

October 13, 2014

Test Results of
Third Quarter
Chronic 7-Day Renewal
Biomonitoring Testing
for
Outfall 001

Control No. 183075-1

Prepared for:

Mr. John Davis
Malvern Water Works
506 Overman
Malvern, AR 72104

Prepared by:

AMERICAN INTERPLEX CORPORATION
8600 Kanis Road
Little Rock, AR 72204-2322

Malvern Water Works
ATTN: Mr. John Davis
506 Overman
Malvern, AR 72104

Re: Chronic 7-Day Renewal utilizing *Pimephales promelas* (Fathead minnow) and *Ceriodaphnia dubia*
- Outfall 001
NPDES Permit No. AR0034126 AFIN 30-00040

Dear Mr. John Davis:

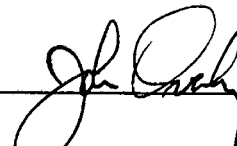
This report is the analytical results and supporting information for the samples submitted to American Interplex Corporation (AIC). The following results are applicable only to the sample identified by the control number referenced above. Accurate assessment of the data requires access to the entire 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 8.5 % effluent, which is above the critical dilution of 6.5 %. Any statistical difference with sublethal effects cannot be considered toxic due to the minimum significant difference (PMSD) calculated result being below the lower PMSD bounds. **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 8.5 % effluent, which is above the critical dilution of 6.5 %. The NOEC for reproduction occurred at 8.5 % effluent, which is above the critical dilution of 6.5 %. **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%	97.5	PASS
Control Growth > or = 0.25 mg per Surviving minnow	0.292	PASS
Control Growth CV < or = 40%	9.28	PASS
Growth Minimum Significant Difference 12 to 30%	11.4	BELOW
Critical Dilution CV < or = 40%	8.82	PASS

Ceriodaphnia dubia Method 1002.0

CRITERIA	RESULTS	PASS/FAIL
Control Survival > or = 80%	100	PASS
Control Reproduction > or = 15 per Surviving Female	28.2	PASS
Control CV < or = 40% per Surviving Female	17.7	PASS
Reproduction Minimum Significant Difference 13 to 47%	17.8	PASS
Critical Dilution CV < or = 40%	16.3	PASS

II. Outlined Report

A. Introduction

1. Permit Number: AR0034126 AFIN 30-00040
2. Test Requirements: Test Methods 1000.0 and 1002.0
3. Receiving Stream: Ouachita River Basin

B. Source of Effluent/Dilution Water

1. Effluent Samples:

- a. Sampling Point:
- b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.4	8.6	8.9
pH (standard units)	6.9	6.5	6.7
Alkalinity (mg/l as CaCO ₃)	28	28	28
Hardness (mg/l as CaCO ₃)	31	33	31
Conductivity (umhos/cm)	210	220	220
Residual Chlorine (mg/l)	<0.05	<0.05	<0.05
Ammonia as N (mg/l)	0.14	0.29	0.81

2. Dilution Water Samples: Synthetic Soft Water #4141

- a. Dates Prepared: September 19 through October 3, 2014
- b. Chemical Data:

Analysis	Sample 1	Sample 2	Sample 3
Dissolved oxygen (mg/l)	7.6	8.8	8.4
pH (standard units)	7.3	7.3	7.6
Alkalinity (mg/l as CaCO ₃)	32	32	32
Hardness (mg/l as CaCO ₃)	47	42	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: September 30, 2014 at 1645
Date & Time Test Terminated: October 7, 2014 at 1445
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: September 30, 2014 at 1600
Date & Time Test Terminated: October 6, 2014 at 1630
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 September 24, 2014 at 1140 to October 1, 2014 at 1020

The results were as follows: (Control No. 182889-1.)

Survival LC-50: 5298.7 mg/l

Growth IC-25: 3684 mg/l

Growth PMSD: 12.5

Ceriodaphnia dubia

Chronic reference tests are performed monthly.

A chronic reference test was performed on September 24, 2014 at 1150 to September 30, 2014 at 1305

The results were as follows: (Control No. 182889-2.)

Survival LC-50: 1918 mg/l

Growth IC-25: 1520 mg/l

Growth PMSD: 10.6

V. Chemical Analysis/Quality Control

Parameter	Method	% Recovery	Relative % Difference
Alkalinity	SM 2320 B	NA	0.00
Hardness	EPA 200.7	102	0.00
pH	SM 4500-H+ B	101	1.08
Conductivity	EPA 120.1	109	0.619

VI. Organism History

Pimephales promelas (Fathead minnow)

Date: September 30, 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: September 30, 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

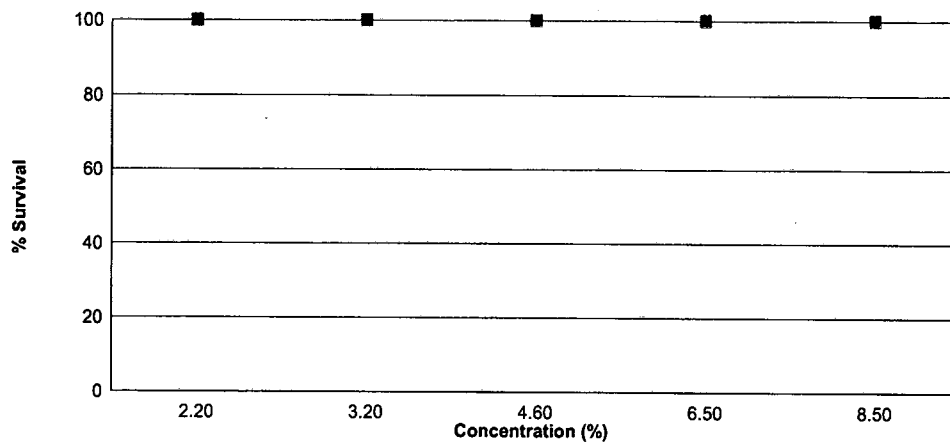
Larvae are exposed in a static renewal system for seven days to different concentrations of effluent with dilution water. Test results are based on the survival and growth (increase in weight) of the larvae.

Effluent dilutions for this test were 2.2 %, 3.2 %, 4.6 %, 6.5 %, 8.5 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 6.5 % effluent.

The test was initiated on September 30, 2014 at 1645 and continued through October 7, 2014 at 1445. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 8.5 % effluent
- b.) NOEC growth = 8.5 % effluent



Summary of the 7-day Fathead Minnow Survival and Growth		
Concentration	Percent Survival	Mean Growth (mg)
Control	97.5	0.285
2.2 %	100	0.335
3.2 %	100	0.352
4.6 %	100	0.331
6.5 %	100	0.331
8.5 %	100	0.359

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

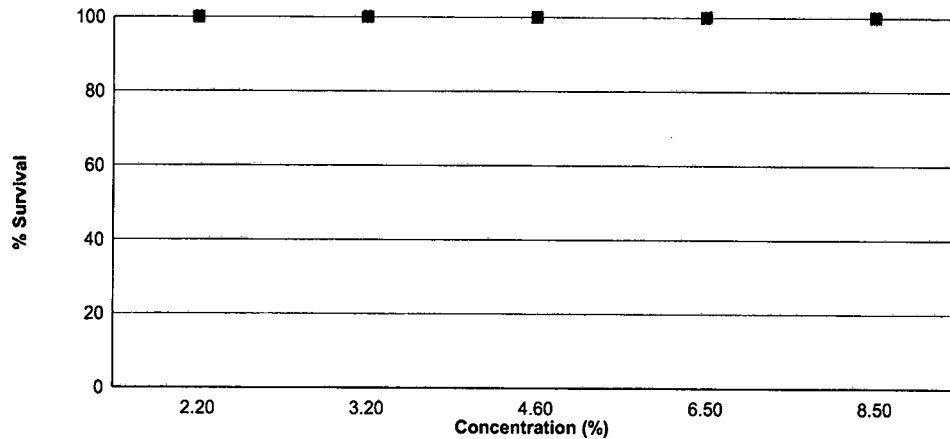
Neonates are exposed in a static renewal system to different concentrations of effluent with dilution water until 60% of surviving control organisms have three broods of offspring with an average of at least 15 young per female.

Effluent dilutions for this test were 2.2 %, 3.2 %, 4.6 %, 6.5 %, 8.5 % in accordance with the NPDES permit.

The low flow or 'critical' dilution is specified in the NPDES permit as 6.5 % effluent.

The test was initiated on September 30, 2014 at 1600 and continued through October 6, 2014 at 1630. Statistical analyses were performed on the observed data and the no observable effects concentrations (NOECs) were as follows:

- a.) NOEC survival = 8.5 % effluent
- b.) NOEC reproduction = 8.5 % effluent



Summary of the 6-day <i>Ceriodaphnia dubia</i> Survival and Reproduction Data		
Concentration	Percent Survival	Mean Reproduction
Control	100	28.2
2.2 %	100	27.2
3.2 %	100	25.0
4.6 %	100	24.3
6.5 %	100	24.4
8.5 %	100	24.0

Appendix A1: Test 1000.0

Pimephales promelas (Fathead Minnow) 7-Day Survival

Date and Time Test Initiated: September 30, 2014 at 1645
Date and Time Test Terminated: October 7, 2014 at 1445

Concentration	Replicate	Number of Survivors						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Control	A	8	8	7	7	7	7	7
	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
2.2 %	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
3.2 %	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
4.6 %	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
6.5 %	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
8.5 %	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: September 30, 2014 at 1645
Test Terminated: October 7, 2014 at 1445

Drying Started: October 6, 2014 at 1720
Drying Ended: October 8, 2014 at 1100

Concentration	Replicate	Weight of pan	Weight of pan + fish	Total weight of fish (g)	Original # of fish	Mean dry weight (mg)
Control	A	.95620	.95838	0.00218	8	0.272
	B	.95762	.95966	0.00204	8	0.255
	C	.95650	.95869	0.00219	8	0.274
	D	.95871	.96117	0.00246	8	0.308
	E	.95694	.95948	0.00254	8	0.318
2.2 %	A	.95775	.96048	0.00273	8	0.341
	B	.95451	.95697	0.00246	8	0.308
	C	.96225	.96491	0.00266	8	0.332
	D	.95999	.96277	0.00278	8	0.348
	E	.95733	.96011	0.00278	8	0.348
3.2 %	A	.96034	.96287	0.00253	8	0.316
	B	.95693	.95983	0.00290	8	0.362
	C	.95469	.95762	0.00293	8	0.366
	D	.95070	.95355	0.00285	8	0.356
	E	.95047	.95336	0.00289	8	0.361
4.6 %	A	.95200	.95472	0.00272	8	0.340
	B	.95290	.95530	0.00240	8	0.300
	C	.95468	.95745	0.00277	8	0.346
	D	.95497	.95753	0.00256	8	0.320
	E	.95538	.95818	0.00280	8	0.350
6.5 %	A	.95738	.95991	0.00253	8	0.316
	B	.95520	.95795	0.00275	8	0.344
	C	.95475	.95725	0.00250	8	0.312
	D	.95767	.96012	0.00245	8	0.306
	E	.95762	.96063	0.00301	8	0.376
8.5 %	A	.95547	.95846	0.00299	8	0.374
	B	.95291	.95576	0.00285	8	0.356
	C	.95352	.95647	0.00295	8	0.369
	D	.95563	.95843	0.00280	8	0.350
	E	.95882	.96159	0.00277	8	0.346

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: September 30, 2014 at 1600
Date and Time Test Terminated: October 6, 2014 at 1630

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	2	0	0	0	0	0	0	0	3	0	5	10	0.500	
4	8	5	5	4	4	6	5	4	0	6	47	10	4.70	
5	0	10	11	8	12	8	11	11	9	11	91	10	9.10	
6	16	15	0	15	16	14	17	15	15	16	139	10	13.9	
7														
8														
TOTAL	26	30	16	27	32	28	33	30	27	33	282	10	28.2	

Concentration: 2.2 %														
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	3	0	0	0	3	0	1	0	3	0	10	10	1.00	
4	8	5	4	3	0	6	5	9	0	4	44	10	4.40	
5	0	10	12	9	4	12	11	0	6	9	73	10	7.30	
6	17	14	0	15	16	16	18	17	15	17	145	10	14.5	
7														
8														
TOTAL	28	29	16	27	23	34	35	26	24	30	272	10	27.2	

Concentration: 3.2 %														
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	2	0	0	0	1	0	2	0	4	0	9	10	0.900	
4	9	4	4	3	6	8	0	6	0	4	44	10	4.40	
5	0	8	10	10	0	8	10	10	10	9	75	10	7.50	
6	13	14	0	12	14	13	14	15	14	13	122	10	12.2	
7														
8														
TOTAL	24	26	14	25	21	29	26	31	28	26	250	10	25.0	

Appendix A1: Test 1002.0

Ceriodaphnia dubia Survival and Reproduction

Date and Time Test Initiated: September 30, 2014 at 1600

Date and Time Test Terminated: October 6, 2014 at 1630

Concentration: 4.6 %													
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	3	0	0	0	3	0	3	0	4	0	13	10	1.30
4	8	5	5	4	0	3	0	5	0	4	34	10	3.40
5	9	8	12	10	9	13	10	8	8	0	87	10	8.70
6	16E	15	0	14	12	13	12	14	16	13	109	10	10.9
7													
8													
TOTAL	20	28	17	28	24	29	25	27	28	17	243	10	24.3

E = Excluded fourth brood neonates

Concentration: 6.5 %													
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	3	0	0	0	3	0	4	0	4	0	14	10	1.40
4	0	5	6	6	0	6	0	5	0	4	32	10	3.20
5	6	7	9	10	8	0	8	10	8	9	75	10	7.50
6	15	16	0	11	13	15	12	13	15	13	123	10	12.3
7													
8													
TOTAL	24	28	15	27	24	21	24	28	27	26	244	10	24.4

Concentration: 8.5 %													
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	2	0	0	0	0	0	2	0	4	0	8	10	0.800
4	9	3	3	4	4	5	0	3	0	5	36	10	3.60
5	0	8	9	9	0	10	9	9	10	7	71	10	7.10
6	16	13	0	12	14	13	16	14	14	13	125	10	12.5
7													
8													
TOTAL	27	24	12	25	18	28	27	26	28	25	240	10	24.0

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	0.87500	1.20940
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	2.2 %	1	1.00000	1.39310
2	2.2 %	2	1.00000	1.39310
2	2.2 %	3	1.00000	1.39310
2	2.2 %	4	1.00000	1.39310
2	2.2 %	5	1.00000	1.39310
3	3.2 %	1	1.00000	1.39310
3	3.2 %	2	1.00000	1.39310
3	3.2 %	3	1.00000	1.39310
3	3.2 %	4	1.00000	1.39310
3	3.2 %	5	1.00000	1.39310
4	4.6 %	1	1.00000	1.39310
4	4.6 %	2	1.00000	1.39310
4	4.6 %	3	1.00000	1.39310
4	4.6 %	4	1.00000	1.39310
4	4.6 %	5	1.00000	1.39310
5	6.5 %	1	1.00000	1.39310
5	6.5 %	2	1.00000	1.39310
5	6.5 %	3	1.00000	1.39310
5	6.5 %	4	1.00000	1.39310
5	6.5 %	5	1.00000	1.39310
6	8.5 %	1	1.00000	1.39310
6	8.5 %	2	1.00000	1.39310
6	8.5 %	3	1.00000	1.39310
6	8.5 %	4	1.00000	1.39310
6	8.5 %	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 = 0.027		
W = 0.4161		
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	2.2 %	30.00	16.00	5.00	
3	3.2 %	30.00	16.00	5.00	
4	4.6 %	30.00	16.00	5.00	
5	6.5 %	30.00	16.00	5.00	
6	8.5 %	30.00	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 = 0.01134 W = 0.9659 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 = 3.332 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	0.01661	0.003322	7.031	
Within (Error)	24	0.01134	0.0004725		
Total	29	0.02795			
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	0.2854	0.2854			
2	2.2 %	0.3354	0.3354	-3.637		
3	3.2 %	0.3522	0.3522	-4.859		
4	4.6 %	0.3312	0.3312	-3.331		
5	6.5 %	0.3308	0.3308	-3.302		
6	8.5 %	0.359	0.359	-5.354		
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	2.2 %	5	0.03244	11.4	-0.05	
3	3.2 %	5	0.03244	11.4	-0.0668	
4	4.6 %	5	0.03244	11.4	-0.0458	
5	6.5 %	5	0.03244	11.4	-0.0454	
6	8.5 %	5	0.03244	11.4	-0.0736	

Appendix A2: Statistics

Ceriodaphnia dubia Survival

Fisher's Exact Test			
Identification	Alive	Dead	Total Animals
Control	10	0	10
2.2 %	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
3.2 %	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
4.6 %	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
6.5 %	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
8.5 %	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.

Summary of Fisher's Exact Test				
Group	Identification	Exposed	Dead	Sig 0.05
0	Control	10	0	
1	2.2 %	10	0	
2	3.2 %	10	0	
3	4.6 %	10	0	
4	6.5 %	10	0	
5	8.5 %	10	0	

Appendix A2: Statistics

Ceriodaphnia dubia Reproduction

Kolmogorov Test for Normality	No Transformation
D = 0.1641 D* = 1.287 Critical D* = 1.035	(alpha = 0.01, N = 60)
Data FAIL normality test (alpha = 0.01).	

Steel's Many-One Rank Test					No Transformation
Ho:Control<Treatment					
Group	Identification	Rank Sum	Critical Value	DF	Sig 0.05
1	Control				
2	2.2 %	97.50	75.00	10.00	
3	3.2 %	79.00	75.00	10.00	
4	4.6 %	81.50	75.00	10.00	
5	6.5 %	75.50	75.00	10.00	
6	8.5 %	75.50	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	153.3	30.66	1.3	
Within (Error)	54	1274	23.59		
Total	59	1427			
Critical F = 3.38 (alpha = 0.01, df = 5,54)					
2.38 (alpha = 0.05, df = 5,54)					
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	28.2	28.2			
2	2.2 %	27.2	27.2	0.4604		
3	3.2 %	25	25	1.473		
4	4.6 %	24.3	24.3	1.796		
5	6.5 %	24.4	24.4	1.749		
6	8.5 %	24	24	1.934		
Dunnett's critical value = 2.31 (1 Tailed, alpha = 0.05, df [used] = 5,40) (Actual df = 5,54)						

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	2.2 %	10	5.018	17.8	1	
3	3.2 %	10	5.018	17.8	3.2	
4	4.6 %	10	5.018	17.8	3.9	
5	6.5 %	10	5.018	17.8	3.8	
6	8.5 %	10	5.018	17.8	4.2	

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: September 30, 2014 at 1449
Date and Time Test Terminated: October 7, 2014 at 1445

Effluent Conc.: Control	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
DO, mg/l	Initial	7.6	7.9	8.8	8.8	8.4	7.9	8.6
	Final *1	8.4	8.8	5.3	7.6	7.9	8.2	7.3
	Final *2	8.2	8.9	8.5	8.6	8.2	8.1	NA
pH, units	Initial	7.3	7.6	7.3	7.3	7.6	7.5	7.4
	Final *1	7.2	7.3	7.2	7.2	7.4	7.2	7.1
	Final *2	7.6	7.6	7.6	7.5	7.5	7.2	NA
Alkalinity, mg CaCO ₃ /l	32	NA	32	NA	32	NA	NA	
Hardness, mg CaCO ₃ /l	47	NA	42	NA	44	NA	NA	
Conductivity, umhos/cm	150	150	150	150	160	190	150	
Res. Chlorine, mg/l	<0.05	NA	<0.05	NA	<0.05	NA	NA	

Effluent Conc.: 2.2 %	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
DO, mg/l	Initial	7.5	8.3	8.8	8.7	8.5	8.0	8.3
	Final *1	8.4	8.7	6.0	7.8	7.6	8.0	7.2
	Final *2	8.4	8.9	8.5	8.8	8.3	8.3	NA
pH, units	Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
	Final *1	7.2	7.2	7.2	7.2	7.2	7.1	7.0
	Final *2	7.5	7.5	7.5	7.4	7.4	7.3	NA

Effluent Conc.: 3.2 %	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	
DO, mg/l	Initial	7.5	8.6	8.7	8.6	8.3	8.1	8.5
	Final *1	8.3	8.7	6.1	7.9	7.8	8.2	7.2
	Final *2	8.2	8.9	8.5	9.0	8.5	8.4	NA
pH, units	Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
	Final *1	7.2	7.1	7.2	7.2	7.1	7.3	7.0
	Final *2	7.5	7.5	7.5	7.4	7.3	7.4	NA

Appendix A3: Water Chemistry

Routine Chemical and Physical Data

Date and Time Test Initiated: September 30, 2014 at 1449

Date and Time Test Terminated: October 7, 2014 at 1445

Effluent Conc.: 4.6 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	8.6	8.9	8.5	8.3	8.0	8.4
	Final *1	8.2	8.7	6.5	7.9	7.7	7.8	7.4
	Final *2	8.2	8.8	8.6	8.7	8.3	8.4	NA
pH, units	Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
	Final *1	7.2	7.2	7.2	7.2	7.1	7.2	7.0
	Final *2	7.5	7.5	7.5	7.3	7.3	7.4	NA

Effluent Conc.: 6.5 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	8.6	8.7	8.9	8.3	8.0	8.4
	Final *1	8.2	8.6	6.6	8.0	7.6	7.9	7.7
	Final *2	8.2	8.8	8.5	8.6	8.4	8.5	NA
pH, units	Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
	Final *1	7.2	7.2	7.1	7.2	7.1	7.2	7.1
	Final *2	7.4	7.4	7.5	7.4	7.3	7.4	NA
Alkalinity, mg CaCO ₃ /l	37	NA	38	NA	33	NA	NA	NA
Hardness, mg CaCO ₃ /l	42	NA	43	NA	41	NA	NA	NA
Conductivity, umhos/cm	150	160	160	150	170	150	160	160
Res. Chlorine, mg/l	<0.05	NA	<0.05	NA	<0.05	NA	NA	NA

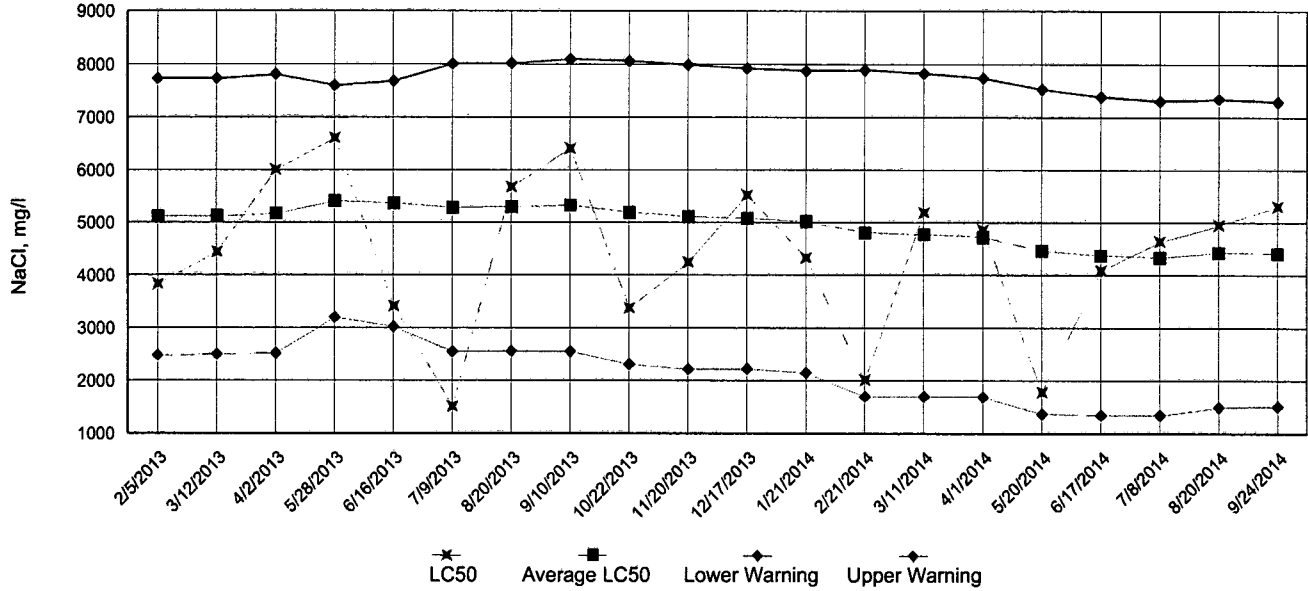
Effluent Conc.: 8.5 %		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
DO, mg/l	Initial	7.6	8.4	8.7	8.8	8.5	7.9	8.3
	Final *1	8.3	8.5	6.6	8.1	7.8	7.8	7.1
	Final *2	8.2	8.8	8.5	8.6	8.3	8.3	NA
pH, units	Initial	7.4	7.4	7.2	7.2	7.3	7.4	7.3
	Final *1	7.2	7.0	7.2	7.3	7.1	7.1	7.0
	Final *2	7.5	7.4	7.4	7.5	7.4	7.4	NA

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

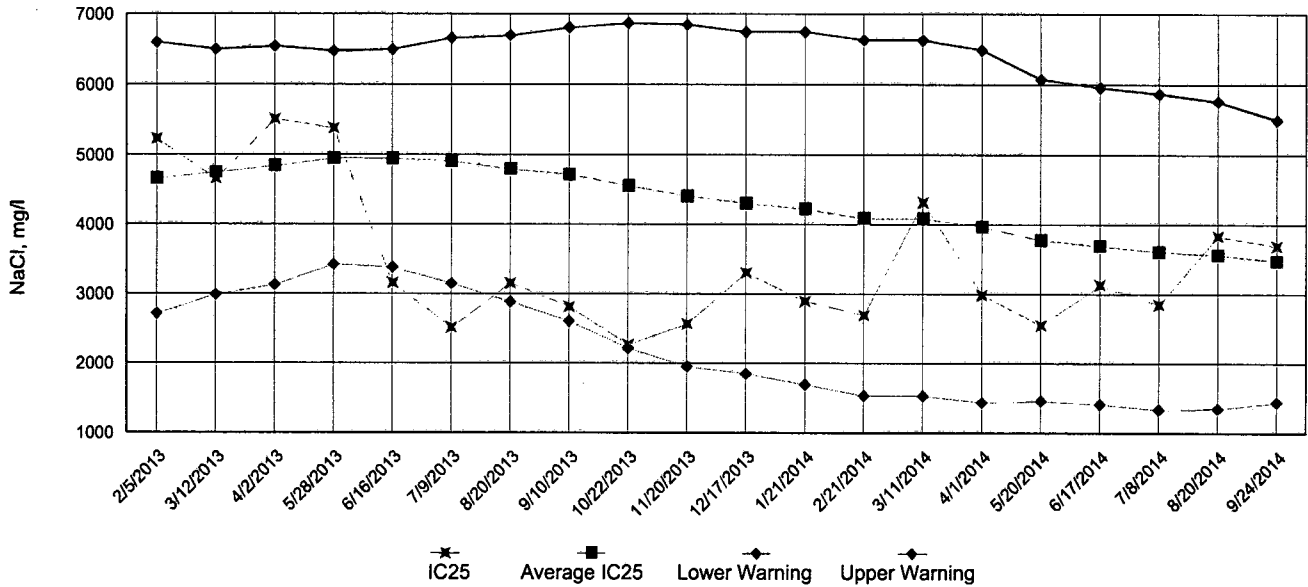
*2 = data from the *Ceriodaphnia dubia* test

Appendix A4: Test 1000.0
Chronic Reference Toxicant, *Pimephales promelas* (Fathead Minnow)

LC50 Survival Data

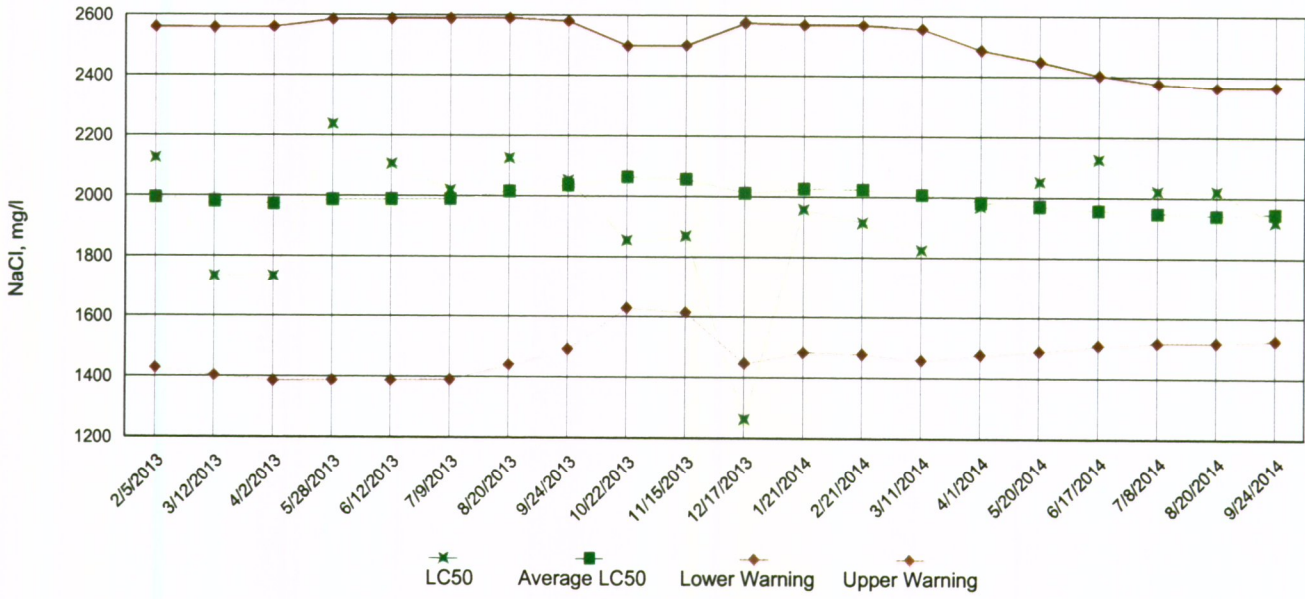


IC25 Growth Data

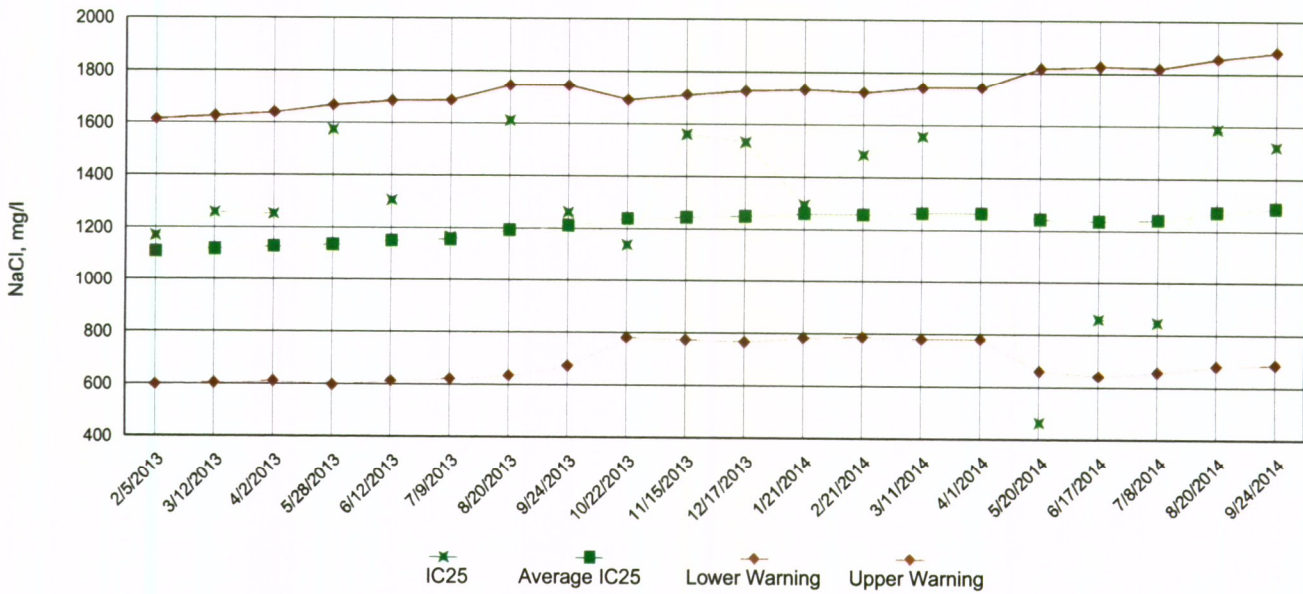


Appendix A4: Test 1002.0
Chronic Reference Toxicant, *Ceriodaphnia dubia*

LC50 Survival Data



IC25 Reproduction Data



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

Permittee: Malvern Water Works

NPDES No.: AR0034126 AFIN 30-00040

Date and Time Test Initiated: September 30, 2014 at 1645

Date and Time Test Terminated: October 7, 2014 at 1445

Dilution water used: Synthetic Soft Water #4141

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	87.5	100	100	100	100	100	100	97.5	5.73
2.2 %	100	100	100	100	100	100	100	100	0.00
3.2 %	100	100	100	100	100	100	100	100	0.00
4.6 %	100	100	100	100	100	100	100	100	0.00
6.5 %	100	100	100	100	100	100	100	100	0.00
8.5 %	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	0.272	0.255	0.274	0.308	0.318	0.285	9.28
2.2 %	0.341	0.308	0.332	0.348	0.348	0.335	4.97
3.2 %	0.316	0.362	0.366	0.356	0.361	0.352	5.83
4.6 %	0.340	0.300	0.346	0.320	0.350	0.331	6.31
6.5 %	0.316	0.344	0.312	0.306	0.376	0.331	8.82
8.5 %	0.374	0.356	0.369	0.350	0.346	0.359	3.37

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	(6.5 %)	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<input type="checkbox"/> YES	<input type="checkbox"/> 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	(6.5 %)	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<input type="checkbox"/> YES	<input type="checkbox"/> NO

3. If you answered NO to 1.a) enter [0] otherwise enter [1]: 0 (TLP6C)

4. If you answered NO to 2.a) enter [0] otherwise enter [1]: 0 (TGP6C)

5. NOEC *Pimephales* Lethality: 8.5 % (TOP6C)

6. LOEC *Pimephales* Lethality: 8.5 % (TXP6C)

7. NOEC *Pimephales* Sublethality: 8.5 % (TPP6C)

8. LOEC *Pimephales* Sublethality: 8.5 % (TYP6C)

9. Coefficient of variation for *Pimephales* growth: 9.28 (TQP6C)

Appendix B: Test 1000.0

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

PERMITTEE: Malvern Water Works SAMPLE No. 1 COLLECTED ending: DATE: September 30, 2014 TIME: 0933
 NPDES NO.: AR0034126 AFIN 30-00040 SAMPLE No. 2 COLLECTED ending: DATE: October 1, 2014 TIME: 0927
 CONTACT: Mr. John Davis SAMPLE No. 3 COLLECTED ending: DATE: October 3, 2014 TIME: 0920
 ANALYST: 280, 304, 307, 310 Test Initiated: DATE: September 30, 2014 TIME: 1645
 Test Terminated: DATE: October 7, 2014 TIME: 1445

DILUTION Control	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	7.9	8.8	8.8	8.4	7.9	8.6
Final	8.4	8.8	5.3	7.6	7.9	8.2	7.3
pH Initial	7.3	7.6	7.3	7.3	7.6	7.5	7.4
Final	7.2	7.3	7.2	7.2	7.4	7.2	7.1
Alkalinity	32	NA	32	NA	32	NA	NA
Hardness	47	NA	42	NA	44	NA	NA
Conductivity	150	150	150	150	160	190	150
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 2.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.5	8.3	8.8	8.7	8.5	8.0	8.3
Final	8.4	8.7	6.0	7.8	7.6	8.0	7.2
pH Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
Final	7.2	7.2	7.2	7.2	7.2	7.1	7.0
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	150	150	170	180	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 3.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.5	8.6	8.7	8.6	8.3	8.1	8.5
Final	8.3	8.7	6.1	7.9	7.8	8.2	7.2
pH Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
Final	7.2	7.1	7.2	7.2	7.1	7.3	7.0
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	170	160	150	170	190	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 4.6 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.6	8.9	8.5	8.3	8.0	8.4
Final	8.2	8.7	6.5	7.9	7.7	7.8	7.4
pH Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
Final	7.2	7.2	7.2	7.2	7.1	7.2	7.0
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	160	150	170	190	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 6.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.6	8.7	8.9	8.3	8.0	8.4
Final	8.2	8.6	6.6	8.0	7.6	7.9	7.7
pH Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
Final	7.2	7.2	7.1	7.2	7.1	7.2	7.1
Alkalinity	37	NA	38	NA	33	NA	NA
Hardness	42	NA	43	NA	41	NA	NA
Conductivity	150	160	160	150	170	150	160
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 8.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.4	8.7	8.8	8.5	7.9	8.3
Final	8.3	8.5	6.6	8.1	7.8	7.8	7.1
pH Initial	7.4	7.4	7.2	7.2	7.3	7.4	7.3
Final	7.2	7.0	7.2	7.3	7.1	7.1	7.0
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	160	160	160	160	170	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

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

Permittee: Malvern Water Works

NPDES No.: AR0034126 AFIN 30-00040

Date and Time Test Initiated: September 30, 2014 at 1600

Date and Time Test Terminated: October 6, 2014 at 1630

Dilution water used: Synthetic Soft Water #4141

PERCENT SURVIVAL

Time of Reading	Control	Percent Effluent				
		2.2 %	3.2 %	4.6 %	6.5 %	8.5 %
24 hour	100	100	100	100	100	100
48 hour	100	100	100	100	100	100
6 day	100	100	100	100	100	100

NUMBER OF YOUNG PRODUCED PER FEMALE @ 6 DAYS

Replicates	Control	Percent Effluent				
		2.2 %	3.2 %	4.6 %	6.5 %	8.5 %
A	26	28	24	20	24	27
B	30	29	26	28	28	24
C	16	16	14	17	15	12
D	27	27	25	28	27	25
E	32	23	21	24	24	18
F	28	34	29	29	21	28
G	33	35	26	25	24	27
H	30	26	31	27	28	26
I	27	24	28	28	27	28
J	33	30	26	17	26	25
Mean per Adult	28.2	27.2	25.0	24.3	24.4	24.0
Mean per Surviving Adult	28.2	27.2	25.0	24.3	24.4	24.0
CV %	17.7	20.3	19.0	19.2	16.3	21.3

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	(6.5 %)	<u> </u> YES	<u> X </u> NO
b.) 1/2 LOW FLOW DILUTION	(NA)	<u> </u> YES	<u> </u> 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	(6.5 %)	<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]: 0 (TLP3B)

4. If you answered NO to 2.a) enter [0] otherwise enter [1]: 0 (TGP3B)

5. NOEC Ceriodaphnia Lethality: 8.5 % (TOP3B)

6. LOEC Ceriodaphnia Lethality: 8.5 % (TXP3B)

7. NOEC Ceriodaphnia Sublethality: 8.5 % (TPP3B)

8. LOEC Ceriodaphnia Sublethality: 8.5 % (TYP3B)

9. Coefficient of variation for Ceriodaphnia Reproduction: 17.7 (TQP3B)

Appendix B: Test 1002.0

CHRONIC TOXICITY SUMMARY FORM
Ceriodaphnia dubia
CHEMICAL PARAMETERS CHART

PERMITTEE: Malvern Water Works
NPDES NO.: AR0034126 AFIN 30-00040
CONTACT: Mr. John Davis
ANALYST: 280, 304, 307, 310

SAMPLE No. 1 COLLECTED ending: DATE: September 30, 2014 TIME: 0933
SAMPLE No. 2 COLLECTED ending: DATE: October 1, 2014 TIME: 0927
SAMPLE No. 3 COLLECTED ending: DATE: October 3, 2014 TIME: 0920
Test Initiated: DATE: September 30, 2014 TIME: 1600
Test Terminated: DATE: October 6, 2014 TIME: 1630

DILUTION Control	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	7.9	8.8	8.8	8.4	7.9	8.6
Final	8.2	8.9	8.5	8.6	8.2	8.1	NA
pH Initial	7.3	7.6	7.3	7.3	7.6	7.5	7.4
Final	7.6	7.6	7.6	7.5	7.5	7.2	NA
Alkalinity	32	NA	32	NA	32	NA	NA
Hardness	47	NA	42	NA	44	NA	NA
Conductivity	150	150	150	150	160	190	150
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 2.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.5	8.3	8.8	8.7	8.5	8.0	8.3
Final	8.4	8.9	8.5	8.8	8.3	8.3	NA
pH Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
Final	7.5	7.5	7.5	7.4	7.4	7.3	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	150	150	170	180	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 3.2 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.5	8.6	8.7	8.6	8.3	8.1	8.5
Final	8.2	8.9	8.5	9.0	8.5	8.4	NA
pH Initial	7.4	7.5	7.3	7.3	7.5	7.3	7.3
Final	7.5	7.5	7.5	7.4	7.3	7.4	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	170	160	150	170	190	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 4.6 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.6	8.9	8.5	8.3	8.0	8.4
Final	8.2	8.8	8.6	8.7	8.3	8.4	NA
pH Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
Final	7.5	7.5	7.5	7.3	7.3	7.4	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	150	160	160	150	170	190	150
Chlorine	NA	NA	NA	NA	NA	NA	NA

DILUTION 6.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.6	8.7	8.9	8.3	8.0	8.4
Final	8.2	8.8	8.5	8.6	8.4	8.5	NA
pH Initial	7.4	7.5	7.3	7.3	7.4	7.3	7.3
Final	7.4	7.4	7.5	7.4	7.3	7.4	NA
Alkalinity	37	NA	38	NA	33	NA	NA
Hardness	42	NA	43	NA	41	NA	NA
Conductivity	150	160	160	150	170	150	160
Chlorine	<0.05	NA	<0.05	NA	<0.05	NA	NA

DILUTION 8.5 %	DAY						
	1	2	3	4	5	6	7
D.O. Initial	7.6	8.4	8.7	8.8	8.5	7.9	8.3
Final	8.2	8.8	8.5	8.6	8.3	8.3	NA
pH Initial	7.4	7.4	7.2	7.2	7.3	7.4	7.3
Final	7.5	7.4	7.4	7.5	7.4	7.4	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA
Hardness	NA	NA	NA	NA	NA	NA	NA
Conductivity	160	160	160	160	160	170	150
Chlorine	NA	NA	NA	NA	NA	NA	NA



8600 Kanis Road
 Little Rock, AR 72204-2322
 (501) 224-5060
 FAX (501) 224-5072

CHAIN OF CUSTODY / ANALYSIS REQUEST FORM

PAGE OF

Client: MALVERN WASTEWATER (.815)			PO No.		NO OF BOTTLES	ANALYSES REQUESTED										AIC CONTROL NO: 183075								
Project Reference:			SAMPLE MATRIX			ALUMINUM	TP, NO3N + NO2N	BISMUTH, LEAD, CAD												AIC PROPOSAL NO:				
Project Manager:			WATER	SOIL											Carrier:									
Sampled By:					GRA	COMP											Received on Ice (4°C)? YES 1.3 NO							
AIC No.	Sample Identification	Date/Time Collected																			Remarks			
	MALVERN WATER PLANT	9/25/14 1:20 PM	X																AIC No - 183076					
	MALVERN WASTEWATER	9/30/14 9:37 AM	X				X												L					
1	MALVERN WASTEWATER BLDG	9/25-30/14	X					X																
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																								
Turnaround Time Requested: (Please circle) NORMAL or EXPEDITED IN _____ DAYS					Relinquished By: <i>[Signature]</i>					Date/Time: 9/30/14 1:01 PM					Received By:					Date/Time:				
Expedited results requested by: _____					Relinquished By:					Date/Time:					Received in Lab By: <i>[Signature]</i>					Date/Time: 9-30-14 1305				
Who should AIC contact with questions: _____					Comments:																			
Phone: _____ Fax: _____																								
Report Attention to: _____																								
Report Address to: _____																								

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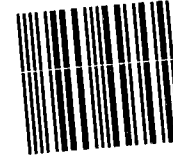


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**Malvern Water Works
Wastewater Division
P.O.Box 638
Malvern, AR 72104**



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