

**CITY OF ROGERS**

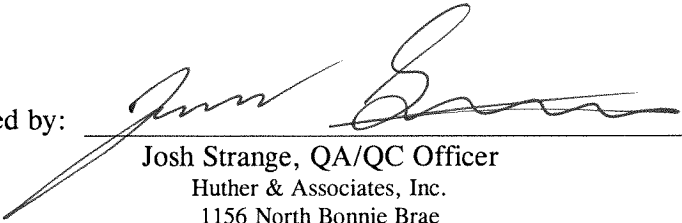
OUTFALL 001

Chronic Biomonitoring Report  
Permit Number NPDES AR0043397

*Ceriodaphnia dubia*  
*Pimephales promelas*

March 23, 2021

Reviewed by:



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Josh Strange, QA/QC Officer

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**TOXICITY TEST REPORT - CHRONIC**

Client ..... City of Rogers                      Laboratory I.D. .... 32538  
Permit No. .... NPDES AR0043397                      Begin Date ..... March 23, 2021  
Sample ..... Outfall 001

Results: **Pass** *Ceriodaphnia dubia* survival and reproduction and *Pimephales promelas* survival and growth at the critical concentration (82% effluent).

**SAMPLE  
COLLECTION**

Composite effluent samples from City of Rogers were delivered by Greyhound Package Express courier to Huther & Associates on March 23, March 25 and March 27, 2021. Effluent samples were collected and composited from Outfall 001 using an automatic sampler by facility personnel. Two toxicity tests were requested: a seven-day *Ceriodaphnia dubia* survival and reproduction test (EPA Method 1002.0), and a seven-day *Pimephales promelas* larval survival and growth test (EPA Method 1000.0). Test organisms, procedures and quality assurance requirements were in accordance with the EPA manual, "*Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition*" (EPA-821-R-02-013).

The effluent samples were analyzed for total residual chlorine (Standard Methods, 23<sup>rd</sup> Edition, 4500-Cl D) and contained <0.01 mg/L, <0.01 mg/L, and <0.01 mg/L, respectively. Effluent and laboratory dilution water hardness, alkalinity, conductivity, pH, and dissolved oxygen data were collected and recorded.

**TEST SETUP**  
*Ceriodaphnia dubia*



The seven-day *Ceriodaphnia dubia* survival and reproduction test was initiated at 1400 hours, March 23, 2021. Five concentrations were prepared (26%, 35%, 46%, 62% and 82% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (Osage Creek). The test was conducted in 25 mL distilled water rinsed plastic beakers containing 15 mL of solution (one organism per beaker, ten beakers per concentration). *C. dubia* neonates were less than 24-hours-old and within eight hours of the same age at test initiation. Neonates were placed in beakers following a randomized block test design. Fresh solutions were prepared and renewed daily. Daily feeding consisted of 0.5 mL *Selenastrum capricornutum* and cerophyll per test chamber. The test proceeded for seven days during which survival, reproduction and water quality data were collected daily.

A control of ten replicate beakers containing one neonate each in distilled, deionized, reconstituted water (same as diluent) was conducted concurrently with the test. There was 100% survival in the control. The test ended at 1400 hours, March 30, 2021. Survival and reproduction data were statistically analyzed ( $p = 0.05$ ) according to EPA procedures to determine the Lowest Observable Effect Concentration (LOEC) and the No Observable Effect Concentration (NOEC).

**SURVIVAL*****Ceriodaphnia dubia***

There was 100% survival to *C. dubia* in all the effluent concentrations tested. Therefore, statistical analyses were not required to determine a no effect concentration.

**LOEC: Not Applicable**

**NOEC: 82% Effluent**

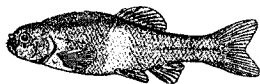
**REPRODUCTION*****Ceriodaphnia dubia***

*C. dubia* reproduction data were normally distributed at the 0.01 alpha level (13.277) using Chi-Square test for normality. Reproduction data were homogeneous using Bartlett's test at the 0.01 alpha level (15.09) without data transformations. Therefore, a parametric test was performed on the homogeneous data. Dunnett's test on *C. dubia* reproduction data demonstrated that there were no statistically significant differences between the control and any of the effluent concentrations.

**LOEC: Not Applicable**

**NOEC: 82% Effluent**

**PMSD: 10.3%**

**TEST SETUP*****Pimephales promelas***

The seven-day *Pimephales promelas* larval survival and growth test was initiated at 1630 hours, March 23, 2021. Five concentrations were prepared (26%, 35%, 46%, 62% and 82% effluent) utilizing distilled, deionized laboratory water reconstituted to match the hardness, alkalinity and pH of the receiving stream (Osage Creek). The test was conducted in 300 mL distilled water rinsed plastic beakers containing 250 mL of solution (eight organisms per beaker, five beakers per concentration). *P. promelas* larvae were less than 24-hours-old at test initiation and originated from a minimum of three in-house spawnings. Fresh solutions were prepared and renewed daily. Larvae in each test chamber were fed <24-hour-old *Artemia* (brine shrimp) three times per day. The test proceeded for seven days during which survival and water quality data were collected daily.

A control of five replicate beakers containing eight larvae each in distilled, deionized, reconstituted water (same as diluent) was conducted concurrently with the test. There was 100% survival in the control. The test ended at 1630 hours, March 30, 2021. At test termination, all larvae were sacrificed, dried for 24-hours, and weighed. Survival and growth (weight) data were statistically analyzed ( $p = 0.05$ ) according to EPA procedures to determine the Lowest Observable Effect Concentration (LOEC) and the No Observable Effect Concentration (NOEC).



Huthner and Associates  
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

CLIENT City of Rogers  
 NPDES # AR0043397  
 LAB ID # 32538  
 TEST TYPE 7 Day Chronic  
 TEST ORGANISM *Ceriodaphnia dubia*  
 ORGANISM AGE < 24-Hours  
 ORGANISM SOURCE In House  
 RECEIVING WATER Osage Creek  
 DILUTION WATER Laboratory

SAMPLE TYPE 24 Hour Composite  
 DATE COLLECTED 03/22/21 03/24/21 03/26/21  
 DATE RECEIVED 03/23/21 03/25/21 03/27/21  
 BEGIN DATE/TIME 03/23/21 1400  
 END DATE/TIME 03/30/21 1400  
 TEST TEMPERATURE (°C) 25 ± 1  
 PHOTO PERIOD 16-hr. Light 8-hr. Dark  
 LIGHT INTENSITY 50-100 ft. candl.  
 TECHNICIAN T. Geiger

**SURVIVAL & REPRODUCTION SUMMARY**

Control										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	4	3	5	2	5	5	2	3	2	2
	4	3	5	2	5	5	2	3	2	2
03/28/21	6	8	10	7	8	10	7	9	8	6
	10	11	15	9	13	15	9	12	10	8
03/29/21	A	A	A	A	A	A	A	A	A	A
	10	11	15	9	13	15	9	12	10	8
03/30/21	12	13	14	12	12	13	12	13	13	12
	22	24	29	21	25	28	21	25	23	20
x# Young 23.8                      C.V. 12.65% x%Survival 100%                  C.V. 0.00%										

26%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	2	3	2	3	3	4	2	5	4	4
	2	3	2	3	3	4	2	5	4	4
03/28/21	10	9	10	7	8	6	11	9	8	9
	12	12	12	10	11	10	13	14	12	13
03/29/21	A	A	A	A	A	A	A	A	A	A
	12	12	12	10	11	10	13	14	12	13
03/30/21	14	13	13	12	12	13	14	12	13	13
	26	25	25	22	23	23	27	26	25	26
x# Young 24.8                      C.V. 6.53% x%Survival 100%                  C.V. 0.00%										

35%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	3	2	3	5	4	3	3	5	4	2
	3	2	3	5	4	3	3	5	4	2
03/28/21	8	9	11	7	6	6	7	9	10	8
	11	11	14	12	10	9	10	14	14	10
03/29/21	A	A	A	A	A	A	A	A	A	A
	11	11	14	12	10	9	10	14	14	10
03/30/21	13	12	13	12	12	13	14	13	14	12
	24	23	27	24	22	22	24	27	28	22
x# Young 24.3                      C.V. 9.31% x%Survival 100%                  C.V. 0.00%										

46%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	2	4	3	2	2	3	5	4	2	5
	2	4	3	2	2	3	5	4	2	5
03/28/21	9	6	8	7	10	7	6	9	7	11
	11	10	11	9	12	10	11	13	9	16
03/29/21	A	A	A	A	A	A	A	A	A	A
	11	10	11	9	12	10	11	13	9	16
03/30/21	13	12	12	13	14	13	12	13	12	14
	24	22	23	22	26	23	23	26	21	30
x# Young 24.0                      C.V. 11.11% x%Survival 100%                  C.V. 0.00%										

where: A = Alive  
 5 = Alive, 5 young  
 D = Dead  
 D5 = 5 Young, Female died

ex 1: 

A
4

 alive today  
 total young to date

ex 2: 

5
12

 alive, 5 young today  
 total young to date

Huthur and Associates  
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

Rogers

Lab ID# 32538

Test Date: March 23, 2021

62%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	2	4	4	2	3	5	4	2	3	2
	2	4	4	2	3	5	4	2	3	2
03/28/21	9	6	8	7	6	10	11	8	8	9
	11	10	12	9	9	15	15	10	11	11
03/29/21	A	A	A	A	A	A	A	A	A	A
	11	10	12	9	9	15	15	10	11	11
03/30/21	12	12	13	13	12	14	13	13	14	13
	23	22	25	22	21	29	28	23	25	24
x# Young 24.2                      C.V. 10.81% x%Survival 100%                      C.V. 0.00%										

82%Effluent										
Date	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
03/24/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/25/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/26/21	A	A	A	A	A	A	A	A	A	A
	0	0	0	0	0	0	0	0	0	0
03/27/21	3	5	2	3	5	4	2	2	4	5
	3	5	2	3	5	4	2	2	4	5
03/28/21	6	7	9	11	9	9	10	9	8	7
	9	12	11	14	14	13	12	11	12	12
03/29/21	A	A	A	A	A	A	A	A	A	A
	9	12	11	14	14	13	12	11	12	12
03/30/21	12	13	13	13	12	12	14	13	12	12
	21	25	24	27	26	25	26	24	24	24
x# Young 24.6                      C.V. 6.69% x%Survival 100%                      C.V. 0.00%										

where: A = Alive  
 5 = Alive, 5 young  
 D = Dead  
 D5 = 5 Young, Female died

ex 1: 

A
4

 alive today  
 total young to date

ex 2: 

5
12

 alive, 5 young today  
 total young to date

Huther and Associates  
7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

Rogers

Lab ID# 32538

Test Date: March 23, 2021

**WET CHEMISTRY MEASUREMENTS**

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
03/23/21	Start	25.0	1	7.95	7.89	7.87	7.92	7.90	7.87	LM
03/24/21	24 Hr.	24.2	1	7.89	7.84	7.81	7.74	7.68	7.66	LM
03/24/21	Renew	24.1	1	7.92	7.88	7.82	7.78	7.70	7.65	LM
03/25/21	48 Hr.	24.0	1	8.16	8.01	7.96	7.93	7.88	7.87	AN
03/25/21	Renew	25.0	2	7.98	7.93	7.90	7.92	7.88	7.78	AN
03/26/21	72 Hr.	24.0	2	7.94	7.90	7.85	7.84	7.80	7.71	TN
03/26/21	Renew	24.0	2	8.11	8.07	8.07	8.04	7.97	7.84	AN
03/27/21	96 Hr.	24.6	2	8.52	7.88	7.84	7.78	7.82	7.77	LM
03/27/21	Renew	25.0	3	8.06	7.97	7.91	7.95	7.90	7.86	LM
03/28/21	120 Hr.	24.5	3	7.92	7.90	7.80	7.79	7.79	7.75	LM
03/28/21	Renew	24.4	3	8.08	8.01	7.94	7.93	7.89	7.63	LM
03/29/21	144 Hr.	24.3	3	7.91	7.83	7.78	7.77	7.59	7.59	AN
03/29/21	Renew	24.3	3	7.92	7.88	7.86	7.81	7.81	7.66	AN
03/30/21	168 Hr.	24.6	3	7.72	7.67	7.64	7.62	7.59	7.59	TN

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
03/23/21	Start	25.0	1	7.73	8.36	7.31	7.69	7.09	7.67	LM
03/24/21	24 Hr.	24.2	1	7.81	7.33	7.31	8.02	7.90	8.36	LM
03/24/21	Renew	24.1	1	8.38	8.49	8.29	7.80	8.07	8.32	LM
03/25/21	48 Hr.	24.0	1	8.30	7.33	8.12	7.93	7.74	7.99	AN
03/25/21	Renew	25.0	2	7.82	7.84	8.04	8.55	7.91	8.10	AN
03/26/21	72 Hr.	24.0	2	7.44	7.52	7.43	7.02	7.45	7.76	TN
03/26/21	Renew	24.0	2	7.83	7.88	8.32	8.28	8.14	7.92	AN
03/27/21	96 Hr.	24.6	2	7.21	7.62	8.01	7.51	8.18	7.86	LM
03/27/21	Renew	25.0	3	8.56	8.18	8.11	8.65	8.47	8.32	LM
03/28/21	120 Hr.	24.5	3	7.75	8.05	7.54	7.69	7.04	7.29	LM
03/28/21	Renew	24.4	3	8.22	8.07	8.30	8.04	8.22	8.17	LM
03/29/21	144 Hr.	24.3	3	7.24	7.60	7.00	7.79	7.39	7.25	AN
03/29/21	Renew	24.3	3	7.07	7.85	8.38	8.09	8.09	7.61	AN
03/30/21	168 Hr.	24.6	3	7.44	7.89	7.69	8.36	8.28	8.43	TN



Huther and Associates  
 7-Day/3 Brood *Ceriodaphnia dubia* Survival and Reproduction Chronic Toxicity Test

Rogers

Lab ID# 32538

Test Date: March 23, 2021

**INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT**

Date	Samp. No.	pH <sup>1</sup>	DO <sup>1</sup>	Hardness mg/L CaCO <sub>3</sub> <sup>1</sup>	Alkalinity mg/L CaCO <sub>3</sub> <sup>1</sup>	Conduct. μS/cm <sup>1</sup>	Resid. Cl <sub>2</sub> mg/L <sup>1</sup>	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L <sup>1</sup>	Analyst
03/23/21	1	7.18	7.77	132	100	631	<0.01	N/A	TN
03/25/21	2	7.53	8.55	132	106	614	<0.01	N/A	TN
03/27/21	3	7.39	7.79	124	100	601	<0.01	N/A	TN
03/23/21	CON	7.95	7.73	120	72	400	-	-	JS

<sup>1</sup> Measurements taken in 100% solution.

*CERIODAPHNIA DUBIA* STATISTICAL ANALYSES  
 Reproduction

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	10	20.000	29.000	23.800
2	26% Effluent	10	22.000	27.000	24.800
3	35% Effluent	10	22.000	28.000	24.300
4	46% Effluent	10	21.000	30.000	24.000
5	62% Effluent	10	21.000	29.000	24.200
6	82% Effluent	10	21.000	27.000	24.600

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V. %
1	Control	9.067	3.011	0.952	12.65
2	26% Effluent	2.622	1.619	0.512	6.53
3	35% Effluent	5.122	2.263	0.716	9.31
4	46% Effluent	7.111	2.667	0.843	11.11
5	62% Effluent	6.844	2.616	0.827	10.81
6	82% Effluent	2.711	1.647	0.521	6.69

Chi-Square Test For Normality: Actual And Expected Frequencies

Interval	< -1.5	-1.5 to -0.5	-0.5 to 0.5	> 0.5 to 1.5	> 1.5
Expected	4.020	14.520	22.920	14.520	4.020
Observed	2	16	25	13	4

Calculated Chi-Square goodness of fit test statistic = 1.5139

Table Chi-Square value (alpha = 0.01) = 13.277

Data Pass normality test. Continue analysis.

Bartlett's Test For Homogeneity of Variance

Calculated B1 statistic = 5.44

Table Chi-square value = 15.09 (alpha = 0.01, DF = 5)

Table Chi-square value = 11.07 (alpha = 0.05, DF = 5)

Data Pass B1 homogeneity test at 0.01 level. Continue analysis.

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	6.883	1.377	0.247
Within (Error)	54	301.300	5.580	
Total	59	308.183		

Critical F value = 2.45 (0.05,5,40)

Since F < Critical F Fail to Reject Ho: All equal

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Mean		T Stat	Sig
		Transformed Mean	Calculated In Original Units		
1	Control	23.800	23.800		
2	26% Effluent	24.800	24.800	-0.947	
3	35% Effluent	24.300	24.300	-0.473	
4	46% Effluent	24.000	24.000	-0.189	
5	62% Effluent	24.200	24.200	-0.379	
6	82% Effluent	24.600	24.600	-0.757	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, DF=40,5)

No statistically significant difference

Dunnett's Test - Table 2 of 2 Ho:Control < Treatment

Grp	Identification	Num of Reps	Minimum Sig	% of Control	Difference
			Diff (In Orig. Units)		from Control
1	Control	10			
2	26% Effluent	10	2.440	10.3	-1.000
3	35% Effluent	10	2.440	10.3	-0.500
4	46% Effluent	10	2.440	10.3	-0.200
5	62% Effluent	10	2.440	10.3	-0.400
6	82% Effluent	10	2.440	10.3	-0.800

Huther and Associates  
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

CLIENT	City of Rogers	SAMPLE TYPE	24 Hour Composite
NPDES #	AR0043397	DATE COLLECTED	03/22/21 03/24/21 03/26/21
LAB ID #	32538	DATE RECEIVED	03/23/21 03/25/21 03/27/21
TEST TYPE	7 Day Chronic	BEGIN DATE/TIME	03/23/21 1630
TEST ORGANISM	<i>Pimephales promelas</i>	END DATE/TIME	03/30/21 1630
ORGANISM AGE	< 24-Hours	TEST TEMPERATURE (°C)	25 ± 1
ORGANISM SOURCE	In House	PHOTO PERIOD	16-hr. Light 8-hr. Dark
RECEIVING WATER	Osage Creek	LIGHT INTENSITY	50-100 ft. cndl.
DILUTION WATER	Laboratory	TECHNICIAN	J. Castillo

**SURVIVAL SUMMARY**

Conc.	03/24/21					03/25/21					03/26/21					03/27/21					03/28/21				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
CON	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
26%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
35%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
46%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
62%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
82%	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

Conc.	03/29/21					03/30/21					x % Survival	C.V. %
	A	B	C	D	E	A	B	C	D	E		
CON	8	8	8	8	8	8	8	8	8	8	100.0	0.00
26%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
35%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
46%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
62%	8	8	8	8	8	8	8	8	8	8	100.0	0.00
82%	8	8	8	8	8	8	8	8	8	8	100.0	0.00

**MEAN DRY WEIGHT PER REP**

% Effluent	Rep A	Rep B	Rep C	Rep D	Rep E	x	C.V.%
CON	0.4490	0.4270	0.4650	0.4570	0.4210	0.4438	4.29
26%	0.4380	0.4530	0.4820	0.4490	0.4520	0.4548	3.59
35%	0.4550	0.4830	0.4290	0.4570	0.4730	0.4594	4.48
46%	0.4650	0.4710	0.4830	0.4250	0.4770	0.4642	4.94
62%	0.4750	0.4800	0.4290	0.4650	0.4810	0.4660	4.64
82%	0.4570	0.4880	0.4530	0.4290	0.4700	0.4594	4.75

Huthner and Associates  
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

Rogers

Lab ID# 32538

Test Date: March 23, 2021

**WET CHEMISTRY MEASUREMENTS**

Date	Time	Temp	Samp. No.	pH of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
03/23/21	Start	25.0	1	7.95	7.89	7.87	7.92	7.90	7.87	LM
03/24/21	24 Hr.	24.2	1	7.85	7.74	7.70	7.73	7.72	7.71	LM
03/24/21	Renew	24.1	1	7.92	7.88	7.82	7.78	7.70	7.65	LM
03/25/21	48 Hr.	24.0	1	7.68	7.53	7.62	7.61	7.57	7.57	TN
03/25/21	Renew	25.0	2	7.98	7.93	7.90	7.92	7.88	7.78	AN
03/26/21	72 Hr.	24.0	2	7.62	7.55	7.56	7.60	7.60	7.49	AN
03/26/21	Renew	24.0	2	8.11	8.07	8.07	8.04	7.97	7.84	AN
03/27/21	96 Hr.	24.6	2	7.48	7.48	7.54	7.51	7.47	7.48	TN
03/27/21	Renew	25.0	3	8.06	7.97	7.91	7.95	7.90	7.86	LM
03/28/21	120 Hr.	24.5	3	7.53	7.44	7.41	7.40	7.36	7.32	LM
03/28/21	Renew	24.4	3	8.08	8.01	7.94	7.93	7.89	7.63	LM
03/29/21	144 Hr.	24.3	3	7.62	7.45	7.47	7.53	7.40	7.38	AN
03/29/21	Renew	24.3	3	7.92	7.88	7.86	7.81	7.81	7.66	AN
03/30/21	168 Hr.	24.6	3	7.41	7.40	7.41	7.43	7.36	7.26	TN

Date	Time	Temp	Samp. No.	DO (mg/L) of Solution						Analyst
				CON	26%	35%	46%	62%	82%	
03/23/21	Start	25.0	1	7.73	8.36	7.31	7.69	7.09	7.67	LM
03/24/21	24 Hr.	24.2	1	8.32	8.17	8.25	7.79	8.65	8.54	LM
03/24/21	Renew	24.1	1	8.38	8.49	8.29	7.80	8.07	8.32	LM
03/25/21	48 Hr.	24.0	1	8.39	8.62	7.68	7.70	8.54	8.64	TN
03/25/21	Renew	25.0	2	7.82	7.84	8.04	8.55	7.91	8.10	AN
03/26/21	72 Hr.	24.0	2	7.94	8.06	8.41	7.23	8.40	8.28	AN
03/26/21	Renew	24.0	2	7.83	7.88	8.32	8.28	8.14	7.92	AN
03/27/21	96 Hr.	24.6	2	7.08	8.17	7.70	7.80	7.85	7.24	TN
03/27/21	Renew	25.0	3	8.56	8.18	8.11	8.65	8.47	8.32	LM
03/28/21	120 Hr.	24.5	3	7.74	8.32	7.09	7.79	8.21	7.40	LM
03/28/21	Renew	24.4	3	8.22	8.07	8.30	8.04	8.22	8.17	LM
03/29/21	144 Hr.	24.3	3	7.71	8.14	7.27	8.53	8.42	7.09	AN
03/29/21	Renew	24.3	3	7.07	7.85	8.38	8.09	8.09	7.61	AN
03/30/21	168 Hr.	24.6	3	7.42	8.19	8.06	8.08	8.00	7.39	TN

Huther and Associates  
7-Day *Pimephales promelas* Survival and Growth Chronic Toxicity Test

Rogers

Lab ID# 32538

Test Date: March 23, 2021

**INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT**

Date	Samp. No.	pH <sup>1</sup>	DO <sup>1</sup>	Hardness mg/L CaCO <sub>3</sub> <sup>1</sup>	Alkalinity mg/L CaCO <sub>3</sub> <sup>1</sup>	Conduct. μS/cm <sup>1</sup>	Resid. Cl <sub>2</sub> mg/L <sup>1</sup>	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L <sup>1</sup>	Analyst
03/23/21	1	7.18	7.77	132	100	631	< 0.01	N/A	TN
03/25/21	2	7.53	8.55	132	106	614	< 0.01	N/A	TN
03/27/21	3	7.39	7.79	124	100	601	< 0.01	N/A	TN
03/23/21	CON	7.95	7.73	120	72	400	-	-	JS

<sup>1</sup> Measurements taken in 100% solution.

*PIMEPHALES PROMELAS* STATISTICAL ANALYSES  
 Growth

Summary Statistics on Transformed Data Table 1 of 2

Grp	Identification	N	Min	Max	Mean
1	Control	5	0.421	0.465	0.444
2	26% Effluent	5	0.438	0.482	0.455
3	35% Effluent	5	0.429	0.483	0.459
4	46% Effluent	5	0.425	0.483	0.464
5	62% Effluent	5	0.429	0.481	0.466
6	82% Effluent	5	0.429	0.488	0.459

Summary Statistics on Transformed Data Table 2 of 2

Grp	Identification	Variance	Sd	Sem	C.V.%
1	Control	0.000	0.019	0.009	4.29
2	26% Effluent	0.000	0.016	0.007	3.59
3	35% Effluent	0.000	0.021	0.009	4.48
4	46% Effluent	0.001	0.023	0.010	4.94
5	62% Effluent	0.000	0.022	0.010	4.64
6	82% Effluent	0.000	0.022	0.010	4.75

Shapiro - Wilk's Test For Normality

D = 0.010

W = 0.943

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data **Pass** normality test at P=0.01 level. Continue analysis.

Bartlett's Test For Homogeneity of Variance

Calculated B1 statistic = 0.51

Table Chi-square value = 15.09 (alpha = 0.01, DF = 5)

Table Chi-square value = 11.07 (alpha = 0.05, DF = 5)

Data **Pass** B1 homogeneity test at 0.01 level. Continue analysis.

ANOVA Table

SOURCE	DF	SS	MS	F
Between	5	0.002	0.000	0.757
Within (Error)	24	0.010	0.000	
Total	29	0.012		

Critical F value = 2.62 (0.05,5,24)

Since F < Critical F Fail to Reject Ho: All equal

Dunnett's Test - Table 1 of 2 Ho:Control < Treatment

Grp	Identification	Mean		T Stat	Sig
		Transformed Mean	Calculated In Original Units		
1	Control	0.444	0.444		
2	26% Effluent	0.455	0.455	-0.848	
3	35% Effluent	0.459	0.459	-1.203	
4	46% Effluent	0.464	0.464	-1.574	
5	62% Effluent	0.466	0.466	-1.712	
6	82% Effluent	0.459	0.459	-1.203	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, DF=24,5)

**No statistically significant difference**

Dunnett's Test - Table 2 of 2 Ho:Control < Treatment

Grp	Identification	Num of Reps	Minimum	Sig	Difference from Control
			Diff (In Orig. Units)	% of Control	
1	Control	5			
2	26% Effluent	5	0.031	6.9	-0.011
3	35% Effluent	5	0.031	6.9	-0.016
4	46% Effluent	5	0.031	6.9	-0.020
5	62% Effluent	5	0.031	6.9	-0.022
6	82% Effluent	5	0.031	6.9	-0.016

**APPENDIX A  
RAW DATA**

7-DAY CERIODAPHnia DUBIA SURVIVAL & REPRODUCTION

DAILY RAW DATA TABLE

PAGE 1 OF 2

CLIENT Rogers  
 OUTFALL 001  
 LAB ID # 32538

START DATE/TIME 3-23-21 TG 1400  
 END DATE/TIME 03-30-21 DM 1400

Con

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
3/24	A	A	A	A	A	A	A	A	A	A	TG	1400
3/25	A	A	A	A	A	A	A	A	A	A	TG	1400
3/26	A	A	A	A	A	A	A	A	A	A	MH	1045
03/27	4	3	5	2	5	5	2	3	2	2	DM	1430
03/28	6	8	10	7	8	10	7	9	8	6	DM	1245
3/29	A	A	A	A	A	A	A	A	A	A	TG	1600
03/30	12	13	14	12	12	13	12	13	13	12	DM	1400
	22	24	29	21	25	28	21	25	23	20		

$\bar{x}$  # Young w/o Dead = 23.8 CV% = 12.65

$\bar{x}$  # Young w/Dead = CV% =

$\bar{x}$  % Survival = 100.0 CV% = 0.00

26

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
3/24	A	A	A	A	A	A	A	A	A	A	TG	1400
3/25	A	A	A	A	A	A	A	A	A	A	TG	1400
3/26	A	A	A	A	A	A	A	A	A	A	MH	1045
03/27	2	3	2	3	3	4	2	5	4	4	DM	1430
03/28	10	9	10	7	8	6	11	9	8	9	DM	1245
3/29	A	A	A	A	A	A	A	A	A	A	TG	1600
03/30	14	13	13	12	12	13	14	12	13	13	DM	1400
	26	25	25	22	23	23	27	26	25	26		

$\bar{x}$  # Young w/o Dead = 24.8 CV% = 6.53

$\bar{x}$  # Young w/Dead = CV% =

$\bar{x}$  % Survival = 100.0 CV% = 0.00

35

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
3/24	A	A	A	A	A	A	A	A	A	A	TG	1400
3/25	A	A	A	A	A	A	A	A	A	A	TG	1400
3/26	A	A	A	A	A	A	A	A	A	A	MH	1045
03/27	3	2	3	5	4	3	3	5	4	2	DM	1430
03/28	8	9	11	7	6	6	7	9	10	8	DM	1245
3/29	A	A	A	A	A	A	A	A	A	A	TG	1600
03/30	13	12	13	12	12	13	14	13	14	12	DM	1400
	24	23	27	24	22	27	24	27	28	22		

$\bar{x}$  # Young w/o Dead = 24.3 CV% = 9.31

$\bar{x}$  # Young w/Dead = CV% =

$\bar{x}$  % Survival = 100.0 CV% = 0.00

46

Date	Rep1	Rep2	Rep3	Rep4	Rep5	Rep6	Rep7	Rep8	Rep9	Rep10	Analyst	Time
3/24	A	A	A	A	A	A	A	A	A	A	TG	1400
3/25	A	A	A	A	A	A	A	A	A	A	TG	1400
3/26	A	A	A	A	A	A	A	A	A	A	MH	1045
03/27	2	4	3	2	2	3	5	4	2	5	DM	1430
03/28	9	6	8	7	10	7	6	9	7	11	DM	1245
3/29	A	A	A	A	A	A	A	A	A	A	TG	1600
03/30	13	12	12	13	14	13	12	13	12	14	DM	1400
	24	22	23	22	26	23	23	26	21	26		

$\bar{x}$  # Young w/o Dead = 24.0 CV% = 11.11

$\bar{x}$  # Young w/Dead = CV% =

$\bar{x}$  % Survival = 100.0 CV% = 0.00





**7-DAY CHRONIC TOXICITY TEST  
PIMEPHALES PROMELAS (fathead minnow) SURVIVAL**

CLIENT/FACILITY: Rogers DATE/TIME STARTED: 3-23-21 JC 1630  
 OUTFALL #: 001 PROJECT #: 32538 DATE/TIME ENDED: 3-30-21 MH 1630  
 ORGANISM ID#: PP0-21-081

Conc.	3-24-21 JC 1630					3-25-21 JC 1045					3-26-21 MH 0935					3-27-21 JC 1110					3-28-21 JC 1240				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
Con	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
26	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
35	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
46	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
62	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
82	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Initials Date/Time	3-24-21 JC 1630					3-25-21 JC 1045					3-26-21 MH 0935					3-27-21 JC 1110					3-28-21 JC 1240				

Conc.	3-29-21 MH 0825					3-30-21 MH 1630					Mean Survival	C.V. %
	A	B	C	D	E	A	B	C	D	E		
Con	8	8	8	8	8	8	8	8	8	8	100.0	0.00
26	8	8	8	8	8	8	8	8	8	8	100.0	0.00
35	8	8	8	8	8	8	8	8	8	8	100.0	0.00
46	8	8	8	8	8	8	8	8	8	8	100.0	0.00
62	8	8	8	8	8	8	8	8	8	8	100.0	0.00
82	8	8	8	8	8	8	8	8	8	8	100.0	0.00
Initials Date/Time	3-29-21 MH 0825					3-30-21 MH 1630						



Client / Facility Rogers  
 Lab ID Number 32538  
 Outfall Number 001  
 Test Date 3-23-21

INITIAL CHEMISTRY MEASUREMENTS @ 100% EFFLUENT

Date	Samp. No.	pH	DO	Hardness mg/L CaCO <sub>3</sub>	Alkalinity mg/L CaCO <sub>3</sub>	Conduct. umhos/cm	Resid. Cl <sub>2</sub> mg/L	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L	Analyst
3-23-21	1	7.18	7.77	132	100	631	<0.01	N/A	TN
3-25-21	2	7.53	8.55	132	106	614	<0.01	N/A	TN
3-27-21	3	7.39	7.79	124	100	601	<0.01	N/A	TN
3-23-21	CON	7.95	7.73	120	72	400	-	-	JS

INITIAL CHEMISTRY MEASUREMENTS @ RECEIVING WATER

Date	Samp. No.	pH	DO	Hardness mg/L CaCO <sub>3</sub>	Alkalinity mg/L CaCO <sub>3</sub>	Conduct. umhos/cm	Resid. Cl <sub>2</sub> mg/L	Dechlor(mL) Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> mg/L	Analyst

Notes:

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**APPENDIX B**  
**REFERENCE TOXICANTS**

**CHRONIC REFERENCE TOXICANT TEST RESULTS**

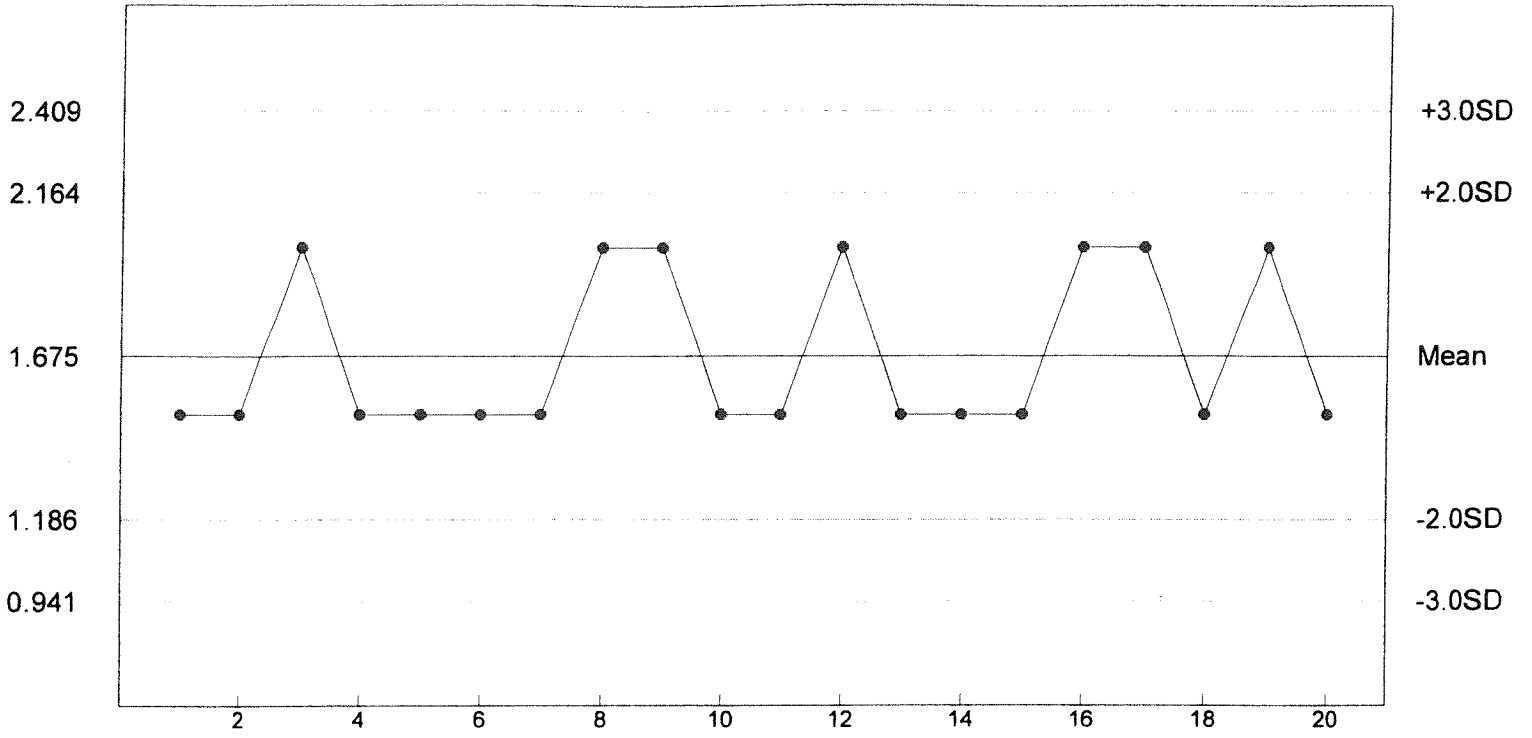
SPECIES: *Ceriodaphnia dubia*  
 CHEMICAL: Sodium Chloride  
 DURATION: 7-Days  
 TEST NUMBER: 3  
 TEST DATE: 03/03/21 - 03/10/21  
 1600 Hrs - 1600 Hrs  
 STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (g/L)	NUMBER EXPOSED	NUMBER DEAD
0.5	10	0
1.0	10	0
1.5	10	1
2.0	10	7
2.5	10	9
3.0	10	10
4.0	10	10

LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR REPRODUCTION	NOEC FOR REPRODUCTION
2.0 g/L	1.5 g/L	1.0 g/L	0.5 g/L

Reference Tox Sodium Chloride g/L

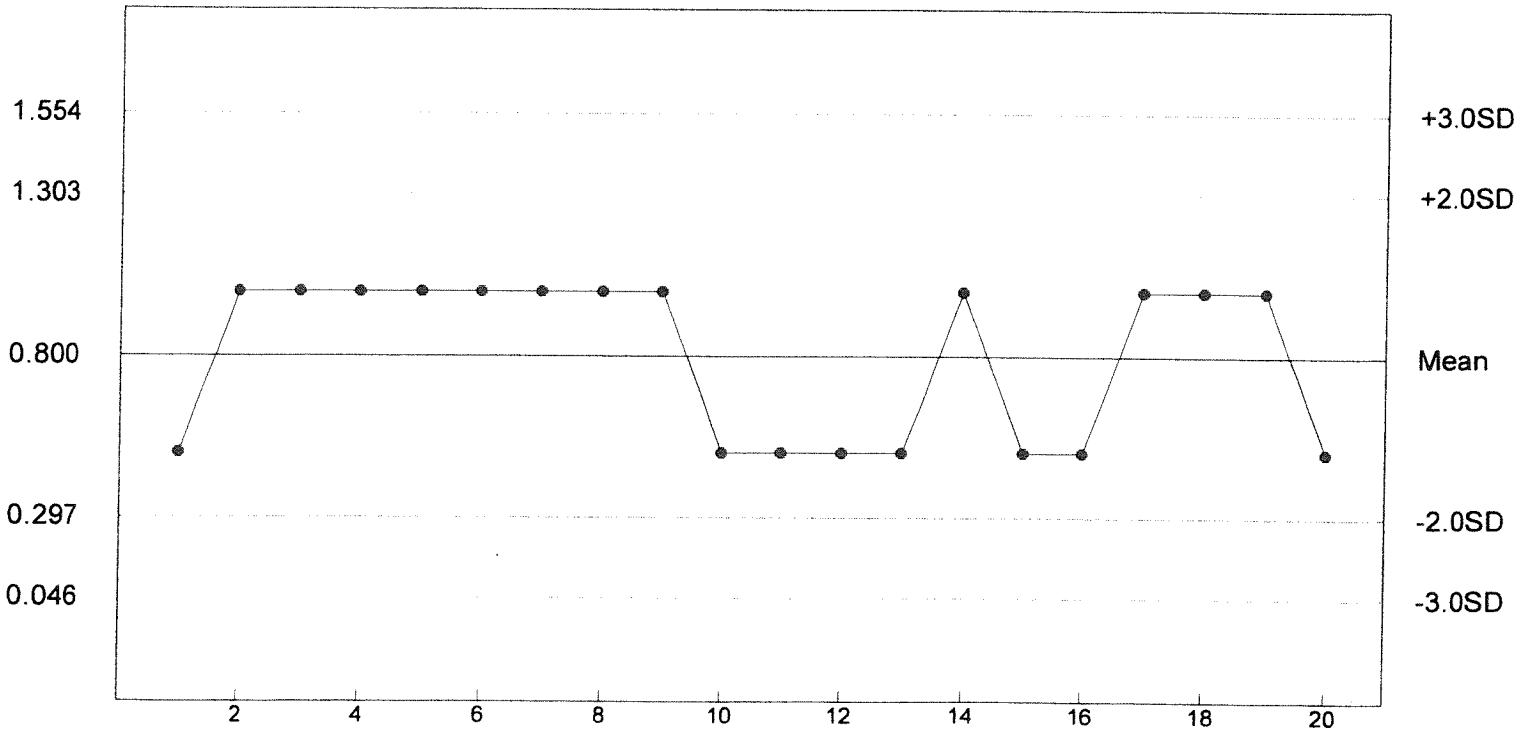
C. dubia Survival - NOEC



n= 20 Mean= 1.675 SD= 0.245 CV= 14.61% Min= 1.500 Max= 2.000

Reference Tox Sodium Chloride g/L

C. dubia Reproduction - NOEC



n= 20 Mean= 0.800 SD= 0.251 CV= 31.41% Min= 0.500 Max= 1.000

**CHRONIC REFERENCE TOXICANT TEST RESULTS**

SPECIES: *Pimephales promelas*

CHEMICAL: Copper Nitrate

DURATION: 7-Days

TEST NUMBER: 3

TEST DATE: 03/03/21 - 03/10/21  
1500 Hrs -1600 Hrs

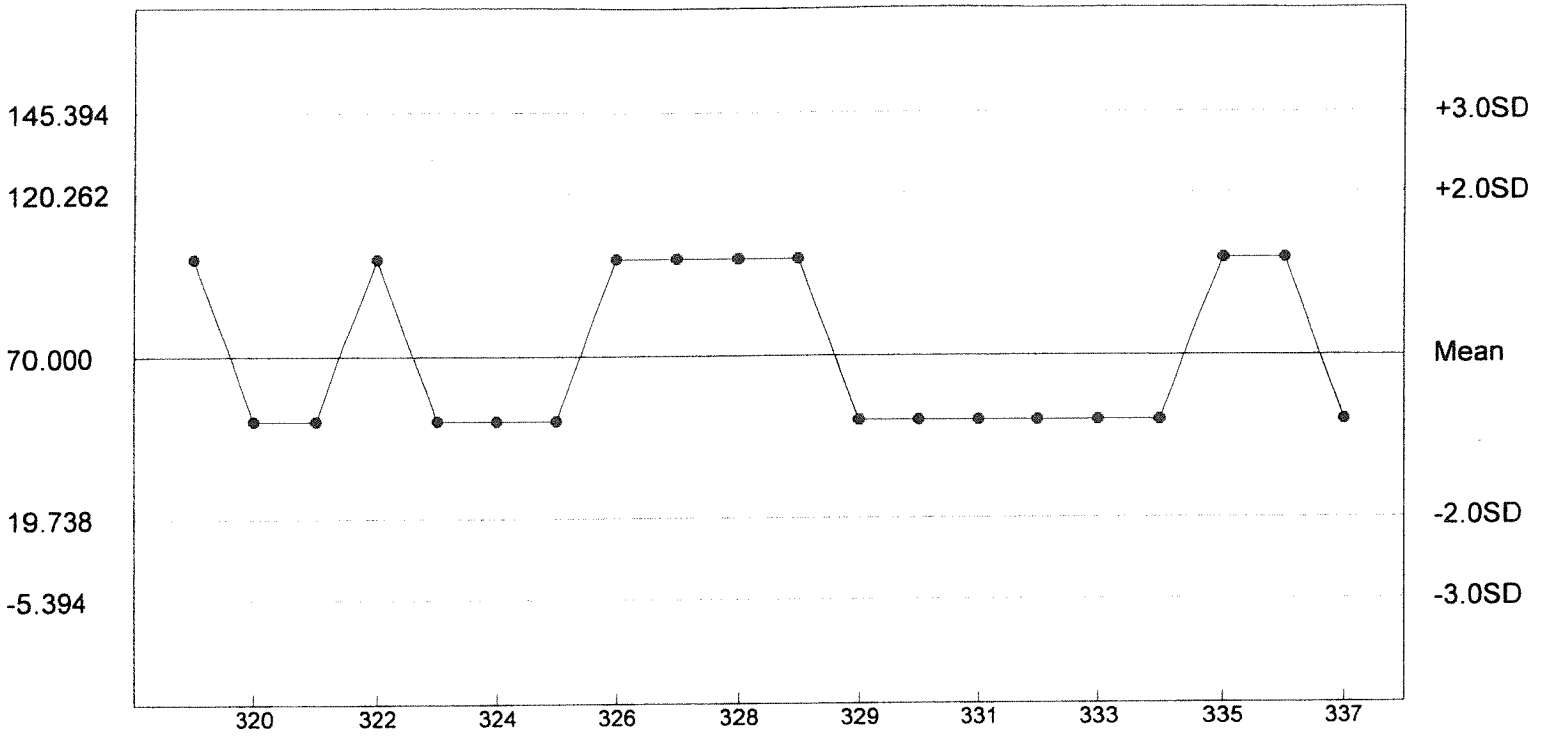
STATISTICAL METHOD: Dunnetts/Steels

CONCENTRATION (ug/L)	NUMBER EXPOSED	NUMBER DEAD
12.5	40	0
25	40	0
50	40	0
100	40	9
200	40	15
400	40	40
800	40	40

LOEC FOR SURVIVAL	NOEC FOR SURVIVAL	LOEC FOR GROWTH	NOEC FOR GROWTH
<b>100 ug/L</b>	<b>50 ug/L</b>	<b>100 ug/L</b>	<b>50 ug/L</b>

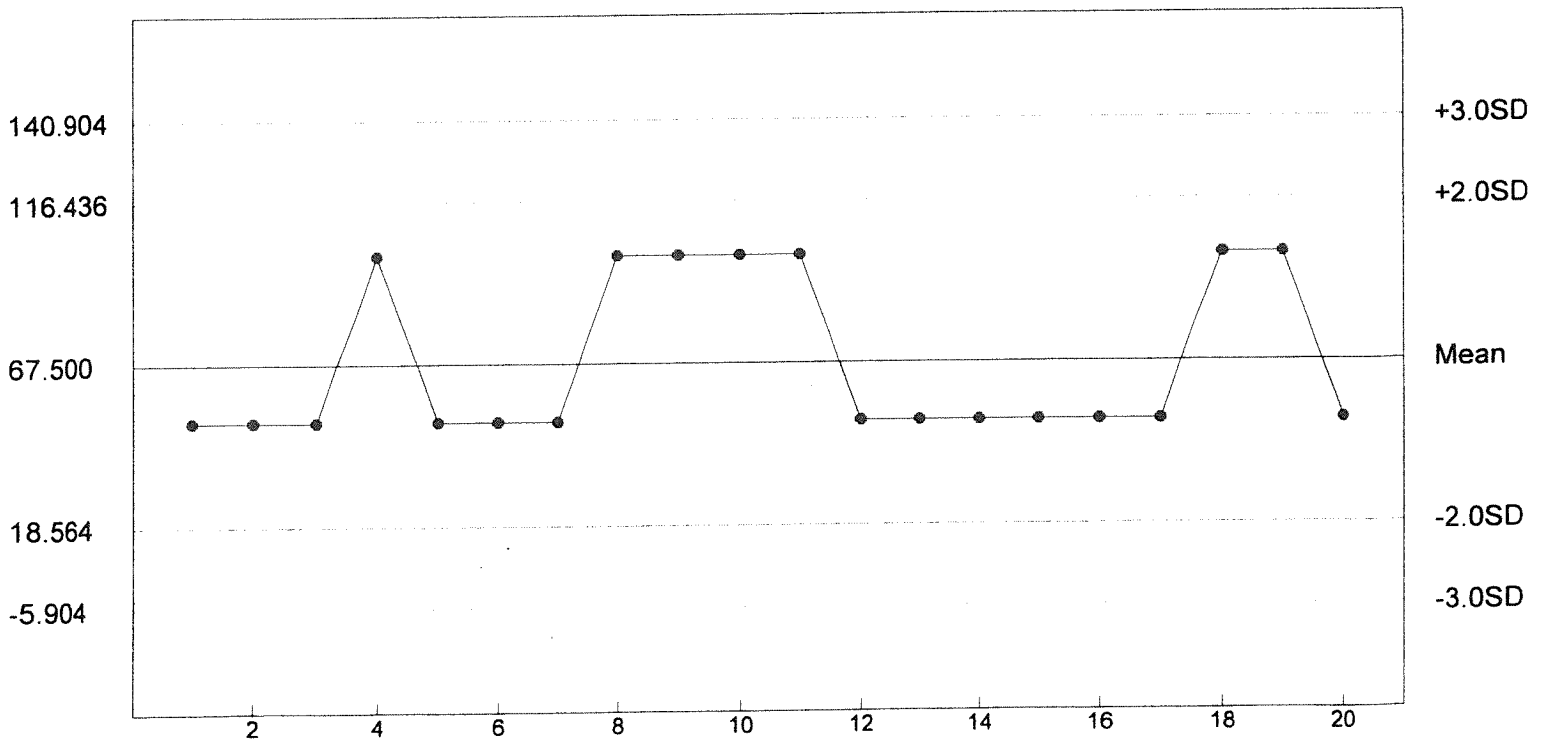


Reference Tox Copper Nitrate ug/L  
*P. promelas* Chronic Survival - NOEC



n= 20 Mean= 70.000 SD= 25.131 CV= 35.90% Min= 50.000 Max= 100.000

Reference Tox Copper Nitrate ug/L  
*P. promelas* Growth - NOEC

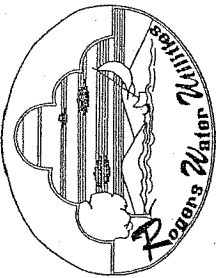


n= 20 Mean= 67.500 SD= 24.468 CV= 36.25% Min= 50.000 Max= 100.000

**APPENDIX C**  
**CHAIN OF CUSTODY SHEETS**







**ROGERS POLLUTION CONTROL FACILITY  
CHAIN OF CUSTODY**

**ANALYSES**

SAMPLE DESCRIPTION	SAMPLE ID	COLLECTION		CONTAINER		TYPE	METH A/M	TEMP °C	C B O D S	N O 2 & N O 3	P O 4	O & C N L S	M E T A L S	W E T	T T O
		DATE	TIME	L	G/P										
Effluent		On: 3-25-21	0830	21+	P	C	A	4.9						X	
Influent		Off: 3-26-21	0830	10	P	C	A	3.9						X	
		On:													
		Off:													
		On:													
		Off:													

Relinquished by: <i>[Signature]</i>	Received by:	Date:	Time:	Relinquished by:	Received by:	Date:	Time:
Relinquished by: <i>[Signature]</i>	Received by: <i>[Signature]</i>	Date: 3-27-21	Time: 0945	Relinquished by:	Received by:	Date:	Time:

COMMENTS: #32538 IR# 1.1 FedEx  
 SAMPLER(S): On: *[Signature]* Off: *[Signature]*

Metals: Ag, As, Be, Cd, Cr, Cu, Mo, Ni, Pb, Sb, Se, Tl, Zn (preserved with HNO<sub>3</sub>)  
 WET: Whole Effluent Toxicity (Biomonitoring).  
 TIO Scan: Table II - Organic Toxic Pollutants as defined by 40 CFR 122 appendix D. (Volatiles, Acid Compounds, Base / Neutral, Pesticides)  
 NH<sub>3</sub>-N, TN, TP and O&C preserved with H<sub>2</sub>SO<sub>4</sub> \* CN preserved with NaOH \* PHENOL preserved with CuSO<sub>4</sub> + Phos Acid

**CITY OF ROGERS  
 NPDES PERMIT NO. AR0043397  
 AFIN NUMBER: 04-00155  
 BIOMONITORING REPORTING  
 TEST DATE: 03/23/21**

**I. *Ceriodaphnia dubia***

**Response**

(A) If the NOEC for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TLP3B.	0
(B) Report the NOEC value for survival, Parameter No. TOP3B.	82%
(C) Report the NOEC value for reproduction, Parameter No. TPP3B.	82%
(D) If the NOEC for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP3B.	0
(E) Report the higher (critical dilution or control) Coefficient of Variation, Parameter No. TQP3B.	12.65%

**II. *Pimephales promelas* (fathead minnow)**

**Response**

(A) If the No Observed Effect Concentration (NOEC) for survival is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TLP6C.	0
(B) Report the NOEC value for survival, Parameter No. TOP6C.	82%
(C) Report the NOEC value for growth, Parameter No. TPP6C.	82%
(D) If the No Observed Effect Concentration (NOEC) for growth is less than the critical dilution, enter a "1"; otherwise, enter a "0". Parameter No. TGP6C.	0
(E) Report the highest (critical dilution or control) Coefficient of Variation, Parameter No. TQP6C.	4.75%
22414 - 10	82%
22414 - PO	82%