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

January 14, 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 DECEMBER 2007

Enclosed is the December 2007 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

Printed on recycled paper

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	07	12	01	To	07	12	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 AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	16.5	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	********	********	**	********	********	27.7	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	********	********	**	********	********	4.8	04	0	31 / 31	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.7	********	8.2	12	0	4 / 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	********	********	**	********	4	4	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	********	********	**	********	<6	<6	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	********	1580	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	423	843-6700	08	01	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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**
12/13/2007 @ 1215	0.33 mg/L	12/16/07 @ 1854	RDH	TN EPA 8015
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
12/13/2007 @ 1155	<0.10 mg/L	12/16/07 @ 1905	RDH	TN EPA 8015

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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	07	12	01	To	07	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.019	0.027	19	0	23 / 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	********	1	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										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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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 0.022mg/L--limit 2.0mg/L)

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Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	101 Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	10	01	To	07	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**		<0.20		19	0	1 / 92	
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	*******	REPORT	*******	MG/L		QTRLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	PERMIT REQUIREMENT										

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

Boron was sampled on 10/03/2007 @ 1328.

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Location HAMILTON COUNTY

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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	07	12	01	To	07	12	31

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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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										
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled 12/02/2007 - 12/07/2007. Report is attached.

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: January 11, 2008 AH 1/11/08

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): 1579

6. Receiving Stream: Tennessee River (TRM 483.6)

7. 1Q10: 3491

8. Outfall Tested: 101

9. Dates Sampled: December 2-7, 2007

10. Average Flow on Days Sampled (MGD): 1573, 1575, 1577, 1578, 1577, 1574

11. Pertinent Site Conditions: Towerbrom 960 was injected into ERCW A & B Trains and RCW. The dates and times for the Towerbrom 960 injection are in the following table. See Appendix B for complete additional chemical application information during the sample collection period.

Injection Location	Date/Start Time (EST)	Date/Ending Time (EST)
ERCW A & B and RCW	12/02/2007 @ 0001	12/07/2007 @ 2400

12. Test Dates: December 4-11, 2007

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) 843-6700

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 December 2-7, 2007, 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 differences from the control 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.

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) Last Used By
101	12/02/07 0738 to 12/03/07 0638	12/03/07 1434	2.7/3.1†	<0.10	12/04/07 1250 12/05/07 1156
Intake	12/02/07 0807 to 12/03/07 0707	12/03/07 1434	2.4	<0.10	12/04/07 1250 12/05/07 1156
101	12/04/07 0752 to 12/05/07 0652	12/05/07 1325	1.7/1.2†	<0.10	12/06/07 1158 12/07/07 1155
Intake	12/04/07 0824 to 12/05/07 0724	12/05/07 1325	2.2	<0.10	12/06/07 1158 12/07/07 1155
101	12/06/07 0750 to 12/07/07 0650	12/07/07 1350	1.5/2.0†	<0.10	12/08/07 1209 12/09/07 1311 12/10/07 1300
Intake	12/06/07 0806 to 12/07/07 0706	12/07/07 1350	0.4	<0.10	12/08/07 1209 12/09/07 1311 12/10/07 1300

*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:	20.75 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	12/04/07 1250 ET	12/04/07 1045 ET
UV Treated Outfall 101	12/04/07 1237 ET	
7. Test Termination: (Date/Time)		
Outfall 101	12/11/07 1200 ET	12/11/07 1009 ET
UV Treated Outfall 101	12/11/07 1145 ET	
8. Test Temperature: Outfall 101:	Mean = 24.6°C (24.1 - 25.0°C)	Mean = 24.8°C (24.5 - 25.1°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.6°C (24.1 - 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 December 4-11, 2007 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	98	98	98
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	98

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.804	0.535	0.540	0.671	0.638
11.3%	0.718	0.745	0.740	0.722	0.731
22.6%	0.709	0.651	0.632	0.737	0.682
45.2%	0.673	0.596	0.556	0.652	0.619
72.6%	0.657	0.628	0.627	0.643	0.639
100.0%	0.582	0.557	0.658	0.624	0.605
Intake	0.626	0.699	0.522	0.690	0.634

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* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted December 4-11, 2007 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	31	32	35	33	27	34	31	34	32	30	31.9
11.3%	33	37	33	34	37	30	34	33	31	33	33.5
22.6%	35	31	35	37	37	36	32	33	36	36	34.8
45.2%	34	38	35	39	35	35	36	40	36	33	36.1
72.6%	38	36	40	35	36	39	35	38	38	36	37.1
100.0%	38	36	41	38	38	41	36	38	37	41	38.4

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* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted December 4-11, 2007 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	29	30	31	29	33	36	31	31	31	31.1
Intake	39	33	37	37	33	36	33	38	37	35	35.8

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 December 4-11, 2007 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	98	98
11.3%	100	100	100	100	100	98	98
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	0.682	0.556	0.830	0.808	0.719
11.3%	0.609	0.664	0.687	0.724	0.671
22.6%	0.801	0.661	0.730	0.767	0.740
45.2%	0.716	0.659	0.599	0.766	0.685
72.6%	0.692	0.688	0.789	0.643	0.703
100.0%	0.650	0.603	0.702	0.643	0.650
Intake	0.691	0.711	0.736	0.698	0.709

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})
Pimephales promelas	December 4-11, 2007	1307	7-days	KCl	0.52 g/L
Ceriodaphnia dubia	December 4-11, 2007	1035	7-days	NaCl	1.07 g/L

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, December 4-11, 2007.

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	24.7 24.6 - 24.8	24.5 24.3 - 24.7	7.6 7.4 - 7.7	7.5 6.8 - 8.0	7.91 7.38 - 8.15	7.75 7.56 - 8.05	312 296 - 337	57 57 - 57	93 92 - 94	- - -
	11.3%	24.7 24.6 - 24.8	24.4 24.2 - 24.5	7.8 7.4 - 8.2	7.5 6.9 - 7.9	7.85 7.57 - 8.09	7.74 7.53 - 8.01	303 287 - 318	- - -	- - -	- - -
	22.6%	24.7 24.6 - 24.9	24.5 24.4 - 24.6	7.8 7.6 - 8.0	7.5 6.9 - 7.9	7.87 7.56 - 8.09	7.75 7.53 - 8.06	297 280 - 320	- - -	- - -	- - -
	45.2%	24.8 24.7 - 24.9	24.5 24.1 - 24.6	7.9 7.6 - 8.1	7.5 6.9 - 7.8	7.87 7.56 - 8.09	7.77 7.52 - 8.09	277 255 - 307	- - -	- - -	- - -
	72.6%	24.8 24.7 - 25.0	24.5 24.3 - 24.6	8.0 7.6 - 8.2	7.5 6.9 - 7.8	7.88 7.54 - 8.13	7.80 7.53 - 8.10	254 241 - 268	- - -	- - -	- - -
	100.0%	24.9 24.7 - 25.0	24.5 24.3 - 24.7	8.0 7.7 - 8.2	7.5 6.9 - 7.9	7.89 7.51 - 8.14	7.83 7.56 - 8.13	234 220 - 250	72 68 - 76	87 78 - 98	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.7 - 25.0	24.5 24.4 - 24.7	8.0 7.7 - 8.4	7.5 6.9 - 7.9	7.87 7.48 - 8.13	7.82 7.58 - 8.09	233 220 - 251	73 70 - 74	89 84 - 94	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.7 24.6 - 24.8	24.7 24.5 - 24.9	7.6 7.4 - 7.7	7.8 7.5 - 8.1	7.91 7.38 - 8.15	7.91 7.58 - 8.07	312 296 - 337	57 57 - 57	93 92 - 94	- - -
	11.3%	24.7 24.7 - 24.8	24.8 24.5 - 24.9	7.8 7.4 - 8.2	7.8 7.5 - 8.1	7.85 7.57 - 8.09	7.92 7.57 - 8.08	303 287 - 318	- - -	- - -	- - -
	22.6%	24.7 24.7 - 24.8	24.7 24.5 - 24.9	7.8 7.6 - 8.0	7.8 7.5 - 8.2	7.87 7.56 - 8.09	7.92 7.57 - 8.08	297 280 - 320	- - -	- - -	- - -
	45.2%	24.8 24.7 - 24.9	24.7 24.5 - 25.0	7.9 7.6 - 8.1	7.9 7.6 - 8.2	7.87 7.56 - 8.09	7.94 7.56 - 8.11	277 255 - 307	- - -	- - -	- - -
	72.6%	24.8 24.7 - 25.1	24.8 24.5 - 25.0	8.0 7.6 - 8.2	7.9 7.6 - 8.2	7.88 7.54 - 8.13	7.97 7.57 - 8.16	254 241 - 268	- - -	- - -	- - -
	100.0%	24.9 24.7 - 25.1	24.8 24.6 - 25.0	8.0 7.7 - 8.2	7.9 7.7 - 8.1	7.89 7.51 - 8.14	7.99 7.57 - 8.19	234 220 - 250	72 68 - 76	87 78 - 98	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.7 - 25.1	24.8 24.7 - 25.0	8.0 7.7 - 8.4	7.9 7.6 - 8.1	7.87 7.48 - 8.13	8.01 7.62 - 8.21	233 220 - 251	73 70 - 74	89 84 - 94	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.6	24.1	25.0
Ceriodaphnia dubia	24.8	24.5	25.1

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, UV-treated Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, December 4-11, 2007.

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	24.7 24.6 - 24.8	24.6 24.3 - 24.7	7.8 7.6 - 8.0	7.6 7.1 - 7.9	7.86 7.61 - 8.08	7.75 7.55 - 7.98	313 294 - 333	57 57 - 58	89 88 - 92
	11.3%	24.8 24.7 - 24.9	24.4 24.2 - 24.6	7.8 7.7 - 7.9	7.6 7.0 - 7.9	7.87 7.61 - 8.08	7.73 7.53 - 7.97	309 288 - 329	- - -	- - -
	22.6%	24.9 24.7 - 25.0	24.4 24.1 - 24.8	7.8 7.7 - 7.9	7.4 6.8 - 7.9	7.86 7.60 - 8.10	7.76 7.53 - 8.00	295 277 - 311	- - -	- - -
	45.2%	24.9 24.7 - 25.0	24.4 24.2 - 24.8	7.8 7.6 - 7.9	7.5 6.6 - 8.0	7.87 7.55 - 8.12	7.77 7.53 - 8.03	281 259 - 305	- - -	- - -
	72.6%	24.9 24.7 - 25.1	24.4 24.1 - 24.8	7.9 7.8 - 8.1	7.5 6.6 - 8.0	7.88 7.55 - 8.15	7.82 7.55 - 8.05	256 236 - 278	- - -	- - -
	100.0%	25.0 24.8 - 25.1	24.4 24.1 - 24.6	8.0 7.8 - 8.2	7.5 6.8 - 8.0	7.89 7.52 - 8.18	7.83 7.57 - 8.09	235 219 - 249	69 66 - 72	90 86 - 94
	Intake	24.9 24.8 - 25.0	24.4 24.2 - 24.6	8.0 7.7 - 8.3	7.6 6.9 - 8.2	7.89 7.52 - 8.16	7.83 7.59 - 8.08	234 215 - 256	66 60 - 70	89 84 - 94

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.6	24.1	25.1

SUMMARY / CONCLUSIONS

Outfall 101 samples collected December 2-7, 2007, 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 differences from the control 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.

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).

Sequoyah Nuclear Plant Biomonitoring
December 4-11, 2007

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 Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling,
March 12, 1998 –December 7, 2007

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 (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 – December 7, 2007

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 (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 – December 7, 2007

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 – December 7, 2007

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 (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 – December 7, 2007

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 – December 7, 2007

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	-	-	-	-	-	-	-	

Sequoyah Nuclear Plant Biomonitoring
December 4-11, 2007

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:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project #3551 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	12/02/07-12/03/07	0738-0638	2 (2.5gal)	NA	X			X	071203.03	2.7/3.1	JH	1434	*
SQN-INT-TOX	Comp	12/02/07-12/03/07	0807-0707	1 (2.5 gal)	NA	X			X	071203.04	2.4	JH	1434	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition Jun/umne

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	12/03/07 10:17 EST	Sonic Delivery BR Sparks	12/03/07 10:17
Sonic Delivery	12/03/07 1434	ETS Jun/umne	12/03/07 1434
BR Sparks			

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:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project # 3557 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	12/04/07-12/05/07	0752-0652	2 (2.5gal)	NA			X		071205.22	1.7 / 1.2	jl	1325	*
SQN-INT-TOX	Comp	12/04/07-12/05/07	0824-0724	1 (2.5 gal)	NA			X		071205.23	2.2	jl	1325	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. jl

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	12/05/07 0942	Sonic Delivery B R Skiles	12/05/07 942
Sonic Delivery	12/05/07	ETS Jim Jenne	12/05/07 1325
B R Skiles	1125		

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:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project #3551 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	12/06/07-12/07/07	0750-0650	2 (2.5gal)	NA			X		071207.12	15C/20C	JH	1350	*
SQN-INT-TOX	Comp	12/06/07-12/07/07	0806-0706	1 (2.5 gal)	NA			X		071207.13	0.4C	JH	1350	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition JHumse

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	12/07/07 / 0953 EST	Sonic Delivery BR Skila	12/07/07 0953
Sonic Delivery BR Skila	12/07/07 1:50	ETS JHumse	12/07/07 1350

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.

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 #: 3551

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	339	1130	1815	2500	
Diluent volume (mL)	2217.5	2161	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	20.75 HOURS OLD	Randomizing template:	Yellow
Date and times organisms were born between:	12-03-07 1600	Incubator number:	3C
Organism source:	ATOX BATCH Pp 12-03-07	*Artemia* lot number:	BG0204V
Transfer bowl information:	pH = 7.52 Temperature = 24.2 °C	Total drying time:	24 HOURS
		Date / Time in: 12-11-07	1230
Average transfer volume:	8.6 ml	Date / Time out: 12-12-07	1230
		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	Sample numbers used	Analyst
0	12-04-07	—	1545	1250	12-01-07A	071203.03+04	JH
1	12-05-07	0830	1432	1156	12-01-07A	071203.03+04	JH
2	12-06-07	0840	1445	1158	12-01-07B	071205.22+23	JH
3	12-07-07	0815	1420	1155	12-01-07B	071205.22+23	JH
4	12-08-07	0805	1400	1209	12-04-07	071207.12+13	JH
5	12-09-07	0950	~~1208~~ 1600	1311	12-04-07	071207.12+13	JH
6	12-10-07	0958	1604	1300	12-04-07	071207.12+13	JH
7	12-11-07			1200			JH

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.638	
Average weight per surviving larvae:	0.638	≥ 0.25 mg/larvae

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

Species: *Pimephales promelas* Date: 12-04-07

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	9 d ~~10~~
6	10	10	10	10	10	10	10	10	10	10	10	9
7	lg 10	lsm 10	lsm 10	10	10	10	10	10	10	10	10	9 lg
A = Pan weight (mg) Color identification: Yellow Analyst: LAB	12.87	14.89	14.88	15.96	13.81	12.82	15.09	15.13	13.56	13.77	14.51	15.06
B = Pan + Larvae weight (mg) Analyst: MM	20.91	20.24	20.28	22.67	20.99	20.27	22.49	22.35	20.65	20.28	20.83	22.43
Larvae weight (mg) = A – B	8.04	5.35	5.40	6.71	7.18	7.45	7.40	7.22	7.09	6.51	6.32	7.37
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.804	0.535	0.540	0.671	0.718	0.745	0.740	0.722	0.709	0.651	0.632	0.737
Average weight per initial number of larvae (mg)	0.638				0.731				0.682			
Percent reduction from control (%)					-14.7%				-7.0%			

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*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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 ISM	10	10	10	10	10	10	10 ISM	10	10
A = Pan weight (mg) Color identification: yellow Analyst: LAB	14.28	14.39	12.70	13.34	14.42	12.74	14.08	14.22	14.35	14.64	14.56	13.98
B = Pan + Larvae weight (mg) Analyst: MM	21.01	20.35	18.26	19.86	20.99	19.02	20.35	20.65	20.17	20.21	21.14	20.22
Larvae weight (mg) = A – B	6.73	5.96	5.56	6.52	6.57	6.28	6.27	6.43	5.82	5.57	6.58	6.24
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.673	0.596	0.556	0.652	0.657	0.628	0.627	0.643	0.582	0.557	0.658	0.624
Average weight per initial number of larvae (mg)	0.619				0.639				0.605			
Percent reduction from control (%)			2.9%				-0.2%				5.1%	

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: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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	9 d 1 SM	10
A = Pan weight (mg) Color identification: Light blue beakers Analyst: LAB A-D	14.93	13.97	13.85	15.00
B = Pan + Larvae weight (mg) Analyst: Jensen	21.19	20.96	19.07	21.90
Larvae weight (mg) = A – B	6.26	6.99	5.22	6.90
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.626	0.699	0.522	0.690
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.634		0.5%	

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: dl

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007

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

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

Project number: 3551

Reveiwed by: J Turner

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	12.87	20.91	8.04	0.804	0.638	20.0	0.804	100.0	0.638	20.0	Not applicable
	B	10	10	14.89	20.24	5.35	0.535			0.535				
	C	10	10	14.88	20.28	5.40	0.540			0.540				
	D	10	10	15.96	22.67	6.71	0.671			0.671				
11.3%	E	10	10	13.81	20.99	7.18	0.718	0.731	1.8	0.718	100.0	0.731	1.8	-14.7
	F	10	10	12.82	20.27	7.45	0.745			0.745				
	G	10	10	15.09	22.49	7.40	0.740			0.740				
	H	10	10	15.13	22.35	7.22	0.722			0.722				
22.6%	I	10	10	13.56	20.65	7.09	0.709	0.703	12.0	0.709	97.5	0.682	7.2	-7.0
	J	10	10	13.77	20.28	6.51	0.651			0.651				
	K	10	10	14.51	20.83	6.32	0.632			0.632				
	L	10	9	15.06	22.43	7.37	0.819			0.737				
45.2%	M	10	10	14.28	21.01	6.73	0.673	0.619	8.6	0.673	100.0	0.619	8.6	2.9
	N	10	10	14.39	20.35	5.96	0.596			0.596				
	O	10	10	12.70	18.26	5.56	0.556			0.556				
	P	10	10	13.34	19.86	6.52	0.652			0.652				
72.6%	Q	10	10	14.42	20.99	6.57	0.657	0.639	2.2	0.657	100.0	0.639	2.2	-0.2
	R	10	10	12.74	19.02	6.28	0.628			0.628				
	S	10	10	14.08	20.35	6.27	0.627			0.627				
	T	10	10	14.22	20.65	6.43	0.643			0.643				
100%	U	10	10	14.35	20.17	5.82	0.582	0.605	7.4	0.582	100.0	0.605	7.4	5.1
	V	10	10	14.64	20.21	5.57	0.557			0.557				
	W	10	10	14.56	21.14	6.58	0.658			0.658				
	X	10	10	13.98	20.22	6.24	0.624			0.624				
100% Intake	Y	10	10	14.93	21.19	6.26	0.626	0.649	8.7	0.626	97.5	0.634	12.9	0.5
	Z	10	10	13.97	20.96	6.99	0.699			0.699				
	AA	10	9	13.85	19.07	5.22	0.580			0.522				
	BB	10	10	15.00	21.90	6.90	0.690			0.690				

Outfall 101:
Dunnett's MSD value: 0.1076
PMSD: 16.9

Intake:
Dunnett's MSD value: 0.1472
PMSD: 23.1

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
December 04-11, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpPFCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	12/11/2007	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	0.8040	0.5350	0.5400	0.6710
11.3	0.7180	0.7450	0.7400	0.7220
22.6	0.7090	0.6510	0.6320	0.7370
45.2	0.6730	0.5960	0.5560	0.6520
72.6	0.6570	0.6280	0.6270	0.6430
100	0.5820	0.5570	0.6580	0.6240

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.6375	1.0000	0.6375	0.5350	0.8040	20.018	4			0.6844	1.0000
11.3	0.7313	1.1471	0.7313	0.7180	0.7450	1.812	4	22.00	10.00	0.6844	1.0000
22.6	0.6823	1.0702	0.6823	0.6320	0.7370	7.188	4	20.00	10.00	0.6823	0.9969
45.2	0.6193	0.9714	0.6193	0.5560	0.6730	8.597	4	19.00	10.00	0.6290	0.9191
72.6	0.6388	1.0020	0.6388	0.6270	0.6570	2.223	4	18.00	10.00	0.6290	0.9191
100	0.6053	0.9494	0.6053	0.5570	0.6580	7.391	4	18.00	10.00	0.6053	0.8844

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93847877	0.884	0.71715058	2.53040028
Bartlett's Test indicates unequal variances (p = 5.44E-03)	16.5491142	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs D-Control				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	36.221			
IC10	87.670			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

sqn_12-04-07data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007
Statistical Analyses

Used for PMSD calculation only. Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpPFCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	12/11/2007	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	0.8040	0.5350	0.5400	0.6710
11.3	0.7180	0.7450	0.7400	0.7220
22.6	0.7090	0.6510	0.6320	0.7370
45.2	0.6730	0.5960	0.5560	0.6520
72.6	0.6570	0.6280	0.6270	0.6430
100	0.5820	0.5570	0.6580	0.6240

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.6375	1.0000	0.6375	0.5350	0.8040	20.018	4			
11.3	0.7313	1.1471	0.7313	0.7180	0.7450	1.812	4	-2.101	2.410	0.1076
22.6	0.6823	1.0702	0.6823	0.6320	0.7370	7.188	4	-1.003	2.410	0.1076
45.2	0.6193	0.9714	0.6193	0.5560	0.6730	8.597	4	0.409	2.410	0.1076
72.6	0.6388	1.0020	0.6388	0.6270	0.6570	2.223	4	-0.028	2.410	0.1076
100	0.6053	0.9494	0.6053	0.5570	0.6580	7.391	4	0.723	2.410	0.1076

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93847877	0.884	0.71715058	2.53040028
Bartlett's Test indicates unequal variances (p = 5.44E-03)	16.5491142	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	0.10756027	0.16872199	0.00867097	0.00398382	0.10239999	5, 18
Treatments vs D-Control										

TVA / Sequoyah Nuclear Plant, Intake
Non-treated
December 04-11, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpPFCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	12/11/2007	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	0.8040	0.5350	0.5400	0.6710
100	0.6260	0.6990	0.5220	0.6900

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6375	1.0000	0.6375	0.5350	0.8040	20.018	4				0.6375	1.0000
100	0.6343	0.9949	0.6343	0.5220	0.6990	12.863	4	0.043	1.943	0.1472	0.6343	0.9949

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91297191	0.749	0.32811175	-0.7982733
F-Test indicates equal variances (p = 0.48)	2.44667292	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	0.14716277	0.23084356	2.1125E-05	0.01147096	0.96716261	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
December 04-11, 2007
Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Project number: 3551

Reviewed by: [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)	7.83	7.56	7.38	7.59	7.83	7.75	8.06	7.67	8.10	7.71	8.15	7.92	8.02	8.05
	DO (mg/L)	7.7	7.5	7.7	8.0	7.6	7.6	7.7	6.8	7.6	7.2	7.6	7.9	7.4	7.6
	Conductivity (µmhos/cm)	296		314		310		337		304		306		317	
	Alkalinity (mg/L $CaCO_3$)	57				57				57					
	Hardness (mg/L $CaCO_3$)	92				94				92					
	Temperature (°C)	24.7	24.5	24.6	24.3	24.6	24.6	24.7	24.3	24.6	24.7	24.8	24.3	24.7	24.5
11.3%	pH (SU)	7.58	7.53	7.57	7.57	7.67	7.77	8.00	7.67	8.04	7.71	8.09	7.92	8.02	8.01
	DO (mg/L)	8.0	7.5	7.6	7.9	7.9	7.7	7.4	6.9	8.0	7.2	7.8	7.9	8.2	7.6
	Conductivity (µmhos/cm)	287		315		312		318		293		296		302	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.7	24.3	24.7	24.5	24.6	24.5	24.8	24.2	24.7	24.5
22.6%	pH (SU)	7.58	7.53	7.56	7.54	7.69	7.81	8.04	7.67	8.05	7.71	8.09	7.93	8.05	8.06
	DO (mg/L)	8.0	7.6	7.6	7.9	7.9	7.6	7.6	6.9	7.9	7.1	7.8	7.8	7.9	7.6
	Conductivity (µmhos/cm)	280		305		304		320		285		288		300	
	Temperature (°C)	24.8	24.5	24.6	24.6	24.7	24.6	24.7	24.5	24.6	24.5	24.8	24.5	24.9	24.4
45.2%	pH (SU)	7.58	7.52	7.56	7.56	7.70	7.86	8.07	7.69	8.05	7.72	8.09	7.96	8.07	8.09
	DO (mg/L)	8.1	7.6	7.6	7.8	8.0	7.6	7.6	6.9	7.9	7.0	8.0	7.8	8.0	7.6
	Conductivity (µmhos/cm)	263		287		281		307		267		255		280	
	Temperature (°C)	24.8	24.5	24.7	24.6	24.7	24.4	24.7	24.6	24.7	24.5	24.9	24.1	24.9	24.6
72.6%	pH (SU)	7.54	7.53	7.57	7.58	7.71	7.86	8.08	7.72	8.04	7.79	8.13	8.05	8.09	8.10
	DO (mg/L)	8.1	7.6	7.7	7.8	8.2	7.8	7.6	6.9	8.0	7.1	8.0	7.8	8.2	7.8
	Conductivity (µmhos/cm)	241		264		260		268		246		249		248	
	Temperature (°C)	24.9	24.6	24.7	24.5	24.8	24.4	24.8	24.3	24.7	24.4	24.9	24.5	25.0	24.3
100%	pH (SU)	7.51	7.56	7.57	7.63	7.74	7.85	8.11	7.78	8.03	7.78	8.14	8.06	8.14	8.13
	DO (mg/L)	8.2	7.6	7.7	7.6	8.2	7.9	7.7	6.9	8.1	7.0	8.1	7.9	8.1	7.8
	Conductivity (µmhos/cm)	220		241		237		250		225		229		235	
	Alkalinity (mg/L $CaCO_3$)	68				72				76					
	Hardness (mg/L $CaCO_3$)	86				78				98					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.7	24.8	24.5	24.9	24.3	24.8	24.6	24.7	24.4	24.8	24.4	25.0	24.[illegible]
100% Intake	pH (SU)	7.48	7.58	7.61	7.63	7.75	7.86	8.09	7.79	7.95	7.76	8.09	8.03	8.13	8.0[illegible]
	DO (mg/L)	8.4	7.6	7.7	7.7	8.1	7.9	7.7	6.9	8.1	6.9	8.2	7.7	8.1	7.[illegible]
	Conductivity (µmhos/cm)	220		251		237		249		222		230		223	
	Alkalinity (mg/L $CaCO_3$)	70				74				74					
	Hardness (mg/L $CaCO_3$)	84				88				94					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.5	24.8	24.7	24.9	24.5	24.8	24.4	24.7	24.4	24.9	24.4	24.9	24.[illegible]

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant – Non-treated

Date: 12-04-07

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MEN	MEN	MEN	MEN	MEN	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.83	7.56	7.38	7.57	7.83	7.75
	DO (mg/L)	7.7	7.5	7.9	8.0	7.6	7.6
	Conductivity (µmhos/cm)	296		314		310	
	Alkalinity (mg $CaCO_3$/L)	57				57	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.7	24.5	24.6	24.3	24.6	24.6
11.3%	pH (S.U.)	7.58	7.53	7.57	7.57	7.67	~~7.75~~ MM 7.77
	DO (mg/L)	8.0	7.5	7.6	7.9	7.9	7.7
	Conductivity (µmhos/cm)	287		315		312	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.7	24.3
22.6%	pH (S.U.)	7.58	7.53	7.56	7.54	7.69	~~7.77~~ MM 7.81
	DO (mg/L)	8.0	7.6	7.6	7.9	7.9	7.6
	Conductivity (µmhos/cm)	280		305		304	
	Temperature (°C)	24.8	24.5	24.6	24.6	24.7	24.6
45.2%	pH (S.U.)	7.58	7.52	7.56	7.56	7.70	~~7.81~~ MM 7.86
	DO (mg/L)	8.1	7.6	7.6	7.8	8.0	7.6
	Conductivity (µmhos/cm)	263		287		281	
	Temperature (°C)	24.8	24.5	24.7	24.6	24.7	24.4
72.6%	pH (S.U.)	7.57	7.53	7.57	7.58	7.71	7.86
	DO (mg/L)	8.1	7.6	7.7	7.8	8.2	7.8
	Conductivity (µmhos/cm)	241		264		260	
	Temperature (°C)	24.9	24.6	24.7	24.5	24.8	24.4
100%	pH (S.U.)	7.51	7.56	~~7.7~~	7.63	7.74	7.85
	DO (mg/L)	8.2	7.6	7.57 ~~7.7~~	7.6	8.2	7.9
	Conductivity (µmhos/cm)	230		241		237	
	Alkalinity (mg $CaCO_3$/L)	68				72	
	Hardness (mg $CaCO_3$/L)	86				78	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.7	24.8	24.5	24.9	24.3
100% Intake	pH (S.U.)	7.48	7.58	7.61	7.63	7.75	7.86
	DO (mg/L)	8.4	7.6	7.7	7.7	8.1	7.9
	Conductivity (µmhos/cm)	220		251		237	
	Alkalinity (mg $CaCO_3$/L)	70				74	
	Hardness (mg $CaCO_3$/L)	84				88	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.5	24.8	24.7	24.9	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 12-04-07
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	MM	MM	MM	MM	MM	MM	MM	MM
Concen-tration	Parameter								
CONTROL	pH (S.U.)	8.06	7.67	8.10	7.71	8.15	7.92	8.02	8.05
	DO (mg/L)	7.7	6.8	7.6	7.2	7.6	7.9	7.4	7.6
	Conductivity (µmhos/cm)	337		301		304		317	
	Alkalinity (mg $CaCO_3$/L)			57					
	Hardness (mg $CaCO_3$/L)			92					
	Temperature (°C)	24.7	24.3	24.6	24.7	24.8	24.3	24.7	24.5
11.3%	pH (S.U.)	8.00	7.67	8.04	7.71	8.09	7.92	8.02	8.01
	DO (mg/L)	7.4	6.9	8.0	7.2	7.8	7.9	8.2	7.6
	Conductivity (µmhos/cm)	318		293		296		302	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.8	24.2	24.7	24.5
22.6%	pH (S.U.)	8.04	7.67	8.05	7.71	8.09	7.93	8.05	8.06
	DO (mg/L)	7.6	6.9	7.9	7.1	7.8	7.8	7.9	7.6
	Conductivity (µmhos/cm)	320		285		288		300	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.8	24.5	24.9	24.4
45.2%	pH (S.U.)	8.07	7.69	8.05	7.72	8.09	7.96	8.07	8.09
	DO (mg/L)	7.6	6.9	7.9	7.0	8.0	7.8	8.0	7.6
	Conductivity (µmhos/cm)	307		267		255		280	
	Temperature (°C)	24.7	24.6	24.7	24.5	24.9	24.1	24.9	24.6
72.6%	pH (S.U.)	8.08	7.72	8.04	7.79	8.13	8.05	8.09	8.10
	DO (mg/L)	7.6	6.9	8.0	7.1	8.0	7.8	8.2	7.8
	Conductivity (µmhos/cm)	268		246		249		248	
	Temperature (°C)	24.8	24.3	24.7	24.4	24.9	24.5	25.0	24.5
100%	pH (S.U.)	8.11	7.78	8.03	7.78	8.14	8.06	8.14	8.13
	DO (mg/L)	7.7	6.9	8.1	7.0	8.1	7.9	8.1	7.8
	Conductivity (µmhos/cm)	250		225		229		235	
	Alkalinity (mg $CaCO_3$/L)			76					
	Hardness (mg $CaCO_3$/L)			98					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.6	24.7	24.4	24.8	24.4	25.0	24.5
100% Intake	pH (S.U.)	8.09	7.79	7.95	7.76	8.09	8.03	8.13	8.09
	DO (mg/L)	7.7	6.9	8.1	6.9	8.2	7.7	8.1	7.8
	Conductivity (µmhos/cm)	249		222		230		223	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			94					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.4	24.7	24.4	24.9	24.4	24.9	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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 #: 3551

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	339	1130	1815	2500	for 2 minutes with a UV sterilizer
Diluent volume (mL)	2217.5	2161	1370	685	0	to remove pathogenic
Total volume (mL)	2500	2500	2500	2500	2500	interferences.

Test organism information:		*Test information:*	
Organism age:	20.5 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	12-03-07 1600	Incubator number:	2 38
Organism source:	ATOX BATCH Pp 12-03-07	*Artemia* lot number:	BG0204V
Transfer bowl information:	pH = 7.52 Temperature = 24.2 °C	Total drying time:	24 HOURS
		Date / Time in: 12-11-07	1230
Average transfer volume:	8.6 ml	Date / Time out: 12-12-07	1230
		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	Sample numbers used	Analyst
0	12-04-07	—	1545	1237	12-01-07A	071203.03+04	dl
1	12-05-07	0830	1432	1142	12-01-07A	071203.03+04	dl
2	12-06-07	0840	1445	1145	12-01-07B	071205.22+23	dl
3	12-07-07	0815	1420	1140	12-01-07B	071205.22+23	dl
4	12-08-07	0800	1400	1156	12-04-07	071207.12+13	dl
5	12-09-07	0950	1600	1257	12-04-07	071207.12+13	dl
6	12-10-07	0958	1604	1247	12-04-07	071207.12+13	dl
7	12-11-07			1145			dl

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.719		NOEC	100%
Average weight per surviving larvae:	0.734	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 12-04-07

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	9 d	10	10	9 d	10	10	10	10	10	10	10
7	10	9	10 lg	10 lg	9	10	10	10	10 lg	10	10	10
A = Pan weight (mg) Color identification: dark blue Analyst: LAB	13.00	14.39	14.78	13.84	13.43	13.38	14.37	14.33	14.50	14.72	13.57	14.21
B = Pan + Larvae weight (mg) Analyst: LAB	19.82	19.95	23.08	21.92	19.52	20.02	21.24	21.57	22.51	21.33	20.87	21.88
Larvae weight (mg) = A – B	6.82	5.56	8.30	8.08	6.09	6.64	6.87	7.24	8.01	6.61	7.30	7.67
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.682	0.556	0.830	0.808	0.609	0.664	0.687	0.724	0.801	0.661	0.730	0.767
Average weight per initial number of larvae (mg)	0.719				0.671				0.740			
Percent reduction from control (%)					6.7%				-2.9%			

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*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 12-04-07

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 SM	10	10	10	10 LG	10	10	10 SM	10	10
A = Pan weight (mg) Color identification: dark blue Analyst: LAB	14.48	14.66	14.81	14.04	13.97	13.90	14.60	13.88	12.61	14.42	14.58	14.16
B = Pan + Larvae weight (mg) Analyst: LAB	21.64	21.25	20.80	21.70	20.89	20.78	22.49	20.31	19.11	20.45	21.60	20.59
Larvae weight (mg) = A – B	7.16	6.59	5.99	7.66	6.92	6.88	7.89	6.43	6.50	6.03	7.02	6.43
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.716	0.659	0.599	0.766	0.692	0.688	0.789	0.643	0.650	0.603	0.702	0.643
Average weight per initial number of larvae (mg)	0.685				0.703				0.650			
Percent reduction from control (%)			4.7%				2.2%				9.7%	

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: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 12-04-07

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 lg	10
A = Pan weight (mg) Color identification: black beakers A-D Analyst: LAB	15.85	14.81	13.60	14.99
B = Pan + Larvae weight (mg) Analyst: LAB	22.76	21.92	20.96	21.97
Larvae weight (mg) = A – B	6.91	7.11	7.36	6.98
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.691	0.711	0.736	0.698
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.709		1.4%	

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: JL

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
December 04-11, 2007

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

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

Project number: 3551

Reveiwed by: J Hunsen

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	13.00	19.82	6.82	0.682	0.734	13.8	0.682	97.5	0.719	17.6	Not applicable
	B	10	9	14.39	19.95	5.56	0.618			0.556				
	C	10	10	14.78	23.08	8.30	0.830			0.830				
	D	10	10	13.84	21.92	8.08	0.808			0.808				
11.3%	E	10	9	13.43	19.52	6.09	0.677	0.688	3.8	0.609	97.5	0.671	7.2	6.7
	F	10	10	13.38	20.02	6.64	0.664			0.664				
	G	10	10	14.37	21.24	6.87	0.687			0.687				
	H	10	10	14.33	21.57	7.24	0.724			0.724				
22.6%	I	10	10	14.50	22.51	8.01	0.801	0.740	8.1	0.801	100.0	0.740	8.1	-2.9
	J	10	10	14.72	21.33	6.61	0.661			0.661				
	K	10	10	13.57	20.87	7.30	0.730			0.730				
	L	10	10	14.21	21.88	7.67	0.767			0.767				
45.2%	M	10	10	14.48	21.64	7.16	0.716	0.685	10.5	0.716	100.0	0.685	10.5	4.7
	N	10	10	14.66	21.25	6.59	0.659			0.659				
	O	10	10	14.81	20.80	5.99	0.599			0.599				
	P	10	10	14.04	21.70	7.66	0.766			0.766				
72.6%	Q	10	10	13.97	20.89	6.92	0.692	0.703	8.7	0.692	100.0	0.703	8.7	2.2
	R	10	10	13.90	20.78	6.88	0.688			0.688				
	S	10	10	14.60	22.49	7.89	0.789			0.789				
	T	10	10	13.88	20.31	6.43	0.643			0.643				
100%	U	10	10	12.61	19.11	6.50	0.650	0.650	6.3	0.650	100.0	0.650	6.3	9.7
	V	10	10	14.42	20.45	6.03	0.603			0.603				
	W	10	10	14.58	21.60	7.02	0.702			0.702				
	X	10	10	14.16	20.59	6.43	0.643			0.643				
100% Intake	Y	10	10	15.85	22.76	6.91	0.691	0.709	2.8	0.691	100.0	0.709	2.8	1.4
	Z	10	10	14.81	21.92	7.11	0.711			0.711				
	AA	10	10	13.60	20.96	7.36	0.736			0.736				
	BB	10	10	14.99	21.97	6.98	0.698			0.698				

Outfall 101:
Dunnett's MSD value: 0.1256
PMSD: 17.5

Intake:
Dunnett's MSD value: 0.1246
PMSD: 17.3

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
December 04-11, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpPFCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	12/11/2007	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	0.6820	0.5560	0.8300	0.8080
11.3	0.6090	0.6640	0.6870	0.7240
22.6	0.8010	0.6610	0.7300	0.7670
45.2	0.7160	0.6590	0.5990	0.7660
72.6	0.6920	0.6880	0.7890	0.6430
100	0.6500	0.6030	0.7020	0.6430

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7190	1.0000	0.7190	0.5560	0.8300	17.626	4				0.7190	1.0000
11.3	0.6710	0.9332	0.6710	0.6090	0.7240	7.177	4	0.921	2.410	0.1256	0.7054	0.9811
22.6	0.7398	1.0289	0.7398	0.6610	0.8010	8.107	4	-0.398	2.410	0.1256	0.7054	0.9811
45.2	0.6850	0.9527	0.6850	0.5990	0.7660	10.525	4	0.652	2.410	0.1256	0.6940	0.9652
72.6	0.7030	0.9777	0.7030	0.6430	0.7890	8.746	4	0.307	2.410	0.1256	0.6940	0.9652
100	0.6495	0.9033	0.6495	0.6030	0.7020	6.261	4	1.333	2.410	0.1256	0.6495	0.9033

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97521883	0.884	-0.3876268	0.23957661
Bartlett's Test indicates equal variances (p = 0.45)	4.72200441	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	0.12562972	0.1747284	0.00431004	0.00543476	0.56852084	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	79.342			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

sqn_05-30-07data

TVA / Sequoyah Nuclear Plant, Intake
UV-treated
December 04-11, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpPFCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	12/11/2007	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	0.6820	0.5560	0.8300	0.8080
100	0.6910	0.7110	0.7360	0.6980

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7190	1.0000	0.7190	0.5560	0.8300	17.626	4				0.7190	1.0000
100	0.7090	0.9861	0.7090	0.6910	0.7360	2.795	4	0.156	1.943	0.1246	0.7090	0.9861

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93012404	0.749	-0.7387113	1.46486826
F-Test indicates equal variances (p = 0.01)	40.8998299	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	0.12462388	0.17332945	0.0002	0.00822633	0.88120699	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
December 04-11, 2007
Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Project number: 3551

Reviewed by: Yumner

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)	7.62	7.55	7.61	7.58	7.67	7.86	7.99	7.68	8.02	7.71	8.08	7.92	8.01	7.98
	DO (mg/L)	8.0	7.7	7.7	7.9	7.9	7.7	7.6	7.2	7.7	7.1	7.9	7.8	8.0	7.6
	Conductivity (µmhos/cm)	295		316		316		333		294		306		330	
	Alkalinity (mg/L $CaCO_3$)	57				58				57					
	Hardness (mg/L $CaCO_3$)	88				92				88					
	Temperature (°C)	24.8	24.7	24.7	24.6	24.8	24.6	24.6	24.6	24.7	24.7	24.6	24.3	24.8	24.4
11.3%	pH (SU)	7.61	7.53	7.61	7.57	7.68	7.80	8.04	7.63	8.01	7.69	8.08	7.89	8.05	7.97
	DO (mg/L)	7.9	7.9	7.7	7.9	7.8	7.7	7.7	7.2	7.7	7.0	7.9	7.7	7.9	7.6
	Conductivity (µmhos/cm)	288		319		315		329		295		301		319	
	Temperature (°C)	24.9	24.5	24.8	24.4	24.8	24.2	24.8	24.3	24.7	24.5	24.8	24.3	24.9	24.6
22.6%	pH (SU)	7.60	7.53	7.61	7.58	7.61	7.85	8.05	7.62	7.99	7.79	8.10	7.95	8.06	8.00
	DO (mg/L)	7.9	7.7	7.7	7.9	7.8	7.6	7.7	6.8	7.7	6.9	7.9	7.6	7.9	7.6
	Conductivity (µmhos/cm)	281		308		305		311		277		293		291	
	Temperature (°C)	24.9	24.8	24.9	24.4	24.9	24.2	24.8	24.4	24.7	24.6	24.8	24.1	25.0	24.6
45.2%	pH (SU)	7.55	7.53	7.61	7.59	7.63	7.85	8.08	7.62	7.99	7.78	8.12	7.99	8.09	8.03
	DO (mg/L)	7.9	7.7	7.6	8.0	7.9	7.6	7.8	6.6	7.8	7.1	7.9	7.5	7.9	7.7
	Conductivity (µmhos/cm)	259		294		286		305		260		275		285	
	Temperature (°C)	24.9	24.8	24.9	24.7	25.0	24.3	24.9	24.2	24.7	24.3	24.8	24.5	25.0	24.3
72.6%	pH (SU)	7.55	7.55	7.61	7.56	7.62	7.90	8.09	7.83	7.99	7.82	8.15	8.02	8.12	8.05
	DO (mg/L)	8.0	7.7	7.8	8.0	8.1	7.7	7.8	6.6	7.9	7.0	8.0	7.6	7.8	7.7
	Conductivity (µmhos/cm)	236		266		261		278		239		253		258	
	Temperature (°C)	25.0	24.8	24.9	24.6	25.0	24.3	24.9	24.1	24.7	24.2	24.9	24.2	25.1	24.5
100%	pH (SU)	7.52	7.61	7.62	7.57	7.67	7.90	8.12	7.76	8.00	7.82	8.18	8.06	8.15	8.09
	DO (mg/L)	8.1	7.8	7.8	8.0	8.1	7.8	7.9	6.8	8.2	7.1	8.0	7.6	7.8	7.7
	Conductivity (µmhos/cm)	219		245		241		249		220		232		237	
	Alkalinity (mg/L $CaCO_3$)	72				66				70					
	Hardness (mg/L $CaCO_3$)	90				94				86					
	Temperature (°C)	25.1	24.6	25.0	24.6	25.1	24.2	24.9	24.1	24.8	24.5	24.9	24.2	25.1	24.5
100% Intake	pH (SU)	7.52	7.59	7.64	7.60	7.65	7.86	8.12	7.77	7.98	7.85	8.13	8.04	8.16	8.08
	DO (mg/L)	8.3	7.8	7.7	8.2	8.1	7.8	7.9	6.9	8.3	7.1	8.2	7.7	7.8	7.7
	Conductivity (µmhos/cm)	217		247		237		237		215		230		256	
	Alkalinity (mg/L $CaCO_3$)	68				70				60					
	Hardness (mg/L $CaCO_3$)	84				88				94					
	Temperature (°C)	25.0	24.6	24.8	24.4	25.0	24.6	24.9	24.2	24.8	24.2	24.9	24.2	24.8	24.6

Species: *Pimephales promelas* Date: 12-04-07
Client: TVA / Sequoyah Nuclear Plant – UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MEW	MEW	MEW	MEW	MEW	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.62	7.55	7.61	7.58	7.67	7.86
	DO (mg/L)	8.0	7.7	7.7	7.9	7.9	7.7
	Conductivity (µmhos/cm)	295		316		316	
	Temperature (°C)	24.8	24.7	24.7	24.6	24.8	24.6
11.3%	pH (S.U.)	7.61	7.53	7.61	7.57	7.68	7.80
	DO (mg/L)	7.9	7.7	7.7	7.9	7.8	7.7
	Conductivity (µmhos/cm)	298		319		315	
	Temperature (°C)	24.9	24.5	24.8	24.4	24.8	24.2
22.6%	pH (S.U.)	7.60	7.53	7.61	7.58	7.61	7.85
	DO (mg/L)	7.9	7.7	7.7	7.9	7.8	7.6
	Conductivity (µmhos/cm)	281		308		305	
	Temperature (°C)	24.9	24.8	24.9	24.4	24.9	24.2
45.2%	pH (S.U.)	7.55	7.53	7.61	7.59	7.63	7.85
	DO (mg/L)	7.9	7.7	7.6	8.0	7.9	7.6
	Conductivity (µmhos/cm)	259		294		286	
	Temperature (°C)	24.9	24.8	24.9	24.7	25.0	24.3
72.6%	pH (S.U.)	7.55	7.55	7.61	7.56	7.62	7.90
	DO (mg/L)	8.0	7.7	7.8	8.0	8.1	7.7
	Conductivity (µmhos/cm)	236		266		261	
	Temperature (°C)	25.0	24.8	24.9	24.6	25.0	24.3
100%	pH (S.U.)	7.52	7.61	7.62	7.57	7.67	7.90
	DO (mg/L)	8.1	7.8	7.8	8.0	8.1	7.8
	Conductivity (µmhos/cm)	219		245		241	
	Temperature (°C)	25.1	24.6	25.0	24.6	25.1	24.2
100% Intake	pH (S.U.)	7.52	7.59	7.64	7.60	7.65	7.86
	DO (mg/L)	8.3	7.8	7.7	8.2	8.1	7.8
	Conductivity (µmhos/cm)	217		247		237	
	Temperature (°C)	25.0	24.6	24.8	24.4	25.0	24.6
		Initial	Final	Initial	Final	Initial	Final

	Day 0 ALK	Day 0 Hardness	Day 7 ALK	Day 7 Hardness
Control	57	88	58	92
100%	72	90	66	94
Intake	68	84	70	88

Species: *Pimephales promelas* Date: 12-04-07
Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		3		4		5		6	
	Analyst	MM	KER	KER	KER	KER	MM	MM	KER
Concentration	Parameter								
CONTROL	pH (S.U.)	7.99	7.66	8.02	7.71	8.08	7.92	8.01	7.98
	DO (mg/L)	7.6	7.2	7.7	7.1	7.9	7.8	8.0	7.6
	Conductivity (µmhos/cm)	333		294		306		330	
	Temperature (°C)	24.6	24.6	24.7	24.7	24.6	24.3	24.8	24.4
11.3%	pH (S.U.)	8.04	7.63	8.01	7.69	8.08	7.89	8.05	7.97
	DO (mg/L)	7.7	7.2	7.7	7.0	7.9	7.7	7.9	7.6
	Conductivity (µmhos/cm)	~~333~~ MM 329		295		301		319	
	Temperature (°C)	24.8	24.3	24.7	24.5	24.8	24.3	24.9	24.6
22.6%	pH (S.U.)	8.05	7.62	7.99	7.79	8.10	7.95	8.06	8.00
	DO (mg/L)	7.7	6.8	7.7	6.9	7.9	7.6	7.9	7.6
	Conductivity (µmhos/cm)	~~329~~ MM 311		277		293		291	
	Temperature (°C)	24.8	24.4	24.7	24.6	24.8	24.1	25.0	24.6
45.2%	pH (S.U.)	8.08	7.62	7.99	7.78	8.12	7.99	8.09	8.03
	DO (mg/L)	7.8	6.6	7.8	7.1	7.9	7.5	7.9	7.7
	Conductivity (µmhos/cm)	~~311~~ MM 305		260		275		285	
	Temperature (°C)	24.9	24.2	24.7	24.3	24.8	24.5	25.0	24.3
72.6%	pH (S.U.)	8.09	7.83	7.99	7.82	8.15	8.02	8.12	8.05
	DO (mg/L)	7.8	6.6	7.9	7.0	8.0	7.6	7.8	7.7
	Conductivity (µmhos/cm)	~~305~~ MM 278		239		253		258	
	Temperature (°C)	24.9	24.1	24.7	24.2	24.9	24.2	25.1	24.5
100%	pH (S.U.)	8.12	7.76	8.00	7.82	8.18	8.06	8.15	8.09
	DO (mg/L)	7.9	6.8	8.2	7.1	8.0	7.6	7.8	7.7
	Conductivity (µmhos/cm)	~~278~~ MM 249		220		232		237	
	Temperature (°C)	24.9	24.1	24.8	24.5	24.9	24.2	25.1	24.5
100% Intake	pH (S.U.)	8.12	7.71	7.98	7.85	8.13	8.04	8.16	8.08
	DO (mg/L)	7.9	6.9	8.3	7.1	8.2	7.7	7.8	7.7
	Conductivity (µmhos/cm)	~~249~~ MM 237		215		230		256	
	Temperature (°C)	24.9	24.2	24.8	24.2	24.9	24.2	24.8	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Day 4	Alk	Hardness
Control	57	88
100%	70	86
Intake	60	94

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 #: 3551

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	339	1130	1815	2500	
Diluent volume (mL)	2217.5	2161	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	< 24 HOURS OLD	Randomizing template:	ORANGE
Date and times organisms were born between:	12-04-07 0712 TO 1000	Incubator number and shelf location:	282
Organism Source Culture board: 11-27-07 A	Cups: 31, 36, 37, 40 | 11-27-07 B cups 4, 6, 8, 11, 16, 17	YCT batch:	10-25-07
Transfer bowl information:	pH = 7.88 Temperature = 21.8	*Selenastrum* batch:	11-21-07

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	12-04-07	1045	12-01-07A	071203.03+04	dl
1	12-05-07	1006	12-01-07A	071203.03+04	dl
2	12-06-07	1004	12-01-07B	071205.22+23	dl
3	12-07-07	1002	12-01-07B	071205.22+23	dl
4	12-08-07	0952	12-04-07	071207.12+13	dl
5	12-09-07	1031	12-04-07	071207.12+13	dl
6	12-10-07	1048	12-04-07	071207.12+13	dl
7	12-11-07	1009			dl

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:	31.9	31.1	≥ 15.0 offspring/female	ChV	>100%
% CV:	7.3%	6.7%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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	4	4	6	4	6	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	14	13	11	10	12	13	15	11	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	15	14	18	16	13	16	14	15	17	14
Total young produced		31	32	35	33	27	34	31	34	32	30
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:	31.9

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	5	4	5	4	4	4	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	12	13	13	10	14	12	12	11
	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	15	19	16	17	20	16	16	17	15	18
Total young produced		33	37	33	34	37	30	34	33	31	33
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:	33.5
% Reduction from Control:	-5.0%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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	5	4	5	4	5	5	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	14	14	13	15	13	11	14	13
	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	17	15	16	19	19	16	15	18	18	19
Total young produced		35	31	35	37	37	36	32	33	36	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:	34.8
% Reduction from Control:	-9.1%

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	4	6	4	5	5	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	15	12	15	13	12	15	16	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	17	19	17	20	17	18	17	20	18	16
Total young produced		34	38	35	39	35	35	36	40	36	33
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:	36.1
% Reduction from Control:	-13.2%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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	5	5	4	4	5	4	4	6	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	14	16	13	13	15	14	13	16	13
	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	19	17	20	18	18	20	17	19	16	19
Total young produced		38	36	40	35	36	39	35	38	38	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:	37.1
% Reduction from Control:	-16.3%

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	4	5	5	5	4	4	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	14	16	14	14	16	15	13	15	15
	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	17	18	21	19	19	20	17	21	18	20
Total young produced		38	36	41	38	38	41	36	38	37	41
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:	38.4
% Reduction from Control:	-20.4%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

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	4	3	4	4	4	4	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	11	10	10	12	13	10	12	11
	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	14	14	15	17	15	17	18	17	15	16
Total young produced		30	29	30	31	29	33	36	31	31	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:	31.1

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	4	4	5	4	4	4	3	5	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	11	12	14	12	11	12	14	12	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	21	18	20	19	17	21	18	19	20	20
Total young produced		39	33	37	37	33	36	33	38	37	35
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:	35.8
% Reduction from Control:	-15.1%

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007

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	4	4	6	4	6	4	4	4	4	44
5	12	14	13	11	10	12	13	15	11	12	123
6	0	0	0	0	0	0	0	0	0	0	0
7	15	14	18	16	13	16	14	15	17	14	152
Total	31	32	35	33	27	34	31	34	32	30	319

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	5	5	4	4	5	4	4	6	6	4	47
5	14	14	16	13	13	15	14	13	16	13	141
6	0	0	0	0	0	0	0	0	0	0	0
7	19	17	20	18	18	20	17	19	16	19	183
Total	38	36	40	35	36	39	35	38	38	36	371

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	5	4	5	4	4	4	4	4	4	4	42
5	13	14	12	13	13	10	14	12	12	11	124
6	0	0	0	0	0	0	0	0	0	0	0
7	15	19	16	17	20	16	16	17	15	18	169
Total	33	37	33	34	37	30	34	33	31	33	335

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	4	5	5	5	4	4	4	6	47
5	15	14	16	14	14	16	15	13	15	15	147
6	0	0	0	0	0	0	0	0	0	0	0
7	17	18	21	19	19	20	17	21	18	20	190
Total	38	36	41	38	38	41	36	38	37	41	384

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	5	4	5	4	5	5	4	4	4	4	44
5	13	12	14	14	13	15	13	11	14	13	132
6	0	0	0	0	0	0	0	0	0	0	0
7	17	15	16	19	19	16	15	18	18	19	172
Total	35	31	35	37	37	36	32	33	36	36	348

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	4	3	4	4	4	4	5	4	4	4	40
5	12	12	11	10	10	12	13	10	12	11	113
6	0	0	0	0	0	0	0	0	0	0	0
7	14	14	15	17	15	17	18	17	15	16	158
Total	30	29	30	31	29	33	36	31	31	31	311

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	4	6	4	5	5	4	4	5	5	46
5	13	15	12	15	13	12	15	16	13	12	136
6	0	0	0	0	0	0	0	0	0	0	0
7	17	19	17	20	17	18	17	20	18	16	179
Total	34	38	35	39	35	35	36	40	36	33	361

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	4	4	5	4	4	4	3	5	5	3	41
5	14	11	12	14	12	11	12	14	12	12	124
6	0	0	0	0	0	0	0	0	0	0	0
7	21	18	20	19	17	21	18	19	20	20	193
Total	39	33	37	37	33	36	33	38	37	35	358

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007

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

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

Project number: 3551

Reveiwed by: [illegible]

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	31	32	35	33	27	34	31	34	32	30	100	31.9	7.3	Not applicable
11.3%	33	37	33	34	37	30	34	33	31	33	100	33.5	6.6	-5.0
22.6%	35	31	35	37	37	36	32	33	36	36	100	34.8	6.0	-9.1
45.2%	34	38	35	39	35	35	36	40	36	33	100	36.1	6.2	-13.2
72.6%	38	36	40	35	36	39	35	38	38	36	100	37.1	4.7	-16.3
100%	38	36	41	38	38	41	36	38	37	41	100	38.4	5.1	-20.4
Control - 2	30	29	30	31	29	33	36	31	31	31	100	31.1	6.7	Not applicable
100% Intake	39	33	37	37	33	36	33	38	37	35	100	35.8	6.1	-15.1

Outfall 101:
Dunnett's MSD value: 2.152
PMSD: 6.7

Intake:
Dunnett's MSD value: 1.660
PMSD: 5.3

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.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/4/2007	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	12/11/2007	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	31.000	32.000	35.000	33.000	27.000	34.000	31.000	34.000	32.000	30.000
11.3	33.000	37.000	33.000	34.000	37.000	30.000	34.000	33.000	31.000	33.000
22.6	35.000	31.000	35.000	37.000	37.000	36.000	32.000	33.000	36.000	36.000
45.2	34.000	38.000	35.000	39.000	35.000	35.000	36.000	40.000	36.000	33.000
72.6	38.000	36.000	40.000	35.000	36.000	39.000	35.000	38.000	38.000	36.000
100	38.000	36.000	41.000	38.000	38.000	41.000	36.000	38.000	37.000	41.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	31.900	1.0000	31.900	27.000	35.000	7.307	10				35.300	1.0000
11.3	33.500	1.0502	33.500	30.000	37.000	6.638	10	-1.700	2.287	2.152	35.300	1.0000
22.6	34.800	1.0909	34.800	31.000	37.000	6.028	10	-3.081	2.287	2.152	35.300	1.0000
45.2	36.100	1.1317	36.100	33.000	40.000	6.187	10	-4.462	2.287	2.152	35.300	1.0000
72.6	37.100	1.1630	37.100	35.000	40.000	4.660	10	-5.525	2.287	2.152	35.300	1.0000
100	38.400	1.2038	38.400	36.000	41.000	5.091	10	-6.906	2.287	2.152	35.300	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.61772913	1.035	-0.0536108	-0.5166972
Bartlett's Test indicates equal variances (p = 0.96)	0.98804921	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	2.15229383	0.06747003	57.08	4.42962963	2.9E-08	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			

sqn_12-04-07data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/4/2007	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	12/11/2007	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	29.000	30.000	31.000	29.000	33.000	36.000	31.000	31.000	31.000
100	39.000	33.000	37.000	37.000	33.000	36.000	33.000	38.000	37.000	35.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	31.100	1.0000	31.100	29.000	36.000	6.685	10				33.450	1.0000
100	35.800	1.1511	35.800	33.000	39.000	6.148	10	-4.909	1.734	1.660	33.450	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95055902	0.868	0.55299874	0.10323569
F-Test indicates equal variances (p = 0.87)	1.12082267	6.54108953		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	1.66023952	0.05338391	110.45	4.58333333	1.1E-04	1, 18
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			

sqn_12-04-07data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
December 04-11, 2007
Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)
Species: *Ceriodaphnia dubia*

Daily Chemical Analyses

Project number: 3551

Reviewed by: [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)	7.83	7.58	7.38	7.66	7.83	8.00	8.06	8.02	8.10	8.07	8.15	7.99	8.02	8.06
	DO (mg/L)	7.7	7.7	7.7	7.9	7.6	7.5	7.7	8.0	7.6	8.0	7.6	8.1	7.4	7.6
	Conductivity (µmhos/cm)	296		314		310		337		304		306		317	
	Alkalinity (mg/L $CaCO_3$)	57				57				57					
	Hardness (mg/L $CaCO_3$)	92				94				92					
	Temperature (°C)	24.6	24.7	24.7	24.9	24.7	24.5	24.7	24.6	24.6	24.8	24.8	24.6	24.6	24.9
11.3%	pH (SU)	7.58	7.57	7.57	7.65	7.67	8.03	8.00	8.02	8.04	8.08	8.09	8.01	8.02	8.06
	DO (mg/L)	8.0	7.7	7.6	7.9	7.9	7.5	7.4	7.8	8.0	8.0	7.8	8.1	8.2	7.6
	Conductivity (µmhos/cm)	287		315		312		318		293		296		302	
	Temperature (°C)	24.7	24.9	24.7	24.6	24.7	24.5	24.7	24.8	24.7	24.8	24.7	24.9	24.8	24.9
22.6%	pH (SU)	7.58	7.57	7.56	7.66	7.69	8.03	8.04	8.02	8.05	8.08	8.09	8.03	8.05	8.07
	DO (mg/L)	8.0	7.8	7.6	7.9	7.9	7.5	7.6	7.8	7.9	7.9	7.8	8.2	7.9	7.7
	Conductivity (µmhos/cm)	280		305		304		320		285		288		300	
	Temperature (°C)	24.7	24.9	24.7	24.8	24.8	24.8	24.7	24.5	24.7	24.6	24.7	24.8	24.8	24.8
45.2%	pH (SU)	7.58	7.56	7.56	7.67	7.70	8.03	8.07	8.06	8.05	8.09	8.09	8.05	8.07	8.11
	DO (mg/L)	8.1	7.8	7.6	8.0	8.0	7.6	7.6	7.9	7.9	8.0	8.0	8.2	8.0	7.6
	Conductivity (µmhos/cm)	263		287		281		307		267		255		280	
	Temperature (°C)	24.7	25.0	24.7	24.8	24.8	24.7	24.8	24.5	24.7	24.6	24.7	25.0	24.9	24.6
72.6%	pH (SU)	7.54	7.57	7.57	7.69	7.71	8.07	8.08	8.07	8.04	8.16	8.13	8.10	8.09	8.12
	DO (mg/L)	8.1	7.8	7.7	8.0	8.2	7.7	7.6	7.9	8.0	8.0	8.0	8.2	8.2	7.6
	Conductivity (µmhos/cm)	241		264		260		268		246		249		248	
	Temperature (°C)	24.8	24.8	24.8	24.9	24.8	24.5	24.8	24.6	24.7	24.9	24.7	25.0	25.1	24.8
100%	pH (SU)	7.51	7.57	7.57	7.75	7.74	8.00	8.11	8.12	8.03	8.16	8.14	8.14	8.14	8.19
	DO (mg/L)	8.2	7.8	7.7	8.0	8.2	7.8	7.7	8.0	8.1	8.1	8.1	8.0	8.1	7.7
	Conductivity (µmhos/cm)	220		241		237		250		225		229		235	
	Alkalinity (mg/L $CaCO_3$)	68				72				76					
	Hardness (mg/L $CaCO_3$)	86				78				98					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	25.0	24.8	24.9	24.9	24.8	24.8	24.6	24.9	24.6	24.7	24.8	25.1	25.0
100% Intake	pH (SU)	7.48	7.62	7.61	7.74	7.75	8.06	8.09	8.12	7.95	8.18	8.09	8.12	8.13	8.21
	DO (mg/L)	8.4	7.6	7.7	8.0	8.1	7.6	7.7	7.8	8.1	8.1	8.2	8.1	8.1	7.8
	Conductivity (µmhos/cm)	220		251		237		249		222		230		223	
	Alkalinity (mg/L $CaCO_3$)	70				74				74					
	Hardness (mg/L $CaCO_3$)	84				88				94					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.7	24.8	25.0	24.9	24.7	24.8	24.7	25.1	24.7	24.7	24.7	24.9	24.8

Species: *Ceriodaphnia dubia* Date: 12-04-05

Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MEN	MEN	MEN	MEN	MEN	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.83	7.58	7.39	7.66	7.83	8.00
	DO (mg/L)	7.7	7.7	7.7	7.9	7.6	7.5
	Conductivity (µmhos/cm)	316		314		310	
	Alkalinity (mg $CaCO_3$/L)	57				57	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.6	24.7	24.7	24.9	24.7	24.5
11.3%	pH (S.U.)	7.58	7.57	7.57	7.65	7.67	8.03
	DO (mg/L)	8.0	7.7	7.6	7.9	7.9	7.5
	Conductivity (µmhos/cm)	287		315		312	
	Temperature (°C)	24.7	24.9	24.7	24.6	24.7	24.5
22.6%	pH (S.U.)	7.58	7.57	7.56	7.66	7.69	8.03
	DO (mg/L)	8.0	7.8	7.6	7.9	7.9	7.5
	Conductivity (µmhos/cm)	280		305		304	
	Temperature (°C)	24.7	24.9	24.7	24.8	24.8	24.8
45.2%	pH (S.U.)	7.58	7.56	7.56	7.67	7.70	8.03
	DO (mg/L)	8.1	7.8	7.6	8.0	8.0	7.6
	Conductivity (µmhos/cm)	263		287		281	
	Temperature (°C)	24.7	25.0	24.7	24.8	24.8	24.7
72.6%	pH (S.U.)	7.54	7.57	7.57	7.69	7.71	8.07
	DO (mg/L)	8.1	7.8	7.7	8.0	8.2	7.7
	Conductivity (µmhos/cm)	241		264		260	
	Temperature (°C)	24.8	24.8	24.8	24.9	24.8	24.5
100%	pH (S.U.)	7.57	7.57	7.57	7.75	7.74	8.00
	DO (mg/L)	8.2	7.8	7.7	8.0	8.2	7.8
	Conductivity (µmhos/cm)	220		241		237	
	Alkalinity (mg $CaCO_3$/L)	68				72	
	Hardness (mg $CaCO_3$/L)	86				78	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	25.0	24.8	24.9	24.9	24.8
100% Intake	pH (S.U.)	7.48	7.62	7.61	7.74	7.75	8.06
	DO (mg/L)	8.4	7.6	7.7	8.0	8.1	7.6
	Conductivity (µmhos/cm)	220		251		237	
	Alkalinity (mg $CaCO_3$/L)	70				74	
	Hardness (mg $CaCO_3$/L)	84				88	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.7	24.8	25.0	24.9	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 12-04-07

		Day							
		3		4		5		6	
	Analyst	MM	MM	MM	MM	MM	MM	MM	MM
Concentration	Parameter								
CONTROL	pH (S.U.)	8.06	8.02	8.10	8.07	8.15	7.99	8.02	8.06
	DO (mg/L)	7.7	8.0	7.6	8.0	7.6	8.1	7.4	7.6
	Conductivity (µmhos/cm)	337		304		306		317	
	Alkalinity (mg $CaCO_3$/L)			57					
	Hardness (mg $CaCO_3$/L)			92					
	Temperature (°C)	24.7	24.6	24.6	24.8	24.8	24.6	24.6	24.9
11.3%	pH (S.U.)	8.00	8.02	8.04	8.08	8.09	8.01	8.02	8.06
	DO (mg/L)	7.4	7.8	8.0	8.0	7.8	8.1	8.2	7.6
	Conductivity (µmhos/cm)	318		293		296		302	
	Temperature (°C)	24.7	24.8	24.7	24.8	24.7	24.9	24.8	24.9
22.6%	pH (S.U.)	8.04	8.02	8.05	8.08	8.09	8.03	8.05	8.07
	DO (mg/L)	7.6	7.8	7.9	7.9	7.8	8.2	7.9	7.7
	Conductivity (µmhos/cm)	320		285		288		300	
	Temperature (°C)	24.7	24.5	24.7	24.6	24.7	24.8	24.8	24.8
45.2%	pH (S.U.)	8.07	8.06	8.05	8.09	8.09	8.08	8.07	8.11
	DO (mg/L)	7.6	7.9	7.9	8.0	8.0	8.2	8.0	7.6
	Conductivity (µmhos/cm)	307		267		255		280	
	Temperature (°C)	24.8	24.5	24.7	24.6	24.7	25.0	24.9	24.6
72.6%	pH (S.U.)	8.08	8.07	8.04	8.16	8.13	8.10	8.09	8.12
	DO (mg/L)	7.6	7.9	8.0	8.0	8.0	8.2	8.2	7.6
	Conductivity (µmhos/cm)	268		246		249		248	
	Temperature (°C)	24.8	24.6	24.7	24.9	24.7	25.0	25.1	24.8
100%	pH (S.U.)	8.11	8.12	8.03	8.16	8.14	8.14	8.14	8.A
	DO (mg/L)	7.7	8.0	8.1	8.1	8.1	8.0	8.1	7.7
	Conductivity (µmhos/cm)	250		235		239		235	
	Alkalinity (mg $CaCO_3$/L)			76					
	Hardness (mg $CaCO_3$/L)			98					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.6	24.9	24.6	24.7	24.8	25.1	25.0
100% Intake	pH (S.U.)	8.09	8.12	7.95	8.18	8.09	8.12	8.13	8.21
	DO (mg/L)	7.7	7.8	8.1	8.1	8.2	8.1	8.1	7.8
	Conductivity (µmhos/cm)	249		222		230		223	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			94					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.7	25.1	24.7	24.7	24.7	24.9	24.8
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

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

Analyst	JPD / LAB	Iodide reagent:	INR 290
Date analyzed	12-04-07	Acid reagent:	INR 270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 482	INSS 482

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%)
INSS 482	0.50	0.511	102.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071204.06	Columbus WWTP	slightly cloudy w/ particles, pale tan	S <0.00000166	
↓	Duplicate		D <0.00000134	LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00766
071204.10	SPINDALE WWTP	cloudy w/ part., black-grey	0.000168
071203.05	RUTHERFORDTON WWTP	slightly cloudy w/ part., pale tan	<0.000200
071204.02	Chocowinity	clear w/ part., no color	<0.0000554
071204.01	Forwood Hills	clear, no color	<0.00000354
071203.03	SQN 101 Tox #1	clear, no color	<0.000474
071204.05	~~SQN 101 #2~~ Plum Island	clear w/ part., pale tan	0.0371
071203.04	SQN Intake Tox	clear w/ part., pale tan	<0.00265
071203.02	Tryon WWTP	clear w/ part., pale tan	<0.000637
071204.03	PCS Phosphate Inc 007	clear, no color	<0.000702

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%)
~~INSS 482~~	0.50	0.511	LB

Reviewed by	JJ
Date reviewed	12-04-07

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

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst	LAB
Date analyzed	12-04-07

Iodide reagent:	
Acid reagent:	LB

Calibration:

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

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%)
INS5482	0.50	0.500	100%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071204.04	PCS Phosphate Inc 100	clear w/ part., pale tan	S <0.000529	
↓	Duplicate		D <0.000471	LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		
			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%)
INS5482	0.50	0.500	100%

Reviewed by	JH
Date reviewed	12-04-07

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

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

Analyst	JPD	Iodide reagent:	INR 290
Date analyzed	12-06-07	Acid reagent:	INR 270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 482	INSS 482

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%)
INSS 482	0.50	~~0.486~~ 0.542	~~97.2~~ % 108 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071205.17	Columbus WWTP	cloudy, pale tan w/particles	S ~~0.215~~ 0.134	
↓	Duplicate		D ~~0.209~~ 0.181	~~0.209~~

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		~~<0.00849~~ <0.0183
071205.18	Tryon WWTP	clear, pale tan w/particles	~~0.215~~ <0.000177
071205.24	Rutherford tm WWTP	cloudy, pale tan w/particles	~~<0.000177~~ <0.0328
071205.25	Spindale WWTP	cloudy, dark grey w/particles	<0.00622
071206.01	Foxwood Hills	clear pale tan, w/particles	<0.00128
071206.02	Chocowinity (RO)	clear no color, no particles	<0.0000728
071206.05	Dixon WTP	clear no color w/particles	<0.000330
071206.03	Roxboro Plant	clear pale tan w/particles	<0.00290
071205.22	TVA-SON-101	clear, no color, w/particles	<0.00262
071205.23	↓ INT	clear pale tan, w/particles	<0.00109

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

071206.06 Plum Island clear, pale tan, w/particles <0.0168

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%)
INSS 482	0.50	0.542	108%

Reviewed by	JH
Date reviewed	12-06-07

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

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

Analyst	LAB	Iodide reagent:	INR290
Date analyzed	12-08-07	Acid reagent:	INR270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS482	INSS482

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%)
INSS482	0.50	0.505	101%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071208.10	Monroe WWTP	clear, pale tan	S <0.000140	
↓	Duplicate		D <0.0000425	— LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00707
071208.03	ALCOA	clear, no color	0.000755
071208.06	Dan River SS	clear, pale tan	<0.000611
071208.09	Kapstone	opaque w/ particles, brown	<0.00100
071208.04	Buck SS	clear, no color	<0.00529
071208.05	Carillon Bldg.	clear, no color	0.00837
071208.11	Wallace WWTP	clear w/ particles, pale tan	0.0292
071208.01	Foxwood Hills	clear w/ particles, pale tan	<0.000141
071208.08	Equip+ Supply	clear, no color	<0.000144
071208.07	Dunn WWTP	clear, pale tan	<0.0000446

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%)
—	0.50		— LB

Reviewed by	dl
Date reviewed	12-08-07

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

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

Analyst	LAB	Iodide reagent:	
Date analyzed	12-08-07	Acid reagent:	LB

Calibration:

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

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%)
INS5482	0.50	0.457	91.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071208.02	Chocowinity	clear w/ part., NO color	S <0.0146	
↓	Duplicate		D <0.00773	LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		LB
071207.14	Murphy WWTP	clear, pale tan	<0.00153
071208.14	Fairfield (RO)	clear, gold	<0.000316
071208.13	Clinton Larkin's	clear, pale tan	<0.000208
071208.15	Ponzer (RO)	clear, no color	<0.000000231
071207.07	Cliffside SS	slightly cloudy, no color	<0.00106
071207.08	Rutherfordton WWTP	clear, pale tan	<0.0000686
071208.12	Greenville WWTP	clear, pale tan	0.0000945
071207.11	Blue Ridge Paper	cloudy w/ particles, ~~gold~~ TAN	<0.0000371
071207.09	Spindale	cloudy w/ particles, black	0.00000096

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%)
	~~0.50~~		LB

Reviewed by	dl
Date reviewed	12-08-07

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

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

Analyst	UAB
Date analyzed	12-08-07

Iodide reagent:	
Acid reagent:	UB

Calibration:

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

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%)
INSS482	0.50	0.464	92.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
071207.05	Tryon WWTP	clear, pale tan	S <0.00327	
↓	Duplicate		D <0.00205	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		
071207.03	Columbus WWTP	slightly cloudy w/ part., pale tan	<0.000142
071207.13 ~~071207.12~~	SQN-intake	clear w/ part., pale tan	<0.000707
071207.12 ~~071207.13~~	SQN-101	clear, pale tan	<0.000818
071208.16	Plum Island	clear w/ particles, pale tan	0.0969
			UB

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%)
INSS482	0.50	0.516	103.2%

Reviewed by	JH
Date reviewed	12-08-07

Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	[illegible]	Time initiated	1353
Date analyzed	12.10.07	Time completed	1453

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 = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
6.3	IN2871	IN5472	0.1	12.6	12.5	0.020	10.0

Blk correction 0.0 - 0.1 = 0.1ml

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%)
IN5494	100	100	12.6	21.6	9.0	10.0	90	90.0%

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%)
12.06.07	MHS H2O	100	21.6	32.3	5.7	10.0	S 57	
↓	Duplicate (B)	↓	27.3	33.2	~~5.7~~ 5.9	↓	D ~~57~~ 59	3.4%

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)
IN5494	50	100	27.3	38.0	10.7	10.0	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%)
57	53	106.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
12.08.07	MHS H2O	100	38.0	43.8	5.8	10.0	58
11.28.07	↓	↓	43.8	49.5	5.7	↓	57
12.01.07A	↓	↓	0.0	5.7	5.7	↓	57
12.01.07B	↓	↓	5.7	11.4	5.7	↓	57
12.04.07	↓	↓	11.4	17.1	5.7	↓	57
11.27.07	SSW H2O	↓	17.1	~~23.6~~ 20.3	3.2	↓	32
12.01.07	↓	↓	20.3	23.6	3.3	↓	33
12.06.07	↓	↓	23.6	26.7	3.1	↓	31
12.08.07	SAT SW	↓	26.7	39.1	12.4	↓	130

Reviewed by: [illegible] Date reviewed: 12.27.07

Alkalinity
(SM 2320 B)

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

Analyst: KEJ
Date analyzed: 12.10.07

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 = 0.018 - 0.022)	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%)
INS5494	100	100	30.1	40.6	9.5	10.0	95	95.0%

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%)
44435	ETS # 120701	100	0.0	2.5	2.5	10.0	S 25	
↓	Duplicate (B)	↓	2.5	5.0	2.5	↓	D 25	—

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)
INS5494	50	100	5.0	13.0	8.0	10.0	80

120702

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%)
35	45	90.0%

Sample measurements:

	Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
	44430	ETS # 120702	100	5.0	8.5	3.5	10.0	35
pH 3.3	44437	↓ # 120703	↓	13.0	13.0	0.0	↓	ND
	11.26.07	SALTSW		13.0	24.0	11.0		110
	12.01.07	↓		24.0	36.3	12.3		120
	12.04.07			36.3	49.3	13.0		130
	12.06.07		↓	0.0	12.2	12.2		120
	071203.01	Columbia 1	50	12.2	15.5	3.3	20	66
	071205.17	2	↓	15.5	19.5	4.0	↓	80
	071207.04	↓ 3		19.5	23.8	4.3		86

Reviewed by: JL
Date reviewed: 12-27-07

Alkalinity
(SM 2320 B)

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

Analyst	[illegible]
Date analyzed	12-10-07

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 = 0.018 - 0.022)	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%)
IN55494	100	100	24.0	33.5	9.5	10.0	95	95.0%

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%)
071203.05	Rutherford tml	100	33.5	35.3	1.8	10.0	S 18	
↓	Duplicate (B)	↓	35.3	37.2	1.9	↓	D 19	5.4%

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)
IN55494	100	50	35.3	41.8	6.5	10.0	65

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%)
19	46	92.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
071205.24	Rutherford 2	100	41.8	44.6	2.8	10.0	28
071207.08	1 3	↓	44.6	47.2	2.6		26
071204.10	Spindale 1	50	1.0	11.5	11.5	(2)	230
071203.06	1		11.5	23.2	11.7		230
071205.25	2		23.2	34.7	11.5		230
071207.09/10	3 (DP)		34.7	47.5	12.8		260
071203.02	Tryon 1	100	0.0	8.4	8.4		84
071205.18	2		8.5	17.4	8.9		89
071207.06	3		17.4	29.0	11.6		120

Reviewed by: [illegible] Date reviewed: 12-27-07

Alkalinity
(SM 2320 B)

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

Analyst	[illegible]	Time initiated	
Date analyzed	12-10-07	Time completed	

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 = 0.018 - 0.022)	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%)
INS5494	100	100	29.3	38.5	9.2	10.0	92	92.0%

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%)
071204.08	B.R. Paper 1	50	0.0 39.9 +	5.2 50.0	5.2 + 11.1	16.3 (12) 10.0	S 330	
↓	Duplicate (B)	↓	0.0	16.1	16.1	↓ ↓	D 320	3.1%

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)
INS5494	100	50	0.0	20.6	20.6	(2) 10.0	410

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%)
320	90	90.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
071207.11	B.R. Paper 2	50	10.7	44.3	33.6	(12) 10.0	670
07120501	ACOA 002	100	20.6	22.9	2.3		23
071205.02	0051		22.9	26.0	3.1		31
071209.03	0052		26.2	29.4	3.2		32
071203.03	TVA-SQN 1	50	0.0	3.4	3.4	(12)	68
071205.22	2		3.4	7.0	3.6		72
071207.12	3		7.0	10.8	3.8		76
071203.04	TVA-SQN INT 1		10.8	14.3	3.5		70
071205.23	2		14.3	18.0	3.7		~~74~~ 74
071207.11	B.R. Paper 2	25	39.4	45.6	16.2	(4)	1050

Reviewed by: [illegible] Date reviewed: 12-27-07

Alkalinity
(SM 2320 B)

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

Analyst	[illegible]
Date analyzed	12.10.07

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 = 0.018 - 0.022)	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%)
INS5494	100	100	100	27.4	9.4	10.0	94	94%

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%)
071207.13	TVASQN INT 3	50	27.6	31.3	3.7	(2) 10.0	S 74	
↓	Duplicate (B)	↓	31.4	35.0	3.6	↓ ↓	D 72	2.7%

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)
INS5494	100	50	31.4	37.6	6.2	(2) 10.0	160

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%)
72	88	88.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
071203.03	TVASQN DV 1	50	39.6	43.2	3.6	(2) 10.0	72
071205.22	↓ 2	↓	43.2	46.5	3.3	↓	66
071207.12	↓ 3	↓	0.0	3.5	3.5	↓	70
071203.04	TVASQN INT DV 1	↓	3.5	6.9	3.4	↓	68
071205.23	↓ 2	↓	7.0	10.5	3.5	↓	70
071207.13	↓ 3	↓	10.5	13.5	3.0	↓	60
12-01-07A	MHS VV 1	100	13.7	19.4	5.7	↓	57
12-01-07B	↓ 2	↓	19.4	25.2	5.8	↓	58
12-04-07	↓ 3	↓	25.2	30.9	5.7	↓	57

Reviewed by: [illegible] Date reviewed: 12-27-07

Alkalinity
(SM 2320 B)

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

Analyst: KEN
Date analyzed: 12-10-07

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 = 0.018 - 0.022)	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%)
INS5494	100	100	30.9	40.2	9.3	10.0	93	93.0%

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%)
071204.01	Foxwood 1	100	40.2	45.6	5.4	10.0	S 54	
↓	Duplicate (B)	↓	0.0	5.6	5.6	10.0	D 56	3.6%

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)
INS5494	50	100	0.0	10.3	10.3	10.0	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	44	88

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
071206.01	Foxwood 2	100	10.3	15.3	5.0	10.0	50
071208.01	↓ 3	↓	15.3	20.0	4.7	↓	47
071204.02	Chinquapin 1	25	20.3	26.1	5.8	(14)	230
071206.02	2	↓	26.1	31.6	5.5	↓	220
071208.02	↓ 3	↓	31.6	37.4	5.8	↓	230
071204.05	Plum 1	↓	37.4	39.0	1.6	↓	64
071206.06	2	↓	39.0	41.2	~~1.2~~ 2.2	↓	~~40~~ 88
071208.16	↓ 3	↓	41.4	43.5	2.1	↓	84

Reviewed by: [signature]
Date reviewed: 12-27-07

Total Hardness
(SM 2340 C)

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

Analyst	PLA	Time initiated	0929
Date analyzed	12-10-07	Time completed	1052

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 = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
WR253	INSS525	0.0	7.8	9.9	0.0204	20.4

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%)
INSS513	40	50	9.0	11.9	2.1	20.4	43	107.5%

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 (acceptable range = ± 10%)
12-06-07	MHS H2O	50	11.9	16.5	4.6	20.4	S 94	
↓	Duplicate (B)	↓	16.5	21.1	4.6	↓	D 94	—

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)
INSS513	~~50~~ 40	50	16.5	23.0	6.5	20.4	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%)
94	36	90.0%

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	20.4	ND
12-06-07	MHS H2O	↓	23.0	27.4	4.4	↓	90
11-28-07	↓	↓	27.4	31.9	4.5	↓	92
12-01-07A	↓	↓	31.9	36.4	4.5	↓	92
12-01-07B	↓	↓	36.5	41.1	4.6	↓	94
12-04-07	↓	↓	41.1	45.6	4.5	↓	92
11-27-07	55W H2O	↓	45.6	47.6	2.0	↓	41
12-01-07	↓	↓	0.0	2.0	2.0	↓	41
12-06-07	↓	↓	2.0	4.2	2.2	↓	45
44413	Tyson-PPO	↓	4.2	5.7	1.5	↓	31

Note. If >15ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 12-27-07

Total Hardness
(SM 2340 C)

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

Analyst	KEN	Time initiated	
Date analyzed	12-26-07	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 = 0.018 - 0.022)	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%)
WS5593	40	50	5.7	7.7	2.0	20.4	41	102.5%

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 (acceptable range = ± 10%)
071203.01	Columbus 1	50	7.7	12.0	4.3	20.4	S 88	
↓	Duplicate (B)	↓	12.0	16.3	4.3	↓	D 88	—

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)
WS5593	40	50	12.0	18.3	6.3	20.4	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%)
88	42	105.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
—	Blank (should be = 0 mg $CaCO_3$/L)						—
071205.17	Columbus 2	50	18.3	22.2	3.9	20.4	80
071207.04	↓ 3		22.2	26.5	4.3		88
071203.05	Rothenbrook 1		26.5	28.9	2.4		49
071205.24	2		28.9	31.6	2.7		55
071207.08	↓ 3	↓	31.6	34.2	2.6		53
071204.10	Spindale-cd +1	25	34.2	35.2	1.0	10	41
071203.06	pp 1		35.2	36.4	1.2		49
071205.25	2		36.4	37.5	1.1		45
071207.09/10	↓ 3 (pp cd)	↓	37.5	38.8	1.3	↓	53

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 12-26-07

Spindale sample was black

Total Hardness
(SM 2340 C)

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

Analyst	[illegible]	Time initiated	
Date analyzed	12-10-07	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 = 0.018 - 0.022)	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%)
IN55573	40	50	38.8	48.8	2.0	20.4	41	102.5%

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 (acceptable range = ± 10%)
071203.02	Tryon 1	50	40.8	42.3	1.5	20.4	S 31	
↓	Duplicate (B)	↓	42.3	43.7	1.4	↓	D 29	6.7%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
IN55513	40	50	42.3	45.7	3.4	20.4	69

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%)
29	40	100.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						
071205.18	Tryon 2	50	45.7	47.4	1.7	20.4	35
071207.06	↓ 3	↓	47.4	48.9	1.5	↓	31
071205.01	AIRA 002	↓	0.0	2.0	2.0	↓	41
071205.07	↓ 005 1	↓	2.0	7.3	5.3	↓	110
071208.03	↓ 005 2	↓	7.3	13.0	5.7	↓	120
071204.08	B.R. Paper 1	25	13.0	16.1	3.1	(2)	130
071207.11	↓ 2	↓	16.1	19.2	3.1	↓	130
071204.01	Foxwood 1	50	19.2	22.2	3.0	↓	61
071206.01	↓ 2	↓	22.2	24.9	2.7	↓	55

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 12-26-07

Total Hardness
(SM 2340 C)

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

Analyst	[illegible]	Time initiated	
Date analyzed	12-17-07	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 = 0.018 - 0.022)	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%)
INSS573	40	50	24.1	26.9	2.0	20.4	41	102.5%

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 (acceptable range = ± 10%)
071208.01	Fairwood 3	50	26.9	29.8	2.9	20.4	S 59	
↓	Duplicate (B)	↓	29.8	32.6	2.8	↓	D 57	3.4%

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)
INSS573	40	50	29.8	34.6	4.8	20.4	98

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%)
57	41	102.5%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						
071203.03	TVA SDW 1	25	34.6	36.7	2.1	(2) 20.4	86
071205.22	2		36.7	38.6	1.9		78
071207.12	3		38.6	41.0	2.4		98
071203.04	TVA SDW INT 1	50	41.0	45.1	4.1		84
071205.23	2		45.1	49.4	4.3		88
071207.13	3		2.0	4.6	4.6		94
071203.03	TVA SDW DUP 1	25	4.6	6.8	2.2	(2)	~~45~~ 90
071205.22	2		6.8	9.1	2.3		94
071207.12	3		9.1	11.2	2.1		86

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: JL Date reviewed 12-26-07

Total Hardness
(SM 2340 C)

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

Analyst	[illegible]	Time initiated	
Date analyzed	12-10-07	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 = 0.018 - 0.022)	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%)
INS553	40	50	11.2	13.2	2.0	20.4	41	102.5%

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 (acceptable range = ± 10%)
12-01-07A	MHS VV 1	50	13.2	17.5	4.3	20.4	S 88	
↓	Duplicate (B)	↓	17.5	22.0	4.5	↓	D 92	4.4%

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)
INS553	40	50	17.5	24.0	6.5	20.4	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%)
92	38	95.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						
12-01-07B	MHSVV 2	50	24.0	28.5	4.5	20.4	92
12-04-07	↓ 3	↓	28.5	32.8	4.3	↓	88
071203.04	TIASONINTVV1		32.8	37.3	4.5		92
071205.23	2		37.3	41.6	4.3		88
071207.13	↓ 3	↓	41.6	46.2	4.6	↓	94

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed: 12-26-07

Sequoyah Nuclear Plant Biomonitoring
December 4-11, 2007

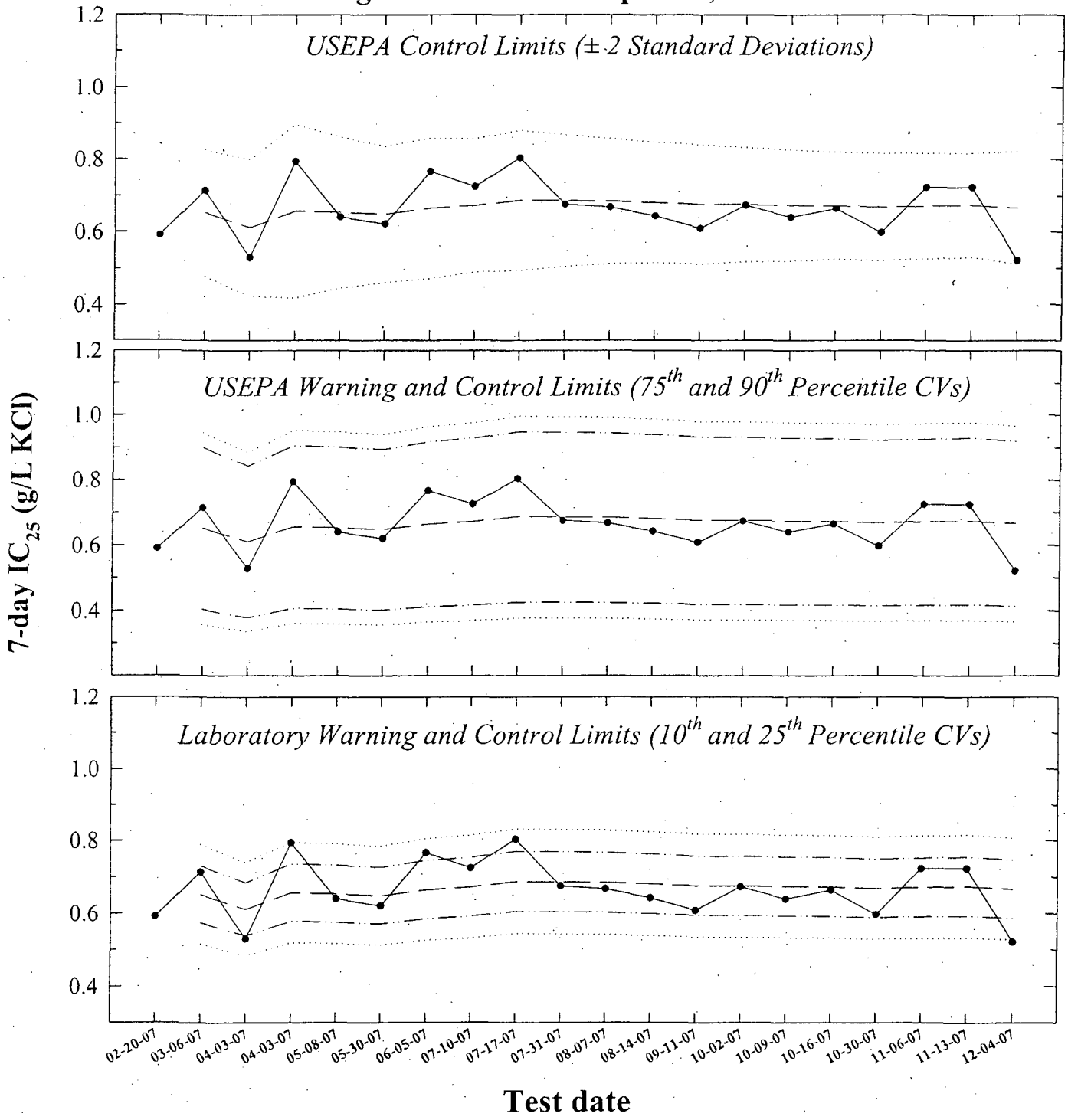
Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, Inc.

Pimephales promelas

Potassium Chloride Chronic Reference Toxicant Control Chart
using Moderately Hard Synthetic Water
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)

Environmental Testing Solutions, Inc.

Pimephales promelas
Potassium Chloride Chronic Reference Toxicant Control Chart
using Moderately Hard Synthetic Water
Organism Source: Aquatox, Inc.

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	02-20-07	0.59																	
2	03-06-07	0.71	0.65	0.09	0.48	0.83	0.08	0.57	0.73	0.14	0.52	0.79	0.25	0.40	0.90	0.29	0.36	0.95	0.13
3	04-03-07	0.53	0.61	0.09	0.42	0.80	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.28	0.34	0.89	0.15
4	04-03-07	0.79	0.66	0.12	0.42	0.90	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.95	0.18
5	05-08-07	0.64	0.65	0.10	0.45	0.86	0.08	0.58	0.73	0.14	0.52	0.79	0.25	0.41	0.90	0.29	0.36	0.95	0.16
6	05-30-07	0.62	0.65	0.09	0.46	0.84	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.14
7	06-05-07	0.77	0.67	0.10	0.47	0.86	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.41	0.92	0.30	0.37	0.96	0.15
8	07-10-07	0.73	0.67	0.09	0.49	0.86	0.08	0.59	0.75	0.14	0.53	0.81	0.26	0.42	0.93	0.30	0.37	0.98	0.14
9	07-17-07	0.80	0.69	0.10	0.49	0.88	0.08	0.60	0.77	0.14	0.54	0.83	0.26	0.43	0.95	0.31	0.38	1.00	0.14
10	07-31-07	0.68	0.69	0.09	0.50	0.87	0.08	0.60	0.77	0.14	0.54	0.83	0.26	0.43	0.95	0.31	0.38	0.99	0.13
11	08-07-07	0.67	0.68	0.09	0.51	0.86	0.08	0.60	0.77	0.14	0.54	0.83	0.26	0.42	0.94	0.31	0.38	0.99	0.13
12	08-14-07	0.64	0.68	0.08	0.51	0.85	0.08	0.60	0.76	0.14	0.54	0.82	0.26	0.42	0.94	0.31	0.37	0.99	0.12
13	09-11-07	0.61	0.68	0.08	0.51	0.84	0.08	0.59	0.76	0.14	0.53	0.82	0.26	0.42	0.93	0.30	0.37	0.98	0.12
14	10-02-07	0.67	0.68	0.08	0.52	0.83	0.08	0.59	0.76	0.14	0.53	0.82	0.26	0.42	0.93	0.30	0.37	0.98	0.12
15	10-09-07	0.64	0.67	0.08	0.52	0.83	0.08	0.59	0.75	0.14	0.53	0.81	0.26	0.42	0.93	0.30	0.37	0.98	0.11
16	10-16-07	0.66	0.67	0.07	0.52	0.82	0.08	0.59	0.75	0.14	0.53	0.81	0.26	0.42	0.93	0.30	0.37	0.98	0.11
17	10-30-07	0.60	0.67	0.07	0.52	0.82	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.41	0.92	0.30	0.37	0.97	0.11
18	11-06-07	0.72	0.67	0.07	0.52	0.82	0.08	0.59	0.75	0.14	0.53	0.81	0.26	0.42	0.93	0.30	0.37	0.97	0.11
19	11-13-07	0.72	0.67	0.07	0.53	0.82	0.08	0.59	0.75	0.14	0.53	0.82	0.26	0.42	0.93	0.30	0.37	0.98	0.11
20	12-04-07	0.52	0.67	0.08	0.51	0.82	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.41	0.92	0.30	0.37	0.97	0.12

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.

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Pimephales promelas
Potassium Chloride Chronic Reference Toxicant Data using Moderately Hard Synthetic Water
Organism Source: Aquatox, Inc.

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	02-20-07	100	0.531		6.3		0.12	22.8	
2	03-06-07	100	0.734	0.632	15.6	11.0	0.12	15.8	19.3
3	04-03-07	100	0.724	0.663	14.8	12.2	0.11	15.8	18.1
4	04-03-07	100	0.763	0.688	3.7	10.1	0.12	15.9	17.6
5	05-08-07	100	0.883	0.727	6.1	9.3	0.09	10.5	16.2
6	05-30-07	100	0.790	0.737	12.2	9.8	0.11	13.6	15.7
7	06-05-07	100	0.644	0.724	11.9	10.1	0.11	17.1	15.9
8	07-10-07	100	0.693	0.720	2.3	9.1	0.05	7.5	14.9
9	07-17-07	100	0.685	0.716	8.5	9.0	0.08	12.2	14.6
10	07-31-07	100	0.686	0.713	7.9	8.9	0.08	11.0	14.2
11	08-07-07	100	0.854	0.726	11.5	9.2	0.13	15.7	14.4
12	08-14-07	97.5	0.900	0.740	13.1	9.5	0.13	14.4	14.4
13	09-11-07	100	0.831	0.747	6.3	9.2	0.14	17.4	14.6
14	10-02-07	100	0.918	0.760	4.9	8.9	0.17	18.1	14.8
15	10-09-07	100	0.772	0.760	7.9	8.9	0.08	10.2	14.5
16	10-16-07	100	0.662	0.754	13.6	9.2	0.08	12.8	14.4
17	10-30-07	100	0.771	0.755	12.0	9.3	0.16	20.1	14.8
18	11-06-07	100	0.624	0.748	6.4	9.2	0.09	14.7	14.8
19	11-13-07	100	0.603	0.740	14.2	9.4	0.10	16.8	14.9
20	12-04-07	100	0.756	0.741	7.9	9.4	0.11	14.5	14.8

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%.

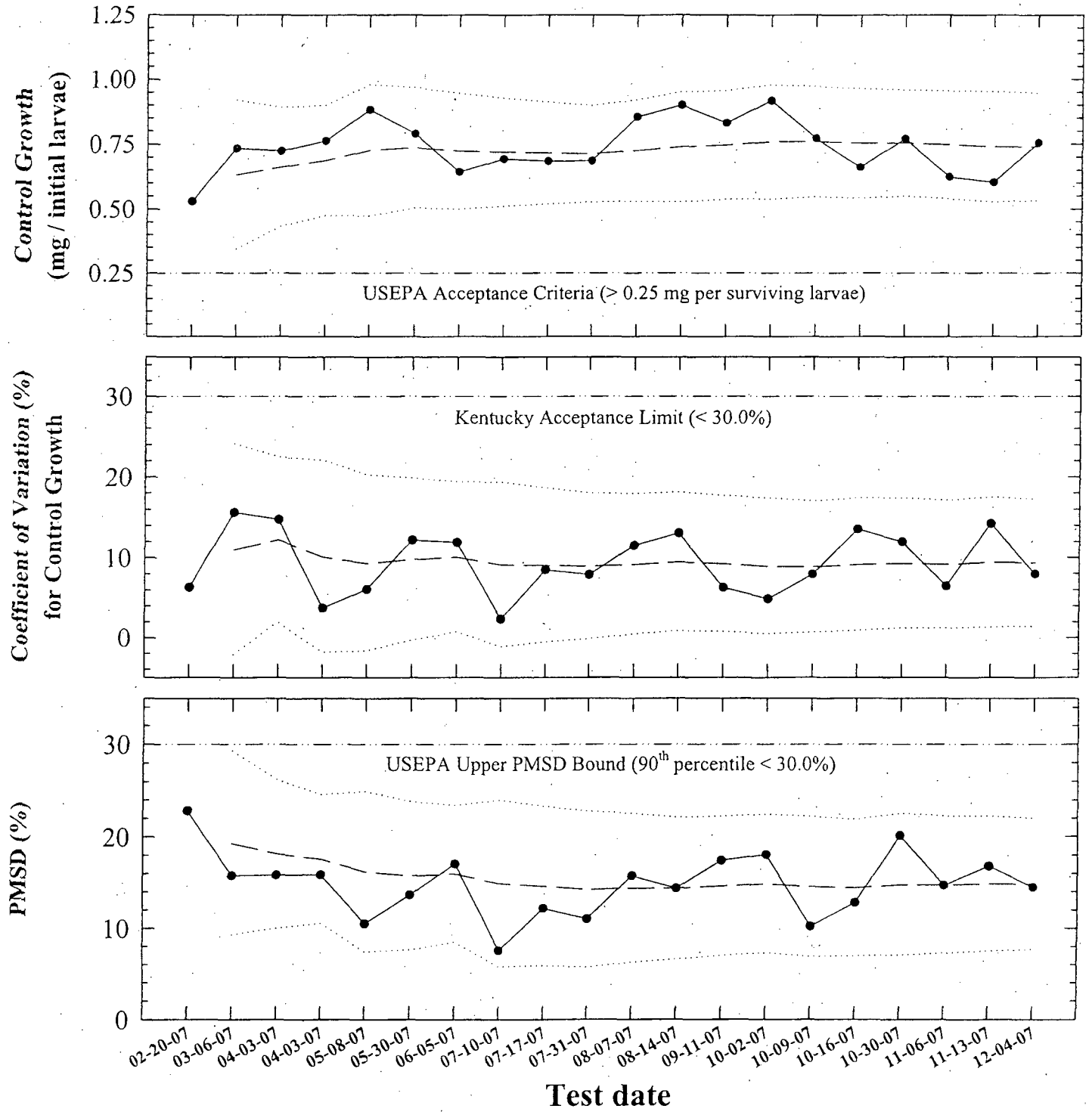
CT = Central Tendancy (mean Control Growth, CV, or PMSD)

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.

Environmental Testing Solutions, Inc.

Pimephales promelas Control Growth, Coefficient of Variation, and PMSD in Potassium Chloride Chronic Reference Toxicant Tests

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)

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

PpKClCR Test Number: 139

Dilution preparation information:						*Comments:*
KCl CHM number:		CHM349				
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:	21-HOURS OLD	Randomizing template:	YELLOW-GREEN
Date and times organisms were born between:	12-03-07 1600	Incubator number and shelf location:	4C
Organism source:	ATOX BATCH Pp 12-03-07	*Artemia* lot number:	BG0204V
Transfer bowl information:	pH = 7.52 SU Temperature = 24.2 °C	Total drying time:	24-HOURS
		Date / Time in: 12-11-07	1230
Average transfer volume:	8.6 ml	Date / Time out: 12-12-07	1230
		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	12-04-07	—	1545	1307	12-01-07A	JL
1	12-05-07	0830	1432	1210	12-01-07A	JL
2	12-06-07	0840	1445	1213	12-01-07B	JL
3	12-07-07	0815	1420	1211	12-01-07B	JL
4	12-08-07	0800	1400	1220	12-04-07	JL
5	12-09-07	~~1000~~ 0950	1600	1325	12-04-07	JL
6	12-10-07	0958	1600	1319	12-04-07	JL
7	12-11-07			1213		JL

Control information:		Acceptance criteria
% Mortality:	2.5%	≤ 20%
Average weight per initial larvae:	0.756	
Average weight per surviving larvae:	0.775	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	808.1
NOEC	450
LOEC	600
ChV	519.6
IC_{25}	520.9

Species: *Pimephales promelas* PpKClCR Test Number: 139

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	9 d	10
4	10	10	10	10	10	10	10	10	10	10	9	9 d
5	10	10	10	10	10	10	10	10	10	10	9	9
6	10	10	10	10	10	10	10	10	10	9 d	9	7 d
7	2LG 10	9 d 1LG	10	10 1LG	10	10	10	10 1LG	10	9 SM	9	7
A = Pan weight (mg) Tray color code:: purple Analyst: LAB	14.69	14.09	15.95	14.31	13.71	13.74	13.53	15.31	13.56	15.92	14.33	13.47
B = Pan + Larvae weight (mg) Analyst: MM	23.01	21.11	23.09	22.05	19.89	20.06	20.54	23.26	18.50	19.26	19.04	17.80
C = Larvae weight (mg) = A – B	8.32	7.02	7.14	7.74	6.18	6.32	7.01	7.95	4.94	3.34	4.71	4.33
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.832	0.702	0.714	0.774	0.618	0.632	0.701	0.795	0.494	0.334	0.471	0.433
Average weight per initial number of larvae (mg)	0.756				0.687				0.433			
Percent reduction from control (%)					9.1%				42.7%			

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:

Species: *Pimephales promelas* PpKClCR Test Number: 139

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	9 1d	9 1d	8 2d	8 2d	7 3d	9 1d	6 4d	6 4d	6 4d	6 4d	4 6d	5 5d
2	9	9	8	8	7	9	6	6	6	5 1d	4	4 1d
3	9	9	8	8	7	7 2d	6	6	6	5	4	4
4	9	9	7 1d	8	5 2d	6 1d	5 1d	6	4 2d	3 2d	4	3 1d
5	8 1d	8 1d	6 1d	6 2d	5	5 1d	3 2d	6	3 1d	2 1d	3 1d	1 2d
6	7 1d	7 1d	5 1d	6	5	4 1d	3	5 1d	1 2d	0 2d	0 3d	1
7	7	6 1d	5	6 SM	5	4	3	5	1 SM	0	0	1
A = Pan weight (mg) Tray color code:: purple Analyst: MM	14.50	13.86	15.53	12.90	14.43	14.38	14.31	14.60	13.61	14.68	14.25	14.09
B = Pan + Larvae weight (mg) Analyst: MM	18.67	17.33	18.33	15.14	16.80	16.08	15.57	17.25	13.73	—	—	14.71
C = Larvae weight (mg) = A – B	4.17	3.47	2.80	2.24	2.37	1.70	1.26	2.65	0.12	—	—	0.62
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.417	0.347	0.280	0.224	0.237	0.170	0.126	0.265	0.012	0	0	0.062
Average weight per initial number of larvae (mg)	0.317		58.0%		0.200		73.6%		0.019		97.6%	
Percent reduction from control (%)												

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: [illegible]

Comments:

Environmental Testing Solutions, Inc.

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)

Species: *Pimephales promelas*

Organism Source: Aquatox, Inc.

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKClCR #139

Test dates: December 04-11, 2007

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	14.69	23.01	8.32	0.832	0.775	6.2	0.832	97.5	0.756	7.9	Not applicable
	B	10	9	14.09	21.11	7.02	0.780			0.702				
	C	10	10	15.95	23.09	7.14	0.714			0.714				
	D	10	10	14.31	22.05	7.74	0.774			0.774				
450	E	10	10	13.71	19.89	6.18	0.618	0.687	11.8	0.618	100.0	0.687	11.8	9.1
	F	10	10	13.74	20.06	6.32	0.632			0.632				
	G	10	10	13.53	20.54	7.01	0.701			0.701				
	H	10	10	15.31	23.26	7.95	0.795			0.795				
600	I	10	10	13.56	18.50	4.94	0.494	0.502	20.3	0.494	87.5	0.433	16.3	42.7
	J	10	9	15.92	19.26	3.34	0.371			0.334				
	K	10	9	14.33	19.04	4.71	0.523			0.471				
	L	10	7	13.47	17.80	4.33	0.619			0.433				
750	M	10	7	14.50	18.67	4.17	0.596	0.527	19.6	0.417	60.0	0.317	26.3	58.0
	N	10	6	13.86	17.33	3.47	0.578			0.347				
	O	10	5	15.53	18.33	2.80	0.560			0.280				
	P	10	6	12.90	15.14	2.24	0.373			0.224				
900	Q	10	5	14.43	16.80	2.37	0.474	0.462	11.1	0.237	42.5	0.200	31.7	73.6
	R	10	4	14.38	16.08	1.70	0.425			0.170				
	S	10	3	14.31	15.57	1.26	0.420			0.126				
	T	10	5	14.60	17.25	2.65	0.530			0.265				
1050	U	10	1	13.61	13.73	0.12	0.000	0.000	0.0	0.012	5.0	0.019	159.7	97.6
	V	10	0	0.00	0.00	0.00	0.000			0.000				
	W	10	0	0.00	0.00	0.00	0.000			0.000				
	X	10	1	14.09	14.71	0.62	0.000			0.062				

Dunnett's MSD value: 0.1095

PMSD: 14.5

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.

Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	12/4/2007	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	12/11/2007	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	0.9000	1.0000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	1.0000	0.9000	0.9000	0.7000
750	0.7000	0.6000	0.5000	0.6000
900	0.5000	0.4000	0.3000	0.5000
1050	0.1000	0.0000	0.0000	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	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
450	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
600	0.8750	0.8974	1.2253	0.9912	1.4120	14.199	4	13.50	10.00	5	40
*750	0.6000	0.6154	0.8872	0.7854	0.9912	9.469	4	10.00	10.00	16	40
*900	0.4250	0.4359	0.7088	0.5796	0.7854	13.871	4	10.00	10.00	23	40
*1050	0.0500	0.0513	0.2403	0.1588	0.3218	39.161	4	10.00	10.00	38	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95269156	0.884	-0.5882964	0.98608425
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.820393	
Treatments vs D-Control				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	10.5797807	1.55653174	7.52897844	13.630583	0.025	5.38853779	7.81472778	0.15	2.90749024	0.09451992	5
Intercept	-25.760609	4.53827135	-34.655621	-16.865597							
TSCR	0.01416527	0.01444836	-0.0141535	0.04248405							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	487.084184	388.552161	553.955155
EC05	3.355	564.961442	477.157271	623.413202
EC10	3.718	611.445976	531.846681	664.596996
EC15	3.964	644.950886	571.834898	694.406478
EC20	4.158	672.884107	605.364523	719.506485
EC25	4.326	697.810537	635.283585	742.239349
EC40	4.747	764.792979	714.272365	806.270707
EC50	5.000	808.146767	762.708183	851.574385
EC60	5.253	853.958158	810.216562	904.099344
EC75	5.674	935.929107	885.93285	1009.83303
EC80	5.842	970.59983	915.339908	1058.10293
EC85	6.036	1012.63712	949.647481	1118.70394
EC90	6.282	1068.12572	993.323362	1201.50749
EC95	6.645	1156.01018	1059.97762	1337.91255
EC99	7.326	1340.83853	1193.93693	1641.5599

Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/4/2007	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	12/11/2007	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	0.8320	0.7020	0.7140	0.7740
450	0.6180	0.6320	0.7010	0.7950
600	0.4940	0.3340	0.4710	0.4330
750	0.4170	0.3470	0.2800	0.2240
900	0.2370	0.1700	0.1260	0.2650
1050	0.0120	0.0000	0.0000	0.0620

			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	0.7555	1.0000	0.7555	0.7020	0.8320	7.934	4				0.7555	1.0000
450	0.6865	0.9087	0.6865	0.6180	0.7950	11.788	4	1.374	2.180	0.1095	0.6865	0.9087
*600	0.4330	0.5731	0.4330	0.3340	0.4940	16.312	4	6.422	2.180	0.1095	0.4330	0.5731
750	0.3170	0.4196	0.3170	0.2240	0.4170	26.341	4				0.3170	0.4196
900	0.1995	0.2641	0.1995	0.1260	0.2650	31.661	4				0.1995	0.2641
1050	0.0185	0.0245	0.0185	0.0000	0.0620	159.711	4				0.0185	0.0245

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96612656	0.805	0.13911643	-1.0072421
Bartlett's Test indicates equal variances (p = 0.89)	0.23211719	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	600	519.615242		0.10947132	0.14489916	0.115353	0.00504333	3.0E-04	2, 9
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	246.36	125.47	45.16	602.14	0.2837
IC10	453.88	78.92	113.63	509.09	-0.8982
IC15	476.23	36.47	293.20	526.96	-2.2311
IC20	498.58	21.00	433.42	550.11	-1.0351
IC25	520.93	17.71	458.63	572.23	-0.2358
IC40	587.99	21.77	543.80	670.46	0.6688
IC50	671.44	40.37	548.59	817.13	0.3585

* indicates IC estimate less than the lowest concentration

Organisms obtained from Aquatox, Inc.

Species: *Pimephales promelas* PpKClCR Test Number: 139

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MEK	MEK	MEK	MEK	MEK	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.83	7.35	7.38	7.58	7.83	7.70
	DO (mg/L)	7.7	7.5	7.7	7.6	7.6	7.3
	Conductivity (µmhos/cm)	296		314		310	
	Alkalinity (mg $CaCO_3$/L)	57		↘		57	
	Hardness (mg $CaCO_3$/L)	92		↘		94	
	Temperature (°C)	24.8	24.3	24.6	24.7	24.7	24.5
450 mg KCl/L	pH (S.U.)	7.87	7.55	7.55	7.54	7.75	7.69
	DO (mg/L)	7.8	7.4	7.7	7.7	7.7	7.3
	Conductivity (µmhos/cm)	1060		1140		1090	
	Temperature (°C)	24.6	24.5	24.6	24.5	24.7	24.5
600 mg KCl/L	pH (S.U.)	7.87	7.59	7.63	7.58	7.74	7.69
	DO (mg/L)	7.8	7.5	7.7	7.6	7.7	7.3
	Conductivity (µmhos/cm)	1510		1420		1350	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.8	24.2
750 mg KCl/L	pH (S.U.)	7.87	7.62	7.68	7.55	7.74	7.67
	DO (mg/L)	7.8	7.5	7.7	7.6	7.7	7.3
	Conductivity (µmhos/cm)	1550		1670		1600	
	Temperature (°C)	24.7	24.5	24.6	24.5	24.8	24.2
900 mg KCl/L	pH (S.U.)	7.92	7.64	7.71	7.55	7.75	7.69
	DO (mg/L)	7.8	7.5	7.6	7.6	7.8	7.2
	Conductivity (µmhos/cm)	1820		1830		1840	
	Temperature (°C)	24.6	24.5	24.5	24.6	24.8	24.6
1050 mg KCl/L	pH (S.U.)	7.91	7.60	7.72	7.55	7.75	7.77
	DO (mg/L)	7.9	7.3	7.6	7.6	7.8	7.4
	Conductivity (µmhos/cm)	2090		2190		2080	
	Temperature (°C)	24.6	24.5	24.7	24.4	24.8	24.3
STOCK	Conductivity (µmhos/cm)	92000		K		K 71500	
		Initial	Final	Initial	Final	Initial	Final

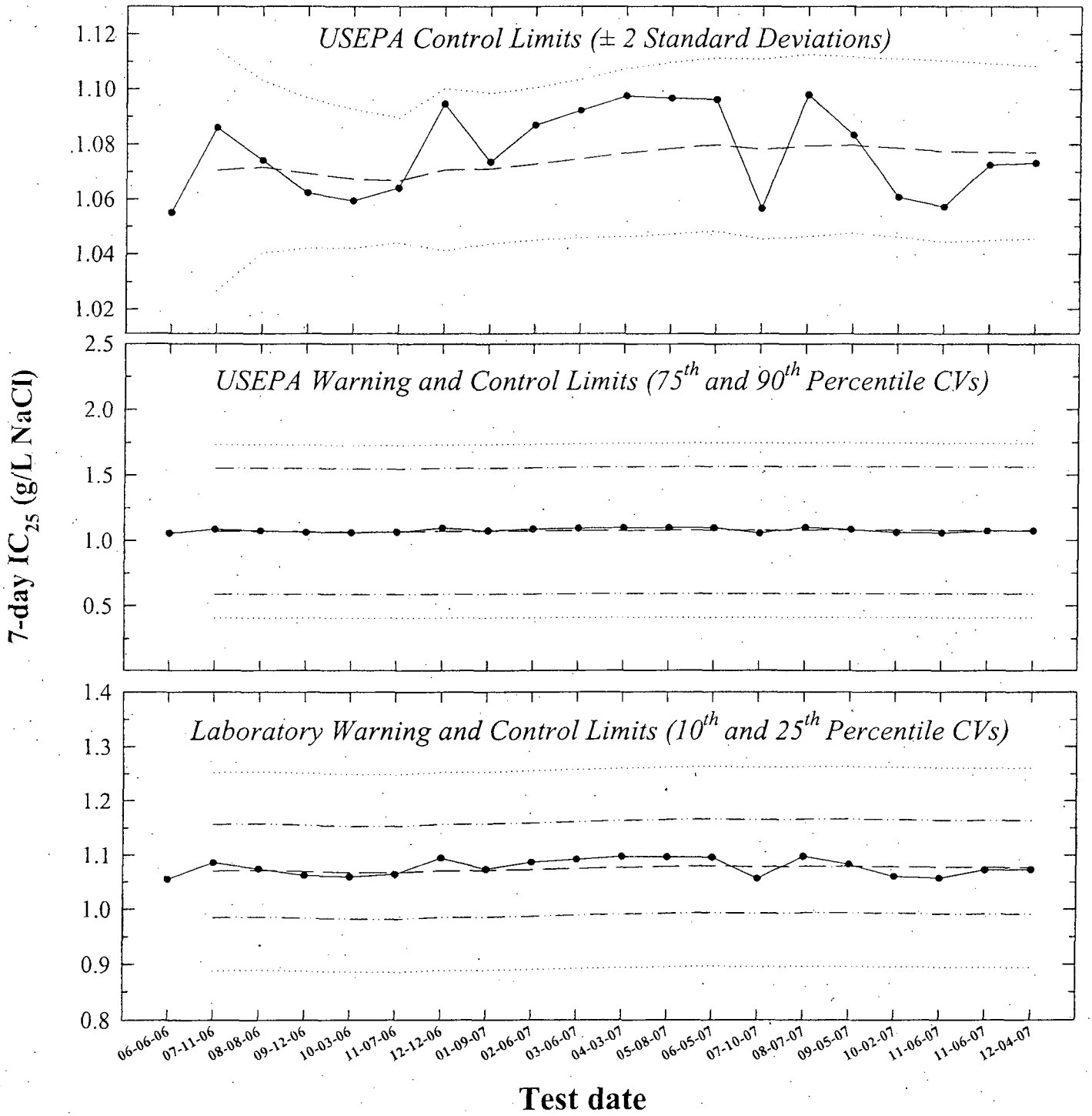
Species: *Pimephales promelas*

PpKCICR Test Number: 139

		Day							
		3		4		5		6	
	Analyst	MM	MM	MM	MM	MM	MM	MM	MM
Concentration	Parameter								
CONTROL	pH (S.U.)	8.06	7.63	8.00	7.64	8.15	7.95	8.02	8.05
	DO (mg/L)	7.7	6.8	7.6	7.3	7.6	7.8	7.4	7.5
	Conductivity (µmhos/cm)	337		304		306		317	
	Alkalinity (mg $CaCO_3$/L)			57					
	Hardness (mg $CaCO_3$/L)			92					
	Temperature (°C)	24.7	24.5	24.7	24.6	24.8	24.3	24.6	24.4
450 mg KCl/L	pH (S.U.)	8.01	7.59	8.00	7.53	8.01	7.88	8.04	8.01
	DO (mg/L)	7.8	6.8	7.6	6.8	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	1160		1130		1070		1090	
	Temperature (°C)	24.7	24.3	24.5	24.5	24.8	24.2	24.5	24.7
600 mg KCl/L	pH (S.U.)	8.01	7.61	7.99	7.57	8.01	7.90	8.03	8.02
	DO (mg/L)	7.8	6.8	7.6	7.2	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	1440		1410		1340		1370	
	Temperature (°C)	24.7	24.6	24.6	24.8	24.8	24.2	24.7	24.6
750 mg KCl/L	pH (S.U.)	8.01	7.60	8.00	7.62	7.99	7.90	8.02	7.92
	DO (mg/L)	7.8	6.8	7.6	7.2	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	1710		1660		1590		1610	
	Temperature (°C)	24.6	24.2	24.6	24.4	24.8	24.5	24.5	24.7
900 mg KCl/L	pH (S.U.)	8.01	7.65	7.98	7.64	7.99	7.90	8.02	7.95
	DO (mg/L)	7.9	6.7	7.6	7.4	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	1970		1900		1830		1880	
	Temperature (°C)	24.6	24.2	24.7	24.5	24.8	24.1	24.5	24.7
1050 mg KCl/L	pH (S.U.)	8.00	7.66	7.98	7.66	7.99	7.88	8.01	7.97
	DO (mg/L)	7.9	7.0	7.6	7.5	7.6	7.4	7.6	7.6
	Conductivity (µmhos/cm)	2160		2130		2110		2170	
	Temperature (°C)	24.7	24.3	24.7	24.5	24.8	24.1	24.5	24.5
STOCK	Conductivity (µmhos/cm)								
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Ceriodaphnia dubia

Sodium Chloride Chronic Reference Toxicant Control Chart using Moderately Hard Synthetic Water



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
Sodium Chloride Chronic Reference Toxicant Control Chart
using Moderately Hard Synthetic Water

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	06-06-06	1.06																	
2	07-11-06	1.09	1.07	0.02	1.03	1.11	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.02
3	08-08-06	1.07	1.07	0.02	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
4	09-12-06	1.06	1.07	0.01	1.04	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
5	10-03-06	1.06	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
6	11-07-06	1.06	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
7	12-12-06	1.09	1.07	0.01	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
8	01-09-07	1.07	1.07	0.01	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
9	02-06-07	1.09	1.07	0.01	1.05	1.10	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
10	03-06-07	1.09	1.07	0.01	1.05	1.10	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
11	04-03-07	1.10	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	1.74	0.01
12	05-08-07	1.10	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
13	06-05-07	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
14	07-10-07	1.06	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
15	08-07-07	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	0.02
16	09-05-07	1.08	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
17	10-02-07	1.06	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
18	11-06-07	1.06	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
19	11-06-07	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
20	12-04-07	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	1.74	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
Sodium Chloride Chronic Reference Toxicant Data using Moderately Hard Synthetic Water

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	06-06-06	100	30.3		5.2		3.0	9.8	
2	07-11-06	100	29.0	29.7	5.4	5.3	2.5	8.6	9.2
3	08-08-06	100	28.6	29.3	8.9	6.5	3.7	12.8	10.4
4	09-12-06	100	30.9	29.7	5.4	6.2	3.3	10.6	10.5
5	10-03-06	100	32.3	30.2	4.6	5.9	3.1	9.5	10.3
6	11-07-06	100	31.0	30.4	6.3	6.0	2.4	7.8	9.9
7	12-12-06	100	28.0	30.0	6.7	6.1	2.2	8.0	9.6
8	01-09-07	100	27.6	29.7	4.9	5.9	2.4	8.6	9.5
9	02-06-07	100	29.9	29.7	7.6	6.1	2.9	9.8	9.5
10	03-06-07	100	30.1	29.8	6.0	6.1	2.6	8.7	9.4
11	04-03-07	100	33.1	30.1	4.4	5.9	2.2	6.6	9.2
12	05-08-07	100	32.0	30.2	8.5	6.2	2.7	8.4	9.1
13	06-05-07	100	28.4	30.1	7.5	6.3	2.5	8.7	9.1
14	07-10-07	100	29.3	30.0	6.0	6.2	2.5	8.5	9.0
15	08-07-07	100	28.7	29.9	7.5	6.3	2.9	10.0	9.1
16	09-05-07	100	29.7	29.9	5.7	6.3	2.5	8.4	9.1
17	10-02-07	100	29.5	29.9	9.4	6.5	2.4	8.2	9.0
18	11-06-07	100	28.0	29.8	6.1	6.4	2.5	8.8	9.0
19	11-06-07	100	30.4	29.8	5.6	6.4	2.2	7.2	8.9
20	12-04-07	100	31.8	29.9	5.5	6.4	2.5	7.9	8.8

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%.

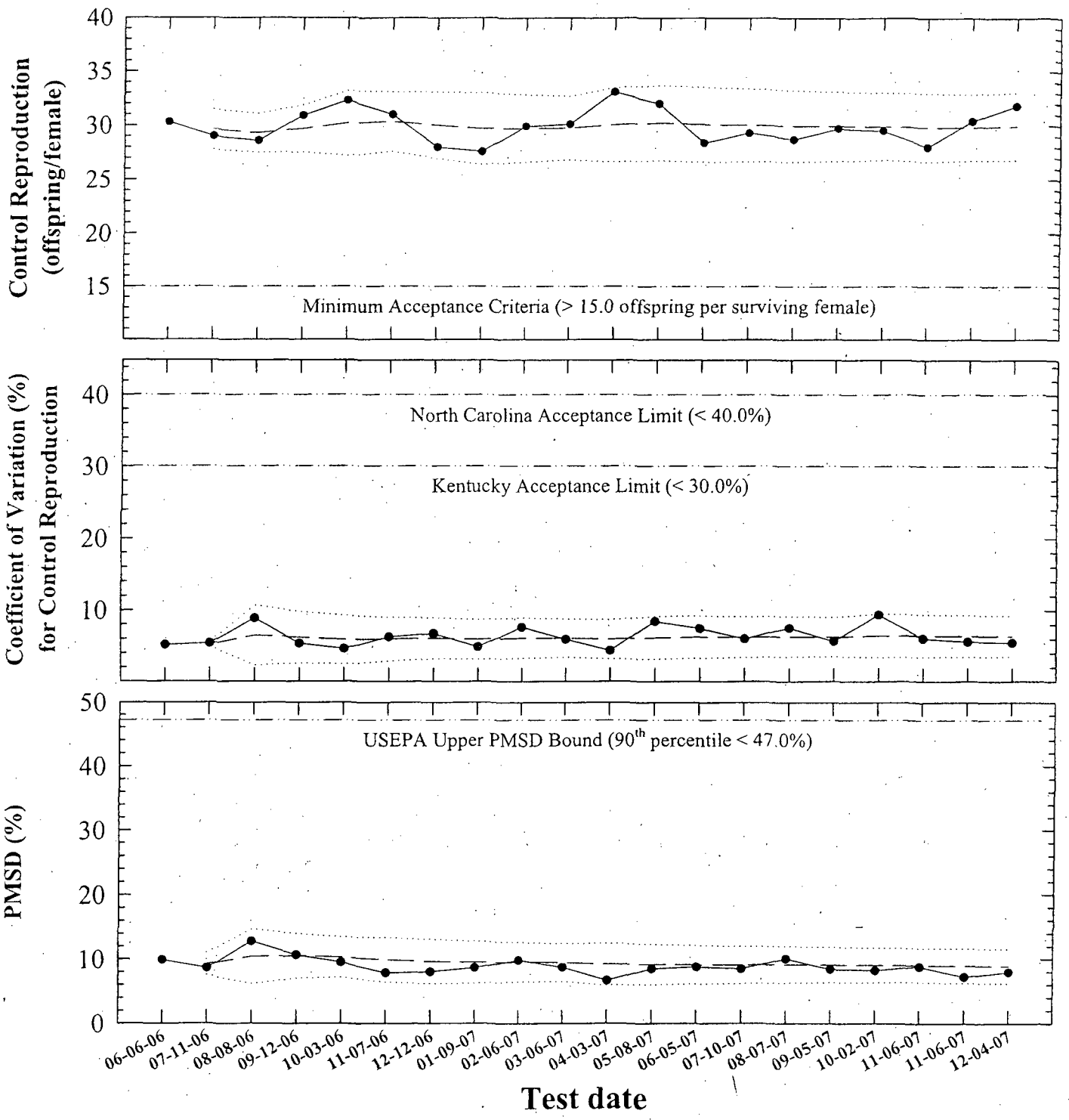
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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 Control Reproduction, Coefficient of Variation, and PMSD in Sodium Chloride Chronic Reference Toxicant Tests



—•— **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)

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

CdNaCLCR #: 69

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:	PURPLE
Date and times organisms were born between:	12-04-07 0712 TO 1000										Incubator number and shelf location:	2B1
Culture board:	11-27-07 A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	10-25-07
Culture board cup number:	1	7	10	12	13	14	21	23	24	29		
Transfer bowl information:	pH = 7.68 SU Temperature = 24.8 °C										*Selenastrum* batch:	11-21-07

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Analyst
0	12-04-07	1035	12-01-07 A	JH
1	12-05-07	0940	12-01-07 A	JH
2	12-06-07	0943	12-01-07 B	JH
3	12-07-07	0936	12-01-07 B	JH
4	12-08-07	0940	12-04-07	JH
5	12-09-07	1013	12-04-07	JH
6	12-10-07	1030	12-04-07	JH
7	12-11-07	0941		JH

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:	31.8	≥ 15.0 offspring/female	ChV	1095.4
% CV:	5.5%	< 40.0 %	IC_{25}	1073.2

Species: *Ceriodaphnia dubia* CdNaCLCR #: 69

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	4	4	3	4	4	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	14	13	13	12	14	10	12	11	11
	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	16	16	16	14	17	14	15	18	16	15
Total young produced		32	34	33	30	33	32	29	34	31	30
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:	31.8

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	4	4	5	4	5	4	4	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	14	13	11	13	11	12	12	11
	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	19	15	16	18	14	14	17	15	18	15
Total young produced		36	33	35	35	30	31	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:	32.8
% Reduction from Control:	-3.1%

Species: *Ceriodaphnia dubia* CdNaCLCR #: 69

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	5	4	4	4	4	5	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	11	12	12	13	11	12	12	10	13
	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	17	16	15	15	18	14	17	18	15	14
Total young produced		33	31	31	31	35	30	34	34	29	31
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:	31.9
% Reduction from Control:	-0.3%

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	5	5	4	5	4	4	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	13	12	11	11	13	10	12	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	14	17	14	13	16	14	16	13	13	13
Total young produced		29	32	31	30	31	29	33	27	28	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:	29.9
% Reduction from Control:	6.0%

Species: *Ceriodaphnia dubia* CdNaCLCR #: 69

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	5	3	3	3	4	4	4	2	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	7	6	2	1	2	2	2	3	3
	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	10	9	6	7	5	8	8	9	8	6
Total young produced		18	21	15	12	9	14	14	15	13	13
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:	14.4
% Reduction from Control:	54.7%

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	4	2	4	3	3	1	2	4	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	3	4	2	2	4	1	0	3	3	1
	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	6	2	5	5	4	6	0	3	5	7
Total young produced		13	10	9	11	11	~~9~~ 10	1	8	12	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:	9.5
% Reduction from Control:	70.1%

Environmental Testing Solutions, Inc.

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	4	4	3	4	4	4	4	4	4	40
5	11	14	13	13	12	14	10	12	11	11	121
6	0	0	0	0	0	0	0	0	0	0	0
7	16	16	16	14	17	14	15	18	16	15	157
Total	32	34	33	30	33	32	29	34	31	30	318

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	5	5	4	5	4	4	4	4	3	4	42
5	10	10	13	12	11	11	13	10	12	12	114
6	0	0	0	0	0	0	0	0	0	0	0
7	14	17	14	13	16	14	16	13	13	13	143
Total	29	32	31	30	31	29	33	27	28	29	299

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	4	4	5	4	5	4	4	5	4	4	43
5	13	14	14	13	11	13	11	12	12	11	124
6	0	0	0	0	0	0	0	0	0	0	0
7	19	15	16	18	14	14	17	15	18	15	161
Total	36	33	35	35	30	31	32	32	34	30	328

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	5	3	3	3	4	4	4	2	4	36
5	4	7	6	2	1	2	2	2	3	3	32
6	0	0	0	0	0	0	0	0	0	0	0
7	10	9	6	7	5	8	8	9	8	6	76
Total	18	21	15	12	9	14	14	15	13	13	144

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	5	4	4	4	4	5	5	4	4	4	43
5	11	11	12	12	13	11	12	12	10	13	117
6	0	0	0	0	0	0	0	0	0	0	0
7	17	16	15	15	18	14	17	18	15	14	159
Total	33	31	31	31	35	30	34	34	29	31	319

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	4	2	4	3	3	1	2	4	2	29
5	3	4	2	2	4	1	0	3	3	1	23
6	0	0	0	0	0	0	0	0	0	0	0
7	6	2	5	5	4	6	0	3	5	7	43
Total	13	10	9	11	11	10	1	8	12	10	95

Environmental Testing Solutions, Inc.

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

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

Test number: CdNaClCR #69

Test dates: December 04-11, 2007

Reveiwed by:

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	32	34	33	30	33	32	29	34	31	30	100	31.8	5.5	Not applicable
600	36	33	35	35	30	31	32	32	34	30	100	32.8	6.6	-3.1
800	33	31	31	31	35	30	34	34	29	31	100	31.9	6.2	-0.3
1000	29	32	31	30	31	29	33	27	28	29	100	29.9	6.2	6.0
1200	18	21	15	12	9	14	14	15	13	13	100	14.4	22.7	54.7
1400	13	10	9	11	11	10	1	8	12	10	100	9.5	34.8	70.1

Dunnett's MSD value: 2.528

PMSD: 7.9

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.

Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/4/2007	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	12/11/2007	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	32.000	34.000	33.000	30.000	33.000	32.000	29.000	34.000	31.000	30.000
600	36.000	33.000	35.000	35.000	30.000	31.000	32.000	32.000	34.000	30.000
800	33.000	31.000	31.000	31.000	35.000	30.000	34.000	34.000	29.000	31.000
1000	29.000	32.000	31.000	30.000	31.000	29.000	33.000	27.000	28.000	29.000
1200	18.000	21.000	15.000	12.000	9.000	14.000	14.000	15.000	13.000	13.000
1400	13.000	10.000	9.000	11.000	11.000	10.000	1.000	8.000	12.000	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	31.800	1.0000	31.800	29.000	34.000	5.507	10				32.300	1.0000
600	32.800	1.0314	32.800	30.000	36.000	6.555	10	-0.905	2.287	2.528	32.300	1.0000
800	31.900	1.0031	31.900	29.000	35.000	6.173	10	-0.090	2.287	2.528	31.900	0.9876
1000	29.900	0.9403	29.900	27.000	33.000	6.197	10	1.719	2.287	2.528	29.900	0.9257
*1200	14.400	0.4528	14.400	9.000	21.000	22.728	10	15.741	2.287	2.528	14.400	0.4458
*1400	9.500	0.2987	9.500	1.000	13.000	34.824	10	20.174	2.287	2.528	9.500	0.2941

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.66751724	1.035	-0.4971278	2.37645227
Bartlett's Test indicates equal variances (p = 0.19)	7.37160444	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		2.52762202	0.07948497	1062.59	6.10925926	5.3E-32	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	921.5	60.3770384	781.022523	1006.55043	-0.4592
IC10	1010.70968	13.9162817	967.482909	1025.43088	-2.1844
IC15	1031.54839	7.70863446	1015.09719	1045.89372	-0.3276
IC20	1052.3871	7.3164753	1037.01044	1065.80062	-0.2733
IC25	1073.22581	7.32317592	1058.07312	1086.73913	-0.1340
IC40	1135.74194	9.47972383	1118.60057	1155.0747	0.3823
IC50	1177.41935	12.637724	1158.20347	1208.08873	0.8224

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 69

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MEN	MEN	MEN	MEN	MEN	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.83	7.38	7.30	7.75	7.83	8.02
	DO (mg/L)	7.9	7.5	7.7	7.8	7.6	8.1
	Conductivity (µmhos/cm)	290		314		310	
	Alkalinity (mg $CaCO_3$/L)	57				57	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.6	24.9	24.5	24.7	24.7	24.8
600 mg NaCl/L	pH (S.U.)	7.87	7.62	7.61	7.66	7.71	7.98
	DO (mg/L)	7.8	7.5	7.5	7.8	7.7	8.1
	Conductivity (µmhos/cm)	1340		1460		1390	
	Temperature (°C)	24.6	24.7	24.7	24.7	24.6	24.8
800 mg NaCl/L	pH (S.U.)	7.86	7.66	7.66	7.65	7.71	7.97
	DO (mg/L)	7.8	7.5	7.5	7.9	7.8	8.1
	Conductivity (µmhos/cm)	1670		1800		1750	
	Temperature (°C)	24.6	24.7	24.8	24.6	24.6	24.6
1000 mg NaCl/L	pH (S.U.)	7.84	7.69	7.70	7.66	7.72	7.97
	DO (mg/L)	7.8	7.5	7.6	7.9	7.9	8.1
	Conductivity (µmhos/cm)	2020		2210		2110	
	Temperature (°C)	24.6	24.9	24.6	24.8	24.6	24.6
1200 mg NaCl/L	pH (S.U.)	7.84	7.70	7.72	7.65	7.70	7.96
	DO (mg/L)	7.8	7.5	7.6	8.0	7.9	8.1
	Conductivity (µmhos/cm)	2350		2540		2440	
	Temperature (°C)	24.6	25.0	24.7	24.6	24.5	24.7
1400 mg NaCl/L	pH (S.U.)	7.88	7.73	7.75	7.66	7.71	7.95
	DO (mg/L)	7.7	7.5	7.5	7.9	7.9	8.1
	Conductivity (µmhos/cm)	2700		2950		2800	
	Temperature (°C)	24.6	24.8	24.7	24.9	24.7	24.6
STOCK	Conductivity (µmhos/cm)	175000		—		—	
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia* CdNaCLCR #: 69

		Day							
		3		4		5		6	
	Analyst	MM	KEN	MM	KEN	KEN	MM	MM	KEN
Concentration	Parameter								
CONTROL	pH (S.U.)	8.06	8.06	8.10	8.09	8.15	8.00	8.02	8.07
	DO (mg/L)	7.7	7.9	7.6	7.9	7.6	7.8	7.4	7.7
	Conductivity (µmhos/cm)	337		301		306		317	
	Alkalinity (mg $CaCO_3$/L)			57					
	Hardness (mg $CaCO_3$/L)			92					
	Temperature (°C)	24.8	24.5	24.6	24.8	24.6	24.8	24.6	24.6
600 mg NaCl/L	pH (S.U.)	7.96	7.99	7.98	8.02	8.03	7.99	7.99	8.04
	DO (mg/L)	7.7	7.9	7.6	7.9	7.6	7.8	7.8	7.7
	Conductivity (µmhos/cm)	1510		1460		1380		1450	
	Temperature (°C)	24.8	24.8	24.5	24.6	24.6	24.7	24.6	24.9
800 mg NaCl/L	pH (S.U.)	7.95	7.97	7.97	8.01	8.02	7.97	8.00	8.03
	DO (mg/L)	8.0	7.9	7.7	7.9	7.7	7.7	7.7	7.6
	Conductivity (µmhos/cm)	1780		1690		1750		1810	
	Temperature (°C)	24.7	24.8	24.5	24.6	24.6	24.6	24.6	24.8
1000 mg NaCl/L	pH (S.U.)	~~7.93~~ MM 7.95	7.97	7.98	8.02	8.02	7.97	8.01	8.03
	DO (mg/L)	8.0	7.9	7.8	7.9	7.8	7.7	7.7	7.7
	Conductivity (µmhos/cm)	2250		2140		2100		2200	
	Temperature (°C)	24.7	24.7	24.7	24.5	24.7	24.6	24.5	25.0
1200 mg NaCl/L	pH (S.U.)	7.95	7.95	7.98	8.01	8.01	7.95	8.00	8.03
	DO (mg/L)	8.1	7.9	7.8	8.0	7.8	7.7	7.7	7.7
	Conductivity (µmhos/cm)	2610		2560		2430		2590	
	Temperature (°C)	24.7	24.7	24.4	24.8	24.7	24.7	24.7	24.8
1400 mg NaCl/L	pH (S.U.)	7.95	7.95	7.97	8.01	8.02	7.97	8.00	8.03
	DO (mg/L)	8.1	7.9	7.8	8.0	7.8	7.6	7.7	7.7
	Conductivity (µmhos/cm)	2730		2720		2800		2910	
	Temperature (°C)	24.7	24.7	24.6	24.4	24.7	24.9	24.5	24.8
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	07	12	01	To	07	12	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 AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**	7.5	********	8.7	12	0	13 / 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	53	73	26	********	6	7	19	0	4 / 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	<51	<63	26	********	<6	<6	19	0	4 / 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	1.056	1.356	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	423	843-6700	08	01	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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	07	12	01	To	07	12	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE XX ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
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	423	843-6700	08	01	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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	07	12	01	To	07	12	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE [XX] ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
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	423	843-6700	08	01	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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	07	12	01	To	07	12	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		
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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	07	12	01	To	07	12	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		
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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	07	12	01	To	07	12	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		
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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	07	12	01	To	07	12	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE XX ***

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										
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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.