Tennessee Valley Authority, Post Office Box 2000, Soddy Daisy, Tennessee 37384-2000

November 13, 2008

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
Enforcement & Compliance Section
6th Floor, L & C Annex
401 Church Street
Nashville, Tennessee 37243-1534

Dear Mr. Patrick Cromer:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR OCTOBER 2008

Enclosed is the October 2008 Discharge Monitoring Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Stephanie A. Howard

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
Timothy P. Cleary
Site Vice President
Sequoyah Nuclear Plant

Enclosure
cc (Enclosure):

Chattanooga Environmental Assistance Center
Division of Water Pollution Control
State Office Building, Suite 550
540 McCallie Avenue
Chattanooga, Tennessee 37402-2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

IE25
NRR

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	26.4	04	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	35.4	04	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.7	04	0	31 / 31	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	8.0	********	8.2	12	0	5 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	20	20	19	0	1 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		MONTHLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	1 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		MONTHLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1649	03	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No closed mode operation. The following information is included in an attachment: CCW data

DMR Attachment

CCW Data

CCW TRENCH				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
10/08/2008 @ 1154	0.36 mg/l	10/13/2008 @ 1636	KLM	TN EPA 8015
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
10/08/2008 @ 1151	0.10 mg/l	10/13/2008 @ 1646	KLM	TN EPA 8015

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

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Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
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From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.024	0.039	19	0	27 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	0	62	********	********		**	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2 DAILY MX	DEG C/HR	********	********	********	****		CONTINUOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

The following injections occured: 1. Biodetergent 73551 (max. calc. conc. was 0.021mg/L--limit 2.0mg/L) 2. MSW 101 (max. calc. conc. was 0.061mg/L--limit 0.2mg/L) 3. H-150M (max. calc. conc. was 0.041mg/L--limit 0.050mg/L) 4. H-150M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L)

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Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
BIOMONITORING FOR OUTFALL 101
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Toxicity was sampled October 26-31, 2008.

November 13, 2008

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, OCTOBER, 2008

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101, samples collected October 26-31, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah.

Call me at (256) 386-2755 if you have any questions or comments following your review of the report.

Cynthia L. Russell
Biologist
Environmental Engineering Services- West
CEB 3A-M

Attachment
cc (Attachment):
Sherrard, R. M., PSC 1X-C
Files, ER&TA, CEB 1B-M

SQN October 2008m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: November 13, 2008

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 1,579
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 3,491
8. Outfall Tested: 101
9. Dates Sampled: October 26-31, 2008
10. Average Flow on Days Sampled (MGD): 1575, 1555, 1554
11. Pertinent Site Conditions: H-150M was injected into the Raw Cooling Water (RCW) System starting on October 28, 2008 at 1120 and ended on October 31, 2008 at 1255.
12. Test Dates: October 28-November 4, 2008
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    Intake: 100.0

    Pimephales promelas: UV treated Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    UV treated Intake: 100.0
16. Permit Limit Endpoint (%): Outfall 101: IC_{25} = 45.2%
17. Test Results: Outfall 101: *Pimephales promelas:* IC_{25} > 100%
    Ceriodaphnia dubia: IC_{25} > 100%

    UV treated Outfall 101: *Pimephales promelas:* IC_{25} > 100%

18. Facility Contact: Stephanie Howard Phone #: (423) 843-6713

19. Consulting / Testing Lab: Environmental Testing Solutions, Inc.

20. Lab Contact: Jim Sumner Phone #: (828) 350-9364

21. TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

22. Notes: Outfall 101 samples collected October 26-31, 2008, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant difference from the controls during this study period.

    Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (ET) Collected	Date (MM/DD/YY)/ Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (ET) First Used By
101	10/26/08 0742 to 10/27/08 0642	10/27/08 1456	1.3/2.1†	<0.10	10/28/08 1647 10/29/08 1549
Intake	10/26/08 0816 to 10/27/08 0716	10/27/08 1456	1.7	<0.10	10/28/08 1647 10/29/08 1549
101	10/28/08 0809 to 10/29/08 0709	10/29/08 1423	0.8/1.5†	<0.10	10/30/08 1630 10/31/08 1550
Intake	10/28/08 0826 to 10/29/08 0726	10/29/08 1423	0.5	<0.10	10/30/08 1630 10/31/08 1550
101	10/30/08 0802 to 10/31/08 0702	10/31/08 1352	1.8/2.8†	<0.10	11/01/08 1548 11/02/08 1605 11/03/08 1553
Intake	10/30/08 0834 to 10/31/08 0734	10/31/08 1352	1.6	<0.10	11/01/08 1548 11/02/08 1605 11/03/08 1553

*TRC = Total Residual Chlorine
†Samples were collected in two 2.5 gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

4. Sample Manipulation: Samples from Outfall 101 and intake were warmed to test temperature (25.0 ± 1.0°C) in a warm water bath.

   Aliquots of Outfall 101 and Intake samples were UV-treated through a 40-watt Smart® UV Sterilizer (manufactured by Emperor Aquatics, Inc.) for 2 minutes.

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatox, Inc.	In-house Cultures
2. Age:	24.55 – 24.78 hours old	<24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	10/28/08 1647 ET	10/28/08 0800 ET
UV Treated Outfall 101	10/28/08 1633 ET	
7. Test Termination: (Date/Time)		
Outfall 101	11/04/08 1556 ET	11/04/08 0705 ET
UV Treated Outfall 101	11/04/08 1540 ET	
8. Test Temperature: Outfall 101:	Mean = 24.8°C (24.5 - 25.1°C)	Mean = 24.8°C (24.6 - 25.1°C)

Test Temperature: UV-Treated Outfall 101: Mean = 24.8°C (24.6 - 25.1°C)

9. Physical / Chemical Measurements: Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.

10. Statistics: Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

1. Results of a *Pimephales promelas* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted October 28 – November 04, 2008 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	98	98
Intake	100	100	100	100	98	95	93

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.707	0.655	0.717	0.672	0.688
11.3%	0.591	0.692	0.691	0.693	0.667
22.6%	0.664	0.709	0.613	0.650	0.659
45.2%	0.586	0.630	0.760	0.688	0.666
72.6%	0.657	0.617	0.577	0.724	0.644
100.0%	0.635	0.565	0.645	0.593	0.610
Intake	0.679	0.758	0.569	0.622	0.657

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

*TUa = 100/LC_{50}: TUc = 100/ IC_{25}

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* (Genus species) Chronic/ 7-day Toxicity Test. (Type / Duration)

Conducted October 28 – November 04, 2008 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	29	35	36	34	34	31	33	35	33	33	33.3
11.3%	34	35	34	38	35	31	37	34	37	31	34.6
22.6%	37	38	34	36	36	36	37	35	37	31	35.7
45.2%	32	38	37	39	34	36	35	39	37	36	36.3
72.6%	38	40	39	37	34	35	39	36	38	38	37.4
100.0%	43	37	39	37	38	38	42	39	37	42	39.2

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

*TUa = $100/LC_{50}$: TUc = $100/IC_{25}$

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* (Genus species) Chronic/ 7-day Toxicity Test. (Type / Duration)

Conducted October 28 – November 04, 2008 using water from Intake

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	36	30	34	32	33	31	32	34	31	32.3
Intake	35	31	34	36	33	32	34	29	35	31	33.0

IC_{25} Value: > 100% Permit Limit: N/A 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: N/A

*TUa = $100/LC_{50}$: TUc = $100/ IC_{25}$

TOXICITY TEST RESULTS, UV-TREATED (see Appendix C for Bench Sheets)

3. Results of a *Pimephales promelas* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted October 28–November 04, 2008 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.489	0.416	0.440	0.502	0.462
11.3%	0.578	0.614	0.632	0.622	0.612
22.6%	0.503	0.489	0.604	0.606	0.551
45.2%	0.575	0.540	0.547	0.639	0.575
72.6%	0.558	0.579	0.663	0.688	0.622
100.0%	0.556	0.557	0.541	0.603	0.564
Intake	0.581	0.660	0.592	0.673	0.627

IC_{25} Value: > 100% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc*

*TUa = 100/LC_{50}: TUc = 100/ IC_{25}

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
P. promelas	October 28 – November 04, 2008	1700	7-days	KCl	0.79 g/L
C. dubia	October 07 – 14, 2008	0815	7-days	NaCl	1.09 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Non-treated Sequoyah Nuclear Plant Effluent (SQN)
October 28 - November 4, 2008

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.8 24.7 - 24.8	24.7 24.6 - 24.8	7.9 7.7 - 8.2	7.5 6.3 - 8.0	7.64 7.41 - 7.90	7.37 7.19 - 7.51	306 296 - 316	60 60 - 61	92 85 - 96	- - -
	11.3%	24.8 24.7 - 25.0	24.8 24.6 - 25.0	8.0 7.8 - 8.2	7.5 6.1 - 8.0	7.63 7.50 - 7.90	7.35 7.10 - 7.49	289 277 - 302	- - -	- - -	- - -
	22.6%	24.9 24.7 - 25.0	24.6 24.5 - 24.8	8.0 7.8 - 8.2	7.5 6.2 - 8.0	7.63 7.48 - 7.91	7.34 7.09 - 7.49	275 260 - 284	- - -	- - -	- - -
	45.2%	24.9 24.7 - 25.0	24.7 24.5 - 24.9	8.0 7.7 - 8.2	7.5 6.3 - 8.0	7.60 7.45 - 7.88	7.35 7.15 - 7.48	252 240 - 263	- - -	- - -	- - -
	72.6%	24.9 24.8 - 25.0	24.8 24.7 - 24.9	8.0 7.8 - 8.3	7.5 6.4 - 8.0	7.60 7.45 - 7.86	7.35 7.10 - 7.50	224 207 - 242	- - -	- - -	- - -
	100.0%	24.9 24.8 - 25.1	24.8 24.6 - 24.9	8.1 7.9 - 8.3	7.5 6.3 - 8.0	7.59 7.45 - 7.85	7.35 7.08 - 7.52	197 182 - 215	67 66 - 68	83 75 - 92	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.8 - 25.0	24.8 24.6 - 24.9	8.1 7.8 - 8.4	7.6 6.4 - 8.0	7.58 7.42 - 7.83	7.35 7.08 - 7.53	204 177 - 283	68 64 - 74	81 79 - 83	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.7 24.7 - 24.9	24.8 24.6 - 25.0	7.9 7.7 - 8.2	7.9 7.4 - 8.2	7.64 7.41 - 7.90	7.52 7.40 - 7.66	306 296 - 316	60 60 - 61	92 85 - 96	- - -
	11.3%	24.8 24.7 - 24.9	24.9 24.7 - 25.1	8.0 7.8 - 8.2	7.9 7.3 - 8.2	7.63 7.50 - 7.90	7.54 7.41 - 7.66	289 277 - 302	- - -	- - -	- - -
	22.6%	24.8 24.7 - 25.0	24.9 24.7 - 25.1	8.0 7.8 - 8.2	7.9 7.3 - 8.2	7.63 7.48 - 7.91	7.53 7.40 - 7.65	275 260 - 284	- - -	- - -	- - -
	45.2%	24.8 24.7 - 25.0	24.8 24.6 - 25.0	8.0 7.7 - 8.2	7.9 7.3 - 8.2	7.60 7.45 - 7.88	7.53 7.39 - 7.64	252 240 - 263	- - -	- - -	- - -
	72.6%	24.8 24.7 - 25.0	24.8 24.6 - 25.0	8.0 7.8 - 8.3	7.9 7.2 - 8.2	7.60 7.45 - 7.86	7.52 7.39 - 7.65	224 207 - 242	- - -	- - -	- - -
	100.0%	24.9 24.8 - 25.0	24.8 24.7 - 25.0	8.1 7.9 - 8.3	7.9 7.3 - 8.2	7.59 7.45 - 7.85	7.52 7.40 - 7.66	197 182 - 215	67 66 - 68	83 75 - 92	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.7 - 25.0	24.8 24.7 - 25.1	8.1 7.8 - 8.4	7.9 7.3 - 8.2	7.58 7.42 - 7.83	7.51 7.41 - 7.65	204 177 - 283	68 64 - 74	81 79 - 83	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.5	25.1
Ceriodaphnia dubia	24.8	24.6	25.1

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Tests, UV-treated Sequoyah Nuclear Plant Effluent (SQN
October 28 - November 4, 2008

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)
Pimephales promelas	Control	24.8 24.8 - 24.9	24.7 24.6 - 24.8	8.0 7.8 - 8.2	7.6 6.6 - 8.1	7.61 7.43 - 7.88	7.40 7.16 - 7.57	294 280 - 303	60 59 - 61	90 85 - 96
	11.3%	24.9 24.8 - 25.0	24.9 24.6 - 25.0	8.1 7.9 - 8.2	7.6 6.6 - 8.0	7.62 7.46 - 7.87	7.37 7.15 - 7.54	288 274 - 300	- - -	- - -
	22.6%	24.9 24.8 - 25.1	24.8 24.6 - 24.9	8.1 7.9 - 8.2	7.6 6.6 - 8.0	7.62 7.46 - 7.86	7.38 7.16 - 7.55	275 266 - 288	- - -	- - -
	45.2%	25.0 24.9 - 25.1	24.7 24.6 - 24.9	8.1 8.0 - 8.3	7.6 6.7 - 8.0	7.61 7.46 - 7.85	7.37 7.16 - 7.54	253 242 - 263	- - -	- - -
	72.6%	25.0 24.9 - 25.1	24.8 24.6 - 24.9	8.1 7.9 - 8.3	7.6 6.7 - 8.0	7.60 7.46 - 7.82	7.36 7.13 - 7.55	226 217 - 235	- - -	- - -
	100.0%	25.0 24.9 - 25.1	24.7 24.6 - 24.9	8.1 8.0 - 8.3	7.6 6.6 - 8.1	7.60 7.46 - 7.81	7.36 7.14 - 7.57	193 181 - 204	70 64 - 80	83 79 - 87
	Intake	24.9 24.9 - 25.0	24.7 24.6 - 24.8	8.1 7.8 - 8.3	7.6 6.6 - 8.1	7.58 7.45 - 7.78	7.37 7.14 - 7.57	189 170 - 202	71 66 - 80	75 64 - 81

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.6	25.1

SUMMARY / CONCLUSIONS

Outfall 101 samples collected October 26-31, 2008, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant difference from the controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL plastic disposable cups, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using ten replicates, each containing one test organism, per treatment. Test vessels consisted of 30-mL polypropylene cups, each containing 15-mL of test solution.

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

1. Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).

2. Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.

3. Temperature was measured by SM 2550 B.

4. Dissolved oxygen was measured by SM 4500 O G.

5. The pH was measured by SM 4500 H+ B.

6. Conductance was measured by SM 2510 B.

7. Alkalinity was measured by SM 2320 B.

8. Total hardness was measured by SM 2340 C.

9. Total residual chlorine was measured by ORION Electrode Method 97-70.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage, glassware preparation, test organism culturing/acquisition and acclimation, test organism handling during test, and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA-821-R-02-013. Any known deviations were noted during the study and are reported herein.

REFERENCE TOXICANT TESTS (See Appendix D for control chart information)

1. Test Type: 7-day chronic tests with results expressed as IC_{25} values in g/L KCl or NaCl.

2. Standard Toxicant: Potassium Chloride (KCl crystalline) for *Pimephales promelas*.
   Sodium Chloride (NaCl crystalline) for *Ceriodaphnia dubia*.

3. Dilution Water Used: Moderately hard synthetic water.

4. Statistics: ToxCalc software Version 5.0 was used for statistical analyses.

REFERENCES

1. NPDES Permit No. TN0026450.

2. USEPA. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (October 2002).

3. Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998.

4. Quality Assurance Program: Standard Operating Procedures, Environmental Testing Solutions, Inc (most current version).

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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

Diffuser Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks During Toxicity Test Sampling

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
03/12/1998	0.016	-	-	-	-	-	-
03/13/1998	0.015	-	-	-	-	-	-
03/14/1998	0.013	-	-	-	-	-	-
03/15/1998	0.030	-	-	-	-	-	-
03/16/1998	0.013	-	-	-	-	-	-
03/17/1998	0.020	-	-	-	-	-	-
03/18/1998	0.018	-	-	-	-	-	-
09/08/1998	0.015	-	0.014	0.005	-	-	0.021
09/09/1998	0.003	-	0.031	0.011	-	-	-
09/10/1998	0.014	-	0.060	0.021	-	-	-
09/11/1998	0.013	-	0.055	0.019	-	-	-
09/12/1998	< 0.001	-	0.044	0.015	-	-	-
09/13/1998	< 0.001	-	0.044	0.015	-	-	-
09/14/1998	0.008	-	0.044	0.015	-	-	-
02/22/1999	< 0.001	-	-	-	-	-	-
02/23/1999	0.005	-	-	-	-	-	-
02/24/1999	0.009	-	-	-	-	-	-
02/25/1999	0.012	-	-	-	-	-	-
02/26/1999	0.008	-	-	-	-	-	-
02/27/1999	< 0.001	-	-	-	-	-	-
02/28/1999	< 0.001	-	-	-	-	-	-
08/18/1999	-	0.015	0.069	0.024	0.006	-	-
08/19/1999	-	0.012	0.068	0.024	-	-	-
08/20/1999	-	0.023	0.070	0.024	-	0.120	-
08/21/1999	-	0.022	0.068	0.024	-	-	-
08/22/1999	-	0.022	0.068	0.024	-	-	-
08/23/1999	-	0.025	0.068	0.024	0.006	-	-
08/24/1999	-	0.016	0.067	0.023	0.020	-	-

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/31/2000	-	< 0.002	0.026	0.009	-	-	-
02/01/2000	-	0.011	0.026	0.028	-	-	-
02/02/2000	-	0.028	0.026	0.009	0.006	-	-
02/03/2000	-	0.008	0.027	0.009	-	-	-
02/04/2000	-	0.006	0.027	0.009	0.005	0.109	-
02/05/2000	-	< 0.002	0.027	0.009	-	-	-
02/06/2000	-	< 0.002	0.027	0.009	-	-	-
07/26/2000	-	< 0.0057	0.055	0.019	-	-	-
07/27/2000	-	0.019	0.055	0.019	-	-	-
07/28/2000	-	0.0088	0.053	0.018	0.004	0.108	-
07/29/2000	-	< 0.0088	0.055	0.019	-	-	-
07/30/2000	-	< 0.0076	0.055	0.019	-	-	-
07/31/2000	-	< 0.0152	0.055	0.019	0.006	-	-
08/01/2000	-	< 0.0141	0.055	0.019	0.005	-	-
12/11/2000	-	0.0143	0.025	0.020	0.005	-	-
12/12/2000	-	0.0092	0.025	0.020	0.005	-	-
12/13/2000	-	< 0.0120	0.025	0.020	-	-	-
12/14/2000	-	< 0.0087	0.025	0.020	-	-	-
12/15/2000	-	0.0120	0.025	0.020	0.005	-	-
12/16/2000	-	< 0.0036	0.025	0.020	-	-	-
12/17/2000	-	< 0.0036	0.025	0.020	-	-	-
08/26/2001	-	0.017	0.06	0.021	0.006	-	-
08/27/2001	-	<0.0096	0.06	0.021	0.005	-	0.021
08/28/2001	-	<0.0085	0.06	0.021	-	-	-
08/29/2001	-	<0.0094	0.059	0.020	0.005	-	0.021
08/30/2001	-	<0.0123	0.06	0.021	0.005	-	-
08/31/2001	-	<0.005	0.059	0.020	-	-	-
11/25/2001	-	<0.0044	-	-	-	-	-
11/26/2001	-	<0.0119	0.024	0.02	0.005	-	-
11/27/2001	-	0.0137	0.023	0.019	0.007	-	-
11/28/2001	-	<0.0089	0.022	0.019	0.006	-	-
11/29/2001	-	0.0132	0.024	0.02	0.007	-	-
11/30/2001	-	< 0.0043	0.024	0.02	-	-	-
12/09/2001	-	<0.0042	-	-	-	-	-
12/10/2001	-	<0.0042	-	-	-	-	-
12/11/2001	-	<0.0104	-	-	-	-	-
12/12/2001	-	0.0128	0.024	0.02	0.008	-	-
12/13/2001	-	<0.0088	0.024	0.02	-	-	-
12/14/2001	-	0.0134	0.024	0.02	0.007	-	-

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
01/03/2002	-	< 0.0042	0.023	0.014	-	-	-
01/04/2002	-	0.0124	0.024	0.014	0.009	-	-
01/05/2002	-	< 0.0042	-	-	-	-	-
01/06/2002	-	< 0.0042	-	-	-	-	-
01/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
02/24/2002	-	< 0.004	-	-	-	-	-
02/25/2002	-	< 0.004	0.023	0.023	-	-	-
02/26/2002	-	0.0143	0.023	0.023	0.007	-	-
02/27/2002	-	< 0.0041	0.023	0.023	-	-	-
02/28/2002	-	< 0.0041	0.024	0.008	-	-	-
03/01/2002	-	< 0.0041	0.024	0.008	-	-	-
05/05/2002	-	-	-	-	-	-	-
05/06/2002	-	-	0.058	0.02	0.014	-	-
05/07/2002	-	-	0.058	0.02	0.015	-	-
05/08/2002	-	-	0.056	0.019	-	-	-
05/09/2002	-	-	0.057	0.02	0.014	-	-
05/10/2002	-	-	0.056	0.019	-	-	-
08/04/2002	-	<0.0058	-	-	-	-	-
08/05/2002	-	<0.0058	0.053	0.018	-	-	0.025
08/06/2002	-	0.0092	0.053	0.018	-	-	-
08/07/2002	-	<0.0107	0.055	0.019	0.007	-	-
08/08/2002	-	<0.0061	0.055	0.019	-	-	-
08/09/2002	-	0.0152	0.054	0.018	0.008	-	-
10/06/2002	-	<0.00497	-	-	-	-	-
10/07/2002	-	0.0153	0.054	0.018	0.009	-	-
10/08/2002	-	<0.0092	0.054	0.018	0.007	-	-
10/09/2002	-	0.0124	0.053	0.018	0.009	-	-
10/10/2002	-	0.0134	0.054	0.018	0.009	-	-
10/11/2002	-	<0.0042	0.054	0.018	-	-	-
01/12/2003	-	<0.0035	-	-	-	-	-
01/13/2003	-	<0.006	0.025	0.019	0.009	-	-
01/14/2003	-	<0.0118	0.026	0.020		-	-
01/15/2003	-	<0.0063	0.026	0.020	0.009	-	-
01/16/2003	-	<0.0034	0.026	0.020		-	-
01/17/2003	-	<0.0034	0.026	0.009	-	-	-
04/06/2003	-	<0.0073	-	-	-	-	-
04/07/2003	-	<0.0189	-	0.021	-	-	-
04/08/2003	-	<0.0117	-	0.021	-	-	-
04/09/2003	-	<0.0139	-	0.021	0.016	-	-
04/10/2003	-	<0.0113	-	0.021	0.018	-	-
04/11/2003	-	<0.0073	-	0.022	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
06/15/2003	-	< 0.0045	-	-	-	-	-
06/16/2003	-	< 0.0037	0.057	0.020	-	-	0.022
06/17/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/18/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/19/2003	-	< 0.0085	0.058	0.020	-	-	0.025
06/20/2003	-	< 0.0048	0.058	0.020	-	-	0.025
08/03/2003	-	<0.0050	-	-	-	-	-
08/04/2003	-	<0.0050	0.058	0.020	-	-	-
08/05/2003	-	<0.0051	0.057	0.020	-	-	0.025
08/06/2003	-	<0.0084	0.057	0.020	-	-	0.025
08/07/2003	-	0.0129	0.057	0.020	-	-	0.024
08/08/2003	-	0.0153	0.057	0.020	0.009	-	-
10/05/2003	-	<0.0043	0.057	0.020	-	-	-
10/06/2003	-	<0.0043	0.057	0.020	-	-	0.025
10/07/2003	-	<0.0090	0.057	0.020	-	-	0.025
10/08/2003	-	<0.0106	0.057	0.020	-	-	0.025
10/09/2003	-	0.0181	0.026	0.022	-	-	0.025
10/10/2003	-	0.0183	0.026	0.024	0.009	-	-
02/01/2004	-	0.0093	0.027	0.009	-	-	-
02/02/2004	-	<0.0034	0.026	0.009	-	-	-
02/03/2004	-	<0.0034	0.026	0.009	-	-	-
02/04/2004	-	0.0124	0.026	0.009	0.009	-	-
02/05/2004	-	<0.0034	0.026	0.009	-	-	-
02/06/2004	-	0.0105	0.026	0.009	0.010	-	-
05/04/2004	-	<0.0123	0.026	0.019	-	-	0.025
05/05/2004	-	<0.0144	0.026	0.014	0.009	-	0.025
05/06/2004	-	<0.0146	0.037	0.013	-	-	0.025
05/07/2004	-	0.0227	0.058	0.020	0.009	-	0.025
05/08/2004	-	0.016	0.060	0.021	-	-	-
05/09/2004	-	<0.0104	0.058	0.020	-	-	-
07/04/2004	-	0.0217	0.057	0.019	-	-	-
07/05/2004	-	<0.0085	0.057	0.020	0.009	-	-
07/06/2004	-	<0.0077	0.058	0.020	-	-	0.031
07/07/2004	-	0.0252	0.056	0.019	-	-	0.031
07/08/2004	-	0.0223	0.057	0.019	0.009	-	-
07/09/2004	-	0.0182	0.057	0.020	0.009	-	-

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat
11/07/2004	-	<0.0187	0.000	0.014	-	-	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042	-	-
02/06/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/07/2005	-	<0.0116	0.028	0.010	-	-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-	-	-	-
02/09/2005	-	0.0199	0.028	0.010	-	-	-	-	-
02/10/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/11/2005	-	0.0155	0.028	0.010	-	-	-	0.007	-
06/05/2005	-	0.0063	-	-	-	-	-	-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	-	-	-	-	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	-	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	-	-	-	-	-	-
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	-	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	-
07/22/2005	-	0.0238	0.054	0.018	-	-	-	0.014	-
10/30/2005	-	0.0068	-	-	-	-	-	-	-
10/31/2005	-	0.0112	-	-	-	-	-	-	-
11/01/2005	-	0.0104	-	-	-	-	-	-	0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	-	-	-	0.036
11/04/2005	-	0.0165	-	-	-	-	-	-	0.035
11/14/2005	-	0.0274	-	-	-	-	-	-	-
11/15/2005	-	0.0256	-	-	-	-	-	-	-
11/16/2005	-	0.0234	-	-	-	-	-	-	-
11/17/2005	-	0.0231	-	-	-	-	-	-	-
11/18/2005	-	0.0200	-	-	-	-	-	-	-
11/19/2005	-	0.0116	-	-	-	-	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 –October 31, 2008

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat	MSW 101 mg/L Phosphate
11/12/2006	-	0.0055	-	-	-	-	-	-	-	-
11/13/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/14/2006	-	0.0143	-	-	-	-	-	-	0.037	-
11/15/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/16/2006	-	0.0267	-	-	-	-	-	-	0.037	-
11/17/2006	-	0.0222	-	-	-	-	-	-	-	-
11/26/2006	-	0.0188	-	-	-	-	-	-	-	-
11/27/2006	-	0.0138	-	-	-	-	-	-	-	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	-	-	-	-	-	-	-	-
11/30/2006	-	0.0376	-	-	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-	-	-	-	-	-
05/28/07	-	-	-	-	-	-	-	-	-	0.015
05/29/07	-	-	-	-	-	-	-	-	0.036	0.015
05/30/07	-	0.0084	-	-	-	-	-	0.017	0.036	0.015
05/31/07	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/07	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/07	-	0.0305	-	-	-	-	-	-	-	0.015
12/02/07	-	0.0241	-	-	-	-	-	-	-	-
12/03/07	-	0.0128	-	-	-	-	-	-	-	-
12/04/07	-	0.0238	-	-	-	-	-	-	-	-
12/05/07	-	0.0158	-	-	-	-	-	-	-	-
12/06/07	-	0.0162	-	-	-	-	-	-	-	-
12/07/07	-	0.0175	-	-	-	-	-	-	-	
04/13/08	-	0.0039	-	-	-	-	-	-	-	-
04/14/08	-	0.0124	-	-	-	-	-	-	-	-
04/15/08	-	0.0229	-	-	-	-	-	-	-	-
04/16/08	-	0.0143	-	-	-	-	-	-	-	-
04/17/08	-	0.0120	-	-	-	-	-	-	-	-
04/18/08	-	0.0149	-	-	-	-	-	-	-	-
10/26/08	-	0.0260	-	-	-	-	-	-	-	-
10/27/08	-	0.0151	-	-	-	-	-	0.017	-	-
10/28/08	-	0.0172	-	-	-	-	-	-	0.041	-
10/29/08	-	0.0154	-	-	-	-	-	0.018	0.041	0.030
10/30/08	-	-	-	-	-	-	-	-	0.041	0.030
10/31/08	-	0.0086	-	-	-	-	-	-	0.041	0.030

Sequoyah Nuclear Plant Biomonitoring
October 28 – November 4, 2008

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:
Chevy Williams:
Roy Quinn

Dissolved Metals Collected. Samples remained on ice through out sampling and transport to lab.

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				5058 · project # Laboratory Use				
	----	Date	Time ET	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time ET	Appearance
SQN-101-TOX	Comp	10/26/08-10/27/08	0742-0642	2 (2.5gal)	1573 - 1577 AVG= 1575			X		081027.01	1.3/2.1°C	JL	1456	*
SQN-INT-TOX	Comp	10/26/08-10/27/08	0816-0716	1 (2.5 gal)	NA			X		081027.02	1.7°C	JL	1456	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition.

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams	10/27/08 10:30 EDT	Sonic Delivery	10/27/08 10:30 EDT
Sonic Delivery	10/27/08 1456 ET	ETS	10/27/08 1456 ET

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:
Chevy Williams: [signature]
Roy Quinn : [signature]

Dissolved Metals Collected. Samples remained on ice through out sampling and transport to lab.

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project #5050 Laboratory Use				
	----	Date	Time ET	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time ET	Appearance
SQN-101-TOX	Comp	10/28/08-10/29/08	0809-0709	2 (2.5gal)	1551-1558 AVG=1555			X		081029.01	0.8/1.5°C	JL	1423	*
SQN-INT-TOX	Comp	10/28/08-10/29/08	0826-0726	1 (2.5 gal)	NA			X		081029.02	0.5°C	JL	1423	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. [signature]

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	10/29/08 0951 EDT	Sonic Delivery [signature]	10/29/08 0951 EDT
Sonic Delivery [signature]	10/29/08 1423 ET	ETS [signature]	10/29/08 1423 ET

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:
Chevy Williams: [signature]
Roy Quinn : [signature]

Dissolved Metals Collected. Samples remained on ice through out sampling and transport to lab.

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project # 5058 Laboratory Use				
	----	Date	Time (EDT)	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time ET	Appearance
SQN-101-TOX	Comp	10/30/08-10/31/08	0802-0702	2 (2.5gal)	1551-1556 AVG=1554			X		081031.01	1.8/2.8C	JL	1352	*
SQN-INT-TOX	Comp	10/30/08-10/31/08	0834-0734	1 (2.5 gal)	NA			X		081031.02	1.6C	JL	1352	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition [signature]

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	10/31/08 1001EDT	Sonic Delivery [signature]	10/31/08 1001EDT
Sonic Delivery	10/31/08 1352 ET	ETS [signature]	10/31/08 1352 ET
[signature]			

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

ETS

Environmental Testing Solutions, Inc.

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 5058

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	565	1130	1815	2500	
Diluent volume (mL)	2217.5	1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	24-28 HOURS OLD	Randomizing template:	~~GREEN~~ YELLOW
Date and times organisms were born between:	10-27-08 1600	Incubator number:	3C
Organism source:	ATOX BATCH Rp 10-27-08	*Artemia* lot number:	BG1004W
Transfer bowl information:	pH = 7.87 Temperature = 24.4 °C	Total drying time:	24-HOURS
		Date / Time in: 11-04-08	1620
Average transfer volume:	7.8 ml	Date / Time out: 11-05-08	1620
		Oven temperature:	60 °C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used MHSW	Sample numbers used	Analyst
0	10-28-08	—	1710	1647	10-18-08	081027.01+02	JL
1	10-29-08	1030	1630	1549	10-18-08	081027.01+02	JL
2	10-30-08	1125	1730	1630	10-25-08 A	081029.01+02	JL
3	10-31-08	1035	1640	1550	10-25-08 A	081029.01+02	JL
4	11-01-08	1030	1630	1548	10-25-08 B	081031.01+02	JL
5	11-02-08	1030	1630	1605	10-29-08 A	081031.01+02	JL
6	11-03-08	1030	1635	1553	10-29-08 A	081031.01+02	JL
7	11-04-08			1556			JL

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.688	
Average weight per surviving larvae:	0.688	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC_{25}	>100%

ETS

Species: *Pimephales promelas* Date: 10-28-08

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	CONTROL				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Color identification: black Analyst: LAB	14.40	14.45	15.01	14.92	14.35	14.18	12.80	15.79	14.27	15.57	15.06	15.56
B = Pan + Larvae weight (mg) Analyst: BLS	21.47	21.00	22.18	21.64	20.26	21.10	19.71	22.72	20.91	22.66	21.19	22.06
Larvae weight (mg) = A – B	7.07	6.55	7.17	6.72	5.91	6.92	6.91	6.93	6.64	7.09	6.13	6.50
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.707	0.655	0.717	0.672	0.591	0.692	0.691	0.693	0.664	0.709	0.613	0.650
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.688				0.667		3.1%		0.659		4.2%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas* Date: 10-28-08
Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	9 1dFg
7	10	10	1LG 10	10	10	10	10	1LG 10	10	10	10	9
A = Pan weight (mg) Color identification: black Analyst: LAB	14.52	14.87	14.76	13.72	14.28	12 13.37	14.04	13.64	14.93	14.22	15.36	14.19
B = Pan + Larvae weight (mg) Analyst: BLS	20.38	21.17	22.36	20.60	20.85	19.54	19.81	20.88	21.28	19.87	21.81	20.12
Larvae weight (mg) = A – B	5.86	6.30	7.60	6.88	6.57	6.17	5.77	7.24	6.35	5.65	6.45	5.93
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.586	0.630	0.760	0.688	0.657	0.617	0.577	0.724	0.635	0.565	0.645	0.593
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.666		3.2%		0.644		6.4%		0.610		11.4%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JH

Comments:

Species: *Pimephales promelas* Date: 10-28-08
Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	9 1dFG	10
6	10	10	8 1dFG	10
7	10	10 1LG	8 1LG	9 1dFG
A = Pan weight (mg) Color identification: black Analyst: LAB	15.34	14.70	13.81	14.04
B = Pan + Larvae weight (mg) Analyst: BLS	22.13	22.28	19.50	20.26
Larvae weight (mg) = A - B	6.79	7.58	5.69	6.22
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.679	0.758	0.569	0.622
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.657		4.5%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
October 28 - November 04, 2008

Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1000.0

Quality Control
Verification of Data Entry, Calculations, and Statistical Analyses

Project number: 5058
Reveiwed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.40	21.47	7.07	0.707	0.688	4.2	0.707	100.0	0.688	4.2	Not applicable
	B	10	10	14.45	21.00	6.55	0.655			0.655				
	C	10	10	15.01	22.18	7.17	0.717			0.717				
	D	10	10	14.92	21.64	6.72	0.672			0.672				
11.3%	E	10	10	14.35	20.26	5.91	0.591	0.667	7.6	0.591	100.0	0.667	7.6	3.1
	F	10	10	14.18	21.10	6.92	0.692			0.692				
	G	10	10	12.80	19.71	6.91	0.691			0.691				
	H	10	10	15.79	22.72	6.93	0.693			0.693				
22.6%	I	10	10	14.27	20.91	6.64	0.664	0.659	6.0	0.664	100.0	0.659	6.0	4.2
	J	10	10	15.57	22.66	7.09	0.709			0.709				
	K	10	10	15.06	21.19	6.13	0.613			0.613				
	L	10	10	15.56	22.06	6.50	0.650			0.650				
45.2%	M	10	10	14.52	20.38	5.86	0.586	0.666	11.3	0.586	100.0	0.666	11.3	3.2
	N	10	10	14.87	21.17	6.30	0.630			0.630				
	O	10	10	14.76	22.36	7.60	0.760			0.760				
	P	10	10	13.72	20.60	6.88	0.688			0.688				
72.6%	Q	10	10	14.28	20.85	6.57	0.657	0.644	9.7	0.657	100.0	0.644	9.7	6.4
	R	10	10	13.37	19.54	6.17	0.617			0.617				
	S	10	10	14.04	19.81	5.77	0.577			0.577				
	T	10	10	13.64	20.88	7.24	0.724			0.724				
100%	U	10	10	14.93	21.28	6.35	0.635	0.626	6.7	0.635	97.5	0.610	6.1	11.4
	V	10	10	14.22	19.87	5.65	0.565			0.565				
	W	10	10	15.36	21.81	6.45	0.645			0.645				
	X	10	9	14.19	20.12	5.93	0.659			0.593				
100% Intake	Y	10	10	15.34	22.13	6.79	0.679	0.710	4.9	0.679	92.5	0.657	12.3	4.5
	Z	10	10	14.70	22.28	7.58	0.758			0.758				
	AA	10	8	13.81	19.50	5.69	0.711			0.569				
	BB	10	9	14.04	20.26	6.22	0.691			0.622				

Outfall 101:
Dunnett's MSD value: 0.0879
PMSD: 12.8

Intake:
Dunnett's MSD value: 0.0836
PMSD: 12.2

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a, USEPA, 2001b)

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
October 28 - November 04, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/28/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.7070	0.6550	0.7170	0.6720
11.3	0.5910	0.6920	0.6910	0.6930
22.6	0.6640	0.7090	0.6130	0.6500
45.2	0.5860	0.6300	0.7600	0.6880
72.6	0.6570	0.6170	0.5770	0.7240
100	0.6350	0.5650	0.6450	0.5930

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6878	1.0000	0.6878	0.6550	0.7170	4.236	4				0.6878	1.0000
11.3	0.6668	0.9695	0.6668	0.5910	0.6930	7.575	4	0.576	2.410	0.0879	0.6668	0.9695
22.6	0.6590	0.9582	0.6590	0.6130	0.7090	6.020	4	0.788	2.410	0.0879	0.6625	0.9633
45.2	0.6660	0.9684	0.6660	0.5860	0.7600	11.308	4	0.596	2.410	0.0879	0.6625	0.9633
72.6	0.6438	0.9360	0.6438	0.5770	0.7240	9.737	4	1.206	2.410	0.0879	0.6438	0.9360
100	0.6095	0.8862	0.6095	0.5650	0.6450	6.112	4	2.145	2.410	0.0879	0.6095	0.8862

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9664126	0.884	0.04385851	-0.363723
Bartlett's Test indicates equal variances (p = 0.67)	3.22156215	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.08789734	0.12780421	0.00283454	0.0026604	0.41157901	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95%CL(Exp)	Skew
IC05	58.553			
IC10	92.420			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Intake - Non-treated
October 28 - November 04, 2008

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/28/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.7070	0.6550	0.7170	0.6720
100	0.6790	0.7580	0.5690	0.6220

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6878	1.0000	0.6878	0.6550	0.7170	4.236	4				0.6878	1.0000
100	0.6570	0.9553	0.6570	0.5690	0.7580	12.320	4	0.715	1.943	0.0836	0.6570	0.9553

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96301621	0.749	0.33030529	0.82117335
F-Test indicates equal variances (p = 0.13)	7.71728659	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.08358076	0.12152782	0.00189112	0.00370012	0.50152063	1, 6

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
October 28 - November 04, 2008

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1000.0

Daily Chemical Analyses

Project number: 5058
Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.90	7.49	7.85	7.38	7.58	7.23	7.43	7.51	7.66	7.40	7.63	7.40	7.41	7.19
	DO (mg/L)	7.9	7.7	7.9	7.8	7.9	7.4	7.9	8.0	8.0	7.8	8.2	7.6	7.7	6.3
	Conductivity (µmhos/cm)	296		316		313		302		302		302		308	
	Alkalinity (mg/L $CaCO_3$)	60				60				61		60			
	Hardness (mg/L $CaCO_3$)	85				96				89		96			
	Temperature (°C)	24.8	24.8	24.7	24.7	24.8	24.8	24.7	24.7	24.8	24.7	24.7	24.6	24.8	24.6
11.3%	pH (SU)	7.90	7.48	7.76	7.36	7.54	7.23	7.51	7.49	7.66	7.38	7.56	7.40	7.50	7.10
	DO (mg/L)	8.1	7.7	7.9	7.9	7.9	7.4	7.8	8.0	8.2	7.7	8.2	7.7	7.8	6.1
	Conductivity (µmhos/cm)	277		280		294		284		287		302		297	
	Temperature (°C)	25.0	24.6	24.7	24.9	25.0	25.0	24.7	24.7	24.8	24.8	24.8	24.8	24.9	24.6
22.6%	pH (SU)	7.91	7.47	7.77	7.36	7.53	7.20	7.48	7.49	7.64	7.37	7.60	7.39	7.49	7.09
	DO (mg/L)	8.1	7.7	7.9	7.9	8.0	7.4	7.8	8.0	8.2	7.7	8.2	7.7	7.9	6.2
	Conductivity (µmhos/cm)	260		269		284		270		280		276		283	
	Temperature (°C)	25.0	24.8	24.8	24.6	25.0	24.7	24.7	24.6	24.8	24.6	24.8	24.5	24.9	24.7
45.2%	pH (SU)	7.88	7.48	7.74	7.36	7.49	7.20	7.45	7.48	7.62	7.35	7.59	7.40	7.46	7.15
	DO (mg/L)	8.1	7.7	7.9	7.9	7.9	7.4	7.9	8.0	8.2	7.7	8.2	7.7	7.7	6.3
	Conductivity (µmhos/cm)	241		240		263		248		256		253		260	
	Temperature (°C)	25.0	24.9	24.8	24.6	25.0	24.8	24.7	24.8	24.8	24.9	24.8	24.5	24.9	24.7
72.6%	pH (SU)	7.86	7.49	7.73	7.35	7.47	7.20	7.45	7.50	7.62	7.40	7.59	7.40	7.45	7.10
	DO (mg/L)	8.2	7.7	7.9	7.9	7.9	7.4	7.9	8.0	8.2	7.7	8.3	7.7	7.8	6.4
	Conductivity (µmhos/cm)	207		210		230		220		242		227		232	
	Temperature (°C)	25.0	24.7	24.8	24.9	25.0	24.8	24.8	24.8	24.9	24.9	24.8	24.7	24.9	24.8
100%	pH (SU)	7.85	7.49	7.72	7.37	7.45	7.22	7.46	7.52	7.62	7.39	7.58	7.40	7.45	7.08
	DO (mg/L)	8.2	7.6	7.9	7.9	8.0	7.4	7.9	8.0	8.2	7.7	8.3	7.8	7.9	6.3
	Conductivity (µmhos/cm)	182		190		203		191		215		199		198	
	Alkalinity (mg/L $CaCO_3$)	66				66				68					
	Hardness (mg/L $CaCO_3$)	92				83				75					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.9	24.8	24.9	25.1	24.7	24.8	24.6	24.9	24.7	25.0	24.7	24.9	24.8
100% Intake	pH (SU)	7.83	7.53	7.72	7.34	7.42	7.23	7.42	7.51	7.64	7.36	7.59	7.40	7.44	7.08
	DO (mg/L)	8.4	7.7	7.8	7.9	8.0	7.5	8.1	8.0	8.2	7.8	8.3	7.7	7.8	6.4
	Conductivity (µmhos/cm)	177		180		200		190		283		195		201	
	Alkalinity (mg/L $CaCO_3$)	66				64				74					
	Hardness (mg/L $CaCO_3$)	81				83				79					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.9	24.8	24.8	25.0	24.8	24.8	24.7	24.9	24.9	24.8	24.6	25.0	24.8

ETS Environmental Testing Solutions, Inc.

Species: *Pimephales promelas*
Client: TVA Sequoyah Nuclear Plant – Non-treated

Date: 10-28-08

Daily Chemistry:

		Day					
		0		1 MGL		Kur 2 DLS	
	Analyst	MGL	JL	JL	JL	JL	MGL
Concentration	Parameter						
CONTROL	pH (S.U.)	7.90	7.49	7.85	7.38	7.58	7.23
	DO (mg/L)	7.9	7.7	7.9	7.9	7.9	7.4
	Conductivity (µmhos/cm)	296		316		313	
	Alkalinity (mg $CaCO_3$/L)	60				60	
	Hardness (mg $CaCO_3$/L)	85		JL		96	
	Temperature (°C)	24.8	24.8	24.7	24.7	24.8	24.8
11.3%	pH (S.U.)	7.90	7.48	7.76	7.36	7.54	7.23
	DO (mg/L)	8.1	7.7	7.9	7.9	7.9	7.4
	Conductivity (µmhos/cm)	277		280		294	
	Temperature (°C)	25.0	24.6	24.7	24.9	25.0	25.0
22.6%	pH (S.U.)	7.91	7.47	7.77	7.36	7.53	7.20
	DO (mg/L)	8.1	7.7	7.9	7.9	8.0	7.4
	Conductivity (µmhos/cm)	260		269		284	
	Temperature (°C)	25.0	24.8	24.8	24.6	25.0	24.7
45.2%	pH (S.U.)	7.88	7.48	7.74	7.36	7.49	7.20
	DO (mg/L)	8.1	7.7	7.9	7.9	7.9	7.4
	Conductivity (µmhos/cm)	241		240		263	
	Temperature (°C)	25.0	24.9	24.8	24.6	25.0	24.8
72.6%	pH (S.U.)	7.86	7.49	7.73	7.35	7.47	7.20
	DO (mg/L)	8.2	7.7	7.9	7.9	7.9	7.4
	Conductivity (µmhos/cm)	207		210		230	
	Temperature (°C)	25.0	24.7	24.8	24.9	25.0	24.8
100%	pH (S.U.)	7.85	7.49	7.72	7.37	7.45	7.22
	DO (mg/L)	8.2	7.6	7.9	7.9	8.0	7.4
	Conductivity (µmhos/cm)	182		190		203	
	Alkalinity (mg $CaCO_3$/L)	66				66	
	Hardness (mg $CaCO_3$/L)	92				83	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.9	24.8	24.9	25.1	24.7
100% Intake	pH (S.U.)	7.83	7.53	7.72	7.34	7.42	7.23
	DO (mg/L)	8.4	7.7	7.8	7.9	8.0	7.5
	Conductivity (µmhos/cm)	177		180		200	
	Alkalinity (mg $CaCO_3$/L)	66				64	
	Hardness (mg $CaCO_3$/L)	81				83	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.9	24.8	24.8	25.0	24.8
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*
Client: TVA - Sequoyah Nuclear Plant - Non-treated

Date: 10-28-08

		Day							
		3		4		5		6	
	Analyst	B/S	LAB	LAB	B/S	B/S	LAB	LAB	B/S
Concentration	Parameter								
CONTROL	pH (S.U.)	7.43	7.51	7.66	7.40	7.63	7.40	7.41	7.19
	DO (mg/L)	7.9	8.0	8.0	7.8	8.2	7.6	7.7	6.3
	Conductivity (µmhos/cm)	302		~~295~~ ~~302~~	302	~~299~~ 302		308	
	Alkalinity (mg $CaCO_3$/L)			61		60			
	Hardness (mg $CaCO_3$/L)			89		96			
	Temperature (°C)	24.7	24.7	24.8	24.7	24.7	24.6	24.8	24.6
11.3%	pH (S.U.)	7.51	7.49	7.66	7.38	7.56	7.40	7.50	7.10
	DO (mg/L)	7.8	8.0	8.2	7.7	8.2	7.7	7.8	6.1
	Conductivity (µmhos/cm)	284		~~289~~ ~~295~~	287	~~288~~ 302		297	
	Temperature (°C)	24.7	24.7	24.8	24.8	24.8	24.8	24.9	24.6
22.6%	pH (S.U.)	7.48	7.49	7.64	7.37	7.60	7.39	7.49	7.09
	DO (mg/L)	7.8	8.0	8.2	7.7	8.2	7.7	7.9	6.2
	Conductivity (µmhos/cm)	270		~~278~~ ~~280~~	280	~~277~~ 276		283	
	Temperature (°C)	24.7	24.6	24.8	24.6	24.8	24.5	24.9	24.7
45.2%	pH (S.U.)	7.49	7.48	7.62	7.35	7.59	7.40	7.46	7.15
	DO (mg/L)	7.9	8.0	8.2	7.7	~~8.3~~ 8.2	7.7	7.7	6.3
	Conductivity (µmhos/cm)	248		256 ~~278~~		~~255~~ 253		260	
	Temperature (°C)	24.7	24.8	24.8	24.9	24.8	24.5	24.9	24.7
72.6%	pH (S.U.)	7.45	7.50	7.62	7.40	7.59	7.40	7.45	7.10
	DO (mg/L)	7.9	8.0	8.2	7.7	8.3	7.7	7.8	6.1
	Conductivity (µmhos/cm)	220		~~227~~ ~~256~~	241	~~224~~ 227		232	
	Temperature (°C)	24.8	24.8	24.9	24.9	24.8	24.7	24.9	24.8
100%	pH (S.U.)	7.46	7.52	7.62	7.39	7.58	7.40	7.45	7.08
	DO (mg/L)	7.9	8.0	8.2	7.7	8.3	7.8	7.9	6.3
	Conductivity (µmhos/cm)	191		~~199~~ ~~227~~	217	~~204~~ 199		198	
	Alkalinity (mg $CaCO_3$/L)			68					
	Hardness (mg $CaCO_3$/L)			75					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.6	24.9	24.7	25.0	24.7	24.9	24.8
100% Intake	pH (S.U.)	7.42	7.51	7.64	7.36	~~7.56~~ 7.58	7.40	7.44	7.08
	DO (mg/L)	8.1	8.0	8.2	7.8	8.3	7.7	7.8	6.4
	Conductivity (µmhos/cm)	190		283 ~~194~~		~~193~~ 195		201	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			79					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.7	24.9	24.9	24.8	24.6	25.0	24.8
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* CONDUCTIVITY VALUES INCORRECTLY PLACED IN NEXT HIGHEST SPACES.
- ANALYST REANALYZED + VALUES WERE CONFIRMED

ETS Environmental Testing Solutions

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1002.0)
Species: *Ceriodaphnia dubia*

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 5058

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	565	1130	1815	2500	
Diluent volume (mL)	2217.5	1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism source information:											*Test information:*	
Organism age:	< 24-hours old										Randomizing template color:	GREEN
Date and times organisms were born between:	10-27-08 1258 TO 1614										Incubator number and shelf location:	281
Culture board:	10-21-08 A								10-21-08 B			
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	10-06-08
Culture board cup number:	4	5	10	12	13	18	27	28	32	6		
Transfer bowl information:	pH = 7.94 SU Temperature = 24.7 °C										*Selenastrum* batch:	09-29-08 + 10-28-08 Milli-Q

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHSW	Sample numbers used	Analyst
0	10-28-08	0800	10-18-08	081027.01 + 02	JL
1	10-29-08	0754	10-18-08	081027.01 + 02	JL
2	10-30-08	0734	10-25-08A	081029.01 + 02	JL
3	10-31-08	0758	10-25-08A	081029.01 + 02	JL
4	11-01-08	0840	10-25-08B	081031.01 + 02	JL
5	11-02-08	0800	10-29-08A	081031.01 + 02	JL
6	11-03-08	0742	10-29-08A	081031.01 + 02	JL
7	11-04-08	0705			JL

Control information:	1	2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	33.3	32.3	≥ 15.0 offspring/female	ChV	>100%
% CV:	6.2%	6.0%	< 40.0 %	IC25	>100%

FTS

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 10·28·08

CONTROL - 1

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	6	5	4	6	4	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	13	14	13	13	13	12	14	12	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	16	0	17	0	0	0	0	16	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	0	17	0	15	14	17	17	0	0
Total young produced		29	35	36	34 ~~35~~	34	31	33	35	33	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.3

CONC: 11.3%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	6	5	5	5	4	5	5	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	12	13	14	12	12	14	13	14	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	17	0	19	0	0	0	0	17	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	16	0	18	15	18	16	0	0
Total young produced		34	35	34	38	35	31	37	34	37	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.6
% Reduction from Control:	-3.9%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 10-28-08

CONC: 22.6%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	6	4	6	4	5	6	5	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	13	13	13	14	12	15	13	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	18	19	17	17	0	19	0	17	19	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	18	0	16	0	0	0
Total young produced		37	38	34	36	36	36	37	35	37	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.7
% Reduction from Control:	-7.2%

CONC: 45.2%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	5	5	4	5	7	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	16	13	15	12	14	14	13	14	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	17	0	19	0	18	16	19	19	19
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	19	0	17	0	0	0	0	0
Total young produced		32	~~36~~ 38	37	39	34	36	35	39	37	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	36.3
% Reduction from Control:	-9.0%

ETS Environmental Testing Services, Inc.

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 10-28-05

CONC: 72.6%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	6	4	5	5	5	6	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	16	15	13	12	12	15	14	13	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	18	20	19	0	17	17	19	0	20	18
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	19	0	0	0	17	0	0
Total young produced		38	40	39	37	34	35	39	36	38	38
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	37.4
% Reduction from Control:	-12.37%

CONC: 100%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	6	4	6	4	5	5	6	5	5	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	16	14	14	13	15	14	16	14	14	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	21	19	19	20	0	19	20	20	18	21
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	18	0	0	0	0	0
Total young produced		43	37	39	37	38	38	42	39	37	42
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	39.2
% Reduction from Control:	-17.7%

ETS

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 10-28-08

CONTROL - 2

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	4	4	5	4	4	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	14	12	14	12	12	11	14	13	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	0	0	0	0	0	0	0	0	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	17	14	16	16	16	16	14	15	0
Total young produced		30	36	30	34	32	33	31	32	34	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.3

CONC: **100% Intake**

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	4	5	5	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	11	13	12	12	12	10	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	15	19	19	16	15	18	15	17	15
Total young produced		35	31	34	36	33	32	34	29	35	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.0
% Reduction from Control:	-2.2%

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101
October 28 - November 04, 2008
Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	6	5	4	6	4	4	4	5	5	47
5	11	13	14	13	13	13	12	14	12	12	127
6	0	16	0	17	0	0	0	0	16	16	65
7	14	0	17	0	15	14	17	17	0	0	94
Total	29	35	36	34	34	31	33	35	33	33	333

72.6%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	4	5	5	5	6	5	5	5	5	51
5	14	16	15	13	12	12	15	14	13	15	139
6	18	20	19	0	17	17	19	0	20	18	148
7	0	0	0	19	0	0	0	17	0	0	36
Total	38	40	39	37	34	35	39	36	38	38	374

11.3%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	6	5	5	5	4	5	5	6	4	49
5	14	12	13	14	12	12	14	13	14	12	130
6	16	17	0	19	0	0	0	0	17	15	84
7	0	0	16	0	18	15	18	16	0	0	83
Total	34	35	34	38	35	31	37	34	37	31	346

100%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	4	6	4	5	5	6	5	5	6	52
5	16	14	14	13	15	14	16	14	14	15	145
6	21	19	19	20	0	19	20	20	18	21	177
7	0	0	0	0	18	0	0	0	0	0	18
Total	43	37	39	37	38	38	42	39	37	42	392

22.6%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	6	4	6	4	5	6	5	5	4	49
5	15	13	13	13	14	12	15	13	13	12	133
6	18	19	17	17	0	19	0	17	19	15	141
7	0	0	0	0	18	0	16	0	0	0	34
Total	37	38	34	36	36	36	37	35	37	31	357

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	4	4	5	4	4	6	4	45
5	11	14	12	14	12	12	11	14	13	11	124
6	14	0	0	0	0	0	0	0	0	16	30
7	0	17	14	16	16	16	16	14	15	0	124
Total	30	36	30	34	32	33	31	32	34	31	323

45.2%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	5	5	4	5	7	4	4	48
5	13	16	13	15	12	14	14	13	14	13	137
6	15	17	0	19	0	18	16	19	19	19	142
7	0	0	19	0	17	0	0	0	0	0	36
Total	32	38	37	39	34	36	35	39	37	36	363

100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	5	5	4	4	5	4	44
5	12	12	11	13	12	12	12	10	13	12	119
6	0	0	0	0	0	0	0	0	0	0	0
7	18	15	19	19	16	15	18	15	17	15	167
Total	35	31	34	36	33	32	34	29	35	31	330

TVA / Sequoyah Nuclear Plant, Outfall 101
October 28 - November 04, 2008

ETS
Environmental Testing Solutions, Inc.

Ceriodaphnia dubia Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1002.0

Quality Control
Verification of Data Entry, Calculations, and Statistical Analyses

Project number: 5058
Reveiwed by:

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	29	35	36	34	34	31	33	35	33	33	100	33.3	6.2	Not applicable
11.3%	34	35	34	38	35	31	37	34	37	31	100	34.6	6.8	-3.9
22.6%	37	38	34	36	36	36	37	35	37	31	100	35.7	5.6	-7.2
45.2%	32	38	37	39	34	36	35	39	37	36	100	36.3	6.1	-9.0
72.6%	38	40	39	37	34	35	39	36	38	38	100	37.4	5.1	-12.3
100%	43	37	39	37	38	38	42	39	37	42	100	39.2	5.9	-17.7
Control - 2	30	36	30	34	32	33	31	32	34	31	100	32.3	6.0	Not applicable
100% Intake	35	31	34	36	33	32	34	29	35	31	100	33.0	6.7	-2.2

Outfall 101:
Dunnett's MSD value: 2.195
PMSD: 6.6

Intake:
Dunnett's MSD value: 1.615
PMSD: 5.0

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.
Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
October 28 - November 04, 2008

Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/28/2008	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	29.000	35.000	36.000	34.000	34.000	31.000	33.000	35.000	33.000	33.000
11.3	34.000	35.000	34.000	38.000	35.000	31.000	37.000	34.000	37.000	31.000
22.6	37.000	38.000	34.000	36.000	36.000	36.000	37.000	35.000	37.000	31.000
45.2	32.000	38.000	37.000	39.000	34.000	36.000	35.000	39.000	37.000	36.000
72.6	38.000	40.000	39.000	37.000	34.000	35.000	39.000	36.000	38.000	38.000
100	43.000	37.000	39.000	37.000	38.000	38.000	42.000	39.000	37.000	42.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	33.300	1.0000	33.300	29.000	36.000	6.179	10				36.083	1.0000
11.3	34.600	1.0390	34.600	31.000	38.000	6.839	10	-1.355	2.287	2.195	36.083	1.0000
22.6	35.700	1.0721	35.700	31.000	38.000	5.610	10	-2.501	2.287	2.195	36.083	1.0000
45.2	36.300	1.0901	36.300	32.000	39.000	6.098	10	-3.126	2.287	2.195	36.083	1.0000
72.6	37.400	1.1231	37.400	34.000	40.000	5.073	10	-4.272	2.287	2.195	36.083	1.0000
100	39.200	1.1772	39.200	37.000	43.000	5.867	10	-6.147	2.287	2.195	36.083	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.66729027	1.035	-0.3926353	-0.3779355
Bartlett's Test indicates equal variances (p = 0.99)	0.62959719	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.19461764	0.06590443	43.1766667	4.60555556	1.8E-06	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Intake
October 28 - November 04, 2008
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/28/2008	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	36.000	30.000	34.000	32.000	33.000	31.000	32.000	34.000	31.000
100	35.000	31.000	34.000	36.000	33.000	32.000	34.000	29.000	35.000	31.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	32.300	1.0000	32.300	30.000	36.000	6.026	10				32.650	1.0000
100	33.000	1.0217	33.000	29.000	36.000	6.700	10	-0.751	1.734	1.615	32.650	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97574127	0.868	-0.0277877	-0.6744365
F-Test indicates equal variances (p = 0.71)	1.29032254	6.54108953		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	1.61535987	0.05001114	2.45	4.33888889	0.46210104	1, 18

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
October 28 - November 04, 2008

ETS
Environmental Testing Solutions, Inc.

Ceriodaphnia dubia Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1002.0

Daily Chemical Analyses

Project number: 5058
Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.90	7.66	7.85	7.48	7.58	7.43	7.43	7.64	7.66	7.40	7.63	7.44	7.41	7.59
	DO (mg/L)	7.9	8.0	7.9	8.0	7.9	7.9	7.9	8.2	8.0	8.0	8.2	7.7	7.7	7.4
	Conductivity (µmhos/cm)	296		316		313		302		302		302		308	
	Alkalinity (mg/L $CaCO_3$)	60				60				61		60			
	Hardness (mg/L $CaCO_3$)	85				96				89		96			
	Temperature (°C)	24.9	24.6	24.7	24.7	24.7	24.9	24.7	25.0	24.8	24.7	24.7	25.0	24.7	25.0
11.3%	pH (SU)	7.90	7.66	7.76	7.47	7.54	7.41	7.51	7.65	7.66	7.59	7.56	7.45	7.50	7.53
	DO (mg/L)	8.1	8.0	7.9	8.0	7.9	7.9	7.8	8.2	8.2	8.1	8.2	8.0	7.8	7.3
	Conductivity (µmhos/cm)	277		280		294		284		287		302		297	
	Temperature (°C)	24.9	24.8	24.7	24.7	24.7	25.1	24.9	24.9	24.8	25.1	24.7	25.0	24.7	24.9
22.6%	pH (SU)	7.91	7.65	7.77	7.45	7.53	7.40	7.48	7.65	7.64	7.59	7.60	7.46	7.49	7.53
	DO (mg/L)	8.1	8.0	7.9	8.0	8.0	7.8	7.8	8.2	8.2	8.1	8.2	8.0	7.9	7.3
	Conductivity (µmhos/cm)	260		269		284		270		280		276		283	
	Temperature (°C)	25.0	24.7	24.8	24.8	24.7	25.1	24.9	25.0	24.8	24.8	24.7	24.8	24.8	24.9
45.2%	pH (SU)	7.88	7.64	7.74	7.44	7.49	7.39	7.45	7.64	7.62	7.59	7.59	7.46	7.46	7.52
	DO (mg/L)	8.1	8.0	7.9	8.1	7.9	7.8	7.9	8.2	8.2	8.1	8.2	8.0	7.7	7.3
	Conductivity (µmhos/cm)	241		240		263		248		256		253		260	
	Temperature (°C)	25.0	24.6	24.8	24.8	24.7	25.0	24.9	24.9	24.9	24.8	24.7	24.7	24.8	24.8
72.6%	pH (SU)	7.86	7.63	7.73	7.44	7.47	7.39	7.45	7.65	7.62	7.58	7.59	7.46	7.45	7.52
	DO (mg/L)	8.2	8.0	7.9	8.1	7.9	7.8	7.9	8.2	8.2	8.2	8.3	7.9	7.8	7.2
	Conductivity (µmhos/cm)	207		210		230		220		242		227		232	
	Temperature (°C)	25.0	24.6	24.8	24.8	24.7	24.8	24.9	24.9	24.9	24.8	24.8	24.9	24.8	25.0
100%	pH (SU)	7.85	7.61	7.72	7.43	7.45	7.40	7.46	7.66	7.62	7.58	7.58	7.46	7.45	7.51
	DO (mg/L)	8.2	8.0	7.9	8.1	8.0	7.8	7.9	8.2	8.2	8.1	8.3	7.9	7.9	7.3
	Conductivity (µmhos/cm)	182		190		203		191		215		199		198	
	Alkalinity (mg/L $CaCO_3$)	66				66				68					
	Hardness (mg/L $CaCO_3$)	92				83				75					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<01.0					
	Temperature (°C)	25.0	24.7	24.9	24.8	24.8	24.7	25.0	24.9	24.9	25.0	24.8	24.7	24.8	24.9
100% Intake	pH (SU)	7.83	7.63	7.72	7.43	7.42	7.41	7.42	7.65	7.64	7.57	7.56	7.44	7.44	7.47
	DO (mg/L)	8.4	8.0	7.8	8.1	8.0	7.9	8.1	8.2	8.2	8.1	8.3	7.7	7.8	7.3
	Conductivity (µmhos/cm)	177		180		200		190		283		195		201	
	Alkalinity (mg/L $CaCO_3$)	66				64				74					
	Hardness (mg/L $CaCO_3$)	81				83				79					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.7	24.9	24.7	24.7	24.7	25.0	25.1	24.9	24.8	24.8	24.8	24.8	24.9

Species: *Ceriodaphnia dubia* Date: 10-23-08

Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1 MOL		2 MOL	KLK
	Analyst	MOL	JL	JL	JL	JL	RLS
Concentration	Parameter						
CONTROL	pH (S.U.)	7.90	7.66	7.85	7.48	7.58	7.43
	DO (mg/L)	7.9	8.0	7.9	8.0	7.9	7.9
	Conductivity (µmhos/cm)	296		316		313	
	Alkalinity (mg $CaCO_3$/L)	60				60	
	Hardness (mg $CaCO_3$/L)	85				96	
	Temperature (°C)	24.9	24.6	24.7	24.7	24.7	24.9
11.3%	pH (S.U.)	7.90	7.66	7.76	7.47	~~7.60~~ 7.54	7.41
	DO (mg/L)	8.1	8.0	7.9	8.0	7.9	7.9
	Conductivity (µmhos/cm)	277		280		294	
	Temperature (°C)	24.9	24.8	24.7	24.7	24.7	25.1
22.6%	pH (S.U.)	7.91	7.65	7.77	7.45	~~7.63~~ 7.53	7.40
	DO (mg/L)	8.1	8.0	7.9	8.0	8.0	7.8
	Conductivity (µmhos/cm)	260		269		284	
	Temperature (°C)	25.0	24.7	24.8	24.8	24.7	25.1
45.2%	pH (S.U.)	7.88	7.64	7.74	7.44	~~7.63~~ 7.49	~~7.30~~ 7.39
	DO (mg/L)	8.1	8.0	7.9	8.1	7.9	7.8
	Conductivity (µmhos/cm)	241		240		263	
	Temperature (°C)	25.0	24.6	24.8	24.8	24.7	25.0
72.6%	pH (S.U.)	7.86	7.63	7.73	7.44	7.47	7.39
	DO (mg/L)	8.2	8.0	7.9	8.1	7.9	7.8
	Conductivity (µmhos/cm)	207		210		230	
	Temperature (°C)	25.0	24.6	24.8	24.8	24.7	24.8
100%	pH (S.U.)	7.85	7.61	7.72	7.43	7.45	7.40
	DO (mg/L)	8.2	8.0	7.9	8.1	8.0	7.8
	Conductivity (µmhos/cm)	182		190		203	
	Alkalinity (mg $CaCO_3$/L)	66				66	
	Hardness (mg $CaCO_3$/L)	92				83	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.7	24.9	24.8	24.8	24.7
100% Intake	pH (S.U.)	7.83	7.63	7.72	7.43	7.42	7.41
	DO (mg/L)	8.4	8.0	7.8	8.1	8.0	7.9
	Conductivity (µmhos/cm)	177		180		200	
	Alkalinity (mg $CaCO_3$/L)	66				64	
	Hardness (mg $CaCO_3$/L)	81				83	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.7	24.9	24.7	24.7	24.7
		Initial	Final	Initial	Final	Initial	Final

FTS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated

Date: 10-28-08

		Day							
		3		4		5		6	
	Analyst	BLS	LAB	LAB	BSC	BSC	LAB	LAB	KEL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.43	7.64	7.66	7.40	~~7.55~~ 7.63	7.44	7.41	7.59
	DO (mg/L)	7.9	8.2	8.0	8.0	8.2	7.7	7.7	7.4
	Conductivity (µmhos/cm)	302		302		302		308	
	Alkalinity (mg $CaCO_3$/L)			61		60			
	Hardness (mg $CaCO_3$/L)			89		96			
	Temperature (°C)	24.7	25.0	24.8	24.7	24.7	25.0	24.7	25.0
11.3%	pH (S.U.)	7.51	7.65	7.66	7.59	7.56	7.45	7.50	7.53
	DO (mg/L)	7.8	8.2	8.2	8.1	8.2	8.0	7.8	7.3
	Conductivity (µmhos/cm)	284		287		* ~~274~~ 302		297	
	Temperature (°C)	24.9	24.9	24.8	25.1	24.7	25.0	24.7	24.9
22.6%	pH (S.U.)	7.48	7.65	7.64	7.59	7.60	7.46	7.49	7.53
	DO (mg/L)	7.8	8.2	8.2	8.1	8.2	8.0	7.9	7.3
	Conductivity (µmhos/cm)	270		280		* ~~255~~ BSC 276		283	
	Temperature (°C)	24.9	25.0	24.8	24.8	24.7	24.8	24.8	24.9
45.2%	pH (S.U.)	7.45	7.64	7.62	7.59	7.59	7.46	7.46	7.52
	DO (mg/L)	7.9	8.2	8.2	8.1	8.2	8.0	7.7	7.3
	Conductivity (µmhos/cm)	* ~~278~~ BSC 248		256		* ~~242~~ 253		260	
	Temperature (°C)	24.9	24.9	24.9	24.8	24.7	24.7	24.8	24.8
72.6%	pH (S.U.)	7.45	7.65	7.62	7.58	7.59	7.46	7.45	7.52
	DO (mg/L)	7.9	8.2	8.2	8.2	8.3	7.9	7.8	7.2
	Conductivity (µmhos/cm)	220		242		227*		232	
	Temperature (°C)	24.9	24.9	24.9	24.8	24.8	24.9	24.8	25.0
100%	pH (S.U.)	~~7.44~~ 7.46	7.66	7.62	7.58	7.58	7.46	7.45	7.57
	DO (mg/L)	7.9	8.2	8.2	8.1	8.3	7.9	7.9	7.3
	Conductivity (µmhos/cm)	* ~~228~~ BSC 191		215		199		198	
	Alkalinity (mg $CaCO_3$/L)			68					
	Hardness (mg $CaCO_3$/L)			75					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.9	24.9	25.0	24.8	24.7	24.8	24.9
100% Intake	pH (S.U.)	7.42	7.65	7.64	7.57	7.56	7.44	7.44	7.47
	DO (mg/L)	8.1	8.2	8.2	8.1	8.3	7.7	7.8	7.3
	Conductivity (µmhos/cm)	190		283		195		201	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			79					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	25.1	24.9	24.8	24.8	24.8	24.8	24.9
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* CORRECTED. CONDUCTIVITY VALUES PLACED INCORRECTLY IN NEXT HIGHEST SPACES.

*VALUES CONFIRMED

Environmental Testing Solutions, Inc.

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 5058

County: Hamilton
Treatment: UV-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	Each concentration was treated
Effluent volume (mL)	282.5	565	1130	1815	2500	for 2 minutes with a UV sterilizer
Diluent volume (mL)	2217.5	1935	1370	685	0	to remove pathogenic
Total volume (mL)	2500	2500	2500	2500	2500	interferences.

Test organism information:		*Test information:*	
Organism age:	24.55 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	10-27-08 1600	Incubator number:	2B
Organism source:	ATOX BATCH Pp 10-27-08	*Artemia* lot number:	BF1604W
Transfer bowl information:	pH = 7.87 Temperature = 24.4 °C	Total drying time:	24 HOURS
		Date / Time in: 11-04-08	1620
Average transfer volume:	7.8 ml	Date / Time out: 11-05-08	1620
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used MHSW	Sample numbers used	Analyst
0	10-28-08	—	1710	1633	10-18-08	081027.01402	JH
1	10-29-08	1030	1630	~~1635~~ 1535	10-18-08	081027.01402	JH
2	10-30-08	1125	1730	1612	10-25-08A	081029.01402	JH
3	10-31-08	1035	1640	1535	10-25-08A	081029.01402	JH
4	11-01-08	1030	1630	1534	10-25-08B	081031.01402	JH
5	11-02-08	1030	1630	1550	10-29-08A	081031.01402	JH
6	11-03-08	1030	1635	1536	10-29-08A	081031.01402	JH
7	11-04-08			1540			JH

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.462		NOEC	100%
Average weight per surviving larvae:	0.462	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 10-28-08
Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	CONTROL				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10 ISM	10 ISM	10 ISM	10	10	10	10	10	10	10 ISM	10	10
A = Pan weight (mg) Color identification: Blue Analyst: LAB	14.40	14.64	14.34	14.33	13.18	14.64	13.12	14.12	14.53	14.27	12.19	14.64
B = Pan + Larvae weight (mg) Analyst: BLS	19.29	18.80	18.74	19.35	18.96	20.78	19.44	20.34	19.56	19.16	18.23	20.70
Larvae weight (mg) = A – B	4.89	4.16	4.40	5.02	5.78	6.14	6.32	6.22	5.03	4.89	6.04	6.06
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.489	0.416	0.440	0.502	0.578	0.614	0.632	0.622	0.503	0.489	0.604	0.606
Average weight per initial number of larvae (mg)	0.462				0.612				0.551			
Percent reduction from control (%)							-32.4%				-19.2%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

ETS Environmental Testing Services

Species: *Pimephales promelas* Date: 10-28-08

Client: TVA Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Color identification: Lblue Analyst: LAB	13.88	14.28	13.87	14.87	14.14	14.67	15.33	13.44	12.92	14.86	13.25	14.40
B = Pan + Larvae weight (mg) Analyst: BLS	19.63	19.68	19.34	21.26	19.72	20.46	21.96	20.32	18.48	20.43	18.66	20.43
Larvae weight (mg) = A – B	5.75	5.40	5.47	6.39	5.58	5.79	6.63	6.88	5.56	5.57	5.41	6.03
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.575	0.540	0.547	0.639	0.558	0.579	0.663	0.688	0.556	0.557	0.541	0.603
Average weight per initial number of larvae (mg)	0.575				0.622				0.564			
Percent reduction from control (%)			-24.6%				-34.7%				-22.2%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas* Date: 10-28-08
Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg) Color identification: ~~LAL~~ 1. blue Analyst: LAB	13.54	13.65	15.84	~~14.29~~ 14.31
B = Pan + Larvae weight (mg) Analyst: BLS	19.35	20.25	21.76	21.04
Larvae weight (mg) = A – B	5.81	6.60	5.92	6.73
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.581	0.660	0.592	0.673
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.627		-35.7%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
October 28 - November 04, 2008

Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1000.0

Quality Control
Verification of Data Entry, Calculations, and Statistical Analyses

Project number: 5058
Reviewed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.40	19.29	4.89	0.489	0.462	8.8	0.489	100.0	0.462	8.8	Not applicable
	B	10	10	14.64	18.80	4.16	0.416			0.416				
	C	10	10	14.34	18.74	4.40	0.440			0.440				
	D	10	10	14.33	19.35	5.02	0.502			0.502				
11.3%	E	10	10	13.18	18.96	5.78	0.578	0.612	3.8	0.578	100.0	0.612	3.8	-32.4
	F	10	10	14.64	20.78	6.14	0.614			0.614				
	G	10	10	13.12	19.44	6.32	0.632			0.632				
	H	10	10	14.12	20.34	6.22	0.622			0.622				
22.6%	I	10	10	14.53	19.56	5.03	0.503	0.551	11.5	0.503	100.0	0.551	11.5	-19.2
	J	10	10	14.27	19.16	4.89	0.489			0.489				
	K	10	10	12.19	18.23	6.04	0.604			0.604				
	L	10	10	14.64	20.70	6.06	0.606			0.606				
45.2%	M	10	10	13.88	19.63	5.75	0.575	0.575	7.8	0.575	100.0	0.575	7.8	-24.6
	N	10	10	14.28	19.68	5.40	0.540			0.540				
	O	10	10	13.87	19.34	5.47	0.547			0.547				
	P	10	10	14.87	21.26	6.39	0.639			0.639				
72.6%	Q	10	10	14.14	19.72	5.58	0.558	0.622	10.2	0.558	100.0	0.622	10.2	-34.7
	R	10	10	14.67	20.46	5.79	0.579			0.579				
	S	10	10	15.33	21.96	6.63	0.663			0.663				
	T	10	10	13.44	20.32	6.88	0.688			0.688				
100%	U	10	10	12.92	18.48	5.56	0.556	0.564	4.8	0.556	100.0	0.564	4.8	-22.2
	V	10	10	14.86	20.43	5.57	0.557			0.557				
	W	10	10	13.25	18.66	5.41	0.541			0.541				
	X	10	10	14.40	20.43	6.03	0.603			0.603				
100% Intake	Y	10	10	13.54	19.35	5.81	0.581	0.627	7.5	0.581	100.0	0.627	7.5	-35.7
	Z	10	10	13.65	20.25	6.60	0.660			0.660				
	AA	10	10	15.84	21.76	5.92	0.592			0.592				
	BB	10	10	14.31	21.04	6.73	0.673			0.673				

Outfall 101:
Dunnett's MSD value: 0.0791
PMSD: 17.1

Intake:
Dunnett's MSD value: 0.0601
PMSD: 13.0

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
October 28 - November 04, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/28/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.4890	0.4160	0.4400	0.5020
11.3	0.5780	0.6140	0.6320	0.6220
22.6	0.5030	0.4890	0.6040	0.6060
45.2	0.5750	0.5400	0.5470	0.6390
72.6	0.5580	0.5790	0.6630	0.6880
100	0.5560	0.5570	0.5410	0.6030

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4618	1.0000	0.4618	0.4160	0.5020	8.778	4				0.5642	1.0000
11.3	0.6115	1.3243	0.6115	0.5780	0.6320	3.846	4	-4.560	2.410	0.0791	0.5642	1.0000
22.6	0.5505	1.1922	0.5505	0.4890	0.6060	11.480	4	-2.703	2.410	0.0791	0.5642	1.0000
45.2	0.5753	1.2458	0.5753	0.5400	0.6390	7.842	4	-3.456	2.410	0.0791	0.5642	1.0000
72.6	0.6220	1.3470	0.6220	0.5580	0.6880	10.160	4	-4.880	2.410	0.0791	0.5642	1.0000
100	0.5643	1.2220	0.5643	0.5410	0.6030	4.759	4	-3.121	2.410	0.0791	0.5642	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94403017	0.884	0.12865374	-1.2634024
Bartlett's Test indicates equal variances (p = 0.53)	4.127841	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.07913777	0.17138661	0.01310714	0.00215657	0.00182693	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Intake - UV-treated
October 28 - November 04, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/28/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.4890	0.4160	0.4400	0.5020
100	0.5810	0.6600	0.5920	0.6730

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4618	1.0000	0.4618	0.4160	0.5020	8.778	4				0.5441	1.0000
100	0.6265	1.3568	0.6265	0.5810	0.6730	7.455	4	-5.328	1.943	0.0601	0.5441	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.82958078	0.749	-0.0508746	-2.4219774
F-Test indicates equal variances (p = 0.82)	1.32792294	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.06008626	0.13012725	0.05428513	0.00191229	0.00178155	1, 6

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
October 28 - November 04, 2008

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1000.0

Daily Chemical Analyses

Project number: 5058

Reviewed by: J/[illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.88	7.53	7.67	7.39	7.43	7.32	7.48	7.57	7.69	7.39	7.63	7.43	7.48	7.16
	DO (mg/L)	8.0	7.7	7.9	8.0	8.1	7.6	7.9	8.1	8.2	7.7	8.0	7.6	7.8	6.6
	Conductivity (µmhos/cm)	297		299		302		280		295		280		303	
	Alkalinity (mg/L $CaCO_3$)	61				59				60		59			
	Hardness (mg/L $CaCO_3$)	85				96				92		87			
	Temperature (°C)	24.9	24.8	24.8	24.6	24.9	24.7	24.8	24.6	24.9	24.6	24.8	24.8	24.8	24.6
11.3%	pH (SU)	7.87	7.46	7.69	7.38	7.46	7.26	7.49	7.54	7.69	7.40	7.64	7.43	7.49	7.15
	DO (mg/L)	8.0	7.8	8.0	7.9	8.2	7.5	7.9	8.0	8.2	7.7	8.1	7.7	8.0	6.6
	Conductivity (µmhos/cm)	274		290		300		279		288		287		296	
	Temperature (°C)	25.0	25.0	24.8	24.6	25.0	25.0	24.8	24.8	25.0	25.0	24.8	24.7	25.0	24.9
22.6%	pH (SU)	7.86	7.46	7.68	7.38	7.46	7.27	7.50	7.55	7.69	7.40	7.64	7.41	7.49	7.16
	DO (mg/L)	8.0	7.8	8.0	7.8	8.2	7.5	8.0	8.0	8.2	7.7	8.2	7.7	7.9	6.6
	Conductivity (µmhos/cm)	266		269		288		270		278		269		287	
	Temperature (°C)	25.1	24.9	24.8	24.6	25.0	24.9	24.8	24.9	25.0	24.7	24.9	24.7	24.9	24.8
45.2%	pH (SU)	7.85	7.46	7.67	7.38	7.46	7.25	7.49	7.54	7.68	7.40	7.64	7.43	7.49	7.16
	DO (mg/L)	8.0	7.8	8.0	7.9	8.2	7.5	8.0	8.0	8.3	7.7	8.2	7.9	8.0	6.7
	Conductivity (µmhos/cm)	242		245		262		248		256		253		263	
	Temperature (°C)	25.1	24.7	24.9	24.7	25.0	24.9	24.9	24.8	25.0	24.8	24.9	24.7	24.9	24.6
72.6%	pH (SU)	7.82	7.45	7.67	7.32	7.46	7.26	7.48	7.55	7.66	7.39	7.64	7.42	7.48	7.13
	DO (mg/L)	8.0	7.8	8.0	7.9	8.2	7.5	8.0	8.0	8.3	7.7	8.2	7.6	7.9	6.7
	Conductivity (µmhos/cm)	217		220		233		221		227		226		235	
	Temperature (°C)	25.1	24.9	24.9	24.8	25.1	24.8	24.9	24.7	25.0	24.7	24.9	24.9	25.0	24.6
100%	pH (SU)	7.81	7.45	7.67	7.32	7.46	7.24	7.48	7.57	7.65	7.37	7.63	7.46	7.48	7.14
	DO (mg/L)	8.0	7.8	8.1	8.0	8.2	7.5	8.2	8.1	8.3	7.7	8.2	7.8	8.0	6.6
	Conductivity (µmhos/cm)	184		191		204		194		199		181		198	
	Alkalinity (mg/L $CaCO_3$)	64				66				80					
	Hardness (mg/L $CaCO_3$)	87				79				83					
	Temperature (°C)	25.1	24.9	24.9	24.6	25.1	24.7	24.9	24.7	25.0	24.7	25.0	24.9	25.0	24.7
100% Intake	pH (SU)	7.78	7.46	7.66	7.36	7.45	7.24	7.47	7.57	7.63	7.38	7.62	7.45	7.47	7.14
	DO (mg/L)	8.1	7.8	8.1	8.0	8.3	7.4	8.1	8.1	8.3	7.7	8.2	7.7	7.8	6.6
	Conductivity (µmhos/cm)	170		179		196		187		194		193		202	
	Alkalinity (mg/L $CaCO_3$)	66				68				80					
	Hardness (mg/L $CaCO_3$)	81				81				64					
	Temperature (°C)	25.0	24.8	24.9	24.6	24.9	24.7	24.9	24.7	24.9	24.6	24.9	24.6	25.0	24.7

Species: *Pimephales promelas* Date: 10-28-08

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KEK	JL	JL	JL	JL	BLS
Concentration	Parameter						
CONTROL	pH (S.U.)	7.80	7.53	~~7.85~~*	7.39	7.43	7.32
	DO (mg/L)	8.0	7.7	7.67 7.9	8.0	8.1	7.6
	Conductivity (µmhos/cm)	297		299		302	
	Alkalinity (mg $CaCO_3$/L)	61				59	
	Hardness (mg $CaCO_3$/L)	85				96	
	Temperature (°C)	24.9	24.8	24.8	24.6	24.9	24.7
11.3%	pH (S.U.)	7.87	7.46	~~7.78~~*	7.38	7.46	7.26
	DO (mg/L)	8.0	7.8	7.69 8.0	7.9	8.2	7.5
	Conductivity (µmhos/cm)	274		290		300	
	Temperature (°C)	25.0	25.0	24.8	24.6	25.0	25.0
22.6%	pH (S.U.)	7.86	7.46	~~7.77~~*	7.38	7.46	7.27
	DO (mg/L)	8.0	7.8	7.68 8.0	7.8	8.2	7.5
	Conductivity (µmhos/cm)	266		269		288	
	Temperature (°C)	25.1	24.9	24.8	24.6	25.0	24.9
45.2%	pH (S.U.)	7.85	7.46	~~7.74~~*	7.38	7.46	7.25
	DO (mg/L)	8.0	7.8	7.67 8.0	7.9	8.2	7.5
	Conductivity (µmhos/cm)	242		245		262	
	Temperature (°C)	25.1	24.7	24.9	24.7	25.0	24.9
72.6%	pH (S.U.)	7.82	7.45	~~7.73~~*	7.32	7.46	7.26
	DO (mg/L)	8.0	7.8	7.69 8.0	7.9	8.2	7.5
	Conductivity (µmhos/cm)	217		220		233	
	Temperature (°C)	25.1	24.9	24.9	24.8	25.1	24.8
100%	pH (S.U.)	7.81	7.45	~~7.72~~*	7.32	7.46	7.24
	DO (mg/L)	8.0	7.8	7.67 8.1	8.0	8.2	7.5
	Conductivity (µmhos/cm)	184		191		204	
	Alkalinity (mg $CaCO_3$/L)	64				66	
	Hardness (mg $CaCO_3$/L)	87				79	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.9	24.9	24.6	25.1	24.7
100% Intake	pH (S.U.)	7.78	7.46	~~7.72~~*	7.36	7.45	7.24
	DO (mg/L)	8.1	7.8	7.66 8.1	8.0	8.3	7.4
	Conductivity (µmhos/cm)	170		179		196	
	Alkalinity (mg $CaCO_3$/L)	66				68	
	Hardness (mg $CaCO_3$/L)	81				81	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.8	24.9	24.6	24.9	24.7
		Initial	Final	Initial	Final	Initial	Final

* pH VALUES REANALYZED + CONFIRMED ON DAY 1. JL

ETS Environmental Testing Solutions, Inc.

Species: *Pimephales promelas* Date: 10-28-08

Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		KEW 3		4		5		6	
	Analyst	BLS	LAB	LAB	BSC	BSC	LAB	LAB	KEW
Concen-tration	Parameter								
CONTROL	pH (S.U.)	7.48	7.57	7.69	7.39	7.63	7.43	7.48	7.16
	DO (mg/L)	7.9	8.1	8.2	7.7	8.0	7.6	7.8	6.6
	Conductivity (µmhos/cm)	280		295		~~270~~ 284 BSC		303	
	Alkalinity (mg $CaCO_3$/L)			60		59			
	Hardness (mg $CaCO_3$/L)			92		87			
	Temperature (°C)	24.8	24.6	24.9	24.6	24.8	24.8	24.8	24.6
11.3%	pH (S.U.)	7.49	7.54	7.69	7.40	7.64	7.43	7.49	7.15
	DO (mg/L)	7.9	8.0	8.2	7.7	8.1	7.7	8.0	6.6
	Conductivity (µmhos/cm)	279		288		~~285~~ 287 BSC		296	
	Temperature (°C)	24.8	24.8	25.0	25.0	24.8	24.7	25.0	24.9
22.6%	pH (S.U.)	7.50	7.55	7.49	7.40	7.64	7.41	7.49	7.16
	DO (mg/L)	8.0	8.0	8.2	7.7	8.2	7.7	7.9	6.6
	Conductivity (µmhos/cm)	270		278		~~277~~ 269 BSC		287	
	Temperature (°C)	24.8	24.9	25.0	~~24.7~~ 24.7	24.9	24.7	24.9	24.8
45.2%	pH (S.U.)	7.49	7.54	7.68	7.40	7.64	7.43	7.49	7.16
	DO (mg/L)	8.0	8.0	8.3	7.7	8.2	7.9	8.0	6.7
	Conductivity (µmhos/cm)	248		256		~~250~~ 253 BSC		263	
	Temperature (°C)	24.9	24.8	25.0	24.8	24.9	24.7	24.9	24.6
72.6%	pH (S.U.)	7.48	7.55	7.66	7.39	7.64	7.42	7.48	7.13
	DO (mg/L)	8.0	8.0	8.3	7.7	8.2	7.6	7.9	6.7
	Conductivity (µmhos/cm)	221		227		~~227~~ 226 BSC		235	
	Temperature (°C)	24.9	24.7	25.0	24.7	24.9	24.9	25.0	24.6
100%	pH (S.U.)	7.48	7.57	7.65	7.37	7.63	7.46	7.48	7.14
	DO (mg/L)	8.2	8.1	8.3	7.7	8.2	7.8	8.0	6.6
	Conductivity (µmhos/cm)	194		199		~~207~~ 181 BSC		198	
	Alkalinity (mg $CaCO_3$/L)			80					
	Hardness (mg $CaCO_3$/L)			83					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.7	25.0	24.7	25.0	24.9	25.0	24.7
100% Intake	pH (S.U.)	7.47	7.57	7.63	7.38	7.62	7.45	7.47	7.14
	DO (mg/L)	8.1	8.1	8.3	7.7	8.2	7.7	7.8	6.6
	Conductivity (µmhos/cm)	197		194		193		202	
	Alkalinity (mg $CaCO_3$/L)			80					
	Hardness (mg $CaCO_3$/L)			64					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.7	24.9	24.6	24.9	24.6	25.0	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* ANALYST PLACED NON TREATED CONDUCTANCE VALUES ON UV SHEET. VALUES WERE REANALYZED & CONFIRMED.

Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

Matrix: Water, RL = 0.10 mg/L
Meter: Accumet Model AR25 pH/Ion Meter

Analyst	MRW	Iodide reagent:	INR321
Date analyzed	10-28-08	Acid reagent:	INR366

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS579	INSS579

Note: For samples with a residual chlorine of > 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.489	97.8 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
081027.01	SQN101	pale tan, clear	S <0.00766	
↓	Duplicate		D <0.00686	

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00739
081027.02	SQN INTAKE	pale tan, clear, particles	0.00734

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.462	92.4%

Reviewed by	
Date reviewed	10-28-08

ETS
Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

Matrix: Water, RL = 0.10 mg/L
Meter: Accumet Model AR25 pH/Ion Meter

Analyst	MRW
Date analyzed	10-30-08

Iodide reagent:	INR321
Acid reagent:	INR306

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS579	INSS579

Note: For samples with a residual chlorine of > 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.531	106.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
081029.01	SQN 101	pale tan, clear	S <0.00928	
↓	Duplicate	particles	D <0.00913	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00876
081029.02	SQN INTAKE	tan, clear, particles	<0.00841

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.488	97.6%

Reviewed by	JS
Date reviewed	10-30-08

Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

Matrix: Water, RL = 0.10 mg/L
Meter: Accumet Model AR25 pH/Ion Meter

Analyst	LAB	Iodide reagent:	INR321
Date analyzed	11-01-08	Acid reagent:	INR3060

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS579	INSS579

Note: For samples with a residual chlorine of > 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.514	102.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
081031.01	SON-101-Tox-#1	slightly cloudy w/ particles, pale tan	S <0.00464	
↓	Duplicate		D <0.00358	— LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0131
081031.02	SON-intake-tox	slightly cloudy w/part, pale tan	0.0107
		LAB	
			LB

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS579	0.50	0.497	99.4%

Reviewed by JL
Date reviewed 11-01-08

Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: [illegible]

Date analyzed: 10-15-08

Time initiated: 12:45

Time completed: 1433

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
4.5	IN2 301	INSS 561	0.0	12.1	12.1	0.0207	10.3

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 607	100	100	12.1	21.6	9.5	10.3	98	98%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
10-13-08 B	MHS H2O	100	21.6	27.4	5.8	10.3	S 60	
↓	Duplicate (B)	↓	27.4	33.2	5.8	↓	D 60	100%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 607	50	100	27.4	38.0	10.6	10.3	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
60	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
10-15-08	MHS H2O	100	38.0	43.8	5.8	10.3	60
10-15-08	↓	↓	0.0	5.8	5.8	↓	60
10-17-08	SSW H2O	↓	5.8	8.9	3.1	↓	32
10-13-08A	MHS H2O	↓	8.9	14.8	5.9	↓	61
10-15-08	SSW H2O	↓	14.8	18.1	3.3	↓	34
53083	EES# 100824	↓	18.1	20.9	2.8	↓	29
53084	↓ 100825	↓	20.9	23.8	2.9	↓	30
53085	↓ 100826	↓	23.8	26.3	2.5	↓	26
53201	Silverbrett pink	5	26.3	27.9	1.6	20	1200

Reviewed by: RLK

Date reviewed: 10-19-08

Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: RCC
Date analyzed: 10.18.06

Titrate samples to pH = 4.50 S.U.

Time initiated:
Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 607	100	100	33.5	42.9	9.4	10.3	97	97%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
53202	S. Werbut Clear	5	0.0	2.7	2.7	10.3	S (20) 560	
1	Duplicate (B)	5	2.7	5.4	2.7	1	D (20) 560	100%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 607	1000	5	2.7	10.0	7.3	(20) 10.3	1500

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
560	940	94%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
53187	Davidson R	1	0.0	6.1	6.1	12 (100) 10.3	6300
081014.01	Fixer Forward 1	100	6.1	9.8	3.7		38
081016.02	2		9.8	19.3	9.5		98
081018.06	3		19.3	26.7	7.4		76
081014.02	Chattanooga 1	25	33.0	42.5	9.5	(4)	390
081016.02	2		0.0	11.1	11.1	(4)	460
081018.07	3		11.1	21.1	10.0	(4)	410
081014.03	Goldsboro 1	100	21.1	25.4	4.3		44
081016.03	2		25.4	30.1	4.7		48

Reviewed by: KCL
Date reviewed: 10.19.06

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: [illegible]
Date analyzed: 10-19-03

Titrate samples to pH = 4.50 S.U.

Time initiated:
Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 007	100	100	30.1	39.6	9.5	10.3	98	98%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
081016.02	Goldsboro 001 3	100	0.0	5.4	5.4	10.3	S 56	
↓	Duplicate (B)	↓	5.4	10.8	5.4	↓	D 56	

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 007	50	100	5.4	15.6	10.2	10.3	~~110~~ 100

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
56	~~54~~ 44	~~108%~~ 88%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
081014.04	Goldsboro 002 1	100	15.6	22.5	6.9	10.3	71
081016.04	↓ 2	↓	22.5	28.4	5.9	↓	61
081018.04	↓ 3	↓	28.4	33.2	4.8	↓	49

Reviewed by: [illegible]
Date reviewed: 10/19/03

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: BSL

Date analyzed: 11-02-08

Titrate samples to pH = 4.50 S.U.

Time initiated: 0923

Time completed: 1039

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
4.2	INR271	INS5569	0.0	11.4	11.4	0.0219	10.9
			11.4	23.5	12.1	0.0207	10.3

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5607	100	100	23.5	32.8	9.3	10.3	96	96%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
10-29-08A	MHS H2O	100	0.0	5.8	5.8	10.3	S 60	
↓	Duplicate (B)	↓	5.8	11.5	5.7	↓	D 59	~~1.70~~ 1.72

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5607	50	100	5.8	16.1	10.3	10.3	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
59	51	102%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
10-29-08B	MHS H2O	100	16.1	22.0	5.9	10.3	61
10-25-08A	↓	↓	22.0	27.8	5.8	↓	60
10-25-08B	↓	↓	27.8	33.7	5.9	↓	61
53372	EES # 100842	↓	33.7	35.6	1.9	↓	20
53373	↓ #100843	↓	35.6	37.5	1.9	↓	20
53374	↓ #100844	↓	37.5	40.1	2.6	↓	27
10-18-08	MHS VV 1	↓	40.1	46.0	5.9	↓	61
10-25-08A	↓ 2	↓	0.0	5.7	5.7	↓	59
10-25-08B	↓ 3	↓	5.7	11.5	5.8	↓	60

Reviewed by: KGR

Date reviewed: 11-03-08

Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: [illegible]
Date analyzed: 11-02-08

Titrate samples to pH = 4.50 S.U.

Time initiated:
Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
JNSS 607	100	100	11.5	21.4	9.9	10.3	102	102%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
10-29-08A	MHSVV 4	100	21.4	27.1	5.7	10.3	S 59	
↓	Duplicate (B)	↓	27.1	32.7	5.6	↓	D 58	1.7%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
JNSS 607	50	100	27.1	37.5	10.4	10.3	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
58	52	104%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
081027.01	TVASONIDI 2x1	50	37.5	40.7	3.2	(2) 10.3	66
081029.01	2		40.7	43.9	3.2	(2)	66
081031.01	3		43.9	47.2	3.3	(2)	68
081027.02	TVASONINT 1		0.0	3.2	3.2	(2)	66
081029.02	2		3.2	6.3	3.1	(2)	64
081031.02	3		6.3	9.9	3.6	(2)	74
081027.01	TVASONIDIUV 1		9.9	13.0	3.1	(2)	64
081029.01	2		13.0	16.2	3.2	(2)	66
081031.01	3		16.2	20.1	3.9	(2)	80

Reviewed by: [illegible]
Date reviewed: 11-03-08

ETS
Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

Matrix: Water, RL = 1.0 mg $CaCO_3$/L

Analyst: BSL
Date analyzed: 11-02-03

Titrate samples to pH = 4.50 S.U.

Time initiated:
Time completed:

~~Titrant normality and~~ multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS1007	100	100	20.1	29.5	9.4	10.3	97	97%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
							S	
	Duplicate (B)						D	

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
081027.02	TVASGNDVINT1	50	29.5	32.7	3.2	(2) 10.3	66
081029.02	2		32.7	36.0	3.3	(2)	68
081031.02	3		36.0	39.9	3.9	(2)	80

Reviewed by: [illegible]

Date reviewed: 11-03-03

ETS Environmental Testing Solutions, inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSC	Time initiated	0930
Date analyzed	10-19-08	Time completed	1040

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
IN2308	INSS 506	0.0	9.7	9.7	0.0206	20.6
		9.7	19.6	9.9	0.0202	20.2

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 571	40	50	19.6	21.5	1.9	20.2	38	96%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
10.13.08B	MHS H2O	50	21.5	26.2	4.7	20.2	S 95	
↓	Duplicate (B)	↓	26.2	30.9	4.7	↓	D 95	100%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 571	40	50	26.2	32.7	6.5	20.2	130

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
95	35	88%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)	50	32.7	32.7	0.0	20.2	ND
10.15.08	MHS H2O	↓	32.7	37.3	4.6	↓	93
10-18-08	↓	↓	37.3	41.5	4.2	↓	85
10.17.08	SSW H2O	↓	41.5	43.5	2.0	↓	40
10.13.08A	MHS H2O	↓	43.5	48.0	4.5	↓	91
10.15.08	SSW H2O	↓	0.0	2.2	2.2	↓	~~42~~ BSC 44
081014.01	Foxwood 1	↓	2.2	4.1	1.9	↓	38
081016.02	↓ 2	↓	4.1	8.2	4.1	↓	83
081018.06	↓ 3	↓	8.2	13.1	4.9	↓	~~100~~ BSC 99
081014.02	Chattanooga 1	25	13.1	17.5	4.4	(2) ↓	180

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KLR Date reviewed 10-19-08

Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSC	Time initiated	
Date analyzed	10-19-05	Time completed	

Titrant normality and multiplier determination:

Titrant reference number	~~Normality check~~ standard number	~~Begin~~ ml	~~End~~ ml	~~Total~~ ml (E)	Normality (N) of EDTA ~~= 0.2/E~~ (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample ~~= N x 1000~~

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 571	40	50	17.5	19.6	2.1	20.2	42	105%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
081016.02	Chattanooga 2	25	19.6	24.4	4.8	(2) 20.2	S 190	
↓	Duplicate (B)	↓	24.4	29.1	4.7	↓	D 190	100%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 571	80	25	24.4	31.0	6.6	(2) 20.2	270

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
190	80	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank ~~(should be = 0 mg $CaCO_3$/L)~~						
081016.07	Chattanooga 3	25	31.0	36.5	5.5	(2) 20.2	220
081014.03	Goldsboro001 1	50	36.5	38.6	2.1		42
081016.03	2		38.6	40.6	2.0		40
081018.02	3		40.6	42.7	2.1		42
081014.04	Goldsboro002 1		30.0	32.1	2.1		42
081016.04	2		32.1	34.0	1.9		38
081018.04	3		34.0	35.9	1.9		38

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 10-19-05

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	KDL	Time initiated	0834
Date analyzed	11-02-08	Time completed	0927

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INS-1	INSS260	0.0	9.6	9.6	0.0208	20.8

INR308

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS571	40	50	9.6	11.6	2.0	20.8	42	104.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
1029.08A	MHS H_2O	50	11.7	16.3	4.6	20.8	S 96	
↓	Duplicate (B)	↓	16.5	21.0	4.5	↓	D 94	2.17

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS571	40	50	16.5	23.0	6.5	20.8	140

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
94	46	115.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20.8	ND
1029.08B	MHS H_2O		23.0	27.6	4.6		96
1025.08A	↓		27.6	32.2	4.6		96
1025.08B	↓		32.2	36.5	4.3		89
10-18-08	MHS VV 1		36.5	40.6	4.1		85
10-25-08A	2		40.6	45.2	4.6		96
10-25-08B	3		0.0	4.4	4.4		92
10-29-08A	4		4.4	8.6	4.2		87
081027.01	TVA-SQN 101 1	25	8.6	10.8	2.2	(2)	92
081029.01	↓ 2	↓	10.8	12.8	2.0	↓	83

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KGL Date reviewed 11-03-08

Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	MLL	Time initiated	
Date analyzed	10-11-08	Time completed	

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 571	40	50	12.0	14.0	2.0	20.0	42	105.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
081031.01	TVASQN 101 3	25	14.0	16.6	1.0	(2) 20.0	S 75	
↓	Duplicate (B)	↓	16.6	18.5	1.9	↓ ↓	D 79	5.3%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS571	80	25	16.6	20.5	3.9	(2) 20.0	160

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
79	81	101.2%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)						
081027.02	TVA SQN INT 1	50	20.5	24.4	3.9	20.0	81
081029.02	↓ 2	↓	34.4	38.4	4.0	↓	83
081031.02	↓ 3	↓	28.4	32.2	3.8	↓	79
081027.01	TVASQN 101 UV 1	25	32.2	34.3	2.1	(2)	87
081029.01	↓ 2	↓	34.3	36.2	1.9	↓	79
081031.01	↓ 3	↓	36.2	38.2	2.0	↓	83
081027.02	TVA SQN INTW 1	50	38.2	42.1	3.9	↓	81
081029.02	↓ 2	↓	42.1	46.0	3.9	↓	81
081031.02	↓ 3	↓	43.9	47.0	3.1	↓	64

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: RSM Date reviewed 11-03-08

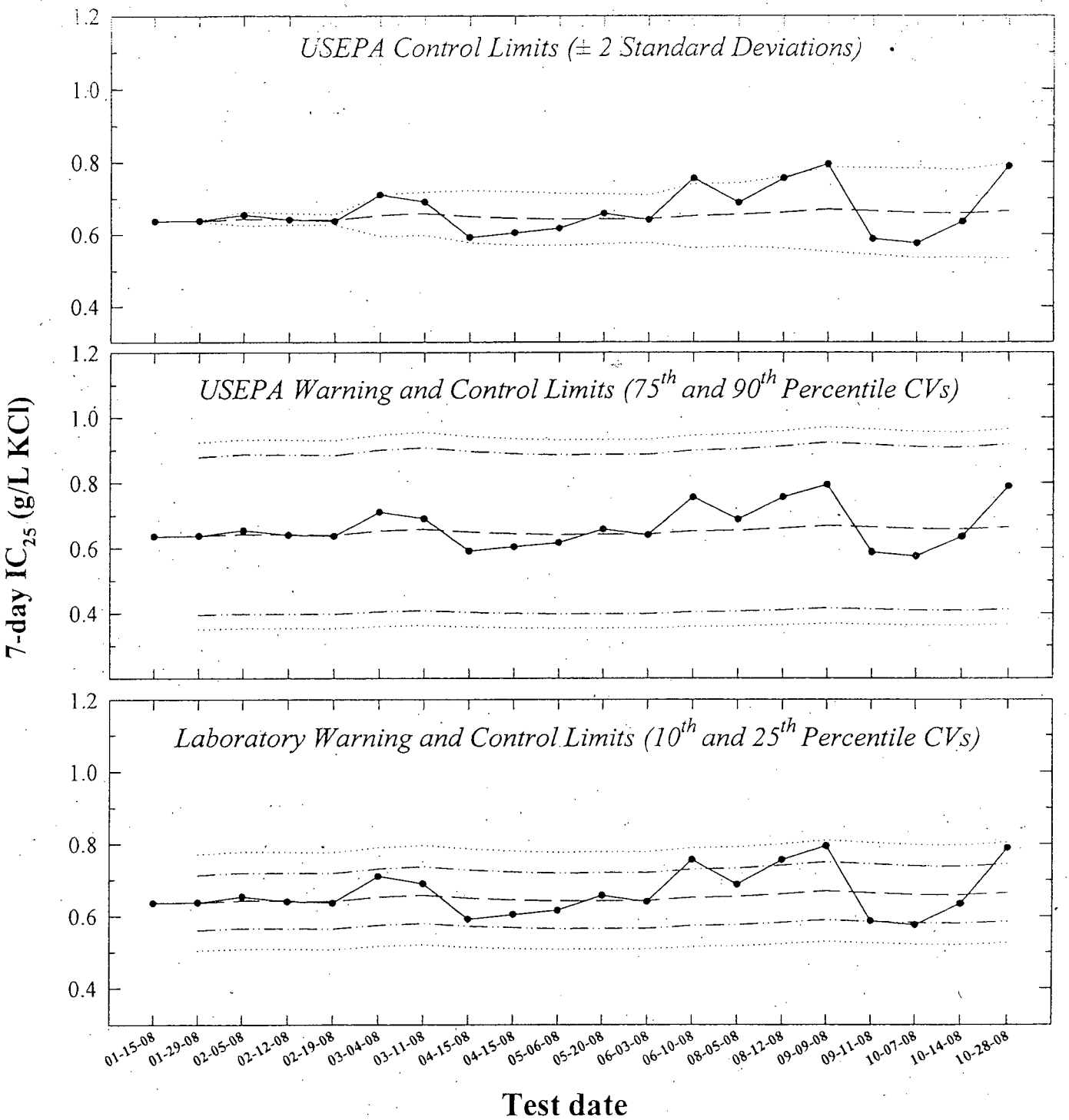
Sequoyah Nuclear Plant Biomonitoring
October 28 – November 4, 2008

Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart
Organism Source: Aquatox, Inc.



—•— **7-day IC_{25}** = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

— — **Central Tendency** (mean IC_{25})

—·—·— **Warning Limits** (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

····· **Control Limits** (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart

Test number	Test date	7-day IC_{25} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	01-15-08	0.64																	
2	01-29-08	0.64	0.64	0.00	0.64	0.64	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.88	0.29	0.35	0.92	0.00
3	02-05-08	0.65	0.64	0.01	0.62	0.66	0.08	0.57	0.72	0.13	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.02
4	02-12-08	0.64	0.64	0.01	0.63	0.66	0.08	0.57	0.72	0.13	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.01
5	02-19-08	0.64	0.64	0.01	0.63	0.66	0.08	0.56	0.72	0.13	0.51	0.78	0.24	0.40	0.88	0.29	0.35	0.93	0.01
6	03-04-08	0.71	0.65	0.03	0.59	0.71	0.08	0.57	0.73	0.14	0.52	0.79	0.25	0.40	0.90	0.29	0.36	0.95	0.04
7	03-11-08	0.69	0.66	0.03	0.60	0.72	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.95	0.05
8	04-15-08	0.59	0.65	0.04	0.58	0.72	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.06
9	04-15-08	0.60	0.64	0.04	0.57	0.72	0.08	0.57	0.72	0.14	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.06
10	05-06-08	0.62	0.64	0.04	0.57	0.71	0.08	0.56	0.72	0.13	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.06
11	05-20-08	0.66	0.64	0.03	0.57	0.71	0.08	0.57	0.72	0.14	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.05
12	06-03-08	0.64	0.64	0.03	0.58	0.71	0.08	0.57	0.72	0.13	0.51	0.78	0.24	0.40	0.89	0.29	0.35	0.93	0.05
13	06-10-08	0.76	0.65	0.04	0.56	0.74	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.07
14	08-05-08	0.69	0.65	0.04	0.57	0.74	0.08	0.58	0.73	0.14	0.52	0.79	0.25	0.41	0.90	0.29	0.36	0.95	0.07
15	08-12-08	0.76	0.66	0.05	0.56	0.76	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.08
16	09-09-08	0.79	0.67	0.06	0.55	0.79	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.41	0.92	0.30	0.37	0.97	0.09
17	09-11-08	0.59	0.66	0.06	0.54	0.78	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.92	0.30	0.37	0.96	0.09
18	10-07-08	0.57	0.66	0.06	0.54	0.78	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.09
19	10-14-08	0.63	0.66	0.06	0.54	0.78	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.95	0.09
20	10-28-08	0.79	0.66	0.07	0.53	0.80	0.08	0.58	0.74	0.14	0.53	0.80	0.25	0.41	0.92	0.30	0.37	0.96	0.10

Note: 7-d IC_{25} = 7-day 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in Pimephales growth for the test population.

CT = Central tendency (mean IC_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. ($S_{A.10}$ = 0.12)

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. ($S_{A.25}$ = 0.21)

USEPA Control and Warning Limits

$S_{A.75}$ = Standard deviation corresponding to the 75th percentile CV. ($S_{A.75}$ = 0.38)

$S_{A.90}$ = Standard deviation corresponding to the 90th percentile CV. ($S_{A.90}$ = 0.45)

CV = Coefficient of variation of the IC_{25} values.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatox, Inc.

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Pimephales promelas
Chronic Reference Toxicant Data

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	01-15-08	100	0.842		10.5		0.14	17.0	
2	01-29-08	97.5	0.728	0.785	5.4	8.0	0.07	9.0	13.0
3	02-05-08	100	0.818	0.796	7.2	7.7	0.07	9.1	11.7
4	02-12-08	100	0.709	0.774	2.4	6.4	0.05	6.8	10.5
5	02-19-08	100	0.833	0.786	6.1	6.3	0.13	15.5	11.5
6	03-04-08	100	0.731	0.777	6.0	6.3	0.07	9.0	11.1
7	03-11-08	97.5	0.695	0.765	5.1	6.1	0.07	10.5	11.0
8	04-15-08	100	0.999	0.794	9.0	6.5	0.11	11.1	11.0
9	04-15-08	100	0.898	0.806	9.1	6.8	0.08	9.1	10.8
10	05-06-08	100	0.857	0.811	4.4	6.5	0.16	18.2	11.5
11	05-20-08	100	0.844	0.814	19.2	7.7	0.16	18.8	12.2
12	06-03-08	100	0.918	0.823	6.1	7.5	0.09	9.4	12.0
13	06-10-08	97.5	0.724	0.815	10.9	7.8	0.11	15.7	12.2
14	08-05-08	100	0.854	0.818	15.3	8.3	0.13	15.0	12.4
15	08-12-08	100	0.674	0.808	5.3	8.1	0.07	9.8	12.3
16	09-09-08	100	0.710	0.802	11.1	8.3	0.12	17.3	12.6
17	09-11-08	100	0.824	0.803	11.1	8.5	0.11	12.9	12.6
18	10-07-08	100	0.788	0.802	1.8	8.1	0.10	12.9	12.6
19	10-14-08	100	0.740	0.799	3.2	7.9	0.05	7.2	12.3
20	10-28-08	100	0.586	0.788	6.5	7.8	0.10	17.8	12.6

Note:

CV = Coefficient of variation for control growth.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

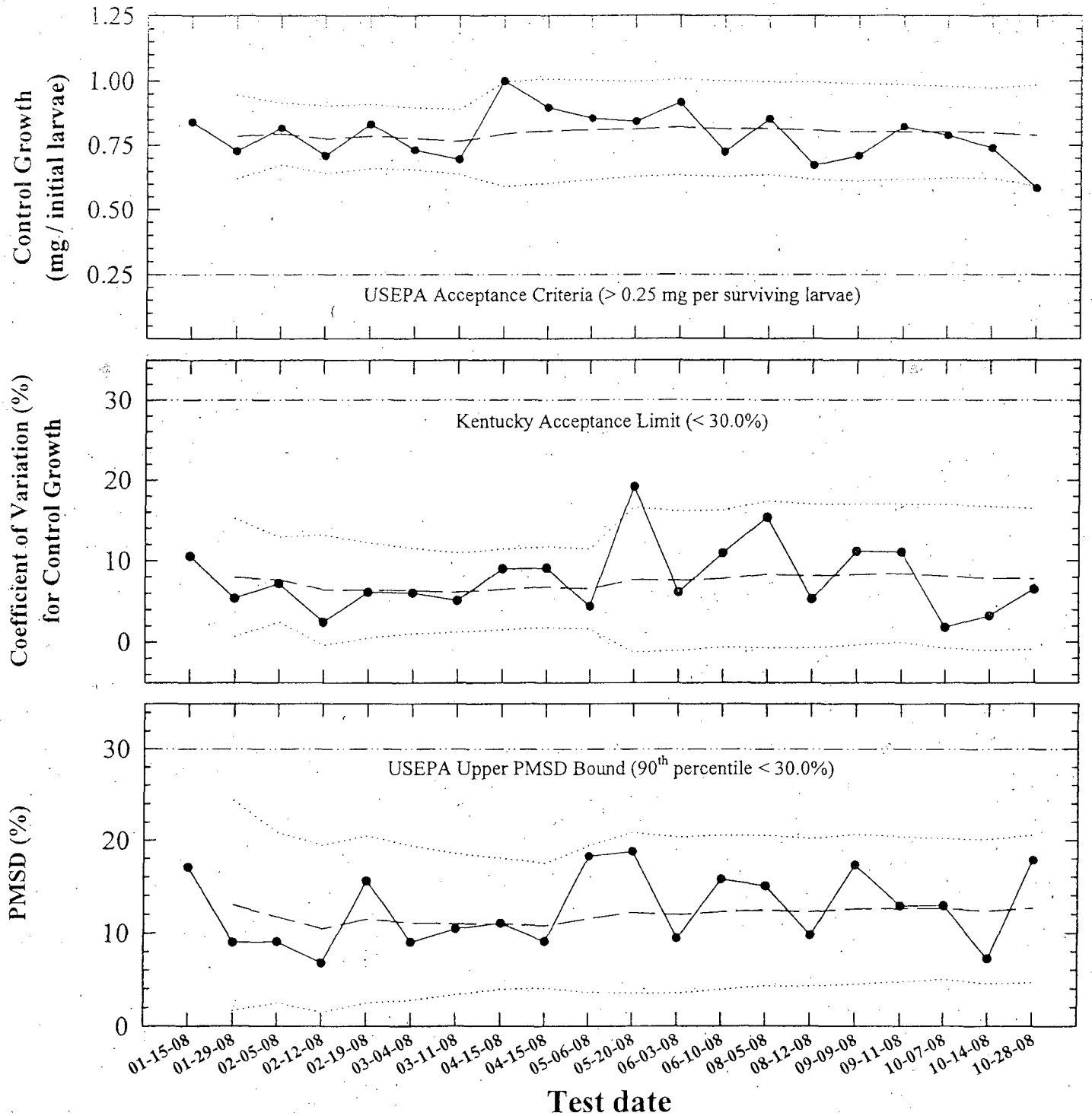
CT = Central Tendancy (mean Control Growth, CV, or PMSD)

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.
USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2 Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatox, Inc.

Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart
Precision of Endpoint Measurements
Organism Source: Aquatox, Inc.



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)**. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— — **Central Tendency** (mean Control Growth, CV, or PMSD)

Control Limits (mean Control Growth, CV, or PMSD ± 2 Standard Deviations)

Environmental Testing Solutions, Inc.

Potassium Chloride Chronic Reference Toxicant Test
(EPA-821-R-02-013 Method 1000.0)
Species: *Pimephales promelas*

PpKClCR Test Number: 162

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 349					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	450	600	750	900	1050	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	991	988	985	982	979	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age:	25 HOURS OLD	Randomizing template:	~~YELLOW~~ GREEN
Date and times organisms were born between:	10-27-08 1600	Incubator number and shelf location:	3D
Organism source:	ATOX BATCH Pp 10-27-08	*Artemia* lot number:	BG 1004W
Transfer bowl information:	pH = 7.87 SU Temperature = 24.4 °C	Total drying time:	24-HOURS
		Date / Time in: 11-04-08	1620
Average transfer volume:	0.1384 mL	Date / Time out: 11-05-08	1620
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Analyst
0	10-28-08	—	1710	1700	10-18-08	JH
1	10-29-08	1030	1630	1600	10-18-08	JH
2	10-30-08	1125	1730	1643	10-25-08A	JH
3	10-31-08	1035	1640	1604	10-25-08A	JH
4	11-01-08	1030	1630	1604	10-25-08B	JH
5	11-02-08	1030	1630	1620	10-29-08A	JH
6	11-03-08	1030	1635	1611	10-29-08A	JH
7	11-04-08			1610		JH

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.586	
Average weight per surviving larvae:	0.586	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	877.0
NOEC	750
LOEC	900
ChV	821.6
IC_{25}	788.8

ETS
Environmental Testing Solutions, Inc.

Species: *Pimephales promelas*

PpA-CICR Test Number: 162

Survival and Growth Data

Day	Control				450 mg KCl/L				600 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	9 d
4	10	10	10	10	10	10	10	10	10	10	9 d	9
5	10	10	10	10	10	10	10	10	10	10	8 d	9
6	10	10	10	10	10	10	9 d	10	10	10	8	9
7	10	10	10	10	10	10	9	10	10	10	8	9 LG
A = Pan weight (mg) Tray color code:: d. green Analyst: LAB	14.78	14.36	14.62	13.28	13.83	14.11	14.82	13.06	13.02	13.59	14.44	14.02
B = Pan + Larvae weight (mg) Analyst: BLS	20.21	20.00	20.84	19.41	19.35	19.88	20.60	18.67	18.69	19.06	18.67	20.51
C = Larvae weight (mg) = A – B	5.43	5.64	6.22	6.13	5.52	5.77	5.78	5.61	5.67	5.47	4.23	6.49
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.543	0.564	0.622	0.613	0.552	0.577	0.578	0.561	0.567	0.547	0.423	0.649
Average weight per initial number of larvae (mg)	0.586				0.567				0.547			
Percent reduction from control (%)							3.2%				6.7%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JH

Comments:

Environmental Testing Solutions, Inc.

Species: *Pimephales promelas* PpKCl CR Test Number: 162

Survival and Growth Data

Day	750 mg KCl/L				900 mg KCl/L				1050 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	9 1d	9 1d	8 1d	8 1d	7 3d	6 4d	4 1d	5 5d	5 5d	4 6d
2	10	10	8 1d	9	8	7 1d	7	6	4	5	5	4
3	10	10	8	9	8	7	6 1d	6	4	5	5	3 1d
4	10	10	8	8 1d	6 2d	7	6	5 1d	3 1d	5	4 1d	3
5	10	10	8	8	4 2d	6 1d	5 1d	5	2 1d	3 2d	4	2 1d
6	10	10	7 1d	8	4	6	5	5	2	2 1d	4	1 1d
7	9 1d ~~10 1d~~	10	7	~~8~~ 7 1d	4	~~6~~ 5 1d	5	5 SM	~~2~~ 1 1d	2	3 1d	1 SM
A = Pan weight (mg) Tray color code:: d.green Analyst: LAB	12.82	14.98	13.96	14.46	14.38	13.89	~~15.2~~ 14.59	13.54	14.23	14.53	14.00	14.14
B = Pan + Larvae weight (mg) Analyst: BLS	17.61	21.25	18.67	19.05	16.38	16.57	17.16	15.84	14.87	15.54	15.54	14.58
C = Larvae weight (mg) = A – B	4.79	6.27	4.71	~~5.54~~ 4.59	2.00	2.68	2.57	2.30	0.64	1.01	1.54	0.44
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.479	0.627	0.471	~~0.554~~ 0.459	0.200	0.268	0.257	0.230	0.064	0.101	0.154	0.044
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.509		13.1%		0.239		59.2%		0.091		84.5%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Reference Toxicant Test
EPA-821-R-02-013, Method 1000.0

Quality Control
Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKCICR #162
Test dates: October 28 November 04, 2008
Reveiwed by:

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.78	20.21	5.43	0.543	0.586	6.5	0.543	100.0	0.586	6.5	Not applicable
	B	10	10	14.36	20.00	5.64	0.564			0.564				
	C	10	10	14.62	20.84	6.22	0.622			0.622				
	D	10	10	13.28	19.41	6.13	0.613			0.613				
450	E	10	10	13.83	19.35	5.52	0.552	0.583	7.0	0.552	97.5	0.567	2.2	3.2
	F	10	10	14.11	19.88	5.77	0.577			0.577				
	G	10	9	14.82	20.60	5.78	0.642			0.578				
	H	10	10	13.06	18.67	5.61	0.561			0.561				
600	I	10	10	13.02	18.69	5.67	0.567	0.591	14.9	0.567	92.5	0.547	17.1	6.7
	J	10	10	13.59	19.06	5.47	0.547			0.547				
	K	10	8	14.44	18.67	4.23	0.529			0.423				
	L	10	9	14.02	20.51	6.49	0.721			0.649				
750	M	10	9	12.82	17.61	4.79	0.532	0.622	10.1	0.479	82.5	0.509	15.5	13.1
	N	10	10	14.98	21.25	6.27	0.627			0.627				
	O	10	7	13.96	18.67	4.71	0.673			0.471				
	P	10	7	14.46	19.05	4.59	0.656			0.459				
900	Q	10	4	14.38	16.38	2.00	0.500	0.503	6.4	0.200	47.5	0.239	12.7	59.2
	R	10	5	13.89	16.57	2.68	0.536			0.268				
	S	10	5	14.59	17.16	2.57	0.514			0.257				
	T	10	5	13.54	15.84	2.30	0.460			0.230				
1050	U	10	1	14.23	14.87	0.64	0.640	0.525	15.9	0.064	17.5	0.091	53.3	84.5
	V	10	2	14.53	15.54	1.01	0.505			0.101				
	W	10	3	14.00	15.54	1.54	0.513			0.154				
	X	10	1	14.14	14.58	0.44	0.440			0.044				

Dunnett's MSD value: 0.1043 MSD = Minimum Significant Difference
PMSD: 17.8 PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatox, Inc.

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	10/28/2008	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
450	1.0000	1.0000	0.9000	1.0000
600	1.0000	1.0000	0.8000	0.9000
750	0.9000	1.0000	0.7000	0.7000
900	0.4000	0.5000	0.5000	0.5000
1050	0.1000	0.2000	0.3000	0.1000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
450	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
600	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40
750	0.8250	0.8250	1.1608	0.9912	1.4120	17.825	4	12.00	10.00	7	40
*900	0.4750	0.4750	0.7602	0.6847	0.7854	6.622	4	10.00	10.00	21	40
*1050	0.1750	0.1750	0.4217	0.3218	0.5796	29.582	4	10.00	10.00	33	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96270359	0.884	0.12251881	0.07880166
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	750	900	821.583836	
Treatments vs D-Control				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.99516854	1.26542412	6.51493721	11.4753999	0	6.5280808	7.81472778	0.09	2.94300923	0.11117079	4
Intercept	-21.472864	3.69736461	-28.719699	-14.226029							

TSCR

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	483.48978	389.172926	549.252679
EC05	3.355	575.63813	493.057452	632.425785
EC10	3.718	631.739647	558.367087	682.984696
EC15	3.964	672.648407	606.421898	720.344523
EC20	4.158	707.042528	646.71135	752.4602
EC25	4.326	737.947854	682.481552	782.205752
EC40	4.747	821.948177	774.797303	870.093762
EC50	5.000	877.019469	829.55876	935.129
EC60	5.253	935.780601	883.109836	1010.80758
EC75	5.674	1042.30013	971.791044	1159.98544
EC80	5.842	1087.85981	1007.70304	1227.18709
EC85	6.036	1143.48471	1050.48901	1311.38658
EC90	6.282	1217.53181	1106.07161	1426.66922
EC95	6.645	1336.1921	1192.70601	1618.06819
EC99	7.326	1590.85723	1371.48327	2052.73137

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/28/2008	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/4/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.5430	0.5640	0.6220	0.6130
450	0.5520	0.5770	0.5780	0.5610
600	0.5670	0.5470	0.4230	0.6490
750	0.4790	0.6270	0.4710	0.4590
900	0.2000	0.2680	0.2570	0.2300
1050	0.0640	0.1010	0.1540	0.0440

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5855	1.0000	0.5855	0.5430	0.6220	6.509	4				0.5855	1.0000
450	0.5670	0.9684	0.5670	0.5520	0.5780	2.236	4	0.406	2.290	0.1043	0.5670	0.9684
600	0.5465	0.9334	0.5465	0.4230	0.6490	17.093	4	0.856	2.290	0.1043	0.5465	0.9334
750	0.5090	0.8693	0.5090	0.4590	0.6270	15.539	4	1.680	2.290	0.1043	0.5090	0.8693
900	0.2388	0.4078	0.2388	0.2000	0.2680	12.720	4				0.2388	0.4078
1050	0.0907	0.1550	0.0907	0.0440	0.1540	53.254	4				0.0907	0.1550

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94647986	0.844	0.24683066	1.28466351
Bartlett's Test indicates equal variances (p = 0.04)	8.28880119	11.3448668		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	750	>750			0.1042998	0.178138	0.004302	0.00414883	0.41126868	3, 12
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	528.84	118.50	171.14	891.05	-0.2714
IC10	678.20	81.73	406.86	823.15	-0.4723
IC15	756.29	53.17	473.75	798.03	-1.6249
IC20	772.53	22.83	690.60	810.16	-3.1449
IC25	788.78	13.72	744.57	822.58	-0.0595
IC40	837.53	9.24	808.29	860.09	-0.0603
IC50	870.03	7.66	845.69	890.11	-0.0839

Environmental Testing Solutions, Inc.

Species: *Pimephales promelas* PpKCl Test Number: 162

Daily Chemistry:

		Day 0		Day 1		Day 2	
	Analyst	MGL	JL	JL	JL	JL	BLS
Concentration	Parameter						
CONTROL	pH (S.U.)	7.90	7.70	7.85	7.40	7.58	7.22
	DO (mg/L)	7.9	7.7	7.8	7.8	7.9	7.5
	Conductivity (µmhos/cm)	296		316		313	
	Alkalinity (mg $CaCO_3$/L)	60				60	
	Hardness (mg $CaCO_3$/L)	85				96	
	Temperature (°C)	24.8	24.7	24.7	24.5	24.6	24.8
450 mg KCl/L	pH (S.U.)	7.98	7.67	7.89	7.46	7.60	7.29
	DO (mg/L)	7.8	7.7	7.9	7.8	8.0	7.4
	Conductivity (µmhos/cm)	1020		1030		1030	
	Temperature (°C)	24.8	24.8	24.8	24.5	24.6	24.8
600 mg KCl/L	pH (S.U.)	7.98	7.70	7.87	7.50	7.63	7.30
	DO (mg/L)	7.9	7.7	7.9	7.8	8.0	7.4
	Conductivity (µmhos/cm)	1260		1250		1240	
	Temperature (°C)	24.8	24.8	24.7	24.4	24.6	24.6
750 mg KCl/L	pH (S.U.)	8.00	7.66	7.90	7.50	7.63	7.31
	DO (mg/L)	7.9	7.7	7.9	7.8	8.0	7.5
	Conductivity (µmhos/cm)	1480		1500		1520	
	Temperature (°C)	24.9	24.8	24.8	24.6	24.7	24.9
900 mg KCl/L	pH (S.U.)	8.00	7.65	7.90	7.53	7.64	7.29
	DO (mg/L)	7.9	7.7	7.9	7.8	8.0	7.4
	Conductivity (µmhos/cm)	1700		1810		1770	
	Temperature (°C)	24.8	24.6	24.8	24.3	24.7	24.9
1050 mg KCl/L	pH (S.U.)	8.00	7.65	7.90	7.53	7.66	7.38
	DO (mg/L)	7.9	7.7	7.9	7.8	8.0	7.5
	Conductivity (µmhos/cm)	1940		2000		1900	
	Temperature (°C)	24.8	24.8	24.8	24.4	24.7	24.7
STOCK	Conductivity (µmhos/cm)	70700					
		Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

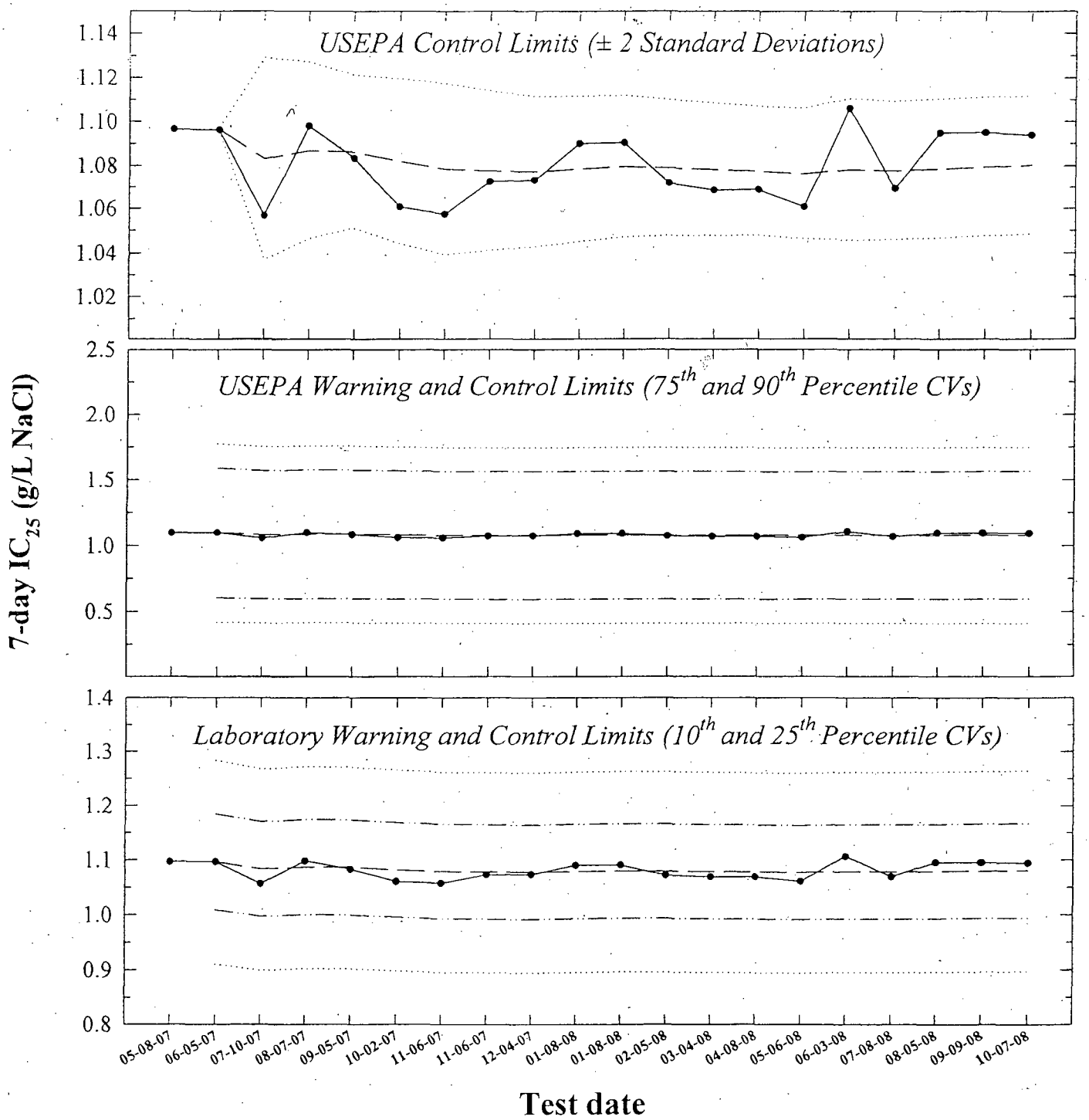
Species: *Pimephales promelas* PpKCICP Test Number: 167

		Day							
		3		4		5		6	
	Analyst	BCS	LAB	LAB	BSC	BSC	LAB	LAB	BSC
Concentration	Parameter								
CONTROL	pH (S.U.)	7.43	7.46	7.66	7.36	7.63	7.40	7.41	7.21
	DO (mg/L)	7.9	8.0	8.0	7.6	~~7.8~~ BSC (8.3)	7.7	7.7	6.6
	Conductivity (µmhos/cm)	302		302		305		308	
	Alkalinity (mg $CaCO_3$/L)	↘		61		60		↘	
	Hardness (mg $CaCO_3$/L)	↘		89		96		↘	
	Temperature (°C)	24.6	24.5	24.6	24.8	24.7	24.8	24.7	24.7
450 mg KCl/L	pH (S.U.)	7.57	7.58	7.78	7.42	7.72	7.49	7.53	7.21
	DO (mg/L)	8.0	8.0	8.1	7.6	~~7.8~~ BSC (8.1)	7.7	7.7	6.6
	Conductivity (µmhos/cm)	1050		1070		1020		1060	
	Temperature (°C)	24.7	24.8	24.8	24.7	24.7	24.7	24.7	24.8
600 mg KCl/L	pH (S.U.)	7.59	7.61	7.81	7.44	7.74	7.49	7.55	7.20
	DO (mg/L)	8.0	8.0	8.2	7.6	~~7.8~~ BSC (8.3)	7.6	7.8	6.4
	Conductivity (µmhos/cm)	1290		1320		1270		1310	
	Temperature (°C)	24.6	24.8	24.8	24.7	24.7	24.7	24.8	24.6
750 mg KCl/L	pH (S.U.)	7.60	7.61	7.83	7.41	7.76	7.46	7.59	7.24
	DO (mg/L)	8.0	8.0	8.3	7.4	~~7.9~~ BSC (8.2)	7.3	7.8	6.1
	Conductivity (µmhos/cm)	1540		1550		1480		1560	
	Temperature (°C)	24.6	24.7	24.8	24.9	24.7	24.6	24.8	24.6
900 mg KCl/L	pH (S.U.)	7.63	7.65	7.83	7.45	7.77	7.50	7.61	7.30
	DO (mg/L)	8.0	8.0	8.3	7.4	~~7.9~~ BSC (8.2)	7.5	7.8	6.3
	Conductivity (µmhos/cm)	1780		1800		1690		1820	
	Temperature (°C)	24.6	24.7	24.8	24.9	24.9	24.8	24.7	24.7
1050 mg KCl/L	pH (S.U.)	7.63	7.66	7.85	7.46	7.77	7.53	7.63	7.33
	DO (mg/L)	7.9	8.0	8.2	7.5	~~7.8~~ BSC (8.1)	7.5	7.9	6.5
	Conductivity (µmhos/cm)	2020		2050		1970		2060	
	Temperature (°C)	24.6	24.9	24.8	24.9	24.7	24.7	24.8	24.7
STOCK	Conductivity (µmhos/cm)	—		— LB		—		—	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* DO VALUES REANALYZED DUE TO METER CALIBRATION DRIFT. - VALUES CONFIRMED.

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart



—•— **7-day IC_{25}** = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— — **Central Tendency** (mean IC_{25})

—·—·- **Warning Limits** (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

Control Limits (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart

Test number	Test date	7-day IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	05-08-07	1.10																	
2	06-05-07	1.10	1.10	0.00	1.10	1.10	0.09	1.01	1.18	0.19	0.91	1.28	0.49	0.60	1.59	0.68	0.42	1.78	0.00
3	07-10-07	1.06	1.08	0.02	1.04	1.13	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.75	0.02
4	08-07-07	1.10	1.09	0.02	1.05	1.13	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.58	0.67	0.41	1.76	0.02
5	09-05-07	1.08	1.09	0.02	1.05	1.12	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.76	0.02
6	10-02-07	1.06	1.08	0.02	1.04	1.12	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.75	0.02
7	11-06-07	1.06	1.08	0.02	1.04	1.12	0.09	0.99	1.16	0.18	0.90	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.02
8	11-06-07	1.07	1.08	0.02	1.04	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.75	0.02
9	12-04-07	1.07	1.08	0.02	1.04	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.74	0.02
10	01-08-08	1.09	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.90	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.02
11	01-08-08	1.09	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
12	02-05-08	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.01
13	03-04-08	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.01
14	04-08-08	1.07	1.08	0.01	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.75	0.01
15	05-06-08	1.06	1.08	0.01	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.74	0.01
16	06-03-08	1.11	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.02
17	07-08-08	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.75	0.01
18	08-05-08	1.09	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.90	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.01
19	09-09-08	1.10	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
20	10-07-08	1.09	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01

Note: 7-d IC_{25} = 7-day 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

CT = Central tendency (mean IC_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. ($S_{A.10}$ = 0.08)

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. ($S_{A.25}$ = 0.17)

USEPA Control and Warning Limits

$S_{A.75}$ = Standard deviation corresponding to the 75th percentile CV. ($S_{A.75}$ = 0.45)

$S_{A.90}$ = Standard deviation corresponding to the 90th percentile CV. ($S_{A.90}$ = 0.62)

CV = Coefficient of variation of the IC_{25} values.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Ceriodaphnia dubia
Chronic Reference Toxicant Data

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CT for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	05-08-07	100	32.0		8.5		2.7	8.4	
2	06-05-07	100	28.4	30.2	7.5	8.0	2.5	8.7	8.6
3	07-10-07	100	29.3	29.9	6.0	7.3	2.5	8.5	8.5
4	08-07-07	100	28.7	29.6	7.5	7.4	2.9	10.0	8.9
5	09-05-07	100	29.7	29.6	5.7	7.0	2.5	8.4	8.8
6	10-02-07	100	29.5	29.6	9.4	7.4	2.4	8.2	8.7
7	11-06-07	100	28.0	29.4	6.1	7.2	2.5	8.8	8.7
8	11-06-07	100	30.4	29.5	5.6	7.0	2.2	7.2	8.5
9	12-04-07	100	31.8	29.8	5.5	6.9	2.5	7.9	8.5
10	01-08-08	100	30.3	29.8	6.6	6.8	2.2	7.3	8.3
11	01-08-08	100	31.8	30.0	4.9	6.7	2.4	7.7	8.3
12	02-05-08	100	31.3	30.1	6.4	6.6	2.8	9.1	8.3
13	03-04-08	100	31.5	30.2	8.0	6.7	2.7	8.5	8.4
14	04-08-08	100	29.6	30.2	7.7	6.8	2.6	8.8	8.4
15	05-06-08	100	32.1	30.3	6.3	6.8	2.5	7.9	8.4
16	06-03-08	100	30.5	30.3	7.9	6.8	3.0	9.9	8.5
17	07-08-08	100	30.9	30.3	6.7	6.8	2.4	7.7	8.4
18	08-05-08	100	29.4	30.3	7.9	6.9	2.2	7.6	8.4
19	09-09-08	100	28.3	30.2	8.5	7.0	3.0	10.5	8.5
20	10-07-08	100	32.4	30.3	7.2	7.0	2.7	8.4	8.5

Note:

CV = Coefficient of variation for control reproduction.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.

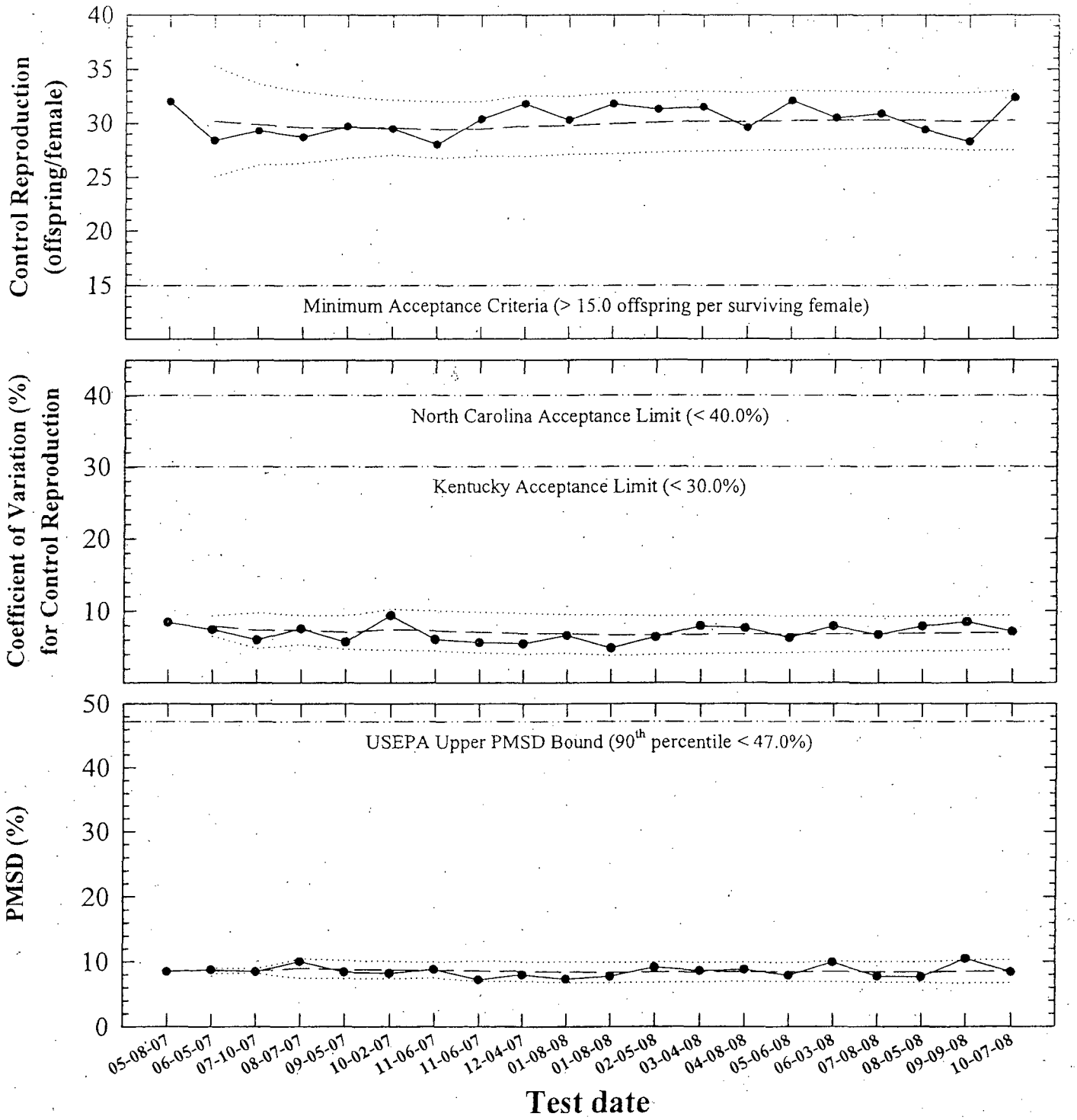
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart
Precision of Endpoint Measurements



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)** PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— — **Central Tendency** (mean Control Reproduction, CV, or PMSD)

Control Limits (mean Control Reproduction, CV, or PMSD ± 2 Standard Deviations)

Environmental Testing Solutions, Inc.

Sodium Chloride Chronic Reference Toxicant Test
(EPA-821-R-02-013 Method 1002.0)
Species: *Ceriodaphnia dubia*

CdNaCLCR #: 80

Dilution preparation information:						*Comments:*
NaCl CHM number:	CHM120					
Stock preparation:	100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water)					
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism source information:											*Test information:*	
Organism age:	< 24-hours old										Randomizing template color:	Blue
Date and times organisms were born between:	10-06-08 1542 TO 1735										Incubator number and shelf location:	2C1
Culture board:	09-30-08 A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	09-09-08
Culture board cup number:	1	2	3	5	8	9	11	16	17	24		
Transfer bowl information:	pH = 7.88 SU Temperature = 24.9 °C										*Selenastrum* batch:	09-29-08

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Analyst
0	10-07-08	0815	10-03-08 B	dl
1	10-08-08	0750	10-03-08 B	dl
2	10-09-08	0735	10-04-08	dl
3	10-10-08	0745	10-06-08	dl
4	10-11-08	0805	10-09-08 A	dl
5	10-12-08	0900	10-09-08 A	dl
6	10-13-08	0825	——	dl
7	10-14-08	——		dl

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC_{50}	>1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	1000
% Mortality:	0%	≤ 20%	LOEC	1200
Mean Offspring/Female:	32.4	≥ 15.0 offspring/female	ChV	1095.4
% CV:	7.2%	< 40.0 %	IC_{25}	1093.8

Species: *Ceriodaphnia dubia* CdNaCLCR =: 80

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	4	4	5	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	10	13	13	14	11	12	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	18	14	14	14	16	18	15	16	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	— X
Total young produced		34	36	28	31	31	35	33	32	31	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.4

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	6	5	5	6	4	5	5	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	12	10	12	13	11	13	12	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	18	15	14	15	17	14	16	16	16	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	— X
Total young produced		38	32	29	33	34	30	34	32	32	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.6
% Reduction from Control:	-0.6%

Species: *Ceriodaphnia dubia* CdNaCLCR #: 80

800 mg NaCl/L *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	4	4	4	6	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	11	10	13	12	12	12	12	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	17	18	16	14	14	14	15	17	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	—
Total young produced		34	36	34	30	31	30	32	32	34	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.3
% Reduction from Control:	0.37%

1000 mg NaCl/L *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	6	4	5	5	4	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	12	10	11	13	13	12	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	15	15	14	17	14	14	16	15	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	—
Total young produced		30	30	32	30	32	32	32	32	29	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.8
% Reduction from Control:	4.9%

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Species: *Ceriodaphnia dubia* CdNaCLCR #: 80

1200 mg NaCl/L *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	5	4	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	7	9	5	10	6	4	7	9	10	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	0	5	5	8	5	0	10	5	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		21	13	13	19	19	13	11	23	18	21
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	17.1
% Reduction from Control:	47.2%

1400 mg NaCl/L *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	3	4	3	2	4	2	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	2	0	5	1	3	1	4	6	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	1	0	0	0	0	0	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		8	5	5	8	3	7	3	8	10	10
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	6.7
% Reduction from Control:	79.3%

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Verification of *Ceriodaphnia* Reproduction Totals

Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	4	4	5	4	5	5	5	46
5	12	13	10	13	13	14	11	12	10	12	120
6	17	18	14	14	14	16	18	15	16	16	158
7											
Total	34	36	28	31	31	35	33	32	31	33	324

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	6	4	5	5	4	4	6	48
5	13	10	12	10	11	13	13	12	10	10	114
6	13	15	15	14	17	14	14	16	15	13	146
7											
Total	30	30	32	30	32	32	32	32	29	29	308

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	5	5	6	4	5	5	4	4	5	49
5	14	12	10	12	13	11	13	12	12	10	119
6	18	15	14	15	17	14	16	16	16	17	158
7											
Total	38	32	29	33	34	30	34	32	32	32	326

1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	5	4	4	4	3	4	39
5	7	9	5	10	6	4	7	9	10	9	76
6	10	0	5	5	8	5	0	10	5	8	56
7											
Total	21	13	13	19	19	13	11	23	18	21	171

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	4	4	4	6	5	5	5	47
5	13	14	11	10	13	12	12	12	12	11	120
6	17	17	18	16	14	14	14	15	17	14	156
7											
Total	34	36	34	30	31	30	32	32	34	30	323

1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	3	4	3	2	4	2	4	4	3	33
5	4	2	0	5	1	3	1	4	6	2	28
6	0	0	1	0	0	0	0	0	0	5	6
7											
Total	8	5	5	8	3	7	3	8	10	10	67

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Ceriodaphnia dubia Chronic Reference Toxicant Test
EPA-821-R-02-013, Method 1002.0

Quality Control
Verification of Data Entry, Calculations, and Statistical Analyses

Test number: CdNaClCR #80
Test dates: October 07-13, 2008
Reveiwed by: [signature]

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	34	36	28	31	31	35	33	32	31	33	100	32.4	7.2	Not applicable
600	38	32	29	33	34	30	34	32	32	32	100	32.6	7.5	-0.6
800	34	36	34	30	31	30	32	32	34	30	100	32.3	6.5	0.3
1000	30	30	32	30	32	32	32	32	29	29	100	30.8	4.3	4.9
1200	21	13	13	19	19	13	11	23	18	21	100	17.1	24.7	47.2
1400	8	5	5	8	3	7	3	8	10	10	100	6.7	38.6	79.3

Dunnett's MSD value: 2.711
PMSD: 8.4

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.

Upper PMSD bound determined by USEPA (90th percentile) = 47%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

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Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/7/2008	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	10/13/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	34.000	36.000	28.000	31.000	31.000	35.000	33.000	32.000	31.000	33.000
600	38.000	32.000	29.000	33.000	34.000	30.000	34.000	32.000	32.000	32.000
800	34.000	36.000	34.000	30.000	31.000	30.000	32.000	32.000	34.000	30.000
1000	30.000	30.000	32.000	30.000	32.000	32.000	32.000	32.000	29.000	29.000
1200	21.000	13.000	13.000	19.000	19.000	13.000	11.000	23.000	18.000	21.000
1400	8.000	5.000	5.000	8.000	3.000	7.000	3.000	8.000	10.000	10.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	32.400	1.0000	32.400	28.000	36.000	7.157	10				32.500	1.0000
600	32.600	1.0062	32.600	29.000	38.000	7.542	10	-0.169	2.287	2.711	32.500	1.0000
800	32.300	0.9969	32.300	30.000	36.000	6.535	10	0.084	2.287	2.711	32.300	0.9938
1000	30.800	0.9506	30.800	29.000	32.000	4.275	10	1.350	2.287	2.711	30.800	0.9477
*1200	17.100	0.5278	17.100	11.000	23.000	24.726	10	12.905	2.287	2.711	17.100	0.5262
*1400	6.700	0.2068	6.700	3.000	10.000	38.569	10	21.677	2.287	2.711	6.700	0.2062

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.7737003	1.035	-0.0350818	-0.1738142
Bartlett's Test indicates equal variances (p = 0.03)	12.0027618	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	1200	1095.44512		2.71098343	0.08367233	1192.29667	7.02777778	9.9E-32	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	990	77.815583	773.3125	1014.27169	-2.4281
IC10	1022.62774	11.2990174	1002.70019	1038.77377	-2.1436
IC15	1046.35036	9.57591142	1027.49595	1064.20095	0.0648
IC20	1070.07299	10.5377883	1048.11784	1091.92162	0.3416
IC25	1093.79562	11.9318091	1072.19759	1121.37833	0.5359
IC40	1164.9635	17.2015679	1138.07325	1205.85798	0.6225
IC50	1216.34615	20.7905444	1181.83123	1255.24757	0.1597

10-07-08

Species: *Ceriodaphnia dubia* CdNaCLCR #: 80

Daily Chemistry:

		Day					
		0		1		2 MEL	
	Analyst	LAB	MEL	MEL	MEL	MEL	BLS
Concentration	Parameter						
CONTROL	pH (S.U.)	7.79	7.93	7.93	7.95	7.83	7.86
	DO (mg/L)	7.6	7.7	7.6	7.8	7.5	7.5
	Conductivity (µmhos/cm)	306		310		314	
	Alkalinity (mg $CaCO_3$/L)	64				64	
	Hardness (mg $CaCO_3$/L)	~~64~~ 94				~~64~~ 88	
	Temperature (°C)	24.8	24.9	24.7	24.6	24.8	24.5
600 mg NaCl/L	pH (S.U.)	7.84	7.83	7.86	7.82	7.83	7.77
	DO (mg/L)	7.7	7.8	7.7	7.7	7.5	7.4
	Conductivity (µmhos/cm)	1360		1350		1390	
	Temperature (°C)	25.0	25.1	24.9	24.6	24.7	24.7
800 mg NaCl/L	pH (S.U.)	7.83	7.80	7.84	7.80	7.82	7.76
	DO (mg/L)	7.7	7.7	7.7	7.7	7.6	7.4
	Conductivity (µmhos/cm)	1710		1690		1740	
	Temperature (°C)	25.0	25.0	24.9	24.6	24.7	24.7
1000 mg NaCl/L	pH (S.U.)	7.81	7.79	7.82	7.78	7.81	7.76
	DO (mg/L)	7.8	7.8	7.7	7.7	7.6	7.4
	Conductivity (µmhos/cm)	2000		2010		2050	
	Temperature (°C)	24.9	25.0	24.9	24.8	24.9	24.7
1200 mg NaCl/L	pH (S.U.)	7.80	7.79	7.80	7.77	7.80	7.74
	DO (mg/L)	7.8	7.8	7.7	7.7	7.6	7.4
	Conductivity (µmhos/cm)	2310		2370		2420	
	Temperature (°C)	24.7	25.2	25.0	24.7	24.7	24.8
1400 mg NaCl/L	pH (S.U.)	7.79	7.77	7.79	7.75	7.79	7.73
	DO (mg/L)	7.8	7.8	7.7	7.7	7.7	7.4
	Conductivity (µmhos/cm)	2640		2710		2760	
	Temperature (°C)	24.9	24.9	25.0	24.6	24.8	24.7
STOCK	Conductivity (µmhos/cm)	100000		—		—	
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 80

		Day							
		KGC 3		4		5		6	
	Analyst	BLS	LAB	LAB	BSC	BSC	LAB		
Concentration	Parameter								
CONTROL	pH (S.U.)	7.72	7.93	7.80	7.97	7.55	7.78		
	DO (mg/L)	7.5	7.9	7.5	7.4	7.4	7.6		
	Conductivity (µmhos/cm)	304		303		320			
	Alkalinity (mg $CaCO_3$/L)	63		62					
	Hardness (mg $CaCO_3$/L)	90		90					
	Temperature (°C)	24.7	24.9	24.6	25.2	24.8	24.9		
600 mg NaCl/L	pH (S.U.)	7.78	7.85	7.85	7.88	7.89	7.75		
	DO (mg/L)	7.6	7.9	8.1	7.4	7.5	7.6		
	Conductivity (µmhos/cm)	1330		1320		1400			
	Temperature (°C)	24.7	25.1	24.8	25.0	24.7	25.2		
800 mg NaCl/L	pH (S.U.)	7.78	7.83	7.84	7.86	7.87	7.76		
	DO (mg/L)	7.6	8.0	8.1	7.4	7.5	7.6		
	Conductivity (µmhos/cm)	1690		1690		1700			
	Temperature (°C)	24.7	25.1	24.8	24.8	24.9	24.8		
1000 mg NaCl/L	pH (S.U.)	7.77	7.83	7.83	7.84	7.83	7.75		
	DO (mg/L)	7.6	8.0	8.1	7.4	7.5	7.6		
	Conductivity (µmhos/cm)	2030		1920		2150			
	Temperature (°C)	24.8	25.2	24.7	25.1	24.9	24.7		
1200 mg NaCl/L	pH (S.U.)	7.75	7.81	7.82	7.83	7.87	7.74		
	DO (mg/L)	7.6	8.0	8.1	7.3	7.4	7.4		
	Conductivity (µmhos/cm)	2370		2230		2230			
	Temperature (°C)	24.8	25.0	24.8	25.1	24.8	25.0		
1400 mg NaCl/L	pH (S.U.)	7.75	7.81	7.82	7.82	7.86	7.74		
	DO (mg/L)	7.5	7.8	8.0	7.3	7.5	7.6		
	Conductivity (µmhos/cm)	2700		2470		2320			
	Temperature (°C)	24.8	24.8	24.8	25.2	24.8	25.0		
STOCK	Conductivity (µmhos/cm)	—		—		—			
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	7.1	********	8.6	12	0	14 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	144	177	26	********	12	16	19	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<70	<77	26	********	<6	<6	19	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.331	1.492	03	********	********	********	**	0	31 / 31	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		SEE PERMIT	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
METAL CLEANING WASTE POND
EFFLUENT

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	***		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name: TVA - SEQUOYAH NUCLEAR PLANT
Address: P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
RECYCLED COOLING WATER
EFFLUENT

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	04	********	********		04			
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	DEG C	********	********	38.3 DAILY MX	DEG C		DAILY	GRAB-4
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	********		19			
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.10 DAILY MX	MG/L		WEEKLY	GRAB-4
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name: TVA - SEQUOYAH NUCLEAR PLANT
Address: P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
RECYCLED COOLING WATER
EFFLUENT

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name: TVA - SEQUOYAH NUCLEAR PLANT
Address: P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	10	01	To	08	10	31

MAJOR
(SUBR 01)
F - FINAL
WASTEWATER & STORM WATER
EFFLUENT

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	********	********	**		********	********	19			
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	2.0 DAILY MN	********	********	MG/L		TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	100 DAILY MX	MG/L		TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	********	********	**	********	********		25			
00545 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	ML/L		ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	*		ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	11	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

During this reporting period, there has been no flow from the Dredge Pond other than that resulting from rainfall.