

March 7, 2014

Test Results of
First Quarter
Chronic 7-Day Renewal
Biomonitoring Testing
for
Plant Effluent
City of Hot Springs

Control No. 175701-1

Prepared for:

Mr. James Sorrells
City of Hot Springs
320 Davidson Drive
Hot Springs, AR 71901

Prepared by:

AMERICAN INTERPLEX CORPORATION
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City of Hot Springs
ATTN: Mr. James Sorrells
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Hot Springs, AR 71901

Re: Chronic 7-Day Renewal utilizing *Pimephales promelas* (Fathead minnow) and *Ceriodaphnia dubia*
Plant Effluent - City of Hot Springs
NPDES Permit No. AR0033880 AFIN#26-00145

Dear Mr. James Sorrells:

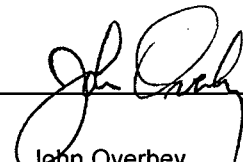
This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC). The following results are applicable only to the sample identified by the control number referenced above. Accurate assessment of the data requires access to the entire document. Each section of the report has been reviewed and approved by the laboratory director or qualified designee.

Testing procedures and Quality Assurance were in accordance with "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms" EPA-821-R-02-013, Fourth Edition, October 2002. Test results are summarized below:

Method 1000.0 Chronic *Pimephales promelas* (Fathead minnow) Survival and Growth Test: The No Observable Effects Concentration (NOEC) for survival occurred at 87 % effluent, which is above the critical dilution of 65 %. The NOEC for growth occurred at 87 % effluent, which is above the critical dilution of 65 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the Fathead minnow test.**

Method 1002.0 Chronic *Ceriodaphnia dubia* Survival and Reproduction Test: The No Observable Effects Concentration (NOEC) for survival occurred at 87 % effluent, which is above the critical dilution of 65 %. The NOEC for reproduction occurred at 87 % effluent, which is above the critical dilution of 65 %. **The sample, therefore, PASSED both lethal and sub-lethal effects for the *Ceriodaphnia dubia* test.**

AMERICAN INTERPLEX CORPORATION



John Overbey
Laboratory Director

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I. Control Acceptance Criteria

Pimephales promelas (Fathead minnow) Method 1000.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Growth > or = 0.25 mg per Surviving minnow	0.335	PASS
Control Growth CV < or = 40%	8.29	PASS
Growth Minimum Significant Difference 12 to 30%	13.5	PASS
Critical Dilution CV < or = 40%	6.39	PASS

Ceriodaphnia dubia Method 1002.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Reproduction > or = 15 per Surviving Female	16.6	PASS
Control CV < or = 40% per Surviving Female	10.3	PASS
Reproduction Minimum Significant Difference 13 to 47%	16.6	PASS
Critical Dilution CV < or = 40%	11.6	PASS

II. Outlined Report

A. Introduction

1. Permit Number: AR0033880 AFIN#26-00145
2. Test Requirements: Chronic Biomonitoring, Quarterly
Test Methods 1000.0 and 1002.0
3. Receiving Stream: Lake Catherine

B. Source of Effluent/Dilution Water

1. Effluent Samples:
 - a. Sampling Point: Plant Effluent
 - b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	9.1	8.3	9.8
pH (standard units)	7.5	7.5	7.6
Alkalinity (mg/l as CaCO ₃)	77	98	81
Hardness (mg/l as CaCO ₃)	78	92	84
Conductivity (umhos/cm)	330	390	360
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05
Ammonia as N (mg/l)	0.17	<0.1	<0.1

2. Dilution Water Samples: Synthetic Soft Water #4073

- a. Dates Prepared: February 25 through March 11, 2014
- b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	8.5	7.9	7.8
pH (standard units)	7.0	7.2	7.5
Alkalinity (mg/l as CaCO ₃)	31	31	31
Hardness (mg/l as CaCO ₃)	44	44	44
Conductivity (umhos/cm)	150	150	160
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05

C. Test Methods

1. Test methods used:

Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013; test Methods 1000.0 and 1002.0, Fathead Minnow Survival and Growth and *Ceriodaphnia dubia* Survival and Reproduction.

2. Endpoint: No Observable Effects Concentration (NOEC)

3. Test Conditions:

Pimephales promelas (Fathead minnow) Survival and Growth Method 1000.0

Date & Time Test Initiated: February 25, 2014 at 1100
Date & Time Test Terminated: March 4, 2014 at 1015
Type & Volume of Test Chamber: 500 ml disposable beaker
Volume of Sample: 250 ml
Number of Organisms per replicate: 8
Number of Replicates per dilution: 5

Ceriodaphnia dubia Survival and Growth Method 1002.0

Date & Time Test Initiated: February 25, 2014 at 1125
Date & Time Test Terminated: March 4, 2014 at 1300
Type & Volume of Test Chamber: 30 ml disposable beaker
Volume of Sample: 15 ml
Number of Organisms per replicate: 1
Number of Replicates per dilution: 10

4. Acclimation of test organisms: Obtained from in-house cultures

5. Test Temperature: 25 +/- 1 degree Celsius

D. Test Organisms

1. Scientific Name

- a. Test 1000.0 *Pimephales promelas*
- b. Test 1002.0 *Ceriodaphnia dubia*

III. Data Analysis

The data was analyzed using American Interplex Corporation's Laboratory Information Management Software based on Toxstat.

Pimephales promelas (Fathead minnow) survival data was transformed using the Arc Sine transformation. Normality and homogeneity of variance were checked using Shapiro-Wilk's. The survival data was then analyzed using Steel's Many-One Rank Test to determine the No Observable Effects Concentration (NOEC).

Fathead minnow growth data was analyzed for normality and homogeneity of variance using Shapiro-Wilk's and Bartlett's test. Dunnett's Test was used to determine the No Observable Effects Concentration (NOEC) for growth.

Ceriodaphnia dubia survival data was analyzed with Fisher's Exact Test. Reproduction data was analyzed using Kolmogorov's Test for Normality and analyzed with Steel's Many-One Rank Test to determine the No Observable Effects Concentration (NOEC) for Reproduction. Dunnett's Test was used to calculate the PMSD.

IV. Standard Reference Toxicants

American Interplex Corporation has an ongoing test organism culturing program. The sensitivity of the offspring is determined by performing a standard reference toxicant test with each effluent test. Sodium chloride in synthetic moderately hard water is used as prescribed in EPA-821-R-02-013.

Pimephales promelas (Fathead minnow)

Chronic reference tests are performed monthly.

A chronic reference test was performed on February 21, 2014 at 1730 to February 28, 2014 at 1530

The results were as follows: (Control No. 175677-1.)

Survival LC-50: 2002 mg/l

Growth IC-25: 2684 mg/l

Growth PMSD: 7.17

Ceriodaphnia dubia

Chronic reference tests are performed monthly.

A chronic reference test was performed on February 21, 2014 at 1730 to February 28, 2014 at 1600

The results were as follows: (Control No. 175677-2.)

Survival LC-50: 1913 mg/l

Growth IC-25: 1484 mg/l

Growth PMSD: 17.1

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320-B	NA	0.00
Hardness	EPA 200.7	100	1.20
pH	SM 4500-H+ B	101	0.271
Conductivity	EPA 120.1	103	3.24

VI. Organism History

Pimephales promelas (Fathead minnow)

Date: February 25, 2014

Age: <24 hours

Source: In-house culture

Water Chemistry Record:

Alkalinity: 57-64 mg/l

Hardness: 80-100 mg/l

Temperature: 25 deg.C

Ceriodaphnia dubia

Date: February 25, 2014

Age: <24 hours

Source: In-house culture

Water Chemistry Record:

Alkalinity: 57-64 mg/l

Hardness: 80-100 mg/l

Temperature: 25 deg.C

VII. Results Summary *Pimephales promelas*, Fathead minnow Larval Survival and Growth Test -- Method 1000.0

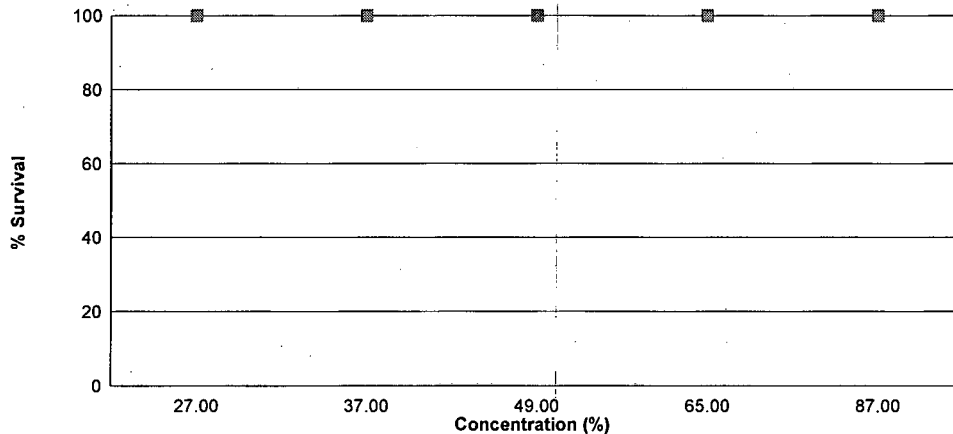
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

Effluent dilutions for this test were 27 %, 37 %, 49 %, 65 %, 87 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 65 % effluent.

The test was initiated on February 25, 2014 at 1100 and continued through March 4, 2014 at 1015. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 87 % effluent
- b.) NOEC growth = 87 % effluent



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	100	0.335
27 %	100	0.358
37 %	100	0.370
49 %	100	0.389
65 %	100	0.426
87 %	100	0.411

VII. Results Summary *Ceriodaphnia dubia*, Cladoceran Survival and Reproduction Test -- Method 1002.0

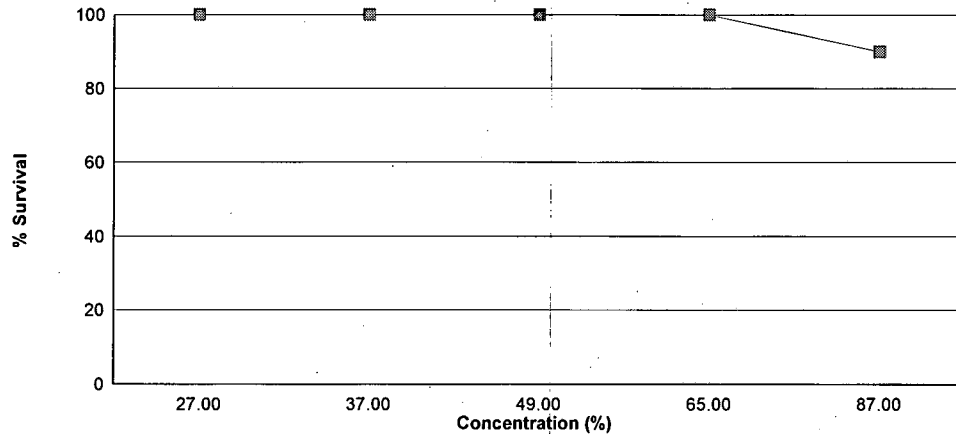
Neonates are exposed in a static renewal system to different concentrations of effluent with dilution water until 60% of surviving control organisms have three broods of offspring with an average of at least 15 young per female.

Effluent dilutions for this test were 27 %, 37 %, 49 %, 65 %, 87 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 65 % effluent.

The test was initiated on February 25, 2014 at 1125 and continued through March 4, 2014 at 1300. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 87 % effluent
- b.) NOEC reproduction = 87 % effluent



Concentration	Percent Survival	Mean Reproduction
Control	100	16.6
27 %	100	16.1
37 %	100	16.9
49 %	100	17.8
65 %	100	16.4
87 %	90.0	16.9

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Survival

Date and Time Test Initiated: February 25, 2014 at 1100

Date and Time Test Terminated: March 4, 2014 at 1015

Concentration Replicate		Number of Survivors						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
27 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
37 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
49 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
65 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8
87 %	A	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Growth

Test Initiated: February 25, 2014 at 1100
Test Terminated: March 4, 2014 at 1015

Drying Started: February 27, 2014 at 1430
Drying Ended: March 6, 2014 at 0930

Concentration	Replicate	Weight of pan	Weight of pan + fish	Total weight of fish (g)	Original # of fish	Mean dry weight (mg)
Control	A	.94822	.95061	0.00239	8	0.299
	B	.94974	.95231	0.00257	8	0.321
	C	.94953	.95215	0.00262	8	0.328
	D	.94985	.95278	0.00293	8	0.366
	E	.94849	.95136	0.00287	8	0.359
27 %	A	.94554	.94815	0.00261	8	0.326
	B	.95083	.95365	0.00282	8	0.352
	C	.94953	.95251	0.00298	8	0.372
	D	.94637	.94929	0.00292	8	0.365
	E	.94623	.94924	0.00301	8	0.376
37 %	A	.94878	.95149	0.00271	8	0.339
	B	.94946	.95207	0.00261	8	0.326
	C	.94486	.94801	0.00315	8	0.394
	D	.94349	.94633	0.00284	8	0.355
	E	.94333	.94683	0.00350	8	0.438
49 %	A	.94912	.95205	0.00293	8	0.366
	B	.94470	.94773	0.00303	8	0.379
	C	.95075	.95387	0.00312	8	0.390
	D	.94969	.95270	0.00301	8	0.376
	E	.95153	.95500	0.00347	8	0.434
65 %	A	.94578	.94947	0.00369	8	0.461
	B	.94830	.95140	0.00310	8	0.388
	C	.94786	.95127	0.00341	8	0.426
	D	.94835	.95168	0.00333	8	0.416
	E	.94864	.95216	0.00352	8	0.440
87 %	A	.94879	.95209	0.00330	8	0.412
	B	.94764	.95095	0.00331	8	0.414
	C	.94789	.95148	0.00359	8	0.449
	D	.94713	.95039	0.00326	8	0.408
	E	.95123	.95419	0.00296	8	0.370

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: February 25, 2014 at 1125

Date and Time Test Terminated: March 4, 2014 at 1300

Concentration: Control														
Day	Replicate										No. of Young	No. of Adults	Young per Adult	
	1	2	3	4	5	6	7	8	9	10				
1	0	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	3	2	2	3	2	2	2	3	4	3	26	10	2.60	
5	0	0	6	0	0	0	0	0	0	0	6	10	0.600	
6	8	5	0	6	5	5	4	5	6	4	48	10	4.80	
7	10	9	9	8	8	8	10	8	7	9	86	10	8.60	
8														
TOTAL	21	16	17	17	15	15	16	16	17	16	166	10	16.6	

Concentration: 27 %														
Day	Replicate										No. of Young	No. of Adults	Young per Adult	
	1	2	3	4	5	6	7	8	9	10				
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
4	3	3	2	3	2	3	2	4	4	2	28	10	2.80	
5	0	0	5	0	0	0	0	0	0	0	5	10	0.500	
6	5	5	0	5	4	6	6	6	6	5	48	10	4.80	
7	8	7	8	8	8	9	8	6	10	8	80	10	8.00	
8														
TOTAL	16	15	15	16	14	18	16	16	20	15	161	10	16.1	

Concentration: 37 %														
Day	Replicate										No. of Young	No. of Adults	Young per Adult	
	1	2	3	4	5	6	7	8	9	10				
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
4	3	4	3	3	3	3	2	2	3	3	29	10	2.90	
5	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
6	5	5	5	5	5	5	6	6	7	6	55	10	5.50	
7	10	8	8	8	9	7	10	9	7	9	85	10	8.50	
8														
TOTAL	18	17	16	16	17	15	18	17	17	18	169	10	16.9	

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: February 25, 2014 at 1125

Date and Time Test Terminated: March 4, 2014 at 1300

Concentration: 49 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	4	3	2	4	4	2	3	3	3	3	31	10	3.10
5	0	0	5	0	0	0	0	0	0	0	5	10	0.500
6	7	5	0	7	5	6	5	5	5	6	51	10	5.10
7	9	8	8	10	9	11	11	8	8	9	91	10	9.10
8													
TOTAL	20	16	15	21	18	19	19	16	16	18	178	10	17.8

Concentration: 65 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	2	2	3	2	2	2	3	3	4	2	25	10	2.50
5	0	0	7	0	4	0	0	0	0	0	11	10	1.10
6	5	6	0	6	7	5	5	6	5	5	50	10	5.00
7	8	9	8	11	0	9	8	7	10	8	78	10	7.80
8													
TOTAL	15	17	18	19	13	16	16	16	19	15	164	10	16.4

Concentration: 87 %													
Day	Replicate										No. of Young	No. of Adults	Young per Adult
	1	2	3	4	5	6	7	8	9	10			
1	0	0	0	0	0	0	0	0	0	0	0	10	0.00
2	0	0	0	0	0	0	0	0	0	0	0	10	0.00
3	0	0	0	0	0	0	0	0	0	0	0	10	0.00
4	3	3	2	4	2	2	3	2	3	X	24	9	2.67
5	8	0	4	0	0	0	0	0	0	X	12	9	1.33
6	0	6	0	7	6	5	6	5	5	X	40	9	4.44
7	12	9	0	12	9	13	14	11	13	X	93	9	10.3
8													
TOTAL	23	18	6	23	17	20	23	18	21	0	169	10	16.9

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

Transformation of Data			Transform: Arc Sin(Square Root(Y))	
Group	Identification	Rep	Value	Transformed
1	Control	1	1.00000	1.39310
1	Control	2	1.00000	1.39310
1	Control	3	1.00000	1.39310
1	Control	4	1.00000	1.39310
1	Control	5	1.00000	1.39310
2	27 %	1	1.00000	1.39310
2	27 %	2	1.00000	1.39310
2	27 %	3	1.00000	1.39310
2	27 %	4	1.00000	1.39310
2	27 %	5	1.00000	1.39310
3	37 %	1	1.00000	1.39310
3	37 %	2	1.00000	1.39310
3	37 %	3	1.00000	1.39310
3	37 %	4	1.00000	1.39310
3	37 %	5	1.00000	1.39310
4	49 %	1	1.00000	1.39310
4	49 %	2	1.00000	1.39310
4	49 %	3	1.00000	1.39310
4	49 %	4	1.00000	1.39310
4	49 %	5	1.00000	1.39310
5	65 %	1	1.00000	1.39310
5	65 %	2	1.00000	1.39310
5	65 %	3	1.00000	1.39310
5	65 %	4	1.00000	1.39310
5	65 %	5	1.00000	1.39310
6	87 %	1	1.00000	1.39310
6	87 %	2	1.00000	1.39310
6	87 %	3	1.00000	1.39310
6	87 %	4	1.00000	1.39310
6	87 %	5	1.00000	1.39310

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Survival

Shapiro - Wilk's Test for Normality		Transform: Arc Sin(Square Root(Y))
D = 0		
W = 0		
Critical W = 0.9	(alpha = 0.01, N = 30)	
Critical W = 0.927	(alpha = 0.05, N = 30)	
Data FAIL normality test (alpha = 0.01).		

Steel's Many-One Rank Test			Transform: Arc Sin(Square Root(Y))		
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	27 %	27.50	16.00	5.00	
3	37 %	27.50	16.00	5.00	
4	49 %	27.50	16.00	5.00	
5	65 %	27.50	16.00	5.00	
6	87 %	27.50	16.00	5.00	
Critical values are 1 tailed (k=5)					

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

Shapiro - Wilk's Test for Normality	No Transformation
<p>D = 0.02196 W = 0.9732 Critical W = 0.9 (alpha = 0.01, N = 30) Critical W = 0.927 (alpha = 0.05, N = 30)</p> <p>Data PASS normality test (alpha = 0.01).</p>	

Bartlett's Test for Homogeneity of Variance	No Transformation
<p>Calculated B1 statistic = 2.857 Critical B = 15.086 (alpha = 0.01, df = 5)</p> <p>Data PASS B1 homogeneity test at 0.01 level.</p>	

Appendix A2: Statistics

Pimephales promelas (Fathead minnow) Growth

ANOVA Table				No Transformation	
SOURCE	DF	SS	MS	F	
Between	5	0.02883	0.005766	6.302	
Within (Error)	24	0.02196	0.000915		
Total	29	0.05079			
Critical F = 3.9 (alpha = 0.01, df = 5,24)					
2.62 (alpha = 0.05, df = 5,24)					
Since F > Critical F REJECT Ho: All equal (alpha = 0.05)					

Dunnett's Test - Table 1 of 2					No Transformation	
Ho:Control<Treatment						
Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05	
1	Control	0.3346	0.3346			
2	27 %	0.3582	0.3582	-1.234		
3	37 %	0.3704	0.3704	-1.871		
4	49 %	0.389	0.389	-2.844		
5	65 %	0.4262	0.4262	-4.788		
6	87 %	0.4106	0.4106	-3.973		
Dunnett's critical value = 2.36 (1 Tailed, alpha = 0.05, df = 5,24)						

Dunnett's Test - Table 2 of 2					No Transformation	
Ho:Control<Treatment						
Group	Identification	Num of Reps	Min Sig Diff (In Orig. Units)	% of Control	Difference From Control	
1	Control	5				
2	27 %	5	0.04515	13.5	-0.0236	
3	37 %	5	0.04515	13.5	-0.0358	
4	49 %	5	0.04515	13.5	-0.0544	
5	65 %	5	0.04515	13.5	-0.0916	
6	87 %	5	0.04515	13.5	-0.076	

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
27 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
37 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
49 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
65 %	10	0	10
Total	20	0	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 10. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
87 %	9	1	10
Total	19	1	20

Critical Fisher's value (10,10,10) (alpha=0.05) is 6. b value is 9. Since b is greater than 6 there is NO SIGNIFICANT DIFFERENCE between CONTROL and TREATMENT at the 0.05 level.

Summary of Fisher's Exact Test				
Group	Identification	Exposed	Dead	Sig 0.05
0	Control	10	0	
1	27 %	10	0	
2	37 %	10	0	
3	49 %	10	0	
4	65 %	10	0	
5	87 %	10	1	

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Kolmogorov Test for Normality	No Transformation
<p>D = 0.2044 D* = 1.604 Critical D* = 1.035 (alpha = 0.01, N = 60)</p> <p>Data FAIL normality test (alpha = 0.01).</p>	

Steel's Many-One Rank Test				No Transformation	
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	27 %	92.00	75.00	10.00	
3	37 %	121.00	75.00	10.00	
4	49 %	122.50	75.00	10.00	
5	65 %	103.50	75.00	10.00	
6	87 %	129.00	75.00	10.00	

Critical values are 1 tailed (k=5)

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Dunnett's Test for PMSD Calculation (excluding deaths if applicable)

ANOVA Table				No Transformation	
SOURCE	DF	SS	MS	F	
Between	5	47.97	9.594	1.422	
Within (Error)	53	357.7	6.749		
Total	58	405.7			
Critical F = 3.39 (alpha = 0.01, df = 5,53)					
2.39 (alpha = 0.05, df = 5,53)					
Since F < Critical F FAIL TO REJECT Ho: All equal (alpha = 0.05)					

Dunnett's Test - Table 1 of 2					No Transformation	
Ho:Control<Treatment						
Group	Identification	Transformed Mean	Mean In Original Units	T Stat	Sig 0.05	
1	Control	16.6	16.6			
2	27 %	16.1	16.1	0.4304		
3	37 %	16.9	16.9	-0.2582		
4	49 %	17.8	17.8	-1.033		
5	65 %	16.4	16.4	0.1721		
6	87 %	18.778	18.778	-1.825		
Dunnett's critical value = 2.31 (1 Tailed, alpha = 0.05, df [used] = 5,40) (Actual df = 5,53)						
WARNING - Unequal replicate sizes. Critical values assuming equal replicate sizes have been used.						

Dunnett's Test - Table 2 of 2					No Transformation	
Ho:Control<Treatment						
Group	Identification	Num of Reps	Min Sig Diff (In Orig. Units)	% of Control	Difference From Control	
1	Control	10				
2	27 %	10	2.684	16.2	0.5	
3	37 %	10	2.684	16.2	-0.3	
4	49 %	10	2.684	16.2	-1.2	
5	65 %	10	2.684	16.2	0.2	
6	87 %	9	2.757	16.6	-2.178	

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: February 25, 2014 at 1528

Date and Time Test Terminated: March 4, 2014 at 1300

Effluent Conc.: Control		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.5	8.3	7.9	8.1	7.8	8.1	8.1
	Final *1	7.7	7.7	7.5	7.0	6.8	6.7	7.0
	Final *2	7.9	7.8	8.0	7.9	8.1	8.3	7.8
pH, units	Initial	7.0	7.5	7.2	7.5	7.5	7.8	7.4
	Final *1	6.6	7.4	7.2	7.0	7.4	6.4	7.2
	Final *2	7.8	7.6	7.7	7.5	7.7	7.5	7.7
Alkalinity, mg CaCO ₃ /l		31	NA	31	NA	31	NA	NA
Hardness, mg CaCO ₃ /l		44	NA	44	NA	44	NA	NA
Conductivity, umhos/cm		150	140	150	160	160	160	160
Res. Chlorine, mg/l		<0.05	NA	<0.05	NA	<0.05	NA	NA

Effluent Conc.: 27 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.7	8.4	8.2	8.2	7.9	8.2	8.2
	Final *1	7.7	8.2	7.3	6.4	6.9	6.8	6.9
	Final *2	8.3	8.0	7.9	8.0	8.3	8.4	7.8
pH, units	Initial	7.5	7.5	7.4	7.7	7.6	7.8	7.4
	Final *1	7.3	7.6	7.2	7.1	7.5	6.9	7.4
	Final *2	7.9	7.7	7.9	7.8	7.8	7.7	7.8

Effluent Conc.: 37 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.9	8.3	8.2	8.0	7.6	8.2	8.2
	Final *1	7.6	8.1	7.0	6.4	6.6	7.0	6.8
	Final *2	8.4	7.8	8.1	8.1	8.2	8.3	8.0
pH, units	Initial	7.5	7.5	7.5	7.7	7.7	7.8	7.4
	Final *1	7.4	7.6	7.2	7.2	7.6	7.2	7.5
	Final *2	8.0	7.8	8.0	8.0	7.9	7.8	7.9

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: February 25, 2014 at 1528
Date and Time Test Terminated: March 4, 2014 at 1300

Effluent Conc.: 49 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.8	8.3	8.1	8.3	7.8	8.0	8.2
	Final *1	7.4	7.9	7.1	6.8	7.1	7.2	6.9
	Final *2	8.1	7.9	8.1	8.1	8.3	8.4	8.1
pH, units	Initial	7.5	7.5	7.6	7.7	7.7	7.8	7.5
	Final *1	7.5	7.7	7.2	7.3	7.7	7.3	7.6
	Final *2	8.0	7.8	7.9	8.1	8.0	7.8	7.8

Effluent Conc.: 65 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.8	8.3	8.2	8.2	7.8	8.1	8.2
	Final *1	7.2	7.5	7.4	6.8	6.8	7.3	7.0
	Final *2	8.1	7.8	7.8	8.0	8.2	8.3	7.7
pH, units	Initial	7.5	7.5	7.6	7.8	7.9	7.8	7.5
	Final *1	7.5	7.4	7.6	7.4	7.7	7.4	7.7
	Final *2	8.0	7.8	8.0	8.1	8.0	7.9	7.9
Alkalinity, mg CaCO ₃ /l	60	NA	74	NA	65	NA	NA	NA
Hardness, mg CaCO ₃ /l	65	NA	77	NA	73	NA	NA	NA
Conductivity, umhos/cm	270	250	300	300	310	290	290	290
Res. Chlorine, mg/l	<0.05	NA	<0.05	NA	<0.05	NA	NA	NA

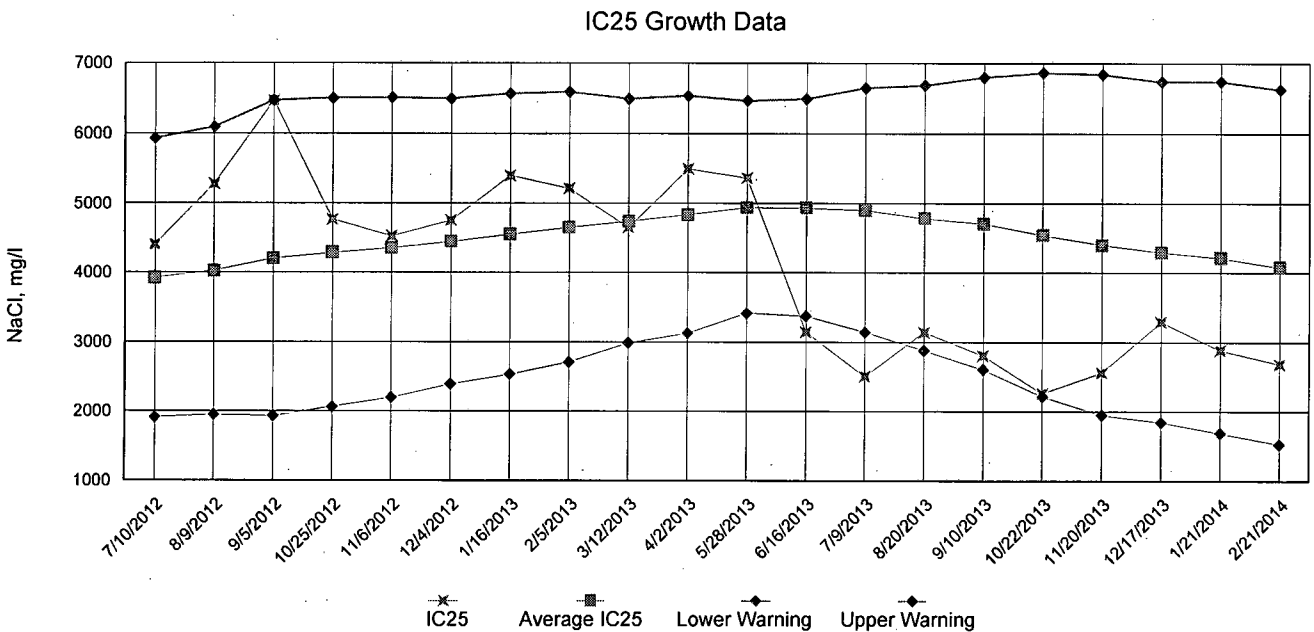
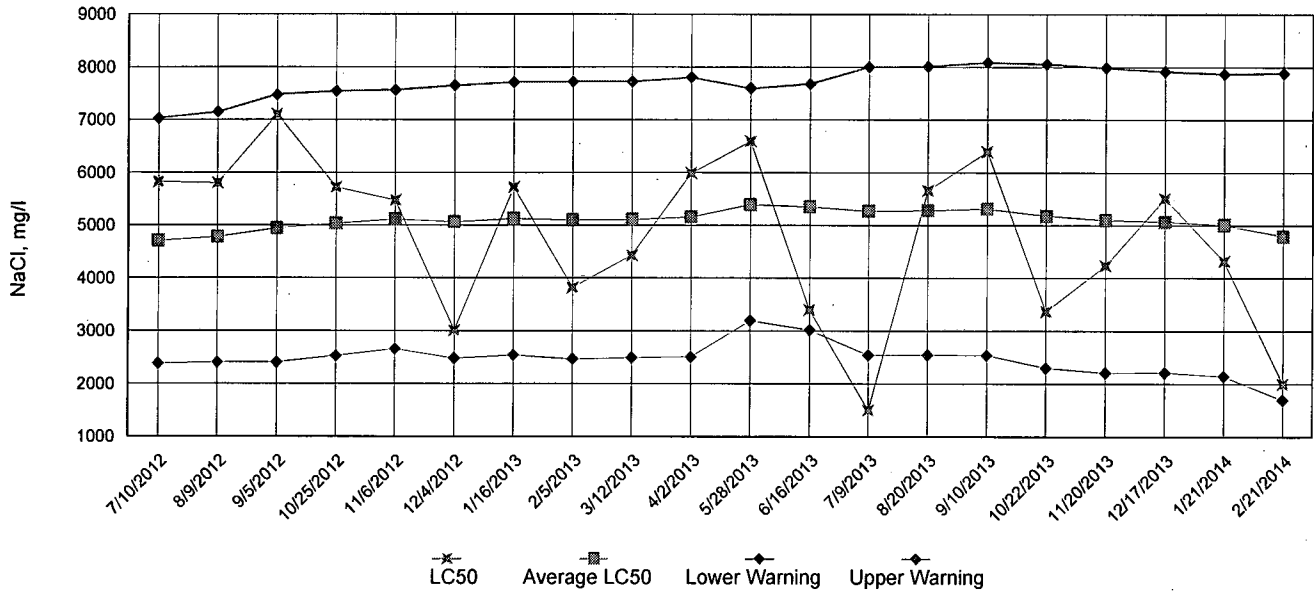
Effluent Conc.: 87 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	8.8	8.3	8.2	8.1	8.0	8.2	8.3
	Final *1	7.3	7.8	7.3	6.6	6.7	6.8	6.8
	Final *2	8.3	8.0	8.0	8.0	8.1	8.4	7.7
pH, units	Initial	7.5	7.6	7.7	7.8	8.0	7.8	7.6
	Final *1	7.6	7.8	7.7	7.5	7.8	7.4	7.7
	Final *2	8.1	8.0	8.2	8.3	8.5	8.1	8.0

*1 = data from the *Pimephales promelas* (Fathead Minnow) test *2 = data from the *Ceriodaphnia dubia* test

Appendix A4: Test 1000.0

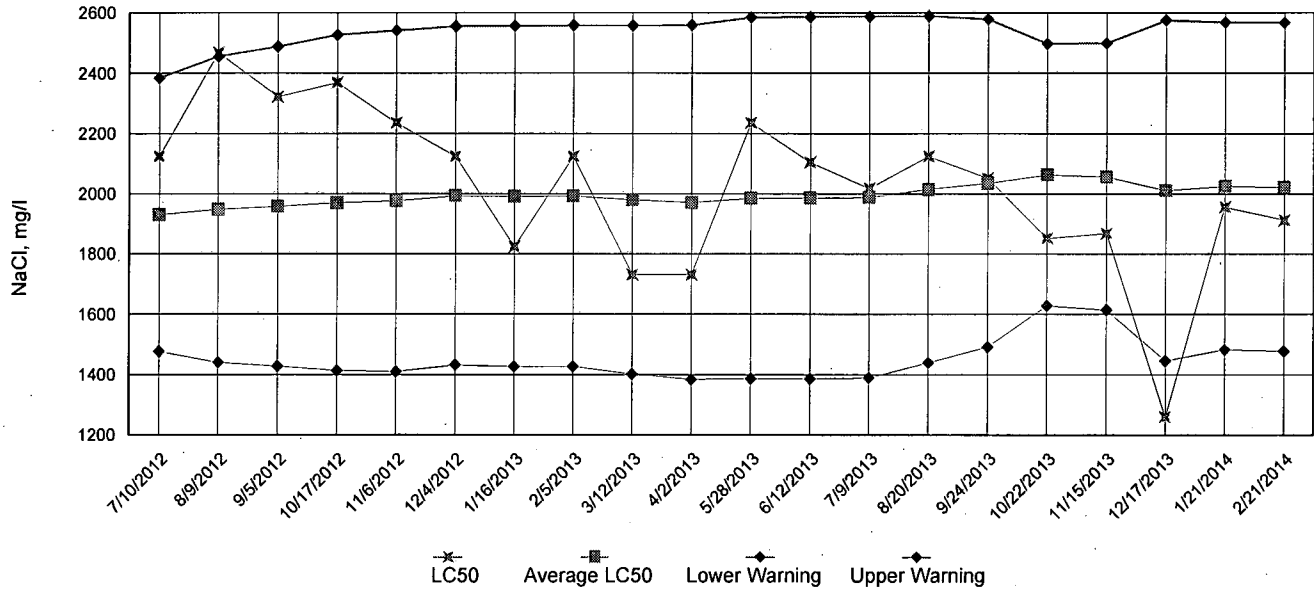
Chronic Reference Toxicant, *Pimephales promelas* (Fathead Minnow)

LC50 Survival Data

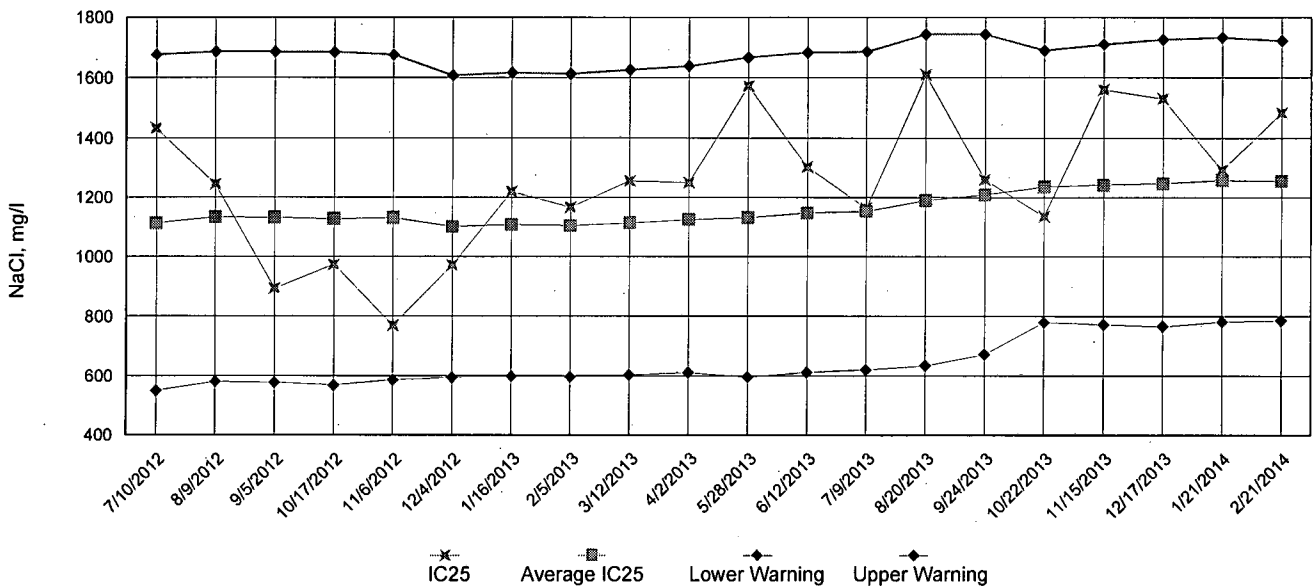


Appendix A4: Test 1002.0
Chronic Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



IC25 Reproduction Data



Appendix B: Test 1000.0
SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

Permittee: City of Hot Springs

NPDES No.: AR0033880 AFIN#26-00145

Date and Time Test Initiated: February 25, 2014 at 1100

Date and Time Test Terminated: March 4, 2014 at 1015

Dilution water used: Synthetic Soft Water #4073

DATA TABLE FOR SURVIVAL

Effluent Conc. %	Percent Survival in replicate chambers					Mean percent survival			CV%
	A	B	C	D	E	24 hr	48 hr	7 days	
Control	100	100	100	100	100	100	100	100	0.00
27 %	100	100	100	100	100	100	100	100	0.00
37 %	100	100	100	100	100	100	100	100	0.00
49 %	100	100	100	100	100	100	100	100	0.00
65 %	100	100	100	100	100	100	100	100	0.00
87 %	100	100	100	100	100	100	100	100	0.00

DATA TABLE FOR GROWTH

Effluent Conc. %	Average dry weight, mg replicate chambers					Mean dry weight, mg	CV%
	A	B	C	D	E		
Control	0.299	0.321	0.328	0.366	0.359	0.335	8.29
27 %	0.326	0.352	0.372	0.365	0.376	0.358	5.63
37 %	0.339	0.326	0.394	0.355	0.438	0.37	12.3
49 %	0.366	0.379	0.390	0.376	0.434	0.389	6.83
65 %	0.461	0.388	0.426	0.416	0.440	0.426	6.39
87 %	0.412	0.414	0.449	0.408	0.370	0.411	6.83

CV = Coefficient of variation = standard deviation * 100 / mean

Appendix B: Test 1000.0

SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Pimephales promelas (Fathead Minnow)
SURVIVAL AND GROWTH

1. Steel's Many-One Rank Test:

Is the mean survival significantly different ($p=0.05$) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	<u> </u> YES	<u> X </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u> </u> YES	<u> </u> NO

2. Dunnett's Test:

Is the mean dry weight (growth) significantly different ($p=0.05$) than the control's dry weight (growth) for the % effluent corresponding to (significant non-lethal effects):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	<u> </u> YES	<u> X </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u> </u> YES	<u> </u> NO

- | | | |
|--|-----------------|---------|
| 3. If you answered NO to 1.a) enter [0] otherwise enter [1]: | <u> 0 </u> | (TLP6C) |
| 4. If you answered NO to 2.a) enter [0] otherwise enter [1]: | <u> 0 </u> | (TGP6C) |
| 5. NOEC Pimephales Lethality: | <u> 87 % </u> | (TOP6C) |
| 6. LOEC Pimephales Lethality: | <u> 87 % </u> | (TXP6C) |
| 7. NOEC Pimephales Sublethality: | <u> 87 % </u> | (TPP6C) |
| 8. LOEC Pimephales Sublethality: | <u> 87 % </u> | (TYP6C) |
| 9. Coefficient of variation for Pimephales growth: | <u> 8.29 </u> | (TQP6C) |

Appendix B: Test 1000.0

CHRONIC TOXICITY SUMMARY FORM
Pimephales promelas (Fathead minnow)
CHEMICAL PARAMETERS CHART

PERMITTEE: City of Hot Springs
NPDES NO.: AR0033880 AFIN#26-00145
CONTACT: Mr. James Sorrells
ANALYST: 280, 304, 307, 310

2400
2400
2400

Test Initiated: DATE: February 25, 2014 TIME: 1100
Test Terminated: DATE: March 4, 2014 TIME: 1015

DILUTION Control	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.5	8.3	7.9	8.1	7.8	8.1	8.1
Final	7.7	7.7	7.5	7.0	6.8	6.7	7.0
pH Initial	7.0	7.5	7.2	7.5	7.5	7.8	7.4
Final	6.6	7.4	7.2	7.0	7.4	6.4	7.2
Alkalinity	31	NA	31	NA	31	NA	NA
Hardness	44	NA	44	NA	44	NA	NA
Conductivity	150	140	150	160	160	160	160
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 27 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.7	8.4	8.2	8.2	7.9	8.2	8.2
Final	7.7	8.2	7.3	6.4	6.9	6.8	6.9
pH Initial	7.5	7.5	7.4	7.7	7.6	7.8	7.4
Final	7.3	7.6	7.2	7.1	7.5	6.9	7.4
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	200	190	210	220	220	210	210
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 37 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.9	8.3	8.2	8.0	7.6	8.2	8.2
Final	7.6	8.1	7.0	6.4	6.6	7.0	6.8
pH Initial	7.5	7.5	7.5	7.7	7.7	7.8	7.4
Final	7.4	7.6	7.2	7.2	7.6	7.2	7.5
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	220	200	240	240	250	240	240
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 49 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.8	8.3	8.1	8.3	7.8	8.0	8.2
Final	7.4	7.9	7.1	6.8	7.1	7.2	6.9
pH Initial	7.5	7.5	7.6	7.7	7.7	7.8	7.5
Final	7.5	7.7	7.2	7.3	7.7	7.3	7.6
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	240	220	260	270	270	260	260
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 65 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.8	8.3	8.2	8.2	7.8	8.1	8.2
Final	7.2	7.5	7.4	6.8	6.8	7.3	7.0
pH Initial	7.5	7.5	7.6	7.8	7.9	7.8	7.5
Final	7.5	7.4	7.6	7.4	7.7	7.4	7.7
Alkalinity	60	NA	74	NA	65	NA	NA
Hardness	65	NA	77	NA	73	NA	NA
Conductivity	270	250	300	300	310	290	290
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 87 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	8.8	8.3	8.2	8.1	8.0	8.2	8.3
Final	7.3	7.8	7.3	6.6	6.7	6.8	6.8
pH Initial	7.5	7.6	7.7	7.8	8.0	7.8	7.6
Final	7.6	7.8	7.7	7.5	7.8	7.4	7.7
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	310	300	360	360	360	340	340
Chlorine	NA	NA	NA	NA	NA	NA	NA

Appendix B: Test 1002.0
SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Ceriodaphnia dubia
SURVIVAL AND REPRODUCTION

Permittee: City of Hot Springs

NPDES No.: AR0033880 AFIN#26-00145

Date and Time Test Initiated: February 25, 2014 at 1125

Date and Time Test Terminated: March 4, 2014 at 1300

Dilution water used: Synthetic Soft Water #4073

PERCENT SURVIVAL

Time of Reading	Control	Percent Effluent				
		27 %	37 %	49 %	65 %	87 %
24 hour	100	100	100	100	100	100
48 hour	100	100	100	100	100	100
7 day	100	100	100	100	100	90.0

NUMBER OF YOUNG PRODUCED PER FEMALE @ 7 DAYS

Replicates	Control	Percent Effluent				
		27 %	37 %	49 %	65 %	87 %
A	21	16	18	20	15	23
B	16	15	17	16	17	18
C	17	15	16	15	18	6
D	17	16	16	21	19	23
E	15	14	17	18	13	17
F	15	18	15	19	16	20
G	16	16	18	19	16	23
H	16	16	17	16	16	18
I	17	20	17	16	19	21
J	16	15	18	18	15	0
Mean per Adult	16.6	16.1	16.9	17.8	16.4	16.9
Mean per Surviving Adult	16.6	16.1	16.9	17.8	16.4	18.8
CV %	10.3	10.7	5.88	11.2	11.6	28.4

CV = Coefficient of variation = standard deviation * 100 / mean
(calculated based on young produced by surviving females)

Appendix B: Test 1002.0
SUMMARY REPORTING FORMS
CHRONIC BIOMONITORING
Ceriodaphnia dubia
SURVIVAL AND REPRODUCTION

1. Fisher's Exact Test:

Is the mean survival significantly different ($p=0.05$) than the control survival for the % effluent corresponding to (lethality):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	_____ YES	_____ X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	_____ YES	_____ NO

2. Steel's Many-One Rank Test:

Is the mean number of young produced per female significantly different ($p=0.05$) than the control's number of young per female for the % effluent corresponding to (significant non-lethal effects):

a.) LOW FLOW OR CRITICAL DILUTION	(65 %)	_____ YES	_____ X NO
b.) 1/2 LOW FLOW DILUTION	(NA)	_____ YES	_____ NO

3. If you answered NO to 1.a) enter [0] otherwise enter [1]: 0 (TLP3B)
4. If you answered NO to 2.a) enter [0] otherwise enter [1]: 0 (TGP3B)
5. NOEC Ceriodaphnia Lethality: 87 % (TOP3B)
6. LOEC Ceriodaphnia Lethality: 87 % (TXP3B)
7. NOEC Ceriodaphnia Sublethality: 87 % (TPP3B)
8. LOEC Ceriodaphnia Sublethality: 87 % (TYP3B)
9. Coefficient of variation for Ceriodaphnia Reproduction: 11.6 (TQP3B)

Appendix B: Test 1002.0

CHRONIC TOXICITY SUMMARY FORM
Ceriodaphnia dubia
CHEMICAL PARAMETERS CHART

PERMITTEE: City of Hot Springs
NPDES NO.: AR0033880 AFIN#26-00145
CONTACT: Mr. James Sorrells
ANALYST: 280, 304, 307, 310

2400
2400
2400

Test Initiated: DATE: February 25, 2014 TIME: 1125
Test Terminated: DATE: March 4, 2014 TIME: 1300

DILUTION	DAY						
	1	2	3	4	5	6	7
Control							
D.O. Initial	8.5	8.3	7.9	8.1	7.8	8.1	8.1
Final	7.9	7.8	8.0	7.9	8.1	8.3	7.8
pH Initial	7.0	7.5	7.2	7.5	7.5	7.8	7.4
Final	7.8	7.6	7.7	7.5	7.7	7.5	7.7
Alkalinity	31	NA	31	NA	31	NA	NA
Hardness	44	NA	44	NA	44	NA	NA
Conductivity	150	140	150	160	160	160	160
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
27 %							
D.O. Initial	8.7	8.4	8.2	8.2	7.9	8.2	8.2
Final	8.3	8.0	7.9	8.0	8.3	8.4	7.8
pH Initial	7.5	7.5	7.4	7.7	7.6	7.8	7.4
Final	7.9	7.7	7.9	7.8	7.8	7.7	7.8
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	200	190	210	220	220	210	210
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
37 %							
D.O. Initial	8.9	8.3	8.2	8.0	7.6	8.2	8.2
Final	8.4	7.8	8.1	8.1	8.2	8.3	8.0
pH Initial	7.5	7.5	7.5	7.7	7.7	7.8	7.4
Final	8.0	7.8	8.0	8.0	7.9	7.8	7.9
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	220	200	240	240	250	240	240
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
49 %							
D.O. Initial	8.8	8.3	8.1	8.3	7.8	8.0	8.2
Final	8.1	7.9	8.1	8.1	8.3	8.4	8.1
pH Initial	7.5	7.5	7.6	7.7	7.7	7.8	7.5
Final	8.0	7.8	7.9	8.1	8.0	7.8	7.8
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	240	220	260	270	270	260	260
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
65 %							
D.O. Initial	8.8	8.3	8.2	8.2	7.8	8.1	8.2
Final	8.1	7.8	7.8	8.0	8.2	8.3	7.7
pH Initial	7.5	7.5	7.6	7.8	7.9	7.8	7.5
Final	8.0	7.8	8.0	8.1	8.0	7.9	7.9
Alkalinity	60	NA	74	NA	65	NA	NA
Hardness	65	NA	77	NA	73	NA	NA
Conductivity	270	250	300	300	310	290	290
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION	DAY						
	1	2	3	4	5	6	7
87 %							
D.O. Initial	8.8	8.3	8.2	8.1	8.0	8.2	8.3
Final	8.3	8.0	8.0	8.0	8.1	8.4	7.7
pH Initial	7.5	7.6	7.7	7.8	8.0	7.8	7.6
Final	8.1	8.0	8.2	8.3	8.5	8.1	8.0
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	310	300	360	360	360	340	340
Chlorine	NA	NA	NA	NA	NA	NA	NA



CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs		PO No. 14-0111		No of BOTTLES		Analyses Requested										AIC Control No: 175701		
Project Reference: Plant Effluent		Sample Matrix		WATER	SOIL	3	X											AIC Proposal No:
Project Manager: James Sorrells		G R A B P																Carrier: Hot Springs Shuttle
Sampled By: A. Ross		Date/Time Collected: 2-23-14 0800-2400		✓	✓	3	X											Received Temperature °C: 0.9°C
AIC No.	Sample Identification: Plant Effluent											Remarks						
Container Type												Field pH calibration						
Preservative												on @ Buffer:						
G = Glass P = Plastic V = VOA vials H = HCl to pH2 T = Sodium Thiosulfate NO = none S = Sulfuric acid pH2 N = Nitric acid pH2 B = NaOH to pH12 Z = Zinc acetate A = (NH4)2SO4																		
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN ___ DAYS						Relinquished By: A. Thomason		Date/Time: 2-24-14 @ 10:10		Received By: M. Mann		Date/Time: 2-24-14 10:10am						
Expedited results requested by: _____						Relinquished By: M. Mann		Date/Time: @ 11:10		Received in Lab By: [Signature]		Date/Time: 2/24/14 11:10						
Who should AIC contact with questions: _____ Phone: _____ Fax: _____						Comments:												
Report Attention to: Mr. James Sorrells Report Address to: 320 Davidson Road Hot Springs, AR 71901																		

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CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

Client: City of Hot Springs			PO No. 14-0111		No of BOTTLES	Analyses Requested										AIC Control No: 175701				
Project Reference: Plant Effluent			Sample Matrix			Chronic.CD. Chronic.FH											AIC Proposal No:			
Project Manager: James Sorrells			WATER	SOIL	3												Carrier: Hot Springs Shuttle			
Sampled By: A. Ross						GRAB	COMP	P											Received Temperature °C: 39°C	
AIC No.	Sample Identification	Date/Time Collected																	Remarks	
(2)	Plant Effluent	2-25-14 0000-2400	X	X																
Container Type																Field pH calibration				
Preservative					NO											on _____ @ _____ Buffer:				
G = Glass P = Plastic			V = VOA vials		H = HCl to pH2		T = Sodium Thiosulfate													
NO = none S = Sulfuric acid pH2			N = Nitric acid pH2		B = NaOH to pH12		Z = Zinc acetate												A = (NH4)2SO4	
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN _____ DAYS					Relinquished By: <i>[Signature]</i>		Date/Time: 2-26-14 3:00		Received By: M. Mann		Date/Time: 2-26-14 @ 10:00									
Expedited results requested by: _____					Relinquished By: M. Mann		Date/Time: 2-26-14 @ 11:10		Received in Lab By: <i>[Signature]</i>		Date/Time: 2/26/14 1110									
Who should AIC contact with questions: _____															Comments:					
Phone: _____ Fax: _____																				
Report Attention to: Mr. James Sorrells																				
Report Address to: 320 Davidson Road Hot Springs, AR 71901																				

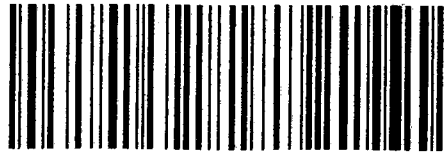


CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

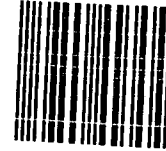
Client: City of Hot Springs		PO No. 14-0111		Analyses Requested										AIC Control No: 175701			
Project Reference: Plant Effluent		Sample Matrix												AIC Proposal No:			
Project Manager: James Sorrells		WATER SOIL												Carrier: Hot Springs Shuttle			
Sampled By: H. Mann		GRA B												Received Temperature °C: 11°C			
AIC No. (3)		Date/Time Collected: 2/27/14		COMP												Remarks	
Sample Identification: PLANT EFFLUENT		C0000-2400		X X													
Container Type														Field pH calibration			
Preservative														on @			
G = Glass		P = Plastic												Buffer:			
NO = none		S = Sulfuric acid pH2															
V = VOA vials		N = Nitric acid pH2															
H = HCl to pH2																	
T = Sodium Thiosulfate																	
B = NaOH to pH12																	
Z = Zinc acetate																	
A = (NH4)2SO4																	
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN _____ DAYS				Relinquished By: H. Mann		Date/Time: 2/28/14 @ 09:50		Received By: M. Mann		Date/Time: 2-28-14 @ 0950							
Expedited results requested by: _____				Relinquished By: M. Mann		Date/Time: 2-28-14 @ 10:50		Received in Lab By: Jimmy Day		Date/Time: 2/28/14 1050							
Who should AIC contact with questions: _____				Comments:													
Phone: _____ Fax: _____																	
Report Attention to: Mr. James Sorrells																	
Report Address to: 320 Davidson Road																	
Hot Springs, AR 71901																	

City of Hot Springs Wastewater
Treatment Plant
320 Davidson Dr.
Hot Springs, AR 71901

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