

EVALUATION OF THE PERFORMANCE OF A RURAL SURFACE WATER TREATMENT PLANT IN NACOGDOCHES, TEXAS

Esmeralda Garcia, Jennifer Hanes, Phillip Sharp, Petra Kadakova

Kefa Onchoke, Ph.D., Michael A. Janusa, Ph.D.

Department of Chemistry & Biochemistry, Stephen F. Austin State University

ABSTRACT

The performance of a rural surface water treatment plant in Nacogdoches Texas was assessed for selected metals (Ag, Ba, Be, Bi, Cd, Co, Cr, Cs, Cu, Ga, In, Li, Mn, Mo, Ni, Pb, Rb, Sr, Tl, V, and Zn) from June 2015 through spring 2016. Results indicate that the lake water coming into the surface water treatment plant was significantly cleaner after treatment and was below maximum World Health Organization (WHO) drinking water standards.

METHODS

Samples were collected in triplicate once a month from the different stages of the treatment process (inlet of lake water, reclaim, aeration, basin, splitter, treated tap water) of the Nacogdoches Surface Water Treatment Plant (SWTP). Samples were analyzed using the EPA protocol for total recoverable metals. Samples were acidified, digested, and filtered to remove residue. The metal concentrations (at the ppb concentration) were determined by using inductively coupled plasma mass spectrometry (ICP-MS).

CURRENT STATUS AND CONCLUSIONS

Data has been collected since June 2015 to the present approximately once a month. Data will be collected for several more months to collect sufficient data for establishing a baseline. Initial results indicate that the majority of metals analyzed have insignificant trace amounts (< 1 ppb) while Ba, Cu, Li, Mn, Ni, Rb, Sr, V, and Zn have measurable amounts especially for the lake water. After the treatment process, Ba, Li, Rb, Sr, and V concentrations in the tap water remain similar to that of the lake water while Cu, Mn, Ni, and Zn concentrations in tap water are significantly reduced by several orders of magnitude from the lake water. Results indicate that the lake water coming into the surface water treatment plant was significantly cleaner after treatment and all metals tested were well below maximum WHO drinking water standards.

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Mean concentrations of selected metals in ppb for Nacogdoches SWTP

Metal	Lake	Reclaim	Aeration	Basin	Splitter	Tap
Ba	34.1 ± 5.5	40.4 ± 13.2	37.7 ± 10.8	36.1 ± 13.7	32.9 ± 5.3	27.1 ± 7.3
Cu	534 ± 59	1.2 ± 0.5	1.1 ± 0.2	0.9 ± 0.3	0.9 ± 0.4	2.0 ± 1.7
Li	5.8 ± 0.3	5.6 ± 0.5	5.8 ± 0.5	5.6 ± 0.2	5.5 ± 0.8	4.5 ± 1.6
Mn	157 ± 50	137 ± 45	132 ± 27	23.3 ± 2.9	7.5 ± 3.7	6.2 ± 2.1
Ni	4.9 ± 0.7	2.5 ± 1.1	2.3 ± 0.6	1.3 ± 0.3	0.7 ± 0.1	0.7 ± 0.2
Rb	3.7 ± 0.3	3.5 ± 0.2	3.6 ± 0.3	3.6 ± 0.3	3.6 ± 0.3	3.0 ± 0.9
Sr	82.8 ± 7.5	79.3 ± 6.0	80.2 ± 7.9	81.2 ± 9.5	81.2 ± 11.9	67.1 ± 17.9
V	13.5 ± 5.4	12.7 ± 3.3	15.4 ± 6.0	14.3 ± 4.7	15.5 ± 6.0	10.5 ± 0.8
Zn	32.9 ± 5.6	12.0 ± 5.9	11.4 ± 5.1	19.2 ± 7.9	7.5 ± 2.7	5.1 ± 2.2

mean ± SD; n (number of samples analyzed) = 9; WHO standard (ppb): Ag (100), Ba (700), Be (2400), Bi (na), Cd (3), Co (40), Cr (50), Cs (na), Cu (2000), Ga (na), In (na), Li (na), Mn (100), Mo (70), Ni (70), Pb (10), Rb (na), Sr (na), Tl (0.5 - USEPA), V (na), and Zn (3000)