

HOPE, CITY OF
PERMIT NO: AR0038466
CHRONIC BIOMONITORING

METHOD 1000.0 - PIMEPHALES PROMELAS
METHOD 1002.0 - CERIODAPHNIA DUBIA

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October 4, 2013

Laboratory Number: 16301.0001, 0002, 0003

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INTRODUCTION AND SUMMARY

Chronic biomonitoring tests:

7 day ceriodaphnia dubia survival and reproduction (method 1002.0) was performed by Sorrells Research Associates for Hope 24 hour composite samples of plant effluent for dates 08/25-26/13, 08/27-28/13, 08/29-30/13.

The samples were delivered to Sorrells lab in ice chest, cooled to 4 degrees c.

These samples were logged in as 16301.0001, 0002, 0003. Chain of custody included in report.

Moderately hard 20% deionized mineral water was used as dilution water.

Testing was initiated 08/27/13 at 1600 hours and continued through 09/04/13 at 1600 hours.

The results of these tests are as follows:

TEST 1000.0 FATHEAD MINNOW

SURVIVAL - NOEL 100% Effluent

GROWTH - NOWL. 100% Effluent

TEST 1002.0 CERIODAPHNIA DUBIA

SURVIVAL - 100% Effluent

REPRODUCTION - 100% Effluent

Fishers Exact Test statistics are included in this report for these observations. No other adjustments were made.

TEST ACCEPTANCE CRITERIA
FOR CONTROL

TEST METHOD	ORGANISM	CRITERIA	RESULTS	PASS/FAIL
1000	Pimephales promelas	Control surv. >or= 80 %	100%	PASS
1002	Ceriodaphnia dubia	Control surv. >or= 80 %	100%	PASS
1000	Pimephales promelas	Control wt. .25 mg or> per larvae.	.314	PASS
1002	Ceriodaphnia dubia	Control repro. 15 or> neonates per surviving female.	18.0	PASS
1000	Pimephales promelas	Control CV 40 % or <	3.9	PASS
1002	Ceriodaphnia Dubia	Control CV 40 % or <	6.42	PASS

NOTE: The test acceptance criteria is based upon the synthetic laboratory control. Laboratory control is moderately hard 20% deionized mineral water, as directed by EPA/600/4-91/002.

OUTLINED REPORT

PERMIT NO: AR0038466
PERMIT REQUIREMENTS:
PLANT LOCATION:
RECEIVING WATER BODY:

CLIENT: Hope, City of
ADDRESS: P.O. Box 667
PHONE NO: Hope, AR 71801

PLANT OPERATIONS

PRODUCT (S): n/a
RAW MATERIALS: n/a
OPERATING SCHEDULE:
SCHEMATIC OF WASTE TREATMENT:

RETENTION TIME:

VOLUME OF WASTE FLOW (MGD, CFS, GPM)

(Cont.)

PHYSICAL AND CHEMICAL DATA:

100 % EFFLUENT	DATE 08/27/13	DATE 08/29/13	DATE 08/31/13
DO (mg/l)	8.01	8.31	8.26
pH (S.U.)	7.52	7.65	7.44
Conductivity (umhos)	854	892	820
Alkalinity (mg/l)	158	192	170
Hardness (mg/l)	82	70	68
Res. Chlorine (mg/l)	0	0	0
Temperature .c	25	25	25

DILUTION WATER SAMPLES -

SOURCE: 20% DMW

COLLECTION DATE: N/A

TIME: N/A

PRETREATMENT: AERATED

Hardness is to be reported as mg/l CaCO₃

D.O. Dissolved Oxygen mg/l

Temperature degrees centigrade

pH standard units

Conductivity = us/cm

Chlorine Residual = mg/l

Chemical Data For Daily Biomonitoring

B570223

Permitee Hope Date 8-27-13 1600

Analyst ED Lab no. 16301

Dilution Control

Day	1 ^{D1}	2	3 ^{D2}	4	5 ^{D3}	6	7	notes
Temp	25.0	25.0	25.0	25.0	25.0	25.0		
pH	7.18	7.15	7.28	7.22	7.15	7.18		
D.O.	8.55	8.50	8.63	8.53	8.48	8.43		
Alk	54		64		68			
Hard.	94		100		88			
Cond.	269		270		277			Blnd 4-52

Dilution 56.3

Day	1	2	3	4	5	6	7	notes
Temp	25.0	25.0	25.0	25.0	25.0	25.0		
pH	7.30	7.33	7.39	7.34	7.30	7.33		
D.O.	8.34	8.30	8.50	8.42	8.40	8.34		
Alk	129		136		114			
Hard.	82		84		78			
Cond.	546		630		559			

Dilution 100

Day	1	2	3	4	5	6	7	notes
Temp	25.0	25.0	25.0	25.0	25.0	25.0		
pH	7.52	7.47	7.65	7.51	7.44	7.46		
D.O.	8.01	7.92	8.31	8.06	8.26	8.16		
Alk	158		192		170			
Hard.	82		70		68			
Cond.	854		892		820			

0

0

0

DATA ANALYSIS

ACCORDING TO EPA/600/4-91/002.

STATISTICAL ANALYSES

TOXSTAT VERSION 3.3

Percent minimum significant difference (PMSD) calculated for sub-lethal endpoints.

This information for *C. dubia* reproduction is found in the inserted tables after page 8. We will highlight these values in Dunnetts Table 2, for all sub-lethal endpoints.

TITLE: HOPE 16301 CERIO REPS
FILE: 16301HCR
TRANSFORM: NO TRANSFORM

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	17.0000	17.0000
1	CONTROL	2	18.0000	18.0000
1	CONTROL	3	20.0000	20.0000
1	CONTROL	4	17.0000	17.0000
1	CONTROL	5	17.0000	17.0000
1	CONTROL	6	18.0000	18.0000
1	CONTROL	7	18.0000	18.0000
1	CONTROL	8	20.0000	20.0000
1	CONTROL	9	18.0000	18.0000
1	CONTROL	10	17.0000	17.0000
2	31.60	1	16.0000	16.0000
2	31.60	2	21.0000	21.0000
2	31.60	3	16.0000	16.0000
2	31.60	4	18.0000	18.0000
2	31.60	5	16.0000	16.0000
2	31.60	6	20.0000	20.0000
2	31.60	7	19.0000	19.0000
2	31.60	8	16.0000	16.0000
2	31.60	9	18.0000	18.0000
2	31.60	10	16.0000	16.0000
3	42.20	1	18.0000	18.0000
3	42.20	2	22.0000	22.0000
3	42.20	3	18.0000	18.0000
3	42.20	4	16.0000	16.0000
3	42.20	5	19.0000	19.0000
3	42.20	6	18.0000	18.0000
3	42.20	7	18.0000	18.0000
3	42.20	8	18.0000	18.0000
3	42.20	9	18.0000	18.0000
3	42.20	10	18.0000	18.0000
4	56.30	1	22.0000	22.0000
4	56.30	2	19.0000	19.0000
4	56.30	3	19.0000	19.0000
4	56.30	4	16.0000	16.0000
4	56.30	5	17.0000	17.0000
4	56.30	6	20.0000	20.0000
4	56.30	7	19.0000	19.0000
4	56.30	8	19.0000	19.0000
4	56.30	9	19.0000	19.0000
4	56.30	10	18.0000	18.0000
5	75.00	1	18.0000	18.0000
5	75.00	2	19.0000	19.0000
5	75.00	3	21.0000	21.0000
5	75.00	4	18.0000	18.0000
5	75.00	5	16.0000	16.0000
5	75.00	6	22.0000	22.0000
5	75.00	7	19.0000	19.0000
5	75.00	8	18.0000	18.0000
5	75.00	9	18.0000	18.0000
5	75.00	10	18.0000	18.0000

6	100.00	1	18.0000	18.0000
6	100.00	2	18.0000	18.0000
6	100.00	3	18.0000	18.0000
6	100.00	4	18.0000	18.0000
6	100.00	5	19.0000	19.0000
6	100.00	6	19.0000	19.0000
6	100.00	7	17.0000	17.0000
6	100.00	8	17.0000	17.0000
6	100.00	9	19.0000	19.0000
6	100.00	10	18.0000	18.0000

HOPE 16301 CERIO REPS
File: 16301HCR Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	17.000	20.000	18.000
2	31.60	10	16.000	21.000	17.600
3	42.20	10	16.000	22.000	18.300
4	56.30	10	16.000	22.000	18.800
5	75.00	10	16.000	22.000	18.700
6	100.00	10	17.000	19.000	18.100

HOPE 16301 CERIO REPS
File: 16301HCR Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	CONTROL	1.333	1.155	0.365
2	31.60	3.600	1.897	0.600
3	42.20	2.233	1.494	0.473
4	56.30	2.622	1.619	0.512
5	75.00	2.900	1.703	0.539
6	100.00	0.544	0.738	0.233

HOPE 16301 CERIO REPS
File: 16301HCR Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	10.150	2.030	0.920
Within (Error)	54	119.100	2.206	

 Total 59 129.250

Critical F value = 2.45 (0.05,5,40)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

HOPE 16301 CERIO REPS
 File: 16301HCR Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	18.000	18.000		
2	31.60	17.600	17.600	0.602	
3	42.20	18.300	18.300	-0.452	
4	56.30	18.800	18.800	-1.205	
5	75.00	18.700	18.700	-1.054	
6	100.00	18.100	18.100	-0.151	

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

HOPE 16301 CERIO REPS
 File: 16301HCR Transform: NO TRANSFORM

DUNNETTS 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	31.60	10	1.534	8.5	0.400
3	42.20	10	1.534	8.5	-0.300
4	56.30	10	1.534	8.5	-0.800
5	75.00	10	1.534	8.5	-0.700
6	100.00	10	1.534	8.5	-0.100

HOPE 16301 CERIO REPS
 File: 16301HCR Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	CONTROL	10	18.000	18.000	17.800
2	31.60	10	17.600	17.600	17.800
3	42.20	10	18.300	18.300	18.300
4	56.30	10	18.800	18.800	18.533
5	75.00	10	18.700	18.700	18.533
6	100.00	10	18.100	18.100	18.533

HOPE 16301 CERIO REPS
 File: 16301HCR Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
CONTROL	17.800				
31.60	17.800	0.301		1.68	k= 1, v=54
42.20	18.300	0.452		1.76	k= 2, v=54
56.30	18.533	0.803		1.79	k= 3, v=54
75.00	18.533	0.803		1.80	k= 4, v=54
100.00	18.533	0.803		1.80	k= 5, v=54

s = 1.485

Note: df used for table values are approximate when v > 20.

HOPE 16301 CERIO REPS
 File: 16301HCR Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	18.000				
2	31.60	17.600	94.00	75.00	10.00	
3	42.20	18.300	115.00	75.00	10.00	
4	56.30	18.800	122.00	75.00	10.00	
5	75.00	18.700	121.00	75.00	10.00	
6	100.00	18.100	113.00	75.00	10.00	

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

TITLE: HOPE 16301 MINNOW WEIGHTS

FILE: 16301HMW

TRANSFORM: NO TRANSFORM

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3220	0.3220
1	CONTROL	2	0.3080	0.3080
1	CONTROL	3	0.2990	0.2990
1	CONTROL	4	0.3250	0.3250
2	32.60	1	0.3330	0.3330
2	32.60	2	0.3090	0.3090
2	32.60	3	0.3090	0.3090
2	32.60	4	0.3160	0.3160
3	42.20	1	0.3020	0.3020
3	42.20	2	0.3240	0.3240
3	42.20	3	0.3200	0.3200
3	42.20	4	0.3310	0.3310
4	56.30	1	0.3100	0.3100
4	56.30	2	0.3360	0.3360
4	56.30	3	0.3110	0.3110
4	56.30	4	0.3280	0.3280
5	75.00	1	0.3340	0.3340
5	75.00	2	0.3030	0.3030
5	75.00	3	0.3120	0.3120
5	75.00	4	0.3250	0.3250
6	100.00	1	0.3330	0.3330
6	100.00	2	0.3290	0.3290
6	100.00	3	0.3170	0.3170
6	100.00	4	0.3240	0.3240

HOPE 16301 MINNOW WEIGHTS

File: 16301HMW

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	4	0.299	0.325	0.314
2	32.60	4	0.309	0.333	0.317
3	42.20	4	0.302	0.331	0.319
4	56.30	4	0.310	0.336	0.321
5	75.00	4	0.303	0.334	0.318
6	100.00	4	0.317	0.333	0.326

HOPE 16301 MINNOW WEIGHTS

File: 16301HMW

Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	CONTROL	0.000	0.012	0.006
2	32.60	0.000	0.011	0.006
3	42.20	0.000	0.012	0.006
4	56.30	0.000	0.013	0.006
5	75.00	0.000	0.014	0.007
6	100.00	0.000	0.007	0.003

HOPE 16301 MINNOW WEIGHTS
 File: 16301HMW Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.000	0.000	0.498
Within (Error)	18	0.002	0.000	
Total	23	0.003		

Critical F value = 2.77 (0.05,5,18)
 Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All groups equal

HOPE 16301 MINNOW WEIGHTS
 File: 16301HMW Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 H_0 : Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.314	0.314		
2	32.60	0.317	0.317	-0.391	
3	42.20	0.319	0.319	-0.691	
4	56.30	0.321	0.321	-0.932	
5	75.00	0.318	0.318	-0.601	
6	100.00	0.326	0.326	-1.473	

Dunnnett table value = 2.41 (1 Tailed Value, $P=0.05$, $df=18,5$)

HOPE 16301 MINNOW WEIGHTS
 File: 16301HMW Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 H_0 : Control < Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
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1	CONTROL	4			
2	32.60	4	0.020	6.4	-0.003
3	42.20	4	0.020	6.4	-0.006
4	56.30	4	0.020	6.4	-0.008
5	75.00	4	0.020	6.4	-0.005
6	100.00	4	0.020	6.4	-0.012

HOPE 16301 MINNOW WEIGHTS

File: 16301HMW Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	CONTROL	4	0.314	0.314	0.314
2	32.60	4	0.317	0.317	0.317
3	42.20	4	0.319	0.319	0.319
4	56.30	4	0.321	0.321	0.320
5	75.00	4	0.318	0.318	0.320
6	100.00	4	0.326	0.326	0.326

HOPE 16301 MINNOW WEIGHTS

File: 16301HMW Transform: NO TRANSFORM

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
CONTROL	0.314				
32.60	0.317	0.388		1.73	k= 1, v=18
42.20	0.319	0.687		1.82	k= 2, v=18
56.30	0.320	0.762		1.85	k= 3, v=18
75.00	0.320	0.762		1.86	k= 4, v=18
100.00	0.326	1.464		1.87	k= 5, v=18

s = 0.012

Note: df used for table values are approximate when v > 20.

HOPE 16301 MINNOW WEIGHTS

File: 16301HMW Transform: NO TRANSFORM

STEELS MANY-ONE RANK TEST - Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	0.314				
2	32.60	0.317	20.00	10.00	4.00	
3	42.20	0.319	20.00	10.00	4.00	

4	56.30	0.321	22.00	10.00	4.00
5	75.00	0.318	20.50	10.00	4.00
6	100.00	0.326	23.00	10.00	4.00

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

TEST METHOD
1000.0

TEST METHOD USED: 1000.0
END POINT(S) OF TEST: NOEL 100 %
DEVIATIONS FROM REFERENCE METHOD: None

DATE AND TIME TEST STARTED: 08/27/13 1600
DATE AND TIME TEST TERMINATED: 09/03/13 1600

TYPE OF TEST CHAMBERS: 500 ml
VOLUME OF SOLUTIONS USED/CHAMBER: 400 ml
NUMBER OF ORGANISMS/TEST CHAMBER: 10
NUMBER OF REPLICATE TEST CHAMBERS/TREATMENT: 4

TEST TEMPERATURE (MEAN): mean = 25

TEST ORGANISMS

SCIENTIFIC NAME: Pimephales promelas
AGE: 24 hours
LIFE STAGE: Embryos
SOURCE: Aquatic BioSystems, Inc.
DISEASES AND TREATMENT: None
FEEDING REGIME: 2/day Brine Shrimp
ORGANISM HISTORY SHEETS ARE ATTACHED

RESULTS SUMMARY

FATHEAD MINNOW, PIMEPHALES PROMELAS, LARVAL SURVIVAL AND GROWTH TEST
METHOD 1000.0

Larvae are exposed in a static renewal system for seven days to different concentrations of effluent or to receiving water. Test results are based on the survival and growth (increase in weight) of the larvae. Effluent dilutions chosen for this test were 100 %, 75%, 56.3%, 42.2% and 31.6% in accordance with the NPDES permit. The low flow or "critical" dilution is specified in the NPDES Permit as 100% effluent.

NOEL(S) ARE AS FOLLOWS:

100% Survival 100% effluent

NOEL Growth 100% effluent

BIOMONITORING REPORT
FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc. %	Percent Survival In				Mean Percent			CV%*
	A	B	C	D	24h	48h	7d	
Dilution Water	100	100	100	100	100	100	100	0.0
31.6%	100	100	100	100	100	100	100	0.0
42.2%	100	100	100	100	100	100	100	0.0
56.3%	100	100	100	100	100	100	100	0.0
75%	100	100	100	100	100	100	100	0.0
100%	100	100	100	90	100	100	97.5	5.1

*coefficient of variation = standard deviation x 100/mean

**ph unadjusted 100% effluent

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

Is the mean survival at 7xdays significantly different (XX0.5) than the control survival for the % effluent corresponding to:

a.) LOW FLOW OR CRITICAL DILUTION (100%): YES [] NO [x]

b.) 1/2 LOW FLOW OR 2 X CRITICAL DILUTION (56.3 %): YES [] NO [x]

2. Dunnett's Procedure:

Is the mean dry weight (growth) at 7 days effluent 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 (100%): YES [] NO [x]

b.) 1/2 LOW FLOW OR 2 X CRITICAL DILUTION (56.3 %): YES [] NO [x]

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]: [0]

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 NOEL below and circle lowest number:

a.) NOEL survival = 100% effluent

b.) NOEL growth = 100% effluent

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

Permittee: **CITY OF HOPE** NPDES NO. AR0038466

Dilution water used: Receiving [] Reconstituted [x]

DATA TABLE FOR GROWTH

EFFLUENT CONC. %	AVERAGE DRY WEIGHT IN MILLIGRAMS IN REPLICATE CHAMBERS				MEAN DRY WEIGHT (MG) 7 days	CV%*
	A	B	C	D		
CONTROL	.322	.308	.299	.325	.314	3.9
31.6 %	.333	.309	.309	.316	.317	3.6
42.2 %	.302	.324	.320	.331	.319	3.9
56.3 %	.310	.336	.311	.328	.321	4.0
75 %	.334	.303	.312	.325	.319	4.3
100%	.333	.329	.317	.324	.326	2.1

*Coefficient of variation = standard deviation X 100/mean

(Coef Of Var Statre 7Day Chronic Pimephales TQP6C = **3.9**)

TEST METHOD
1002.0

TEST METHOD USED: 1002.0

DATE AND TIME TEST STARTED: 08/27/13 1600
DATE AND TIME TEST TERMINATED: 09/04/13 1600
TYPE OF TEST CHAMBERS: 30 ml
VOLUME OF SOLUTIONS USED/CHAMBER: 15 ml
NUMBER OF ORGANISMS/TEST CHAMBER: 1
NUMBER OF REPLICATE TEST CHAMBERS/TREATMENT: 10

TEST TEMPERATURE (MEAN AND RANGE): 25

TEST ORGANISMS

SCIENTIFIC NAME: Ceriodaphnia dubia
AGE: Less than 24 hours
LIFE STAGE: Neonates
SOURCE: Aquatic BioSystems, Inc.
DISEASES AND TREATMENT: None
FEEDING REGIME: Daily
ORGANISM HISTORY SHEETS ARE ATTACHED

RESULTS SUMMARY
CLADOCERAN, CERIODAPHNIA DUBIA, SURVIVAL AND REPRODUCTION TEST
METHOD 1002.0

Ceriodaphnia are exposed in a static renewal system to different concentrations of effluent, and to receiving water until 60% of surviving control organisms have three broods of offspring (15 neonates per surviving female). Effluent dilutions for this test were 100%, 75%, 56.3%, 42.2%, and 31.6% in accordance with the NPDES Permit. The "critical" dilution is specified as 100% effluent. Test results are based on survival and reproduction. If the test is conducted as described, the control organism should produce three broods of young during a seven-day period.

BIOMONITORING REPORT
CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

Permittee: CITY OF HOPE NPDES NO. AR0038466
Dilution water used: Receiving [] Reconstituted [X]

NUMBER OF YOUNG PRODUCED PER FEMALE @ 7 DAYS

PERCENT EFFLUENT (%)

REP	0 %	31.6%	42.2%	56.3%	75 %	100 %
A	17	16	18	22	18	18
B	18	21	22	19	19	18
C	20	16	18	19	21	18
D	17	18	16	16	18	18
E	17	16	19	17	16	19
F	18	20	18	20	22	19
G	18	19	18	19	19	17
H	20	16	18	19	18	17
I	18	18	18	19	18	19
J	17	16	18	18	18	18
CV%	6.42	10.8	8.17	8.61	9.11	4.08
MEAN	18.0	17.6	18.30	18.8	18.7	18.1

*coefficient of variation = standard deviation x 100/mean

(Coef Of Var Statre 7Day Chronic Ceriodaphnia TQP3B = **6.42**)

STANDARD REFERENCE TOXICANTS

STANDARD TOXICANT USED AND SOURCE: SODIUM CHLORIDE
DATE AND TIME OF MOST RECENT TEST: 06/11/13
DILUTION WATER USED IN TEST: 20% DMW
RESULTS(LC50 OR, NOEC AND/OR ECL): LC50 = 1427 FATHEAD MINNOW
RESULTS(LC50 OR, NOEC AND/OR ECL): LC50 = 735 CERIODAPHNIA
ACCEPTABLE PERFORMANCE, STUDY 31= 100%.
PHYSICAL AND CHEMICAL METHODS USED:

SPECIFIC CONDUCTANCE METHOD 2510 B
OXYGEN, DISSOLVED METHOD 4500- O G
CHLORINE, TOTAL RESIDUAL METHOD 4500- C I F
ALKALINITY, CACO3 METHOD 2320 B

SUMMARY OF REFERENCE TOXICANT (S) ARE AS FOLLOWS:

FATHEAD MINNOW

Standard Recovery FATHEAD MINNOW 87.6%

CERIODAPHNIA

Standard Recovery CERIODAPHNIA 100%

APPENDIX 1A
TEST 1000.0

Permittee	Hope 16301							
Effluent	Percent Survival In Rep. Chambers				Mean Percent Survival			CV%*
Conc.	A	B	C	D	24h	48h	7 days	*
CONTROL	100	100	100	100	100	100	100	0.0
31.60%	100	100	100	100	100	100	100	0.0
42.20%	100	100	100	100	100	100	100	0.0
56.30%	100	100	100	100	100	100	100	0.0
75.00%	100	100	100	100	100	100	100	0.0
100.00%	100	100	100	90	100	100	97.5	5.1
Permittee	Hope 16301							
Effluent	Average Dry Weight (mg)				Mean Dry Weight (mg)			
Conc.	A	B	C	D	7 days	CV%*		
CONTROL	0.322	0.308	0.299	0.325	0.314	3.9		
31.6	0.333	0.309	0.309	0.316	0.317	3.6		
42.2	0.302	0.324	0.320	0.331	0.319	3.9		
56.3	0.310	0.336	0.311	0.328	0.321	4.0		
75	0.334	0.303	0.312	0.325	0.319	4.3		
100	0.333	0.329	0.317	0.324	0.326	2.1		

Figure 2. Survival data for fathead minnow larval survival and growth to

Discharger: Hope Test Dates: 8-27-13 1600
 Location: 16301 Analyst: AE/EA

Conc:	Rep. No.	No. Survivors							Remarks
		Day							
		1	2	3	4	5	6	7	
Control	1	10	10	10	10	10	10	10	
	2	10	10	10	10	10	10	10	
	3	10	10	10	10	10	10	10	
	4	10	10	10	10	10	10	10	
Conc:	5	10	10	10	10	10	10	10	
	6	10	10	10	10	10	10	10	
	7	10	10	10	10	10	10	10	
31.6 Conc:	8	10	10	10	10	10	10	10	
	9	10	10	10	10	10	10	10	
	10	10	10	10	10	10	10	10	
	11	10	10	10	10	10	10	10	
42.2 Conc:	12	10	10	10	10	10	10	10	
	13	10	10	10	10	10	10	10	
	14	10	10	10	10	10	10	10	
	15	10	10	10	10	10	10	10	
56.3 Conc:	16	10	10	10	10	10	10	10	
	17	10	10	10	10	10	10	10	
	18	10	10	10	10	10	10	10	
	19	10	10	10	10	10	10	10	
75 Conc:	20	10	10	10	10	10	10	10	
	21	10	10	10	9	9	9	9	
	22	10	10	10	10	10	10	10	
100 Conc:	23	10	10	10	10	10	10	10	
	24	10	10	10	10	10	10	10	

Comments:

Discharge: HOPE
 Location: 16301
 Analyst: W/ED

Test Date(s): 8-27-13
 Weighing Date: 9-5-13

Drying Temperature (°C): 104
 Drying Time (h): 2

Conc:	Rep. No.	A Wgt. of boat (mg)	B Dry wgt: foil and larvae (mg)	B-A Total dry wgt of larvae (mg)	C No. of larvae	(B-A)/C Mean dry wgt of larvae (mg)	Remarks
Control	1	130255	130577	322	10	.322	
	2	127114	127422	308	10	.308	
	3	125257	125550	299	10	.299	
	4	126496	126821	325	10	.325	
Conc:	5	129605	129938	333	10	.333	
	6	128210	128519	309	10	.309	
31.6 Conc:	7	124146	124455	309	10	.309	
	8	125487	125803	316	10	.316	
45 Conc:	9	129108	129410	302	10	.302	
	10	122704	123028	324	10	.324	
	11	126115	126435	320	10	.320	
42.2 Conc:	12	129002	129333	331	10	.331	
	13	131255	131565	310	10	.310	
56.3 Conc:	14	129450	129786	336	10	.336	
	15	132196	132507	311	10	.311	
	16	130403	130731	328	10	.328	
75 Conc:	17	125621	125955	334	10	.334	
	18	127384	127687	303	10	.303	
	19	129012	129324	312	10	.312	
	20	128284	128609	325	10	.325	
100 Conc:	21	122388	122688	300	9	.333	
	22	125406	125735	329	10	.329	
	23	128510	128827	317	10	.317	128827
	24	126282	126606	324	10	.324	

¹Adapted from Hughes, et al., 1987.

Control: 125333 125334

APPENDIX 2A
TEST 1002.0

conc.	Hope 16301	CERIO	REPLICATE CONTAINERS							s.d. = 1.1547	CV% = 6.415003			
control	DAY	1	2	3	4	5	6	7	8	9	10	#young	#adult	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3				1							2	10	0.20
temp:	4	3	2	4	3	1	4	4	2	2	3	28	10	2.80
temp:	5		1			2			1	1		5	10	0.50
temp:	6	6	6	5	7	5	6	6	7	7	6	61	10	6.10
temp:	7		2	3				1				6	10	0.60
temp:	8	8	7	8	6	9	7	8	10	7	8	78	10	7.80
	TOTAL	17	18	20	17	17	18	18	20	18	17	180	10	18.00
conc.	31.60 DAY	1	2	3	4	5	6	7	8	9	10	no. young	no. adults	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3	1										0	10	0.00
temp:	4	2	4	2	1	3	3	3	3	4	2	27	10	2.70
temp:	5				3		1				1	5	10	0.50
temp:	6	5	7	6	6	4	7	7	5	5	5	57	10	5.70
temp:	7	2				4			1	2		9	10	0.90
temp:	8	6	10	8	8	5	9	9	7	7	8	77	10	7.70
	TOTAL	16	21	16	18	16	20	19	16	18	16	176	10	17.60
CONC.	42.20 DAY	1	2	3	4	5	6	7	8	9	10	no. young	no. adults	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3					1		2				3	10	0.30
temp:	4	4	2	2	2	1	4	1	3	3	5	27	10	2.70
temp:	5		2		1	3		1				7	10	0.70
temp:	6	4	7	7	6	5	7	5	7	6	4	58	10	5.80
temp:	7	4				3		1		2		10	10	1.00
temp:	8	6	11	9	7	6	7	8	8	7	9	78	10	7.80
	TOTAL	18	22	18	16	19	18	18	18	18	18	183	10	18.30
CONC.	56.30 DAY	1	2	3	4	5	6	7	8	9	10	no. young	no. adults	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3											0	10	0.00
temp:	4	1	4	4	2	4	5	3	3	2	4	32	10	3.20
temp:	5	4			1			1				6	10	0.60
temp:	6	5	7	7	6	6	6	6	7	7	5	62	10	6.20
temp:	7	6			2						3	11	10	1.10
temp:	8	6	8	8	5	7	9	9	9	10	6	77	10	7.70
	TOTAL	22	19	19	16	17	20	19	19	19	18	188	10	18.80
CONC.	75.00 DAY	1	2	3	4	5	6	7	8	9	10	no. young	no. adults	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3				1			1	1			3	10	0.30
temp:	4	4	2	2	3	4	5	4	2	1	3	30	10	3.00
temp:	5			3						2		5	10	0.50
temp:	6	6	8	7	5	5	7	7	7	6	6	64	10	6.40
temp:	7											0	10	0.00
temp:	8	8	9	9	9	7	10	7	8	9	9	85	10	8.50
	TOTAL	18	19	21	18	16	22	19	18	18	18	187	10	18.70
CONC.	100.00 DAY	1	2	3	4	5	6	7	8	9	10	no. young	no. adults	
temp:	1											0	10	0.00
temp:	2											0	10	0.00
temp:	3		1					1				2	10	0.20
temp:	4	2	3	5	1	4	2	2	2	4	3	28	10	2.80
temp:	5	1			4							5	10	0.50
temp:	6	6	5	5	6	6	8	7	7	5	6	61	10	6.10
temp:	7		2			1				1		5	10	0.50
temp:	8	9	7	8	7	8	9	7	8	9	8	80	10	8.00
*	TOTAL	18	18	18	18	19	19	17	17	19	18	181	10	18.10

16301 Hope Creek

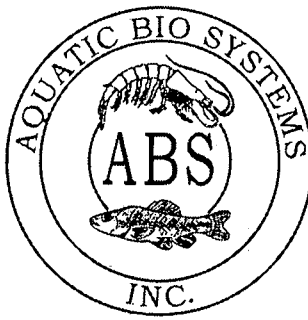
8-27-13 1600

CONC.	DAY	REPLICATE CONTAINERS										s.d.=	CVX =	#DIV/O!	
control	DAY	1	2	3	4	5	6	7	8	9	10	no. youn	no. adults	young/adult	
16301	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	3	2	4	3	1	4	4	2	2	3	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	6	6	5	7	8	6	6	7	7	6	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	8	7	8	6	9	7	8	10	7	8	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
31.6	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	2	4	2	1	3	3	3	3	4	2	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	5	7	6	6	4	7	7	5	5	5	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	6	10	8	8	5	9	9	7	7	8	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
42.2	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	4	2	2	2	1	4	1	3	3	5	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	4	7	7	6	5	7	5	7	6	4	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	6	11	9	7	6	7	8	8	7	9	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
56.3	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	4	4	4	2	4	5	3	3	2	4	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	5	7	7	6	6	6	6	7	7	5	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	6	8	8	5	7	9	9	9	10	6	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
75	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	4	2	2	3	4	5	4	2	1	3	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	6	8	7	5	5	7	7	7	6	6	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	8	9	9	9	7	10	7	8	9	9	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	
100	1											0			
temp:	2											0		#DIV/O!	
temp:	3											0		#DIV/O!	
temp:	4	2	3	5	1	4	2	2	2	4	3	0	10	#DIV/O!	
temp:	5											0		#DIV/O!	
temp:	6	6	5	5	6	6	8	7	7	5	6	0	10	#DIV/O!	
temp:	7											0		#DIV/O!	
temp:	8	9	7	8	7	8	9	7	8	9	8	0	10	#DIV/O!	
*	TOTAL	0	0	0	0	0	0	0	0	0	0	0	10	0.00	

Fig. 2 - CERIO page 34

APPENDIX B
ORGANISM HISTORY

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524



Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 8/26/2013

SPECIES: *Pimephales promelas*

AGE: N/A

LIFE STAGE: Embryo

HATCH DATE: 8/26/2013

BEGAN FEEDING: N/A

FOOD: N/A

Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>24°C</u>	<u>--</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO ₃):	<u>110 mg/l</u>	<u>--</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>80 mg/l</u>	<u>--</u>
pH:	<u>7.90</u>	<u>--</u>

Comments:

Facility Supervisor

Rec'd
8-27-13
16301

APPENDIX C
CHAINS OF CUSTODY

CHAIN OF CUSTODY RECORD

TURN AROUND TIME
RUSH 24HR. 48 HR.
5 DAY REG
OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 16301.0001B

CLIENT # 15020

P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR

C 4= COOL TO 4.C

S<2= SULFURIC ACID TO pH<2

N<2= NITRIC ACID TO pH<2

T= THIOSULFATE FOR DECHLORINATION

W= WINKLER AZIDE MODIFICATION

P= MEMBRANE ELECTRODE

NaOH= pH >12

110913A2

OF COMPANY, CITY, OR PROJECT

PROJECT NO:

SAMPLER(S) NAME: (PRINT)

CITY OF Hope

ISCO AUTOMATIC SAMPLER

PLE	SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
		DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
	<u>WPFE</u>	<u>6 AM 8/25/13</u>	<u>6 AM 8/26/13</u>	<u>24H Comp</u>	<u>7.74</u>	<u>C4</u>				<u>6-1/2 gal</u>	<u>W.E.T</u>

METHOD OF SHIPMENT (CIRCLE) FED EX WALK IN SRA UPS OTHER	FIELD CALIBRATION RECORD pH 7 pH 4 pH 10 D.O	NOTES/COMMENTS/OBSERVATIONS <u>Temp @ Lab 2.0° 1335</u>
TYPE OF SAMPLE(S): (CIRCLE) WATER SOIL W/W SLUDGE OTHER		FIELD ANALYSIS CONDUCTED BY: (CIRCLE) SRA CLIENT

RELINQUISHED BY: Kim Halston DATE/TIME: 8/26/13 @ 1:34 p RECEIVED BY: Danny Riddle DATE/TIME: 8-26-13

RELINQUISHED BY: _____ DATE/TIME: _____ RECEIVED BY: _____ DATE/TIME: 13



SORRELLS RESEARCH ASSOCIATES, INC

8100 NATIONAL DRIVE, LITTLE ROCK, AR 72209

501-562-8139 800-331-8139

FAX 501-562-7025

CHAIN OF CUSTODY RECORD

TURN AROUND TIME

RUSH 24HR. 48 HR.

5 DAY REG

OTHER _____

FOR LAB/OFFICE USE ONLY

LAB # 16301-0002 B

CLIENT # 15020

P.O.# _____

STANDARD METHODS PRESERVATION PER EPA 40 CFR

C 4= COOL TO 4.C

S<2= SULFURIC ACID TO pH<2

N<2= NITRIC ACID TO pH<2

T= THIOSULFATE FOR DECHLORINATION

W= WINKLER AZIDE MODIFICATION

P= MEMBRANE ELECTRODE

NaOH= pH >12

OF COMPANY, CITY, OR PROJECT

PROJECT NO:

SAMPLER(S) NAME: (PRINT)

11091342

City of Hope

1500 Automatic

SAMPLE ID AND/OR COLLECTION LOCATION	START	END	COMP	FIELD ANALYSIS				D.O (W)	CONTAINER TYPE	ANALYSIS REQUIRED
	DATE/TIME	DATE/TIME	GRAB	pH	TEMP	FLOW	CL2	D.O(P)	PRESERVATIVE	
<u>WTFE</u>	<u>6AM 8-27-13</u>	<u>6AM 8-28-13</u>	<u>24 Hr Comp</u>		<u>CA</u>				<u>6-1/2 gal Plastic</u>	<u>W.E.T</u>

METHOD OF SHIPMENT (CIRCLE)
 FED EX WALK IN SRA UPS OTHER

FIELD CALIBRATION RECORD

pH 7			
pH 4			
pH 10			
D.O			

NOTES/COMMENTS/OBSERVATIONS

Containers CA
pH, temp @ lab = 7.6, 21.6°C

TYPE OF SAMPLE(S): (CIRCLE)
 WATER SOIL W/W SLUDGE OTHER

FIELD ANALYSIS CONDUCTED BY: (CIRCLE) SRA CLIENT

RELINQUISHED BY: ROL SMITH

DATE/TIME: 8/28/13 @ 12:32pm REC

BY: [Signature]

DATE/TIME: 8-28-13 12:32

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY (LAB):

DATE/TIME: 8-28-13 16

APPENDIX D
LABORATORY CONTROL
CERIO CULTURE RECORD

8-19-13

DATE START	*														
DATE END	*														
ANALYST	*														
WATER TYPE	*			day 8		day 14									
% SURVIVAL	*			#VALUE!		#VALUE!									
#YOUNG MEAN				0											
stnd DEV from mean		0		#DIV/0!											

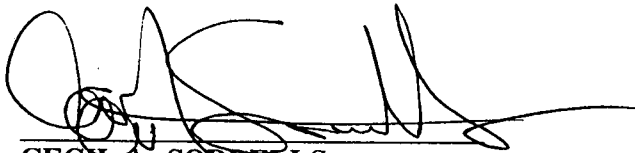
DAY	REPLICATE NUMBER										No.	No.	Young/
	1	2	3	4	5	6	7	8	9	10	Young	Adults	Adult
1											0		#####
2											0		#####
3			1							1	0	10	#####
4	3	4	2	2	4	3	3	5	4	4	0	10	#####
5		1		2							0	11	#####
6	5	6	5	4	7	7	6	6	5	7	0	10	#####
7		2	3	2	1				4	1	0	10	#####
8	8	7	9	9	7	10	8	8	6	9	0	10	#####
total8	0	0	0	0	0	0	0	0	0	0	0		#####
9											0		#####
10											0		#####
11											0		#####
12											0		#####
13											0		#####
14											0		#####
total14											0		#####

DAY	REPLICATE NUMBER										No.	No.	Young/
	11	12	13	14	15	16	17	18	19	20	Young	Adults	Adult
1											0		#####
2											0		#####
3											0	10	#####
4	4	3	3	3	3		2	4	2	3	0	10	#####
5		2		1		4	1		3		0	10	#####
6	5	7	7	6	6	3	7	5	7	6	0	10	#####
7	3				2	5	1				0	10	#####
8	7	8	10	7	9	9	8	11	9	8	0	10	#####
total8	0	0	0	0	0	0	0	0	0	0	0	10	0
9											0		#####
10											0		#####
11											0		#####
12											0		#####
13											0		#####
14											0		#####
total14	0	0	0	0	0	0	0	0	0	0	0	10	0

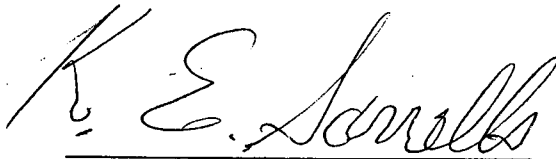
8-19-13

**BIOMONITORING ANALYSIS
BY
SORRELLS RESEARCH ASSOCIATES, INC**

REVIEW



**CECIL A. SORRELLS
BIOMONITORING MANAGER/PRESIDENT**



**K.E. SORRELLS, M.S.
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