surface water
2/19/2002	2002	2	1A	A cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	1B	B cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	2A	A cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	2B	B cell	Cu	unfiltered	14	surface water
2/19/2002	2002	2	3A	A cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	3B	B cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	4A	A cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	4B	B cell	Cu	unfiltered	10	surface water
2/19/2002	2002	2	New A-01	stream	Cu	unfiltered	10	surface water
2/19/2002	2002	2	Old A-01	old outfall	Cu	unfiltered	48	surface water
2/19/2002	2002	2	Splitter	splitter	Cu	unfiltered	22	surface water
3/20/2002	2002	3	4A	A cell	Cu	unfiltered	12	surface water
3/20/2002	2002	3	New A-01	stream	Cu	unfiltered	10	surface water
3/20/2002	2002	3	1A	A cell	Cu	unfiltered	11	surface water
3/20/2002	2002	3	1B	B cell	Cu	unfiltered	10	surface water
3/20/2002	2002	3	2A	A cell	Cu	unfiltered	14	surface water
3/20/2002	2002	3	2B	B cell	Cu	unfiltered	10	surface water
3/20/2002	2002	3	3A	A cell	Cu	unfiltered	13	surface water
3/20/2002	2002	3	3B	B cell	Cu	unfiltered	10	surface water
3/20/2002	2002	3	4B	B cell	Cu	unfiltered	10	surface water
3/20/2002	2002	3	Old A-01	old outfall	Cu	unfiltered	49	surface water
3/20/2002	2002	3	Splitter	splitter	Cu	unfiltered	41	surface water
4/23/2002	2002	4	4A	A cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	New A-01	stream	Cu	unfiltered	10	surface water
4/23/2002	2002	4	1A	A cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	1B	B cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	2A	A cell	Cu	unfiltered	10	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
4/23/2002	2002	4	2B	B cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	3A	A cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	3B	B cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	4B	B cell	Cu	unfiltered	10	surface water
4/23/2002	2002	4	Old A-01	old outfall	Cu	unfiltered	10	surface water
4/23/2002	2002	4	Splitter	splitter	Cu	unfiltered	10	surface water
5/14/2002	2002	5	4A	A cell	Cu	unfiltered	13	surface water
5/14/2002	2002	5	New A-01	stream	Cu	unfiltered	26	surface water
5/14/2002	2002	5	1A	A cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	1B	B cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	1B	B cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	2A	A cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	2B	B cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	3A	A cell	Cu	unfiltered	23	surface water
5/14/2002	2002	5	3A	A cell	Cu	unfiltered	24	surface water
5/14/2002	2002	5	3B	B cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	4B	B cell	Cu	unfiltered	10	surface water
5/14/2002	2002	5	Old A-01	old outfall	Cu	unfiltered	31	surface water
5/14/2002	2002	5	Splitter	splitter	Cu	unfiltered	48	surface water
6/20/2002	2002	6	1A	A cell	Cu	unfiltered	22	surface water
6/20/2002	2002	6	1B	B cell	Cu	unfiltered	10	surface water
6/20/2002	2002	6	2A	A cell	Cu	unfiltered	16	surface water
6/20/2002	2002	6	2B	B cell	Cu	unfiltered	10	surface water
6/20/2002	2002	6	3A	A cell	Cu	unfiltered	35	surface water
6/20/2002	2002	6	3B	B cell	Cu	unfiltered	10	surface water
6/20/2002	2002	6	4A	A cell	Cu	unfiltered	29	surface water
6/20/2002	2002	6	4B	B cell	Cu	unfiltered	22	surface water
6/20/2002	2002	6	New A-01	stream	Cu	unfiltered	10	surface water
6/20/2002	2002	6	Old A-01	old outfall	Cu	unfiltered	55	surface water
6/20/2002	2002	6	Splitter	splitter	Cu	unfiltered	60	surface water
7/23/2002	2002	7	1A	A cell	Cu	unfiltered	10	surface water
7/23/2002	2002	7	1B	B cell	Cu	unfiltered	10	surface water
7/23/2002	2002	7	2A	A cell	Cu	unfiltered	10	surface water
7/23/2002	2002	7	2B	B cell	Cu	unfiltered	28	surface water
7/23/2002	2002	7	3A	A cell	Cu	unfiltered	13	surface water
7/23/2002	2002	7	3B	B cell	Cu	unfiltered	10	surface water
7/23/2002	2002	7	4A	A cell	Cu	unfiltered	12	surface water
7/23/2002	2002	7	4B	B cell	Cu	unfiltered	10	surface water
7/23/2002	2002	7	New A-01	stream	Cu	unfiltered	10	surface water
7/23/2002	2002	7	Old A-01	old outfall	Cu	unfiltered	42	surface water
7/23/2002	2002	7	Splitter	splitter	Cu	unfiltered	54	surface water
8/21/2002	2002	8	1A	A cell	Cu	unfiltered	11	surface water
8/21/2002	2002	8	1B	B cell	Cu	unfiltered	10	surface water
8/21/2002	2002	8	2A	A cell	Cu	unfiltered	11	surface water
8/21/2002	2002	8	2B	B cell	Cu	unfiltered	10	surface water
8/21/2002	2002	8	3A	A cell	Cu	unfiltered	14	surface water
8/21/2002	2002	8	3B	B cell	Cu	unfiltered	10	surface water
8/21/2002	2002	8	4A	A cell	Cu	unfiltered	11	surface water
8/21/2002	2002	8	4B	B cell	Cu	unfiltered	10	surface water
8/21/2002	2002	8	New A-01	stream	Cu	unfiltered	10	surface water
8/21/2002	2002	8	Old A-01	old outfall	Cu	unfiltered	36	surface water
8/21/2002	2002	8	Splitter	splitter	Cu	unfiltered	24	surface water
9/25/2002	2002	9	1A	A cell	Cu	unfiltered	12	surface water
9/25/2002	2002	9	1B	B cell	Cu	unfiltered	10	surface water
9/25/2002	2002	9	2A	A cell	Cu	unfiltered	38	surface water
9/25/2002	2002	9	2B	B cell	Cu	unfiltered	10	surface water
9/25/2002	2002	9	3A	A cell	Cu	unfiltered	22	surface water
9/25/2002	2002	9	3B	B cell	Cu	unfiltered	20	surface water
9/25/2002	2002	9	4A	A cell	Cu	unfiltered	10	surface water
9/25/2002	2002	9	4B	B cell	Cu	unfiltered	10	surface water
9/25/2002	2002	9	New A-01	stream	Cu	unfiltered	10	surface water
9/25/2002	2002	9	Old A-01	old outfall	Cu	unfiltered	53	surface water
9/25/2002	2002	9	Splitter	splitter	Cu	unfiltered	37	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
7/16/2003	2003	7	A01-NEW-001	stream	Cu	unfiltered	3.234	surface water
7/17/2003	2003	7	A01-NEW-001	stream	Cu	unfiltered	3.068	surface water
7/18/2003	2003	7	A01-NEW-001	stream	Cu	unfiltered	3.024	surface water
7/21/2003	2003	7	A01-NEW-002	stream	Cu	unfiltered	3.926	surface water
7/22/2003	2003	7	A01-NEW-002	stream	Cu	unfiltered	3.436	surface water
7/16/2003	2003	7	A01-OLD-001	old outfall	Cu	unfiltered	27.755	surface water
7/17/2003	2003	7	A01-OLD-001	old outfall	Cu	unfiltered	21.860	surface water
7/18/2003	2003	7	A01-OLD-001	old outfall	Cu	unfiltered	22.254	surface water
7/21/2003	2003	7	A01-OLD-002	old outfall	Cu	unfiltered	24.285	surface water
7/22/2003	2003	7	A01-OLD-002	old outfall	Cu	unfiltered	20.382	surface water
7/16/2003	2003	7	A01-SPL-001	splitter	Cu	unfiltered	15.135	surface water
7/17/2003	2003	7	A01-SPL-001	splitter	Cu	unfiltered	15.258	surface water
7/18/2003	2003	7	A01-SPL-001	splitter	Cu	unfiltered	15.325	surface water
7/21/2003	2003	7	A01-SPL-002	splitter	Cu	unfiltered	17.025	surface water
7/22/2003	2003	7	A01-SPL-002	splitter	Cu	unfiltered	10.958	surface water
4/28/2004	2004	4	A Cells	A cell	Cu	unfiltered	16.190	surface water
4/28/2004	2004	4	B Cells	B cell	Cu	unfiltered	10.850	surface water
4/28/2004	2004	4	Effluent	stream	Cu	unfiltered	7.760	surface water
4/28/2004	2004	4	influent	old outfall	Cu	unfiltered	33.970	surface water
4/28/2004	2004	4	splitter	splitter	Cu	unfiltered	37.450	surface water
5/19/2004	2004	5	A Cells	A cell	Cu	unfiltered	9.290	surface water
5/19/2004	2004	5	B Cells	B cell	Cu	unfiltered	4.980	surface water
5/19/2004	2004	5	Effluent	stream	Cu	unfiltered	4.490	surface water
5/19/2004	2004	5	influent	old outfall	Cu	unfiltered	31.880	surface water
5/19/2004	2004	5	splitter	splitter	Cu	unfiltered	24.010	surface water
6/23/2004	2004	6	A Cells	A cell	Cu	unfiltered	12.920	surface water
6/23/2004	2004	6	B Cells	B cell	Cu	unfiltered	4.880	surface water
6/23/2004	2004	6	Effluent	stream	Cu	unfiltered	5.960	surface water
6/23/2004	2004	6	influent	old outfall	Cu	unfiltered	17.930	surface water
6/23/2004	2004	6	splitter	splitter	Cu	unfiltered	23.420	surface water
7/19/2004	2004	7	A Cells	A cell	Cu	unfiltered	8.860	surface water
7/19/2004	2004	7	B Cells	B cell	Cu	unfiltered	3.590	surface water
7/19/2004	2004	7	Effluent	stream	Cu	unfiltered	2.990	surface water
7/19/2004	2004	7	influent	old outfall	Cu	unfiltered	33.840	surface water
7/19/2004	2004	7	splitter	splitter	Cu	unfiltered	24.750	surface water
8/12/2004	2004	8	A Cells	A cell	Cu	unfiltered	9.700	surface water
8/12/2004	2004	8	B Cells	B cell	Cu	unfiltered	4.060	surface water
8/12/2004	2004	8	Effluent	stream	Cu	unfiltered	4.280	surface water
8/12/2004	2004	8	influent	old outfall	Cu	unfiltered	38.240	surface water
8/12/2004	2004	8	splitter	splitter	Cu	unfiltered	51.600	surface water
9/9/2004	2004	9	A Cells	A cell	Cu	unfiltered	8.600	surface water
9/9/2004	2004	9	B Cells	B cell	Cu	unfiltered	2.950	surface water
9/9/2004	2004	9	Effluent	stream	Cu	unfiltered	2.880	surface water
9/9/2004	2004	9	influent	old outfall	Cu	unfiltered	39.280	surface water
9/9/2004	2004	9	splitter	splitter	Cu	unfiltered	20.520	surface water
12/13/2004	2004	12	A Cells	A cell	Cu	unfiltered	5.920	surface water
12/13/2004	2004	12	B Cells	B cell	Cu	unfiltered	2.900	surface water
12/13/2004	2004	12	Effluent	stream	Cu	unfiltered	2.880	surface water
12/13/2004	2004	12	influent	old outfall	Cu	unfiltered	11.640	surface water
12/13/2004	2004	12	splitter	splitter	Cu	unfiltered	8.390	surface water
1/18/2005	2005	1	A Cells	A cell	Cu	unfiltered	9.630	surface water
1/18/2005	2005	1	B Cells	B cell	Cu	unfiltered	3.110	surface water
1/18/2005	2005	1	Effluent	stream	Cu	unfiltered	3.890	surface water
1/18/2005	2005	1	influent	old outfall	Cu	unfiltered	12.060	surface water
1/18/2005	2005	1	splitter	splitter	Cu	unfiltered	8.750	surface water
2/15/2005	2005	2	A Cells	A cell	Cu	unfiltered	7.250	surface water
2/15/2005	2005	2	B Cells	B cell	Cu	unfiltered	4.800	surface water
2/15/2005	2005	2	Effluent	stream	Cu	unfiltered	4.300	surface water
2/15/2005	2005	2	influent	old outfall	Cu	unfiltered	13.150	surface water
2/15/2005	2005	2	splitter	splitter	Cu	unfiltered	11.640	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	6.007	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	8.092	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	5.838	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	7.334	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	5.907	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	8.317	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	5.946	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	7.857	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	4.731	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	6.417	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	4.761	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	7.264	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	6.374	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	8.415	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	6.109	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	8.695	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	4.577	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	6.193	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	4.185	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	6.880	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	5.596	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	7.601	surface water
7/28/2016	2016	7	4A	A cell	Cu	filtered	5.806	surface water
7/28/2016	2016	7	4A	A cell	Cu	unfiltered	7.233	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	5.256	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	5.911	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	5.200	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	5.990	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	4.315	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	4.679	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	3.994	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	5.641	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	5.150	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	5.985	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	5.215	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	6.681	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	3.506	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	6.178	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	3.793	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	8.867	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	4.749	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	6.132	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	5.328	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	6.911	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	4.489	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	8.438	surface water
7/28/2016	2016	7	4B	B cell	Cu	filtered	4.627	surface water
7/28/2016	2016	7	4B	B cell	Cu	unfiltered	7.027	surface water
1/28/2020	2020	1	1A inlet	A cell	Cu	unfiltered	4.511	surface water
1/28/2020	2020	1	1A outlet	A cell	Cu	unfiltered	4.117	surface water
1/28/2020	2020	1	1B inlet	B cell	Cu	unfiltered	3.518	surface water
1/28/2020	2020	1	1B outlet	B cell	Cu	unfiltered	2.780	surface water
1/28/2020	2020	1	2A inlet	A cell	Cu	unfiltered	5.607	surface water
1/28/2020	2020	1	2A outlet	A cell	Cu	unfiltered	3.006	surface water
1/28/2020	2020	1	2B inlet	B cell	Cu	unfiltered	3.786	surface water
1/28/2020	2020	1	2B outlet	B cell	Cu	unfiltered	2.386	surface water
1/28/2020	2020	1	3A inlet	A cell	Cu	unfiltered	5.649	surface water
1/28/2020	2020	1	3A outlet	A cell	Cu	unfiltered	3.341	surface water
1/28/2020	2020	1	3B inlet	B cell	Cu	unfiltered	3.266	surface water
1/28/2020	2020	1	3B outlet	B cell	Cu	unfiltered	2.514	surface water
1/28/2020	2020	1	4A inlet	A cell	Cu	unfiltered	4.637	surface water
1/28/2020	2020	1	4A outlet	A cell	Cu	unfiltered	3.252	surface water
1/28/2020	2020	1	4B inlet	B cell	Cu	unfiltered	3.442	surface water
1/28/2020	2020	1	4B outlet	B cell	Cu	unfiltered	2.489	surface water
1/28/2020	2020	1	d A-01 Outf	old outfall	Cu	unfiltered	12.156	surface water
1/28/2020	2020	1	plitter Box 1	splitter	Cu	unfiltered	4.878	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
1/28/2020	2020	1	Splitter Box 2A	splitter	Cu	unfiltered	5.030	surface water
1/28/2020	2020	1	Splitter Box 3A	splitter	Cu	unfiltered	5.154	surface water
1/28/2020	2020	1	Splitter Box 4A	splitter	Cu	unfiltered	4.911	surface water
1/28/2020	2020	1	Stream	stream	Cu	unfiltered	2.316	surface water
2/21/2020	2020	2	1A inlet	A cell	Cu	unfiltered	7.215	surface water
2/21/2020	2020	2	1A outlet	A cell	Cu	unfiltered	6.215	surface water
2/21/2020	2020	2	1B inlet	B cell	Cu	unfiltered	5.961	surface water
2/21/2020	2020	2	1B outlet	B cell	Cu	unfiltered	4.439	surface water
2/21/2020	2020	2	2A inlet	A cell	Cu	unfiltered	7.056	surface water
2/21/2020	2020	2	2A outlet	A cell	Cu	unfiltered	5.910	surface water
2/21/2020	2020	2	2B inlet	B cell	Cu	unfiltered	5.931	surface water
2/21/2020	2020	2	2B outlet	B cell	Cu	unfiltered	3.951	surface water
2/21/2020	2020	2	3A inlet	A cell	Cu	unfiltered	6.960	surface water
2/21/2020	2020	2	3A outlet	A cell	Cu	unfiltered	4.979	surface water
2/21/2020	2020	2	3B inlet	B cell	Cu	unfiltered	5.432	surface water
2/21/2020	2020	2	3B outlet	B cell	Cu	unfiltered	3.766	surface water
2/21/2020	2020	2	4A inlet	A cell	Cu	unfiltered	6.952	surface water
2/21/2020	2020	2	4A outlet	A cell	Cu	unfiltered	6.380	surface water
2/21/2020	2020	2	4B inlet	B cell	Cu	unfiltered	5.403	surface water
2/21/2020	2020	2	4B outlet	B cell	Cu	unfiltered	4.194	surface water
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Cu	unfiltered	10.558	surface water
2/21/2020	2020	2	Splitter Box 1A	splitter	Cu	unfiltered	7.372	surface water
2/21/2020	2020	2	Splitter Box 2A	splitter	Cu	unfiltered	7.375	surface water
2/21/2020	2020	2	Splitter Box 3A	splitter	Cu	unfiltered	7.703	surface water
2/21/2020	2020	2	Splitter Box 4A	splitter	Cu	unfiltered	7.590	surface water
2/21/2020	2020	2	Stream	stream	Cu	unfiltered	4.170	surface water
3/18/2020	2020	3	1A inlet	A cell	Cu	unfiltered	5.414	surface water
3/18/2020	2020	3	1A outlet	A cell	Cu	unfiltered	4.278	surface water
3/18/2020	2020	3	1B inlet	B cell	Cu	unfiltered	3.923	surface water
3/18/2020	2020	3	1B outlet	B cell	Cu	unfiltered	3.212	surface water
3/18/2020	2020	3	2A inlet	A cell	Cu	unfiltered	5.887	surface water
3/18/2020	2020	3	2A outlet	A cell	Cu	unfiltered	4.401	surface water
3/18/2020	2020	3	2B inlet	B cell	Cu	unfiltered	4.199	surface water
3/18/2020	2020	3	2B outlet	B cell	Cu	unfiltered	3.546	surface water
3/18/2020	2020	3	3A inlet	A cell	Cu	unfiltered	5.539	surface water
3/18/2020	2020	3	3A outlet	A cell	Cu	unfiltered	3.770	surface water
3/18/2020	2020	3	3B inlet	B cell	Cu	unfiltered	3.724	surface water
3/18/2020	2020	3	3B outlet	B cell	Cu	unfiltered	2.992	surface water
3/18/2020	2020	3	4A inlet	A cell	Cu	unfiltered	5.658	surface water
3/18/2020	2020	3	4A outlet	A cell	Cu	unfiltered	4.608	surface water
3/18/2020	2020	3	4B inlet	B cell	Cu	unfiltered	4.166	surface water
3/18/2020	2020	3	4B outlet	B cell	Cu	unfiltered	5.070	surface water
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Cu	unfiltered	16.694	surface water
3/18/2020	2020	3	Splitter Box 1A	splitter	Cu	unfiltered	5.532	surface water
3/18/2020	2020	3	Splitter Box 2A	splitter	Cu	unfiltered	5.658	surface water
3/18/2020	2020	3	Splitter Box 3A	splitter	Cu	unfiltered	5.620	surface water
3/18/2020	2020	3	Splitter Box 4A	splitter	Cu	unfiltered	5.499	surface water
3/18/2020	2020	3	Stream	stream	Cu	unfiltered	3.414	surface water
6/24/2020	2020	6	1A inlet	A cell	Cu	unfiltered	4.444	surface water
6/24/2020	2020	6	1A outlet	A cell	Cu	unfiltered	3.043	surface water
6/24/2020	2020	6	1B inlet	B cell	Cu	unfiltered	2.572	surface water
6/24/2020	2020	6	1B outlet	B cell	Cu	unfiltered	2.168	surface water
6/24/2020	2020	6	2A inlet	A cell	Cu	unfiltered	4.670	surface water
6/24/2020	2020	6	2A outlet	A cell	Cu	unfiltered	2.564	surface water
6/24/2020	2020	6	2B inlet	B cell	Cu	unfiltered	2.700	surface water
6/24/2020	2020	6	2B outlet	B cell	Cu	unfiltered	2.131	surface water
6/24/2020	2020	6	3A inlet	A cell	Cu	unfiltered	4.113	surface water
6/24/2020	2020	6	3A outlet	A cell	Cu	unfiltered	2.624	surface water
6/24/2020	2020	6	3B inlet	B cell	Cu	unfiltered	2.592	surface water
6/24/2020	2020	6	3B outlet	B cell	Cu	unfiltered	1.613	surface water
6/24/2020	2020	6	4A inlet	A cell	Cu	unfiltered	5.147	surface water
6/24/2020	2020	6	4A outlet	A cell	Cu	unfiltered	2.854	surface water
6/24/2020	2020	6	4B inlet	B cell	Cu	unfiltered	3.032	surface water

Appendix A. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)	Sample type
6/24/2020	2020	6	4B outlet	B cell	Cu	unfiltered	2.199	surface water
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Cu	unfiltered	36.782	surface water
6/24/2020	2020	6	Splitter Box 1A	splitter	Cu	unfiltered	5.179	surface water
6/24/2020	2020	6	Splitter Box 2A	splitter	Cu	unfiltered	5.092	surface water
6/24/2020	2020	6	Splitter Box 3A	splitter	Cu	unfiltered	5.265	surface water
6/24/2020	2020	6	Splitter Box 4A	splitter	Cu	unfiltered	4.864	surface water
6/24/2020	2020	6	Stream	stream	Cu	unfiltered	1.907	surface water
7/10/2020	2020	7	1A inlet	A cell	Cu	unfiltered	10.619	surface water
7/10/2020	2020	7	1A outlet	A cell	Cu	unfiltered	7.247	surface water
7/10/2020	2020	7	1B inlet	B cell	Cu	unfiltered	6.308	surface water
7/10/2020	2020	7	1B outlet	B cell	Cu	unfiltered	2.112	surface water
7/10/2020	2020	7	2A inlet	A cell	Cu	unfiltered	12.002	surface water
7/10/2020	2020	7	2A outlet	A cell	Cu	unfiltered	5.815	surface water
7/10/2020	2020	7	2B inlet	B cell	Cu	unfiltered	4.755	surface water
7/10/2020	2020	7	2B outlet	B cell	Cu	unfiltered	3.245	surface water
7/10/2020	2020	7	3A inlet	A cell	Cu	unfiltered	10.200	surface water
7/10/2020	2020	7	3A outlet	A cell	Cu	unfiltered	3.335	surface water
7/10/2020	2020	7	3B inlet	B cell	Cu	unfiltered	5.474	surface water
7/10/2020	2020	7	3B outlet	B cell	Cu	unfiltered	1.876	surface water
7/10/2020	2020	7	4A inlet	A cell	Cu	unfiltered	13.672	surface water
7/10/2020	2020	7	4A outlet	A cell	Cu	unfiltered	6.697	surface water
7/10/2020	2020	7	4B inlet	B cell	Cu	unfiltered	5.133	surface water
7/10/2020	2020	7	4B outlet	B cell	Cu	unfiltered	3.196	surface water
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Cu	unfiltered	28.131	surface water
7/10/2020	2020	7	Splitter Box 1A	splitter	Cu	unfiltered	14.705	surface water
7/10/2020	2020	7	Splitter Box 2A	splitter	Cu	unfiltered	12.667	surface water
7/10/2020	2020	7	Splitter Box 3A	splitter	Cu	unfiltered	13.625	surface water
7/10/2020	2020	7	Splitter Box 4A	splitter	Cu	unfiltered	13.809	surface water
7/10/2020	2020	7	Stream	stream	Cu	unfiltered	2.985	surface water

Appendix B. Lead concentrations in wetland surface waters (raw data).

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
7/16/2003	2003	7	A01-NEW-001	stream	Pb	unfiltered	0.081
7/17/2003	2003	7	A01-NEW-001	stream	Pb	unfiltered	0.055
7/18/2003	2003	7	A01-NEW-001	stream	Pb	unfiltered	0.126
7/21/2003	2003	7	A01-NEW-002	stream	Pb	unfiltered	0.143
7/22/2003	2003	7	A01-NEW-002	stream	Pb	unfiltered	0.081
7/16/2003	2003	7	A01-OLD-001	old outfall	Pb	unfiltered	1.128
7/17/2003	2003	7	A01-OLD-001	old outfall	Pb	unfiltered	1.083
7/18/2003	2003	7	A01-OLD-001	old outfall	Pb	unfiltered	0.951
7/21/2003	2003	7	A01-OLD-002	old outfall	Pb	unfiltered	0.333
7/22/2003	2003	7	A01-OLD-002	old outfall	Pb	unfiltered	0.957
7/16/2003	2003	7	A01-SPL-001	splitter	Pb	unfiltered	0.583
7/17/2003	2003	7	A01-SPL-001	splitter	Pb	unfiltered	0.549
7/18/2003	2003	7	A01-SPL-001	splitter	Pb	unfiltered	0.610
7/21/2003	2003	7	A01-SPL-002	splitter	Pb	unfiltered	0.694
7/22/2003	2003	7	A01-SPL-002	splitter	Pb	unfiltered	0.374
4/28/2004	2004	4	A Cells	A cell	Pb	unfiltered ?	0.920
5/19/2004	2004	5	A Cells	A cell	Pb	unfiltered ?	0.630
6/23/2004	2004	6	A Cells	A cell	Pb	unfiltered ?	1.720
7/19/2004	2004	7	A Cells	A cell	Pb	unfiltered ?	4.780
8/12/2004	2004	8	A Cells	A cell	Pb	unfiltered ?	0.980
9/9/2004	2004	9	A Cells	A cell	Pb	unfiltered ?	0.100
12/13/2004	2004	12	A Cells	A cell	Pb	unfiltered ?	0.150
4/28/2004	2004	4	B Cells	B cell	Pb	unfiltered ?	0.300
5/19/2004	2004	5	B Cells	B cell	Pb	unfiltered ?	0.250
6/23/2004	2004	6	B Cells	B cell	Pb	unfiltered ?	1.629
7/19/2004	2004	7	B Cells	B cell	Pb	unfiltered ?	1.270
8/12/2004	2004	8	B Cells	B cell	Pb	unfiltered ?	1.130
9/9/2004	2004	9	B Cells	B cell	Pb	unfiltered ?	0.100
12/13/2004	2004	12	B Cells	B cell	Pb	unfiltered ?	0.150
4/28/2004	2004	4	Effluent	stream	Pb	unfiltered ?	0.220
5/19/2004	2004	5	Effluent	stream	Pb	unfiltered ?	0.640
6/23/2004	2004	6	Effluent	stream	Pb	unfiltered ?	0.090
7/19/2004	2004	7	Effluent	stream	Pb	unfiltered ?	1.840
8/12/2004	2004	8	Effluent	stream	Pb	unfiltered ?	0.510
9/9/2004	2004	9	Effluent	stream	Pb	unfiltered ?	0.100
12/13/2004	2004	12	Effluent	stream	Pb	unfiltered ?	0.001
4/28/2004	2004	4	influent	old outfall	Pb	unfiltered ?	2.360
5/19/2004	2004	5	influent	old outfall	Pb	unfiltered ?	1.110
6/23/2004	2004	6	influent	old outfall	Pb	unfiltered ?	0.636
7/19/2004	2004	7	influent	old outfall	Pb	unfiltered ?	3.130
8/12/2004	2004	8	influent	old outfall	Pb	unfiltered ?	1.710
9/9/2004	2004	9	influent	old outfall	Pb	unfiltered ?	0.500
12/13/2004	2004	12	influent	old outfall	Pb	unfiltered ?	0.800
4/28/2004	2004	4	splitter	splitter	Pb	unfiltered ?	0.821
5/19/2004	2004	5	splitter	splitter	Pb	unfiltered ?	0.520
6/23/2004	2004	6	splitter	splitter	Pb	unfiltered ?	0.440
7/19/2004	2004	7	splitter	splitter	Pb	unfiltered ?	5.290
8/12/2004	2004	8	splitter	splitter	Pb	unfiltered ?	2.320
9/9/2004	2004	9	splitter	splitter	Pb	unfiltered ?	0.100
12/13/2004	2004	12	splitter	splitter	Pb	unfiltered ?	0.950
1/18/2005	2005	1	A Cells	A cell	Pb	unfiltered ?	0.500
2/15/2005	2005	2	A Cells	A cell	Pb	unfiltered ?	0.310
1/18/2005	2005	1	B Cells	B cell	Pb	unfiltered ?	0.270
2/15/2005	2005	2	B Cells	B cell	Pb	unfiltered ?	0.120
1/18/2005	2005	1	Effluent	stream	Pb	unfiltered ?	0.140
2/15/2005	2005	2	Effluent	stream	Pb	unfiltered ?	0.100
1/18/2005	2005	1	influent	old outfall	Pb	unfiltered ?	0.480
2/15/2005	2005	2	influent	old outfall	Pb	unfiltered ?	0.170
1/18/2005	2005	1	splitter	splitter	Pb	unfiltered ?	0.370
2/15/2005	2005	2	splitter	splitter	Pb	unfiltered ?	0.220
7/28/2016	2016	7	W-4A1-1F	A cell	Pb	filtered	0.055

Appendix B. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
7/28/2016	2016	7	W-4A1-1U	A cell	Pb	unfiltered	0.134
7/28/2016	2016	7	W-4A1-2F	A cell	Pb	filtered	0.064
7/28/2016	2016	7	W-4A1-2U	A cell	Pb	unfiltered	0.120
7/28/2016	2016	7	W-4A2-1F	A cell	Pb	filtered	0.040
7/28/2016	2016	7	W-4A2-1U	A cell	Pb	unfiltered	0.138
7/28/2016	2016	7	W-4A2-2F	A cell	Pb	filtered	0.050
7/28/2016	2016	7	W-4A2-2U	A cell	Pb	unfiltered	0.149
7/28/2016	2016	7	W-4A3-1F	A cell	Pb	filtered	0.048
7/28/2016	2016	7	W-4A3-1U	A cell	Pb	unfiltered	0.104
7/28/2016	2016	7	W-4A3-2F	A cell	Pb	filtered	0.039
7/28/2016	2016	7	W-4A3-2U	A cell	Pb	unfiltered	0.136
7/28/2016	2016	7	W-4A4-1F	A cell	Pb	filtered	0.050
7/28/2016	2016	7	W-4A4-1U	A cell	Pb	unfiltered	0.138
7/28/2016	2016	7	W-4A4-2F	A cell	Pb	filtered	0.044
7/28/2016	2016	7	W-4A4-2U	A cell	Pb	unfiltered	0.163
7/28/2016	2016	7	W-4A5-1F	A cell	Pb	filtered	0.050
7/28/2016	2016	7	W-4A5-1U	A cell	Pb	unfiltered	0.126
7/28/2016	2016	7	W-4A5-2F	A cell	Pb	filtered	0.049
7/28/2016	2016	7	W-4A5-2U	A cell	Pb	unfiltered	0.172
7/28/2016	2016	7	W-4A6-1F	A cell	Pb	filtered	0.049
7/28/2016	2016	7	W-4A6-1U	A cell	Pb	unfiltered	0.129
7/28/2016	2016	7	W-4A6-2F	A cell	Pb	filtered	0.069
7/28/2016	2016	7	W-4A6-2U	A cell	Pb	unfiltered	0.118
7/28/2016	2016	7	W-4B1-1F	B cell	Pb	filtered	0.046
7/28/2016	2016	7	W-4B1-1U	B cell	Pb	unfiltered	0.089
7/28/2016	2016	7	W-4B1-2F	B cell	Pb	filtered	0.061
7/28/2016	2016	7	W-4B1-2U	B cell	Pb	unfiltered	0.111
7/28/2016	2016	7	W-4B2-1F	B cell	Pb	filtered	0.038
7/28/2016	2016	7	W-4B2-1U	B cell	Pb	unfiltered	0.108
7/28/2016	2016	7	W-4B2-2F	B cell	Pb	filtered	0.053
7/28/2016	2016	7	W-4B2-2U	B cell	Pb	unfiltered	0.179
7/28/2016	2016	7	W-4B3-1F	B cell	Pb	filtered	0.038
7/28/2016	2016	7	W-4B3-1U	B cell	Pb	unfiltered	0.096
7/28/2016	2016	7	W-4B3-2F	B cell	Pb	filtered	0.055
7/28/2016	2016	7	W-4B3-2U	B cell	Pb	unfiltered	0.125
7/28/2016	2016	7	W-4B4-1F	B cell	Pb	filtered	0.012
7/28/2016	2016	7	W-4B4-1U	B cell	Pb	unfiltered	0.208
7/28/2016	2016	7	W-4B4-2F	B cell	Pb	filtered	0.025
7/28/2016	2016	7	W-4B4-2U	B cell	Pb	unfiltered	0.344
7/28/2016	2016	7	W-4B5-1F	B cell	Pb	filtered	0.052
7/28/2016	2016	7	W-4B5-1U	B cell	Pb	unfiltered	0.100
7/28/2016	2016	7	W-4B5-2F	B cell	Pb	filtered	0.113
7/28/2016	2016	7	W-4B5-2U	B cell	Pb	unfiltered	0.233
7/28/2016	2016	7	W-4B6-1F	B cell	Pb	filtered	0.038
7/28/2016	2016	7	W-4B6-1U	B cell	Pb	unfiltered	0.240
7/28/2016	2016	7	W-4B6-2F	B cell	Pb	filtered	0.041
7/28/2016	2016	7	W-4B6-2U	B cell	Pb	unfiltered	0.152
1/28/2020	2020	1	1A inlet	A cell	Pb	unfiltered	0.193
2/21/2020	2020	2	1A inlet	A cell	Pb	unfiltered	0.522
3/18/2020	2020	3	1A inlet	A cell	Pb	unfiltered	0.137
6/24/2020	2020	6	1A inlet	A cell	Pb	unfiltered	0.273
7/10/2020	2020	7	1A inlet	A cell	Pb	unfiltered	0.180
1/28/2020	2020	1	1A outlet	A cell	Pb	unfiltered	0.341
2/21/2020	2020	2	1A outlet	A cell	Pb	unfiltered	0.439
3/18/2020	2020	3	1A outlet	A cell	Pb	unfiltered	0.143
6/24/2020	2020	6	1A outlet	A cell	Pb	unfiltered	0.227
7/10/2020	2020	7	1A outlet	A cell	Pb	unfiltered	0.273
1/28/2020	2020	1	1B inlet	B cell	Pb	unfiltered	0.208
2/21/2020	2020	2	1B inlet	B cell	Pb	unfiltered	0.536
3/18/2020	2020	3	1B inlet	B cell	Pb	unfiltered	0.138
6/24/2020	2020	6	1B inlet	B cell	Pb	unfiltered	0.251

Appendix B. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
7/10/2020	2020	7	1B inlet	B cell	Pb	unfiltered	0.231
1/28/2020	2020	1	1B outlet	B cell	Pb	unfiltered	0.186
2/21/2020	2020	2	1B outlet	B cell	Pb	unfiltered	0.399
3/18/2020	2020	3	1B outlet	B cell	Pb	unfiltered	0.126
6/24/2020	2020	6	1B outlet	B cell	Pb	unfiltered	0.336
7/10/2020	2020	7	1B outlet	B cell	Pb	unfiltered	0.095
1/28/2020	2020	1	2A inlet	A cell	Pb	unfiltered	0.196
2/21/2020	2020	2	2A inlet	A cell	Pb	unfiltered	0.551
3/18/2020	2020	3	2A inlet	A cell	Pb	unfiltered	0.331
6/24/2020	2020	6	2A inlet	A cell	Pb	unfiltered	0.286
7/10/2020	2020	7	2A inlet	A cell	Pb	unfiltered	0.439
1/28/2020	2020	1	2A outlet	A cell	Pb	unfiltered	0.143
2/21/2020	2020	2	2A outlet	A cell	Pb	unfiltered	0.447
3/18/2020	2020	3	2A outlet	A cell	Pb	unfiltered	0.158
6/24/2020	2020	6	2A outlet	A cell	Pb	unfiltered	0.242
7/10/2020	2020	7	2A outlet	A cell	Pb	unfiltered	0.233
1/28/2020	2020	1	2B inlet	B cell	Pb	unfiltered	0.230
2/21/2020	2020	2	2B inlet	B cell	Pb	unfiltered	0.468
3/18/2020	2020	3	2B inlet	B cell	Pb	unfiltered	0.141
6/24/2020	2020	6	2B inlet	B cell	Pb	unfiltered	0.245
7/10/2020	2020	7	2B inlet	B cell	Pb	unfiltered	0.216
1/28/2020	2020	1	2B outlet	B cell	Pb	unfiltered	0.079
2/21/2020	2020	2	2B outlet	B cell	Pb	unfiltered	0.237
3/18/2020	2020	3	2B outlet	B cell	Pb	unfiltered	0.092
6/24/2020	2020	6	2B outlet	B cell	Pb	unfiltered	0.220
7/10/2020	2020	7	2B outlet	B cell	Pb	unfiltered	0.149
1/28/2020	2020	1	3A inlet	A cell	Pb	unfiltered	0.177
2/21/2020	2020	2	3A inlet	A cell	Pb	unfiltered	0.549
3/18/2020	2020	3	3A inlet	A cell	Pb	unfiltered	0.155
6/24/2020	2020	6	3A inlet	A cell	Pb	unfiltered	0.275
7/10/2020	2020	7	3A inlet	A cell	Pb	unfiltered	0.265
1/28/2020	2020	1	3A outlet	A cell	Pb	unfiltered	0.144
2/21/2020	2020	2	3A outlet	A cell	Pb	unfiltered	0.464
3/18/2020	2020	3	3A outlet	A cell	Pb	unfiltered	0.139
6/24/2020	2020	6	3A outlet	A cell	Pb	unfiltered	0.268
7/10/2020	2020	7	3A outlet	A cell	Pb	unfiltered	0.179
1/28/2020	2020	1	3B inlet	B cell	Pb	unfiltered	0.236
2/21/2020	2020	2	3B inlet	B cell	Pb	unfiltered	0.362
3/18/2020	2020	3	3B inlet	B cell	Pb	unfiltered	0.112
6/24/2020	2020	6	3B inlet	B cell	Pb	unfiltered	0.266
7/10/2020	2020	7	3B inlet	B cell	Pb	unfiltered	0.238
1/28/2020	2020	1	3B outlet	B cell	Pb	unfiltered	0.101
2/21/2020	2020	2	3B outlet	B cell	Pb	unfiltered	0.258
3/18/2020	2020	3	3B outlet	B cell	Pb	unfiltered	0.082
6/24/2020	2020	6	3B outlet	B cell	Pb	unfiltered	0.234
7/10/2020	2020	7	3B outlet	B cell	Pb	unfiltered	0.102
1/28/2020	2020	1	4A inlet	A cell	Pb	unfiltered	0.153
2/21/2020	2020	2	4A inlet	A cell	Pb	unfiltered	0.546
3/18/2020	2020	3	4A inlet	A cell	Pb	unfiltered	0.181
6/24/2020	2020	6	4A inlet	A cell	Pb	unfiltered	0.438
7/10/2020	2020	7	4A inlet	A cell	Pb	unfiltered	0.554
1/28/2020	2020	1	4A outlet	A cell	Pb	unfiltered	0.120
2/21/2020	2020	2	4A outlet	A cell	Pb	unfiltered	0.458
3/18/2020	2020	3	4A outlet	A cell	Pb	unfiltered	0.151
6/24/2020	2020	6	4A outlet	A cell	Pb	unfiltered	0.266
7/10/2020	2020	7	4A outlet	A cell	Pb	unfiltered	0.272
1/28/2020	2020	1	4B inlet	B cell	Pb	unfiltered	0.149
2/21/2020	2020	2	4B inlet	B cell	Pb	unfiltered	0.374
3/18/2020	2020	3	4B inlet	B cell	Pb	unfiltered	0.145
6/24/2020	2020	6	4B inlet	B cell	Pb	unfiltered	0.347
7/10/2020	2020	7	4B inlet	B cell	Pb	unfiltered	0.227

Appendix B. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
1/28/2020	2020	1	4B outlet	B cell	Pb	unfiltered	0.087
2/21/2020	2020	2	4B outlet	B cell	Pb	unfiltered	0.242
3/18/2020	2020	3	4B outlet	B cell	Pb	unfiltered	0.160
6/24/2020	2020	6	4B outlet	B cell	Pb	unfiltered	0.240
7/10/2020	2020	7	4B outlet	B cell	Pb	unfiltered	0.118
1/28/2020	2020	1	Old A-01 Outfall	old outfall	Pb	unfiltered	0.267
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Pb	unfiltered	0.438
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Pb	unfiltered	0.433
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Pb	unfiltered	0.956
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Pb	unfiltered	1.144
1/28/2020	2020	1	Splitter Box 1A	splitter	Pb	unfiltered	0.186
2/21/2020	2020	2	Splitter Box 1A	splitter	Pb	unfiltered	0.577
3/18/2020	2020	3	Splitter Box 1A	splitter	Pb	unfiltered	0.154
6/24/2020	2020	6	Splitter Box 1A	splitter	Pb	unfiltered	0.254
7/10/2020	2020	7	Splitter Box 1A	splitter	Pb	unfiltered	0.582
1/28/2020	2020	1	Splitter Box 2A	splitter	Pb	unfiltered	0.253
2/21/2020	2020	2	Splitter Box 2A	splitter	Pb	unfiltered	0.714
3/18/2020	2020	3	Splitter Box 2A	splitter	Pb	unfiltered	0.145
6/24/2020	2020	6	Splitter Box 2A	splitter	Pb	unfiltered	0.279
7/10/2020	2020	7	Splitter Box 2A	splitter	Pb	unfiltered	0.417
1/28/2020	2020	1	Splitter Box 3A	splitter	Pb	unfiltered	0.262
2/21/2020	2020	2	Splitter Box 3A	splitter	Pb	unfiltered	0.564
3/18/2020	2020	3	Splitter Box 3A	splitter	Pb	unfiltered	0.145
6/24/2020	2020	6	Splitter Box 3A	splitter	Pb	unfiltered	0.316
7/10/2020	2020	7	Splitter Box 3A	splitter	Pb	unfiltered	0.554
1/28/2020	2020	1	Splitter Box 4A	splitter	Pb	unfiltered	0.205
2/21/2020	2020	2	Splitter Box 4A	splitter	Pb	unfiltered	0.526
3/18/2020	2020	3	Splitter Box 4A	splitter	Pb	unfiltered	0.146
6/24/2020	2020	6	Splitter Box 4A	splitter	Pb	unfiltered	0.298
7/10/2020	2020	7	Splitter Box 4A	splitter	Pb	unfiltered	0.597
1/28/2020	2020	1	Stream	stream	Pb	unfiltered	0.105
2/21/2020	2020	2	Stream	stream	Pb	unfiltered	0.276
3/18/2020	2020	3	Stream	stream	Pb	unfiltered	0.091
6/24/2020	2020	6	Stream	stream	Pb	unfiltered	0.225
7/10/2020	2020	7	Stream	stream	Pb	unfiltered	0.136

Appendix C. Zinc concentrations in wetland surface waters (raw data).

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
7/16/2003	2003	7	A01-NEW-001	stream	Zn	unfiltered	84.373
7/17/2003	2003	7	A01-NEW-001	stream	Zn	unfiltered	21.378
7/18/2003	2003	7	A01-NEW-001	stream	Zn	unfiltered	235.034
7/21/2003	2003	7	A01-NEW-002	stream	Zn	unfiltered	20.539
7/22/2003	2003	7	A01-NEW-002	stream	Zn	unfiltered	19.098
7/16/2003	2003	7	A01-OLD-001	old outfall	Zn	unfiltered	49.965
7/17/2003	2003	7	A01-OLD-001	old outfall	Zn	unfiltered	50.616
7/18/2003	2003	7	A01-OLD-001	old outfall	Zn	unfiltered	51.422
7/21/2003	2003	7	A01-OLD-002	old outfall	Zn	unfiltered	54.363
7/22/2003	2003	7	A01-OLD-002	old outfall	Zn	unfiltered	44.915
7/16/2003	2003	7	A01-SPL-001	splitter	Zn	unfiltered	30.706
7/17/2003	2003	7	A01-SPL-001	splitter	Zn	unfiltered	27.702
7/18/2003	2003	7	A01-SPL-001	splitter	Zn	unfiltered	23.917
7/21/2003	2003	7	A01-SPL-002	splitter	Zn	unfiltered	40.561
7/22/2003	2003	7	A01-SPL-002	splitter	Zn	unfiltered	29.654
4/28/2004	2004	4	A Cells	A cell	Zn	unfiltered	23.620
5/19/2004	2004	5	A Cells	A cell	Zn	unfiltered	13.440
6/23/2004	2004	6	A Cells	A cell	Zn	unfiltered	4.580
7/19/2004	2004	7	A Cells	A cell	Zn	unfiltered	11.270
8/12/2004	2004	8	A Cells	A cell	Zn	unfiltered	11.820
9/9/2004	2004	9	A Cells	A cell	Zn	unfiltered	9.700
12/13/2004	2004	12	A Cells	A cell	Zn	unfiltered	11.320
4/28/2004	2004	4	B Cells	B cell	Zn	unfiltered	27.950
5/19/2004	2004	5	B Cells	B cell	Zn	unfiltered	10.470
6/23/2004	2004	6	B Cells	B cell	Zn	unfiltered	6.580
7/19/2004	2004	7	B Cells	B cell	Zn	unfiltered	6.040
8/12/2004	2004	8	B Cells	B cell	Zn	unfiltered	9.780
9/9/2004	2004	9	B Cells	B cell	Zn	unfiltered	2.720
12/13/2004	2004	12	B Cells	B cell	Zn	unfiltered	4.640
4/28/2004	2004	4	Effluent	stream	Zn	unfiltered	22.600
5/19/2004	2004	5	Effluent	stream	Zn	unfiltered	10.660
6/23/2004	2004	6	Effluent	stream	Zn	unfiltered	5.400
7/19/2004	2004	7	Effluent	stream	Zn	unfiltered	12.240
8/12/2004	2004	8	Effluent	stream	Zn	unfiltered	11.080
9/9/2004	2004	9	Effluent	stream	Zn	unfiltered	0.940
12/13/2004	2004	12	Effluent	stream	Zn	unfiltered	4.070
4/28/2004	2004	4	influent	old outfall	Zn	unfiltered	11.440
5/19/2004	2004	5	influent	old outfall	Zn	unfiltered	16.320
6/23/2004	2004	6	influent	old outfall	Zn	unfiltered	25.820
7/19/2004	2004	7	influent	old outfall	Zn	unfiltered	12.780
8/12/2004	2004	8	influent	old outfall	Zn	unfiltered	23.430
9/9/2004	2004	9	influent	old outfall	Zn	unfiltered	31.180
12/13/2004	2004	12	influent	old outfall	Zn	unfiltered	22.400
4/28/2004	2004	4	splitter	splitter	Zn	unfiltered	39.020
5/19/2004	2004	5	splitter	splitter	Zn	unfiltered	11.010
6/23/2004	2004	6	splitter	splitter	Zn	unfiltered	44.820
7/19/2004	2004	7	splitter	splitter	Zn	unfiltered	18.020
8/12/2004	2004	8	splitter	splitter	Zn	unfiltered	43.560
9/9/2004	2004	9	splitter	splitter	Zn	unfiltered	46.230
12/13/2004	2004	12	splitter	splitter	Zn	unfiltered	38.270
1/18/2005	2005	1	A Cells	A cell	Zn	unfiltered	25.090
2/15/2005	2005	2	A Cells	A cell	Zn	unfiltered	18.640
1/18/2005	2005	1	B Cells	B cell	Zn	unfiltered	8.630
2/15/2005	2005	2	B Cells	B cell	Zn	unfiltered	4.800
1/18/2005	2005	1	Effluent	stream	Zn	unfiltered	7.990
2/15/2005	2005	2	Effluent	stream	Zn	unfiltered	4.300
1/18/2005	2005	1	influent	old outfall	Zn	unfiltered	9.630
2/15/2005	2005	2	influent	old outfall	Zn	unfiltered	12.570
1/18/2005	2005	1	splitter	splitter	Zn	unfiltered	17.350
2/15/2005	2005	2	splitter	splitter	Zn	unfiltered	18.070

Appendix C. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
7/28/2016	2016	7	W-4A1-1F	A cell	Zn	filtered	42.810
7/28/2016	2016	7	W-4A1-1U	A cell	Zn	unfiltered	42.110
7/28/2016	2016	7	W-4A1-2F	A cell	Zn	filtered	38.460
7/28/2016	2016	7	W-4A1-2U	A cell	Zn	unfiltered	42.270
7/28/2016	2016	7	W-4A2-1F	A cell	Zn	filtered	40.440
7/28/2016	2016	7	W-4A2-1U	A cell	Zn	unfiltered	42.640
7/28/2016	2016	7	W-4A2-2F	A cell	Zn	filtered	52.760
7/28/2016	2016	7	W-4A2-2U	A cell	Zn	unfiltered	44.860
7/28/2016	2016	7	W-4A3-1F	A cell	Zn	filtered	39.800
7/28/2016	2016	7	W-4A3-1U	A cell	Zn	unfiltered	43.690
7/28/2016	2016	7	W-4A3-2F	A cell	Zn	filtered	45.200
7/28/2016	2016	7	W-4A3-2U	A cell	Zn	unfiltered	48.680
7/28/2016	2016	7	W-4A4-1F	A cell	Zn	filtered	29.720
7/28/2016	2016	7	W-4A4-1U	A cell	Zn	unfiltered	35.770
7/28/2016	2016	7	W-4A4-2F	A cell	Zn	filtered	42.850
7/28/2016	2016	7	W-4A4-2U	A cell	Zn	unfiltered	39.910
7/28/2016	2016	7	W-4A5-1F	A cell	Zn	filtered	43.020
7/28/2016	2016	7	W-4A5-1U	A cell	Zn	unfiltered	40.230
7/28/2016	2016	7	W-4A5-2F	A cell	Zn	filtered	48.110
7/28/2016	2016	7	W-4A5-2U	A cell	Zn	unfiltered	33.540
7/28/2016	2016	7	W-4A6-1F	A cell	Zn	filtered	41.190
7/28/2016	2016	7	W-4A6-1U	A cell	Zn	unfiltered	51.230
7/28/2016	2016	7	W-4A6-2F	A cell	Zn	filtered	52.530
7/28/2016	2016	7	W-4A6-2U	A cell	Zn	unfiltered	37.000
7/28/2016	2016	7	W-4B1-1F	B cell	Zn	filtered	53.570
7/28/2016	2016	7	W-4B1-1U	B cell	Zn	unfiltered	35.720
7/28/2016	2016	7	W-4B1-2F	B cell	Zn	filtered	38.180
7/28/2016	2016	7	W-4B1-2U	B cell	Zn	unfiltered	41.490
7/28/2016	2016	7	W-4B2-1F	B cell	Zn	filtered	40.100
7/28/2016	2016	7	W-4B2-1U	B cell	Zn	unfiltered	32.000
7/28/2016	2016	7	W-4B2-2F	B cell	Zn	filtered	34.210
7/28/2016	2016	7	W-4B2-2U	B cell	Zn	unfiltered	32.640
7/28/2016	2016	7	W-4B3-1F	B cell	Zn	filtered	45.280
7/28/2016	2016	7	W-4B3-1U	B cell	Zn	unfiltered	40.190
7/28/2016	2016	7	W-4B3-2F	B cell	Zn	filtered	37.690
7/28/2016	2016	7	W-4B3-2U	B cell	Zn	unfiltered	45.430
7/28/2016	2016	7	W-4B4-1F	B cell	Zn	filtered	35.680
7/28/2016	2016	7	W-4B4-1U	B cell	Zn	unfiltered	56.780
7/28/2016	2016	7	W-4B4-2F	B cell	Zn	filtered	38.130
7/28/2016	2016	7	W-4B4-2U	B cell	Zn	unfiltered	41.160
7/28/2016	2016	7	W-4B5-1F	B cell	Zn	filtered	29.770
7/28/2016	2016	7	W-4B5-1U	B cell	Zn	unfiltered	42.230
7/28/2016	2016	7	W-4B5-2F	B cell	Zn	filtered	46.970
7/28/2016	2016	7	W-4B5-2U	B cell	Zn	unfiltered	34.650
7/28/2016	2016	7	W-4B6-1F	B cell	Zn	filtered	45.760
7/28/2016	2016	7	W-4B6-1U	B cell	Zn	unfiltered	38.620
7/28/2016	2016	7	W-4B6-2F	B cell	Zn	filtered	38.280
7/28/2016	2016	7	W-4B6-2U	B cell	Zn	unfiltered	31.430
7/10/2020	2020	7	1A inlet	A cell	Zn	unfiltered	32.483
1/28/2020	2020	1	1A inlet	A cell	Zn	unfiltered	10.157
2/21/2020	2020	2	1A inlet	A cell	Zn	unfiltered	36.913
3/18/2020	2020	3	1A inlet	A cell	Zn	unfiltered	14.575
6/24/2020	2020	6	1A inlet	A cell	Zn	unfiltered	8.953
7/10/2020	2020	7	1A outlet	A cell	Zn	unfiltered	18.022
1/28/2020	2020	1	1A outlet	A cell	Zn	unfiltered	14.049
2/21/2020	2020	2	1A outlet	A cell	Zn	unfiltered	29.079
3/18/2020	2020	3	1A outlet	A cell	Zn	unfiltered	12.138
6/24/2020	2020	6	1A outlet	A cell	Zn	unfiltered	9.597
7/10/2020	2020	7	1B inlet	B cell	Zn	unfiltered	15.266
1/28/2020	2020	1	1B inlet	B cell	Zn	unfiltered	10.529

Appendix C. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
2/21/2020	2020	2	1B inlet	B cell	Zn	unfiltered	28.357
3/18/2020	2020	3	1B inlet	B cell	Zn	unfiltered	10.145
6/24/2020	2020	6	1B inlet	B cell	Zn	unfiltered	8.806
7/10/2020	2020	7	1B outlet	B cell	Zn	unfiltered	5.163
1/28/2020	2020	1	1B outlet	B cell	Zn	unfiltered	8.603
2/21/2020	2020	2	1B outlet	B cell	Zn	unfiltered	18.074
3/18/2020	2020	3	1B outlet	B cell	Zn	unfiltered	8.689
6/24/2020	2020	6	1B outlet	B cell	Zn	unfiltered	9.078
7/10/2020	2020	7	2A inlet	A cell	Zn	unfiltered	36.027
1/28/2020	2020	1	2A inlet	A cell	Zn	unfiltered	12.334
2/21/2020	2020	2	2A inlet	A cell	Zn	unfiltered	39.467
3/18/2020	2020	3	2A inlet	A cell	Zn	unfiltered	16.137
6/24/2020	2020	6	2A inlet	A cell	Zn	unfiltered	10.163
7/10/2020	2020	7	2A outlet	A cell	Zn	unfiltered	12.955
1/28/2020	2020	1	2A outlet	A cell	Zn	unfiltered	10.094
2/21/2020	2020	2	2A outlet	A cell	Zn	unfiltered	24.690
3/18/2020	2020	3	2A outlet	A cell	Zn	unfiltered	11.722
6/24/2020	2020	6	2A outlet	A cell	Zn	unfiltered	9.527
7/10/2020	2020	7	2B inlet	B cell	Zn	unfiltered	10.282
1/28/2020	2020	1	2B inlet	B cell	Zn	unfiltered	12.144
2/21/2020	2020	2	2B inlet	B cell	Zn	unfiltered	23.486
3/18/2020	2020	3	2B inlet	B cell	Zn	unfiltered	11.680
6/24/2020	2020	6	2B inlet	B cell	Zn	unfiltered	8.797
7/10/2020	2020	7	2B outlet	B cell	Zn	unfiltered	7.238
1/28/2020	2020	1	2B outlet	B cell	Zn	unfiltered	9.625
2/21/2020	2020	2	2B outlet	B cell	Zn	unfiltered	14.695
3/18/2020	2020	3	2B outlet	B cell	Zn	unfiltered	11.632
6/24/2020	2020	6	2B outlet	B cell	Zn	unfiltered	6.893
7/10/2020	2020	7	3A inlet	A cell	Zn	unfiltered	31.073
1/28/2020	2020	1	3A inlet	A cell	Zn	unfiltered	14.096
2/21/2020	2020	2	3A inlet	A cell	Zn	unfiltered	37.380
3/18/2020	2020	3	3A inlet	A cell	Zn	unfiltered	13.472
6/24/2020	2020	6	3A inlet	A cell	Zn	unfiltered	8.282
7/10/2020	2020	7	3A outlet	A cell	Zn	unfiltered	9.166
1/28/2020	2020	1	3A outlet	A cell	Zn	unfiltered	10.846
2/21/2020	2020	2	3A outlet	A cell	Zn	unfiltered	20.953
3/18/2020	2020	3	3A outlet	A cell	Zn	unfiltered	9.667
6/24/2020	2020	6	3A outlet	A cell	Zn	unfiltered	5.632
7/10/2020	2020	7	3B inlet	B cell	Zn	unfiltered	12.562
1/28/2020	2020	1	3B inlet	B cell	Zn	unfiltered	11.063
2/21/2020	2020	2	3B inlet	B cell	Zn	unfiltered	24.947
3/18/2020	2020	3	3B inlet	B cell	Zn	unfiltered	10.707
6/24/2020	2020	6	3B inlet	B cell	Zn	unfiltered	6.348
7/10/2020	2020	7	3B outlet	B cell	Zn	unfiltered	6.162
1/28/2020	2020	1	3B outlet	B cell	Zn	unfiltered	9.956
2/21/2020	2020	2	3B outlet	B cell	Zn	unfiltered	14.439
3/18/2020	2020	3	3B outlet	B cell	Zn	unfiltered	9.671
6/24/2020	2020	6	3B outlet	B cell	Zn	unfiltered	6.327
7/10/2020	2020	7	4A inlet	A cell	Zn	unfiltered	42.782
1/28/2020	2020	1	4A inlet	A cell	Zn	unfiltered	10.961
2/21/2020	2020	2	4A inlet	A cell	Zn	unfiltered	38.010
3/18/2020	2020	3	4A inlet	A cell	Zn	unfiltered	15.340
6/24/2020	2020	6	4A inlet	A cell	Zn	unfiltered	13.204
7/10/2020	2020	7	4A outlet	A cell	Zn	unfiltered	16.176
1/28/2020	2020	1	4A outlet	A cell	Zn	unfiltered	9.334
2/21/2020	2020	2	4A outlet	A cell	Zn	unfiltered	30.085
3/18/2020	2020	3	4A outlet	A cell	Zn	unfiltered	11.661
6/24/2020	2020	6	4A outlet	A cell	Zn	unfiltered	7.638
7/10/2020	2020	7	4B inlet	B cell	Zn	unfiltered	12.986
1/28/2020	2020	1	4B inlet	B cell	Zn	unfiltered	10.110

Appendix C. continued

Date	Year	Month	Location	Location description	Analyte	Filtration	Concentration (µg/L)
2/21/2020	2020	2	4B inlet	B cell	Zn	unfiltered	21.974
3/18/2020	2020	3	4B inlet	B cell	Zn	unfiltered	9.323
6/24/2020	2020	6	4B inlet	B cell	Zn	unfiltered	7.334
7/10/2020	2020	7	4B outlet	B cell	Zn	unfiltered	7.170
1/28/2020	2020	1	4B outlet	B cell	Zn	unfiltered	9.468
2/21/2020	2020	2	4B outlet	B cell	Zn	unfiltered	16.547
3/18/2020	2020	3	4B outlet	B cell	Zn	unfiltered	10.006
6/24/2020	2020	6	4B outlet	B cell	Zn	unfiltered	6.755
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Zn	unfiltered	40.555
1/28/2020	2020	1	Old A-01 Outfall	old outfall	Zn	unfiltered	8.573
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Zn	unfiltered	37.641
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Zn	unfiltered	17.653
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Zn	unfiltered	34.770
7/10/2020	2020	7	Splitter Box 1A	splitter	Zn	unfiltered	42.034
1/28/2020	2020	1	Splitter Box 1A	splitter	Zn	unfiltered	10.868
2/21/2020	2020	2	Splitter Box 1A	splitter	Zn	unfiltered	42.448
3/18/2020	2020	3	Splitter Box 1A	splitter	Zn	unfiltered	17.143
6/24/2020	2020	6	Splitter Box 1A	splitter	Zn	unfiltered	13.411
7/10/2020	2020	7	Splitter Box 2A	splitter	Zn	unfiltered	37.905
1/28/2020	2020	1	Splitter Box 2A	splitter	Zn	unfiltered	10.496
2/21/2020	2020	2	Splitter Box 2A	splitter	Zn	unfiltered	40.802
3/18/2020	2020	3	Splitter Box 2A	splitter	Zn	unfiltered	17.258
6/24/2020	2020	6	Splitter Box 2A	splitter	Zn	unfiltered	12.897
7/10/2020	2020	7	Splitter Box 3A	splitter	Zn	unfiltered	40.545
1/28/2020	2020	1	Splitter Box 3A	splitter	Zn	unfiltered	9.559
2/21/2020	2020	2	Splitter Box 3A	splitter	Zn	unfiltered	43.050
3/18/2020	2020	3	Splitter Box 3A	splitter	Zn	unfiltered	16.964
6/24/2020	2020	6	Splitter Box 3A	splitter	Zn	unfiltered	15.308
7/10/2020	2020	7	Splitter Box 4A	splitter	Zn	unfiltered	39.901
1/28/2020	2020	1	Splitter Box 4A	splitter	Zn	unfiltered	9.600
2/21/2020	2020	2	Splitter Box 4A	splitter	Zn	unfiltered	47.598
3/18/2020	2020	3	Splitter Box 4A	splitter	Zn	unfiltered	17.385
6/24/2020	2020	6	Splitter Box 4A	splitter	Zn	unfiltered	11.667
7/10/2020	2020	7	Stream	stream	Zn	unfiltered	7.861
1/28/2020	2020	1	Stream	stream	Zn	unfiltered	7.395
2/21/2020	2020	2	Stream	stream	Zn	unfiltered	17.225
3/18/2020	2020	3	Stream	stream	Zn	unfiltered	10.261
6/24/2020	2020	6	Stream	stream	Zn	unfiltered	6.197

Appendix D. Copper concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A-A1 5-10	2004	6	A	inlet	1	5-10	Cu	22.760
4A-A2 5-10	2004	6	A	inlet	2	5-10	Cu	20.447
4A-A1 10-20	2004	6	A	inlet	1	10-20	Cu	6.530
4A-A2 10-20	2004	6	A	inlet	2	10-20	Cu	4.802
4A-A1 Floc	2004	6	A	inlet	1	0-2	Cu	1275.690
4A-A2 Floc	2004	6	A	inlet	2	0-2	Cu	1139.037
4A-A1 OM	2004	6	A	inlet	1	2-5	Cu	205.271
4A-A2 OM	2004	6	A	inlet	2	2-5	Cu	313.861
4B-A1 5-10	2004	6	A	inlet	1	5-10	Cu	10.328
4B-A2 5-10	2004	6	A	inlet	2	5-10	Cu	6.223
4B-A1 10-20	2004	6	A	inlet	1	10-20	Cu	8.274
4B-A2 10-20	2004	6	A	inlet	2	10-20	Cu	5.728
4B-A1 Floc	2004	6	A	inlet	1	0-2	Cu	151.578
4B-A2 Floc	2004	6	A	inlet	2	0-2	Cu	268.957
4B-A1 OM	2004	6	A	inlet	1	2-5	Cu	33.346
4B-A2 OM	2004	6	A	inlet	2	2-5	Cu	181.285
4A-B1 5-10	2004	6	B	middle	1	5-10	Cu	15.029
4A-B2 5-10	2004	6	B	middle	2	5-10	Cu	9.766
4A-B1 10-20	2004	6	B	middle	1	10-20	Cu	6.214
4A-B2 10-20	2004	6	B	middle	2	10-20	Cu	5.701
4A-B1 Floc	2004	6	B	middle	1	0-2	Cu	808.394
4A-B2 Floc	2004	6	B	middle	2	0-2	Cu	895.543
4A-B1 OM	2004	6	B	middle	1	2-5	Cu	344.010
4A-B2 OM	2004	6	B	middle	2	2-5	Cu	187.126
4B-B1 5-10	2004	6	B	middle	1	5-10	Cu	6.307
4B-B2 5-10	2004	6	B	middle	2	5-10	Cu	9.513
4B-B1 10-20	2004	6	B	middle	1	10-20	Cu	7.219
4B-B2 10-20	2004	6	B	middle	2	10-20	Cu	6.441
4B-B1 Floc	2004	6	B	middle	1	0-2	Cu	356.759
4B-B2 Floc	2004	6	B	middle	2	0-2	Cu	274.286
4B-B1 OM	2004	6	B	middle	1	2-5	Cu	91.530
4B-B2 OM	2004	6	B	middle	2	2-5	Cu	46.001
4A-C1 5-10	2004	6	C	middle	1	5-10	Cu	11.252
4A-C2 5-10	2004	6	C	middle	2	5-10	Cu	15.897
4A-C1 10-20	2004	6	C	middle	1	10-20	Cu	10.632
4A-C2-10-20	2004	6	C	middle	2	10-20	Cu	11.281
4A-C1 Floc	2004	6	C	middle	1	0-2	Cu	819.905
4A-C2 Floc	2004	6	C	middle	2	0-2	Cu	501.125
4A-C1 OM	2004	6	C	middle	1	2-5	Cu	192.394
4A-C2 OM	2004	6	C	middle	2	2-5	Cu	101.569
4B-C1 5-10	2004	6	C	middle	1	5-10	Cu	12.247
4B-C2 5-10	2004	6	C	middle	2	5-10	Cu	8.239
4B-C1 10-20	2004	6	C	middle	1	10-20	Cu	12.463
4B-C2 10-20	2004	6	C	middle	2	10-20	Cu	6.111
4B-C1 Floc	2004	6	C	middle	1	0-2	Cu	292.708
4B-C1 OM	2004	6	C	middle	1	2-5	Cu	39.936
4B-C2 OM	2004	6	C	middle	2	2-5	Cu	58.297
4A-D1 5-10	2004	6	D	outlet	1	5-10	Cu	8.250
4A-D2 5-10	2004	6	D	outlet	2	5-10	Cu	11.781
4A-D1 10-20	2004	6	D	outlet	1	10-20	Cu	7.656
4A-D2 10-20	2004	6	D	outlet	2	10-20	Cu	10.731
4A-D1 Floc	2004	6	D	outlet	1	0-2	Cu	397.827
4A-D2 Floc	2004	6	D	outlet	2	0-2	Cu	534.012
4A-D1 OM	2004	6	D	outlet	1	2-5	Cu	188.678
4A-D2 OM	2004	6	D	outlet	2	2-5	Cu	103.591
4B-D1 5-10	2004	6	D	outlet	1	5-10	Cu	7.523
4B-D2 5-10	2004	6	D	outlet	2	5-10	Cu	6.891
4B-D1 10-20	2004	6	D	outlet	1	10-20	Cu	16.005
4B-D2 10-20	2004	6	D	outlet	2	10-20	Cu	10.065

Appendix D. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4B-D1 Floc	2004	6	D	outlet	1	0-2	Cu	273.582
4B-D2 Floc	2004	6	D	outlet	2	0-2	Cu	199.652
4B-D1 OM	2004	6	D	outlet	1	2-5	Cu	30.449
4B-D2 OM	2004	6	D	outlet	2	2-5	Cu	39.275
4A1-1A	2016	6	A	inlet	1	5-10	Cu	38.290
4A1-2A	2016	6	A	inlet	2	5-10	Cu	20.050
4A1-1B	2016	6	A	inlet	1	10-20	Cu	8.995
4A1-2B	2016	6	A	inlet	2	10-20	Cu	8.921
4A1-1F	2016	6	A	inlet	1	0-2	Cu	475.400
4A1-2F	2016	6	A	inlet	2	0-2	Cu	97.200
4B1-1A	2016	6	D	outlet	1	5-10	Cu	9.050
4B1-2A	2016	6	D	outlet	2	5-10	Cu	11.200
4B1-1B	2016	6	D	outlet	1	10-20	Cu	6.867
4B1-2B	2016	6	D	outlet	2	10-20	Cu	11.070
4B1-1F	2016	6	D	outlet	1	0-2	Cu	62.670
4B1-2F	2016	6	D	outlet	2	0-2	Cu	187.800
4A2-1A	2016	6	A	inlet	1	5-10	Cu	25.880
4A2-2A	2016	6	A	inlet	2	5-10	Cu	58.670
4A2-1B	2016	6	A	inlet	1	10-20	Cu	12.130
4A2-2B	2016	6	A	inlet	2	10-20	Cu	8.810
4A2-1F	2016	6	A	inlet	1	0-2	Cu	562.200
4A2-2F	2016	6	A	inlet	2	0-2	Cu	633.200
4B2-1A	2016	6	D	outlet	1	5-10	Cu	13.400
4B2-2A	2016	6	D	outlet	2	5-10	Cu	11.500
4B2-1B	2016	6	D	outlet	1	10-20	Cu	11.200
4B2-2B	2016	6	D	outlet	2	10-20	Cu	10.980
4B2-1F	2016	6	D	outlet	1	0-2	Cu	119.000
4B2-2F	2016	6	D	outlet	2	0-2	Cu	133.100
4A3-1A	2016	6	B/C	middle	1	5-10	Cu	8.769
4A3-2A	2016	6	B/C	middle	2	5-10	Cu	7.169
4A3-1B	2016	6	B/C	middle	1	10-20	Cu	7.103
4A3-2B	2016	6	B/C	middle	2	10-20	Cu	5.048
4A3-1F	2016	6	B/C	middle	1	0-2	Cu	203.500
4A3-2F	2016	6	B/C	middle	2	0-2	Cu	351.600
4B3-1A	2016	6	B/C	middle	1	5-10	Cu	12.860
4B3-2A	2016	6	B/C	middle	2	5-10	Cu	21.650
4B3-1B	2016	6	B/C	middle	1	10-20	Cu	10.140
4B3-2B	2016	6	B/C	middle	2	10-20	Cu	12.560
4B3-1F	2016	6	B/C	middle	1	0-2	Cu	177.900
4B3-2F	2016	6	B/C	middle	2	0-2	Cu	206.800
4A4-1A	2016	6	B/C	middle	1	5-10	Cu	15.000
4A4-2A	2016	6	B/C	middle	2	5-10	Cu	13.410
4A4-1B	2016	6	B/C	middle	1	10-20	Cu	14.770
4A4-2B	2016	6	B/C	middle	2	10-20	Cu	13.510
4A4-1F	2016	6	B/C	middle	1	0-2	Cu	546.300
4A4-2F	2016	6	B/C	middle	2	0-2	Cu	474.600
4B4-1A	2016	6	B/C	middle	1	5-10	Cu	14.360
4B4-2A	2016	6	B/C	middle	2	5-10	Cu	7.798
4B4-1B	2016	6	B/C	middle	1	10-20	Cu	10.050
4B4-2B	2016	6	B/C	middle	2	10-20	Cu	9.983
4B4-1F	2016	6	B/C	middle	1	0-2	Cu	191.500
4B4-2F	2016	6	B/C	middle	2	0-2	Cu	188.200
4A5-1A	2016	6	D	outlet	1	5-10	Cu	32.500
4A5-2A	2016	6	D	outlet	2	5-10	Cu	13.860
4A5-1B	2016	6	D	outlet	1	10-20	Cu	9.504
4A5-2B	2016	6	D	outlet	2	10-20	Cu	7.001
4A5-1F	2016	6	D	outlet	1	0-2	Cu	162.200
4A5-2F	2016	6	D	outlet	2	0-2	Cu	94.370
4B5-1A	2016	6	A	inlet	1	5-10	Cu	19.240

Appendix D. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4B5-2A	2016	6	A	inlet	2	5-10	Cu	15.550
4B5-1B	2016	6	A	inlet	1	10-20	Cu	13.530
4B5-2B	2016	6	A	inlet	2	10-20	Cu	11.490
4B5-1F	2016	6	A	inlet	1	0-2	Cu	219.700
4B5-2F	2016	6	A	inlet	2	0-2	Cu	259.200
4A6-1A	2016	6	D	outlet	1	5-10	Cu	19.260
4A6-2A	2016	6	D	outlet	2	5-10	Cu	13.800
4A6-1B	2016	6	D	outlet	1	10-20	Cu	9.700
4A6-2B	2016	6	D	outlet	2	10-20	Cu	3.911
4A6-1F	2016	6	D	outlet	1	0-2	Cu	428.000
4A6-2F	2016	6	D	outlet	2	0-2	Cu	396.600
4B6-1A	2016	6	A	inlet	1	5-10	Cu	9.945
4B6-2A	2016	6	A	inlet	2	5-10	Cu	23.910
4B6-1B	2016	6	A	inlet	1	10-20	Cu	5.321
4B6-2B	2016	6	A	inlet	2	10-20	Cu	5.674
4B6-1F	2016	6	A	inlet	1	0-2	Cu	237.600
4B6-2F	2016	6	A	inlet	2	0-2	Cu	304.000
A-01 4A A1+A2	2020	7	A	inlet	1	0-2	Cu	118.064
4A-A1-INORG1	2020	7	A	inlet	1	5-10	Cu	20.785
4A-A1-INORG1 DUPLICATE	2020	7	A	inlet	1	5-10	Cu	19.777
4A-A2-INORG1	2020	7	A	inlet	2	5-10	Cu	13.086
4A-A1-INORG2	2020	7	A	inlet	1	10-20	Cu	7.810
4A-A2-INORG2	2020	7	A	inlet	2	10-20	Cu	9.553
4A-A1-OM	2020	7	A	inlet	1	2-5	Cu	175.914
4A-A2-OM	2020	7	A	inlet	2	2-5	Cu	15.194
A-01 4B A1+A2	2020	7	A	inlet	1	0-2	Cu	88.639
4B-A1-INORG1	2020	7	A	inlet	1	5-10	Cu	5.663
4B-A2-INORG1	2020	7	A	inlet	2	5-10	Cu	5.818
4B-A1-INORG2	2020	7	A	inlet	1	10-20	Cu	5.727
4B-A2-INORG2	2020	7	A	inlet	2	10-20	Cu	9.156
4B-A1-OM	2020	7	A	inlet	1	2-5	Cu	17.007
4B-A2-OM	2020	7	A	inlet	2	2-5	Cu	16.566
A-01 4A B1+B2	2020	7	B	middle	1	0-2	Cu	74.187
A-01 4A B1+B2 DUPLICATE	2020	7	B	middle	1	0-2	Cu	58.258
4A-B1-INORG1	2020	7	B	middle	1	5-10	Cu	7.193
4A-B1-INORG1 DUPLICATE	2020	7	B	middle	1	5-10	Cu	6.310
4A-B2-INORG1	2020	7	B	middle	2	5-10	Cu	8.234
4A-B1-INORG2	2020	7	B	middle	1	10-20	Cu	5.309
4A-B2-INORG2	2020	7	B	middle	2	10-20	Cu	5.296
4A-B1-OM	2020	7	B	middle	1	2-5	Cu	15.620
4A-B2-OM	2020	7	B	middle	2	2-5	Cu	27.451
A-01 4B B1+B2	2020	7	B	middle	1	0-2	Cu	221.722
4B-B1-INORG1	2020	7	B	middle	1	5-10	Cu	8.643
4B-B2-INORG1	2020	7	B	middle	2	5-10	Cu	9.884
4B-B1-INORG2	2020	7	B	middle	1	10-20	Cu	9.365
4B-B2-INORG2	2020	7	B	middle	2	10-20	Cu	4.702
4B-B2-INORG2 DUPLICATE	2020	7	B	middle	2	10-20	Cu	9.129
4B-B1-OM	2020	7	B	middle	1	2-5	Cu	13.462
4B-B2-OM	2020	7	B	middle	2	2-5	Cu	40.905
A-01 4A C1+C2	2020	7	C	middle	1	0-2	Cu	153.379
4A-C1-INORG1	2020	7	C	middle	1	5-10	Cu	6.031
4A-C2-INORG1	2020	7	C	middle	2	5-10	Cu	6.018
4A-C1-INORG2	2020	7	C	middle	1	10-20	Cu	7.426
4A-C2-INORG2	2020	7	C	middle	2	10-20	Cu	6.450
4A-C1-OM	2020	7	C	middle	1	2-5	Cu	30.572
4A-C2-OM	2020	7	C	middle	2	2-5	Cu	12.348
A-01 4B C1+C2	2020	7	C	middle	1	0-2	Cu	226.116
4B-C1-INORG1	2020	7	C	middle	1	5-10	Cu	12.474
4B-C2-INORG1	2020	7	C	middle	2	5-10	Cu	7.383

Appendix D. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4B-C1-INORG2	2020	7	C	middle	1	10-20	Cu	8.109
4B-C2-INORG2	2020	7	C	middle	2	10-20	Cu	5.716
4B-C1-OM	2020	7	C	middle	1	2-5	Cu	58.863
4B-C2-OM	2020	7	C	middle	2	2-5	Cu	35.846
A-01 4A D1+D2	2020	7	D	outlet	1	0-2	Cu	31.756
4A-D1-INORG1	2020	7	D	outlet	1	5-10	Cu	4.821
4A-D2-INORG1	2020	7	D	outlet	2	5-10	Cu	6.587
4A-D1-INORG2	2020	7	D	outlet	1	10-20	Cu	7.847
4A-D2-INORG2	2020	7	D	outlet	2	10-20	Cu	6.671
4A-D1-OM	2020	7	D	outlet	1	2-5	Cu	9.600
4A-D2-OM	2020	7	D	outlet	2	2-5	Cu	5.878
A-01 4B D1+D2	2020	7	D	outlet	1	0-2	Cu	49.226
4B-D1-INORG1	2020	7	D	outlet	1	5-10	Cu	9.040
4B-D2-INORG1	2020	7	D	outlet	2	5-10	Cu	6.315
4B-D1-INORG2	2020	7	D	outlet	1	10-20	Cu	6.340
4B-D2-INORG2	2020	7	D	outlet	2	10-20	Cu	6.325
4B-D2-INORG2 DUPLICATE	2020	7	D	outlet	2	10-20	Cu	7.689
4B-D1-OM	2020	7	D	outlet	1	2-5	Cu	13.201
4B-D1-OM DUPLICATE	2020	7	D	outlet	1	2-5	Cu	13.755
4B-D2-OM	2020	7	D	outlet	2	2-5	Cu	22.219

Appendix E. Lead concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A-A1 5-10	2004	6	A	inlet	1	5-10	Pb	6.206
4A-A2 5-10	2004	6	A	inlet	2	5-10	Pb	4.508
4A-A1 10-20	2004	6	A	inlet	1	10-20	Pb	3.594
4A-A2 10-20	2004	6	A	inlet	2	10-20	Pb	3.264
4A-A1 Floc	2004	6	A	inlet	1	0-2	Pb	54.849
4A-A2 Floc	2004	6	A	inlet	2	0-2	Pb	57.817
4A-A1 OM	2004	6	A	inlet	1	2-5	Pb	16.844
4A-A2 OM	2004	6	A	inlet	2	2-5	Pb	17.671
4B-A1 5-10	2004	6	A	inlet	1	2-5	Pb	4.960
4B-A2 5-10	2004	6	A	inlet	2	5-10	Pb	3.452
4B-A1 10-20	2004	6	A	inlet	1	10-20	Pb	3.598
4B-A2 10-20	2004	6	A	inlet	2	10-20	Pb	3.685
4B-A2 Floc	2004	6	A	inlet	2	0-2	Pb	22.822
4B-A1 Floc LOI	2004	6	A	inlet	1	0-2	Pb	23.903
4B-A1 OM	2004	6	A	inlet	1	2-5	Pb	7.222
4B-A2 OM	2004	6	A	inlet	2	2-5	Pb	12.106
4A-B1 5-10	2004	6	B	middle	1	5-10	Pb	5.135
4A-B2 5-10	2004	6	B	middle	2	5-10	Pb	3.920
4A-B1 10-20	2004	6	B	middle	1	10-20	Pb	3.814
4A-B2 10-20	2004	6	B	middle	2	10-20	Pb	4.056
4A-B1 Floc	2004	6	B	middle	1	0-2	Pb	32.738
4A-B2 Floc	2004	6	B	middle	2	0-2	Pb	36.208
4A-B1 OM	2004	6	B	middle	1	2-5	Pb	19.888
4A-B2 OM	2004	6	B	middle	2	2-5	Pb	11.057
4B-B1 5-10	2004	6	B	middle	1	5-10	Pb	3.965
4B-B2 5-10	2004	6	B	middle	2	5-10	Pb	4.687
4B-B1 10-20	2004	6	B	middle	1	10-20	Pb	4.590
4B-B2 10-20	2004	6	B	middle	2	10-20	Pb	3.668
4B-B2 Floc	2004	6	B	middle	2	0-2	Pb	23.761
4B-B1 Floc	2004	6	B	middle	1	0-2	Pb	32.155
4B-B1 OM	2004	6	B	middle	1	2-5	Pb	11.588
4B-B2 OM	2004	6	B	middle	2	2-5	Pb	6.718
4A-C1 5-10	2004	6	C	middle	1	5-10	Pb	5.774
4A-C2 5-10	2004	6	C	middle	2	5-10	Pb	6.710
4A-C1 10-20	2004	6	C	middle	1	10-20	Pb	6.193
4A-C2-10-20	2004	6	C	middle	2	10-20	Pb	4.539
4A-C1 Floc	2004	6	C	middle	1	0-2	Pb	40.226
4A-C2 Floc	2004	6	C	middle	2	0-2	Pb	27.418
4A-C1 OM	2004	6	C	middle	1	2-5	Pb	14.953
4A-C2 OM	2004	6	C	middle	2	2-5	Pb	9.313
4B-C1 5-10	2004	6	C	middle	1	5-10	Pb	7.427
4B-C2 5-10	2004	6	C	middle	2	5-10	Pb	4.569
4B-C1 10-20	2004	6	C	middle	1	10-20	Pb	6.420
4B-C2 10-20	2004	6	C	middle	2	10-20	Pb	4.661
4B-C1 Floc	2004	6	C	middle	1	0-2	Pb	21.835
4B-C2 Floc missing	2004	6	C	middle	2	0-2	Pb	
4B-C1 OM	2004	6	C	middle	1	2-5	Pb	8.500
4B-C2 OM	2004	6	C	middle	2	2-5	Pb	7.345
4A-D1 5-10	2004	6	D	outlet	1	5-10	Pb	4.928
4A-D2 5-10	2004	6	D	outlet	2	5-10	Pb	5.590
4A-D1 10-20	2004	6	D	outlet	1	10-20	Pb	4.264
4A-D2 10-20	2004	6	D	outlet	2	10-20	Pb	7.328
4A-D1 Floc	2004	6	D	outlet	1	0-2	Pb	31.213
4A-D2 Floc	2004	6	D	outlet	2	0-2	Pb	36.996
4A-D1 OM	2004	6	D	outlet	1	2-5	Pb	18.680
4A-D2 OM	2004	6	D	outlet	2	2-5	Pb	12.300
4B-D1 5-10	2004	6	D	outlet	1	5-10	Pb	4.953
4B-D2 5-10	2004	6	D	outlet	2	5-10	Pb	5.354

Appendix E. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4B-D1 10-20	2004	6	D	outlet	1	10-20	Pb	9.499
4B-D2 10-20	2004	6	D	outlet	2	10-20	Pb	6.048
4B-D1 Floc	2004	6	D	outlet	1	0-2	Pb	23.979
4B-D2 Floc	2004	6	D	outlet	2	0-2	Pb	21.960
4B-D1 OM	2004	6	D	outlet	1	2-5	Pb	4.350
4B-D2 OM	2004	6	D	outlet	2	2-5	Pb	9.051
4A1-1A	2016	6	1	inlet	1	5-10	Pb	11.260
4A1-2A	2016	6	1	inlet	2	5-10	Pb	9.095
4A1-1B	2016	6	1	inlet	1	10-20	Pb	9.208
4A1-2B	2016	6	1	inlet	2	10-20	Pb	9.533
4A1-1F	2016	6	1	inlet	1	0-2	Pb	36.050
4A1-2F	2016	6	1	inlet	2	0-2	Pb	14.150
4B1-1A	2016	6	1	outlet	1	5-10	Pb	7.733
4B1-2A	2016	6	1	outlet	2	5-10	Pb	11.550
4B1-1B	2016	6	1	outlet	1	10-20	Pb	8.900
4B1-2B	2016	6	1	outlet	2	10-20	Pb	13.200
4B1-1F	2016	6	1	outlet	1	0-2	Pb	11.190
4B1-2F	2016	6	1	outlet	2	0-2	Pb	30.340
4A2-1A	2016	6	2	inlet	1	5-10	Pb	12.130
4A2-2A	2016	6	2	inlet	2	5-10	Pb	42.330
4A2-1B	2016	6	2	inlet	1	10-20	Pb	15.590
4A2-2B	2016	6	2	inlet	2	10-20	Pb	10.790
4A2-1F	2016	6	2	inlet	1	0-2	Pb	50.600
4A2-2F	2016	6	2	inlet	2	0-2	Pb	52.510
4B2-1A	2016	6	2	outlet	1	5-10	Pb	11.190
4B2-2A	2016	6	2	outlet	2	5-10	Pb	10.200
4B2-1B	2016	6	2	outlet	1	10-20	Pb	13.260
4B2-2B	2016	6	2	outlet	2	10-20	Pb	12.850
4B2-1F	2016	6	2	outlet	1	0-2	Pb	25.690
4B2-2F	2016	6	2	outlet	2	0-2	Pb	29.350
4A3-1A	2016	6	3	middle	1	5-10	Pb	8.701
4A3-2A	2016	6	3	middle	2	5-10	Pb	8.313
4A3-1B	2016	6	3	middle	1	10-20	Pb	11.580
4A3-2B	2016	6	3	middle	2	10-20	Pb	9.173
4A3-1F	2016	6	3	middle	1	0-2	Pb	28.880
4A3-2F	2016	6	3	middle	2	0-2	Pb	30.760
4B3-1A	2016	6	3	middle	1	5-10	Pb	12.260
4B3-2A	2016	6	3	middle	2	5-10	Pb	13.760
4B3-1B	2016	6	3	middle	1	10-20	Pb	13.560
4B3-2B	2016	6	3	middle	2	10-20	Pb	12.980
4B3-1F	2016	6	3	middle	1	0-2	Pb	27.680
4B3-2F	2016	6	3	middle	2	0-2	Pb	30.650
4A4-1A	2016	6	4	middle	1	5-10	Pb	12.290
4A4-2A	2016	6	4	middle	2	5-10	Pb	12.700
4A4-1B	2016	6	4	middle	1	10-20	Pb	12.500
4A4-2B	2016	6	4	middle	2	10-20	Pb	18.370
4A4-1F	2016	6	4	middle	1	0-2	Pb	41.310
4A4-2F	2016	6	4	middle	2	0-2	Pb	39.140
4B4-1A	2016	6	4	middle	1	5-10	Pb	12.310
4B4-2A	2016	6	4	middle	2	5-10	Pb	9.976
4B4-1B	2016	6	4	middle	1	10-20	Pb	12.910
4B4-2B	2016	6	4	middle	2	10-20	Pb	11.610
4B4-1F	2016	6	4	middle	1	0-2	Pb	29.060
4B4-2F	2016	6	4	middle	2	0-2	Pb	29.610
4A5-1A	2016	6	5	outlet	1	5-10	Pb	11.370
4A5-2A	2016	6	5	outlet	2	5-10	Pb	8.136
4A5-1B	2016	6	5	outlet	1	10-20	Pb	8.689
4A5-2B	2016	6	5	outlet	2	10-20	Pb	8.210

Appendix E. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A5-1F	2016	6	5	outlet	1	0-2	Pb	24.700
4A5-2F	2016	6	5	outlet	2	0-2	Pb	17.230
4B5-1A	2016	6	5	inlet	1	5-10	Pb	14.250
4B5-2A	2016	6	5	inlet	2	5-10	Pb	12.100
4B5-1B	2016	6	5	inlet	1	10-20	Pb	15.190
4B5-2B	2016	6	5	inlet	2	10-20	Pb	13.160
4B5-1F	2016	6	5	inlet	1	0-2	Pb	29.380
4B5-2F	2016	6	5	inlet	2	0-2	Pb	32.920
4A6-1A	2016	6	6	outlet	1	5-10	Pb	14.200
4A6-2A	2016	6	6	outlet	2	5-10	Pb	10.490
4A6-1B	2016	6	6	outlet	1	10-20	Pb	12.870
4A6-2B	2016	6	6	outlet	2	10-20	Pb	4.656
4A6-1F	2016	6	6	outlet	1	0-2	Pb	37.570
4A6-2F	2016	6	6	outlet	2	0-2	Pb	33.870
4B6-1A	2016	6	6	inlet	1	5-10	Pb	8.343
4B6-2A	2016	6	6	inlet	2	5-10	Pb	8.090
4B6-1B	2016	6	6	inlet	1	10-20	Pb	7.315
4B6-2B	2016	6	6	inlet	2	10-20	Pb	7.250
4B6-1F	2016	6	6	inlet	1	0-2	Pb	31.890
4B6-2F	2016	6	6	inlet	2	0-2	Pb	34.700
A-01 4A A1+A2	2020	7	A	inlet	1	0-2	Pb	8.901
4A-A1-INORG1	2020	7	A	inlet	1	5-10	Pb	11.023
4A-A1-INORG1 DUPLICATE	2020	7	A	inlet	1	5-10	Pb	12.347
4A-A2-INORG1	2020	7	A	inlet	2	5-10	Pb	12.639
4A-A1-INORG2	2020	7	A	inlet	1	10-20	Pb	9.934
4A-A2-INORG2	2020	7	A	inlet	2	10-20	Pb	12.794
4A-A1-OM	2020	7	A	inlet	1	2-5	Pb	14.811
4A-A2-OM	2020	7	A	inlet	2	2-5	Pb	8.898
A-01 4B A1+A2	2020	7	A	inlet	1	0-2	Pb	7.697
4B-A1-INORG1	2020	7	A	inlet	1	5-10	Pb	8.128
4B-A2-INORG1	2020	7	A	inlet	2	5-10	Pb	6.871
4B-A1-INORG2	2020	7	A	inlet	1	10-20	Pb	8.646
4B-A2-INORG2	2020	7	A	inlet	2	10-20	Pb	12.950
4B-A1-OM	2020	7	A	inlet	1	2-5	Pb	9.291
4B-A2-OM	2020	7	A	inlet	2	2-5	Pb	7.150
A-01 4A B1+B2	2020	7	B	middle	1	0-2	Pb	7.533
A-01 4A B1+B2 DUPLICATE	2020	7	B	middle	1	0-2	Pb	5.434
4A-B1-INORG1	2020	7	B	middle	1	5-10	Pb	8.548
4A-B1-INORG1 DUPLICATE	2020	7	B	middle	1	5-10	Pb	7.626
4A-B2-INORG1	2020	7	B	middle	2	5-10	Pb	10.051
4A-B1-INORG2	2020	7	B	middle	1	10-20	Pb	6.466
4A-B2-INORG2	2020	7	B	middle	2	10-20	Pb	6.758
4A-B1-OM	2020	7	B	middle	1	2-5	Pb	7.728
4A-B2-OM	2020	7	B	middle	2	2-5	Pb	8.879
A-01 4B B1+B2	2020	7	B	middle	1	0-2	Pb	16.093
4B-B1-INORG1	2020	7	B	middle	1	5-10	Pb	9.588
4B-B2-INORG1	2020	7	B	middle	2	5-10	Pb	13.312
4B-B1-INORG2	2020	7	B	middle	1	10-20	Pb	14.894
4B-B2-INORG2	2020	7	B	middle	2	10-20	Pb	6.619
4B-B2-INORG2 DUPLICATE	2020	7	B	middle	2	10-20	Pb	13.540
4B-B1-OM	2020	7	B	middle	1	2-5	Pb	5.913
4B-B2-OM	2020	7	B	middle	2	2-5	Pb	6.742
A-01 4A C1+C2	2020	7	C	middle	1	0-2	Pb	13.097
4A-C1-INORG1	2020	7	C	middle	1	5-10	Pb	6.126
4A-C2-INORG1	2020	7	C	middle	2	5-10	Pb	7.908
4A-C1-INORG2	2020	7	C	middle	1	10-20	Pb	9.267
4A-C2-INORG2	2020	7	C	middle	2	10-20	Pb	9.609
4A-C1-OM	2020	7	C	middle	1	2-5	Pb	8.321

Appendix E. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A-C2-OM	2020	7	C	middle	2	2-5	Pb	7.889
A-01 4B C1+C2	2020	7	C	middle	1	0-2	Pb	19.001
4B-C1-INORG1	2020	7	C	middle	1	5-10	Pb	6.087
4B-C2-INORG1	2020	7	C	middle	2	5-10	Pb	13.750
4B-C1-INORG2	2020	7	C	middle	1	10-20	Pb	11.852
4B-C2-INORG2	2020	7	C	middle	2	10-20	Pb	8.093
4B-C1-OM	2020	7	C	middle	1	2-5	Pb	8.421
4B-C2-OM	2020	7	C	middle	2	2-5	Pb	12.214
A-01 4A D1+D2	2020	7	D	outlet	1	0-2	Pb	3.933
4A-D1-INORG1	2020	7	D	outlet	1	5-10	Pb	6.776
4A-D2-INORG1	2020	7	D	outlet	2	5-10	Pb	9.544
4A-D1-INORG2	2020	7	D	outlet	1	10-20	Pb	11.931
4A-D2-INORG2	2020	7	D	outlet	2	10-20	Pb	9.784
4A-D1-OM	2020	7	D	outlet	1	2-5	Pb	7.990
4A-D2-OM	2020	7	D	outlet	2	2-5	Pb	8.978
A-01 4B D1+D2	2020	7	D	outlet	1	0-2	Pb	6.769
4B-D1-INORG1	2020	7	D	outlet	1	5-10	Pb	12.694
4B-D2-INORG1	2020	7	D	outlet	2	5-10	Pb	8.821
4B-D1-INORG2	2020	7	D	outlet	1	10-20	Pb	11.170
4B-D2-INORG2	2020	7	D	outlet	2	10-20	Pb	9.953
4B-D2-INORG2 DUPLICATE	2020	7	D	outlet	2	10-20	Pb	13.186
4B-D1-OM	2020	7	D	outlet	1	2-5	Pb	8.217
4B-D1-OM DUPLICATE	2020	7	D	outlet	1	2-5	Pb	10.093
4B-D2-OM	2020	7	D	outlet	2	2-5	Pb	6.583

Appendix F. Zinc concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A-A1 5-10	2004	6	A	inlet	1	5-10	Zn	19.569
4A-A2 5-10	2004	6	A	inlet	2	5-10	Zn	15.876
4A-A1 10-20	2004	6	A	inlet	1	10-20	Zn	5.575
4A-A2 10-20	2004	6	A	inlet	2	10-20	Zn	4.580
4A-A1 Floc	2004	6	A	inlet	1	0-2	Zn	909.252
4A-A2 Floc	2004	6	A	inlet	2	0-2	Zn	766.821
4A-A1 OM	2004	6	A	inlet	1	2-5	Zn	155.779
4A-A2 OM	2004	6	A	inlet	2	2-5	Zn	218.817
4B-A1 5-10	2004	6	A	inlet	1	5-10	Zn	9.296
4B-A2 5-10	2004	6	A	inlet	2	5-10	Zn	5.383
4B-A1 10-20	2004	6	A	inlet	1	10-20	Zn	8.249
4B-A2 10-20	2004	6	A	inlet	2	10-20	Zn	4.704
4B-A2 Floc	2004	6	A	inlet	2	0-2	Zn	213.913
4B-A1 Floc LOI	2004	6	A	inlet	1	0-2	Zn	135.186
4B-A1 OM	2004	6	A	inlet	1	2-5	Zn	27.999
4B-A2 OM	2004	6	A	inlet	2	2-5	Zn	169.638
4A-B1 5-10	2004	6	B	middle	1	5-10	Zn	15.498
4A-B2 5-10	2004	6	B	middle	2	5-10	Zn	13.934
4A-B1 10-20	2004	6	B	middle	1	10-20	Zn	5.197
4A-B2 10-20	2004	6	B	middle	2	10-20	Zn	5.948
4A-B1 Floc	2004	6	B	middle	1	0-2	Zn	657.299
4A-B2 Floc	2004	6	B	middle	2	0-2	Zn	726.292
4A-B1 OM	2004	6	B	middle	1	2-5	Zn	268.997
4A-B2 OM	2004	6	B	middle	2	2-5	Zn	141.795
4B-B1 5-10	2004	6	B	middle	1	5-10	Zn	5.584
4B-B2 5-10	2004	6	B	middle	2	5-10	Zn	8.329
4B-B1 10-20	2004	6	B	middle	1	10-20	Zn	7.183
4B-B2 10-20	2004	6	B	middle	2	10-20	Zn	5.955
4B-B2 Floc	2004	6	B	middle	2	0-2	Zn	209.703
4B-B1 Floc	2004	6	B	middle	1	0-2	Zn	225.050
4B-B1 OM	2004	6	B	middle	1	2-5	Zn	82.562
4B-B2 OM	2004	6	B	middle	2	2-5	Zn	47.491
4A-C1 5-10	2004	6	C	middle	1	5-10	Zn	12.867
4A-C2 5-10	2004	6	C	middle	2	5-10	Zn	13.118
4A-C1 10-20	2004	6	C	middle	1	10-20	Zn	10.134
4A-C2-10-20	2004	6	C	middle	2	10-20	Zn	10.154
4A-C1 Floc	2004	6	C	middle	1	0-2	Zn	521.525
4A-C2 Floc	2004	6	C	middle	2	0-2	Zn	397.556
4A-C1 OM	2004	6	C	middle	1	2-5	Zn	125.575
4A-C2 OM	2004	6	C	middle	2	2-5	Zn	81.119
4B-C1 5-10	2004	6	C	middle	1	5-10	Zn	9.069
4B-C2 5-10	2004	6	C	middle	2	5-10	Zn	6.958
4B-C1 10-20	2004	6	C	middle	1	10-20	Zn	9.357
4B-C2 10-20	2004	6	C	middle	2	10-20	Zn	5.697
4B-C1 Floc	2004	6	C	middle	1	Floc	Zn	219.792
4B-C2 Floc missing	2004	6	C	middle	2	0-2	Zn	
4B-C1 OM	2004	6	C	middle	1	2-5	Zn	35.278
4B-C2 OM	2004	6	C	middle	2	2-5	Zn	60.766
4A-D1 5-10	2004	6	D	outlet	1	5-10	Zn	8.873
4A-D2 5-10	2004	6	D	outlet	2	5-10	Zn	10.852
4A-D1 10-20	2004	6	D	outlet	1	10-20	Zn	6.482
4A-D2 10-20	2004	6	D	outlet	2	10-20	Zn	10.669
4A-D1 Floc	2004	6	D	outlet	1	0-2	Zn	388.741
4A-D2 Floc	2004	6	D	outlet	2	0-2	Zn	451.094
4A-D1 OM	2004	6	D	outlet	1	2-5	Zn	211.941
4A-D2 OM	2004	6	D	outlet	2	2-5	Zn	97.043
4B-D1 5-10	2004	6	D	outlet	1	5-10	Zn	9.713

Appendix F. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4B-D2 5-10	2004	6	D	outlet	2	5-10	Zn	7.545
4B-D1 10-20	2004	6	D	outlet	1	10-20	Zn	13.509
4B-D2 10-20	2004	6	D	outlet	2	10-20	Zn	7.792
4B-D1 Floc	2004	6	D	outlet	1	0-2	Zn	318.053
4B-D2 Floc	2004	6	D	outlet	2	0-2	Zn	175.313
4B-D1 OM	2004	6	D	outlet	1	2-5	Zn	41.942
4B-D2 OM	2004	6	D	outlet	2	2-5	Zn	47.201
4A1-1A	2016	6	1	inlet	1	5-10	Zn	37.060
4A1-2A	2016	6	1	inlet	2	5-10	Zn	22.400
4A1-1B	2016	6	1	inlet	1	10-20	Zn	11.660
4A1-2B	2016	6	1	inlet	2	10-20	Zn	13.250
4A1-1F	2016	6	1	inlet	1	0-2	Zn	463.200
4A1-2F	2016	6	1	inlet	2	0-2	Zn	138.700
4B1-1A	2016	6	1	outlet	1	5-10	Zn	12.520
4B1-2A	2016	6	1	outlet	2	5-10	Zn	15.790
4B1-1B	2016	6	1	outlet	1	10-20	Zn	10.420
4B1-2B	2016	6	1	outlet	2	10-20	Zn	14.750
4B1-1F	2016	6	1	outlet	1	0-2	Zn	118.500
4B1-2F	2016	6	1	outlet	2	0-2	Zn	333.900
4A2-1A	2016	6	2	inlet	1	5-10	Zn	30.340
4A2-2A	2016	6	2	inlet	2	5-10	Zn	91.860
4A2-1B	2016	6	2	inlet	1	10-20	Zn	16.160
4A2-2B	2016	6	2	inlet	2	10-20	Zn	13.100
4A2-1F	2016	6	2	inlet	1	0-2	Zn	628.500
4A2-2F	2016	6	2	inlet	2	0-2	Zn	715.600
4B2-1A	2016	6	2	outlet	1	5-10	Zn	18.970
4B2-2A	2016	6	2	outlet	2	5-10	Zn	17.680
4B2-1B	2016	6	2	outlet	1	10-20	Zn	16.310
4B2-2B	2016	6	2	outlet	2	10-20	Zn	15.600
4B2-1F	2016	6	2	outlet	1	0-2	Zn	229.600
4B2-2F	2016	6	2	outlet	2	0-2	Zn	249.100
4A3-1A	2016	6	3	middle	1	5-10	Zn	13.400
4A3-2A	2016	6	3	middle	2	5-10	Zn	10.010
4A3-1B	2016	6	3	middle	1	10-20	Zn	12.810
4A3-2B	2016	6	3	middle	2	10-20	Zn	8.384
4A3-1F	2016	6	3	middle	1	0-2	Zn	307.700
4A3-2F	2016	6	3	middle	2	0-2	Zn	324.800
4B3-1A	2016	6	3	middle	1	5-10	Zn	18.550
4B3-2A	2016	6	3	middle	2	5-10	Zn	5.520
4B3-1B	2016	6	3	middle	1	10-20	Zn	13.860
4B3-2B	2016	6	3	middle	2	10-20	Zn	44.330
4B3-1F	2016	6	3	middle	1	0-2	Zn	287.900
4B3-2F	2016	6	3	middle	2	0-2	Zn	338.800
4A4-1A	2016	6	4	middle	1	5-10	Zn	18.690
4A4-2A	2016	6	4	middle	2	5-10	Zn	17.610
4A4-1B	2016	6	4	middle	1	10-20	Zn	19.040
4A4-2B	2016	6	4	middle	2	10-20	Zn	18.790
4A4-1F	2016	6	4	middle	1	0-2	Zn	749.100
4A4-2F	2016	6	4	middle	2	0-2	Zn	645.400
4B4-1A	2016	6	4	middle	1	5-10	Zn	19.620
4B4-2A	2016	6	4	middle	2	5-10	Zn	14.180
4B4-1B	2016	6	4	middle	1	10-20	Zn	16.420
4B4-2B	2016	6	4	middle	2	10-20	Zn	19.990
4B4-1F	2016	6	4	middle	1	0-2	Zn	329.600
4B4-2F	2016	6	4	middle	2	0-2	Zn	327.200
4A5-1A	2016	6	5	outlet	1	5-10	Zn	46.720
4A5-2A	2016	6	5	outlet	2	5-10	Zn	22.230

Appendix F. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A5-1B	2016	6	5	outlet	1	10-20	Zn	12.200
4A5-2B	2016	6	5	outlet	2	10-20	Zn	12.960
4A5-1F	2016	6	5	outlet	1	0-2	Zn	289.600
4A5-2F	2016	6	5	outlet	2	0-2	Zn	158.400
4B5-1A	2016	6	5	inlet	1	5-10	Zn	24.440
4B5-2A	2016	6	5	inlet	2	5-10	Zn	21.400
4B5-1B	2016	6	5	inlet	1	10-20	Zn	17.530
4B5-2B	2016	6	5	inlet	2	10-20	Zn	15.700
4B5-1F	2016	6	5	inlet	1	0-2	Zn	303.400
4B5-2F	2016	6	5	inlet	2	0-2	Zn	360.600
4A6-1A	2016	6	6	outlet	1	5-10	Zn	26.880
4A6-2A	2016	6	6	outlet	2	5-10	Zn	20.190
4A6-1B	2016	6	6	outlet	1	10-20	Zn	13.420
4A6-2B	2016	6	6	outlet	2	10-20	Zn	7.344
4A6-1F	2016	6	6	outlet	1	0-2	Zn	640.000
4A6-2F	2016	6	6	outlet	2	0-2	Zn	507.200
4B6-1A	2016	6	6	inlet	1	5-10	Zn	13.500
4B6-2A	2016	6	6	inlet	2	5-10	Zn	24.000
4B6-1B	2016	6	6	inlet	1	10-20	Zn	8.292
4B6-2B	2016	6	6	inlet	2	10-20	Zn	9.022
4B6-1F	2016	6	6	inlet	1	0-2	Zn	343.300
4B6-2F	2016	6	6	inlet	2	0-2	Zn	449.900
A-01 4A A1+A2	2020	7	A	inlet	1	0-2	Zn	179.584
4A-A1-INORG1	2020	7	A	inlet	1	5-10	Zn	28.154
4A-A1-INORG1 DUPLICATE	2020	7	A	inlet	1	5-10	Zn	29.084
4A-A2-INORG1	2020	7	A	inlet	2	5-10	Zn	18.808
4A-A1-INORG2	2020	7	A	inlet	1	10-20	Zn	10.510
4A-A2-INORG2	2020	7	A	inlet	2	10-20	Zn	12.497
4A-A1-OM	2020	7	A	inlet	1	2-5	Zn	272.298
4A-A2-OM	2020	7	A	inlet	2	2-5	Zn	23.427
A-01 4B A1+A2	2020	7	A	inlet	1	0-2	Zn	188.231
4B-A1-INORG1	2020	7	A	inlet	1	5-10	Zn	6.230
4B-A2-INORG1	2020	7	A	inlet	2	5-10	Zn	8.066
4B-A1-INORG2	2020	7	A	inlet	1	10-20	Zn	6.767
4B-A2-INORG2	2020	7	A	inlet	2	10-20	Zn	14.204
4B-A1-OM	2020	7	A	inlet	1	2-5	Zn	31.519
4B-A2-OM	2020	7	A	inlet	2	2-5	Zn	33.420
A-01 4A B1+B2	2020	7	B	middle	1	0-2	Zn	106.521
A-01 4A B1+B2 DUPLICATE	2020	7	B	middle	1	0-2	Zn	85.927
4A-B1-INORG1	2020	7	B	middle	1	5-10	Zn	11.050
4A-B1-INORG1 DUPLICATE	2020	7	B	middle	1	5-10	Zn	9.930
4A-B2-INORG1	2020	7	B	middle	2	5-10	Zn	13.731
4A-B1-INORG2	2020	7	B	middle	1	10-20	Zn	9.321
4A-B2-INORG2	2020	7	B	middle	2	10-20	Zn	11.282
4A-B1-OM	2020	7	B	middle	1	2-5	Zn	23.811
4A-B2-OM	2020	7	B	middle	2	2-5	Zn	41.553
A-01 4B B1+B2	2020	7	B	middle	1	0-2	Zn	461.519
4B-B1-INORG1	2020	7	B	middle	1	5-10	Zn	10.097
4B-B2-INORG1	2020	7	B	middle	2	5-10	Zn	12.844
4B-B1-INORG2	2020	7	B	middle	1	10-20	Zn	14.250
4B-B2-INORG2	2020	7	B	middle	2	10-20	Zn	3.451
4B-B2-INORG2 DUPLICATE	2020	7	B	middle	2	10-20	Zn	9.989
4B-B1-OM	2020	7	B	middle	1	2-5	Zn	21.620
4B-B2-OM	2020	7	B	middle	2	2-5	Zn	67.446
A-01 4A C1+C2	2020	7	C	middle	1	0-2	Zn	271.264
4A-C1-INORG1	2020	7	C	middle	1	5-10	Zn	7.922
4A-C2-INORG1	2020	7	C	middle	2	5-10	Zn	6.975

Appendix F. continued

Sample ID	Year	Month	Cell Quarters	Location within cell	Replicate	Sediment depth (cm)	Element	Concentration (mg/kg)
4A-C1-INORG2	2020	7	C	middle	1	10-20	Zn	11.199
4A-C2-INORG2	2020	7	C	middle	2	10-20	Zn	8.333
4A-C1-OM	2020	7	C	middle	1	2-5	Zn	49.895
4A-C2-OM	2020	7	C	middle	2	2-5	Zn	19.263
A-01 4B C1+C2	2020	7	C	middle	1	0-2	Zn	405.856
4B-C1-INORG1	2020	7	C	middle	1	5-10	Zn	17.650
4B-C2-INORG1	2020	7	C	middle	2	5-10	Zn	6.609
4B-C1-INORG2	2020	7	C	middle	1	10-20	Zn	12.899
4B-C2-INORG2	2020	7	C	middle	2	10-20	Zn	3.506
4B-C1-OM	2020	7	C	middle	1	2-5	Zn	90.255
4B-C2-OM	2020	7	C	middle	2	2-5	Zn	50.501
A-01 4A D1+D2	2020	7	D	outlet	1	0-2	Zn	62.724
4A-D1-INORG1	2020	7	D	outlet	1	5-10	Zn	8.062
4A-D2-INORG1	2020	7	D	outlet	2	5-10	Zn	8.767
4A-D1-INORG2	2020	7	D	outlet	1	10-20	Zn	12.746
4A-D2-INORG2	2020	7	D	outlet	2	10-20	Zn	9.372
4A-D1-OM	2020	7	D	outlet	1	2-5	Zn	17.496
4A-D2-OM	2020	7	D	outlet	2	2-5	Zn	10.398
A-01 4B D1+D2	2020	7	D	outlet	1	floc	Zn	83.754
4B-D1-INORG1	2020	7	D	outlet	1	5-10	Zn	11.975
4B-D2-INORG1	2020	7	D	outlet	2	5-10	Zn	7.940
4B-D1-INORG2	2020	7	D	outlet	1	10-20	Zn	6.718
4B-D2-INORG2	2020	7	D	outlet	2	10-20	Zn	5.944
4B-D2-INORG2 DUPLICATE	2020	7	D	outlet	2	10-20	Zn	10.185
4B-D1-OM	2020	7	D	outlet	1	2-5	Zn	19.625
4B-D1-OM DUPLICATE	2020	7	D	outlet	1	2-5	Zn	20.782
4B-D2-OM	2020	7	D	outlet	2	2-5	Zn	34.969

Appendix G. Copper concentrations in wetland sediment pore water

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
9/8/2004	2004	8	A1 4A A1 5-10	4A A1	A cell	5-10	Cu	filtered	3.093
9/8/2004	2004	8	A1 4A A1 10-20	4A A1	A cell	10-20	Cu	filtered	2.685
9/8/2004	2004	8	A1 4A A1 OM	4A A1	A cell	2-5	Cu	filtered	69.83
9/8/2004	2004	8	A1 4A B1 5-10	4A B1	A cell	5-10	Cu	filtered	30.33
9/8/2004	2004	8	A1 4A B1 10-20	4A B1	A cell	10-20	Cu	filtered	4.616
9/8/2004	2004	8	A1 4A B1 OM	4A B1	A cell	2-5	Cu	filtered	64.62
9/8/2004	2004	8	A1 4A C1 5-10	4A C1	A cell	5-10	Cu	filtered	47.58
9/8/2004	2004	8	A1 4A C1 10-20	4A C1	A cell	10-20	Cu	filtered	7.102
9/8/2004	2004	8	A1 4A C1 OM	4A C1	A cell	2-5	Cu	filtered	28.95
9/8/2004	2004	8	A1 4A D1 5-10	4A D1	A cell	5-10	Cu	filtered	8.125
9/8/2004	2004	8	A1 4A D1 10-20	4A D1	A cell	10-20	Cu	filtered	4.284
9/8/2004	2004	8	A1 4A D1 OM	4A D1	A cell	2-5	Cu	filtered	11.74
9/8/2004	2004	8	A1 4B B1 OM	4B B1	B cell	2-5	Cu	filtered	22.36
9/8/2004	2004	8	A1 4B C1 5-10	4B C1	B cell	5-10	Cu	filtered	11.46
9/8/2004	2004	8	A1 4B C1 10-20	4B C1	B cell	10-20	Cu	filtered	31.91
9/8/2004	2004	8	A1 4B C1 OM	4B C1	B cell	2-5	Cu	filtered	20.01
9/8/2004	2004	8	A1 4B C2 OM	4B C2	B cell	2-5	Cu	filtered	10.2
9/8/2004	2004	8	4B A1 5-10	4B A1	B cell	5-10	Cu	filtered	4.786
9/8/2004	2004	8	4B A1 10-20	4B A1	B cell	10-20	Cu	filtered	8.819
9/8/2004	2004	8	4B A1 OM	4B A1	B cell	2-5	Cu	filtered	8.333
9/8/2004	2004	8	4B B2 OM	4B B2	B cell	2-5	Cu	filtered	12.11
9/8/2004	2004	8	4B D1 5-10	4B D1	B cell	5-10	Cu	filtered	4.718
9/8/2004	2004	8	4B D1 10-20	4B D1	B cell	10-20	Cu	filtered	15.91
9/8/2004	2004	8	4B D1 OM	4B D1	B cell	2-5	Cu	filtered	10.23
9/8/2004	2004	8	4B D2 OM	4B D2	B cell	2-5	Cu	filtered	14.18
7/28/2016	2016	7	PW-4A-1A-LA	4A-1A	A cell	5-10	Cu	filtered	0.637
7/28/2016	2016	7	PW-4A-1A-LB	4A-1A	A cell	10-20	Cu	filtered	0.597
7/28/2016	2016	7	PW-4A-1B-LA	4A-1B	A cell	5-10	Cu	filtered	1.466
7/28/2016	2016	7	PW-4A-1B-LB	4A-1B	A cell	10-20	Cu	filtered	5.308
7/28/2016	2016	7	PW-4A-2A-LA	4A-2A	A cell	5-10	Cu	filtered	9.742
7/28/2016	2016	7	PW-4A-2A-LB	4A-2A	A cell	10-20	Cu	filtered	3.536
7/28/2016	2016	7	PW-4A-2B-LA	4A-2B	A cell	5-10	Cu	filtered	5.601
7/28/2016	2016	7	PW-4A-2B-LB	4A-2B	A cell	10-20	Cu	filtered	0.624
7/28/2016	2016	7	PW-4A-3A-LA	4A-3A	A cell	5-10	Cu	filtered	8.111
7/28/2016	2016	7	PW-4A-3A-LB	4A-3A	A cell	10-20	Cu	filtered	5.864
7/28/2016	2016	7	PW-4A-3B-LA	4A-3B	A cell	5-10	Cu	filtered	5.625
7/28/2016	2016	7	PW-4A-3B-LB	4A-3B	A cell	10-20	Cu	filtered	4.343
7/28/2016	2016	7	PW-4A-4A-LA	4A-4A	A cell	5-10	Cu	filtered	35.92
7/28/2016	2016	7	PW-4A-4A-LB	4A-4A	A cell	10-20	Cu	filtered	3.396
7/28/2016	2016	7	PW-4A-4B-LA	4A-4B	A cell	5-10	Cu	filtered	34.29
7/28/2016	2016	7	PW-4A-4B-LB	4A-4B	A cell	10-20	Cu	filtered	0.029
7/28/2016	2016	7	PW-4A-5A-LA	4A-5A	A cell	5-10	Cu	filtered	2.42
7/28/2016	2016	7	PW-4A-5A-LB	4A-5A	A cell	10-20	Cu	filtered	0.087
7/28/2016	2016	7	PW-4A-5B-LB	4A-5B	A cell	10-20	Cu	filtered	0.373
7/28/2016	2016	7	PW-4A-6A-LA	4A-6A	A cell	5-10	Cu	filtered	4.274
7/28/2016	2016	7	PW-4A-6A-LB	4A-6A	A cell	10-20	Cu	filtered	0.895
7/28/2016	2016	7	PW-4A-6B-LA	4A-6B	A cell	5-10	Cu	filtered	30.35
7/28/2016	2016	7	PW-4A-6B-LB	4A-6B	A cell	10-20	Cu	filtered	1.82
7/28/2016	2016	7	PW-4B-2-LA	4B-2A	B cell	5-10	Cu	filtered	12.29
7/28/2016	2016	7	PW-4B-2-LB	4B-2A	B cell	10-20	Cu	filtered	1.463
7/28/2016	2016	7	PW-4B-3A-LA	4B-3A	B cell	5-10	Cu	filtered	2.354
7/28/2016	2016	7	PW-4B-3A-LB	4B-3A	B cell	10-20	Cu	filtered	0.164
7/28/2016	2016	7	PW-4B-3B-LA	4B-3B	B cell	5-10	Cu	filtered	0.383
7/28/2016	2016	7	PW-4B-3B-LB	4B-3B	B cell	10-20	Cu	filtered	1.244
7/28/2016	2016	7	PW-4B-4-LA	4B-4A	B cell	5-10	Cu	filtered	2.149
7/28/2016	2016	7	PW-4B-4-LB	4B-4A	B cell	10-20	Cu	filtered	1.192

Appendix G. continued

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
7/28/2016	2016	7	PW-4B-5A-LA	4B-5A	B cell	5-10	Cu	filtered	2.54
7/28/2016	2016	7	PW-4B-5A-LB	4B-5A	B cell	10-20	Cu	filtered	1.108
7/28/2016	2016	7	PW-4B-5B-LA	4B-5B	B cell	5-10	Cu	filtered	6.591
7/28/2016	2016	7	PW-4B-5B-LB	4B-5B	B cell	10-20	Cu	filtered	1.235
9/23/2020	2020	9	4A-A-1-OH	4A A1	A cell	2-5	Cu	filtered	8.888
9/23/2020	2020	9	4A-A-2-IN1	4A A2	A cell	5-10	Cu	filtered	13.536
9/23/2020	2020	9	4A-A-2-OH	4A A2	A cell	2-5	Cu	filtered	6.829
9/23/2020	2020	9	4A-B-1-OH	4A B1	A cell	2-5	Cu	filtered	6.051
9/23/2020	2020	9	4A-B-2-IN1	4A B2	A cell	5-10	Cu	filtered	3.093
9/23/2020	2020	9	4A-B-2-IN2	4A B2	A cell	10-20	Cu	filtered	1.058
9/23/2020	2020	9	4A-B-2-OH	4A B2	A cell	2-5	Cu	filtered	5.151
9/23/2020	2020	9	4A-C-1-IN1	4A C1	A cell	5-10	Cu	filtered	8.783
9/23/2020	2020	9	4A-C-1-IN2	4A C1	A cell	10-20	Cu	filtered	0.287
9/23/2020	2020	9	4A-C-1-OH	4A C1	A cell	2-5	Cu	filtered	0.887
9/23/2020	2020	9	4A-C-2-OH	4A C2	A cell	2-5	Cu	filtered	3.840
9/23/2020	2020	9	4A-D-1-OH	4A D1	A cell	2-5	Cu	filtered	3.979
9/23/2020	2020	9	4A-D-2-IN1	4A D2	A cell	5-10	Cu	filtered	0.429
9/23/2020	2020	9	4A-D-2-IN2	4A D2	A cell	10-20	Cu	filtered	0.345
9/23/2020	2020	9	4A-D-2-OH	4A D2	A cell	2-5	Cu	filtered	2.289
9/23/2020	2020	9	4B-A-1-OH	4B A1	B cell	2-5	Cu	filtered	3.516
9/23/2020	2020	9	4B-A-2-IN1	4B A2	B cell	5-10	Cu	filtered	16.690
9/23/2020	2020	9	4B-A-2-IN2	4B A2	B cell	10-20	Cu	filtered	0.958
9/23/2020	2020	9	4B-A-2-OH	4B A2	B cell	2-5	Cu	filtered	6.702
9/23/2020	2020	9	4B-B-1-IN2	4B B1	B cell	10-20	Cu	filtered	0.201
9/23/2020	2020	9	4B-B-1-OH	4B B1	B cell	2-5	Cu	filtered	2.173
9/23/2020	2020	9	4B-B-2-IN1	4B B2	B cell	5-10	Cu	filtered	0.446
9/23/2020	2020	9	4B-B-2-OH	4B B2	B cell	2-5	Cu	filtered	3.217
9/23/2020	2020	9	4B-C-1-IN1	4B C1	B cell	5-10	Cu	filtered	0.947
9/23/2020	2020	9	4B-C-1-IN2	4B C1	B cell	10-20	Cu	filtered	0.260
9/23/2020	2020	9	4B-C-1-OH	4B C1	B cell	2-5	Cu	filtered	1.805
9/23/2020	2020	9	4B-C-2-OH	4B C2	B cell	2-5	Cu	filtered	4.480
9/23/2020	2020	9	4B-D-1-IN2	4B D1	B cell	10-20	Cu	filtered	0.258
9/23/2020	2020	9	4B-D-1-OH	4B D1	B cell	2-5	Cu	filtered	2.850
9/23/2020	2020	9	4B-D-2-IN1	4B D2	B cell	5-10	Cu	filtered	0.195
9/23/2020	2020	9	4B-D-2-OH	4B D2	B cell	2-5	Cu	filtered	0.731

Appendix H. Lead concentrations in wetland sediment pore water (raw data).

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (μg/L)
9/8/2004	2004	8	A1 4A D1 5-10	4A D1	A cell	5-10	Pb	filtered	11.29
9/8/2004	2004	8	A1 4A D1 10-20	4A D1	A cell	10-20	Pb	filtered	3.239
9/8/2004	2004	8	A1 4A D1 OM	4A D1	A cell	2-5	Pb	filtered	1.23
9/8/2004	2004	8	A1 4A A1 5-10	4A A1	A cell	5-10	Pb	filtered	2.084
9/8/2004	2004	8	A1 4A A1 10-20	4A A1	A cell	10-20	Pb	filtered	0.991
9/8/2004	2004	8	A1 4A A1 OM	4A A1	A cell	2-5	Pb	filtered	1.095
9/8/2004	2004	8	A1 4A B1 5-10	4A B1	A cell	5-10	Pb	filtered	15.75
9/8/2004	2004	8	A1 4A C1 5-10	4A C1	A cell	5-10	Pb	filtered	52.95
9/8/2004	2004	8	A1 4A B1 10-20	4A B1	A cell	10-20	Pb	filtered	1.653
9/8/2004	2004	8	A1 4A C1 10-20	4A C1	A cell	10-20	Pb	filtered	5.374
9/8/2004	2004	8	A1 4A B1 OM	4A B1	A cell	2-5	Pb	filtered	2.538
9/8/2004	2004	8	A1 4A C1 OM	4A C1	A cell	2-5	Pb	filtered	1.192
9/8/2004	2004	8	4B A1 5-10	4B A1	B cell	5-10	Pb	filtered	1.404
9/8/2004	2004	8	4B A1 10-20	4B A1	B cell	10-20	Pb	filtered	2.961
9/8/2004	2004	8	4B A1 OM	4B A1	B cell	2-5	Pb	filtered	5.206
9/8/2004	2004	8	A1 4B C1 5-10	4B C1	B cell	5-10	Pb	filtered	5.077
9/8/2004	2004	8	A1 4B C1 10-20	4B C1	B cell	10-20	Pb	filtered	6.252
9/8/2004	2004	8	A1 4B B1 OM	4B B1	B cell	2-5	Pb	filtered	0.914
9/8/2004	2004	8	A1 4B C1 OM	4B C1	B cell	2-5	Pb	filtered	4.574
9/8/2004	2004	8	A1 4B C2 OM	4B C2	B cell	2-5	Pb	filtered	-0.549
9/8/2004	2004	8	4B B2 OM	4B B2	B cell	2-5	Pb	filtered	28.44
9/8/2004	2004	8	4B D1 5-10	4B D1	B cell	5-10	Pb	filtered	0.604
9/8/2004	2004	8	4B D1 10-20	4B D1	B cell	10-20	Pb	filtered	1.433
9/8/2004	2004	8	4B D1 OM	4B D1	B cell	2-5	Pb	filtered	0.755
9/8/2004	2004	8	4B D2 OM	4B D2	B cell	2-5	Pb	filtered	44.1
7/28/2016	2016	7	PW-4A-1A-LA	4A-1A	A cell	5-10	Pb	filtered	0.147
7/28/2016	2016	7	PW-4A-1B-LA	4A-1B	A cell	5-10	Pb	filtered	0.052
7/28/2016	2016	7	PW-4A-2A-LA	4A-2A	A cell	5-10	Pb	filtered	2.278
7/28/2016	2016	7	PW-4A-2B-LA	4A-2B	A cell	5-10	Pb	filtered	2.847
7/28/2016	2016	7	PW-4A-1A-LB	4A-1A	A cell	10-20	Pb	filtered	0.082
7/28/2016	2016	7	PW-4A-1B-LB	4A-1B	A cell	10-20	Pb	filtered	1.263
7/28/2016	2016	7	PW-4A-2A-LB	4A-2A	A cell	10-20	Pb	filtered	2.578
7/28/2016	2016	7	PW-4A-2B-LB	4A-2B	A cell	10-20	Pb	filtered	0.375
7/28/2016	2016	7	PW-4A-3A-LA	4A-3A	A cell	5-10	Pb	filtered	5.342
7/28/2016	2016	7	PW-4A-3B-LA	4A-3B	A cell	5-10	Pb	filtered	2.675
7/28/2016	2016	7	PW-4A-4A-LA	4A-4A	A cell	5-10	Pb	filtered	6.328
7/28/2016	2016	7	PW-4A-4B-LA	4A-4B	A cell	5-10	Pb	filtered	9.212
7/28/2016	2016	7	PW-4A-3A-LB	4A-3A	A cell	10-20	Pb	filtered	7.181
7/28/2016	2016	7	PW-4A-3B-LB	4A-3B	A cell	10-20	Pb	filtered	4.676
7/28/2016	2016	7	PW-4A-4A-LB	4A-4A	A cell	10-20	Pb	filtered	0.738
7/28/2016	2016	7	PW-4A-4B-LB	4A-4B	A cell	10-20	Pb	filtered	0.012
7/28/2016	2016	7	PW-4A-5A-LA	4A-5A	A cell	5-10	Pb	filtered	1.312
7/28/2016	2016	7	PW-4A-6A-LA	4A-6A	A cell	5-10	Pb	filtered	0.535
7/28/2016	2016	7	PW-4A-6B-LA	4A-6B	A cell	5-10	Pb	filtered	24.62
7/28/2016	2016	7	PW-4A-5A-LB	4A-5A	A cell	10-20	Pb	filtered	0.201
7/28/2016	2016	7	PW-4A-5B-LB	4A-5B	A cell	10-20	Pb	filtered	0.316
7/28/2016	2016	7	PW-4A-6A-LB	4A-6A	A cell	10-20	Pb	filtered	0.136
7/28/2016	2016	7	PW-4A-6B-LB	4A-6B	A cell	10-20	Pb	filtered	0.793
7/28/2016	2016	7	PW-4B-5A-LA	4B-5A	B cell	5-10	Pb	filtered	0.507
7/28/2016	2016	7	PW-4B-5B-LA	4B-5B	B cell	5-10	Pb	filtered	3.312
7/28/2016	2016	7	PW-4B-5A-LB	4B-5A	B cell	10-20	Pb	filtered	0.067
7/28/2016	2016	7	PW-4B-5B-LB	4B-5B	B cell	10-20	Pb	filtered	0.197
7/28/2016	2016	7	PW-4B-3A-LA	4B-3A	B cell	5-10	Pb	filtered	0.077
7/28/2016	2016	7	PW-4B-3B-LA	4B-3B	B cell	5-10	Pb	filtered	0.095
7/28/2016	2016	7	PW-4B-4-LA	4B-4A	B cell	5-10	Pb	filtered	0.073
7/28/2016	2016	7	PW-4B-3A-LB	4B-3A	B cell	10-20	Pb	filtered	0.047

Appendix H. continued

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
7/28/2016	2016	7	PW-4B-3B-LB	4B-3B	B cell	10-20	Pb	filtered	0.04
7/28/2016	2016	7	PW-4B-4-LB	4B-4A	B cell	10-20	Pb	filtered	0.026
7/28/2016	2016	7	PW-4B-2-LA	4B-2A	B cell	5-10	Pb	filtered	0.078
7/28/2016	2016	7	PW-4B-2-LB	4B-2A	B cell	10-20	Pb	filtered	0.096
9/23/2020	2020	9	4A-A-2-IN1	4A A2	A cell	5-10	Pb	filtered	1.654
9/23/2020	2020	9	4A-B-2-IN1	4A B2	A cell	5-10	Pb	filtered	1.354
9/23/2020	2020	9	4A-C-1-IN1	4A C1	A cell	5-10	Pb	filtered	6.676
9/23/2020	2020	9	4A-D-2-IN1	4A D2	A cell	5-10	Pb	filtered	0.189
9/23/2020	2020	9	4A-B-2-IN2	4A B2	A cell	10-20	Pb	filtered	0.760
9/23/2020	2020	9	4A-C-1-IN2	4A C1	A cell	10-20	Pb	filtered	0.093
9/23/2020	2020	9	4A-D-2-IN2	4A D2	A cell	10-20	Pb	filtered	0.084
9/23/2020	2020	9	4A-A-1-OH	4A A1	A cell	2-5	Pb	filtered	0.821
9/23/2020	2020	9	4A-A-2-OH	4A A2	A cell	2-5	Pb	filtered	0.482
9/23/2020	2020	9	4A-B-1-OH	4A B1	A cell	2-5	Pb	filtered	0.783
9/23/2020	2020	9	4A-B-2-OH	4A B2	A cell	2-5	Pb	filtered	0.643
9/23/2020	2020	9	4A-C-1-OH	4A C1	A cell	2-5	Pb	filtered	0.183
9/23/2020	2020	9	4A-C-2-OH	4A C2	A cell	2-5	Pb	filtered	1.446
9/23/2020	2020	9	4A-D-1-OH	4A D1	A cell	2-5	Pb	filtered	1.174
9/23/2020	2020	9	4A-D-2-OH	4A D2	A cell	2-5	Pb	filtered	1.163
9/23/2020	2020	9	4B-A-2-IN1	4B A2	B cell	5-10	Pb	filtered	3.182
9/23/2020	2020	9	4B-B-2-IN1	4B B2	B cell	5-10	Pb	filtered	0.088
9/23/2020	2020	9	4B-C-1-IN1	4B C1	B cell	5-10	Pb	filtered	0.221
9/23/2020	2020	9	4B-D-2-IN1	4B D2	B cell	5-10	Pb	filtered	<MDL
9/23/2020	2020	9	4B-A-2-IN2	4B A2	B cell	10-20	Pb	filtered	0.077
9/23/2020	2020	9	4B-B-1-IN2	4B B1	B cell	10-20	Pb	filtered	<MDL
9/23/2020	2020	9	4B-C-1-IN2	4B C1	B cell	10-20	Pb	filtered	<MDL
9/23/2020	2020	9	4B-D-1-IN2	4B D1	B cell	10-20	Pb	filtered	<MDL
9/23/2020	2020	9	4B-A-1-OH	4B A1	B cell	2-5	Pb	filtered	0.653
9/23/2020	2020	9	4B-A-2-OH	4B A2	B cell	2-5	Pb	filtered	1.468
9/23/2020	2020	9	4B-B-1-OH	4B B1	B cell	2-5	Pb	filtered	0.183
9/23/2020	2020	9	4B-B-2-OH	4B B2	B cell	2-5	Pb	filtered	0.144
9/23/2020	2020	9	4B-C-1-OH	4B C1	B cell	2-5	Pb	filtered	0.234
9/23/2020	2020	9	4B-C-2-OH	4B C2	B cell	2-5	Pb	filtered	0.691
9/23/2020	2020	9	4B-D-1-OH	4B D1	B cell	2-5	Pb	filtered	0.429
9/23/2020	2020	9	4B-D-2-OH	4B D2	B cell	2-5	Pb	filtered	0.103

Appendix I. Zinc concentrations in wetland sediment pore water (raw data).

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
9/8/2004	2004	8	A1 4A D1 5-10	4A D1	A cell	5-10	Zn	filtered	1572.000
9/8/2004	2004	8	A1 4A D1 10-20	4A D1	A cell	10-20	Zn	filtered	17.060
9/8/2004	2004	8	A1 4A D1 OM	4A D1	A cell	2-5	Zn	filtered	602.800
9/8/2004	2004	8	A1 4A A1 5-10	4A A1	A cell	5-10	Zn	filtered	77.620
9/8/2004	2004	8	A1 4A A1 10-20	4A A1	A cell	10-20	Zn	filtered	43.260
9/8/2004	2004	8	A1 4A A1 OM	4A A1	A cell	2-5	Zn	filtered	2127.000
9/8/2004	2004	8	A1 4A B1 5-10	4A B1	A cell	5-10	Zn	filtered	1966.000
9/8/2004	2004	8	A1 4A C1 5-10	4A C1	A cell	5-10	Zn	filtered	5821.000
9/8/2004	2004	8	A1 4A B1 10-20	4A B1	A cell	10-20	Zn	filtered	84.770
9/8/2004	2004	8	A1 4A C1 10-20	4A C1	A cell	10-20	Zn	filtered	1330.000
9/8/2004	2004	8	A1 4A B1 OM	4A B1	A cell	2-5	Zn	filtered	3411.000
9/8/2004	2004	8	A1 4A C1 OM	4A C1	A cell	2-5	Zn	filtered	935.600
9/8/2004	2004	8	4B A1 5-10	4B A1	B cell	5-10	Zn	filtered	152.800
9/8/2004	2004	8	4B A1 10-20	4B A1	B cell	10-20	Zn	filtered	77.050
9/8/2004	2004	8	4B A1 OM	4B A1	B cell	2-5	Zn	filtered	40.840
9/8/2004	2004	8	A1 4B C1 5-10	4B C1	B cell	5-10	Zn	filtered	50.000
9/8/2004	2004	8	A1 4B C1 10-20	4B C1	B cell	10-20	Zn	filtered	5404.000
9/8/2004	2004	8	A1 4B B1 OM	4B B1	B cell	2-5	Zn	filtered	133.100
9/8/2004	2004	8	A1 4B C1 OM	4B C1	B cell	2-5	Zn	filtered	616.400
9/8/2004	2004	8	A1 4B C2 OM	4B C2	B cell	2-5	Zn	filtered	144.800
9/8/2004	2004	8	4B B2 OM	4B B2	B cell	2-5	Zn	filtered	938.200
9/8/2004	2004	8	4B D1 5-10	4B D1	B cell	5-10	Zn	filtered	27.460
9/8/2004	2004	8	4B D1 10-20	4B D1	B cell	10-20	Zn	filtered	419.100
9/8/2004	2004	8	4B D1 OM	4B D1	B cell	2-5	Zn	filtered	77.090
9/8/2004	2004	8	4B D2 OM	4B D2	B cell	2-5	Zn	filtered	2801.000
7/28/2016	2016	7	PW-4A-1A-LA	4A-1A	A cell	5-10	Zn	filtered	71.070
7/28/2016	2016	7	PW-4A-1B-LA	4A-1B	A cell	5-10	Zn	filtered	70.520
7/28/2016	2016	7	PW-4A-2A-LA	4A-2A	A cell	5-10	Zn	filtered	47.240
7/28/2016	2016	7	PW-4A-2B-LA	4A-2B	A cell	5-10	Zn	filtered	55.970
7/28/2016	2016	7	PW-4A-1A-LB	4A-1A	A cell	10-20	Zn	filtered	58.350
7/28/2016	2016	7	PW-4A-1B-LB	4A-1B	A cell	10-20	Zn	filtered	111.200
7/28/2016	2016	7	PW-4A-2A-LB	4A-2A	A cell	10-20	Zn	filtered	60.270
7/28/2016	2016	7	PW-4A-2B-LB	4A-2B	A cell	10-20	Zn	filtered	61.000
7/28/2016	2016	7	PW-4A-3A-LA	4A-3A	A cell	5-10	Zn	filtered	59.160
7/28/2016	2016	7	PW-4A-3B-LA	4A-3B	A cell	5-10	Zn	filtered	51.480
7/28/2016	2016	7	PW-4A-4A-LA	4A-4A	A cell	5-10	Zn	filtered	138.900
7/28/2016	2016	7	PW-4A-4B-LA	4A-4B	A cell	5-10	Zn	filtered	60.740
7/28/2016	2016	7	PW-4A-3A-LB	4A-3A	A cell	10-20	Zn	filtered	131.300
7/28/2016	2016	7	PW-4A-3B-LB	4A-3B	A cell	10-20	Zn	filtered	99.780
7/28/2016	2016	7	PW-4A-4A-LB	4A-4A	A cell	10-20	Zn	filtered	76.680
7/28/2016	2016	7	PW-4A-4B-LB	4A-4B	A cell	10-20	Zn	filtered	66.680
7/28/2016	2016	7	PW-4A-5A-LA	4A-5A	A cell	5-10	Zn	filtered	33.010
7/28/2016	2016	7	PW-4A-6A-LA	4A-6A	A cell	5-10	Zn	filtered	51.350
7/28/2016	2016	7	PW-4A-6B-LA	4A-6B	A cell	5-10	Zn	filtered	89.920
7/28/2016	2016	7	PW-4A-5A-LB	4A-5A	A cell	10-20	Zn	filtered	79.800
7/28/2016	2016	7	PW-4A-5B-LB	4A-5B	A cell	10-20	Zn	filtered	109.000
7/28/2016	2016	7	PW-4A-6A-LB	4A-6A	A cell	10-20	Zn	filtered	53.280
7/28/2016	2016	7	PW-4A-6B-LB	4A-6B	A cell	10-20	Zn	filtered	45.040
7/28/2016	2016	7	PW-4B-5A-LA	4B-5A	B cell	5-10	Zn	filtered	79.990
7/28/2016	2016	7	PW-4B-5B-LA	4B-5B	B cell	5-10	Zn	filtered	60.610
7/28/2016	2016	7	PW-4B-5A-LB	4B-5A	B cell	10-20	Zn	filtered	86.550

Appendix I. continued

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
7/28/2016	2016	7	PW-4B-5B-LB	4B-5B	B cell	10-20	Zn	filtered	76.660
7/28/2016	2016	7	PW-4B-3A-LA	4B-3A	B cell	5-10	Zn	filtered	78.950
7/28/2016	2016	7	PW-4B-3B-LA	4B-3B	B cell	5-10	Zn	filtered	92.550
7/28/2016	2016	7	PW-4B-4-LA	4B-4A	B cell	5-10	Zn	filtered	58.210
7/28/2016	2016	7	PW-4B-3A-LB	4B-3A	B cell	10-20	Zn	filtered	106.000
7/28/2016	2016	7	PW-4B-3B-LB	4B-3B	B cell	10-20	Zn	filtered	55.940
7/28/2016	2016	7	PW-4B-4-LB	4B-4A	B cell	10-20	Zn	filtered	56.510
7/28/2016	2016	7	PW-4B-2-LA	4B-2A	B cell	5-10	Zn	filtered	61.210
7/28/2016	2016	7	PW-4B-2-LB	4B-2A	B cell	10-20	Zn	filtered	66.670
9/23/2020	2020	9	4A-A-2-IN1	4A A2	A cell	5-10	Zn	filtered	17.022
9/23/2020	2020	9	4A-B-2-IN1	4A B2	A cell	5-10	Zn	filtered	5.173
9/23/2020	2020	9	4A-C-1-IN1	4A C1	A cell	5-10	Zn	filtered	22.624
9/23/2020	2020	9	4A-D-2-IN1	4A D2	A cell	5-10	Zn	filtered	42.425
9/23/2020	2020	9	4A-B-2-IN2	4A B2	A cell	10-20	Zn	filtered	3.333
9/23/2020	2020	9	4A-C-1-IN2	4A C1	A cell	10-20	Zn	filtered	<MDL
9/23/2020	2020	9	4A-D-2-IN2	4A D2	A cell	10-20	Zn	filtered	2.706
9/23/2020	2020	9	4A-A-1-OH	4A A1	A cell	2-5	Zn	filtered	17.739
9/23/2020	2020	9	4A-A-2-OH	4A A2	A cell	2-5	Zn	filtered	481.149
9/23/2020	2020	9	4A-B-1-OH	4A B1	A cell	2-5	Zn	filtered	7.494
9/23/2020	2020	9	4A-B-2-OH	4A B2	A cell	2-5	Zn	filtered	7.594
9/23/2020	2020	9	4A-C-1-OH	4A C1	A cell	2-5	Zn	filtered	<MDL
9/23/2020	2020	9	4A-C-2-OH	4A C2	A cell	2-5	Zn	filtered	8.231
9/23/2020	2020	9	4A-D-1-OH	4A D1	A cell	2-5	Zn	filtered	15.832
9/23/2020	2020	9	4A-D-2-OH	4A D2	A cell	2-5	Zn	filtered	10.619
9/23/2020	2020	9	4B-A-2-IN1	4B A2	B cell	5-10	Zn	filtered	71.719
9/23/2020	2020	9	4B-B-2-IN1	4B B2	B cell	5-10	Zn	filtered	7.079
9/23/2020	2020	9	4B-C-1-IN1	4B C1	B cell	5-10	Zn	filtered	<MDL
9/23/2020	2020	9	4B-D-2-IN1	4B D2	B cell	5-10	Zn	filtered	<MDL
9/23/2020	2020	9	4B-A-2-IN2	4B A2	B cell	10-20	Zn	filtered	11.361
9/23/2020	2020	9	4B-B-1-IN2	4B B1	B cell	10-20	Zn	filtered	<MDL
9/23/2020	2020	9	4B-C-1-IN2	4B C1	B cell	10-20	Zn	filtered	<MDL
9/23/2020	2020	9	4B-D-1-IN2	4B D1	B cell	10-20	Zn	filtered	<MDL
9/23/2020	2020	9	4B-A-1-OH	4B A1	B cell	2-5	Zn	filtered	17.801
9/23/2020	2020	9	4B-A-2-OH	4B A2	B cell	2-5	Zn	filtered	29.802
9/23/2020	2020	9	4B-B-1-OH	4B B1	B cell	2-5	Zn	filtered	241.267
9/23/2020	2020	9	4B-B-2-OH	4B B2	B cell	2-5	Zn	filtered	169.698
9/23/2020	2020	9	4B-C-1-OH	4B C1	B cell	2-5	Zn	filtered	51.374
9/23/2020	2020	9	4B-C-2-OH	4B C2	B cell	2-5	Zn	filtered	19.497
9/23/2020	2020	9	4B-D-1-OH	4B D1	B cell	2-5	Zn	filtered	35.584
9/23/2020	2020	9	4B-D-2-OH	4B D2	B cell	2-5	Zn	filtered	1.936

Appendix J. Iron concentrations in wetland sediment pore water (raw data).

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
9/8/2004	2004	8	A1 4A D1 5-10	4A D1	A cell	5-10	Fe	filtered	4239.000
9/8/2004	2004	8	A1 4A D1 10-20	4A D1	A cell	10-20	Fe	filtered	804.300
9/8/2004	2004	8	A1 4A D1 OM	4A D1	A cell	2-5	Fe	filtered	152.500
9/8/2004	2004	8	A1 4A A1 5-10	4A A1	A cell	5-10	Fe	filtered	1690.000
9/8/2004	2004	8	A1 4A A1 10-20	4A A1	A cell	10-20	Fe	filtered	2722.000
9/8/2004	2004	8	A1 4A A1 OM	4A A1	A cell	OM	Fe	filtered	96.530
9/8/2004	2004	8	A1 4A B1 5-10	4A B1	A cell	5-10	Fe	filtered	2915.000
9/8/2004	2004	8	A1 4A C1 5-10	4A C1	A cell	5-10	Fe	filtered	5221.000
9/8/2004	2004	8	A1 4A B1 10-20	4A B1	A cell	10-20	Fe	filtered	303.900
9/8/2004	2004	8	A1 4A C1 10-20	4A C1	A cell	10-20	Fe	filtered	1536.000
9/8/2004	2004	8	A1 4A B1 OM	4A B1	A cell	2-5	Fe	filtered	1097.000
9/8/2004	2004	8	A1 4A C1 OM	4A C1	A cell	2-5	Fe	filtered	132.700
9/8/2004	2004	8	4B A1 5-10	4B A1	B cell	5-10	Fe	filtered	258.100
9/8/2004	2004	8	4B A1 10-20	4B A1	B cell	10-20	Fe	filtered	116.700
9/8/2004	2004	8	4B A1 OM	4B A1	B cell	2-5	Fe	filtered	108.600
9/8/2004	2004	8	A1 4B C1 5-10	4B C1	B cell	5-10	Fe	filtered	1863.000
9/8/2004	2004	8	A1 4B C1 10-20	4B C1	B cell	10-20	Fe	filtered	6246.000
9/8/2004	2004	8	A1 4B B1 OM	4B B1	B cell	2-5	Fe	filtered	192.400
9/8/2004	2004	8	A1 4B C1 OM	4B C1	B cell	2-5	Fe	filtered	63.930
9/8/2004	2004	8	A1 4B C2 OM	4B C2	B cell	2-5	Fe	filtered	131.200
9/8/2004	2004	8	4B B2 OM	4B B2	B cell	2-5	Fe	filtered	1391.000
9/8/2004	2004	8	4B D1 5-10	4B D1	B cell	5-10	Fe	filtered	122.800
9/8/2004	2004	8	4B D1 10-20	4B D1	B cell	10-20	Fe	filtered	376.100
9/8/2004	2004	8	4B D1 OM	4B D1	B cell	2-5	Fe	filtered	263.700
9/8/2004	2004	8	4B D2 OM	4B D2	B cell	2-5	Fe	filtered	3331.000
9/23/2020	2020	9	4A-A-2-IN1	4A A2	A cell	5-10	Fe	filtered	641.179
9/23/2020	2020	9	4A-A-1-OH	4A A1	A cell	2-5	Fe	filtered	514.546
9/23/2020	2020	9	4A-A-2-OH	4A A2	A cell	2-5	Fe	filtered	1709.047
9/23/2020	2020	9	4A-B-2-IN1	4A B2	A cell	5-10	Fe	filtered	544.800
9/23/2020	2020	9	4A-C-1-IN1	4A C1	A cell	5-10	Fe	filtered	2379.623
9/23/2020	2020	9	4A-B-2-IN2	4A B2	A cell	10-20	Fe	filtered	584.471
9/23/2020	2020	9	4A-C-1-IN2	4A C1	A cell	10-20	Fe	filtered	11.344
9/23/2020	2020	9	4A-B-1-OH	4A B1	A cell	2-5	Fe	filtered	776.565
9/23/2020	2020	9	4A-B-2-OH	4A B2	A cell	2-5	Fe	filtered	385.873
9/23/2020	2020	9	4A-C-1-OH	4A C1	A cell	2-5	Fe	filtered	103.195
9/23/2020	2020	9	4A-C-2-OH	4A C2	A cell	2-5	Fe	filtered	735.765
9/23/2020	2020	9	4A-D-2-IN1	4A D2	A cell	5-10	Fe	filtered	2004.041
9/23/2020	2020	9	4A-D-2-IN2	4A D2	A cell	10-20	Fe	filtered	18.110
9/23/2020	2020	9	4A-D-1-OH	4A D1	A cell	2-5	Fe	filtered	1372.707
9/23/2020	2020	9	4A-D-2-OH	4A D2	A cell	2-5	Fe	filtered	1183.506
9/23/2020	2020	9	4B-A-2-IN1	4B A2	B cell	5-10	Fe	filtered	6371.977
9/23/2020	2020	9	4B-D-2-IN1	4B D2	B cell	5-10	Fe	filtered	27.419
9/23/2020	2020	9	4B-A-2-IN2	4B A2	B cell	10-20	Fe	filtered	105.662
9/23/2020	2020	9	4B-D-1-IN2	4B D1	B cell	10-20	Fe	filtered	17.460
9/23/2020	2020	9	4B-A-1-OH	4B A1	B cell	2-5	Fe	filtered	1104.694
9/23/2020	2020	9	4B-A-2-OH	4B A2	B cell	2-5	Fe	filtered	1158.944
9/23/2020	2020	9	4B-D-1-OH	4B D1	B cell	2-5	Fe	filtered	553.710
9/23/2020	2020	9	4B-D-2-OH	4B D2	B cell	2-5	Fe	filtered	67.295
9/23/2020	2020	9	4B-B-2-IN1	4B B2	B cell	5-10	Fe	filtered	36.758
9/23/2020	2020	9	4B-C-1-IN1	4B C1	B cell	5-10	Fe	filtered	129.436
9/23/2020	2020	9	4B-B-1-IN2	4B B1	B cell	10-20	Fe	filtered	6.352
9/23/2020	2020	9	4B-C-1-IN2	4B C1	B cell	10-20	Fe	filtered	72.284
9/23/2020	2020	9	4B-B-1-OH	4B B1	B cell	2-5	Fe	filtered	8074.610
9/23/2020	2020	9	4B-B-2-OH	4B B2	B cell	2-5	Fe	filtered	3294.556
9/23/2020	2020	9	4B-C-1-OH	4B C1	B cell	2-5	Fe	filtered	12912.580
9/23/2020	2020	9	4B-C-2-OH	4B C2	B cell	2-5	Fe	filtered	590.388

Appendix K. Manganese concentrations in wetland sediment pore water (raw data).

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
9/8/2004	2004	8	A1 4A D1 5-10	4A D1	A cell	5-10	Mn	filtered	2088.000
9/8/2004	2004	8	A1 4A D1 10-20	4A D1	A cell	10-20	Mn	filtered	2576.000
9/8/2004	2004	8	A1 4A D1 OM	4A D1	A cell	2-5	Mn	filtered	889.100
9/8/2004	2004	8	A1 4A A1 5-10	4A A1	A cell	5-10	Mn	filtered	1258.000
9/8/2004	2004	8	A1 4A A1 10-20	4A A1	A cell	10-20	Mn	filtered	6582.000
9/8/2004	2004	8	A1 4A A1 OM	4A A1	A cell	2-5	Mn	filtered	524.200
9/8/2004	2004	8	A1 4A B1 5-10	4A B1	A cell	5-10	Mn	filtered	777.900
9/8/2004	2004	8	A1 4A C1 5-10	4A C1	A cell	5-10	Mn	filtered	731.000
9/8/2004	2004	8	A1 4A B1 10-20	4A B1	A cell	10-20	Mn	filtered	4740.000
9/8/2004	2004	8	A1 4A C1 10-20	4A C1	A cell	10-20	Mn	filtered	1005.000
9/8/2004	2004	8	A1 4A B1 OM	4A B1	A cell	2-5	Mn	filtered	1131.000
9/8/2004	2004	8	A1 4A C1 OM	4A C1	A cell	2-5	Mn	filtered	737.100
9/8/2004	2004	8	4B A1 5-10	4B A1	B cell	5-10	Mn	filtered	1555.000
9/8/2004	2004	8	4B A1 10-20	4B A1	B cell	10-20	Mn	filtered	3954.000
9/8/2004	2004	8	4B A1 OM	4B A1	B cell	2-5	Mn	filtered	74.720
9/8/2004	2004	8	A1 4B C1 5-10	4B C1	B cell	5-10	Mn	filtered	197.600
9/8/2004	2004	8	A1 4B C1 10-20	4B C1	B cell	10-20	Mn	filtered	1239.000
9/8/2004	2004	8	A1 4B B1 OM	4B B1	B cell	2-5	Mn	filtered	304.000
9/8/2004	2004	8	A1 4B C1 OM	4B C1	B cell	2-5	Mn	filtered	84.870
9/8/2004	2004	8	A1 4B C2 OM	4B C2	B cell	2-5	Mn	filtered	247.300
9/8/2004	2004	8	4B B2 OM	4B B2	B cell	2-5	Mn	filtered	201.300
9/8/2004	2004	8	4B D1 5-10	4B D1	B cell	5-10	Mn	filtered	300.000
9/8/2004	2004	8	4B D1 10-20	4B D1	B cell	10-20	Mn	filtered	1163.000
9/8/2004	2004	8	4B D1 OM	4B D1	B cell	2-5	Mn	filtered	191.500
9/8/2004	2004	8	4B D2 OM	4B D2	B cell	2-5	Mn	filtered	312.900
7/28/2016	2016	7	PW-4A-1A-LA	4A-1A	A cell	5-10	Mn	filtered	259.000
7/28/2016	2016	7	PW-4A-1B-LA	4A-1B	A cell	5-10	Mn	filtered	254.000
7/28/2016	2016	7	PW-4A-2A-LA	4A-2A	A cell	5-10	Mn	filtered	14.200
7/28/2016	2016	7	PW-4A-2B-LA	4A-2B	A cell	5-10	Mn	filtered	32.740
7/28/2016	2016	7	PW-4A-1A-LB	4A-1A	A cell	10-20	Mn	filtered	414.000
7/28/2016	2016	7	PW-4A-1B-LB	4A-1B	A cell	10-20	Mn	filtered	492.600
7/28/2016	2016	7	PW-4A-2A-LB	4A-2A	A cell	10-20	Mn	filtered	77.690
7/28/2016	2016	7	PW-4A-2B-LB	4A-2B	A cell	10-20	Mn	filtered	210.500
7/28/2016	2016	7	PW-4A-3A-LA	4A-3A	A cell	5-10	Mn	filtered	24.150
7/28/2016	2016	7	PW-4A-3B-LA	4A-3B	A cell	5-10	Mn	filtered	38.170
7/28/2016	2016	7	PW-4A-4A-LA	4A-4A	A cell	5-10	Mn	filtered	65.420
7/28/2016	2016	7	PW-4A-4B-LA	4A-4B	A cell	5-10	Mn	filtered	41.360
7/28/2016	2016	7	PW-4A-3A-LB	4A-3A	A cell	10-20	Mn	filtered	18.490
7/28/2016	2016	7	PW-4A-3B-LB	4A-3B	A cell	10-20	Mn	filtered	33.150
7/28/2016	2016	7	PW-4A-4A-LB	4A-4A	A cell	10-20	Mn	filtered	29.920
7/28/2016	2016	7	PW-4A-4B-LB	4A-4B	A cell	10-20	Mn	filtered	71.400
7/28/2016	2016	7	PW-4A-5A-LA	4A-5A	A cell	5-10	Mn	filtered	386.400
7/28/2016	2016	7	PW-4A-6A-LA	4A-6A	A cell	5-10	Mn	filtered	225.600
7/28/2016	2016	7	PW-4A-6B-LA	4A-6B	A cell	5-10	Mn	filtered	50.390
7/28/2016	2016	7	PW-4A-5A-LB	4A-5A	A cell	10-20	Mn	filtered	320.800
7/28/2016	2016	7	PW-4A-5B-LB	4A-5B	A cell	10-20	Mn	filtered	38.840
7/28/2016	2016	7	PW-4A-6A-LB	4A-6A	A cell	10-20	Mn	filtered	206.200
7/28/2016	2016	7	PW-4A-6B-LB	4A-6B	A cell	10-20	Mn	filtered	9.390
7/28/2016	2016	7	PW-4B-5A-LA	4B-5A	B cell	5-10	Mn	filtered	399.900
7/28/2016	2016	7	PW-4B-5B-LA	4B-5B	B cell	5-10	Mn	filtered	199.100
7/28/2016	2016	7	PW-4B-5A-LB	4B-5A	B cell	10-20	Mn	filtered	490.900
7/28/2016	2016	7	PW-4B-5B-LB	4B-5B	B cell	10-20	Mn	filtered	156.900
7/28/2016	2016	7	PW-4B-3A-LA	4B-3A	B cell	5-10	Mn	filtered	132.900
7/28/2016	2016	7	PW-4B-3B-LA	4B-3B	B cell	5-10	Mn	filtered	383.000
7/28/2016	2016	7	PW-4B-4-LA	4B-4A	B cell	5-10	Mn	filtered	66.590
7/28/2016	2016	7	PW-4B-3A-LB	4B-3A	B cell	10-20	Mn	filtered	68.620

Appendix K. continued

Date	Year	Month	Sample ID	Location	Location description	Sediment depth (cm)	Element	Filtration	Concentration (µg/L)
7/28/2016	2016	7	PW-4B-3B-LB	4B-3B	B cell	10-20	Mn	filtered	103.200
7/28/2016	2016	7	PW-4B-4-LB	4B-4A	B cell	10-20	Mn	filtered	220.300
7/28/2016	2016	7	PW-4B-2-LA	4B-2A	B cell	5-10	Mn	filtered	1.845
7/28/2016	2016	7	PW-4B-2-LB	4B-2A	B cell	10-20	Mn	filtered	31.470
9/23/2020	2020	9	4A-A-2-IN1	4A A2	A cell	5-10	Mn	filtered	3.894
9/23/2020	2020	9	4A-B-2-IN1	4A B2	A cell	5-10	Mn	filtered	4.184
9/23/2020	2020	9	4A-C-1-IN1	4A C1	A cell	5-10	Mn	filtered	18.627
9/23/2020	2020	9	4A-D-2-IN1	4A D2	A cell	5-10	Mn	filtered	35.792
9/23/2020	2020	9	4A-B-2-IN2	4A B2	A cell	10-20	Mn	filtered	5.613
9/23/2020	2020	9	4A-C-1-IN2	4A C1	A cell	10-20	Mn	filtered	1.347
9/23/2020	2020	9	4A-D-2-IN2	4A D2	A cell	10-20	Mn	filtered	10.862
9/23/2020	2020	9	4A-A-1-OH	4A A1	A cell	2-5	Mn	filtered	15.562
9/23/2020	2020	9	4A-A-2-OH	4A A2	A cell	2-5	Mn	filtered	1085.022
9/23/2020	2020	9	4A-B-1-OH	4A B1	A cell	2-5	Mn	filtered	3.866
9/23/2020	2020	9	4A-B-2-OH	4A B2	A cell	2-5	Mn	filtered	5.653
9/23/2020	2020	9	4A-C-1-OH	4A C1	A cell	2-5	Mn	filtered	2.342
9/23/2020	2020	9	4A-C-2-OH	4A C2	A cell	2-5	Mn	filtered	5.956
9/23/2020	2020	9	4A-D-1-OH	4A D1	A cell	2-5	Mn	filtered	44.491
9/23/2020	2020	9	4A-D-2-OH	4A D2	A cell	2-5	Mn	filtered	27.900
9/23/2020	2020	9	4B-A-2-IN1	4B A2	B cell	5-10	Mn	filtered	176.932
9/23/2020	2020	9	4B-B-2-IN1	4B B2	B cell	5-10	Mn	filtered	36.348
9/23/2020	2020	9	4B-C-1-IN1	4B C1	B cell	5-10	Mn	filtered	3.583
9/23/2020	2020	9	4B-D-2-IN1	4B D2	B cell	5-10	Mn	filtered	1.113
9/23/2020	2020	9	4B-A-2-IN2	4B A2	B cell	10-20	Mn	filtered	60.032
9/23/2020	2020	9	4B-B-1-IN2	4B B1	B cell	10-20	Mn	filtered	<MDL
9/23/2020	2020	9	4B-C-1-IN2	4B C1	B cell	10-20	Mn	filtered	6.508
9/23/2020	2020	9	4B-D-1-IN2	4B D1	B cell	10-20	Mn	filtered	0.627
9/23/2020	2020	9	4B-A-1-OH	4B A1	B cell	2-5	Mn	filtered	58.940
9/23/2020	2020	9	4B-A-2-OH	4B A2	B cell	2-5	Mn	filtered	30.862
9/23/2020	2020	9	4B-B-1-OH	4B B1	B cell	2-5	Mn	filtered	1248.904
9/23/2020	2020	9	4B-B-2-OH	4B B2	B cell	2-5	Mn	filtered	946.099
9/23/2020	2020	9	4B-C-1-OH	4B C1	B cell	2-5	Mn	filtered	1959.789
9/23/2020	2020	9	4B-C-2-OH	4B C2	B cell	2-5	Mn	filtered	162.076
9/23/2020	2020	9	4B-D-1-OH	4B D1	B cell	2-5	Mn	filtered	50.964
9/23/2020	2020	9	4B-D-2-OH	4B D2	B cell	2-5	Mn	filtered	3.070

Appendix L. DGT copper concentrations in wetland surface water (raw data).

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
12/6/2000	2000	12	1A	A cell	Cu	31.000
12/18/2000	2000	12	1A	A cell	Cu	15.000
12/6/2000	2000	12	1B	B cell	Cu	17.000
12/18/2000	2000	12	1B	B cell	Cu	18.000
12/6/2000	2000	12	2A	A cell	Cu	29.000
12/18/2000	2000	12	2A	A cell	Cu	14.000
12/6/2000	2000	12	2B	B cell	Cu	27.000
12/18/2000	2000	12	2B	B cell	Cu	14.000
12/6/2000	2000	12	3A	A cell	Cu	24.000
12/18/2000	2000	12	3A	A cell	Cu	10.000
12/6/2000	2000	12	3B	B cell	Cu	17.000
12/18/2000	2000	12	3B	B cell	Cu	13.000
12/6/2000	2000	12	4A	A cell	Cu	40.000
12/18/2000	2000	12	4A	A cell	Cu	14.000
12/6/2000	2000	12	4B	B cell	Cu	23.000
12/18/2000	2000	12	4B	B cell	Cu	18.000
12/6/2000	2000	12	Old A-01	old outfall	Cu	282.000
12/6/2000	2000	12	Splitter	splitter	Cu	122.000
12/18/2000	2000	12	Splitter	splitter	Cu	26.000
1/11/2001	2001	1	1A	A cell	Cu	16.000
1/11/2001	2001	1	1B	B cell	Cu	15.000
1/11/2001	2001	1	2A	A cell	Cu	22.000
1/11/2001	2001	1	2B	B cell	Cu	17.000
1/11/2001	2001	1	3A	A cell	Cu	13.000
1/11/2001	2001	1	3B	B cell	Cu	11.000
1/11/2001	2001	1	4A	A cell	Cu	15.000
1/11/2001	2001	1	4B	B cell	Cu	10.000
1/11/2001	2001	1	New A-01	stream	Cu	16.000
1/11/2001	2001	1	Old A-01	old outfall	Cu	35.000
1/11/2001	2001	1	Splitter	splitter	Cu	20.000
2/21/2001	2001	2	1A	A cell	Cu	12.000
2/21/2001	2001	2	1B	B cell	Cu	10.000
2/21/2001	2001	2	2A	A cell	Cu	14.000
2/21/2001	2001	2	2B	B cell	Cu	14.000
2/21/2001	2001	2	3A	A cell	Cu	10.000
2/21/2001	2001	2	3B	B cell	Cu	10.000
2/21/2001	2001	2	4A	A cell	Cu	14.000
2/21/2001	2001	2	4B	B cell	Cu	10.000
2/21/2001	2001	2	New A-01	stream	Cu	15.000
2/21/2001	2001	2	Old A-01	old outfall	Cu	23.000
2/21/2001	2001	2	Splitter	splitter	Cu	21.000
3/27/2001	2001	3	1A	A cell	Cu	10.000
3/27/2001	2001	3	1B	B cell	Cu	11.000
3/27/2001	2001	3	2A	A cell	Cu	16.000
3/27/2001	2001	3	2B	B cell	Cu	12.000
3/27/2001	2001	3	3A	A cell	Cu	12.000
3/27/2001	2001	3	3B	B cell	Cu	12.000
3/27/2001	2001	3	4A	A cell	Cu	18.000
3/27/2001	2001	3	4B	B cell	Cu	14.000
3/27/2001	2001	3	New A-01	stream	Cu	10.000
3/27/2001	2001	3	Old A-01	old outfall	Cu	31.000
3/27/2001	2001	3	Splitter	splitter	Cu	21.000
4/26/2001	2001	4	1A	A cell	Cu	19.000
4/26/2001	2001	4	1B	B cell	Cu	14.000
4/26/2001	2001	4	2A	A cell	Cu	21.000
4/26/2001	2001	4	2B	B cell	Cu	10.000

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
4/26/2001	2001	4	3A	A cell	Cu	14.000
4/26/2001	2001	4	3B	B cell	Cu	10.000
4/26/2001	2001	4	4A	A cell	Cu	27.000
4/26/2001	2001	4	4B	B cell	Cu	10.000
4/26/2001	2001	4	New A-01	stream	Cu	10.000
4/26/2001	2001	4	Old A-01	old outfall	Cu	16.000
4/26/2001	2001	4	Splitter	splitter	Cu	30.000
5/31/2001	2001	5	1A	A cell	Cu	10.000
5/31/2001	2001	5	1B	B cell	Cu	10.000
5/31/2001	2001	5	2A	A cell	Cu	10.000
5/31/2001	2001	5	2B	B cell	Cu	10.000
5/31/2001	2001	5	3A	A cell	Cu	10.000
5/31/2001	2001	5	3B	B cell	Cu	10.000
5/31/2001	2001	5	4A	A cell	Cu	10.000
5/31/2001	2001	5	4B	B cell	Cu	10.000
5/31/2001	2001	5	New A-01	stream	Cu	10.000
5/31/2001	2001	5	Old A-01	old outfall	Cu	31.000
5/31/2001	2001	5	Splitter	splitter	Cu	17.000
6/19/2001	2001	6	1A	A cell	Cu	10.000
6/19/2001	2001	6	1B	B cell	Cu	10.000
6/19/2001	2001	6	2A	A cell	Cu	10.000
6/19/2001	2001	6	2B	B cell	Cu	10.000
6/19/2001	2001	6	3A	A cell	Cu	10.000
6/19/2001	2001	6	3B	B cell	Cu	10.000
6/19/2001	2001	6	4A	A cell	Cu	10.000
6/19/2001	2001	6	4B	B cell	Cu	10.000
6/19/2001	2001	6	New A-01	stream	Cu	10.000
6/19/2001	2001	6	Old A-01	old outfall	Cu	36.000
6/19/2001	2001	6	Splitter	splitter	Cu	10.000
7/24/2001	2001	7	1A	A cell	Cu	10.000
7/24/2001	2001	7	1B	B cell	Cu	10.000
7/24/2001	2001	7	2A	A cell	Cu	10.000
7/24/2001	2001	7	2B	B cell	Cu	10.000
7/24/2001	2001	7	3A	A cell	Cu	12.000
7/24/2001	2001	7	3B	B cell	Cu	10.000
7/24/2001	2001	7	4A	A cell	Cu	13.000
7/24/2001	2001	7	4B	B cell	Cu	10.000
7/24/2001	2001	7	New A-01	stream	Cu	10.000
7/24/2001	2001	7	Old A-01	old outfall	Cu	44.000
7/24/2001	2001	7	Splitter	splitter	Cu	38.000
8/21/2001	2001	8	1A	A cell	Cu	10.000
8/21/2001	2001	8	1B	B cell	Cu	10.000
8/21/2001	2001	8	2A	A cell	Cu	10.000
8/21/2001	2001	8	2B	B cell	Cu	10.000
8/21/2001	2001	8	3A	A cell	Cu	10.000
8/21/2001	2001	8	3B	B cell	Cu	10.000
8/21/2001	2001	8	4A	A cell	Cu	10.000
8/21/2001	2001	8	4B	B cell	Cu	10.000
8/21/2001	2001	8	New A-01	stream	Cu	10.000
8/21/2001	2001	8	Old A-01	old outfall	Cu	76.000
8/21/2001	2001	8	Splitter	splitter	Cu	43.000
9/20/2001	2001	9	1A	A cell	Cu	10.000
9/20/2001	2001	9	1B	B cell	Cu	10.000
9/20/2001	2001	9	2A	A cell	Cu	14.000
9/20/2001	2001	9	2B	B cell	Cu	12.000
9/20/2001	2001	9	3A	A cell	Cu	10.000

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
9/20/2001	2001	9	3B	B cell	Cu	10.000
9/20/2001	2001	9	4A	A cell	Cu	10.000
9/20/2001	2001	9	4B	B cell	Cu	10.000
9/20/2001	2001	9	New A-01	stream	Cu	10.000
9/20/2001	2001	9	Old A-01	old outfall	Cu	182.000
9/20/2001	2001	9	Splitter	splitter	Cu	33.000
10/23/2001	2001	10	1A	A cell	Cu	11.000
10/23/2001	2001	10	1B	B cell	Cu	10.000
10/23/2001	2001	10	2A	A cell	Cu	15.000
10/23/2001	2001	10	2B	B cell	Cu	11.000
10/23/2001	2001	10	3A	A cell	Cu	12.000
10/23/2001	2001	10	3B	B cell	Cu	10.000
10/23/2001	2001	10	4A	A cell	Cu	12.000
10/23/2001	2001	10	4B	B cell	Cu	11.000
10/23/2001	2001	10	New A-01	stream	Cu	10.000
10/23/2001	2001	10	Old A-01	old outfall	Cu	26.000
10/23/2001	2001	10	Splitter	splitter	Cu	23.000
11/27/2001	2001	11	1A	A cell	Cu	13.000
11/27/2001	2001	11	1B	B cell	Cu	10.000
11/27/2001	2001	11	2A	A cell	Cu	15.000
11/27/2001	2001	11	2B	B cell	Cu	10.000
11/27/2001	2001	11	3A	A cell	Cu	17.000
11/27/2001	2001	11	3B	B cell	Cu	10.000
11/27/2001	2001	11	4A	A cell	Cu	26.000
11/27/2001	2001	11	4B	B cell	Cu	10.000
11/27/2001	2001	11	New A-01	stream	Cu	12.000
11/27/2001	2001	11	Old A-01	old outfall	Cu	21.000
11/27/2001	2001	11	Splitter	splitter	Cu	40.000
12/18/2001	2001	12	1A	A cell	Cu	10.000
12/18/2001	2001	12	1B	B cell	Cu	10.000
12/18/2001	2001	12	2A	A cell	Cu	10.000
12/18/2001	2001	12	2B	B cell	Cu	10.000
12/18/2001	2001	12	3A	A cell	Cu	10.000
12/18/2001	2001	12	3B	B cell	Cu	10.000
12/18/2001	2001	12	4A	A cell	Cu	10.000
12/18/2001	2001	12	4B	B cell	Cu	10.000
12/18/2001	2001	12	New A-01	stream	Cu	10.000
12/18/2001	2001	12	Old A-01	old outfall	Cu	22.000
12/18/2001	2001	12	Splitter	splitter	Cu	29.000
1/22/2002	2002	1	1A	A cell	Cu	10.000
1/22/2002	2002	1	1B	B cell	Cu	10.000
1/22/2002	2002	1	2A	A cell	Cu	10.000
1/22/2002	2002	1	2B	B cell	Cu	10.000
1/22/2002	2002	1	3A	A cell	Cu	10.000
1/22/2002	2002	1	3B	B cell	Cu	10.000
1/22/2002	2002	1	4A	A cell	Cu	10.000
1/22/2002	2002	1	4B	B cell	Cu	10.000
1/22/2002	2002	1	New A-01	stream	Cu	10.000
1/22/2002	2002	1	Old A-01	old outfall	Cu	10.000
1/22/2002	2002	1	Splitter	splitter	Cu	11.000
2/19/2002	2002	2	1A	A cell	Cu	10.000
2/19/2002	2002	2	1B	B cell	Cu	10.000
2/19/2002	2002	2	2A	A cell	Cu	10.000
2/19/2002	2002	2	2B	B cell	Cu	14.000
2/19/2002	2002	2	3A	A cell	Cu	10.000
2/19/2002	2002	2	3B	B cell	Cu	10.000

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
2/19/2002	2002	2	4A	A cell	Cu	10.000
2/19/2002	2002	2	4B	B cell	Cu	10.000
2/19/2002	2002	2	New A-01	stream	Cu	10.000
2/19/2002	2002	2	Old A-01	old outfall	Cu	48.000
2/19/2002	2002	2	Splitter	splitter	Cu	22.000
3/20/2002	2002	3	4A	A cell	Cu	12.000
3/20/2002	2002	3	New A-01	stream	Cu	10.000
3/20/2002	2002	3	1A	A cell	Cu	11.000
3/20/2002	2002	3	1B	B cell	Cu	10.000
3/20/2002	2002	3	2A	A cell	Cu	14.000
3/20/2002	2002	3	2B	B cell	Cu	10.000
3/20/2002	2002	3	3A	A cell	Cu	13.000
3/20/2002	2002	3	3B	B cell	Cu	10.000
3/20/2002	2002	3	4B	B cell	Cu	10.000
3/20/2002	2002	3	Old A-01	old outfall	Cu	49.000
3/20/2002	2002	3	Splitter	splitter	Cu	41.000
4/23/2002	2002	4	4A	A cell	Cu	10.000
4/23/2002	2002	4	New A-01	stream	Cu	10.000
4/23/2002	2002	4	1A	A cell	Cu	10.000
4/23/2002	2002	4	1B	B cell	Cu	10.000
4/23/2002	2002	4	2A	A cell	Cu	10.000
4/23/2002	2002	4	2B	B cell	Cu	10.000
4/23/2002	2002	4	3A	A cell	Cu	10.000
4/23/2002	2002	4	3B	B cell	Cu	10.000
4/23/2002	2002	4	4B	B cell	Cu	10.000
4/23/2002	2002	4	Old A-01	old outfall	Cu	10.000
4/23/2002	2002	4	Splitter	splitter	Cu	10.000
5/14/2002	2002	5	4A	A cell	Cu	13.000
5/14/2002	2002	5	New A-01	stream	Cu	26.000
5/14/2002	2002	5	1A	A cell	Cu	10.000
5/14/2002	2002	5	1B	B cell	Cu	10.000
5/14/2002	2002	5	1B	B cell	Cu	10.000
5/14/2002	2002	5	2A	A cell	Cu	10.000
5/14/2002	2002	5	2B	B cell	Cu	10.000
5/14/2002	2002	5	3A	A cell	Cu	23.000
5/14/2002	2002	5	3A	A cell	Cu	24.000
5/14/2002	2002	5	3B	B cell	Cu	10.000
5/14/2002	2002	5	4B	B cell	Cu	10.000
5/14/2002	2002	5	Old A-01	old outfall	Cu	31.000
5/14/2002	2002	5	Splitter	splitter	Cu	48.000
6/20/2002	2002	6	1A	A cell	Cu	22.000
6/20/2002	2002	6	1B	B cell	Cu	10.000
6/20/2002	2002	6	2A	A cell	Cu	16.000
6/20/2002	2002	6	2B	B cell	Cu	10.000
6/20/2002	2002	6	3A	A cell	Cu	35.000
6/20/2002	2002	6	3B	B cell	Cu	10.000
6/20/2002	2002	6	4A	A cell	Cu	29.000
6/20/2002	2002	6	4B	B cell	Cu	22.000
6/20/2002	2002	6	New A-01	stream	Cu	10.000
6/20/2002	2002	6	Old A-01	old outfall	Cu	55.000
6/20/2002	2002	6	Splitter	splitter	Cu	60.000
7/23/2002	2002	7	1A	A cell	Cu	10.000
7/23/2002	2002	7	1B	B cell	Cu	10.000
7/23/2002	2002	7	2A	A cell	Cu	10.000
7/23/2002	2002	7	2B	B cell	Cu	28.000
7/23/2002	2002	7	3A	A cell	Cu	13.000

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
7/23/2002	2002	7	3B	B cell	Cu	10.000
7/23/2002	2002	7	4A	A cell	Cu	12.000
7/23/2002	2002	7	4B	B cell	Cu	10.000
7/23/2002	2002	7	New A-01	stream	Cu	10.000
7/23/2002	2002	7	Old A-01	old outfall	Cu	42.000
7/23/2002	2002	7	Splitter	splitter	Cu	54.000
8/21/2002	2002	8	1A	A cell	Cu	11.000
8/21/2002	2002	8	1B	B cell	Cu	10.000
8/21/2002	2002	8	2A	A cell	Cu	11.000
8/21/2002	2002	8	2B	B cell	Cu	10.000
8/21/2002	2002	8	3A	A cell	Cu	14.000
8/21/2002	2002	8	3B	B cell	Cu	10.000
8/21/2002	2002	8	4A	A cell	Cu	11.000
8/21/2002	2002	8	4B	B cell	Cu	10.000
8/21/2002	2002	8	New A-01	stream	Cu	10.000
8/21/2002	2002	8	Old A-01	old outfall	Cu	36.000
8/21/2002	2002	8	Splitter	splitter	Cu	24.000
9/25/2002	2002	9	1A	A cell	Cu	12.000
9/25/2002	2002	9	1B	B cell	Cu	10.000
9/25/2002	2002	9	2A	A cell	Cu	38.000
9/25/2002	2002	9	2B	B cell	Cu	10.000
9/25/2002	2002	9	3A	A cell	Cu	22.000
9/25/2002	2002	9	3B	B cell	Cu	20.000
9/25/2002	2002	9	4A	A cell	Cu	10.000
9/25/2002	2002	9	4B	B cell	Cu	10.000
9/25/2002	2002	9	New A-01	stream	Cu	10.000
9/25/2002	2002	9	Old A-01	old outfall	Cu	53.000
9/25/2002	2002	9	Splitter	splitter	Cu	37.000
7/16/2003	2003	7	A01-NEW-001	stream	Cu	3.234
7/17/2003	2003	7	A01-NEW-001	stream	Cu	3.068
7/18/2003	2003	7	A01-NEW-001	stream	Cu	3.024
7/21/2003	2003	7	A01-NEW-002	stream	Cu	3.926
7/22/2003	2003	7	A01-NEW-002	stream	Cu	3.436
7/16/2003	2003	7	A01-OLD-001	old outfall	Cu	27.755
7/17/2003	2003	7	A01-OLD-001	old outfall	Cu	21.860
7/18/2003	2003	7	A01-OLD-001	old outfall	Cu	22.254
7/21/2003	2003	7	A01-OLD-002	old outfall	Cu	24.285
7/22/2003	2003	7	A01-OLD-002	old outfall	Cu	20.382
7/16/2003	2003	7	A01-SPL-001	splitter	Cu	15.135
7/17/2003	2003	7	A01-SPL-001	splitter	Cu	15.258
7/18/2003	2003	7	A01-SPL-001	splitter	Cu	15.325
7/21/2003	2003	7	A01-SPL-002	splitter	Cu	17.025
7/22/2003	2003	7	A01-SPL-002	splitter	Cu	10.958
4/28/2004	2004	4	A Cells	A cell	Cu	16.190
4/28/2004	2004	4	B Cells	B cell	Cu	10.850
4/28/2004	2004	4	Effluent	stream	Cu	7.760
4/28/2004	2004	4	influent	old outfall	Cu	33.970
4/28/2004	2004	4	splitter	splitter	Cu	37.450
5/19/2004	2004	5	A Cells	A cell	Cu	9.290
5/19/2004	2004	5	B Cells	B cell	Cu	4.980
5/19/2004	2004	5	Effluent	stream	Cu	4.490
5/19/2004	2004	5	influent	old outfall	Cu	31.880
5/19/2004	2004	5	splitter	splitter	Cu	24.010
6/23/2004	2004	6	A Cells	A cell	Cu	12.920
6/23/2004	2004	6	B Cells	B cell	Cu	4.880
6/23/2004	2004	6	Effluent	stream	Cu	5.960

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
6/23/2004	2004	6	influent	old outfall	Cu	17.930
6/23/2004	2004	6	splitter	splitter	Cu	23.420
7/19/2004	2004	7	A Cells	A cell	Cu	8.860
7/19/2004	2004	7	B Cells	B cell	Cu	3.590
7/19/2004	2004	7	Effluent	stream	Cu	2.990
7/19/2004	2004	7	influent	old outfall	Cu	33.840
7/19/2004	2004	7	splitter	splitter	Cu	24.750
8/12/2004	2004	8	A Cells	A cell	Cu	9.700
8/12/2004	2004	8	B Cells	B cell	Cu	4.060
8/12/2004	2004	8	Effluent	stream	Cu	4.280
8/12/2004	2004	8	influent	old outfall	Cu	38.240
8/12/2004	2004	8	splitter	splitter	Cu	51.600
9/9/2004	2004	9	A Cells	A cell	Cu	8.600
9/9/2004	2004	9	B Cells	B cell	Cu	2.950
9/9/2004	2004	9	Effluent	stream	Cu	2.880
9/9/2004	2004	9	influent	old outfall	Cu	39.280
9/9/2004	2004	9	splitter	splitter	Cu	20.520
12/13/2004	2004	12	A Cells	A cell	Cu	5.920
12/13/2004	2004	12	B Cells	B cell	Cu	2.900
12/13/2004	2004	12	Effluent	stream	Cu	2.880
12/13/2004	2004	12	influent	old outfall	Cu	11.640
12/13/2004	2004	12	splitter	splitter	Cu	8.390
1/18/2005	2005	1	A Cells	A cell	Cu	9.630
1/18/2005	2005	1	B Cells	B cell	Cu	3.110
1/18/2005	2005	1	Effluent	stream	Cu	3.890
1/18/2005	2005	1	influent	old outfall	Cu	12.060
1/18/2005	2005	1	splitter	splitter	Cu	8.750
2/15/2005	2005	2	A Cells	A cell	Cu	7.250
2/15/2005	2005	2	B Cells	B cell	Cu	4.800
2/15/2005	2005	2	Effluent	stream	Cu	4.300
2/15/2005	2005	2	influent	old outfall	Cu	13.150
2/15/2005	2005	2	splitter	splitter	Cu	11.640
7/28/2016	2016	7	4A	A cell	Cu	6.007
7/28/2016	2016	7	4A	A cell	Cu	8.092
7/28/2016	2016	7	4A	A cell	Cu	5.838
7/28/2016	2016	7	4A	A cell	Cu	7.334
7/28/2016	2016	7	4A	A cell	Cu	5.907
7/28/2016	2016	7	4A	A cell	Cu	8.317
7/28/2016	2016	7	4A	A cell	Cu	5.946
7/28/2016	2016	7	4A	A cell	Cu	7.857
7/28/2016	2016	7	4A	A cell	Cu	4.731
7/28/2016	2016	7	4A	A cell	Cu	6.417
7/28/2016	2016	7	4A	A cell	Cu	4.761
7/28/2016	2016	7	4A	A cell	Cu	7.264
7/28/2016	2016	7	4A	A cell	Cu	6.374
7/28/2016	2016	7	4A	A cell	Cu	8.415
7/28/2016	2016	7	4A	A cell	Cu	6.109
7/28/2016	2016	7	4A	A cell	Cu	8.695
7/28/2016	2016	7	4A	A cell	Cu	4.577
7/28/2016	2016	7	4A	A cell	Cu	6.193
7/28/2016	2016	7	4A	A cell	Cu	4.185
7/28/2016	2016	7	4A	A cell	Cu	6.880
7/28/2016	2016	7	4A	A cell	Cu	5.596
7/28/2016	2016	7	4A	A cell	Cu	7.601
7/28/2016	2016	7	4A	A cell	Cu	5.806
7/28/2016	2016	7	4A	A cell	Cu	7.233

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
7/28/2016	2016	7	4B	B cell	Cu	5.256
7/28/2016	2016	7	4B	B cell	Cu	5.911
7/28/2016	2016	7	4B	B cell	Cu	5.200
7/28/2016	2016	7	4B	B cell	Cu	5.990
7/28/2016	2016	7	4B	B cell	Cu	4.315
7/28/2016	2016	7	4B	B cell	Cu	4.679
7/28/2016	2016	7	4B	B cell	Cu	3.994
7/28/2016	2016	7	4B	B cell	Cu	5.641
7/28/2016	2016	7	4B	B cell	Cu	5.150
7/28/2016	2016	7	4B	B cell	Cu	5.985
7/28/2016	2016	7	4B	B cell	Cu	5.215
7/28/2016	2016	7	4B	B cell	Cu	6.681
7/28/2016	2016	7	4B	B cell	Cu	3.506
7/28/2016	2016	7	4B	B cell	Cu	6.178
7/28/2016	2016	7	4B	B cell	Cu	3.793
7/28/2016	2016	7	4B	B cell	Cu	8.867
7/28/2016	2016	7	4B	B cell	Cu	4.749
7/28/2016	2016	7	4B	B cell	Cu	6.132
7/28/2016	2016	7	4B	B cell	Cu	5.328
7/28/2016	2016	7	4B	B cell	Cu	6.911
7/28/2016	2016	7	4B	B cell	Cu	4.489
7/28/2016	2016	7	4B	B cell	Cu	8.438
7/28/2016	2016	7	4B	B cell	Cu	4.627
7/28/2016	2016	7	4B	B cell	Cu	7.027
1/28/2020	2020	1	1A inlet	A cell	Cu	4.511
1/28/2020	2020	1	1A outlet	A cell	Cu	4.117
1/28/2020	2020	1	1B inlet	B cell	Cu	3.518
1/28/2020	2020	1	1B outlet	B cell	Cu	2.780
1/28/2020	2020	1	2A inlet	A cell	Cu	5.607
1/28/2020	2020	1	2A outlet	A cell	Cu	3.006
1/28/2020	2020	1	2B inlet	B cell	Cu	3.786
1/28/2020	2020	1	2B outlet	B cell	Cu	2.386
1/28/2020	2020	1	3A inlet	A cell	Cu	5.649
1/28/2020	2020	1	3A outlet	A cell	Cu	3.341
1/28/2020	2020	1	3B inlet	B cell	Cu	3.266
1/28/2020	2020	1	3B outlet	B cell	Cu	2.514
1/28/2020	2020	1	4A inlet	A cell	Cu	4.637
1/28/2020	2020	1	4A outlet	A cell	Cu	3.252
1/28/2020	2020	1	4B inlet	B cell	Cu	3.442
1/28/2020	2020	1	4B outlet	B cell	Cu	2.489
1/28/2020	2020	1	Old A-01 Outfall	old outfall	Cu	12.156
1/28/2020	2020	1	Splitter Box 1A	splitter	Cu	4.878
1/28/2020	2020	1	Splitter Box 2A	splitter	Cu	5.030
1/28/2020	2020	1	Splitter Box 3A	splitter	Cu	5.154
1/28/2020	2020	1	Splitter Box 4A	splitter	Cu	4.911
1/28/2020	2020	1	Stream	stream	Cu	2.316
2/21/2020	2020	2	1A inlet	A cell	Cu	7.215
2/21/2020	2020	2	1A outlet	A cell	Cu	6.215
2/21/2020	2020	2	1B inlet	B cell	Cu	5.961
2/21/2020	2020	2	1B outlet	B cell	Cu	4.439
2/21/2020	2020	2	2A inlet	A cell	Cu	7.056
2/21/2020	2020	2	2A outlet	A cell	Cu	5.910
2/21/2020	2020	2	2B inlet	B cell	Cu	5.931
2/21/2020	2020	2	2B outlet	B cell	Cu	3.951
2/21/2020	2020	2	3A inlet	A cell	Cu	6.960
2/21/2020	2020	2	3A outlet	A cell	Cu	4.979

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
2/21/2020	2020	2	3B inlet	B cell	Cu	5.432
2/21/2020	2020	2	3B outlet	B cell	Cu	3.766
2/21/2020	2020	2	4A inlet	A cell	Cu	6.952
2/21/2020	2020	2	4A outlet	A cell	Cu	6.380
2/21/2020	2020	2	4B inlet	B cell	Cu	5.403
2/21/2020	2020	2	4B outlet	B cell	Cu	4.194
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Cu	10.558
2/21/2020	2020	2	Splitter Box 1A	splitter	Cu	7.372
2/21/2020	2020	2	Splitter Box 2A	splitter	Cu	7.375
2/21/2020	2020	2	Splitter Box 3A	splitter	Cu	7.703
2/21/2020	2020	2	Splitter Box 4A	splitter	Cu	7.590
2/21/2020	2020	2	Stream	stream	Cu	4.170
3/18/2020	2020	3	1A inlet	A cell	Cu	5.414
3/18/2020	2020	3	1A outlet	A cell	Cu	4.278
3/18/2020	2020	3	1B inlet	B cell	Cu	3.923
3/18/2020	2020	3	1B outlet	B cell	Cu	3.212
3/18/2020	2020	3	2A inlet	A cell	Cu	5.887
3/18/2020	2020	3	2A outlet	A cell	Cu	4.401
3/18/2020	2020	3	2B inlet	B cell	Cu	4.199
3/18/2020	2020	3	2B outlet	B cell	Cu	3.546
3/18/2020	2020	3	3A inlet	A cell	Cu	5.539
3/18/2020	2020	3	3A outlet	A cell	Cu	3.770
3/18/2020	2020	3	3B inlet	B cell	Cu	3.724
3/18/2020	2020	3	3B outlet	B cell	Cu	2.992
3/18/2020	2020	3	4A inlet	A cell	Cu	5.658
3/18/2020	2020	3	4A outlet	A cell	Cu	4.608
3/18/2020	2020	3	4B inlet	B cell	Cu	4.166
3/18/2020	2020	3	4B outlet	B cell	Cu	5.070
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Cu	16.694
3/18/2020	2020	3	Splitter Box 1A	splitter	Cu	5.532
3/18/2020	2020	3	Splitter Box 2A	splitter	Cu	5.658
3/18/2020	2020	3	Splitter Box 3A	splitter	Cu	5.620
3/18/2020	2020	3	Splitter Box 4A	splitter	Cu	5.499
3/18/2020	2020	3	Stream	stream	Cu	3.414
6/24/2020	2020	6	1A inlet	A cell	Cu	4.444
6/24/2020	2020	6	1A outlet	A cell	Cu	3.043
6/24/2020	2020	6	1B inlet	B cell	Cu	2.572
6/24/2020	2020	6	1B outlet	B cell	Cu	2.168
6/24/2020	2020	6	2A inlet	A cell	Cu	4.670
6/24/2020	2020	6	2A outlet	A cell	Cu	2.564
6/24/2020	2020	6	2B inlet	B cell	Cu	2.700
6/24/2020	2020	6	2B outlet	B cell	Cu	2.131
6/24/2020	2020	6	3A inlet	A cell	Cu	4.113
6/24/2020	2020	6	3A outlet	A cell	Cu	2.624
6/24/2020	2020	6	3B inlet	B cell	Cu	2.592
6/24/2020	2020	6	3B outlet	B cell	Cu	1.613
6/24/2020	2020	6	4A inlet	A cell	Cu	5.147
6/24/2020	2020	6	4A outlet	A cell	Cu	2.854
6/24/2020	2020	6	4B inlet	B cell	Cu	3.032
6/24/2020	2020	6	4B outlet	B cell	Cu	2.199
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Cu	36.782
6/24/2020	2020	6	Splitter Box 1A	splitter	Cu	5.179
6/24/2020	2020	6	Splitter Box 2A	splitter	Cu	5.092
6/24/2020	2020	6	Splitter Box 3A	splitter	Cu	5.265
6/24/2020	2020	6	Splitter Box 4A	splitter	Cu	4.864
6/24/2020	2020	6	Stream	stream	Cu	1.907

Appendix L. continued

Date	Year	Month	Location	Location description	Element	DGT concentration (µg/L)
7/10/2020	2020	7	1A inlet	A cell	Cu	10.619
7/10/2020	2020	7	1A outlet	A cell	Cu	7.247
7/10/2020	2020	7	1B inlet	B cell	Cu	6.308
7/10/2020	2020	7	1B outlet	B cell	Cu	2.112
7/10/2020	2020	7	2A inlet	A cell	Cu	12.002
7/10/2020	2020	7	2A outlet	A cell	Cu	5.815
7/10/2020	2020	7	2B inlet	B cell	Cu	4.755
7/10/2020	2020	7	2B outlet	B cell	Cu	3.245
7/10/2020	2020	7	3A inlet	A cell	Cu	10.200
7/10/2020	2020	7	3A outlet	A cell	Cu	3.335
7/10/2020	2020	7	3B inlet	B cell	Cu	5.474
7/10/2020	2020	7	3B outlet	B cell	Cu	1.876
7/10/2020	2020	7	4A inlet	A cell	Cu	13.672
7/10/2020	2020	7	4A outlet	A cell	Cu	6.697
7/10/2020	2020	7	4B inlet	B cell	Cu	5.133
7/10/2020	2020	7	4B outlet	B cell	Cu	3.196
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Cu	28.131
7/10/2020	2020	7	Splitter Box 1A	splitter	Cu	14.705
7/10/2020	2020	7	Splitter Box 2A	splitter	Cu	12.667
7/10/2020	2020	7	Splitter Box 3A	splitter	Cu	13.625
7/10/2020	2020	7	Splitter Box 4A	splitter	Cu	13.809
7/10/2020	2020	7	Stream	stream	Cu	2.985

Appendix M. DGT lead concentrations in wetland surface water (raw data).

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
7/16/2003	2003	7	A01-NEW-001	stream	Pb	0.081
7/17/2003	2003	7	A01-NEW-001	stream	Pb	0.055
7/18/2003	2003	7	A01-NEW-001	stream	Pb	0.126
7/21/2003	2003	7	A01-NEW-002	stream	Pb	0.143
7/22/2003	2003	7	A01-NEW-002	stream	Pb	0.081
7/16/2003	2003	7	A01-OLD-001	old outfall	Pb	1.128
7/17/2003	2003	7	A01-OLD-001	old outfall	Pb	1.083
7/18/2003	2003	7	A01-OLD-001	old outfall	Pb	0.951
7/21/2003	2003	7	A01-OLD-002	old outfall	Pb	0.333
7/22/2003	2003	7	A01-OLD-002	old outfall	Pb	0.957
7/16/2003	2003	7	A01-SPL-001	splitter	Pb	0.583
7/17/2003	2003	7	A01-SPL-001	splitter	Pb	0.549
7/18/2003	2003	7	A01-SPL-001	splitter	Pb	0.610
7/21/2003	2003	7	A01-SPL-002	splitter	Pb	0.694
7/22/2003	2003	7	A01-SPL-002	splitter	Pb	0.374
4/28/2004	2004	4	A Cells	A cell	Pb	0.920
5/19/2004	2004	5	A Cells	A cell	Pb	0.630
6/23/2004	2004	6	A Cells	A cell	Pb	1.720
7/19/2004	2004	7	A Cells	A cell	Pb	4.780
8/12/2004	2004	8	A Cells	A cell	Pb	0.980
9/9/2004	2004	9	A Cells	A cell	Pb	0.100
12/13/2004	2004	12	A Cells	A cell	Pb	0.150
4/28/2004	2004	4	B Cells	B cell	Pb	0.300
5/19/2004	2004	5	B Cells	B cell	Pb	0.250
6/23/2004	2004	6	B Cells	B cell	Pb	1.629
7/19/2004	2004	7	B Cells	B cell	Pb	1.270
8/12/2004	2004	8	B Cells	B cell	Pb	1.130
9/9/2004	2004	9	B Cells	B cell	Pb	0.100
12/13/2004	2004	12	B Cells	B cell	Pb	0.150
4/28/2004	2004	4	Effluent	stream	Pb	0.220
5/19/2004	2004	5	Effluent	stream	Pb	0.640
6/23/2004	2004	6	Effluent	stream	Pb	0.090
7/19/2004	2004	7	Effluent	stream	Pb	1.840
8/12/2004	2004	8	Effluent	stream	Pb	0.510
9/9/2004	2004	9	Effluent	stream	Pb	0.100
12/13/2004	2004	12	Effluent	stream	Pb	0.001
4/28/2004	2004	4	influent	old outfall	Pb	2.360
5/19/2004	2004	5	influent	old outfall	Pb	1.110
6/23/2004	2004	6	influent	old outfall	Pb	0.636
7/19/2004	2004	7	influent	old outfall	Pb	3.130
8/12/2004	2004	8	influent	old outfall	Pb	1.710
9/9/2004	2004	9	influent	old outfall	Pb	0.500
12/13/2004	2004	12	influent	old outfall	Pb	0.800
4/28/2004	2004	4	splitter	splitter	Pb	0.821
5/19/2004	2004	5	splitter	splitter	Pb	0.520
6/23/2004	2004	6	splitter	splitter	Pb	0.440
7/19/2004	2004	7	splitter	splitter	Pb	5.290
8/12/2004	2004	8	splitter	splitter	Pb	2.320
9/9/2004	2004	9	splitter	splitter	Pb	0.100
12/13/2004	2004	12	splitter	splitter	Pb	0.950
1/18/2005	2005	1	A Cells	A cell	Pb	0.500
2/15/2005	2005	2	A Cells	A cell	Pb	0.310
1/18/2005	2005	1	B Cells	B cell	Pb	0.270
2/15/2005	2005	2	B Cells	B cell	Pb	0.120

Appendix M. continued

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
1/18/2005	2005	1	Effluent	stream	Pb	0.140
2/15/2005	2005	2	Effluent	stream	Pb	0.100
1/18/2005	2005	1	influent	old outfall	Pb	0.480
2/15/2005	2005	2	influent	old outfall	Pb	0.170
1/18/2005	2005	1	splitter	splitter	Pb	0.370
2/15/2005	2005	2	splitter	splitter	Pb	0.220
7/28/2016	2016	7	W-4A1-1F	A cell	Pb	0.055
7/28/2016	2016	7	W-4A1-1U	A cell	Pb	0.134
7/28/2016	2016	7	W-4A1-2F	A cell	Pb	0.064
7/28/2016	2016	7	W-4A1-2U	A cell	Pb	0.120
7/28/2016	2016	7	W-4A2-1F	A cell	Pb	0.040
7/28/2016	2016	7	W-4A2-1U	A cell	Pb	0.138
7/28/2016	2016	7	W-4A2-2F	A cell	Pb	0.050
7/28/2016	2016	7	W-4A2-2U	A cell	Pb	0.149
7/28/2016	2016	7	W-4A3-1F	A cell	Pb	0.048
7/28/2016	2016	7	W-4A3-1U	A cell	Pb	0.104
7/28/2016	2016	7	W-4A3-2F	A cell	Pb	0.039
7/28/2016	2016	7	W-4A3-2U	A cell	Pb	0.136
7/28/2016	2016	7	W-4A4-1F	A cell	Pb	0.050
7/28/2016	2016	7	W-4A4-1U	A cell	Pb	0.138
7/28/2016	2016	7	W-4A4-2F	A cell	Pb	0.044
7/28/2016	2016	7	W-4A4-2U	A cell	Pb	0.163
7/28/2016	2016	7	W-4A5-1F	A cell	Pb	0.050
7/28/2016	2016	7	W-4A5-1U	A cell	Pb	0.126
7/28/2016	2016	7	W-4A5-2F	A cell	Pb	0.049
7/28/2016	2016	7	W-4A5-2U	A cell	Pb	0.172
7/28/2016	2016	7	W-4A6-1F	A cell	Pb	0.049
7/28/2016	2016	7	W-4A6-1U	A cell	Pb	0.129
7/28/2016	2016	7	W-4A6-2F	A cell	Pb	0.069
7/28/2016	2016	7	W-4A6-2U	A cell	Pb	0.118
7/28/2016	2016	7	W-4B1-1F	B cell	Pb	0.046
7/28/2016	2016	7	W-4B1-1U	B cell	Pb	0.089
7/28/2016	2016	7	W-4B1-2F	B cell	Pb	0.061
7/28/2016	2016	7	W-4B1-2U	B cell	Pb	0.111
7/28/2016	2016	7	W-4B2-1F	B cell	Pb	0.038
7/28/2016	2016	7	W-4B2-1U	B cell	Pb	0.108
7/28/2016	2016	7	W-4B2-2F	B cell	Pb	0.053
7/28/2016	2016	7	W-4B2-2U	B cell	Pb	0.179
7/28/2016	2016	7	W-4B3-1F	B cell	Pb	0.038
7/28/2016	2016	7	W-4B3-1U	B cell	Pb	0.096
7/28/2016	2016	7	W-4B3-2F	B cell	Pb	0.055
7/28/2016	2016	7	W-4B3-2U	B cell	Pb	0.125
7/28/2016	2016	7	W-4B4-1F	B cell	Pb	0.012
7/28/2016	2016	7	W-4B4-1U	B cell	Pb	0.208
7/28/2016	2016	7	W-4B4-2F	B cell	Pb	0.025
7/28/2016	2016	7	W-4B4-2U	B cell	Pb	0.344
7/28/2016	2016	7	W-4B5-1F	B cell	Pb	0.052
7/28/2016	2016	7	W-4B5-1U	B cell	Pb	0.100
7/28/2016	2016	7	W-4B5-2F	B cell	Pb	0.113
7/28/2016	2016	7	W-4B5-2U	B cell	Pb	0.233
7/28/2016	2016	7	W-4B6-1F	B cell	Pb	0.038
7/28/2016	2016	7	W-4B6-1U	B cell	Pb	0.240
7/28/2016	2016	7	W-4B6-2F	B cell	Pb	0.041
7/28/2016	2016	7	W-4B6-2U	B cell	Pb	0.152
1/28/2020	2020	1	1A inlet	A cell	Pb	0.193
2/21/2020	2020	2	1A inlet	A cell	Pb	0.522

Appendix M. continued

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
3/18/2020	2020	3	1A inlet	A cell	Pb	0.137
6/24/2020	2020	6	1A inlet	A cell	Pb	0.273
7/10/2020	2020	7	1A inlet	A cell	Pb	0.180
1/28/2020	2020	1	1A outlet	A cell	Pb	0.341
2/21/2020	2020	2	1A outlet	A cell	Pb	0.439
3/18/2020	2020	3	1A outlet	A cell	Pb	0.143
6/24/2020	2020	6	1A outlet	A cell	Pb	0.227
7/10/2020	2020	7	1A outlet	A cell	Pb	0.273
1/28/2020	2020	1	1B inlet	B cell	Pb	0.208
2/21/2020	2020	2	1B inlet	B cell	Pb	0.536
3/18/2020	2020	3	1B inlet	B cell	Pb	0.138
6/24/2020	2020	6	1B inlet	B cell	Pb	0.251
7/10/2020	2020	7	1B inlet	B cell	Pb	0.231
1/28/2020	2020	1	1B outlet	B cell	Pb	0.186
2/21/2020	2020	2	1B outlet	B cell	Pb	0.399
3/18/2020	2020	3	1B outlet	B cell	Pb	0.126
6/24/2020	2020	6	1B outlet	B cell	Pb	0.336
7/10/2020	2020	7	1B outlet	B cell	Pb	0.095
1/28/2020	2020	1	2A inlet	A cell	Pb	0.196
2/21/2020	2020	2	2A inlet	A cell	Pb	0.551
3/18/2020	2020	3	2A inlet	A cell	Pb	0.331
6/24/2020	2020	6	2A inlet	A cell	Pb	0.286
7/10/2020	2020	7	2A inlet	A cell	Pb	0.439
1/28/2020	2020	1	2A outlet	A cell	Pb	0.143
2/21/2020	2020	2	2A outlet	A cell	Pb	0.447
3/18/2020	2020	3	2A outlet	A cell	Pb	0.158
6/24/2020	2020	6	2A outlet	A cell	Pb	0.242
7/10/2020	2020	7	2A outlet	A cell	Pb	0.233
1/28/2020	2020	1	2B inlet	B cell	Pb	0.230
2/21/2020	2020	2	2B inlet	B cell	Pb	0.468
3/18/2020	2020	3	2B inlet	B cell	Pb	0.141
6/24/2020	2020	6	2B inlet	B cell	Pb	0.245
7/10/2020	2020	7	2B inlet	B cell	Pb	0.216
1/28/2020	2020	1	2B outlet	B cell	Pb	0.079
2/21/2020	2020	2	2B outlet	B cell	Pb	0.237
3/18/2020	2020	3	2B outlet	B cell	Pb	0.092
6/24/2020	2020	6	2B outlet	B cell	Pb	0.220
7/10/2020	2020	7	2B outlet	B cell	Pb	0.149
1/28/2020	2020	1	3A inlet	A cell	Pb	0.177
2/21/2020	2020	2	3A inlet	A cell	Pb	0.549
3/18/2020	2020	3	3A inlet	A cell	Pb	0.155
6/24/2020	2020	6	3A inlet	A cell	Pb	0.275
7/10/2020	2020	7	3A inlet	A cell	Pb	0.265
1/28/2020	2020	1	3A outlet	A cell	Pb	0.144
2/21/2020	2020	2	3A outlet	A cell	Pb	0.464
3/18/2020	2020	3	3A outlet	A cell	Pb	0.139
6/24/2020	2020	6	3A outlet	A cell	Pb	0.268
7/10/2020	2020	7	3A outlet	A cell	Pb	0.179
1/28/2020	2020	1	3B inlet	B cell	Pb	0.236
2/21/2020	2020	2	3B inlet	B cell	Pb	0.362
3/18/2020	2020	3	3B inlet	B cell	Pb	0.112
6/24/2020	2020	6	3B inlet	B cell	Pb	0.266
7/10/2020	2020	7	3B inlet	B cell	Pb	0.238
1/28/2020	2020	1	3B outlet	B cell	Pb	0.101
2/21/2020	2020	2	3B outlet	B cell	Pb	0.258
3/18/2020	2020	3	3B outlet	B cell	Pb	0.082

Appendix M. continued

Date	Year	Month	Location	Location description	Element	Concentration (μg/L)
6/24/2020	2020	6	3B outlet	B cell	Pb	0.234
7/10/2020	2020	7	3B outlet	B cell	Pb	0.102
1/28/2020	2020	1	4A inlet	A cell	Pb	0.153
2/21/2020	2020	2	4A inlet	A cell	Pb	0.546
3/18/2020	2020	3	4A inlet	A cell	Pb	0.181
6/24/2020	2020	6	4A inlet	A cell	Pb	0.438
7/10/2020	2020	7	4A inlet	A cell	Pb	0.554
1/28/2020	2020	1	4A outlet	A cell	Pb	0.120
2/21/2020	2020	2	4A outlet	A cell	Pb	0.458
3/18/2020	2020	3	4A outlet	A cell	Pb	0.151
6/24/2020	2020	6	4A outlet	A cell	Pb	0.266
7/10/2020	2020	7	4A outlet	A cell	Pb	0.272
1/28/2020	2020	1	4B inlet	B cell	Pb	0.149
2/21/2020	2020	2	4B inlet	B cell	Pb	0.374
3/18/2020	2020	3	4B inlet	B cell	Pb	0.145
6/24/2020	2020	6	4B inlet	B cell	Pb	0.347
7/10/2020	2020	7	4B inlet	B cell	Pb	0.227
1/28/2020	2020	1	4B outlet	B cell	Pb	0.087
2/21/2020	2020	2	4B outlet	B cell	Pb	0.242
3/18/2020	2020	3	4B outlet	B cell	Pb	0.160
6/24/2020	2020	6	4B outlet	B cell	Pb	0.240
7/10/2020	2020	7	4B outlet	B cell	Pb	0.118
1/28/2020	2020	1	Old A-01 Outfall	old outfall	Pb	0.267
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Pb	0.438
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Pb	0.433
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Pb	0.956
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Pb	1.144
1/28/2020	2020	1	Splitter Box 1A	splitter	Pb	0.186
2/21/2020	2020	2	Splitter Box 1A	splitter	Pb	0.577
3/18/2020	2020	3	Splitter Box 1A	splitter	Pb	0.154
6/24/2020	2020	6	Splitter Box 1A	splitter	Pb	0.254
7/10/2020	2020	7	Splitter Box 1A	splitter	Pb	0.582
1/28/2020	2020	1	Splitter Box 2A	splitter	Pb	0.253
2/21/2020	2020	2	Splitter Box 2A	splitter	Pb	0.714
3/18/2020	2020	3	Splitter Box 2A	splitter	Pb	0.145
6/24/2020	2020	6	Splitter Box 2A	splitter	Pb	0.279
7/10/2020	2020	7	Splitter Box 2A	splitter	Pb	0.417
1/28/2020	2020	1	Splitter Box 3A	splitter	Pb	0.262
2/21/2020	2020	2	Splitter Box 3A	splitter	Pb	0.564
3/18/2020	2020	3	Splitter Box 3A	splitter	Pb	0.145
6/24/2020	2020	6	Splitter Box 3A	splitter	Pb	0.316
7/10/2020	2020	7	Splitter Box 3A	splitter	Pb	0.554
1/28/2020	2020	1	Splitter Box 4A	splitter	Pb	0.205
2/21/2020	2020	2	Splitter Box 4A	splitter	Pb	0.526
3/18/2020	2020	3	Splitter Box 4A	splitter	Pb	0.146
6/24/2020	2020	6	Splitter Box 4A	splitter	Pb	0.298
7/10/2020	2020	7	Splitter Box 4A	splitter	Pb	0.597
1/28/2020	2020	1	Stream	stream	Pb	0.105
2/21/2020	2020	2	Stream	stream	Pb	0.276
3/18/2020	2020	3	Stream	stream	Pb	0.091
6/24/2020	2020	6	Stream	stream	Pb	0.225
7/10/2020	2020	7	Stream	stream	Pb	0.136

Appendix N. DGT zinc concentrations in wetland surface water (raw data).

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
7/16/2003	2003	7	A01-NEW-001	stream	Zn	84.373
7/17/2003	2003	7	A01-NEW-001	stream	Zn	21.378
7/18/2003	2003	7	A01-NEW-001	stream	Zn	235.034
7/21/2003	2003	7	A01-NEW-002	stream	Zn	20.539
7/22/2003	2003	7	A01-NEW-002	stream	Zn	19.098
7/16/2003	2003	7	A01-OLD-001	old outfall	Zn	49.965
7/17/2003	2003	7	A01-OLD-001	old outfall	Zn	50.616
7/18/2003	2003	7	A01-OLD-001	old outfall	Zn	51.422
7/21/2003	2003	7	A01-OLD-002	old outfall	Zn	54.363
7/22/2003	2003	7	A01-OLD-002	old outfall	Zn	44.915
7/16/2003	2003	7	A01-SPL-001	splitter	Zn	30.706
7/17/2003	2003	7	A01-SPL-001	splitter	Zn	27.702
7/18/2003	2003	7	A01-SPL-001	splitter	Zn	23.917
7/21/2003	2003	7	A01-SPL-002	splitter	Zn	40.561
7/22/2003	2003	7	A01-SPL-002	splitter	Zn	29.654
4/28/2004	2004	4	A Cells	A cell	Zn	23.620
5/19/2004	2004	5	A Cells	A cell	Zn	13.440
6/23/2004	2004	6	A Cells	A cell	Zn	4.580
7/19/2004	2004	7	A Cells	A cell	Zn	11.270
8/12/2004	2004	8	A Cells	A cell	Zn	11.820
9/9/2004	2004	9	A Cells	A cell	Zn	9.700
12/13/2004	2004	12	A Cells	A cell	Zn	11.320
4/28/2004	2004	4	B Cells	B cell	Zn	27.950
5/19/2004	2004	5	B Cells	B cell	Zn	10.470
6/23/2004	2004	6	B Cells	B cell	Zn	6.580
7/19/2004	2004	7	B Cells	B cell	Zn	6.040
8/12/2004	2004	8	B Cells	B cell	Zn	9.780
9/9/2004	2004	9	B Cells	B cell	Zn	2.720
12/13/2004	2004	12	B Cells	B cell	Zn	4.640
4/28/2004	2004	4	Effluent	stream	Zn	22.600
5/19/2004	2004	5	Effluent	stream	Zn	10.660
6/23/2004	2004	6	Effluent	stream	Zn	5.400
7/19/2004	2004	7	Effluent	stream	Zn	12.240
8/12/2004	2004	8	Effluent	stream	Zn	11.080
9/9/2004	2004	9	Effluent	stream	Zn	0.940
12/13/2004	2004	12	Effluent	stream	Zn	4.070
4/28/2004	2004	4	influent	old outfall	Zn	11.440
5/19/2004	2004	5	influent	old outfall	Zn	16.320
6/23/2004	2004	6	influent	old outfall	Zn	25.820
7/19/2004	2004	7	influent	old outfall	Zn	12.780
8/12/2004	2004	8	influent	old outfall	Zn	23.430
9/9/2004	2004	9	influent	old outfall	Zn	31.180
12/13/2004	2004	12	influent	old outfall	Zn	22.400
4/28/2004	2004	4	splitter	splitter	Zn	39.020
5/19/2004	2004	5	splitter	splitter	Zn	11.010
6/23/2004	2004	6	splitter	splitter	Zn	44.820
7/19/2004	2004	7	splitter	splitter	Zn	18.020
8/12/2004	2004	8	splitter	splitter	Zn	43.560
9/9/2004	2004	9	splitter	splitter	Zn	46.230
12/13/2004	2004	12	splitter	splitter	Zn	38.270
1/18/2005	2005	1	A Cells	A cell	Zn	25.090
2/15/2005	2005	2	A Cells	A cell	Zn	18.640
1/18/2005	2005	1	B Cells	B cell	Zn	8.630
2/15/2005	2005	2	B Cells	B cell	Zn	4.800

Appendix N. continued

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
1/18/2005	2005	1	Effluent	stream	Zn	7.990
2/15/2005	2005	2	Effluent	stream	Zn	4.300
1/18/2005	2005	1	influent	old outfall	Zn	9.630
2/15/2005	2005	2	influent	old outfall	Zn	12.570
1/18/2005	2005	1	splitter	splitter	Zn	17.350
2/15/2005	2005	2	splitter	splitter	Zn	18.070
7/28/2016	2016	7	W-4A1-1F	A cell	Zn	42.810
7/28/2016	2016	7	W-4A1-1U	A cell	Zn	42.110
7/28/2016	2016	7	W-4A1-2F	A cell	Zn	38.460
7/28/2016	2016	7	W-4A1-2U	A cell	Zn	42.270
7/28/2016	2016	7	W-4A2-1F	A cell	Zn	40.440
7/28/2016	2016	7	W-4A2-1U	A cell	Zn	42.640
7/28/2016	2016	7	W-4A2-2F	A cell	Zn	52.760
7/28/2016	2016	7	W-4A2-2U	A cell	Zn	44.860
7/28/2016	2016	7	W-4A3-1F	A cell	Zn	39.800
7/28/2016	2016	7	W-4A3-1U	A cell	Zn	43.690
7/28/2016	2016	7	W-4A3-2F	A cell	Zn	45.200
7/28/2016	2016	7	W-4A3-2U	A cell	Zn	48.680
7/28/2016	2016	7	W-4A4-1F	A cell	Zn	29.720
7/28/2016	2016	7	W-4A4-1U	A cell	Zn	35.770
7/28/2016	2016	7	W-4A4-2F	A cell	Zn	42.850
7/28/2016	2016	7	W-4A4-2U	A cell	Zn	39.910
7/28/2016	2016	7	W-4A5-1F	A cell	Zn	43.020
7/28/2016	2016	7	W-4A5-1U	A cell	Zn	40.230
7/28/2016	2016	7	W-4A5-2F	A cell	Zn	48.110
7/28/2016	2016	7	W-4A5-2U	A cell	Zn	33.540
7/28/2016	2016	7	W-4A6-1F	A cell	Zn	41.190
7/28/2016	2016	7	W-4A6-1U	A cell	Zn	51.230
7/28/2016	2016	7	W-4A6-2F	A cell	Zn	52.530
7/28/2016	2016	7	W-4A6-2U	A cell	Zn	37.000
7/28/2016	2016	7	W-4B1-1F	B cell	Zn	53.570
7/28/2016	2016	7	W-4B1-1U	B cell	Zn	35.720
7/28/2016	2016	7	W-4B1-2F	B cell	Zn	38.180
7/28/2016	2016	7	W-4B1-2U	B cell	Zn	41.490
7/28/2016	2016	7	W-4B2-1F	B cell	Zn	40.100
7/28/2016	2016	7	W-4B2-1U	B cell	Zn	32.000
7/28/2016	2016	7	W-4B2-2F	B cell	Zn	34.210
7/28/2016	2016	7	W-4B2-2U	B cell	Zn	32.640
7/28/2016	2016	7	W-4B3-1F	B cell	Zn	45.280
7/28/2016	2016	7	W-4B3-1U	B cell	Zn	40.190
7/28/2016	2016	7	W-4B3-2F	B cell	Zn	37.690
7/28/2016	2016	7	W-4B3-2U	B cell	Zn	45.430
7/28/2016	2016	7	W-4B4-1F	B cell	Zn	35.680
7/28/2016	2016	7	W-4B4-1U	B cell	Zn	56.780
7/28/2016	2016	7	W-4B4-2F	B cell	Zn	38.130
7/28/2016	2016	7	W-4B4-2U	B cell	Zn	41.160
7/28/2016	2016	7	W-4B5-1F	B cell	Zn	29.770
7/28/2016	2016	7	W-4B5-1U	B cell	Zn	42.230
7/28/2016	2016	7	W-4B5-2F	B cell	Zn	46.970
7/28/2016	2016	7	W-4B5-2U	B cell	Zn	34.650
7/28/2016	2016	7	W-4B6-1F	B cell	Zn	45.760
7/28/2016	2016	7	W-4B6-1U	B cell	Zn	38.620
7/28/2016	2016	7	W-4B6-2F	B cell	Zn	38.280
7/28/2016	2016	7	W-4B6-2U	B cell	Zn	31.430
7/10/2020	2020	7	1A inlet	A cell	Zn	32.483
1/28/2020	2020	1	1A inlet	A cell	Zn	10.157

Appendix N. continued

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
2/21/2020	2020	2	1A inlet	A cell	Zn	36.913
3/18/2020	2020	3	1A inlet	A cell	Zn	14.575
6/24/2020	2020	6	1A inlet	A cell	Zn	8.953
7/10/2020	2020	7	1A outlet	A cell	Zn	18.022
1/28/2020	2020	1	1A outlet	A cell	Zn	14.049
2/21/2020	2020	2	1A outlet	A cell	Zn	29.079
3/18/2020	2020	3	1A outlet	A cell	Zn	12.138
6/24/2020	2020	6	1A outlet	A cell	Zn	9.597
7/10/2020	2020	7	1B inlet	B cell	Zn	15.266
1/28/2020	2020	1	1B inlet	B cell	Zn	10.529
2/21/2020	2020	2	1B inlet	B cell	Zn	28.357
3/18/2020	2020	3	1B inlet	B cell	Zn	10.145
6/24/2020	2020	6	1B inlet	B cell	Zn	8.806
7/10/2020	2020	7	1B outlet	B cell	Zn	5.163
1/28/2020	2020	1	1B outlet	B cell	Zn	8.603
2/21/2020	2020	2	1B outlet	B cell	Zn	18.074
3/18/2020	2020	3	1B outlet	B cell	Zn	8.689
6/24/2020	2020	6	1B outlet	B cell	Zn	9.078
7/10/2020	2020	7	2A inlet	A cell	Zn	36.027
1/28/2020	2020	1	2A inlet	A cell	Zn	12.334
2/21/2020	2020	2	2A inlet	A cell	Zn	39.467
3/18/2020	2020	3	2A inlet	A cell	Zn	16.137
6/24/2020	2020	6	2A inlet	A cell	Zn	10.163
7/10/2020	2020	7	2A outlet	A cell	Zn	12.955
1/28/2020	2020	1	2A outlet	A cell	Zn	10.094
2/21/2020	2020	2	2A outlet	A cell	Zn	24.690
3/18/2020	2020	3	2A outlet	A cell	Zn	11.722
6/24/2020	2020	6	2A outlet	A cell	Zn	9.527
7/10/2020	2020	7	2B inlet	B cell	Zn	10.282
1/28/2020	2020	1	2B inlet	B cell	Zn	12.144
2/21/2020	2020	2	2B inlet	B cell	Zn	23.486
3/18/2020	2020	3	2B inlet	B cell	Zn	11.680
6/24/2020	2020	6	2B inlet	B cell	Zn	8.797
7/10/2020	2020	7	2B outlet	B cell	Zn	7.238
1/28/2020	2020	1	2B outlet	B cell	Zn	9.625
2/21/2020	2020	2	2B outlet	B cell	Zn	14.695
3/18/2020	2020	3	2B outlet	B cell	Zn	11.632
6/24/2020	2020	6	2B outlet	B cell	Zn	6.893
7/10/2020	2020	7	3A inlet	A cell	Zn	31.073
1/28/2020	2020	1	3A inlet	A cell	Zn	14.096
2/21/2020	2020	2	3A inlet	A cell	Zn	37.380
3/18/2020	2020	3	3A inlet	A cell	Zn	13.472
6/24/2020	2020	6	3A inlet	A cell	Zn	8.282
7/10/2020	2020	7	3A outlet	A cell	Zn	9.166
1/28/2020	2020	1	3A outlet	A cell	Zn	10.846
2/21/2020	2020	2	3A outlet	A cell	Zn	20.953
3/18/2020	2020	3	3A outlet	A cell	Zn	9.667
6/24/2020	2020	6	3A outlet	A cell	Zn	5.632
7/10/2020	2020	7	3B inlet	B cell	Zn	12.562
1/28/2020	2020	1	3B inlet	B cell	Zn	11.063
2/21/2020	2020	2	3B inlet	B cell	Zn	24.947
3/18/2020	2020	3	3B inlet	B cell	Zn	10.707
6/24/2020	2020	6	3B inlet	B cell	Zn	6.348
7/10/2020	2020	7	3B outlet	B cell	Zn	6.162
1/28/2020	2020	1	3B outlet	B cell	Zn	9.956
2/21/2020	2020	2	3B outlet	B cell	Zn	14.439

Appendix N. continued

Date	Year	Month	Location	Location description	Element	Concentration (µg/L)
3/18/2020	2020	3	3B outlet	B cell	Zn	9.671
6/24/2020	2020	6	3B outlet	B cell	Zn	6.327
7/10/2020	2020	7	4A inlet	A cell	Zn	42.782
1/28/2020	2020	1	4A inlet	A cell	Zn	10.961
2/21/2020	2020	2	4A inlet	A cell	Zn	38.010
3/18/2020	2020	3	4A inlet	A cell	Zn	15.340
6/24/2020	2020	6	4A inlet	A cell	Zn	13.204
7/10/2020	2020	7	4A outlet	A cell	Zn	16.176
1/28/2020	2020	1	4A outlet	A cell	Zn	9.334
2/21/2020	2020	2	4A outlet	A cell	Zn	30.085
3/18/2020	2020	3	4A outlet	A cell	Zn	11.661
6/24/2020	2020	6	4A outlet	A cell	Zn	7.638
7/10/2020	2020	7	4B inlet	B cell	Zn	12.986
1/28/2020	2020	1	4B inlet	B cell	Zn	10.110
2/21/2020	2020	2	4B inlet	B cell	Zn	21.974
3/18/2020	2020	3	4B inlet	B cell	Zn	9.323
6/24/2020	2020	6	4B inlet	B cell	Zn	7.334
7/10/2020	2020	7	4B outlet	B cell	Zn	7.170
1/28/2020	2020	1	4B outlet	B cell	Zn	9.468
2/21/2020	2020	2	4B outlet	B cell	Zn	16.547
3/18/2020	2020	3	4B outlet	B cell	Zn	10.006
6/24/2020	2020	6	4B outlet	B cell	Zn	6.755
7/10/2020	2020	7	Old A-01 Outfall	old outfall	Zn	40.555
1/28/2020	2020	1	Old A-01 Outfall	old outfall	Zn	8.573
2/21/2020	2020	2	Old A-01 Outfall	old outfall	Zn	37.641
3/18/2020	2020	3	Old A-01 Outfall	old outfall	Zn	17.653
6/24/2020	2020	6	Old A-01 Outfall	old outfall	Zn	34.770
7/10/2020	2020	7	Splitter Box 1A	splitter	Zn	42.034
1/28/2020	2020	1	Splitter Box 1A	splitter	Zn	10.868
2/21/2020	2020	2	Splitter Box 1A	splitter	Zn	42.448
3/18/2020	2020	3	Splitter Box 1A	splitter	Zn	17.143
6/24/2020	2020	6	Splitter Box 1A	splitter	Zn	13.411
7/10/2020	2020	7	Splitter Box 2A	splitter	Zn	37.905
1/28/2020	2020	1	Splitter Box 2A	splitter	Zn	10.496
2/21/2020	2020	2	Splitter Box 2A	splitter	Zn	40.802
3/18/2020	2020	3	Splitter Box 2A	splitter	Zn	17.258
6/24/2020	2020	6	Splitter Box 2A	splitter	Zn	12.897
7/10/2020	2020	7	Splitter Box 3A	splitter	Zn	40.545
1/28/2020	2020	1	Splitter Box 3A	splitter	Zn	9.559
2/21/2020	2020	2	Splitter Box 3A	splitter	Zn	43.050
3/18/2020	2020	3	Splitter Box 3A	splitter	Zn	16.964
6/24/2020	2020	6	Splitter Box 3A	splitter	Zn	15.308
7/10/2020	2020	7	Splitter Box 4A	splitter	Zn	39.901
1/28/2020	2020	1	Splitter Box 4A	splitter	Zn	9.600
2/21/2020	2020	2	Splitter Box 4A	splitter	Zn	47.598
3/18/2020	2020	3	Splitter Box 4A	splitter	Zn	17.385
6/24/2020	2020	6	Splitter Box 4A	splitter	Zn	11.667
7/10/2020	2020	7	Stream	stream	Zn	7.861
1/28/2020	2020	1	Stream	stream	Zn	7.395
2/21/2020	2020	2	Stream	stream	Zn	17.225
3/18/2020	2020	3	Stream	stream	Zn	10.261
6/24/2020	2020	6	Stream	stream	Zn	6.197

Appendix O. DGT copper concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4A2-1A	2016	7	4A	inlet	1	5-10	Cu	1.897
DS-4A2-2A	2016	7	4A	inlet	2	5-10	Cu	1.409
DS-4A1-2B	2016	7	4A	inlet	2	10-20	Cu	1.682
DS-4A2-1B	2016	7	4A	inlet	1	10-20	Cu	1.790
DS-4A2-2B	2016	7	4A	inlet	2	10-20	Cu	1.881
DS-4A2-1F	2016	7	4A	inlet	1	2-5	Cu	1.607
DS-4A2-2F	2016	7	4A	inlet	2	2-5	Cu	1.605
DS-4A3-1A	2016	7	4A	middle	1	5-10	Cu	1.901
DS-4A3-2A	2016	7	4A	middle	2	5-10	Cu	2.069
DS-4A4-1A	2016	7	4A	middle	1	5-10	Cu	1.819
DS-4A4-2A	2016	7	4A	middle	2	5-10	Cu	1.391
DS-4A3-1B	2016	7	4A	middle	1	10-20	Cu	1.645
DS-4A3-2B	2016	7	4A	middle	2	10-20	Cu	1.491
DS-4A4-1B	2016	7	4A	middle	1	10-20	Cu	3.363
DS-4A4-2B	2016	7	4A	middle	2	10-20	Cu	1.198
DS-4A3-1F	2016	7	4A	middle	1	2-5	Cu	2.099
DS-4A3-2F	2016	7	4A	middle	2	2-5	Cu	1.446
DS-4A4-1F	2016	7	4A	middle	1	2-5	Cu	2.209
DS-4A4-2F	2016	7	4A	middle	2	2-5	Cu	1.341
DS-4A5-1A	2016	7	4A	outlet	1	5-10	Cu	1.321
DS-4A5-2A	2016	7	4A	outlet	2	5-10	Cu	1.936
DS-4A6-1A	2016	7	4A	outlet	1	5-10	Cu	1.514
DS-4A6-2A	2016	7	4A	outlet	2	5-10	Cu	1.531
DS-4A5-1B	2016	7	4A	outlet	1	10-20	Cu	1.145
DS-4A5-2B	2016	7	4A	outlet	2	10-20	Cu	1.420
DS-4A6-1B	2016	7	4A	outlet	1	10-20	Cu	1.692
DS-4A6-2B	2016	7	4A	outlet	2	10-20	Cu	1.827
DS-4A5-1F	2016	7	4A	outlet	1	2-5	Cu	1.359
DS-4A5-2F	2016	7	4A	outlet	2	2-5	Cu	5.937
DS-4A6-1F	2016	7	4A	outlet	1	2-5	Cu	1.598
DS-4A6-2F	2016	7	4A	outlet	2	2-5	Cu	1.596
DS-4B-5-1A	2016	7	4B	inlet	1	5-10	Cu	2.505
DS-4B-5-2A	2016	7	4B	inlet	2	5-10	Cu	1.978
DS-4B-6-1A	2016	7	4B	inlet	1	5-10	Cu	0.741
DS-4B-6-2A	2016	7	4B	inlet	2	5-10	Cu	0.798
DS-4B-5-1B	2016	7	4B	inlet	1	10-20	Cu	3.810
DS-4B-5-2B	2016	7	4B	inlet	2	10-20	Cu	2.319
DS-4B-6-1B	2016	7	4B	inlet	1	10-20	Cu	BD
DS-4B-6-2B	2016	7	4B	inlet	2	10-20	Cu	1.177
DS-4B-5-1F	2016	7	4B	inlet	1	2-5	Cu	2.114
DS-4B-5-2F	2016	7	4B	inlet	2	2-5	Cu	1.830
DS-4B-6-1F	2016	7	4B	inlet	1	2-5	Cu	0.810
DS-4B-6-2F	2016	7	4B	inlet	2	2-5	Cu	0.704
DS-4B-3-1A	2016	7	4B	middle	1	5-10	Cu	1.000
DS-4B-3-2A	2016	7	4B	middle	2	5-10	Cu	1.265
DS-4B-4-1A	2016	7	4B	middle	1	5-10	Cu	1.157
DS-4B-4-2A	2016	7	4B	middle	2	5-10	Cu	0.954
DS-4B-3-1B	2016	7	4B	middle	1	10-20	Cu	1.037
DS-4B-3-2B	2016	7	4B	middle	2	10-20	Cu	1.875
DS-4B-4-1B	2016	7	4B	middle	1	10-20	Cu	1.305
DS-4B-4-2B	2016	7	4B	middle	2	10-20	Cu	1.059

Appendix O. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4B-3-1F	2016	7	4B	middle	1	2-5	Cu	1.003
DS-4B-3-2F	2016	7	4B	middle	2	2-5	Cu	5.616
DS-4B-4-1F	2016	7	4B	middle	1	2-5	Cu	1.454
DS-4B-4-2F	2016	7	4B	middle	2	2-5	Cu	0.582
DS-4B-1-1A	2016	7	4B	outlet	1	5-10	Cu	1.867
DS-4B-1-2A	2016	7	4B	outlet	2	5-10	Cu	2.028
DS-4B-2-1A	2016	7	4B	outlet	1	5-10	Cu	0.774
DS-4B-2-2A	2016	7	4B	outlet	2	5-10	Cu	0.727
DS-4B-1-1B	2016	7	4B	outlet	1	10-20	Cu	1.617
DS-4B-1-2B	2016	7	4B	outlet	2	10-20	Cu	2.045
DS-4B-2-1B	2016	7	4B	outlet	1	10-20	Cu	1.077
DS-4B-2-2B	2016	7	4B	outlet	2	10-20	Cu	0.562
DS-4B-1-1F	2016	7	4B	outlet	1	2-5	Cu	2.491
DS-4B-1-2F	2016	7	4B	outlet	2	2-5	Cu	2.000
DS-4B-2-1F	2016	7	4B	outlet	1	2-5	Cu	0.873
DS-4B-2-2F	2016	7	4B	outlet	2	2-5	Cu	0.944
4A-A1-S-INORG1	2020	7	4A	inlet	1	5-10	Cu	9.222
4A-A2-S-INORG1	2020	7	4A	inlet	2	5-10	Cu	3.978
4A-A3-S-INORG1	2020	7	4A	inlet	3	5-10	Cu	1.019
4A-A1-S-INORG2	2020	7	4A	inlet	1	10-20	Cu	5.416
4A-A2-S-INORG2	2020	7	4A	inlet	2	10-20	Cu	3.341
4A-A3-S-INORG2	2020	7	4A	inlet	3	10-20	Cu	5.521
4A-A1-S-OM	2020	7	4A	inlet	1	2-5	Cu	7.747
4A-A2-S-OM	2020	7	4A	inlet	2	2-5	Cu	4.250
4A-A3-S-OM	2020	7	4A	inlet	3	2-5	Cu	2.511
4A-B1-S-INORG1	2020	7	4A	middle	1	5-10	Cu	9.088
4A-B2-S-INORG1	2020	7	4A	middle	2	5-10	Cu	4.283
4A-C1-S-INORG1	2020	7	4A	middle	1	5-10	Cu	1.383
4A-C2-S-INORG1	2020	7	4A	middle	2	5-10	Cu	0.777
4A-B1-S-INORG2	2020	7	4A	middle	1	10-20	Cu	8.700
4A-B2-S-INORG2	2020	7	4A	middle	2	10-20	Cu	2.950
4A-C1-S-INORG2	2020	7	4A	middle	1	10-20	Cu	2.221
4A-C2-S-INORG2	2020	7	4A	middle	2	10-20	Cu	1.109
4A-B1-S-OM	2020	7	4A	middle	1	2-5	Cu	17.446
4A-B2-S-OM	2020	7	4A	middle	2	2-5	Cu	14.374
4A-C1-S-OM	2020	7	4A	middle	1	2-5	Cu	0.830
4A-C2-S-OM	2020	7	4A	middle	2	2-5	Cu	0.454
4A-D1-S-INORG1	2020	7	4A	oulet	1	5-10	Cu	1.870
4A-D2-S-INORG1	2020	7	4A	oulet	2	5-10	Cu	3.003
4A-D1-S-INORG2	2020	7	4A	oulet	1	10-20	Cu	2.627
4A-D2-S-INORG2	2020	7	4A	oulet	2	10-20	Cu	1.467
4A-D1-S-OM	2020	7	4A	oulet	1	2-5	Cu	6.913
4A-D2-S-OM	2020	7	4A	oulet	2	2-5	Cu	7.459
4B-A1-S-INORG1	2020	7	4B	inlet	1	5-10	Cu	2.984
4B-A2-S-INORG1	2020	7	4B	inlet	2	5-10	Cu	27.853
4B-A1-S-INORG2	2020	7	4B	inlet	1	10-20	Cu	2.286
4B-A2-S-INORG2	2020	7	4B	inlet	2	10-20	Cu	14.553
4B-A1-S-OM	2020	7	4B	inlet	1	2-5	Cu	5.169
4B-A2-S-OM	2020	7	4B	inlet	2	2-5	Cu	18.762
4B-B1-S-INORG1	2020	7	4B	middle	1	5-10	Cu	3.990
4B-B2-S-INORG1	2020	7	4B	middle	2	5-10	Cu	4.794
4B-C1-S-INORG1	2020	7	4B	middle	1	5-10	Cu	6.388
4B-C2-S-INORG1	2020	7	4B	middle	2	5-10	Cu	2.475

Appendix O. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
4B-B1-S-INORG2	2020	7	4B	middle	1	10-20	Cu	6.753
4B-B2-S-INORG2	2020	7	4B	middle	2	10-20	Cu	4.962
4B-C1-S-INORG2	2020	7	4B	middle	1	10-20	Cu	3.815
4B-C2-S-INORG2	2020	7	4B	middle	2	10-20	Cu	1.783
4B-B1-S-OM	2020	7	4B	middle	1	2-5	Cu	7.919
4B-B2-S-OM	2020	7	4B	middle	2	2-5	Cu	8.592
4B-C1-S-OM	2020	7	4B	middle	1	2-5	Cu	5.827
4B-C2-S-OM	2020	7	4B	middle	2	2-5	Cu	2.091
4B-D1-S-INORG1	2020	7	4B	outlet	1	5-10	Cu	2.278
4B-D2-S-INORG1	2020	7	4B	outlet	2	5-10	Cu	3.906
4B-D1-S-INORG2	2020	7	4B	outlet	1	10-20	Cu	1.083
4B-D2-S-INORG2	2020	7	4B	outlet	2	10-20	Cu	3.148
4B-D1-S-OM	2020	7	4B	outlet	1	2-5	Cu	5.485
4B-D2-S-OM	2020	7	4B	outlet	2	2-5	Cu	4.073

Appendix P. DGT lead concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4A2-1A	2016	7	4A	inlet	1	5-10	Pb	0.478
DS-4A2-2A	2016	7	4A	inlet	2	5-10	Pb	0.401
DS-4A1-2B	2016	7	4A	inlet	2	10-20	Pb	0.534
DS-4A2-1B	2016	7	4A	inlet	1	10-20	Pb	0.429
DS-4A2-2B	2016	7	4A	inlet	2	10-20	Pb	0.400
DS-4A2-1F	2016	7	4A	inlet	1	2-5	Pb	0.490
DS-4A2-2F	2016	7	4A	inlet	2	2-5	Pb	0.445
DS-4A3-1A	2016	7	4A	middle	1	5-10	Pb	0.481
DS-4A3-2A	2016	7	4A	middle	2	5-10	Pb	0.627
DS-4A4-1A	2016	7	4A	middle	1	5-10	Pb	0.380
DS-4A4-2A	2016	7	4A	middle	2	5-10	Pb	0.436
DS-4A3-1B	2016	7	4A	middle	1	10-20	Pb	0.441
DS-4A3-2B	2016	7	4A	middle	2	10-20	Pb	0.396
DS-4A4-1B	2016	7	4A	middle	1	10-20	Pb	0.564
DS-4A4-2B	2016	7	4A	middle	2	10-20	Pb	0.451
DS-4A3-1F	2016	7	4A	middle	1	2-5	Pb	0.490
DS-4A3-2F	2016	7	4A	middle	2	2-5	Pb	0.491
DS-4A4-1F	2016	7	4A	middle	1	2-5	Pb	0.488
DS-4A4-2F	2016	7	4A	middle	2	2-5	Pb	0.500
DS-4A5-1A	2016	7	4A	outlet	1	5-10	Pb	0.448
DS-4A5-2A	2016	7	4A	outlet	2	5-10	Pb	0.604
DS-4A6-1A	2016	7	4A	outlet	1	5-10	Pb	0.585
DS-4A6-2A	2016	7	4A	outlet	2	5-10	Pb	0.499
DS-4A5-1B	2016	7	4A	outlet	1	10-20	Pb	0.407
DS-4A5-2B	2016	7	4A	outlet	2	10-20	Pb	0.435
DS-4A6-1B	2016	7	4A	outlet	1	10-20	Pb	0.591
DS-4A6-2B	2016	7	4A	outlet	2	10-20	Pb	0.546
DS-4A5-1F	2016	7	4A	outlet	1	2-5	Pb	0.495
DS-4A5-2F	2016	7	4A	outlet	2	2-5	Pb	1.919
DS-4A6-1F	2016	7	4A	outlet	1	2-5	Pb	0.588
DS-4A6-2F	2016	7	4A	outlet	2	2-5	Pb	0.595
DS-4B-5-1A	2016	7	4B	inlet	1	5-10	Pb	0.758
DS-4B-5-2A	2016	7	4B	inlet	2	5-10	Pb	0.830
DS-4B-6-1A	2016	7	4B	inlet	1	5-10	Pb	0.194
DS-4B-6-2A	2016	7	4B	inlet	2	5-10	Pb	0.194
DS-4B-5-1B	2016	7	4B	inlet	1	10-20	Pb	0.880
DS-4B-5-2B	2016	7	4B	inlet	2	10-20	Pb	0.876
DS-4B-6-1B	2016	7	4B	inlet	1	10-20	Pb	BDL
DS-4B-6-2B	2016	7	4B	inlet	2	10-20	Pb	0.284
DS-4B-5-1F	2016	7	4B	inlet	1	2-5	Pb	0.774
DS-4B-5-2F	2016	7	4B	inlet	2	2-5	Pb	0.816
DS-4B-6-1F	2016	7	4B	inlet	1	2-5	Pb	0.190
DS-4B-6-2F	2016	7	4B	inlet	2	2-5	Pb	0.235
DS-4B-3-1A	2016	7	4B	middle	1	5-10	Pb	0.264
DS-4B-3-2A	2016	7	4B	middle	2	5-10	Pb	0.347
DS-4B-4-1A	2016	7	4B	middle	1	5-10	Pb	0.351
DS-4B-4-2A	2016	7	4B	middle	2	5-10	Pb	0.332
DS-4B-3-1B	2016	7	4B	middle	1	10-20	Pb	0.336
DS-4B-3-2B	2016	7	4B	middle	2	10-20	Pb	0.281
DS-4B-4-1B	2016	7	4B	middle	1	10-20	Pb	0.410
DS-4B-4-2B	2016	7	4B	middle	2	10-20	Pb	0.395

Appendix P. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4B-3-1F	2016	7	4B	middle	1	2-5	Pb	0.232
DS-4B-3-2F	2016	7	4B	middle	2	2-5	Pb	1.220
DS-4B-4-1F	2016	7	4B	middle	1	2-5	Pb	0.324
DS-4B-4-2F	2016	7	4B	middle	2	2-5	Pb	0.276
DS-4B-1-1A	2016	7	4B	outlet	1	5-10	Pb	0.814
DS-4B-1-2A	2016	7	4B	outlet	2	5-10	Pb	0.877
DS-4B-2-1A	2016	7	4B	outlet	1	5-10	Pb	0.242
DS-4B-2-2A	2016	7	4B	outlet	2	5-10	Pb	0.191
DS-4B-1-1B	2016	7	4B	outlet	1	10-20	Pb	0.721
DS-4B-1-2B	2016	7	4B	outlet	2	10-20	Pb	0.819
DS-4B-2-1B	2016	7	4B	outlet	1	10-20	Pb	0.247
DS-4B-2-2B	2016	7	4B	outlet	2	10-20	Pb	0.168
DS-4B-1-1F	2016	7	4B	outlet	1	2-5	Pb	0.848
DS-4B-1-2F	2016	7	4B	outlet	2	2-5	Pb	0.789
DS-4B-2-1F	2016	7	4B	outlet	1	2-5	Pb	0.233
DS-4B-2-2F	2016	7	4B	outlet	2	2-5	Pb	0.268
4A-A1-S-INORG1	2020	7	4A	inlet	1	5-10	Pb	0.362
4A-A2-S-INORG1	2020	7	4A	inlet	2	5-10	Pb	0.094
4A-A3-S-INORG1	2020	7	4A	inlet	3	5-10	Pb	0.003
4A-A1-S-INORG2	2020	7	4A	inlet	1	10-20	Pb	0.073
4A-A2-S-INORG2	2020	7	4A	inlet	2	10-20	Pb	0.036
4A-A3-S-INORG2	2020	7	4A	inlet	3	10-20	Pb	0.071
4A-A1-S-OM	2020	7	4A	inlet	1	2-5	Pb	0.165
4A-A2-S-OM	2020	7	4A	inlet	2	2-5	Pb	0.009
4A-A3-S-OM	2020	7	4A	inlet	3	2-5	Pb	0.020
4A-B1-S-INORG1	2020	7	4A	middle	1	5-10	Pb	0.190
4A-B2-S-INORG1	2020	7	4A	middle	2	5-10	Pb	0.015
4A-C1-S-INORG1	2020	7	4A	middle	1	5-10	Pb	0.000
4A-C2-S-INORG1	2020	7	4A	middle	2	5-10	Pb	0.000
4A-B1-S-INORG2	2020	7	4A	middle	1	10-20	Pb	0.111
4A-B2-S-INORG2	2020	7	4A	middle	2	10-20	Pb	0.011
4A-C1-S-INORG2	2020	7	4A	middle	1	10-20	Pb	0.000
4A-C2-S-INORG2	2020	7	4A	middle	2	10-20	Pb	0.000
4A-B1-S-OM	2020	7	4A	middle	1	2-5	Pb	0.407
4A-B2-S-OM	2020	7	4A	middle	2	2-5	Pb	0.185
4A-C1-S-OM	2020	7	4A	middle	1	2-5	Pb	0.000
4A-C2-S-OM	2020	7	4A	middle	2	2-5	Pb	0.000
4A-D1-S-INORG1	2020	7	4A	oulet	1	5-10	Pb	0.044
4A-D2-S-INORG1	2020	7	4A	oulet	2	5-10	Pb	0.121
4A-D1-S-INORG2	2020	7	4A	oulet	1	10-20	Pb	0.082
4A-D2-S-INORG2	2020	7	4A	oulet	2	10-20	Pb	0.020
4A-D1-S-OM	2020	7	4A	oulet	1	2-5	Pb	0.150
4A-D2-S-OM	2020	7	4A	oulet	2	2-5	Pb	0.070
4B-A1-S-INORG1	2020	7	4B	inlet	1	5-10	Pb	0.056
4B-A2-S-INORG1	2020	7	4B	inlet	2	5-10	Pb	0.385
4B-A1-S-INORG2	2020	7	4B	inlet	1	10-20	Pb	0.000
4B-A2-S-INORG2	2020	7	4B	inlet	2	10-20	Pb	0.096
4B-A1-S-OM	2020	7	4B	inlet	1	2-5	Pb	0.151
4B-A2-S-OM	2020	7	4B	inlet	2	2-5	Pb	0.370
4B-B1-S-INORG1	2020	7	4B	middle	1	5-10	Pb	0.000
4B-B2-S-INORG1	2020	7	4B	middle	2	5-10	Pb	0.016
4B-C1-S-INORG1	2020	7	4B	middle	1	5-10	Pb	0.000
4B-C2-S-INORG1	2020	7	4B	middle	2	5-10	Pb	0.065

Appendix P. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
4B-B1-S-INORG2	2020	7	4B	middle	1	10-20	Pb	0.021
4B-B2-S-INORG2	2020	7	4B	middle	2	10-20	Pb	0.191
4B-C1-S-INORG2	2020	7	4B	middle	1	10-20	Pb	0.000
4B-C2-S-INORG2	2020	7	4B	middle	2	10-20	Pb	0.000
4B-B1-S-OM	2020	7	4B	middle	1	2-5	Pb	0.089
4B-B2-S-OM	2020	7	4B	middle	2	2-5	Pb	0.078
4B-C1-S-OM	2020	7	4B	middle	1	2-5	Pb	0.000
4B-C2-S-OM	2020	7	4B	middle	2	2-5	Pb	0.000
4B-D1-S-INORG1	2020	7	4B	outlet	1	5-10	Pb	0.007
4B-D2-S-INORG1	2020	7	4B	outlet	2	5-10	Pb	0.033
4B-D1-S-INORG2	2020	7	4B	outlet	1	10-20	Pb	0.000
4B-D2-S-INORG2	2020	7	4B	outlet	2	10-20	Pb	0.036
4B-D1-S-OM	2020	7	4B	outlet	1	2-5	Pb	0.034
4B-D2-S-OM	2020	7	4B	outlet	2	2-5	Pb	0.041

Appendix Q. DGT zinc concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (μg/L)
DS-4A2-1A	2016	7	4A	inlet	1	5-10	Zn	19.184
DS-4A2-2A	2016	7	4A	inlet	2	5-10	Zn	15.936
DS-4A1-2B	2016	7	4A	inlet	2	10-20	Zn	21.065
DS-4A2-1B	2016	7	4A	inlet	1	10-20	Zn	18.722
DS-4A2-2B	2016	7	4A	inlet	2	10-20	Zn	14.820
DS-4A2-1F	2016	7	4A	inlet	1	2-5	Zn	17.967
DS-4A2-2F	2016	7	4A	inlet	2	2-5	Zn	15.924
DS-4A3-1A	2016	7	4A	middle	1	5-10	Zn	19.442
DS-4A3-2A	2016	7	4A	middle	2	5-10	Zn	37.104
DS-4A4-1A	2016	7	4A	middle	1	5-10	Zn	18.643
DS-4A4-2A	2016	7	4A	middle	2	5-10	Zn	15.090
DS-4A3-1B	2016	7	4A	middle	1	10-20	Zn	24.715
DS-4A3-2B	2016	7	4A	middle	2	10-20	Zn	22.184
DS-4A4-1B	2016	7	4A	middle	1	10-20	Zn	31.114
DS-4A4-2B	2016	7	4A	middle	2	10-20	Zn	15.604
DS-4A3-1F	2016	7	4A	middle	1	2-5	Zn	28.107
DS-4A3-2F	2016	7	4A	middle	2	2-5	Zn	33.111
DS-4A4-1F	2016	7	4A	middle	1	2-5	Zn	25.268
DS-4A4-2F	2016	7	4A	middle	2	2-5	Zn	20.178
DS-4A5-1A	2016	7	4A	outlet	1	5-10	Zn	24.418
DS-4A5-2A	2016	7	4A	outlet	2	5-10	Zn	22.376
DS-4A6-1A	2016	7	4A	outlet	1	5-10	Zn	25.092
DS-4A6-2A	2016	7	4A	outlet	2	5-10	Zn	26.319
DS-4A5-1B	2016	7	4A	outlet	1	10-20	Zn	29.037
DS-4A5-2B	2016	7	4A	outlet	2	10-20	Zn	29.927
DS-4A6-1B	2016	7	4A	outlet	1	10-20	Zn	22.768
DS-4A6-2B	2016	7	4A	outlet	2	10-20	Zn	21.373
DS-4A5-1F	2016	7	4A	outlet	1	2-5	Zn	24.490
DS-4A5-2F	2016	7	4A	outlet	2	2-5	Zn	30.120
DS-4A6-1F	2016	7	4A	outlet	1	2-5	Zn	28.532
DS-4A6-2F	2016	7	4A	outlet	2	2-5	Zn	25.982
DS-4B-5-1A	2016	7	4B	inlet	1	5-10	Zn	28.989
DS-4B-5-2A	2016	7	4B	inlet	2	5-10	Zn	26.006
DS-4B-6-1A	2016	7	4B	inlet	1	5-10	Zn	19.701
DS-4B-6-2A	2016	7	4B	inlet	2	5-10	Zn	20.095
DS-4B-5-1B	2016	7	4B	inlet	1	10-20	Zn	27.233
DS-4B-5-2B	2016	7	4B	inlet	2	10-20	Zn	20.425
DS-4B-6-1B	2016	7	4B	inlet	1	10-20	Zn	BDL
DS-4B-6-2B	2016	7	4B	inlet	2	10-20	Zn	17.350
DS-4B-5-1F	2016	7	4B	inlet	1	2-5	Zn	23.403
DS-4B-5-2F	2016	7	4B	inlet	2	2-5	Zn	25.092
DS-4B-6-1F	2016	7	4B	inlet	1	2-5	Zn	12.832
DS-4B-6-2F	2016	7	4B	inlet	2	2-5	Zn	19.082
DS-4B-3-1A	2016	7	4B	middle	1	5-10	Zn	28.869
DS-4B-3-2A	2016	7	4B	middle	2	5-10	Zn	19.410
DS-4B-4-1A	2016	7	4B	middle	1	5-10	Zn	16.956
DS-4B-4-2A	2016	7	4B	middle	2	5-10	Zn	22.453
DS-4B-3-1B	2016	7	4B	middle	1	10-20	Zn	23.232
DS-4B-3-2B	2016	7	4B	middle	2	10-20	Zn	19.179
DS-4B-4-1B	2016	7	4B	middle	1	10-20	Zn	21.611
DS-4B-4-2B	2016	7	4B	middle	2	10-20	Zn	22.294

Appendix Q. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4B-3-1F	2016	7	4B	middle	1	2-5	Zn	22.549
DS-4B-3-2F	2016	7	4B	middle	2	2-5	Zn	29.879
DS-4B-4-1F	2016	7	4B	middle	1	2-5	Zn	15.572
DS-4B-4-2F	2016	7	4B	middle	2	2-5	Zn	16.511
DS-4B-1-1A	2016	7	4B	outlet	1	5-10	Zn	23.466
DS-4B-1-2A	2016	7	4B	outlet	2	5-10	Zn	26.078
DS-4B-2-1A	2016	7	4B	outlet	1	5-10	Zn	21.579
DS-4B-2-2A	2016	7	4B	outlet	2	5-10	Zn	25.717
DS-4B-1-1B	2016	7	4B	outlet	1	10-20	Zn	25.693
DS-4B-1-2B	2016	7	4B	outlet	2	10-20	Zn	23.646
DS-4B-2-1B	2016	7	4B	outlet	1	10-20	Zn	23.533
DS-4B-2-2B	2016	7	4B	outlet	2	10-20	Zn	24.514
DS-4B-1-1F	2016	7	4B	outlet	1	2-5	Zn	24.899
DS-4B-1-2F	2016	7	4B	outlet	2	2-5	Zn	22.573
DS-4B-2-1F	2016	7	4B	outlet	1	2-5	Zn	24.322
DS-4B-2-2F	2016	7	4B	outlet	2	2-5	Zn	18.510
4A-A1-S-INORG1	2020	7	4A	inlet	1	5-10	Zn	25.996
4A-A2-S-INORG1	2020	7	4A	inlet	2	5-10	Zn	15.021
4A-A3-S-INORG1	2020	7	4A	inlet	3	5-10	Zn	1.147
4A-A1-S-INORG2	2020	7	4A	inlet	1	10-20	Zn	21.866
4A-A2-S-INORG2	2020	7	4A	inlet	2	10-20	Zn	19.886
4A-A3-S-INORG2	2020	7	4A	inlet	3	10-20	Zn	9.313
4A-A1-S-OM	2020	7	4A	inlet	1	2-5	Zn	0.000
4A-A2-S-OM	2020	7	4A	inlet	2	2-5	Zn	0.000
4A-A3-S-OM	2020	7	4A	inlet	3	2-5	Zn	0.000
4A-B1-S-INORG1	2020	7	4A	middle	1	5-10	Zn	14.584
4A-B2-S-INORG1	2020	7	4A	middle	2	5-10	Zn	8.852
4A-C1-S-INORG1	2020	7	4A	middle	1	5-10	Zn	2.010
4A-B1-S-INORG2	2020	7	4A	middle	1	10-20	Zn	20.046
4A-B2-S-INORG2	2020	7	4A	middle	2	10-20	Zn	9.245
4A-C1-S-INORG2	2020	7	4A	middle	1	10-20	Zn	19.493
4A-C2-S-INORG2	2020	7	4A	middle	2	10-20	Zn	9.499
4A-B1-S-OM	2020	7	4A	middle	1	2-5	Zn	35.408
4A-B2-S-OM	2020	7	4A	middle	2	2-5	Zn	27.317
4A-C1-S-OM	2020	7	4A	middle	1	2-5	Zn	11.052
4A-C2-S-OM	2020	7	4A	middle	2	2-5	Zn	0.000
4A-D1-S-INORG1	2020	7	4A	oulet	1	5-10	Zn	4.184
4A-D2-S-INORG1	2020	7	4A	oulet	2	5-10	Zn	0.000
4A-D1-S-INORG2	2020	7	4A	oulet	1	10-20	Zn	8.561
4A-D2-S-INORG2	2020	7	4A	oulet	2	10-20	Zn	18.129
4A-D1-S-OM	2020	7	4A	oulet	1	2-5	Zn	9.130
4A-D2-S-OM	2020	7	4A	oulet	2	2-5	Zn	16.651
4B-A1-S-INORG1	2020	7	4B	inlet	1	5-10	Zn	16.233
4B-A2-S-INORG1	2020	7	4B	inlet	2	5-10	Zn	77.407
4B-A1-S-INORG2	2020	7	4B	inlet	1	10-20	Zn	24.807
4B-A2-S-INORG2	2020	7	4B	inlet	2	10-20	Zn	44.152
4B-A1-S-OM	2020	7	4B	inlet	1	2-5	Zn	42.077
4B-A2-S-OM	2020	7	4B	inlet	2	2-5	Zn	51.003
4B-B1-S-INORG1	2020	7	4B	middle	1	5-10	Zn	10.935
4B-B2-S-INORG1	2020	7	4B	middle	2	5-10	Zn	2.152
4B-C1-S-INORG1	2020	7	4B	middle	1	5-10	Zn	15.533
4B-C2-S-INORG1	2020	7	4B	middle	2	5-10	Zn	18.659
4B-B1-S-INORG2	2020	7	4B	middle	1	10-20	Zn	13.844

Appendix Q. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
4B-B2-S-INORG2	2020	7	4B	middle	2	10-20	Zn	12.765
4B-C1-S-INORG2	2020	7	4B	middle	1	10-20	Zn	6.295
4B-C2-S-INORG2	2020	7	4B	middle	2	10-20	Zn	3.852
4B-B1-S-OM	2020	7	4B	middle	1	2-5	Zn	9.666
4B-B2-S-OM	2020	7	4B	middle	2	2-5	Zn	27.536
4B-C1-S-OM	2020	7	4B	middle	1	2-5	Zn	8.306
4B-C2-S-OM	2020	7	4B	middle	2	2-5	Zn	7.104
4B-D1-S-INORG1	2020	7	4B	outlet	1	5-10	Zn	10.449
4B-D2-S-INORG1	2020	7	4B	outlet	2	5-10	Zn	11.446
4B-D1-S-INORG2	2020	7	4B	outlet	1	10-20	Zn	0.000
4B-D2-S-INORG2	2020	7	4B	outlet	2	10-20	Zn	11.481
4B-D1-S-OM	2020	7	4B	outlet	1	2-5	Zn	10.536
4B-D2-S-OM	2020	7	4B	outlet	2	2-5	Zn	35.525

Appendix R. DGT manganese concentrations in wetland sediments (raw data).

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4A2-1A	2016	7	4A	inlet	1	5-10	Mn	52.630
DS-4A2-2A	2016	7	4A	inlet	2	5-10	Mn	41.073
DS-4A1-2B	2016	7	4A	inlet	2	10-20	Mn	60.735
DS-4A2-1B	2016	7	4A	inlet	1	10-20	Mn	37.546
DS-4A2-2B	2016	7	4A	inlet	2	10-20	Mn	43.674
DS-4A2-1F	2016	7	4A	inlet	1	2-5	Mn	28.390
DS-4A2-2F	2016	7	4A	inlet	2	2-5	Mn	22.539
DS-4A3-1A	2016	7	4A	middle	1	5-10	Mn	22.614
DS-4A3-2A	2016	7	4A	middle	2	5-10	Mn	59.759
DS-4A4-1A	2016	7	4A	middle	1	5-10	Mn	17.563
DS-4A4-2A	2016	7	4A	middle	2	5-10	Mn	49.978
DS-4A3-1B	2016	7	4A	middle	1	10-20	Mn	27.715
DS-4A3-2B	2016	7	4A	middle	2	10-20	Mn	35.770
DS-4A4-1B	2016	7	4A	middle	1	10-20	Mn	117.020
DS-4A4-2B	2016	7	4A	middle	2	10-20	Mn	43.750
DS-4A3-1F	2016	7	4A	middle	1	2-5	Mn	12.335
DS-4A3-2F	2016	7	4A	middle	2	2-5	Mn	33.943
DS-4A4-1F	2016	7	4A	middle	1	2-5	Mn	10.704
DS-4A4-2F	2016	7	4A	middle	2	2-5	Mn	28.865
DS-4A5-1A	2016	7	4A	outlet	1	5-10	Mn	34.922
DS-4A5-2A	2016	7	4A	outlet	2	5-10	Mn	17.603
DS-4A6-1A	2016	7	4A	outlet	1	5-10	Mn	89.906
DS-4A6-2A	2016	7	4A	outlet	2	5-10	Mn	87.104
DS-4A5-1B	2016	7	4A	outlet	1	10-20	Mn	28.042
DS-4A5-2B	2016	7	4A	outlet	2	10-20	Mn	62.814
DS-4A6-1B	2016	7	4A	outlet	1	10-20	Mn	96.209
DS-4A6-2B	2016	7	4A	outlet	2	10-20	Mn	119.999
DS-4A5-1F	2016	7	4A	outlet	1	2-5	Mn	5.366
DS-4A5-2F	2016	7	4A	outlet	2	2-5	Mn	2.847
DS-4A6-1F	2016	7	4A	outlet	1	2-5	Mn	38.724
DS-4A6-2F	2016	7	4A	outlet	2	2-5	Mn	37.498
DS-4B-5-1A	2016	7	4B	inlet	1	5-10	Mn	352.217
DS-4B-5-2A	2016	7	4B	inlet	2	5-10	Mn	507.563
DS-4B-6-1A	2016	7	4B	inlet	1	5-10	Mn	52.833
DS-4B-6-2A	2016	7	4B	inlet	2	5-10	Mn	70.819
DS-4B-5-1B	2016	7	4B	inlet	1	10-20	Mn	370.979
DS-4B-5-2B	2016	7	4B	inlet	2	10-20	Mn	436.770
DS-4B-6-1B	2016	7	4B	inlet	1	10-20	Mn	BDL
DS-4B-6-2B	2016	7	4B	inlet	2	10-20	Mn	75.922
DS-4B-5-1F	2016	7	4B	inlet	1	2-5	Mn	176.934
DS-4B-5-2F	2016	7	4B	inlet	2	2-5	Mn	316.445
DS-4B-6-1F	2016	7	4B	inlet	1	2-5	Mn	27.292
DS-4B-6-2F	2016	7	4B	inlet	2	2-5	Mn	35.122
DS-4B-3-1A	2016	7	4B	middle	1	5-10	Mn	421.510
DS-4B-3-2A	2016	7	4B	middle	2	5-10	Mn	338.959
DS-4B-4-1A	2016	7	4B	middle	1	5-10	Mn	171.181
DS-4B-4-2A	2016	7	4B	middle	2	5-10	Mn	136.534
DS-4B-3-1B	2016	7	4B	middle	1	10-20	Mn	249.004
DS-4B-3-2B	2016	7	4B	middle	2	10-20	Mn	194.445
DS-4B-4-1B	2016	7	4B	middle	1	10-20	Mn	116.747
DS-4B-4-2B	2016	7	4B	middle	2	10-20	Mn	112.745

Appendix R. continued

Sample ID	Year	Month	Cell	Location description	Replicate	Sediment depth (cm)	Element	Concentration (µg/L)
DS-4B-3-1F	2016	7	4B	middle	1	2-5	Mn	204.851
DS-4B-3-2F	2016	7	4B	middle	2	2-5	Mn	186.890
DS-4B-4-1F	2016	7	4B	middle	1	2-5	Mn	132.782
DS-4B-4-2F	2016	7	4B	middle	2	2-5	Mn	83.301
DS-4B-1-1A	2016	7	4B	outlet	1	5-10	Mn	36.172
DS-4B-1-2A	2016	7	4B	outlet	2	5-10	Mn	41.776
DS-4B-2-1A	2016	7	4B	outlet	1	5-10	Mn	36.573
DS-4B-2-2A	2016	7	4B	outlet	2	5-10	Mn	28.443
DS-4B-1-1B	2016	7	4B	outlet	1	10-20	Mn	16.660
DS-4B-1-2B	2016	7	4B	outlet	2	10-20	Mn	74.121
DS-4B-2-1B	2016	7	4B	outlet	1	10-20	Mn	47.805
DS-4B-2-2B	2016	7	4B	outlet	2	10-20	Mn	25.441
DS-4B-1-1F	2016	7	4B	outlet	1	2-5	Mn	19.027
DS-4B-1-2F	2016	7	4B	outlet	2	2-5	Mn	20.330
DS-4B-2-1F	2016	7	4B	outlet	1	2-5	Mn	19.615
DS-4B-2-2F	2016	7	4B	outlet	2	2-5	Mn	8.845

Distribution List

Distribution

Anna.knox@srnl.doe.gov
Michael.paller@srnl.doe.gov
John.mayer@srnl.doe.gov
Alex.kugler@srnl.doe.gov
cj.bannochie@srnl.doe.gov
brady.lee@srnl.doe.gov
alex.cozzi@srnl.doe.gov
samuel.fink@srnl.doe.gov
Brenda.Garcia-Diaz@srnl.doe.gov
connie.herman@srnl.doe.gov
dennis.jackson@srnl.doe.gov
brady.lee@srnl.doe.gov
Joseph.Manna@srnl.doe.gov
daniel.mccabe@srnl.doe.gov
Gregg.Morgan@srnl.doe.gov
frank.pennebaker@srnl.doe.gov
William.Ramsey@SRNL.DOE.gov
eric.skidmore@srnl.doe.gov
michael.stone@srnl.doe.gov
Boyd.Wiedenman@srnl.doe.gov
Records Administration (EDWS)

Robert.backer@srs.gov
Susan.blas@srs.gov
chris.bergren@srs.gov
Thomas.Gaughan@srs.gov
mike.griffith@srs.gov
Thomas.Gaughan@srs.gov
sandra.smith@srs.gov
Kelsey.Holcomb@srs.gov
seth.miller@srs.gov
winston.moore@srs.gov
j.ross@srs.gov
manuel.terronez@srs.gov