ftn Associates Ltd.
water resources / environmental consultants

TOXICITY REDUCTION EVALUATION
ACTIVITY REPORT
SEARCY WASTEWATER TREATMENT PLANT
OUTFALL 001 (AR0021601)
THIRD QUARTER 2016

OCTOBER 31, 2016

TOXICITY REDUCTION EVALUATION
ACTIVITY REPORT
SEARCY WASTEWATER TREATMENT PLANT
OUTFALL 001 (AR0021601)
THIRD QUARTER 2016

Prepared for:

Searcy Wastewater Treatment Plant
PO Box 1319
Searcy, AR 72145

Prepared by:

FTN Associates, Ltd.
3 Innwood Circle, Suite 220
Little Rock, AR 72211

FTN No. 15350-1096-001

October 31, 2016

TABLE OF CONTENTS

LIST OF TABLES

1.0 SUMMARY AND CONCLUSIONS

The screening test conducted on sample collected on July 27, 2016, did not have sufficient toxicity to justify further follow up testing. Based on previous analyses measured copper (Cu) and zinc (Zn) concentrations in this sample were sufficient to have caused sub-lethal toxicity. This result suggests that water-effects ratios (WERs) of approximately 3.9 and 9.5 for Cu and Zn, respectively, would be necessary for toxicity on the sample collected on June 7, 2016 to have been caused by Cu and/or Zn. FTN Associates, Ltd. (FTN)'s experience indicates that WERs of this magnitude are common for Cu but not for Zn. Follow-up testing on sample collected August 28-29, 2016, indicated that the measured Zn concentration accounted for only 10% of the observed toxicity.

Results from tests conducted during the third quarter indicate that observed episodes of toxicity since the implementation of this TRE study are most likely not due to Zn.

2.0 INTRODUCTION

The Searcy Wastewater Treatment Plant (SWWTP), in Searcy, Arkansas, has implemented a toxicity reduction evaluation (TRE) study per requirements of National Pollutant Discharge Elimination System (NPDES) Permit No. AR0021601. The TRE is being conducted according to the TRE Action Plan submitted to the Arkansas Department of Environmental Quality (ADEQ) on December 9, 2015, and approved by ADEQ on December 10, 2015. This document provides the results of TRE activities performed during the first quarter of 2016.

3.0 TRE ACTIVITIES

3.1 Routine Biomonitoring and Effluent Screening

Results of quarterly biomonitoring WET testing and effluent screening tests conducted during January 2106 through September 2106 are provided in Table 1. Routine water chemistry

(pH, alkalinity, hardness, conductivity, total ammonia) from each sample is provided in Table 2. No toxicity to *P. promelas* has been observed.

The screening test conducted on sample collected on July 27, 2016 did not have sufficient toxicity to justify further follow up testing. Based on previous analyses measured Cu and Zn concentrations in this sample (Table 1) were sufficient to have caused sub-lethal toxicity. This result suggests that WERs of approximately 3.9 and 9.5 for Cu and Zn, respectively, would be necessary for toxicity on the sample collected on June 7, 2016, to have been caused by Cu and/or Zn. FTN experience indicates that a WERs for Cu of this magnitude are common but not for Zn.

Table 1. Summary of chronic toxicity tests using *C. dubia* conducted on Outfall 001 samples collected during 2016.

	Percent Survival (N = 10) on Sampling Date					
	2/23/2016[1]	**3/29/2016**	**5/23/2016**	**6/7/2016**	**7/27/2016**	**8/28/2016**
% Effluent	**3/1/2016[2]**	**3/30/2016**	**5/27/2016**	**6/8/2016**		**9/3/2016**
Control	90	100	100	100	100	100
8	90		100			100
11	100		100			100
14	100		90			80
19	100	100	100	70	100	90
25	100		100			40*
100		100		40*	100	
	Mean Number of Neonates per Female					
	2/23/2016[1]	**3/29/2016**	**5/23/2016**	**6/7/2016**		
% Effluent	**3/1/2016[2]**	**3/30/2016**	**5/27/2016**	**6/8/2016**		
Control	20.0	19.3	23.9	27.2	28.1	26.3
8	19.3		27.7			15.0*
11	22.4		26.1			14.0*
14	23.5		26.4			10.0*
19	24.3	18.8	27.5	16.3*	30.3	12.7*
25	26.0		27.0			
100		23.7		--	32.9	

[1]First day of sampling period; [2]Last day of sampling period; *Statistically less than the control(P<0.05).

Table 2. Routine water chemistry of samples collected for toxicity testing.

Parameter		2/23/2016[1]	3/29/2016	5/23/2016	6/7/2016	7/27/2016	8/28/2016
		3/1/2016[2]	3/30/2016	5/27/2016	6/8/2016	7/27/2016	9/3/2016
pH (su)		7.4	7.1	6.2	6.9	7.5	6.8
		7.5		7.2			7.8
		7.6		7.8			8.0
Average pH		7.5	7.1	7.1	6.9	7.5	7.5
Alkalinity (mg/L as $CaCO_3$)		50	43	9	40	41	31
		56		48			52
		64		40			67
Average alkalinity		56.7	43.0	32.4	40.0	41.0	50.0
Hardness (mg/L as $CaCO_3$)		46	38	65	49	44	50
		46		58			43
		45		42			120
Average hardness		45.7	38.0	55.0	49.0	44.0	71.0
Conductivity (µS/cm)		260	280	480	290	350	240
		260		460			260
		280		280			300
Average conductivity		266.7	280.0	406.7	290.0	350.0	266.7
Total ammonia (mg N/L)		5.4	0.4	9.2	2.3	1.7	2.6
		6.8		9.2			0.4
		11.0		1.8			2.0
Average ammonia		7.7	0.4	6.7	2.3	1.7	1.7
Copper (µg/L)	Total	NM	NM	NM	5.7	7.3	NM
	Dissolved	NM	NM	NM	NM	NM	NM
Zinc (µg/L)	Total	NM	NM	NM	41	99	22*
	Dissolved	NM	NM	NM	NM	NM	20*

[1] - First day of sampling period; [2] - Last day of sampling period; NM - not measured; Measured on sample collected 8/28/2016

4.0 FOLLOW UP TESTING

The biomonitoring test conducted on a sample collected August 28 - September 3, 2016, showed sufficient toxicity to *C. dubia* to justify follow-up TIE testing. However, due to laboratory miscommunication, only minimal follow-up testing was performed on this sample. August 28-29 was tested for acute toxicity and analyzed for total and dissolved Zn (Table 3). A comparison of the measured Zn concentration and observed toxicity on the sample collected

August 28-29, 2016 (Table 3) indicated that the measured Zn concentration accounted for only 10% of the observed toxicity.

Results from these tests indicate that observed episodes of toxicity since the implementation of this TRE study are most likely not due to Zn.

Table 3. Analysis of acute toxicity and Zn concentration in effluent sample collected 8/28/2016.

% sample		48 h results % survival	Hardness slopes	
Control		100	Cu	0.9422
6.25		100	Zn	0.8473
12.5		100	LC50 Tus (ug/L) @ hds = 50	
25		90	Cu	11.2
50		70	Zn	174
100		60		
Effluent values	Hardness (mg/L as $CaCO_3$)	50		
	Cu	NM		
	Zn	22		
	Cu	NA		
Hardness Corrected (Hardness = 50)	Cu	NM		
	Zn	23.8		
Predicted toxic units				
	Zn	0.1		

NM - not measured; NA - not applicable

5.0 LITERATURE CITED

USEPA. 1992. *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I* [EPA/600/6-91/005F]. T.J. Norberg-King, D.I. Mount, J.R. Amato, D.A. Jensen and J.A. Thompson, ASci Corp, Duluth, MN.