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RETURN RECEIPT REQUESTED

July 12, 2016

Arkansas Department of Environmental Quality  
NPDES Enforcement Section  
5301 Northshore Drive  
North Little Rock, AR 72118-5317

RE: Discharge Monitoring Report  
Magnet Cove Generating Station  
Permit Number AR0049611

To Whom It May Concern:

Attached, please find the Monthly Discharge Monitoring Reports listed in the table below:

Discharge Number	Monitoring Period (year, month, day)
AR0049611 – 01A A	2016 / 06 / 01 – 2016 / 06 / 30
AR0049611 – 001 A	2016 / 06 / 01 – 2016 / 06 / 30
AR0049611 – 01B A	2016 / 06 / 01 – 2016 / 06 / 30

Attached, please find the Quarterly Discharge Monitoring Reports listed in the table below:

Discharge Number	Quarterly Period (year, month, day)
TX1 Q	2016 / 01 / 01 – 2016 / 06 / 30

If you have any questions, please feel free to contact me at 501-618-4373, or John Morgan at 501-618-4374.

Sincerely,

Rob Smith  
Plant Manager

RS: jmm

Cc: File 8.5.14 – 2016

Direct Line: 501-618-4373  
Direct Fax: 501-618-4399  
Email: [rob.smith@aecc.com](mailto:rob.smith@aecc.com)

# Arkansas Analytical, Inc.

**Toxicity Test Results**  
**AECC – Magnet Cove Plant**  
**April 2016**  
**AFIN #30-00337**

*Pimephales promelas*, Acute Toxicity, EPA-821-R-02-012, October 2002

*Daphnia pulex*, Acute Toxicity, EPA-821-R-02-012, October 2002

Prepared for: **Mr. John Morgan**  
**AECC – Magnet Cove**  
**410 Henderson**  
**Malvern, AR 72104**

Prepared by: Arkansas Analytical, Inc.  
8100 National Drive  
Little Rock, Arkansas 72209  
**Lab Number K1604004**

Monday, April 18, 2016

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## **Introduction**

This report contains test results for the toxicity testing of AECC – Magnet Cove Plant. The NPDES permit number is AR0049611. The permit requires acute biomonitoring testing semi annually for both *Daphnia pulex* and *Pimephales promelas*. The test results in this report represent the testing for the first half of 2016.

The facility is located 6.5 miles North of Malvern and 2.3 miles South of Magnet Cove near Highway 270 in Section 28, Township 3 South, Range 17 West in Hot Spring County, Arkansas. The discharge is to receiving waters named Ouachita River in Segment 2F of the Ouachita River Basin.

## **Plant Operations**

To be provided by permittee.

### Source of Effluent and Dilution Water

The samples were 24-hour composites collected at the final discharge of Outfall 001. Mean daily discharge is to be provided by permittee.

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended	Date, Time Received	Storage Temperature (°C)
SAMPLE A:	4-4-16, 1430	4-5-16, 1330	4-5-16, 1620	4
SAMPLE B:	4-5-16, 1519	4-6-16, 1419	4-6-16, 1627	7

The dilution water used was soft synthetic water prepared in the lab.

Chain of custody documentation and flow documentation are located in Appendix A.

Both effluent samples and dilution water samples were analyzed for pH, hardness, total alkalinity, and conductivity. Results are provided in Appendix B.

### Dilution Series

Five dilutions in addition to a control (0% effluent) were used in the toxicity tests. The dilutions, which were made with soft synthetic water, were 5%, 7%, 10%, 13%, and 17%. The low-flow effluent concentration (**critical dilution**) was defined as **13% effluent**.

## Test Methods

The analyses performed were 48 Hour Static Renewal Acute Toxicity Tests using the fathead minnow, *Pimephales promelas*, and the daphnid, *Daphnia pulex*. The tests were conducted according to EPA-821-R-02-012, October 2002. The endpoint of the test is death, established by either no movement or no reaction to gentle prodding. Raw data is provided in Appendix B. Statistics are provided in Appendix C.

	<i>Daphnia Pulex</i>	<i>Pimephales promelas</i>
Deviation from method:	None	None
Date, Time Started	4-6-16, 1140	4-6-16, 1230
Date, Time Ended	4-8-16, 1200	4-8-16, 1220
Type and volume of test chambers:	1-ounce plastic cups	500 ml plastic cups
Volume of solution per chamber:	25 milliliters	250 milliliters
Number of organisms per chamber:	8	10
Number of replicates:	5	5
Feeding frequency and amount:	None	None
Acclimation temperature of organisms:	25 degrees Centigrade	25 degrees Centigrade
Test temperature:	25 degrees Centigrade	25 degrees Centigrade

## Test Organisms

	<i>Daphnia pulex</i>	<i>Pimephales promelas</i>
Scientific name:	<i>Daphnia pulex</i>	<i>Pimephales promelas</i>
Age:	< 24 hours old	6 days old
Source:	In house culture	Aquatox
Diseases and treatment	None	None

Organism History is provided in Appendix D.

## Quality Assurance

### Test Acceptability

#### TEST ACCEPTANCE CRITERIA for *Daphnia pulex*

Control Criteria	Results	Pass	Fail
Greater than or equal to 90% survival	97.5%	X	

#### TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 90% survival	100%	X	

### Reference Toxicant

The reference toxicant used was Potassium Chloride prepared in-house. The tests were performed using moderately hard synthetic as dilution water. The results of the reference toxicant were:

#### REFERENCE TOXICANT

<i>Daphnia pulex</i> 3/5/16 - 3/7/16		<i>Pimephales promelas</i> 3/5/16 - 3/7/16	
NOEC Survival:	500 ppm KCl	NOEC Survival:	500ppm KCl
LOEC Survival:	1000 ppm KCl	LOEC Survival:	1000 ppm KCl
LC50:	722 ppm KCl	LC50:	1050 ppm KCl

Quality Assurance charts are provided in Appendix E.

**Summary of Results**  
**AECC – Magnet Cove Plant**

<i>Daphnia pulex</i>			<i>Pimephales promelas</i>		
NOEC / LOEC Survival	17% / NA	PASS	NOEC / LOEC Survival	17% / NA	PASS
LC50	NA	NA	LC50	NA	NA

**Conclusion**

EPA-821-R-02-012, October 2002, *Pimephales promelas*

The permit issued to AECC – Magnet Cove, permit AR0049611, specifies that the **critical dilution is 13% effluent**. The effluent samples **did not** exhibit acute toxicity at the critical dilution, and, as such, the effluent samples **passed** the test. Therefore, there is no further action to be taken.

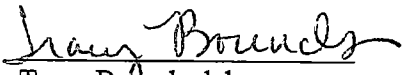
EPA-821-R-02-012, October 2002, *Daphnia pulex*

The permit issued to AECC – Magnet Cove, permit AR0049611, specifies that the **critical dilution is 13% effluent**. The effluent samples **did not** exhibit acute toxicity at the critical dilution, and, as such, the effluent samples **passed** the test. Therefore, there is no further action to be taken.

Biomonitoring Analyst:

Tracy Bounds, Zabrina Ruggles

Reviewed by:

  
Tracy Bounds, lab manager

**ACUTE FORMS**  
**FATHEAD MINNOW SURVIVAL RESULTS**  
*(Pimephales promelas)*

PERMITTEE: AECC – Magnet Cove

NPDES #: AR0049611

Sample Collection:	Date, Time Started	Date, Time Ended
SAMPLE A:	4-4-16, 1430	4-5-16, 1330
SAMPLE B:	4-5-16, 1519	4-6-16, 1419

Test initiated (date, time): 4-6-16, 1230      Test terminated (date, time): 4-8-16, 1220

Dilution water used:      Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL**

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival		
	A	B	C	D	E		24 hours	48 hours	CV %
Control	100	100	100	100	100		100	100	0.00
5%	100	90	100	100	100		98	98	
7%	100	100	90	100	100		100	98	
10%	100	100	100	100	100		100	100	
13%	100	100	100	100	100		100	100	0.00
17%	100	100	100	100	100		100	100	

Coefficient of Variation = standard deviation / mean \* 100



SUMMARY REPORTING FORMS FOR ACUTE BIOMONITORING  
FATHEAD MINNOW LARVAE SURVIVAL  
48 hr Acute  
*Pimephales promelas*

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

Is the mean survival at 48 hours significantly different ( $p=0.05$ ) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%)      YES \_\_\_\_\_ NO X

2. If you answered NO to 1a. enter [0] otherwise enter [1]: 0

3. Enter the response to item 2 on DMR Form, parameter #TEM6C.

4. Enter percentage for the corresponding parameters below:

a.) Survival NOEC (parameter TOM6C): 17 % effluent.

b.) Coefficient of variation (parameter TQM6C): 0.00 %.

**ACUTE FORMS**  
*Daphnia pulex* SURVIVAL RESULTS

Permittee: AECC – Magnet Cove

NPDES #: AR0049611

Sample Collection:	Date, Time Started	Date, Time Ended
SAMPLE A:	4-4-16, 1430	4-5-16, 1330
SAMPLE B:	4-5-16, 1519	4-6-16, 1419

Test initiated (date, time): 4-6-16, 1140      Test terminated (date, time): 4-8-16, 1200

Dilution water used:    Soft Synthetic

**DATA TABLE FOR *Daphnia pulex* SURVIVAL**

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24 hours	48 hours		
Control	100	100	100	87.5	100	97.5	97.5	5.73	
5%	100	87.5	100	100	100	97.5	97.5		
7%	100	100	100	100	100	100	100		
10%	100	100	100	100	100	100	100		
13%	100	100	100	100	100	100	100	0.00	
17%	87.5	100	100	100	87.5	95	95		

Coefficient of Variation = standard deviation/ mean \* 100

SUMMARY REPORTING FORMS FOR ACUTE BIOMONITORING  
*Daphnia pulex* SURVIVAL  
48 hr Acute

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

Is the mean survival at 48 hours significantly different ( $p=0.05$ ) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%)      YES \_\_\_\_\_ NO X

2. If you answered NO to 1a. Enter [0] otherwise enter [1]: 0

3. Enter the response to item 2 on DMR Form, parameter #TEM3D.

4. Enter percentage corresponding to the parameters below:

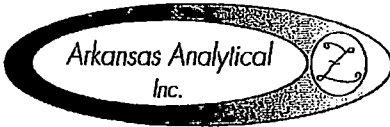
a.) Survival NOEC (parameter TOM3D): 17 % effluent.

b.) Coefficient of variation (parameter TQM3D): 5.73 %.

APPENDIX A





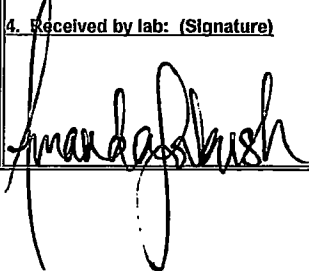
Chain of Custody Forms



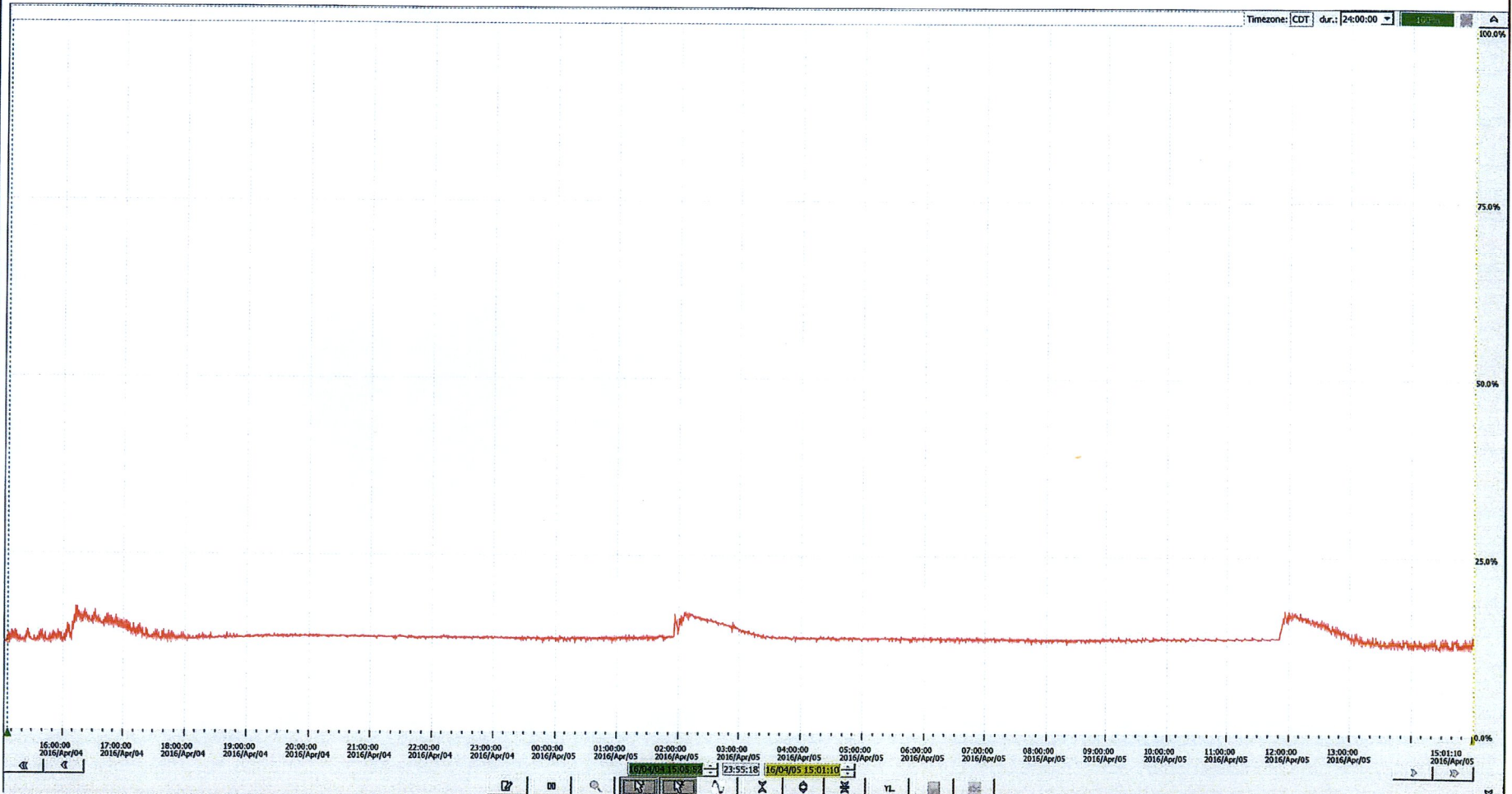


8100 National Dr.  
 Little Rock, AR 72209  
 PHONE: 501-455-3233  
 FAX: 501-455-6118

# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION			Project Description			Turnaround Time		Preservation Codes:									
AECC - Magnet Cove Plant			Acute Toxicity			1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination					
410 Henderson Rd.						2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid(HCl)					
Malvern, AR 72109			Reporting Information			3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12					
Attn: John Morgan			Telephone: 501-467-3232			Routine		TEST PARAMETERS								Bottle Type Code	
			Fax: 501-467-3233			Preservative Code: 1										G = Glass; P = Plastic	
			Email: john.morgan@aecc.com; john.mehlin@aecc.com			Bottle Type: P										V = Septum; A = Amber	
 Sampler(s) Signature			Allen Parker Sampler(s) Printed					Acute Biomonitoring								Arkansas Analytical Work Order Number:	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION										
	Date/s	Time/s					Outfall 001					X		K1604004A			
	4/4-5/16	1430-1330		X	24	Water											
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS							
		1620 4-5-16				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No											
						2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No											
						3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No											
						4. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No											
						5. TEMPERATURE ON RECEIPT: 4 °C											
						6. TEMPERATURE GUN ID: HHT# 2											
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY											
																	

# MAGNET COVE



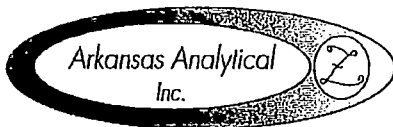
TAG COLOR	SIGNAL TAG	DESIGNATION	RANGE LOW	RANGE HI	CURSOR 1	CURSOR 2	Y DIFF	UNIT	LAST
	19GMA98CF101 XQ01	COMB EFF MIX/MNTR CHAM FL	0.0000	1500	184.4092	191.2432	-6.8340	GPM	191.2432

Constant flow  
as per J. Morgan  
fb 4-6-16

Date	15/01/16	WASTE WATER EFFLUENT-10GBB10EJ100	= WASTE WATER EFFLUENT					
Drawn By			+					
Checked By								
State	Change	Date	Editor	Standard	Trend Display 19GMA98CF101 XQ01	en		Page 1 Pg. 1

**Arkansas Analytical # K1604004 A**  
**Magnet Cove**  
**Flow Composite Information**

<b>Date</b>	<b>Time</b>	<b>Sample #</b>	<b>Volume (mL)</b>	<b>Flow (GPM)</b>
4/4/2016	1600	1	50	184
4/4/2016	1700	2	50	184
4/4/2016	1800	3	50	184
4/4/2016	1900	4	50	184
4/4/2016	2000	5	50	184
4/4/2016	2100	6	50	184
4/4/2016	2200	7	50	184
4/4/2016	2300	8	50	184
4/4/2016	2400	9	50	184
4/5/2016	0100	10	50	184
4/5/2016	0200	11	50	184
4/5/2016	0300	12	50	184
4/5/2016	0400	13	50	184
4/5/2016	0500	14	50	184
4/5/2016	0600	15	50	184
4/5/2016	0700	16	50	184
4/5/2016	0800	17	50	184
4/5/2016	0900	18	50	184
4/5/2016	1000	19	50	184
4/5/2016	1100	20	50	184
4/5/2016	1200	21	50	184
4/5/2016	1300	22	50	184
4/5/2016	1400	23	50	184
4/5/2016	1500	24	50	184
		<b>TOT VOL=</b>	<b>1200</b>	



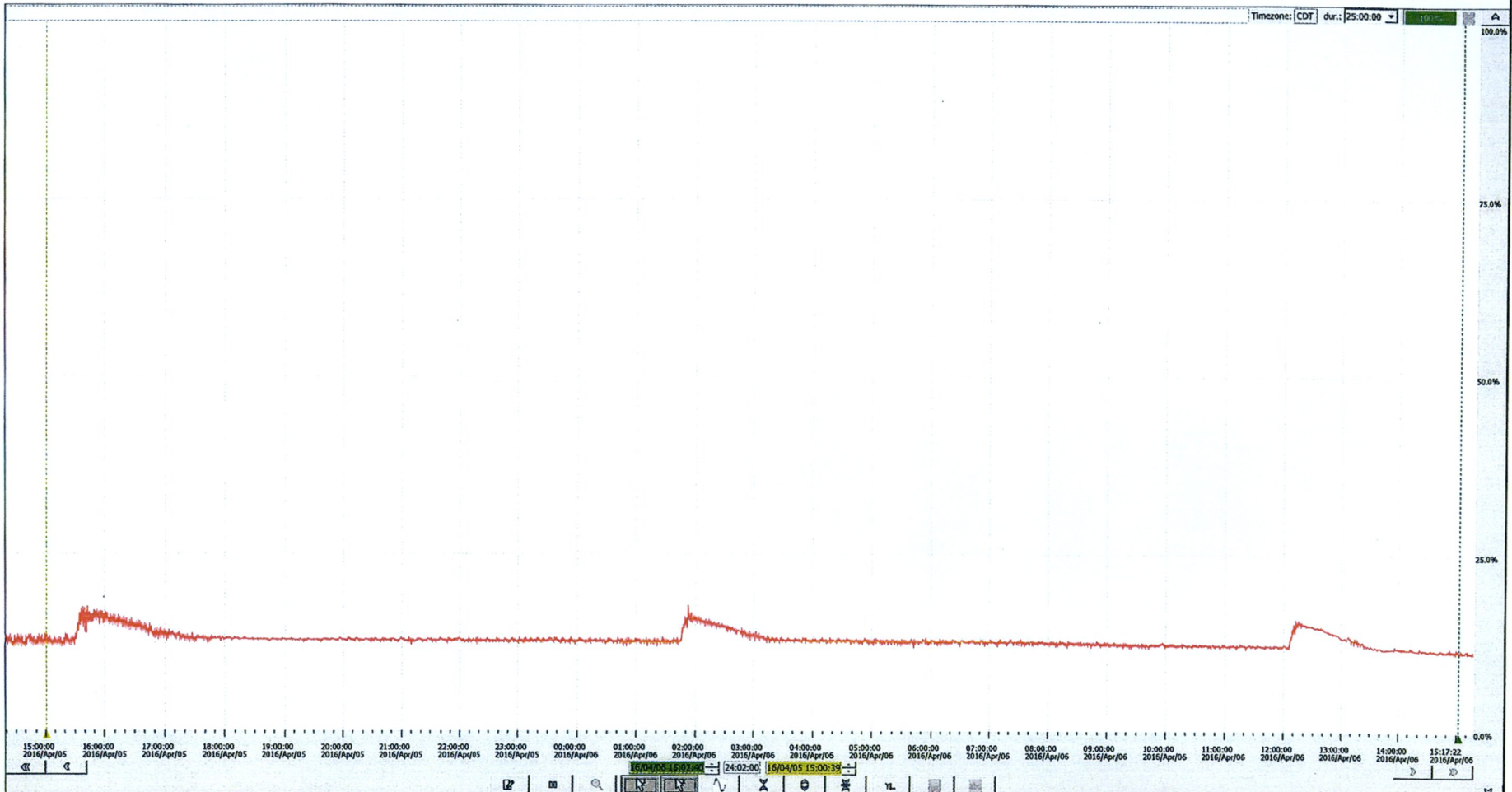
8100 National Dr.  
 Little Rock, AR 72209  
 PHONE: 501-455-3233  
 FAX: 501-455-6118

# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION			Project Description			Turnaround Time		Preservation Codes:												
AECC - Magnet Cove Plant 410 Henderson Rd. Malvern, AR 72109			Acute Toxicity			1 Day (100%) 2 Day (50%) 3 Day (25%)		1. Cool, 4 Degrees Centigrade 2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2 3. Nitric Acid (HNO <sub>3</sub> ), pH < 2					4. Thiosulfate for Dechlorination 5. Hydrochloric Acid(HCl) 6. Sodium Hydroxide (NaOH), pH > 12							
Attn: John Morgan			Reporting Information			Routine		TEST PARAMETERS										Bottle Type Code		
Telephone: 501-467-3232			Telephone: 501-467-3232			Preservative Code: 1												G = Glass; P = Plastic V = Septum; A = Amber		
Fax: 501-467-3233			Email: john.morgan@aecc.com; john.mehlin@aecc.com			Bottle Type: P												Arkansas Analytical Work Order Number:		
 Allen Parker Cecil Samrells			Allen Parker Cecil Samrells			Acute Biomonitoring														
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION													
	Date/s	Time/s																		
	4/5-6/16	1519-1419		X	24	Water	Outfall 001	X											K16040048	
1. Relinquished by: (Signature)			Date/Time			2. Received by: (Signature)			SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS					
			4-6-16 4:27						1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 7 °C 6. TEMPERATURE GUN ID: HHT# 2											
3. Relinquished by: (Signature)			Date/Time			4. Received by lab: (Signature)			FOR COMPLETION BY LAB ONLY											



# MAGNET COVER



TAG COLOR	SIGNAL TAG	DESIGNATION	RANGE LOW	RANGE HI	CURSOR 1	CURSOR 2	Y DIFF	UNIT	LAST
	19GMA98CF101 XQ01	COMB EFF MDX/HNTR CHAM FL	0.0000	1500	171.6079	202.3410	-30.7330	GPM	166.2969

Date	15/01/16	WASTE WATER EFFLUENT-10GBB10EJ100	= WASTE WATER EFFLUENT					
Drawn By			+					
Checked By								
State	Change	Date	Editor	Standard	Trend Display 19GMA98CF101 XQ01	en	Page 1	
© 2007 SIEMENS AG. All Rights Reserved.							Page 1	2016/04/06 15:19:37

**Arkansas Analytical # K1604004 B**  
**Magnet Cove**  
**Flow Composite Information**

<b>Date</b>	<b>Time</b>	<b>Sample #</b>	<b>Volume (mL)</b>	<b>Flow (GPM)</b>
4/5/2016	1500	1	50	172
4/5/2016	1600	2	50	172
4/5/2016	1700	3	50	172
4/5/2016	1800	4	50	172
4/5/2016	1900	5	50	172
4/5/2016	2000	6	50	172
4/5/2016	2100	7	50	172
4/5/2016	2200	8	50	172
4/5/2016	2300	9	50	172
4/5/2016	2400	10	50	172
4/6/2016	0100	11	50	172
4/6/2016	0200	12	50	172
4/6/2016	0300	13	50	172
4/6/2016	0400	14	50	172
4/6/2016	0500	15	50	172
4/6/2016	0600	16	50	172
4/6/2016	0700	17	50	172
4/6/2016	0800	18	50	172
4/6/2016	0900	19	50	172
4/6/2016	1000	20	50	172
4/6/2016	1100	21	50	172
4/6/2016	1200	22	50	172
4/6/2016	1300	23	50	172
4/6/2016	1400	24	50	172
<b>TOT VOL=</b>			1200	

APPENDIX B

Physical, Chemical, and Raw Data for Fathead Minnow and *Daphnia pulex*

Biomonitoring Report  
Acute 24/48 Hour Static Test

Lab Number: K1604004	Test Organism: Fathead minnows
Client: MECC - Magnet Cove	Age of Organism: 6 days
Date/ Time Started: 4-6-16 / 1230	Source of Organism: Aquatox
Date/ Time Ended: 4-8-16 / 1220	Dilution Water: SS 320

Conc.	Rep #	# Live Organisms			pH/Temp.		Dissolved O <sub>2</sub> mg/L		Alkalinity mg/L		Hardness mg/L		Conductivity		T Res Cl mg/L	
		0 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr
Control	A	10	10	10	7.8/7.3	8.8/7.8	7.9/7.3	8.0/7.2								
	B				24/25	23/25										
	C							SS 320	32	42	142	1188	0.07	0.00		
	D							A/B	156	154	348	334	1212	1188	0.07	0.00
	E															
5%	A	10	10	10	7.9/7.5	8.1/7.8	8.4/7.2	8.1/7.4								
	B		9	9	24/25	21/25										
	C		10	10												
	D			10												
	E			10												
7%	A	10	10	10	8.1/7.4	8.2/7.7	8.6/7.2	8.5/7.4								
	B		10	10	24/25	22/25										
	C			9												
	D			10												
	E			10												
10%	A	10	10	10	8.2/7.6	8.2/7.7	8.4/7.3	8.6/7.4								
	B				24/25	22/25										
	C															
	D															
	E															
13%	A	10	10	10	8.2/7.6	8.3/7.7	8.3/7.1	8.6/7.4								
	B				24/25	21/25										
	C															
	D															
	E															
17%	A	10	10	10	8.3/7.6	8.3/7.8	8.3/7.0	8.7/7.6								
	B				24/25	21/25										
	C															
	D															
	E															

Biomonitoring Report  
Acute 24/48 Hour Static Test

Lab Number: K1604004	Test Organism: <i>Daphnia pulex</i>
Client: AECC - Magnet	Age of Organism: 224 hrs
Date/ Time Started: 4-6-16/ 1140	Source of Organism: In house
Date/ Time Ended: 4-8-16/ 1200	Dilution Water: SS 320

Conc.	Rep #	# Live Organisms			pH/Temp.		Dissolved O <sub>2</sub> mg/L		Alkalinity mg/L		Hardness mg/L		Conductivity		T Res Cl mg/L		
		0 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	24 hr	48 hr	
CONTROL	A	8	8	8	7.8/8.1	7.8/8.2	7.9/8.5	8.0/8.3									
	B	8	8	8	24/25	23/25											
	C	8	8	8					SS 320	32	42	142	142	1405	1405		
	D	7	7	7					A/B	150	154	348	334	1212	1188	0.07	0.00
	E	8	8	8													
5%	A	8	8	8	7.9/8.2	8.1/8.1	8.4/9.0	8.1/8.6									
	B	7	7	7	24/25	21/25											
	C	8	8	8													
	D	8	8	8													
	E	8	8	8													
7%	A	8	8	8	8.1/8.2	8.2/8.1	8.6/9.0	8.5/8.5									
	B	8	8	8	24/25	22/25											
	C	8	8	8													
	D	8	8	8													
	E	8	8	8													
10%	A	8	8	8	8.2/8.2	8.2/8.1	8.4/9.0	8.6/8.6									
	B	8	8	8	24/25	22/25											
	C	8	8	8													
	D	8	8	8													
	E	8	8	8													
13%	A	8	8	8	8.3/8.1	8.3/8.0	8.3/9.1	8.6/8.7									
	B	8	8	8	24/25	21/25											
	C	8	8	8													
	D	8	8	8													
	E	8	8	8													
17%	A	8	7	7	8.3/8.1	8.3/8.0	8.3/9.1	8.7/8.7									
	B	8	8	8	24/25	21/25											
	C	8	8	8													
	D	8	8	8													
	E	7	7	7													

APPENDIX C

Fathead Minnow and *Daphnia pulex* Statistics

AA # K1604004, FATHEAD MINNOW 48 HR ACUTE, 4-6-16  
File: magnetF Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.042

W = 0.547

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.

AA # K1604004, FATHEAD MINNOW 48 HR ACUTE, 4-6-16  
File: magnetF Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance

Bartlett's test for homogeneity of variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.  
Additional transformations are useless.

TITLE: AA # K1604004, FATHEAD MINNOW 48 HR ACUTE, 4-6-16  
FILE: magnetF  
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	5 % EFFLUENT	1	1.0000	1.4120
2	5 % EFFLUENT	2	0.9000	1.2490
2	5 % EFFLUENT	3	1.0000	1.4120
2	5 % EFFLUENT	4	1.0000	1.4120
2	5 % EFFLUENT	5	1.0000	1.4120

3	7 %	EFFLUENT	1	1.0000	1.4120
3	7 %	EFFLUENT	2	1.0000	1.4120
3	7 %	EFFLUENT	3	0.9000	1.2490
3	7 %	EFFLUENT	4	1.0000	1.4120
3	7 %	EFFLUENT	5	1.0000	1.4120
4	10 %	EFFLUENT	1	1.0000	1.4120
4	10 %	EFFLUENT	2	1.0000	1.4120
4	10 %	EFFLUENT	3	1.0000	1.4120
4	10 %	EFFLUENT	4	1.0000	1.4120
4	10 %	EFFLUENT	5	1.0000	1.4120
5	13 %	EFFLUENT	1	1.0000	1.4120
5	13 %	EFFLUENT	2	1.0000	1.4120
5	13 %	EFFLUENT	3	1.0000	1.4120
5	13 %	EFFLUENT	4	1.0000	1.4120
5	13 %	EFFLUENT	5	1.0000	1.4120
6	17 %	EFFLUENT	1	1.0000	1.4120
6	17 %	EFFLUENT	2	1.0000	1.4120
6	17 %	EFFLUENT	3	1.0000	1.4120
6	17 %	EFFLUENT	4	1.0000	1.4120
6	17 %	EFFLUENT	5	1.0000	1.4120

AA # K1604004, FATHEAD MINNOW 48 HR ACUTE, 4-6-16  
 File: magnetF 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	1.412				
2	5 % EFFLUENT	1.379	25.00	16.00	5.00	
3	7 % EFFLUENT	1.379	25.00	16.00	5.00	
4	10 % EFFLUENT	1.412	27.50	16.00	5.00	
5	13 % EFFLUENT	1.412	27.50	16.00	5.00	
6	17 % EFFLUENT	1.412	27.50	16.00	5.00	

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



AA# K1604004, DAPNIA PULEX ACUTE 48H, 4-6-16  
File: magnetD Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.094

W = 0.760

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.

AA# K1604004, DAPNIA PULEX ACUTE 48H, 4-6-16  
File: magnetD Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance

Bartlett's test for homogeneity of variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.  
Additional transformations are useless.

TITLE: AA# K1604004, DAPNIA PULEX ACUTE 48H, 4-6-16  
FILE: magnetD  
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	0.8750	1.2094
1	CONTROL	5	1.0000	1.3931
2	5 % EFFLUENT	1	1.0000	1.3931
2	5 % EFFLUENT	2	0.8750	1.2094
2	5 % EFFLUENT	3	1.0000	1.3931
2	5 % EFFLUENT	4	1.0000	1.3931
2	5 % EFFLUENT	5	1.0000	1.3931

3	7 %	EFFLUENT	1	1.0000	1.3931
3	7 %	EFFLUENT	2	1.0000	1.3931
3	7 %	EFFLUENT	3	1.0000	1.3931
3	7 %	EFFLUENT	4	1.0000	1.3931
3	7 %	EFFLUENT	5	1.0000	1.3931
4	10 %	EFFLUENT	1	1.0000	1.3931
4	10 %	EFFLUENT	2	1.0000	1.3931
4	10 %	EFFLUENT	3	1.0000	1.3931
4	10 %	EFFLUENT	4	1.0000	1.3931
4	10 %	EFFLUENT	5	1.0000	1.3931
5	13 %	EFFLUENT	1	1.0000	1.3931
5	13 %	EFFLUENT	2	1.0000	1.3931
5	13 %	EFFLUENT	3	1.0000	1.3931
5	13 %	EFFLUENT	4	1.0000	1.3931
5	13 %	EFFLUENT	5	1.0000	1.3931
6	17 %	EFFLUENT	1	0.8750	1.2094
6	17 %	EFFLUENT	2	1.0000	1.3931
6	17 %	EFFLUENT	3	1.0000	1.3931
6	17 %	EFFLUENT	4	1.0000	1.3931
6	17 %	EFFLUENT	5	0.8750	1.2094

AA# K1604004, DAPNIA PULEX ACUTE 48H, 4-6-16  
 File: magnetD 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	1.356				
2	5 % EFFLUENT	1.356	27.50	16.00	5.00	
3	7 % EFFLUENT	1.393	30.00	16.00	5.00	
4	10 % EFFLUENT	1.393	30.00	16.00	5.00	
5	13 % EFFLUENT	1.393	30.00	16.00	5.00	
6	17 % EFFLUENT	1.320	25.00	16.00	5.00	

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

APPENDIX D

Organism History

# AQUATOX, INC.

416 TWIN POINTS ROAD  
HOT SPRINGS, ARKANSAS 71913  
501-520-0560

## TEST ORGANISM HISTORY

DATE SHIPPED 4/1/16 CLIENT ARK ANALYTICAL

Purchase Order #: \_\_\_\_\_

SPECIES: Pimephales promelas

Quantity Shipped: 800+ 15-1600  
CSF

Age: HATCHED 3/31/16

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO3): = 160

Dissolved Oxygen (Mg/l): 8.5

Temperature (°C): 25.1

Feeding: ARTEMIA

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Shipped Via:  Federal Express  UPS Overnight  Shuttle

Packaged By: \_\_\_\_\_



# Aquatic Research Organisms

## DATA SHEET

### I. Organism History

Species: Daphnia pulex  
Source: Lab reared  Hatchery reared \_\_\_\_\_ Field collected \_\_\_\_\_  
Hatch date 7/06 Receipt date \_\_\_\_\_  
Lot number 01 00 06 DP Strain AKO  
Brood Origination EPA 04

### II. Water Quality


Temperature 23 °C Salinity — ppt DO SAT  
pH 7.2 Hardness ~75 ppm

### III. Culture Conditions

System: Fw static renewal  
Diet: Flake Food \_\_\_\_\_ Phytoplankton  Trout Chow \_\_\_\_\_  
Brine Shrimp \_\_\_\_\_ Rotifers \_\_\_\_\_ Other YCT  
Prophylactic Treatments: \_\_\_\_\_  
Comments: All gravid as of 1:45 pm EST

### IV. Shipping Information

Client: ARK ANAK # of Organisms: 1 culture  
Carrier: FedEx Date Shipped: 7/27/06

Biologist: 

1 - 800 - 927 - 1650

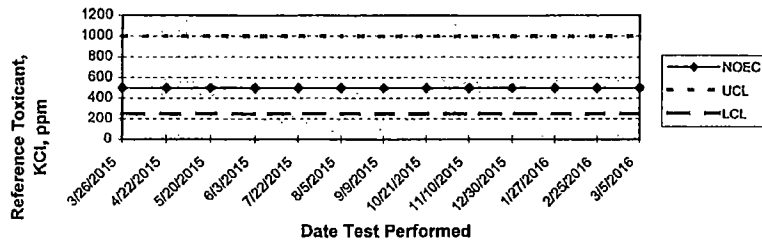
PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

APPENDIX E

Quality Assurance Charts

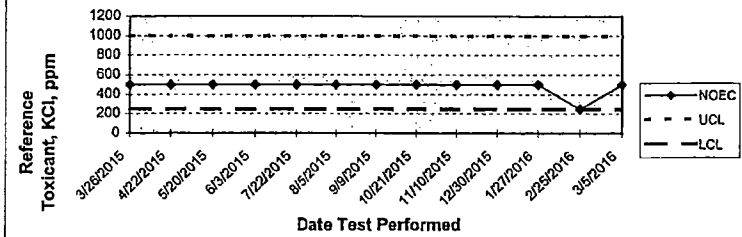
**ARKANSAS ANALYTICAL, INC.**

**FATHEAD MINNOW NOEC  
QUALITY ASSURANCE  
48 HOUR ACUTE**



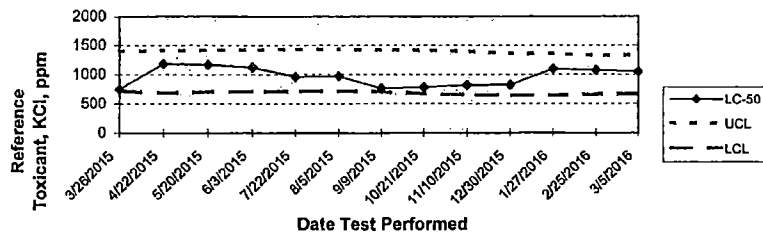
**ARKANSAS ANALYTICAL, INC.**

**DAPHNIA PULEX NOEC  
QUALITY ASSURANCE  
48 HOUR ACUTE**



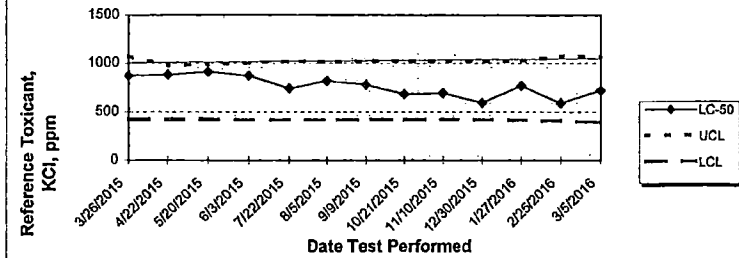
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**FATHEAD MINNOW LC50  
QUALITY ASSURANCE  
48 HOUR ACUTE**



**ARKANSAS ANALYTICAL, INC.**

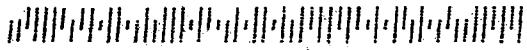
**DAPHNIA PULEX LC50  
QUALITY ASSURANCE  
48 HOUR ACUTE**



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4

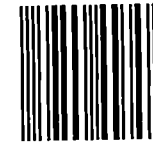
Malvern, AR 72104



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Arkansas Department of Environmental Quality

NPDES Enforcement Section

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