



3rd QTR EPA
AR0021750

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

RECEIVED

AUG 8 2014

WATER/WASTEWATER

August 01, 2014

Lance McAvoy
City of Fort Smith
3900 Kelley Hwy.
Fort Smith, AR 72904

RE: Project: MASSARD BIOMONITORING
Pace Project No.: 60174163

Dear Lance McAvoy:

Enclosed are the analytical results for sample(s) received by the laboratory on July 22, 2014. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Alice Flanagan
alice.flanagan@pacelabs.com
Project Manager

Enclosures

cc: Dan Clover, City of Fort Smith, AR



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: MASSARD BIOMONITORING

Pace Project No.: 60174163

Southeast Kansas Certification IDs

808 West McKay, Frontenac, KS 66763

Arkansas Certification #: 13-012-0

Iowa Certification #: 118

Kansas/NELAP Certification #: E-10116

Louisiana Certification #: 03055

Oklahoma Certification #: 2012-051

Texas Certification #: T104704407-13-4

Utah Certification #: KS000212013-3

Minnesota Certification #: 495004

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SAMPLE SUMMARY

Project: MASSARD BIOMONITORING
Pace Project No.: 60174163

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60174163001	MASSARD EFFLUENT	Water	07/21/14 08:00	07/22/14 13:30

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SAMPLE ANALYTE COUNT

Project: MASSARD BIOMONITORING
Pace Project No.: 60174163

Lab ID	Sample ID	Method	Analysts	Analytes Reported
60174163001	MASSARD EFFLUENT	EPA 821/R-02/013	TDH	1

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ANALYTICAL RESULTS

Project: MASSARD BIOMONITORING

Pace Project No.: 60174163

Sample: MASSARD EFFLUENT	Lab ID: 60174163001	Collected: 07/21/14 08:00	Received: 07/22/14 13:30	Matrix: Water				
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Chronic Toxicity	Analytical Method: EPA 821/R-02/013							
Toxicity, Chronic	Complete		1.0	1		07/22/14 14:00		

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QUALIFIERS

Project: MASSARD BIOMONITORING
Pace Project No.: 60174163

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: MASSARD BIOMONITORING
Pace Project No.: 60174163

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60174163001	MASSARD EFFLUENT	EPA 821/R-02/013	BIO/1731		

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Sample Condition Upon Receipt

WO#: 60174163



Handwritten initials/signature

Client Name: Govt Smith

Courier: Fed Ex UPS USPS Client Commercial Pace Other

Tracking #: _____ Pace Shipping Label Used? Yes No

Custody Seal on Cooler/Box Present: Yes No Seals intact: Yes No

Packing Material: Bubble Wrap Bubble Bags Foam None Other

Thermometer Used: 1243 Type of Ice: Wet Blue None Samples received on ice, cooling process has begun (circle one)

Cooler Temperature: 2-4

Date and initials of person examining contents: 7/22/14 B30SM

Temperature should be above freezing to 6°C

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody filled out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler name & signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	12.
Sample labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Includes date/time/ID/analyses Matrix:		13.
All containers needing preservation have been checked.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
All containers needing preservation are found to be in compliance with EPA recommendation.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	<input type="checkbox"/> Yes <input type="checkbox"/> No	Initial when completed
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Lot # of added preservative
Pace Trip Blank lot # (if purchased):		15.
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Project sampled in USDA Regulated Area:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.
Client Notification/ Resolution:	Copy COC to Client? Y / <input checked="" type="checkbox"/> N	Field Data Required? Y / N
Project Manager Review:	<u>AME</u>	Date: <u>7/24/14</u>

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REFERENCE #60174163

Pace Analytical Services, Inc.
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Fax: 913.599.1759

July 31, 2014

Lance McAvoy
City of Fort Smith (Massard)
3900 Kelley HWY
Fort Smith, AR 72904

Re: Lab Project Number: 60174163
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,



Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

REPORT OF LABORATORY ANALYSIS

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**CHRONIC TOXICITY TEST FOR
CITY OF FORT SMITH (Massard)**

PERMIT # AR 0021750
AFIN # 66-00226

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

Lance McAvoy
City of Fort Smith (Massard)
3900 Kelley HWY
Fort Smith, AR 72904

PREPARED BY:
Pace Analytical Services, Inc.
808 West McKay
Frontenac, KS 66763
1-620-235-0003

July 31, 2014

REPORT OF LABORATORY ANALYSIS

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SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (*Pimephales promelas*), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (*Ceriodaphnia dubia*), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the CITY OF FORT SMITH (Massard) effluent discharge from July 21, 2014 to July 25, 2014. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ($p < 0.05$) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Kärber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 11% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 11% for survival. The LC50 was estimated to be >11% effluent. No significant reduction in growth was observed in the 11% effluent concentration. The Toxic Units is <1. The IC25 is >11. The NOEC for growth in effluent was determined to be 11%. The PMSD is 16.7.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 11% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 11% for survival. The LC50 was estimated to be >11% effluent. No significant reduction in reproduction was observed in the 11% effluent concentrations. The Toxic Units is <1. The IC25 is >11. The NOEC for reproduction in effluent was determined to be 11%. The PMSD is 14.1.

The chronic toxicity exhibited by the fathead minnows and the *Ceriodaphnia* treated by the effluent sampled from July 21 to July 25 from the CITY OF FORT SMITH (Massard) effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the CITY OF FORT SMITH (Massard) effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

TEST MATERIAL

City of Fort Smith (Massard) personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 7-22-14. Subsequent samples followed by delivery on 7-24-14 and on 7-26-14. All samples were stored at $\leq 6^{\circ}$ Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 7-22-14 and carried out until 7-29-14. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

TEST ORGANISMS

Organisms used in these tests were cultured at Pace under controlled temperature and photo period conditions and/or were purchased from an external supplier. Pace maintains records of culture techniques for all organisms, whether produced in house or purchased.

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REFERENCE #60174163

Pace Analytical Services, Inc.
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Fax: 913.599.1759

RESULTS

REPORT OF LABORATORY ANALYSIS

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TABLE 1

Permittee: CITY OF FORT SMITH (Massard) Effluent discharge.

Date Sampled No. 1: 7-21-14 8:00

No. 2: 7-23-14 8:00

No. 3: 7-25-14 8:00

Test Initiated: 14:00

Date: 7-22-14

Dilution Water used: Moderately Hard Synthetic Water

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers					Mean Dry Weight (mg)	CV% *
	A	B	C	D	E		
Control 0%	0.350	0.429	0.456	0.394	0.432	0.412	10.00
Dilution 1 3%	0.440	0.489	0.438	0.468	0.369	0.441	10.29
Dilution 2 5%	0.451	0.367	0.452	0.457	0.355	0.416	12.20
Dilution 3 6%	0.472	0.451	0.478	0.421	0.381	0.441	9.10
Dilution 4 8%	0.311	0.405	0.457	0.336	0.432	0.388	16.10
Dilution 5 11%	0.448	0.393	0.372	0.429	0.421	0.413	7.30

* Coefficient of Variation = Standard Deviation X 100 / Mean

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Permittee: CITY OF FORT SMITH (Massard) Effluent discharge.

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	87.5	100	100	100	100	100	100	95	5.99
Dilution 1 3%	100	100	100	100	87.5	100	100	97.5	4.79
Dilution 2 5%	100	87.5	100	100	87.5	100	100	95	5.99
Dilution 3 6%	100	100	100	100	87.5	100	100	97.5	4.79
Dilution 4 8%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 5 11%	100	100	100	100	100	100	100	100	0.00

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CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 3%	Dilution 2 5%	Dilution 3 6%	Dilution 3 8%	Dilution 4 11%
1	20	25	22	22	22	22
2	20	16	19	26	22	17
3	22	22	22	17	24	24
4	17	24	24	24	18	24
5	21	22	22	20	21	22
6	17	20	20	26	23	22
7	22	24	26	21	24	23
8	25	24	24	26	21	20
9	21	26	21	25	24	25
10	18	23	21	17	19	29
Mean	20.3	22.6	22.1	22.4	21.8	21.8
SD	2.497	2.875	2.079	3.565	2.098	3.155
CV %	12.30	12.72	9.41	15.92	9.62	13.84

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REFERENCE #60174163

Permittee: CITY OF FORT SMITH (Massard) Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

Percent Effluent (%)						
Time Elapsed	Control 0%	Dilution 1 3%	Dilution 2 5%	Dilution 3 6%	Dilution 4 8%	Dilution 5 11%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.0	0.0	0.0	0.0	0.0	0.0
CV %	0.0	0.0	0.0	0.0	0.0	0.0

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TABLE 2
SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW
(*Pimephales promelas*) LARVAL SURVIVAL AND GROWTH TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.1 ml newly hatched brine shrimp nauplii three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 3%, 5%, 6%, 8%, 11%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

TABLE 2 (CONT.)

**SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN
(*Ceriodaphnia dubia*) SURVIVAL AND REPRODUCTION TEST**

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml

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TABLE 2 (CONT.)

8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 3%, 5%, 6%, 8%, 11%
18. Test duration	Until 60% or more surviving control females have three broods or a maximum of 8 days.
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

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TABLE 2 (SECTION 2)

**BIOMONITORING CHRONIC TOXICITY REPORT
FATHEAD MINNOW (Pimephales promelas)
CHEMICAL PARAMETERS CHART**

Permittee: CITY OF FORT SMITH (Massard). Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.
Timothy Harrell
Mike Bollin

SAMPLE NO. 1 COLLECTED: DATE: 7-21-14

SAMPLE NO. 2 COLLECTED: DATE: 7-23-14

SAMPLE NO. 3 COLLECTED: DATE: 7-25-14

**TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION**

	Control	100%
PH	7.53	7.34
D.O.	8.30	9.00
Temp	25.0	25.0
Alk	58	79
Hard	98	98
Cond	410	570
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO₃
Hardness is reported as mg/L CaCO₃
Conductance is reported as umhos
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.55	7.20	25.2
3% Effluent	7.55	7.20	25.0
5% Effluent	7.55	7.20	25.0
6% Effluent	7.56	7.20	25.0
8% Effluent	7.55	7.10	25.0
11% Effluent	7.55	7.10	25.0

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.60	7.90	25.1
3% Effluent	7.60	7.90	25.0
5% Effluent	7.60	7.90	25.0
6% Effluent	7.60	7.80	25.0
8% Effluent	7.60	7.80	25.0
11% Effluent	7.60	7.80	25.0

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FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	11%
pH	7.66	7.66
D.O.	7.70	7.30
Temp	25.0	25.0
Alk	64	66
Hard	98	144
Cond	550	740

- * D.O. is reported as mg/L
- Alkalinity is reported as mg/L CaCO₃
- Hardness is reported as mg/L CaCO₃
- Conductance is reported as umhos

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TEST VALIDITY

The Pimephales promelas control survival rate was 95%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.412 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 5.99 and 10.00. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 20.3 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 12.30. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 11% for survival and 11% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 11% for Survival and 11% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 3%, 5%, 6%, 8%, and 11%. The effluent sampled on 7-21-14, 7-23-14, and 7-25-14 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

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APPENDIX A STATISTICAL ANNALYSIS

REPORT OF LABORATORY ANALYSIS

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60174163 Ft Smith FATHEAD SURVIVAL

File: 6174163A Transform: ARC SINE(SQUARE ROOT(Y))

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	2.010	7.260	11.460	7.260	2.010
OBSERVED	4	2	21	3	0

Calculated Chi-Square goodness of fit test statistic = 18.2325

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

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60174163 Ft Smith FATHEAD SURVIVAL

File: 6174163A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.059

W = 0.705

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

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

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60174163 Ft Smith FATHEAD SURVIVAL

File: 6174163A

Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	3%	5	0.991	1.107	1.084
3	5%	5	0.991	1.107	1.061
4	6%	5	0.991	1.107	1.084
5	8%	5	0.991	1.107	1.084
6	11%	5	1.107	1.107	1.107

60174163 Ft Smith FATHEAD SURVIVAL

File: 6174163A

Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	3%	0.003	0.052	0.023	4.79
3	5%	0.004	0.064	0.028	5.99
4	6%	0.003	0.052	0.023	4.79
5	8%	0.003	0.052	0.023	4.79
6	11%	0.000	0.000	0.000	0.00

60174163 Ft Smith FATHEAD SURVIVAL
 File: C:\TOXSTAT\6174163A.

Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST

Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.084				
2	3%	1.084				
3	5%	1.061	27.50	16.00	5.00	
4	6%	1.084	25.00	16.00	5.00	
5	8%	1.084	27.50	16.00	5.00	
6	11%	1.107	27.50	16.00	5.00	
			30.00	16.00	5.00	

Critical values use $k = 5$, are 1 tailed, and $\alpha = 0.05$

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.051

W = 0.917

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.

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 2.14

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.

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B

Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.350	0.456	0.412
2	3%	5	0.369	0.489	0.441
3	5%	5	0.355	0.457	0.416
4	6%	5	0.381	0.478	0.441
5	8%	5	0.311	0.457	0.388
6	11%	5	0.372	0.448	0.413

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B

Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.002	0.041	0.018	10.00
2	3%	0.002	0.045	0.020	10.29
3	5%	0.003	0.051	0.023	12.20
4	6%	0.002	0.040	0.018	9.10
5	8%	0.004	0.062	0.028	16.10
6	11%	0.001	0.030	0.013	7.30

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B

Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.010	0.002	0.933
Within (Error)	24	0.051	0.002	
Total	29	0.061		

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

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.412	0.412		
2	3%	0.441	0.441	-0.981	
3	5%	0.416	0.416	-0.144	
4	6%	0.441	0.441	-0.974	
5	8%	0.388	0.388	0.823	
6	11%	0.413	0.413	-0.014	

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

60174163 Ft Smith FATHEAD GROWTH

File: 6174163B

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	3%	5	0.069	16.7	-0.029
3	5%	5	0.069	16.7	-0.004
4	6%	5	0.069	16.7	-0.028
5	8%	5	0.069	16.7	0.024
6	11%	5	0.069	16.7	-0.000

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
3%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=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	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
5%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=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	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
6%	10	0	10

TOTAL 20 0 20

CRITICAL FISHER'S VALUE (10,10,10) (p=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	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
8%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=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	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
11%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=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 TESTS

NUMBER	NUMBER	SIG
--------	--------	-----

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	3%	10	0	
2	5%	10	0	
3	6%	10	0	
4	8%	10	0	
5	11%	10	0	

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6174163E Transform: NO TRANSFORMATION

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	5	11	26	15	3

Calculated Chi-Square goodness of fit test statistic = 1.7808

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

Data PASS normality test. Continue analysis.

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU

File: 6174163E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 4.13

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.

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6174163E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	17.000	25.000	20.300
2	3%	10	16.000	26.000	22.600
3	5%	10	19.000	26.000	22.100
4	6%	10	17.000	26.000	22.400
5	8%	10	18.000	24.000	21.800
6	11%	10	17.000	29.000	22.800

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6174163E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	6.233	2.497	0.790	12.30
2	3%	8.267	2.875	0.909	12.72
3	5%	4.322	2.079	0.657	9.41
4	6%	12.711	3.565	1.127	15.92
5	8%	4.400	2.098	0.663	9.62
6	11%	9.956	3.155	0.998	13.84

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
File: 6174163E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	41.000	8.200	1.072
Within (Error)	54	413.000	7.648	
Total	59	454.000		

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

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
 File: 6174163E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	20.300	20.300		
2	3%	22.600	22.600	-1.860	
3	5%	22.100	22.100	-1.455	
4	6%	22.400	22.400	-1.698	
5	8%	21.800	21.800	-1.213	
6	11%	22.800	22.800	-2.021	

Dunnnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60174163 Ft Smith CERIODAPHNIA DUBIA REPRODU
 File: 6174163E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	3%	10	2.857	14.1	-2.300
3	5%	10	2.857	14.1	-1.800
4	6%	10	2.857	14.1	-2.100
5	8%	10	2.857	14.1	-1.500
6	11%	10	2.857	14.1	-2.500

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	3	5	6	8	11
Response 1	20	25	22	22	22	22
Response 2	20	16	19	26	22	17
Response 3	22	22	22	17	24	24
Response 4	17	24	24	24	18	24
Response 5	21	22	22	20	21	22
Response 6	17	20	20	26	23	22
Response 7	22	24	26	21	24	23
Response 8	25	24	24	26	21	20
Response 9	21	26	21	25	24	25
Response 10	18	23	21	17	19	29

*** Inhibition Concentration Percentage Estimate ***

Toxicant/Effluent: Ft Smith

Test Start Date: 7/22/14 Test Ending Date: 7/29/14

Test Species: Dubia

Test Duration: 7 Day

DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	20.300	2.497	22.000
2	10	3.000	22.600	2.875	22.000
3	10	5.000	22.100	2.079	22.000
4	10	6.000	22.400	3.565	22.000
5	10	8.000	21.800	2.098	22.000
6	10	11.000	22.800	3.155	22.000

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	3	5	6	8	11
Response 1	.350	.440	.451	.472	.311	.448
Response 2	.429	.489	.367	.451	.405	.393
Response 3	.456	.438	.452	.478	.457	.372
Response 4	.394	.468	.457	.421	.336	.429
Response 5	.432	.469	.355	.381	.432	.421

*** Inhibition Concentration Percentage Estimate ***

Toxicant/Effluent: Ft Smith

Test Start Date: 7/22/14 Test Ending Date: 7/29/14

Test Species: Fathead

Test Duration: 7 Day

DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.412	0.041	0.437
2	5	3.000	0.461	0.022	0.437
3	5	5.000	0.416	0.051	0.429
4	5	6.000	0.441	0.040	0.429
5	5	8.000	0.388	0.062	0.400
6	5	11.000	0.413	0.030	0.400

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.



Pace Analytical[®]
www.pacelabs.com

REFERENCE #60174163

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

APPENDIX B CHAIN OF CUSTODY FORMS

REPORT OF LABORATORY ANALYSIS

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Sample Condition Upon Receipt

Client Name: BA Smith

Courier: Fed Ex UPS USPS Client Commercial Pace Other

Tracking #: _____ Pace Shipping Label Used? Yes No

Custody Seal on Cooler/Box Present: Yes No Seals intact: Yes No

Packing Material: Bubble Wrap Bubble Bags Foam None Other

Thermometer Used: Tau3 Type of Ice: Wet Blue None Samples received on ice, cooling process has begun.
(circle one)

Cooler Temperature: 108
Temperature should be above freezing to 6°C

Optional
Proj Due Date:
Proj Name:

Date and initials of person examining contents: 11/24/14 SM 1100

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.	
Chain of Custody filled out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.	
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.	
Sampler name & signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.	
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.	
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.	
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.	
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.	
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.	
Containers intact:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.	
Unpreserved 5035A soils frozen w/in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.	
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	12.	
Sample labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
Includes date/time/ID/analyses Matrix:		13.	
All containers needing preservation have been checked.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A		
All containers needing preservation are found to be in compliance with EPA recommendation.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.	
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	<input type="checkbox"/> Yes <input type="checkbox"/> No	Initial when completed	Lot # of added preservative
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A		
Pace Trip Blank lot # (if purchased):		15.	
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.	
Project sampled in USDA Regulated Area:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	17. List State:	

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

Sample Condition Upon Receipt

Client Name: FT Smith

Optional
Proj Due Date:
Proj Name:

Courier: Fed Ex UPS USPS Client Commercial Pace Other

Tracking #: _____ Pace Shipping Label Used? Yes No

Custody Seal on Cooler/Box Present: Yes No Seals intact: Yes No

Packing Material: Bubble Wrap Bubble Bags Foam None Other

Thermometer Used: T-243 Type of Ice: Web Blue None Samples received on ice, cooling process has begun.

Cooler Temperature: 2.4

Temperature should be above freezing to 6°C

Date and initials of person examining contents: MB 7/26/14 12/15

Chain of Custody present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody filled out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler name & signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples arrived within holding time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time analyses (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
Pace containers used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
Containers intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Filtered volume received for dissolved tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12.
Sample labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Includes date/time/ID/analyses Matrix: <u>WT</u>		13.
All containers needing preservation have been checked.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
All containers needing preservation are found to be in compliance with EPA recommendation.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Initial when completed
Trip Blank present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Lot # of added preservative
Pace Trip Blank lot # (if purchased):		15.
Headspace in VOA vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.
Project sampled in USDA Regulated Area:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	17. List State:

Client Notification/ Resolution: _____ Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

APPENDIX C

REFERENCE TOXICANTS SUMMARY

REPORT OF LABORATORY ANALYSIS

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The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 7/8/14 14:00 End: 7/15/14 13:00

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	9	2	0
8 g/l	40	36	28	6
6 g/l	40	40	33	22
4 g/l	40	40	40	39
2 g/l	40	40	40	39

IC25 (4.87 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	5	0	0
2.0 g/l	10	10	8	1
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.09 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: 
Timothy Harrell, Technical Director

REPORT OF LABORATORY ANALYSIS

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APPENDIX D
STATE AGENCY FORMS

REPORT OF LABORATORY ANALYSIS

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Biomonitoring Form
Chronic Toxicity Summary Form
Ceriodaphnia dubia
Chemical Parameters Chart

Permittee: City of Fort Smith
NPDES No.: AR 0021750
Contact: Lance McAvoy
Analyst: Tim Harrell
Mike Bollin

Sample No. 1 Collected: Date: 7/21/2014 Time: 8:00
Sample No. 2 Collected: Date: 7/23/2014 Time: 8:00
Sample No. 3 Collected: Date: 7/25/2014 Time: 8:00
Test Begin: Date: 7/22/2014 Time: 14:00
Test End: Date: 7/29/2014 Time: 13:10

Dilution: 0 Day:									Dilution: 6 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.2	25.1	24.8	25	25.1	25.2	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	
DO Initial	8.3	8.2	8.1	8.9	8	8.2	8.1		DO Initial		8.2	8.1	8.2	8.1	8.3	8.1	
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.7		DO Final	7.2	7.8	7.4	7.3	7.1	7.3	7.3	
pH Initial	7.53	7.51	7.46	7.52	7.57	7.55	7.5		pH Initial		7.72	7.52	7.57	7.55	7.62	7.58	
pH Final	7.55	7.6	7.56	7.6	7.68	7.61	7.66		pH Final	7.56	7.6	7.61	7.62	7.8	7.65	7.67	
Alkalinity	58								Alkalinity								
Hardness	98								Hardness								
Conductivity	410								Conductivity								
Chlorine	<.1						<.1		Chlorine								

Dilution: 3 Day:									Dilution: 8 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.1	24.9	24.8	25	24.9	25	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	
DO Initial		8.2	8.1	8.2	8	8.2	8.1		DO Initial		8.3	8.1	8.2	8.1	8.3	8.2	
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.2		DO Final	7.1	7.8	7.3	7.3	7.1	7.3	7.3	
pH Initial		7.68	7.51	7.54	7.54	7.59	7.56		pH Initial		7.73	7.53	7.59	7.55	7.62	7.59	
pH Final	7.55	7.6	7.6	7.6	7.76	7.63	7.66		pH Final	7.55	7.6	7.63	7.65	7.83	7.68	7.67	
Alkalinity									Alkalinity								
Hardness									Hardness								
Conductivity									Conductivity								
Chlorine									Chlorine								

Dilution: 5 Day:									Dilution: 11 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.1	24.9	24.8	25	24.9	25	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	Init. 100%
DO Initial		8.2	8.1	8.2	8	8.3	8.1		DO Initial		8.4	8	8.2	8.2	8.3	8.2	9
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.3		DO Final	7.1	7.8	7.3	7.3	7.1	7.3	7.3	
pH Initial		7.72	7.52	7.56	7.54	7.61	7.57		pH Initial		7.75	7.55	7.61	7.58	7.62	7.59	7.34
pH Final	7.55	7.6	7.61	7.62	7.78	7.65	7.67		pH Final	7.55	7.6	7.64	7.66	7.83	7.68	7.67	
Alkalinity									Alkalinity								79
Hardness									Hardness								98
Conductivity									Conductivity								570
Chlorine									Chlorine							<.1	<.1

**Summary Reporting Forms
Chronic Biomonitoring**

Ceriodaphnia dubia Survival and Reproduction

Permittee: City of Fort Smith NPDES No.: AR 0021750

Composite 1 Collected		Time:	Date:		Time:	Date:
	From	8:00	7/20/2014	To	8:00	7/21/2014

Composite 2 Collected	From	8:00	7/22/2014	To	8:00	7/23/2014
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Composite 3 Collected	From	8:00	7/24/2014	To	8:00	7/25/2014
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Test initiated: am/pm 14:00 AM date 7/22/2014
 Test terminated: am/pm 12:30 AM date 7/29/2014

Dilution water used: Receiving Reconstituted X

Percent Survival

Time of Reading	Percent Effluent					
	0	3	5	6	8	11
24h	100	100	100	100	100	100
48h	100	100	100	100	100	100
End of test	100	100	100	100	100	100

Number of Young Produced per Female @ End of Test

Rep	0	3	5	6	8	11
A	20	25	22	22	22	22
B	20	16	19	26	22	17
C	22	22	22	17	24	24
D	17	24	24	24	18	24
E	21	22	22	20	21	22
F	17	20	20	26	23	22
G	22	24	26	21	24	23
H	25	24	24	26	21	20
I	21	26	21	25	24	25
J	18	23	21	17	19	29
Mean	20.3	22.6	22.1	22.4	21.8	22.8
CV%*	12.3	12.72	9.41	15.92	9.62	13.84

*coefficient of variation = standard deviation x 100/mean.

Ceriodaphnia dubia
Survival and Reproduction (cont)

1. Fisher's Exact Test:

Is the mean survival at the end of the test significantly different ($p=.05$) than the control survival for the % effluent corresponding to (lethality):

a) Low Flow or Critical Dilution	(8 %):	Yes:	No: X
b) ½ Low Flow Dilution	(%):	Yes:	No:

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

Is the mean number of young produced per female significantly different ($p=.05$) than the control's number of young per female for the % effluent corresponding to (significant non-lethal effects):

a) Low Flow or Critical Dilution	(8 %):	Yes:	No: X
b) ½ Low Flow Dilution	(%):	Yes:	No:

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP3B.

6. Enter response to item 4 on DMR Form, parameter #TFP3B.

7. Enter percent effluent corresponding to each NOEC below and circle lowest number:

a) NOEC survival:	11 % effluent
b) NOEC reproduction:	11 % effluent

Biomonitoring Form
 Chronic Toxicity Summary Form
Pimephales promelas
 Chemical Parameters Chart

Permittee: City of Fort Smith
 NPDES No.: AR 0021750
 Contact: Lance McAvoy
 Analyst: Tim Harrell
 Mike Bollin

Sample No. 1 Collected: Date: 7/21/2014 Time: 8:00
 Sample No. 2 Collected: Date: 7/23/2014 Time: 8:00
 Sample No. 3 Collected: Date: 7/25/2014 Time: 8:00
 Test Begin: Date: 7/22/2014 Time: 14:00
 Test End: Date: 7/29/2014 Time: 13:10

Dilution: 0 Day:									Dilution: 6 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.2	25.1	24.8	25	25.1	25.2	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	
DO Initial	8.3	8.2	8.1	8.9	8	8.2	8.1		DO Initial		8.2	8.1	8.2	8.1	8.3	8.1	
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.7		DO Final	7.2	7.8	7.4	7.3	7.1	7.3	7.3	
pH Initial	7.53	7.51	7.46	7.52	7.57	7.55	7.5		pH Initial		7.72	7.52	7.57	7.55	7.62	7.58	
pH Final	7.55	7.6	7.56	7.6	7.68	7.61	7.66		pH Final	7.56	7.6	7.61	7.62	7.8	7.65	7.67	
Alkalinity	58								Alkalinity								
Hardness	98								Hardness								
Conductivity	410								Conductivity								
Chlorine	<.1						<.1		Chlorine								

Dilution: 3 Day:									Dilution: 8 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.1	24.9	24.8	25	24.9	25	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	
DO Initial		8.2	8.1	8.2	8	8.2	8.1		DO Initial		8.3	8.1	8.2	8.1	8.3	8.2	
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.2		DO Final	7.1	7.8	7.3	7.3	7.1	7.3	7.3	
pH Initial		7.68	7.51	7.54	7.54	7.59	7.56		pH Initial		7.73	7.53	7.59	7.55	7.62	7.59	
pH Final	7.55	7.6	7.6	7.6	7.76	7.63	7.66		pH Final	7.55	7.6	7.63	7.65	7.83	7.68	7.67	
Alkalinity									Alkalinity								
Hardness									Hardness								
Conductivity									Conductivity								
Chlorine									Chlorine								

Dilution: 5 Day:									Dilution: 11 Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.1	24.9	24.8	25	24.9	25	25		Temp (C)	25.1	24.9	24.8	25	24.9	25	25	Init. 100%
DO Initial		8.2	8.1	8.2	8	8.3	8.1		DO Initial		8.4	8	8.2	8.2	8.3	8.2	9
DO Final	7.2	7.9	7.4	7.3	7	7.3	7.3		DO Final	7.1	7.8	7.3	7.3	7.1	7.3	7.3	
pH Initial		7.72	7.52	7.56	7.54	7.61	7.57		pH Initial		7.75	7.55	7.61	7.58	7.62	7.59	7.34
pH Final	7.55	7.6	7.61	7.62	7.78	7.65	7.67		pH Final	7.55	7.6	7.64	7.66	7.83	7.68	7.67	
Alkalinity									Alkalinity								79
Hardness									Hardness								98
Conductivity									Conductivity								570
Chlorine									Chlorine							<.1	<.1

**Summary Reporting Forms Chronic Biomonitoring
Fathead Minnow Larvae Growth and Survival
(Pimephales promelas)**

Permittee: City of Fort Smith NPDES No.: AR 0021750

	Time:	Date:		Time:	Date:
Composite 1 Collected	From	8:00	7/20/2014	To	8:00 7/21/2014

Composite 2 Collected	From	8:00	7/22/2014	To	8:00 7/23/2014
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Composite 3 Collected	From	8:00	7/24/2014	To	8:00 7/25/2014
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Test initiated: am/pm 14:00 AM date 7/22/2014
 Test terminated: am/pm 12:30 AM date 7/29/2014

Dilution water used: Receiving Reconstituted X

Data Table for Survival

Effluent Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV%*
	A	B	C	D	E	24h	48h	7 days	
Syn 0 %	87.5	100	100	100	100	100	100	97.5	4.79
3%	100	100	100	100	87.5	100	100	97.5	4.79
5%	100	87.5	100	100	87.5	100	100	95	5.99
6%	100	100	100	100	87.5	100	100	97.5	4.79
8%	87.5	100	100	100	100	100	100	97.5	4.79
11%	100	100	100	100	100	100	100	100	0

Data Table for Survival

Effluent Conc. %	Average Dry Weight in milligrams in Replicate Chambers					Mean Dry Weight mg	CV%*
	A	B	C	D	E		
Syn. 0%	0.35	0.429	0.456	0.394	0.432	0.412	10
3%	0.44	0.489	0.438	0.468	0.369	0.441	10.29
5%	0.451	0.367	0.452	0.457	0.355	0.416	12.2
6%	0.472	0.451	0.478	0.421	0.381	0.441	9.1
8%	0.311	0.405	0.457	0.336	0.432	0.388	16.1
11%	0.448	0.393	0.372	0.429	0.421	0.413	7.3

*coefficient of variation = standard deviation x 100/mean.

Fathead Minnow Larvae Growth and Survival (cont)
(Pimephales promelas)

1. Dunnett's Procedure or Steels Many-One Rank Test as appropriate:

Is the mean survival at 7 days significantly different ($p=.05$) than the control survival for the % effluent corresponding to:

a) Low Flow or Critical Dilution	(8 %):	Yes:	No: X
b) ½ Low Flow Dilution	(%):	Yes:	No:

2. Dunnett's Procedure (or appropriate test):

Is the mean dry weight (growth) of the effluent at 7 days significantly different ($p=0.05$) than the control's dry weight for the % effluent corresponding to (significant non-lethal effects):

a) Low Flow or Critical Dilution	(8 %):	Yes:	No: X
b) ½ Low Flow Dilution	(%):	Yes:	No:

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP6C.

6. Enter response to item 4 on DMR Form, parameter #TFP6C.

7. Enter percent effluent corresponding to each NOEC below and circle lowest number:

a) NOEC survival:	11 % effluent
b) NOEC reproduction:	11 % effluent