



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

July 9, 2003

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

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR JUNE 2003

Enclosed is the June 2003 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
Acting Environmental Supervisor
Signatory Authority for
Richard T. Purcell
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

JE25

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**

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

MAJOR
 (SUBR 01)

Form Approved.
 OMB No. 2040-0004

TN0026450 **101 G**
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL
 DIFFUSER DISCHARGE
 EFFLUENT

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
03	06	01	03	06	30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	SAMPLE MEASUREMENT	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	X	*****	*****	**	*****	*****	26.9	04	0	30 / 30	MODEL D
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	X	*****	*****	**	*****	*****	39.9	04	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	X	*****	*****	**	7.2	*****	7.4	12	0	8 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	X	*****	*****	**	*****	7	8	19	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	100 DAILY MX	MGL		WEEKLY	GRAB
OIL AND GREASE	X	*****	*****	**	*****	<5	<5	19	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	15 MO AVG	20 DAILY MX	MGL		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	X	*****	1667	03	*****	*****	*****	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT DAILY MX	MGD	*****	*****	*****	****		CONTINUOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	X	*****	*****	**	*****	<0.010	0.025	19	0	37 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	0.036	0.058 INST MAX	MGL		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	TELEPHONE		DATE		
		423	843-6700	03	07	14
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		AREA CODE	NUMBER	YEAR	MO	DAY

Stephanie A. Howard
 Acting Environmental Supervisor

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
 No closed mode operation. The following injections occurred: 1. PCL-222 (max. calc. conc. was 0.067mg/L—limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.011mg/L—limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.023mg/L—limit 0.100mg/L) 4. H-130M (max. calc. conc. was 0.030mg/L—limit 0.050mg/L) 5. H-130M (low detection level analytical method was 0.040mg/L—limit 0.050mg/L)

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

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(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
 Facility TVA - SEQUOYAH NUCLEAR PLANT
 Location HAMILTON COUNTY

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

MAJOR
(SUBR 01)

Form Approved.
OMB No. 2040-0004

TN0026450 101 G
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL
 DIFFUSER DISCHARGE
 EFFLUENT

MONITORING PERIOD
 From

YEAR	MO	DAY
03	06	01

 To

YEAR	MO	DAY
03	06	30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	X	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE 82234 1 0 0	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.4	62	0	30 / 30	CALCTD
EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	2.0	DEG C /HR		CONTINUOUS	CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C 00016 1 S 0	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	2.1	04	0	30 / 30	CALCTD
EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	3.0	DEG. C.		CONTINUOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL 01022 1 0 0	SAMPLE MEASUREMENT	*****	*****	**	<0.2	<0.2	<0.2	19	0	1 / 30	GRAB
EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	REPORT	REPORT	REPORT	MGL		ONCE/MONTH	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	<i>Stephanie A. Howard</i> Acting Environmental Supervisor	TELEPHONE		DATE		
			423 843-6700	03 07 14			
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
 CCW data for June 2003 is attached. Quarterly velliger monitoring information is attached.

CCW CHANNEL

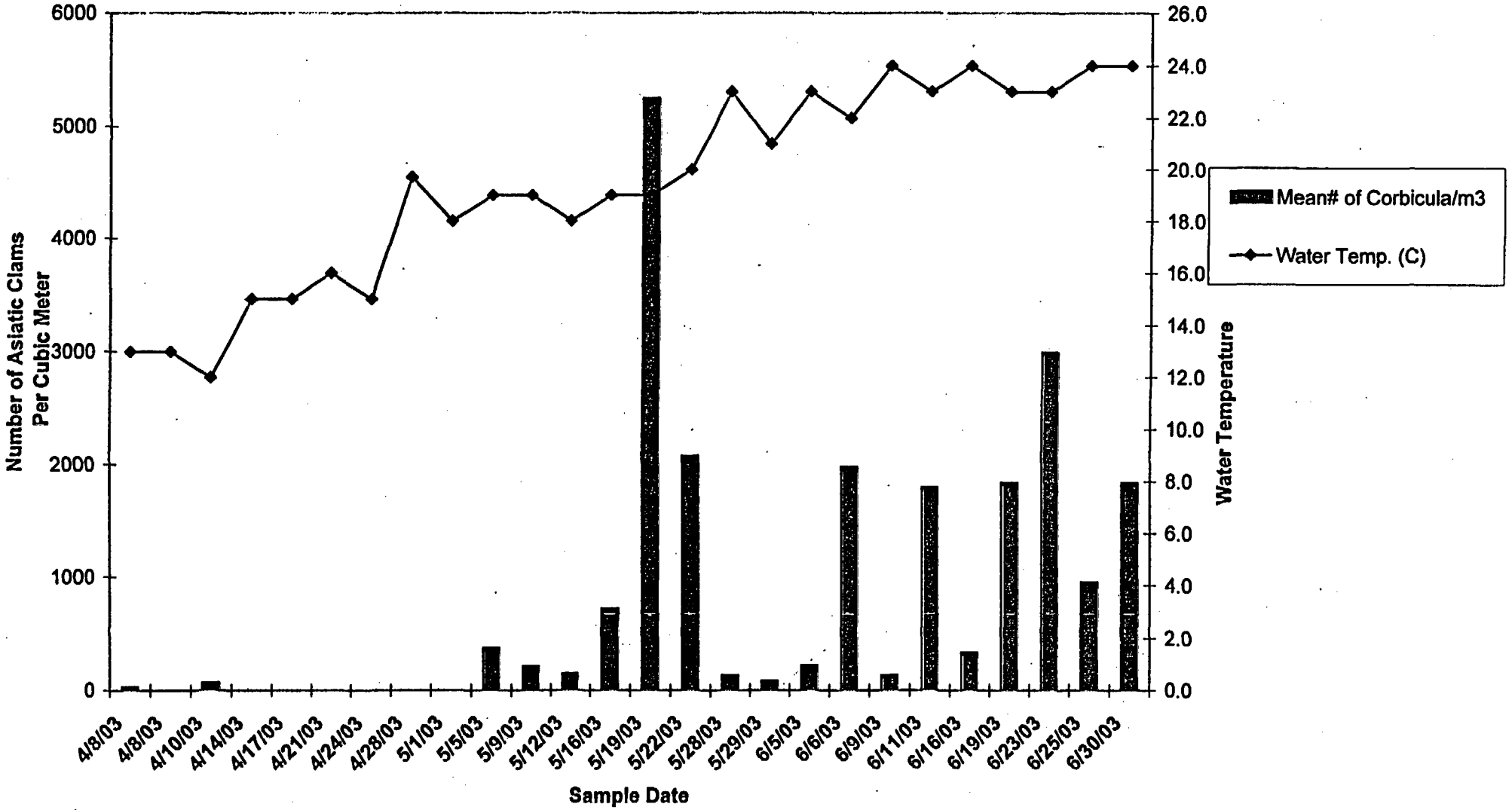
Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst
06/16/2003 0900	< 0.5 mg/L	06/19/2003 1942	JBR

CCW TRENCH

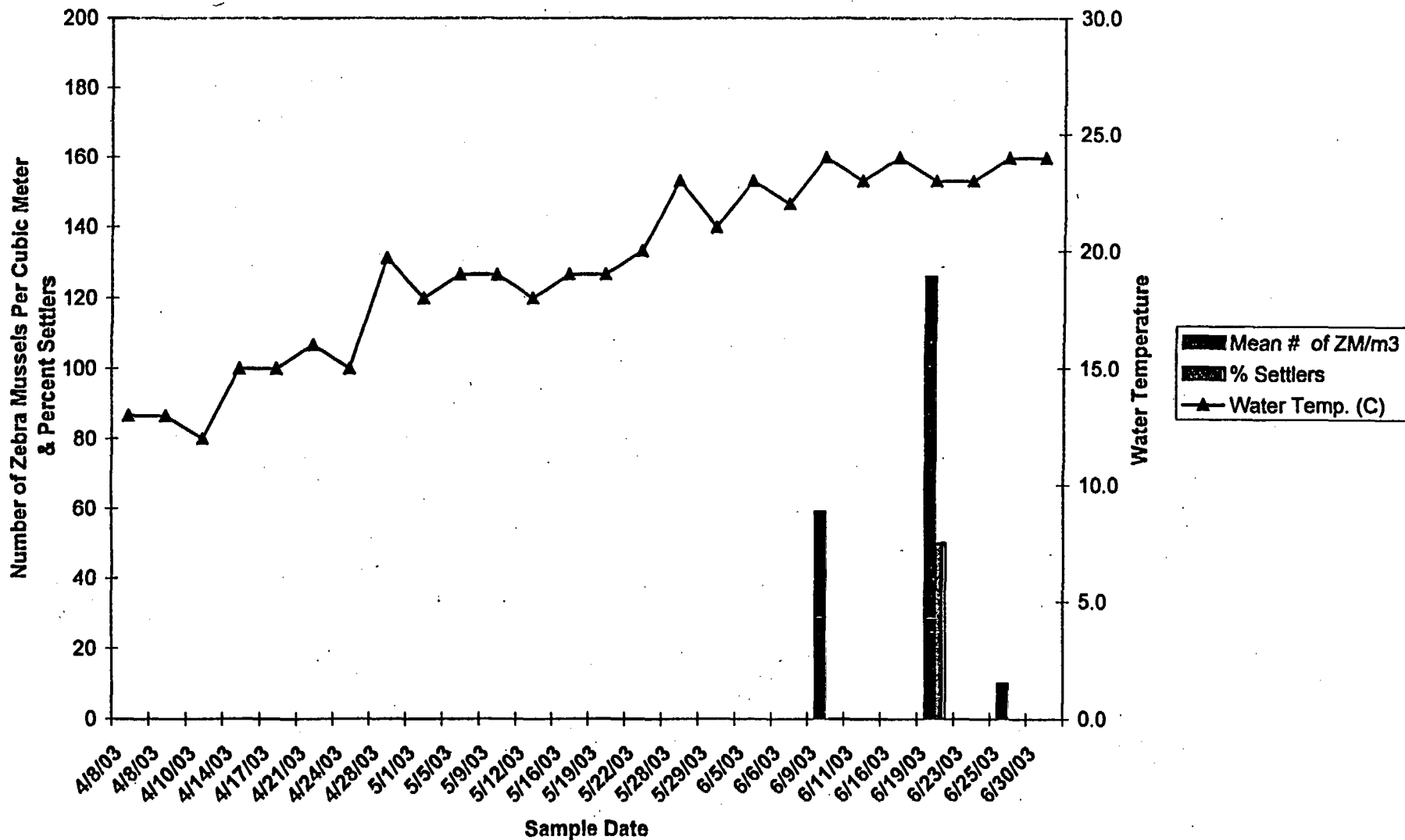
Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst
06/16/2003 0905	0.5 mg/L	06/19/2003 1905	JBR

SQN Forbay Clam Graph

Sequoyah Nuclear Plant Forebay
Clam Densities



Sequoyah Nuclear Forbay Zebra Mussel Densities



Sample Date	Mean # of ZM/m ³	% Settlers	Water Temp. (C)	Sample Date	Mean# of Corbicula/m ³	Water Temp. (C)	LOCATION	SUB LOCATION	SAMPLE TYPE	COLLECTED BY
4/8/03	0	0	13.0	4/8/03	31	13.0	Intake	Intake Forebay	QUANT	Jones-Brier/Lehman
4/8/03	0	0	13.0	4/8/03	0	13.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery/Jones-Brier
4/10/03	0	0	12.0	4/10/03	68	12.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/14/03	0	0	15.0	4/14/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/17/03	0	0	15.0	4/17/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/21/03	0	0	16.0	4/21/03	0	16.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/24/03	0	0	15.0	4/24/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/28/03	0	0	19.7	4/28/03	0	19.7	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/1/03	0	0	18.0	5/1/03	0	18.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/5/03	0	0	19.0	5/5/03	379	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/9/03	0	0	19.0	5/9/03	213	19.0	Intake	Intake Forebay	QUANT	Ron Lowery/M.G. Beavers
5/12/03	0	0	18.0	5/12/03	144	18.0	Intake	Intake Forebay	QUANT	Ron Lowery/R.D. Nunley
5/16/03	0	0	19.0	5/16/03	720	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/19/03	0	0	19.0	5/19/03	5,248	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/22/03	0	0	20.0	5/22/03	2,074	20.0	Intake	Intake Forebay	QUANT	Ron Lowery/M.G. Beavers
5/28/03	0	0	23.0	5/28/03	129	23.0	Intake	Intake Forebay	QUANT	Ron Lowery/D. Angel
5/29/03	0	0	21.0	5/29/03	83	21.0	Intake	Intake Forebay	QUANT	Ron Lowery/D. Adcock
6/5/03	0	0	23.0	6/5/03	220	23.0	Intake	Intake Forebay	QUANT	Ron Lowery/E. Childers
6/6/03	0	0	22.0	6/6/03	1,976	22.0	Intake	Intake Forebay	QUANT	Ron Lowery/J.I. Childers
6/9/03	59	0	24.0	6/9/03	132	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/11/03	0	0	23.0	6/11/03	1,792	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/16/03	0	0	24.0	6/16/03	333	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/19/03	126	50	23.0	6/19/03	1833	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/23/03	0	0	23.0	6/23/03	2,991	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/25/03	10	0	24.0	6/25/03	955	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/30/03	0	0	24.0	6/30/03	1832	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery

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

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

Form Approved.
 OMB No. 2040-0004

TN0026450 **101 T**
PERMIT NUMBER **DISCHARGE NUMBER**

MONITORING PERIOD						
YEAR	MO	DAY	YEAR	MO	DAY	
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*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	X	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	*****	*****	23	0	1 / 90	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART-ERLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	23	0	1 / 90	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART-ERLY	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	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.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

Stephanie A. Howard
 Acting Environmental Supervisor

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
 An unscheduled whole effluent toxicity (WET) test was performed June 15-20, 2003 due to H-130M injection. Report is attached.

July 9, 2003

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT
NO. TN0026450, H130M SPECIAL STUDY, JUNE, 2003

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101 samples collected June 15-20 showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

In addition to the routine compliance test, fathead minnows were also tested in Outfall 101 and intake samples which were treated using UV exposure for pathogen removal prior to introduction of test organisms. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, mortality which occurred in minnows exposed to routine compliance samples and UV treated samples was not sufficient to jeopardize statistical validity.

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

Cynthia L. Russell

Cynthia L. Russell

Biologist

Environmental Engineering Services- West

CEB 3A-M

Attachment

cc (Attachment):

Files, ER&TA, CEB 1B-M

SQN H130M-June 2003m

**TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT**

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: July 9, 2003

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN 0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: June 15 – 20, 2003
10. Average Flow on Days Sampled (MGD): 1585.5, 1592.5, 1557.0
11. Pertinent Site Conditions:

H130M was being injected from June 16- 22, 2003. The dates and times for the injection of H130M are provided below. The resulting H130M concentrations are summarized in Appendix B, along with other chemicals in use during sampling.

Injector Location	Date/Start Time (EDT)	Date/ Ending Time (EDT)
Essential Raw Cooling Water (ERCW)-Bravo Train	June 16, 2003/1010*	June 17, 2003/0840*
	June 17, 2003/0950*	June 18, 2003/0830*
	June 18, 2003/0940*	June 19, 2003/0910*
Raw Cooling Water (RCW)	June 19, 2003/1605	June 22, 2003/1425

* The break between starting and ending times allowed for the back washing of ERCW traveling screens and strainers.

12. Test Dates: June 17 - 24, 2003
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 10.98, 22, 43.9, 72, 100
Intake: 100
Pimephales promelas: UV treated Outfall 101: 10.98, 22, 43.9, 72, 100
UV treated Intake: 100
16. Permit Limit Endpoint (%): Outfall 101: IC₂₅ = 43.9%
17. Test Results: Outfall 101: *Pimephales promelas*: IC₂₅ > 100
Ceriodaphnia dubia: IC₂₅ > 100
UV treated Outfall 101: *Pimephales promelas*: IC₂₅ > 100
18. Facility Contact: Ann Hurt
Phone #: (423) 843-6714
19. Consulting / Testing Lab: Environmental Testing Solutions, LLC
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 June 15 - 20, 2003, showed no toxic effects to fathead minnows or daphnids. The resulting IC₂₅ values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake
2. Sample Type: Composite
3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (EDT) Collected	Date (MM/DD/YY)/ Time (EDT) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (EDT) Used
101	06/15/03 1257 to 06/16/03 1157	06/17/03 0946	0.4 [†]	<0.10	06/17/03 1422 06/18/03 1330
Intake	06/15/03 1135 to 06/16/03 1235	06/17/03 0946	0.4	<0.10	06/17/03 1422 06/18/03 1330
101	06/17/03 1402 to 06/18/03 1302	06/19/03 0939	0.7 [†]	<0.10	06/19/03 1336 06/20/03 1400
Intake	06/17/03 1348 to 06/18/03 1248	06/19/03 0939	0.4	<0.10	06/19/03 1336 06/20/03 1400
101	06/19/03 1256 to 06/20/03 1156	06/21/03 1004	0.9 [†]	<0.10	06/21/03 1340 06/22/03 1342 06/23/03 1338
Intake	06/19/03 1233 to 06/20/03 1133	06/21/03 1004	2.1	<0.10	06/21/03 1340 06/22/03 1342 06/23/03 1338

*TRC = Total Residual Chlorine

[†]Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

4. Sample Manipulation: Samples from Outfall 101 and the 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 Rainbow Lifeguard® UV Sterilizer for 2 minutes.

	<u><i>Pimephales promelas</i></u>	<u><i>Ceriodaphnia dubia</i></u>
<u>Test Organisms:</u>		
1. Source:	<u>Aquatic BioSystems, Inc.</u>	<u>In-house Cultures</u>
2. Age:	<u>23.5-25.5-hours old</u>	<u>< 24-hours old</u>
<u>Test Method Summary:</u>		
1. Test Conditions:	<u>Static, Renewal</u>	<u>Static, Renewal</u>
2. Test Duration:	<u>7 days</u>	<u>Until at least 60% of control females have 3 broods</u>
3. Control / Dilution Water:	<u>Moderately Hard Synthetic</u>	<u>Moderately Hard Synthetic</u>
4. Number of Replicates:	<u>4</u>	<u>10</u>
5. Organisms per Replicate:	<u>10</u>	<u>1</u>
6) Test Initiation: (Date/Time)		
Outfall 101	<u>06/17/03-1422 EDT</u>	<u>06/17/03-1314 EDT</u>
UV Treated Outfall 101	<u>06/17/03-1440 EDT</u>	
7) Test Termination: (Date/Time)		
Outfall 101	<u>06/24/03-1440 EDT</u>	<u>06/24/03-1300 EDT</u>
UV Treated Outfall 101	<u>06/24/03-1505 EDT</u>	
8) Test Temperature: Outfall 101:	<u>Mean = 24.9°C</u> <u>(24.3-25.5°C)</u>	<u>Mean = 24.7°C</u> <u>(24.3-25.6°C)</u>
Test Temperature: UV-Treated Outfall 101:	<u>Mean = 24.9°C</u> <u>(24.3-25.7°C)</u>	
9. Physical / Chemical Measurements:	<u>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.</u>	
10. Statistics:	<u>Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).</u>	

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 June 17- 24, 2003 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
10.98%	100	98	98	98	98	98	98
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	98	98	98	98

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.886	0.778	0.763	0.915	0.835
10.98%	0.799	0.739	0.711	0.833	0.771
22%	0.970	0.806	0.863	0.960	0.900
43.9%	0.941	0.964	0.964	0.968	0.959
72%	0.890	0.925	0.942	1.027	0.946
100%	0.944	0.915	0.952	0.816	0.907
Intake	0.843	0.923	0.798	0.919	0.871

IC ₂₅ Value: <u>> 100%</u> Permit Limit: <u>43.9</u> 95% Confidence Limits: Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>	Calculated TU Estimates: <u>< 1.0 TUc*</u> Permit Limit: <u>2.3 TUc</u>
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*TUa = 100/LC₅₀; TUc = 100/ IC₂₅

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 June 17- 24, 2003 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
10.98%	100	100	100	100	100	100	100
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	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	30	23	27	28	30	26	29	24	29	27.6
10.98%	27	29	24	30	28	30	33	28	31	31	29.1
22%	31	30	34	29	37	28	28	30	32	28	30.7
43.9%	35	31	34	31	32	35	32	29	33	36	32.8
72%	34	29	35	30	36	31	33	33	30	36	32.7
100%	37	34	32	33	35	36	35	37	31	35	34.5
Intake	28	29	33	31	29	30	29	27	29	33	29.8

IC₂₅ Value: > 100%
 Permit Limit: 43.9

95% Confidence Limits:
 Upper Limit: NA
 Lower Limit: NA

Calculated TU Estimates: < 1.0 TUc*

Permit Limit: 2.3 TUc

*TUa = 100/LC₅₀; TUc = 100/ IC₂₅

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 June 17 - 24, 2003 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used - days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	98	98	98	98	98	98
22%	100	98	98	98	98	98	98
43.9%	100	100	100	100	100	100	100
72%	100	98	98	98	98	98	98
100%	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	0.722	0.769	0.830	0.923	0.811
10.98%	0.840	0.831	0.912	0.944	0.881
22%	0.974	0.880	0.837	0.942	0.908
43.9%	0.822	0.853	0.945	0.898	0.880
72%	0.909	1.045	1.009	0.971	0.983
100%	1.002	0.938	0.886	0.745	0.893
Intake	0.860	0.916	0.924	1.048	0.937
IC ₂₅ Value: <u>≥ 100%</u>			Calculated TU Estimates: <u>≤ 1.0 TUc*</u>		
95% Confidence Limits: <u>NA</u> Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>			Permit Limit: <u>NA</u>		

*TU_a = 100/LC₅₀; TU_c = 100/ IC₂₅

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC ₂₅)
<i>Pimephales promelas</i>	June 17, 2003	1346	7-days	KCl	602.2 mg/L
<i>Ceriodaphnia dubia</i>	June 04, 2003	1310	7-days	NaCl	1068.7 mg/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, June 17-24, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO ₃)	Hardness (mg/L CaCO ₃)	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control	25.3	24.6	7.6	7.3	7.72	7.56	301	60.9	84.1	-
		25.1 - 25.5	24.3 - 24.7	7.6 - 7.7	6.5 - 7.7	7.63 - 7.80	7.36 - 7.73	290 - 317	60.2 - 61.2	82.8 - 84.8	-
	10.98%	25.3	24.6	7.7	7.3	7.71	7.56	287	-	-	-
		25.0 - 25.5	24.3 - 24.7	7.5 - 7.9	6.5 - 7.6	7.67 - 7.76	7.44 - 7.69	276 - 301	-	-	-
	22%	25.3	24.6	7.7	7.3	7.71	7.56	276	-	-	-
		25.0 - 25.5	24.3 - 24.7	7.5 - 7.9	6.6 - 7.7	7.67 - 7.75	7.46 - 7.69	265 - 284	-	-	-
	43.9%	25.3	24.6	7.8	7.4	7.67	7.55	243	-	-	-
25.0 - 25.5		24.3 - 24.7	7.6 - 7.9	6.7 - 7.8	7.64 - 7.71	7.43 - 7.67	233 - 248	-	-	-	
72%	25.2	24.6	7.8	7.4	7.62	7.55	206	-	-	-	
	24.8 - 25.5	24.3 - 24.7	7.6 - 7.9	6.7 - 7.8	7.56 - 7.69	7.48 - 7.67	199 - 215	-	-	-	
100%	25.3	24.6	7.8	7.4	7.56	7.51	166	57.4	64.0	<0.10	
	24.7 - 25.5	24.3 - 24.7	7.6 - 8.0	6.9 - 7.6	7.43 - 7.66	7.42 - 7.64	164 - 169	57.1 - 58.1	62.6 - 66.7	<0.10 - <0.10	
Intake	25.2	24.6	7.9	7.4	7.55	7.50	164	57.8	63.3	<0.10	
	24.9 - 25.5	24.3 - 24.7	7.8 - 8.0	6.8 - 7.8	7.47 - 7.67	7.41 - 7.64	161 - 168	57.1 - 58.1	62.6 - 64.6	<0.10 - <0.10	
<i>Ceriodaphnia dubia</i>	Control	25.0	24.4	7.6	7.9	7.72	7.83	301	60.9	84.1	-
		24.5 - 25.6	24.3 - 24.5	7.6 - 7.7	7.7 - 8.2	7.63 - 7.80	7.72 - 7.92	290 - 317	60.2 - 61.2	82.8 - 84.8	-
	10.98%	25.0	24.4	7.7	7.9	7.71	7.86	287	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.5 - 7.8	7.6 - 8.3	7.67 - 7.76	7.73 - 7.97	276 - 301	-	-	-
	22%	25.0	24.4	7.7	7.9	7.71	7.85	276	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.5 - 7.9	7.6 - 8.4	7.67 - 7.75	7.73 - 7.96	265 - 284	-	-	-
	43.9%	25.0	24.4	7.8	7.9	7.67	7.85	243	-	-	-
24.5 - 25.6		24.3 - 24.5	7.6 - 7.9	7.6 - 8.4	7.64 - 7.71	7.70 - 7.97	233 - 248	-	-	-	
72%	25.0	24.4	7.8	7.9	7.62	7.81	206	-	-	-	
	24.5 - 25.6	24.3 - 24.5	7.6 - 7.9	7.6 - 8.5	7.56 - 7.69	7.67 - 7.93	199 - 215	-	-	-	
100%	25.0	24.4	7.8	7.9	7.56	7.79	166	57.0	63.3	<0.10	
	24.5 - 25.6	24.3 - 24.5	7.6 - 8.0	7.6 - 8.4	7.43 - 7.66	7.65 - 7.91	164 - 169	57.1 - 58.1	62.6 - 67.0	<0.10 - <0.10	
Intake	25.0	24.4	7.9	7.9	7.55	7.77	164	57.8	63.3	<0.10	
	24.5 - 25.6	24.3 - 24.5	7.8 - 8.0	7.6 - 8.3	7.47 - 7.67	7.66 - 7.84	161 - 168	57.1 - 58.1	62.6 - 64.6	<0.10 - <0.10	

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, June 17-24, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO ₃)	Hardness (mg/L CaCO ₃)	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control	25.3	24.6	7.8	7.5	7.72	7.61	296	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 8.0	7.1 - 7.8	7.61 - 7.77	7.53 - 7.72	285 - 306	-	-	-
	10.98%	25.3	24.6	7.8	7.4	7.73	7.56	289	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.5 - 8.0	7.0 - 7.6	7.63 - 7.77	7.47 - 7.68	279 - 300	-	-	-
	22%	25.3	24.6	7.8	7.4	7.73	7.55	276	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 8.0	6.9 - 7.7	7.61 - 7.77	7.44 - 7.68	266 - 284	-	-	-
	43.9%	25.2	24.6	7.8	7.3	7.71	7.53	242	-	-	-
24.6 - 25.7		24.3 - 24.8	7.6 - 8.0	6.9 - 7.6	7.59 - 7.77	7.43 - 7.68	234 - 249	-	-	-	
72%	25.2	24.6	7.8	7.3	7.68	7.50	206	-	-	-	
	24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.7 - 7.6	7.57 - 7.75	7.42 - 7.65	200 - 216	-	-	-	
100%	25.2	24.6	7.8	7.4	7.64	7.51	167	-	-	-	
	24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.8 - 7.8	7.52 - 7.74	7.42 - 7.64	163 - 170	-	-	-	
Intake	25.3	24.6	7.8	7.3	7.61	7.49	163	-	-	-	
	24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.9 - 7.7	7.52 - 7.69	7.36 - 7.63	160 - 166	-	-	-	

SUMMARY / CONCLUSIONS

Outfall 101 samples collected June 17 - 24, 2003, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.

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 400-mL polypropylene beakers, 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. Regents, 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 using EPA Method 170.1.
4. Dissolved oxygen was measured using EPA Method 360.1.
5. The pH was measured EPA Method 150.1.
6. Conductance was measured EPA Method 120.1.
7. Alkalinity was measured using EPA Method 310.1.
8. Total Hardness was measured EPA Method 130.2.
9. Total residual chlorine was measured using EPA Method 330.5.

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 IC₂₅ values in g 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. TN 0026450
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. Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

**Sequoyah Nuclear Plant Biomonitoring
June 17 - 24, 2003**

Appendix B

**Diffuser Discharge Concentrations of Total Residual Chlorine,
Diffuser Discharge Concentrations of Chemicals Used to Control Growth
of Microbiologically Induced Bacteria and Asiatic Clams,
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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PGE-272 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat- PF mg/L Azole	H-150M 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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PGL-222 mg/E Phosphate	PCL-401 mg/L Copolymer	CE-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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L EMAD	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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

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

**Sequoyah Nuclear Plant Biomonitoring
June 17 - 24, 2003**

Appendix C

**Chain of Custody Records and
Toxicity Test Bench Sheets**

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TENNESSEE VALLEY AUTHORITY
 Project Name: SEQUOYAH NUCLEAR PLANT
 P.O. Number: PO BOX 2000
 Facility Sampled: SEQUOYAH NUCLEAR PLANT
 NPDES Number: TN 0026450
 Collected By: WANDA K ALLEN

ENVIRONMENTAL TESTING SOLUTIONS
 351 DEPOT STREET
 ASHVILLE, NC 28801
 PHONE: 828-350-9364
 FAX: 256-386-2963
 EMAIL: CLRUSSEL2@TVA.GOV

FedEx UPS Bus Client CTI \$ _____
 Other (specify): _____

General Comments:
Custody seals intact, samples received in good condition.
Hummer

Field Identification / Sample Description	Grab/Comp.	Shp. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use					
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appearance	
SQN-DSN-101-TOX	GRAB Comp	4	6/15/03 1257 1257 1257	6/16/03 1257 1157 1157	(2) 2.5 GAL							030617-01	0.4°C	dl	0946	See COMMENTS
SQN-INT-TOX	Comp GRAB	4	6/15/03 1135	6/16/03 1235	(1) 2.5 GAL							030617-02	0.4°C	dl	0946	✓

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/16/03 1400	<i>Fedex</i>	06-16-03 1400
<i>Fedex</i>	06-17-03 0946	<i>Hummer</i>	06-17-03 0946

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°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: TENNESSEE VALLEY AUTHORITY
 Project Name: SEQUOYAH NUCLEAR PLANT
 P.O. Number: PO BOX 2000
 Facility Sampled: SEQUOYAH NUCLEAR PLANT
 NPDES Number: TN 0026450
 Collected By: WANDA K ALLEN

ENVIRONMENTAL TESTING SOLUTIONS
 351 DEPOT STREET
 ASHVILLE, NC 28801
 PHONE: 828-350-9364
 FAX: 256-386-2963
 EMAIL: CLRUSSEL2@TVA.GOV

FedEx UPS Bus Client CTI \$ _____
 Other (specify): _____

General Comments:
Custody seals intact. Samples received in ~~all~~ good condition.
June

Field Identification / Sample Description	Grab/Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use					
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appearance	
SQN-DSN-101-TOX	GRAB Comp	4	6/17/03 1402 1402	6/18/03 1302 1302	(2) 2.5 GAL		✓					0306A.01	0.9°C	J	0939	See COMMENTS
SQN-INT-TOX	Comp GRAB	4	6/17/03 1349	6/18/03 1248	(1) 2.5 GAL		✓					0306A.02	0.4°C	J	0939	✓

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/18/03 1500	<i>Fedex</i>	06-18-03 1500
<i>Fedex</i>	06-19-03 0939	<i>Kekeeman ETS</i>	06-19-03 0939

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°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: TENNESSEE VALLEY AUTHORITY
 Project Name: SEQUOYAH NUCLEAR PLANT
 P.O. Number: PO BOX 2000
 Facility Sampled: SEQUOYAH NUCLEAR PLANT
 NPDES Number: TN 0026450
 Collected By: WANDA K ALLEN

ENVIRONMENTAL TESTING SOLUTIONS
 351 DEPOT STREET
 ASHVILLE, NC 28801
 PHONE: 828-350-9364
 FAX: 256-386-2963
 EMAIL: CLRUSSEL2@TVA.GOV

FedEx UPS Bus Client CTI \$ _____
 Other (specify): _____
 General Comments:
** Custody seals intact. Samples received in good condition.*
J. Sumner

Field Identification / Sample Description	Grab/Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use					
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appearance	
SQN-DSN-101-TOX	GRAB Comp	4	6/19/03 1256 1256	6/20/03 1156 1156	(2) 2.5 GAL		✓					03062106	09°C	J	1004	See COMMENTS
SQN-INT-TOX	Comp GRAB	4	6/19/03 1233	6/20/03 1133	(1) 2.5 GAL		✓					03062107	21°C	J	1004	✓

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/20/03 1500	<i>Fedex</i>	06-20-03 1500
<i>Fedex</i>	06-21-03 1004	<i>J. Sumner</i>	06-21-03 1004

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°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 #: 744
NON TREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	219.6	440	878	1440	2000	
Diluent volume (mL)	1780.4	1560	1122	560	0	
Total volume (mL)	2000	2000	2000	2000	2000	

Test organism information: 23.5 - 25.5 cm		Test information:	
Organism age:	29.5 - 29.5 - hours old	Randomizing template:	BLUE
Date and times organisms were born between:	06-16-03 1100 TO 1300 MDT	Incubator number:	3
Organism source:	ABS BATCH 06-16-03	Artemia lot number:	B604030
Transfer bowl information:	pH = 8.00 Temperature = 24.7 °C	Total drying time:	1hr
		Date / Time in:	06-24-03 1530
Average transfer volume:	10.4 mL	Date / Time out:	06-25-03 1030
		Oven temperature:	103°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	06-17-03		1500	1422	BHHS 06-21-03	030617.01/.02	dl
1	06-18-03	0900	1500	1330	06-17-03	030617.01/.02	dl
2	06-19-03	0900	1500	1336	06-17-03	030619.01/.02	dl
3	06-20-03	1030	1635	1400	06-17-03	030619.01/.02	dl
4	06-21-03	0900	1500	1340	06-17-03	030621.06/.07	dl
5	06-22-03	0913	1520	1342	06-21-03	030621.06/.07	dl
6	06-23-03	0852	1500	1338	06-21-03	030621.06/.07	dl
7	06-24-03			1440			dl

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC ₅₀	> 100%
Average weight per initial larvae:	0.8352		NOEC	100%
Average weight per surviving larvae:	0.8352	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC ₂₅	> 100%

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH
 NONTREATED

Date: 06-17-03

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	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	9 ^{1d}	10	10	10	10
3	10	10	10	10	10	10	10	9	10	10	10	10
4	10	10	10	10	10	10	10	9	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	10	10	10	9	10	10	10	10
7	10	10	10	10	10	10	10	9	10	10	10	10
A = Pan weight (mg)	14.345	14.658	14.933	15.045	15.069	14.905	15.039	15.049	15.249	14.861	14.945	14.935
B = Pan + Larvae weight (mg)	23.60	22.44	22.56	24.19	23.06	21.95	22.15	23.38	21.95	22.92	23.57	24.57
Larvae weight (mg) = A - B	8.885	8.782	10.762	9.945	8.791	9.785	9.711	8.831	9.701	8.059	8.625	9.595

$\delta \rightarrow$ 8.885 8.782 10.762 9.945 8.791 9.785 9.711 8.831 9.701 8.059 8.625 9.595
 Calculations and data reviewed: *Jf* ← Per INITIAL LARVAE

Comments:

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH
 NONTREATED

Date: 06-17-03

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg)	15.019	14.760	14.697	14.833	15.266	15.053	14.842	15.396	14.646	14.735	14.47	15.113
B = Pan + Larvae weight (mg)	24.43	24.40	24.34	24.51	24.17	24.30	24.26	25.67	24.09	23.88	24.22	23.27
Larvae weight (mg) = A - B	0.9411	0.9440	0.9443	0.9477	0.8904	0.9247	0.9418	1.0274	0.9444	0.9145	0.9523	0.8157

\rightarrow 9.411 9.640 9.643 9.677 8.904 9.217 9.418 10.274 9.444 9.145 9.523 8.377
 Calculations and data reviewed. ← FOR INITIAL LARVAE

Comments:

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH

Date: 06-17-03

NONTREATED

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	9 ^{id}	10
5	10	10	9	10
6	10	10	9	10
7	10	10	9	10
A = Pan weight (mg)	14.636	14.623	14.881	15.037
B = Pan + Larvae weight (mg)	23.07	23.92	22.86	24.23
Larvae weight (mg) = A - B	8.434	9.227	7.974	9.193

\rightarrow 8.434 9.227 7.974 9.193

← PER INITIAL LARVAE

Calculations and data reviewed: *[Signature]*

Comments:

Environmental Testing Solutions, LLC

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

Client: TVA Sequoyah Nuclear Plant, Nontreated
Test dates: June 17-24, 2003
Project number: 744

Reviewed by: *J. Jumper*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.745	23.600	8.855	0.8855	100.0	0.8352	9.1	Not applicable
	B	10	10	14.658	22.440	7.782	0.7782				
	C	10	10	14.933	22.560	7.627	0.7627				
	D	10	10	15.045	24.190	9.145	0.9145				
10.98%	E	10	10	15.069	23.060	7.991	0.7991	97.5	0.7705	7.2	7.8
	F	10	10	14.565	21.950	7.385	0.7385				
	G	10	10	15.039	22.150	7.111	0.7111				
	H	10	9	15.049	23.380	8.331	0.8331				
22%	I	10	10	15.249	24.950	9.701	0.9701	100.0	0.8995	8.8	-7.7
	J	10	10	14.861	22.920	8.059	0.8059				
	K	10	10	14.945	23.570	8.625	0.8625				
	L	10	10	14.975	24.570	9.595	0.9595				
43.9%	M	10	10	15.019	24.430	9.411	0.9411	100.0	0.9593	1.3	-14.9
	N	10	10	14.760	24.400	9.640	0.9640				
	O	10	10	14.697	24.340	9.643	0.9643				
	P	10	10	14.833	24.510	9.677	0.9677				
72%	Q	10	10	15.266	24.170	8.904	0.8904	100.0	0.9461	6.2	-13.3
	R	10	10	15.053	24.300	9.247	0.9247				
	S	10	10	14.842	24.260	9.418	0.9418				
	T	10	10	15.396	25.670	10.274	1.0274				
100%	U	10	10	14.646	24.090	9.444	0.9444	100.0	0.9067	6.9	-8.6
	V	10	10	14.735	23.880	9.145	0.9145				
	W	10	10	14.697	24.220	9.523	0.9523				
	X	10	10	15.113	23.270	8.157	0.8157				
100% Intake	U	10	10	14.636	23.070	8.434	0.8434	97.5	0.8708	7.0	-4.3
	V	10	10	14.693	23.920	9.227	0.9227				
	W	10	9	14.881	22.860	7.979	0.7979				
	X	10	10	15.037	24.230	9.193	0.9193				

Outfall 101:
 Dunnett's MSD value: 0.1046
 PMSD: 12.5

MSD = Minimum Significant Difference
 PMSD = Percent Minimum Significant Difference

Intake:
 Dunnett's MSD value: 0.0946
 PMSD: 11.3

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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing). Lower PMSD bound determined by USEPA (10th percentile) = 9.4%. Upper PMSD bound determined by USEPA (90th percentile) = 35%. The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

Environmental Testing Solutions, LLC

Statistical Analyses

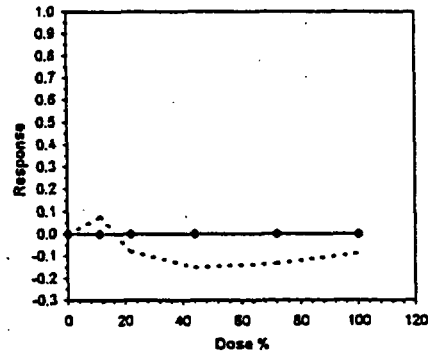
Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID: Sequoyah Nuclear Plant, Outfall 101		
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: CHRONIC-(EPA-821-R-02-013)	Test Species: PP-Pimephales promelas		

Conc-%	1	2	3	4
D-Control	0.8855	0.7782	0.7627	0.9145
10.98	0.7991	0.7385	0.7111	0.8331
22	0.9701	0.8059	0.8625	0.9595
43.9	0.9411	0.9640	0.9643	0.9677
72	0.8904	0.9247	0.9418	1.0274
100	0.9444	0.9145	0.9523	0.8157

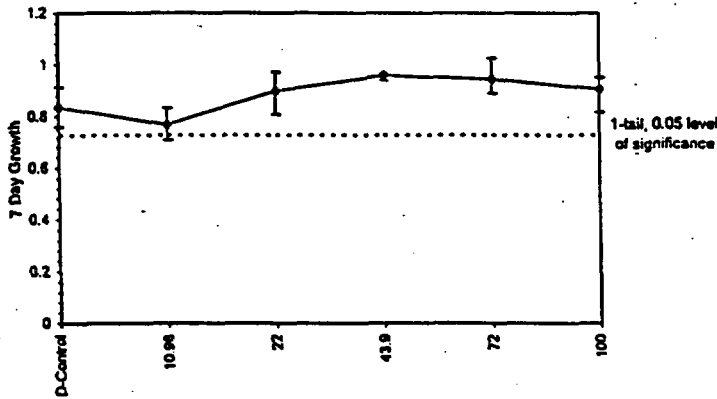
Conc-%	Mean	N-Mean	Transform: Untransformed				CV%	N	t-Stat	I-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	Mean						N-Mean	
D-Control	0.8352	1.0000	0.8352	0.7627	0.9145	9.098	4				0.8862	1.0000	
10.98	0.7705	0.9224	0.7705	0.7111	0.8331	7.222	4	1.493	2.410	0.1046	0.8862	1.0000	
22	0.8995	1.0770	0.8995	0.8059	0.9701	8.781	4	-1.481	2.410	0.1046	0.8862	1.0000	
43.9	0.9593	1.1485	0.9593	0.9411	0.9677	1.275	4	-2.858	2.410	0.1046	0.8862	1.0000	
72	0.9461	1.1327	0.9461	0.8904	1.0274	6.160	4	-2.554	2.410	0.1046	0.8862	1.0000	
100	0.9067	1.0856	0.9067	0.8157	0.9523	6.929	4	-1.647	2.410	0.1046	0.8862	1.0000	

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.932284813	0.884	-0.13984902	-1.10445676						
Bartlett's Test indicates equal variances ($p = 0.24$)	6.764860153	15.08631706								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDm	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.104393279	0.125227668	0.02041572	0.003767068	0.003256632	5, 18

Linear Interpolation (100 Resamples)				
Petal	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

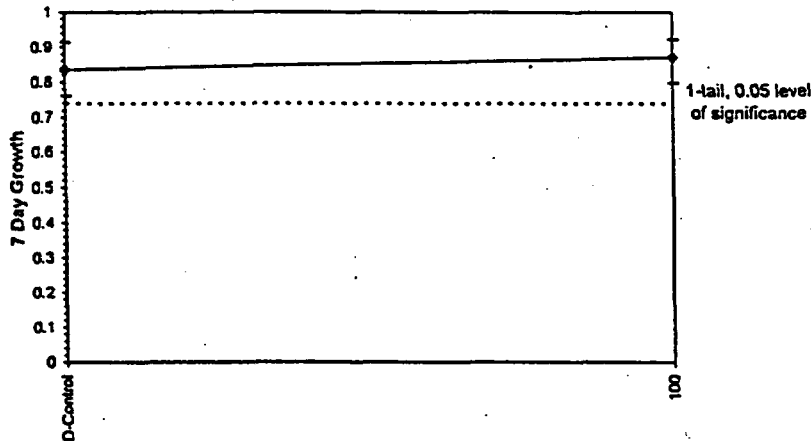
Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID: Sequoyah Nuclear Plant, Intake		
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species: PP-Pimephales promelas		
Comments:				

Conc.-%	1	2	3	4
D-Control	0.8855	0.7782	0.7627	0.9145
100	0.8434	0.9227	0.7979	0.9193

Conc.-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	I-Tailed Critical	MSD
			Mean	Min	Max	CV%				
D-Control	0.8352	1.0000	0.8352	0.7627	0.9145	9.098	4			
100	0.8708	1.0426	0.8708	0.7979	0.9227	6.989	4	-0.731	1.943	0.0946

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.83873248	0.749	-0.07104958	-2.28744906
F-Test indicates equal variances ($p = 0.72$)	1.55915618	47.4683456		
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.09459063	0.11325168	0.00253472	0.00473914
			0.49213776	1, 6

Dose-Response Plot



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

Client: TVA
 Facility: SEQUOIA NUCLEAR PLANT
 NPDES #: TN-0026450
 Project #: _____ - NONTREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	219.6	440	878	1440	2000	
Diluent volume (mL)	1780.4	1560	1122	560	0	
Total volume (mL)	2000	2000	2000	2000	2000	

Test organism information:		Test information:	
Organism age:	< 24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	06-17-03 0752 TO 1126	Incubator number and shelf location:	2
Organism source:	06-10-03 A-D	YCT batch:	ABS 05-23-03
Transfer bowl information:	pH = 8.00 Temperature = 24.9	Selenastrum batch:	ABS 05-23-03

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	06-17-03	1314	MHS 06-17-03	030617.01/.02	dl
1	06-18-03	1228	06-17-03	030617.01/.02	dl
2	06-19-03	1233	06-17-03	030618.01/.02	dl
3	06-20-03	1302	06-17-03	030619.01/.02	dl
4	06-21-03	1225	06-17-03	030621.06/.07	dl
5	06-22-03	1238	06-21-03	030621.06/.07	dl
6	06-23-03	1220	06-21-03	030621.06/.07	dl
7	06-24-03	1300			dl

Control information:		Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	≤ 20%	7-day LC50	>100%
% Adults having 3 rd Broods:	100%	≥ 80%	NOEC	100%
% Mortality:	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	27.6	≥ 15.0 offspring/female	ChV	>100%
% CV:	9.2%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOIAH

Date: 06-17-03

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	3	4	3	3	3	4	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	0	0	0	0	10	0	11	9	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	10	8	10	12	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	16	12	14	13	16	12	14	12	16
Total young produced		30	30	23	21	28	30	26	29	24	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 rd Broods		X	X	X	X	X	X	X	X	X	X

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	27.6

CONCENTRATION: 10.98%

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	3	3	5	4	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	11	0	11	0	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	11	9	10	0	10	0	11	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	12	16	14	17	17	13	15	18
Total young produced		27	29	24	30	28	30	33	28	31	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.1
% Reduction from Control:	-5.47%

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOIAN

Date: 06-17-03

CONCENTRATION: 22%

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	3	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	13	0	14	0	10	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	11	12	0	10	0	11	0	13	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	14	17	16	19	13	14	14	17	14
Total young produced		31	30	34	29	37	28	28	30	32	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.7
% Reduction from Control:	-11.2%

CONCENTRATION: 43.9%

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	3	4	6	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	12	0	0	12	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	12	10	11	0	13	11	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	15	17	17	16	16	17	13	20	19
Total young produced		35	31	34	31	32	35	32	29	33	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.8
% Reduction from Control:	-18.8%

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOYAH

Date: 06-17-03

CONCENTRATION: 72%

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	3	4	4	3	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	14	11	12	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	10	12	11	0	0	0	10	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	15	18	15	18	17	17	19	17	20
Total young produced		34	29	35	30	36	31	33	33	30	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.7
% Reduction from Control:	-18.5%

CONCENTRATION: 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	5	4	4	4	3	5	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	13	12	0	13	11	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	13	11	15	0	0	13	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	17	17	14	19	19	18	20	15	17
Total young produced		37	34	32	33	35	36	35	37	31	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.5
% Reduction from Control:	-25.0%

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOYAH

Date: 06-17-03

CONCENTRATION: 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	3	4	4	4	4	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	0	0	0	11	0	0	0	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	12	12	11	0	9	12	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	18	15	14	15	16	12	15	17
Total young produced		28	29	33	31	29	30	29	27	29	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.8
% Reduction from Control:	-2.4%

Environmental Testing Solutions, LLC

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	3	4	3	3	3	4	4	4	3	4	35
5	9	0	0	0	0	10	0	11	9	9	48
6	0	10	8	10	12	0	10	0	0	0	50
7	18	16	12	14	13	16	12	14	12	16	143
Total	30	30	23	27	28	30	26	29	24	29	276

43.9%

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	3	4	6	4	4	3	4	40
5	0	0	0	0	12	0	0	12	10	13	47
6	12	12	13	11	0	13	11	0	0	0	72
7	19	15	17	17	16	16	17	13	20	19	169
Total	35	31	34	31	32	35	32	29	33	36	328

10.98%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	3	3	5	4	3	3	36
5	0	0	0	0	11	0	11	0	13	10	45
6	9	11	9	10	0	10	0	11	0	0	60
7	14	14	12	16	14	17	17	13	15	18	150
Total	27	29	24	30	28	30	33	28	31	31	291

72%

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	3	4	4	3	5	40
5	0	0	0	0	14	11	12	0	10	0	47
6	14	10	12	11	0	0	0	10	0	11	68
7	16	15	18	15	18	17	17	19	17	20	172
Total	34	29	35	30	36	31	33	33	30	36	327

22%

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	3	5	3	39
5	0	0	13	0	14	0	10	0	10	0	47
6	11	12	0	10	0	11	0	13	0	11	68
7	15	14	17	16	19	13	14	14	17	14	153
Total	31	30	34	29	37	28	28	30	32	28	307

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	5	4	4	4	3	5	4	4	5	4	42
5	0	0	0	0	13	12	0	13	11	14	63
6	14	13	11	15	0	0	13	0	0	0	66
7	18	17	17	14	19	19	18	20	15	17	174
Total	37	34	32	33	35	36	35	37	31	35	345

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	3	4	4	4	4	3	4	4	38
5	10	11	0	0	0	11	0	0	0	12	44
6	0	0	12	12	11	0	9	12	10	0	66
7	14	14	18	15	14	15	16	12	15	17	150
Total	28	29	33	31	29	30	29	27	29	33	298

Environmental Testing Solutions, LLC

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

Client: TVA Sequoyah Nuclear Plant, Nontreated
 Test dates: June 17-24, 2003
 Project number: 744

Reviewed by: *Jumra*

Concentration (%)	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	30	30	23	27	28	30	26	29	24	29	100	27.6	9.2	Not applicable
10.98%	27	29	24	30	28	30	33	28	31	31	100	29.1	8.6	-5.4
22%	31	30	34	29	37	28	28	30	32	28	100	30.7	9.6	-11.2
43.9%	35	31	34	31	32	35	32	29	33	36	100	32.8	6.7	-18.8
72%	34	29	35	30	36	31	33	33	30	36	100	32.7	7.9	-18.5
100%	37	34	32	33	35	36	35	37	31	35	100	34.5	5.8	-25.0
100% Intake	28	29	33	31	29	30	29	27	29	33	100	29.8	6.7	-2.4

Outfall 112:

Dunnett's MSD value: 2.515 2.542
 PMSD: 9.1 9.1

Intake:

Dunnett's MSD value: 1.772
 PMSD: 6.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 11%.

Upper PMSD bound determined by USEPA (90th percentile) = 37%.

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for Ceriodaphnia reproduction in chronic reference toxicant tests.

Environmental Testing Solutions, LLC

Statistical Analyses

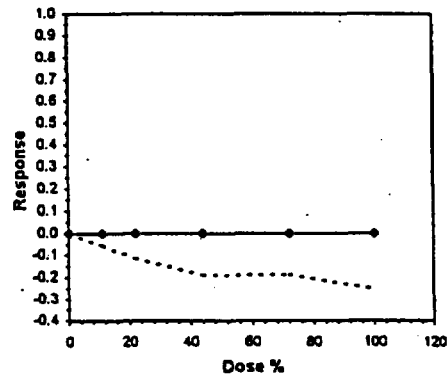
Ceriodaphnia Survival and Reproduction Test-Reproduction				
Start Date: June 17, 2003	Test ID: C4FRCR	Sample ID:	Sequoyah Nuclear Plant, Outfall 101	
End Date: June 24, 2003	Lab ID: ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date	Protocol: CHRONIC-(EPA-821-R-02-013)	Test Species:	CD-Ceriodaphnia dubia	
Comments:				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	30.000	23.000	27.000	28.000	30.000	26.000	29.000	24.000	29.000
10.98	27.000	29.000	24.000	30.000	28.000	30.000	33.000	28.000	31.000	31.000
22	31.000	30.000	34.000	29.000	37.000	28.000	28.000	30.000	32.000	28.000
43.9	35.000	31.000	34.000	31.000	32.000	35.000	32.000	29.000	33.000	36.000
72	34.000	29.000	35.000	30.000	36.000	31.000	33.000	33.000	30.000	34.000
100	37.000	34.000	32.000	33.000	35.000	36.000	35.000	37.000	31.000	35.000

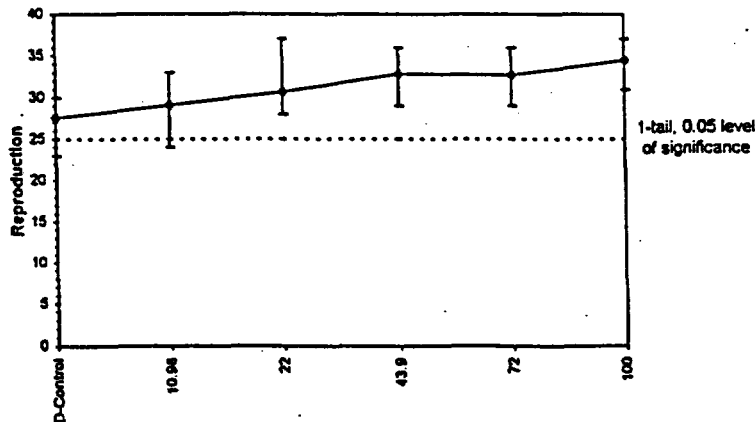
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	27.600	1.0000	27.600	23.000	30.000	9.229	10				31.233	1.0000
10.98	29.100	1.0543	29.100	24.000	33.000	8.641	10	-1.349	2.287	2.542	31.233	1.0000
22	30.700	1.1123	30.700	28.000	37.000	9.595	10	-2.789	2.287	2.542	31.233	1.0000
43.9	32.800	1.1884	32.800	29.000	36.000	6.710	10	-4.678	2.287	2.542	31.233	1.0000
72	32.700	1.1848	32.700	29.000	36.000	7.903	10	-4.588	2.287	2.542	31.233	1.0000
100	34.500	1.2500	34.500	31.000	37.000	5.837	10	-6.208	2.287	2.542	31.233	1.0000

Auxiliary Tests	Statistic	Critical	Slow	Kart
Kolmogorov D Test indicates normal distribution ($p > 0.01$)	0.52460682	1.035	0.00625967	-0.350923
Bartlett's Test indicates equal variances ($p = 0.91$)	1.50215983	15.0863171		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Dunnnett's Test	100	>100		1
Treatments vs D-Control	MSD ₀	MSD ₁	MSB	MSE
	2.54175679	0.09209264	66.6266667	6.17777778
	F-Prob	df		
	3.2E-07	5, 54		

Point	%	SD	Linear Interpolation (200 Resamples)	
			95% CL	Slow
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



Environmental Testing Solutions, LLC

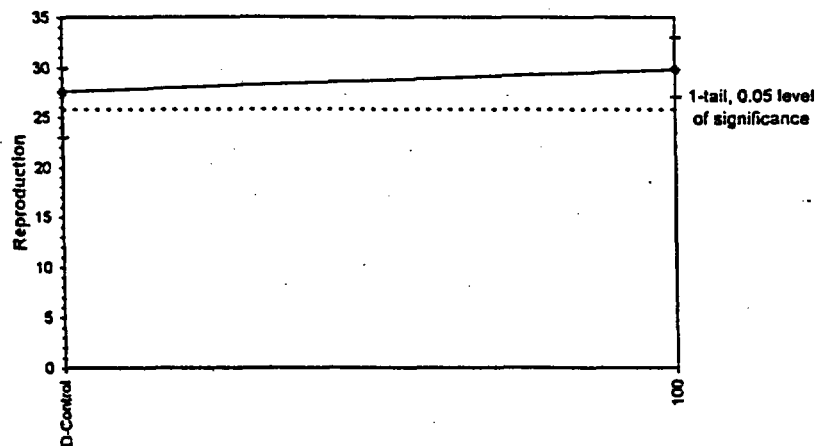
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date:	June 17, 2003	Test ID:	CdFRCR	Sample ID:	Sequoyah Nuclear Plant, Intake					
End Date:	June 24, 2003	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report					
Sample Date:		Protocol:	CHRONIC (EPA-821-R-02-013)	Test Species:	CD-Ceriodaphnia dubia					
Comments:										
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	30.000	23.000	27.000	28.000	30.000	26.000	29.000	24.000	29.000
100	28.000	29.000	33.000	31.000	29.000	30.000	29.000	27.000	29.000	33.000

Conc-%	Mean	N-Mean	Transform: Untransformed						t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%	N				
D-Control	27.600	1.0000	27.600	23.000	30.000	9.229	10	-2.153	1.734	1.772	
100	29.800	1.0797	29.800	27.000	33.000	6.674	10				

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.95612454	0.868	-0.33926213	-0.54348982		
F-Test indicates equal variances ($p = 0.47$)	1.6404494	6.54108572				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	1.77217886	0.06420938	24.2	5.22222222	0.04515683	1, 18
Treatments vs D-Control						

Dose-Response Plot



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

Client: TVA
 Facility: SEQUOYA NUCLEAR PLANT
 NPDES #: TN-0026450
 Project #: 744
UV-TREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	CACH CONCENTRATION WAS UV-TREATED FOR 2-MINUTES WITH A 40 WATT UV-STERILIZER
Effluent volume (mL)	29.6	440	878	1440	2000	
Diluent volume (mL)	1780.4	1566	1122	560	0	
Total volume (mL)	2000	2000	2000	2000	2000	

Test organism information:		Test information:	
Organism age:	27.5 - 29.5 - hours old	Randomizing template:	Yellow
Date and times organisms were born between:	06-16-03 1100 TO 1300 MDT	Incubator number:	3
Organism source:	ABS BATCH 06-10-03	Artemia lot number:	06-04030
Transfer bowl information:	pH = 8.00 Temperature = 21.7 °C	Total drying time:	19hr
Average transfer volume:	10.4 mL	Date / Time in:	06-24-03 1530
		Date / Time out:	06-25-03 1030
		Oven temperature:	103°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	06-17-03	0800	1500	1440	MHS 06-17-03	030617.01 / .02	JH
1	06-18-03	0900	1500	1352	06-17-03	030617.01 / .02	JH
2	06-19-03	0900	1500	1400	06-17-03	030619.01 / .02	JH
3	06-20-03	1030	1635	1421	06-17-03	030619.01 / .02	JH
4	06-21-03	0900	1500	1408	06-17-03	030621.06 / .07	JH
5	06-22-03	0913	1520	1409	06-21-03	030621.06 / .07	JH
6	06-23-03	0852	1500	1403	06-21-03	030621.06 / .07	JH
7	06-24-03			1505			JH

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC ₅₀	> 100%
Average weight per initial larvae:	0.8110		NOEC	100%
Average weight per surviving larvae:	0.8110	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC ₂₅	> 100%

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH

Date: 06-17-03

UV-TREATED

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	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	9 ^{1d}	10	10	9 ^{1d}	10
3	10	10	10	10	10	10	10	9	10	10	9	10
4	10	10	10	10	10	10	10	9	10	10	9	10
5	10	10	10	10	10	10	10	9	10	10	9	10
6	10	10	10	10	10	10	10	9	10	10	9	10
7	10	10	10	10	10	10	10	9	10	10	9	10
A = Pan weight (mg)	15.15 ²	15.08 ⁵	15.078	15.031	14.685	15.005	14.842	14.655	14.788	14.920	14.550	15.008
B = Pan + Larvae weight (mg)	22.38	22.78	23.38	24.26	23.88	23.51	23.96	24.09	24.53	23.72	22.92	24.43
Larvae weight (mg) = A - B	0.723	0.705	0.8302	0.924	0.895	0.835	0.918	0.9435	0.942	0.800	0.8370	0.9422

01 → 1.223 7.685 8.307 9.229 8.305 8.305 9.118 9.435 9.742 8.800 8.370 9.422
 Calculations and data reviewed: *df*

← PER INST'L LARVAE

Comments:

Species: *Pimephales promelas*

Client: TYA-SEQUOIAH
UV-TREATED

Date: 06-17-03

Survival and Growth Data

Day	43.9%				72%				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	9 ^{id}	10	10	10	10
3	10	10	10	10	10	10	10	9	10	10	10	10
4	10	10	10	10	10	10	10	9	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	10	10	10	9	10	10	10	10
7	10	10	10	10	10	10	10	9	10	10	10	10
A = Pan weight (mg)	14.846	14.690	15.013	14.959	15.171	15.263	14.975	15.055	14.973	15.107	15.004	15.096
B = Pan + Larvae weight (mg)	23.02	23.22	24.46	23.94	24.26	25.71	25.06	24.76	24.99	24.49	23.86	22.55
Larvae weight (mg) = A - B	8.224	8.530	9.447	10.961	10.984	10.447	10.085	9.9705	10.017	9.9303	10.0054	10.7491

$\delta \rightarrow$ 8.224 8.530 9.447 10.961 10.984 10.447 10.085 9.9705 10.017 9.9303 10.0054 10.7491
 Calculations and data reviewed:

= Per INITIAL LARVAE
JF

Comments:

Species: *Pimephales promelas*

Client: TVA - Sequoyah

Date: 06-17-03

UV-TREATED

Survival and Growth Data

Day	100% INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	14.836	15.060	14.766	14.986
B = Pan + Larvae weight (mg)	23.44	24.22	24.01	25.47
Larvae weight (mg) = A - B	8.604	9.160	9.244	10.484

dl → 8.604 9.160 9.244 10.484

← Per INITIAL LARVAE

Calculations and data reviewed: *dl*

Comments:

Environmental Testing Solutions, LLC

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

Client: TVA Sequoyah Nuclear Plant, UV Treated

Test dates: June 17-24, 2003

Project number: 744

Revised by: *J. Sumner*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.157	22.380	7.223	0.7223	100.0	0.8110	10.7	Not applicable
	B	10	10	15.095	22.780	7.685	0.7685				
	C	10	10	15.078	23.380	8.302	0.8302				
	D	10	10	15.031	24.260	9.229	0.9229				
10.98%	E	10	10	14.685	23.080	8.395	0.8395	97.5	0.8813	6.3	-8.7
	F	10	10	15.005	23.310	8.305	0.8305				
	G	10	10	14.842	23.960	9.118	0.9118				
	H	10	9	14.655	24.090	9.435	0.9435				
22%	I	10	10	14.788	24.530	9.742	0.9742	97.5	0.9084	6.8	-12.0
	J	10	10	14.920	23.720	8.800	0.8800				
	K	10	9	14.550	22.920	8.370	0.8370				
	L	10	10	15.008	24.430	9.422	0.9422				
43.9%	M	10	10	14.846	23.070	8.224	0.8224	100.0	0.8796	6.1	-8.5
	N	10	10	14.690	23.220	8.530	0.8530				
	O	10	10	15.013	24.460	9.447	0.9447				
	P	10	10	14.959	23.940	8.981	0.8981				
72%	Q	10	10	15.171	24.260	9.089	0.9089	97.5	0.9832	5.9	-21.2
	R	10	10	15.263	25.710	10.447	1.0447				
	S	10	10	14.975	25.060	10.085	1.0085				
	T	10	9	15.055	24.760	9.705	0.9705				
100%	U	10	10	14.973	24.990	10.017	1.0017	100.0	0.8928	12.2	-10.1
	V	10	10	15.107	24.490	9.383	0.9383				
	W	10	10	15.004	23.860	8.856	0.8856				
	X	10	10	15.096	22.550	7.454	0.7454				
100% Intake	Y	10	10	14.836	23.440	8.604	0.8604	100.0	0.9373	8.5	-15.6
	Z	10	10	15.060	24.220	9.160	0.9160				
	AA	10	10	14.766	24.010	9.244	0.9244				
	BB	10	10	14.986	25.470	10.484	1.0484				

Outfall 101:

Dunnett's MSD value: 0.1254
 PMSD: 15.5

Intake:

Dunnett's MSD value: 0.1142
 PMSD: 14.1

MSD =
 PMSD =

Minimum Significant Difference

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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through Lower PMSD bound determined by USEPA (10th percentile) = 9.4%. Upper PMSD bound determined by USEPA (90th percentile) = 35%.

The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

Environmental Testing Solutions, LLC

Statistical Analyses

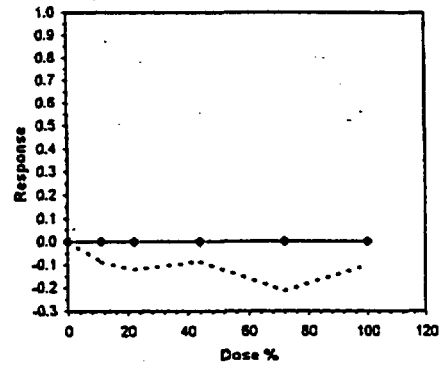
Larval Fish Growth and Survival Test-7 Day Growth					
Start Date:	6/17/03	Test ID:	PpFRCR	Sample ID:	Sequoyah Nuclear Plant, Outfall 101
End Date:	6/24/03	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Data		Protocol:	CHRONIC-(EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.7223	0.7683	0.8302	0.9229
10.98	0.8393	0.8305	0.9118	0.9435
22	0.9742	0.8300	0.8370	0.9422
43.9	0.8224	0.8330	0.9447	0.8981
72	0.9089	1.0447	1.0085	0.9705
100	1.0017	0.9383	0.8356	0.7454

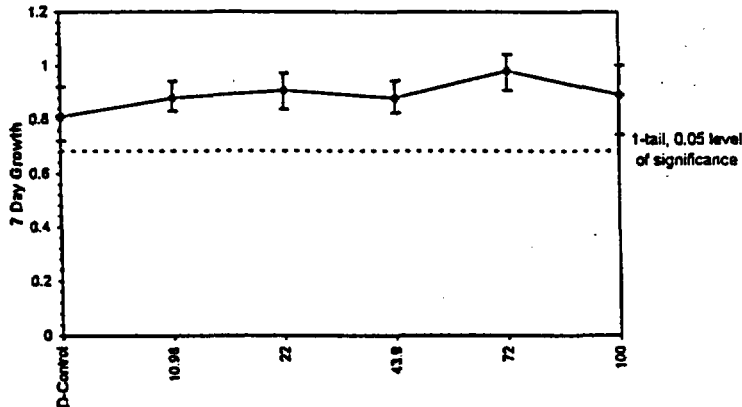
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8110	1.0000	0.8110	0.7223	0.9229	10.694	4			0.8927	1.0000	
10.98	0.8813	1.0867	0.8813	0.8305	0.9435	6.258	4	-1.352	2.410	0.1254	0.8927	
22	0.9084	1.1201	0.9084	0.8370	0.9742	6.779	4	-1.872	2.410	0.1254	0.8927	
43.9	0.8796	1.0846	0.8796	0.8224	0.9447	6.073	4	-1.318	2.410	0.1254	0.8927	
72	0.9832	1.2123	0.9832	0.9089	1.0447	5.903	4	-3.309	2.410	0.1254	0.8927	
100	0.8928	1.1008	0.8928	0.7454	1.0017	12.221	4	-1.572	2.410	0.1254	0.8927	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97625077	0.884	-0.2164391	-0.3347123
Bartlett's Test indicates equal variances (p = 0.78)	2.47064233	15.0853171		
Hypothesis Test (1-tail, 0.85)	NOEC	LOEC	ChV	TU
Dunnnett's Test	100	>100		1
Treatments vs D-Control	MSDw	MSDp	MSB	MSE
	0.1233815	0.15460587	0.01232593	0.00541331
	F-Prob	df		
	0.09053341	5, 18		

Point	%	SD	Linear Interpolation (200 Resamples)	
			95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



Environmental Testing Solutions, LLC

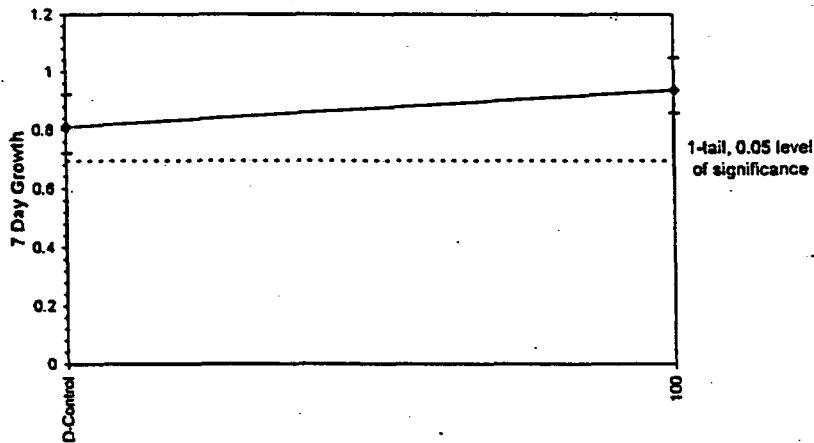
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth					
Start Date:	6/17/03	Test ID:	PpFRCR	Sample ID:	Sequoyah Nuclear Plant, Intake
End Date:	6/24/03	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	CHRONIC-(EPA-821-R-02-013)	Test Species:	FP-Pimephales promelas
Comments:	UV-treated				
Conc-%	1	2	3	4	
D-Control	0.7223	0.7683	0.8302	0.9229	
100	0.8604	0.9160	0.9244	1.0484	

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%				
D-Control	0.8110	1.0000	0.8110	0.7223	0.9229	10.694	4			
100	0.9373	1.1558	0.9373	0.8604	1.0484	8.463	4	-2.150	1.943	0.1142

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.8905884	0.749	0.64399405	-0.89201984		
F-Test indicates equal variances ($p = 0.89$)	1.19533205	47.4683456				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.11419269	0.14080913	0.03191601	0.00690685	0.07514437	1, 6
Treatments vs D-Control						

Dose-Response Plot



Environmental Testing Solutions, LLC

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

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated
 Test dates: June 17 - 24, 2003
 Project number: 744

Reviewed by: CM

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)	7.80	7.62	7.77	7.69	7.63	7.73	7.63	7.54	7.73	7.36	7.73	7.47	7.74	7.51
	DO (mg/L)	7.7	7.5	7.6	7.4	7.6	7.7	7.6	7.2	7.6	6.5	7.6	7.2	7.7	7.6
	Conductivity (µmhos/cm)	306		294		290		317		302		295		300	
	Alkalinity (mg/L CaCO ₃)	60.2		61.2								61.2			
	Hardness (mg/L CaCO ₃)	82.8		84.8								84.8			
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.2	24.7	25.3	24.3	25.1	24.6
10.98%	pH (SU)	7.69	7.60	7.69	7.67	7.75	7.69	7.72	7.58	7.72	7.44	7.76	7.47	7.67	7.50
	DO (mg/L)	7.6	7.4	7.8	7.4	7.8	7.6	7.9	7.4	7.5	6.5	7.6	7.1	7.7	7.6
	Conductivity (µmhos/cm)	301		290		287		280		296		276		282	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.3	24.7	25.3	24.3	25.0	24.7
22%	pH (SU)	7.70	7.54	7.67	7.67	7.75	7.69	7.71	7.54	7.72	7.46	7.74	7.52	7.67	7.52
	DO (mg/L)	7.8	7.3	7.8	7.4	7.8	7.6	7.9	7.4	7.5	6.6	7.6	7.2	7.7	7.7
	Conductivity (µmhos/cm)	284		279		276		273		282		265		273	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.2	24.7	25.3	24.3	25.0	24.7
43.9%	pH (SU)	7.66	7.54	7.66	7.67	7.70	7.67	7.64	7.53	7.68	7.43	7.71	7.50	7.66	7.51
	DO (mg/L)	7.9	7.2	7.8	7.4	7.8	7.6	7.9	7.4	7.6	6.7	7.6	7.4	7.7	7.8
	Conductivity (µmhos/cm)	248		243		247		242		246		233		240	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.1	24.5	25.2	24.7	25.4	24.3	25.0	24.7
72%	pH (SU)	7.62	7.54	7.60	7.63	7.69	7.67	7.56	7.54	7.61	7.48	7.69	7.51	7.60	7.50
	DO (mg/L)	7.8	7.2	7.8	7.4	7.9	7.8	7.8	7.5	7.7	6.7	7.6	7.3	7.8	7.7
	Conductivity (µmhos/cm)	215		206		204		204		207		199		204	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.1	24.5	25.3	24.7	25.4	24.3	24.8	24.7
100%	pH (SU)	7.57	7.47	7.52	7.60	7.62	7.64	7.43	7.50	7.55	7.42	7.66	7.48	7.60	7.46
	DO (mg/L)	7.9	7.3	7.9	7.4	8.0	7.6	7.8	7.6	7.9	6.9	7.6	7.3	7.8	7.6
	Conductivity (µmhos/cm)	169		167		167		165		167		164		166	
	Alkalinity (mg/L CaCO ₃)	57.1				58.1				57.1					
	Hardness (mg/L CaCO ₃)	62.6				66.7				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.4	24.7	25.4	24.3	24.7	24.7
	pH (SU)	7.59	7.46	7.56	7.62	7.67	7.64	7.47	7.49	7.54	7.41	7.53	7.43	7.50	7.45
	DO (mg/L)	8.0	7.4	7.9	7.4	7.9	7.7	8.0	7.6	7.9	6.8	7.8	7.3	7.8	7.8
	Conductivity (µmhos/cm)	168		165		166		164		163		161		164	
	Alkalinity (mg/L CaCO ₃)	58.1				58.1				57.1					
	Hardness (mg/L CaCO ₃)	64.6				62.6				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.6	25.1	24.7	25.4	24.3	24.9	24.7	

Species: *Pimephales promelas*

Client: TVA-SEONDNAH

Date: 06-17-03

NONTREATED

Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.72	7.77	7.69	7.63	7.73
	DO (mg/L)	7.7	7.5	7.6	7.4	7.6	7.7
MHS	Conductivity (umhos/cm)	300		294		290	
	Alkalinity (mg CaCO ₃ /L)	60.2		61.2		—	
	Hardness (mg CaCO ₃ /L)	82.8		85.4		—	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
10.98%	pH (S.U.)	7.69	7.60	7.69	7.67	7.73	7.69
	DO (mg/L)	7.6	7.4	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	301		290		287	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
22%	pH (S.U.)	7.70	7.54	7.67	7.67	7.73	7.69
	DO (mg/L)	7.8	7.3	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	284		279		270	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
43.9%	pH (S.U.)	7.66	7.54	7.66	7.67	7.70	7.67
	DO (mg/L)	7.9	7.2	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	248		243		247	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
72%	pH (S.U.)	7.62	7.54	7.62	7.63	7.69	7.67
	DO (mg/L)	7.8	7.2	7.8	7.4	7.9	7.8
	Conductivity (umhos/cm)	215		206		204	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
100%	pH (S.U.)	7.57	7.47	7.52	7.60	7.62	7.64
	DO (mg/L)	7.9	7.3	7.9	7.4	8.0	7.6
	Conductivity (umhos/cm)	169		167		167	
	Alkalinity (mg CaCO ₃ /L)	57.1				58.1	
	Hardness (mg CaCO ₃ /L)	63.2				64.7	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
100% INTAKE	pH (S.U.)	7.59	7.46	7.50	7.62	7.67	7.64
	DO (mg/L)	8.0	7.4	7.9	7.4	7.9	7.7
	Conductivity (umhos/cm)	168		165		166	
	Alkalinity (mg CaCO ₃ /L)	58.1				58.1	
	Hardness (mg CaCO ₃ /L)	65.6				63.6	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
	Initial	Final	Initial	Final	Initial	Final	

Species: *Pimephales promelas*

Client: TVA - Sequoyah
NON TREATED

Date: 06-17-03

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.63	7.54	7.73	7.30	7.73	7.47	7.74	7.51
	DO (mg/L)	7.6	7.2	7.6	6.5	7.6	7.2	7.7	7.6
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO ₃ /L)	—		—		646.2		—	
	Hardness (mg CaCO ₃ /L)	—		—		859.8		—	
	Temperature (°C)	25.2	24.5	25.2	24.7	25.3	24.3	25.1	24.6
10.987	pH (S.U.)	7.72	7.58	7.72	7.44	7.70	7.47	7.67	7.50
	DO (mg/L)	7.9	7.4	7.5	6.5	7.6	7.1	7.7	7.6
	Conductivity (µmhos/cm)	280		296		276		282	
	Temperature (°C)	25.2	24.5	25.3	24.7	25.3	24.3	25.0	24.7
227	pH (S.U.)	7.71	7.54	7.72	7.46	7.74	7.52	7.67	7.52
	DO (mg/L)	7.9	7.4	7.5	6.6	7.6	7.2	7.7	7.7
	Conductivity (µmhos/cm)	273		282		265		273	
	Temperature (°C)	25.2	24.5	25.2	24.7	25.3	24.3	25.0	24.7
43.97	pH (S.U.)	7.64	7.53	7.68	7.43	7.71	7.50	7.66	7.51
	DO (mg/L)	7.9	7.4	7.6	6.7	7.6	7.4	7.7	7.8
	Conductivity (µmhos/cm)	242		246		233		240	
	Temperature (°C)	25.1	24.5	25.2	24.7	25.4	24.3	25.0	24.7
727	pH (S.U.)	7.50	7.54	7.61	7.48	7.69	7.51	7.60	7.50
	DO (mg/L)	7.8	7.5	7.7	6.7	7.6	7.3	7.8	7.7
	Conductivity (µmhos/cm)	204		207		199		204	
	Temperature (°C)	25.1	24.5	25.3	24.7	25.4	24.3	24.8	24.7
1007	pH (S.U.)	7.43	7.50	7.55	7.42	7.60	7.48	7.60	7.46
	DO (mg/L)	7.8	7.6	7.9	6.9	7.6	7.3	7.8	7.6
	Conductivity (µmhos/cm)	165		167		164		166	
	Alkalinity (mg CaCO ₃ /L)			57.1					
	Hardness (mg CaCO ₃ /L)			463.6					
	TR Chlorine (mg/L)			20.10					
	Temperature (°C)	25.2	24.5	25.4	24.7	25.4	24.3	24.7	24.7
1007 Intake	pH (S.U.)	7.47	7.49	7.54	7.41	7.53	7.43	7.50	7.45
	DO (mg/L)	8.0	7.6	7.9	6.8	7.8	7.3	7.8	7.8
	Conductivity (µmhos/cm)	164		163		161		164	
	Alkalinity (mg CaCO ₃ /L)			57.1					
	Hardness (mg CaCO ₃ /L)			463.6					
	TR chlorine (mg/L)			20.10					
	Temperature (°C)	25.2	24.6	25.1	24.7	25.4	24.3	24.9	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)

Species: *Ceriodaphnia dubia*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: June 17 - 24, 2003

Project number: 744

Reviewed by: Cue

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)	7.80	7.72	7.77	7.73	7.63	7.86	7.63	7.92	7.73	7.87	7.73	7.80	7.74	7.91
	DO (mg/L)	7.7	7.7	7.6	7.7	7.6	8.0	7.6	7.9	7.6	7.8	7.6	7.8	7.7	8.2
	Conductivity (µmhos/cm)	306		294		290		317		302		295		300	
	Alkalinity (mg/L CaCO ₃)	60.2		61.2								61.2			
	Hardness (mg/L CaCO ₃)	82.8		84.8								84.8			
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
10.98%	pH (SU)	7.69	7.73	7.69	7.73	7.75	7.88	7.72	7.95	7.72	7.93	7.76	7.81	7.67	7.97
	DO (mg/L)	7.6	7.6	7.8	7.6	7.8	8.0	7.8	8.0	7.5	7.8	7.6	7.9	7.7	8.3
	Conductivity (µmhos/cm)	301		290		287		280		296		276		282	
	Temperature (°C)	24.5	24.4	25.3	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
22%	pH (SU)	7.70	7.73	7.67	7.73	7.75	7.88	7.71	7.94	7.72	7.90	7.74	7.81	7.67	7.96
	DO (mg/L)	7.8	7.6	7.8	7.6	7.8	8.0	7.9	8.0	7.5	7.9	7.6	7.9	7.7	8.4
	Conductivity (µmhos/cm)	284		279		276		273		282		265		273	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
43.9%	pH (SU)	7.66	7.70	7.66	7.72	7.70	7.89	7.64	7.93	7.68	7.89	7.71	7.82	7.66	7.97
	DO (mg/L)	7.9	7.7	7.8	7.6	7.8	8.0	7.9	7.9	7.6	7.9	7.6	8.0	7.7	8.4
	Conductivity (µmhos/cm)	248		243		247		242		246		233		240	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
72%	pH (SU)	7.62	7.67	7.60	7.70	7.69	7.84	7.56	7.87	7.61	7.87	7.69	7.81	7.60	7.93
	DO (mg/L)	7.8	7.7	7.8	7.6	7.9	8.0	7.8	7.9	7.7	7.9	7.6	8.0	7.8	8.5
	Conductivity (µmhos/cm)	215		206		204		204		207		199		204	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100%	pH (SU)	7.57	7.65	7.52	7.68	7.62	7.81	7.43	7.86	7.55	7.80	7.66	7.79	7.60	7.91
	DO (mg/L)	7.9	7.6	7.9	7.7	8.0	8.0	7.8	7.9	7.9	7.8	7.6	8.0	7.8	8.4
	Conductivity (µmhos/cm)	169		167		167		165		167		164		166	
	Alkalinity (mg/L CaCO ₃)	57.1				58.1				57.1					
	Hardness (mg/L CaCO ₃)	62.6				66.7				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100% Intake	pH (SU)	7.59	7.66	7.56	7.68	7.67	7.84	7.47	7.84	7.54	7.82	7.53	7.74	7.50	7.78
	DO (mg/L)	8.0	7.8	7.9	7.6	7.9	8.0	8.0	7.9	7.9	7.8	7.8	8.0	7.8	8.3
	Conductivity (µmhos/cm)	168		165		166		164		163		161		164	
	Alkalinity (mg/L CaCO ₃)	58.1				58.1				57.1					
	Hardness (mg/L CaCO ₃)	64.6				62.6				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5

Species: *Ceriodaphnia dubia*

Client: TVA-SEAWAYAH

Date: 06-17-03

Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.72	7.77	7.73	7.63	7.80
	DO (mg/L)	7.7	7.7	7.6	7.7	7.6	8.0
	Conductivity (µmhos/cm)	306		294		290	
	Alkalinity (mg CaCO ₃ /L)	60.2		61.2		—	
	Hardness (mg CaCO ₃ /L)	82.8		85.8		—	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
10.98%	pH (S.U.)	7.69	7.73	7.69	7.73	7.75	7.88
	DO (mg/L)	7.6	7.6	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	301		290		287	
	Temperature (°C)	24.5	24.4	25.3	24.4	25.4	24.5
22%	pH (S.U.)	7.70	7.73	7.67	7.73	7.76	7.88
	DO (mg/L)	7.8	7.6	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	284		279		276	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
43.9%	pH (S.U.)	7.66	7.70	7.66	7.72	7.70	7.89
	DO (mg/L)	7.9	7.7	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	240		243		247	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
72%	pH (S.U.)	7.62	7.67	7.60	7.70	7.69	7.84
	DO (mg/L)	7.8	7.7	7.8	7.6	7.9	8.0
	Conductivity (µmhos/cm)	215		200		204	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
100%	pH (S.U.)	7.57	7.65	7.52	7.68	7.62	7.81
	DO (mg/L)	7.9	7.6	7.9	7.7	8.0	8.0
	Conductivity (µmhos/cm)	169		167		167	
	Alkalinity (mg CaCO ₃ /L)	57.1				58.1	
	Hardness (mg CaCO ₃ /L)	62.6				67.6	
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
100% INTAKE	pH (S.U.)	7.59	7.66	7.56	7.68	7.67	7.84
	DO (mg/L)	8.0	7.8	7.9	7.6	7.9	8.0
	Conductivity (µmhos/cm)	168		165		166	
	Alkalinity (mg CaCO ₃ /L)	58.1				58.1	
	Hardness (mg CaCO ₃ /L)	64.6				63.6	
	TR chlorine (mg/L)	40.0				40.10	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah

Date: 06-17-03

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.63	7.92	7.73	7.87	7.73	7.80	7.74	7.91
	DO (mg/L)	7.6	7.9	7.6	7.8	7.6	7.8	7.7	8.2
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO ₃ /L)	—		—		61.2		—	
	Hardness (mg CaCO ₃ /L)	—		—		54.8 85µm		—	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
10.98%	pH (S.U.)	7.72	7.95	7.72	7.93	7.74	7.81	7.67	7.97
	DO (mg/L)	7.8	8.0	7.5	7.8	7.6	7.9	7.7	8.3
	Conductivity (µmhos/cm)	280		290		276		282	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
22%	pH (S.U.)	7.71	7.94	7.72	7.90	7.74	7.81	7.67	7.96
	DO (mg/L)	7.9	8.0	7.5	7.9	7.6	7.9	7.7	8.4
	Conductivity (µmhos/cm)	273		282		265		273	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.4	24.5	24.7	24.5
43.9%	pH (S.U.)	7.64	7.93	7.68	7.89	7.71	7.82	7.66	7.97
	DO (mg/L)	7.9	7.9	7.6	7.9	7.6	8.0	7.7	8.4
	Conductivity (µmhos/cm)	242		246		233		240	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
72%	pH (S.U.)	7.56	7.87	7.61	7.87	7.69	7.81	7.60	7.93
	DO (mg/L)	7.8	7.9	7.7	7.9	7.6	8.0	7.8	8.5
	Conductivity (µmhos/cm)	204		207		199		204	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100%	pH (S.U.)	7.43	7.86	7.55	7.80	7.66	7.79	7.60	7.91
	DO (mg/L)	7.8	7.9	7.9	7.8	7.6	8.0	7.8	8.4
	Conductivity (µmhos/cm)	165		167		164		166	
	Alkalinity (mg CaCO ₃ /L)			57.1					
	Hardness (mg CaCO ₃ /L)			67.6 63µm					
	TR Chlorine (mg/L)	✓		20.10		✓		✓	
Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5	
100% INTAKE	pH (S.U.)	7.47	7.84	7.54	7.82	7.53	7.74	7.54 7.50	7.78
	DO (mg/L)	8.0	7.9	7.9	7.8	7.8	8.0	7.8	8.3
	Conductivity (µmhos/cm)	164		163		161		164	
	Alkalinity (mg CaCO ₃ /L)			57.1					
	Hardness (mg CaCO ₃ /L)			67.6 63µm					
	TR chlorine (mg/L)			20.10					
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

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

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated

Test dates: June 17 - 24, 2003

Project number: 744

Reviewed by: CR

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)	7.69	7.53	7.61	7.72	7.75	7.70	7.75	7.64	7.77	7.53	7.75	7.57	7.71	7.57
	DO (mg/L)	8.0	7.3	7.6	7.5	7.6	7.8	8.0	7.5	7.9	7.1	7.8	7.5	8.0	7.8
	Conductivity (µmhos/cm)	306		286		285		300		298		295		302	
	Alkalinity (mg/L CaCO ₃)	-		-		-		-		-		61		-	
	Hardness (mg/L CaCO ₃)	-		-		-		-		-		85		-	
	Temperature (°C)	25.4	24.8	25.4	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
10.98%	pH (SU)	7.72	7.47	7.63	7.68	7.76	7.66	7.76	7.59	7.77	7.52	7.76	7.49	7.72	7.52
	DO (mg/L)	7.9	7.2	7.6	7.4	7.5	7.6	8.0	7.5	7.8	7.0	7.8	7.3	8.0	7.6
	Conductivity (µmhos/cm)	300		279		279		296		288		287		294	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
22%	pH (SU)	7.71	7.44	7.61	7.68	7.76	7.66	7.76	7.60	7.77	7.48	7.76	7.49	7.73	7.49
	DO (mg/L)	7.8	7.2	7.6	7.4	7.6	7.7	8.0	7.4	7.8	6.9	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	284		269		266		282		275		274		280	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.2	24.6
43.9%	pH (SU)	7.70	7.45	7.59	7.68	7.73	7.64	7.73	7.58	7.76	7.43	7.77	7.48	7.69	7.48
	DO (mg/L)	7.9	7.1	7.6	7.4	7.7	7.5	7.8	7.4	7.8	6.9	7.8	7.4	8.0	7.6
	Conductivity (µmhos/cm)	248		234		235		249		242		240		244	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
72%	pH (SU)	7.67	7.42	7.57	7.65	7.70	7.60	7.67	7.54	7.70	7.42	7.75	7.43	7.67	7.46
	DO (mg/L)	7.9	7.1	7.6	7.5	7.7	7.5	7.7	7.4	7.8	6.7	7.8	7.4	7.9	7.6
	Conductivity (µmhos/cm)	216		200		200		210		203		204		206	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
100%	pH (SU)	7.63	7.42	7.52	7.64	7.67	7.58	7.62	7.50	7.66	7.46	7.74	7.47	7.64	7.49
	DO (mg/L)	7.9	7.1	7.6	7.6	7.7	7.4	7.7	7.5	7.9	6.8	7.6	7.5	7.9	7.8
	Conductivity (µmhos/cm)	170		163		163		169		166		167		168	
	Alkalinity (mg/L CaCO ₃)	-		-		-		-		-		-		-	
	Hardness (mg/L CaCO ₃)	-		-		-		-		-		-		-	
	Total Residual Chlorine (mg/L)	-		-		-		-		-		-		-	
Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	24.8	24.6	
100% Intake	pH (SU)	7.63	7.43	7.52	7.63	7.67	7.57	7.59	7.54	7.61	7.44	7.69	7.36	7.54	7.46
	DO (mg/L)	7.9	7.2	7.6	7.3	7.6	7.5	7.8	7.4	7.9	6.9	7.7	7.1	7.8	7.7
	Conductivity (µmhos/cm)	166		160		162		165		166		164		161	
	Alkalinity (mg/L CaCO ₃)	-		-		-		-		-		-		-	
	Hardness (mg/L CaCO ₃)	-		-		-		-		-		-		-	
	Total Residual Chlorine (mg/L)	-		-		-		-		-		-		-	
Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6	

Species: *Pimephales promelas*

Client: TVA - SEQUOIAH

Date: 06-17-03

Daily Chemistry:

UV-TREATED

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.69	7.53	7.61	7.72	7.75	7.70
	DO (mg/L)	8.0	7.3	7.6	7.5	7.6	7.8
	Conductivity (µmhos/cm)	306		286		285	
	Alkalinity (mg CaCO ₃ /L)	60 ca		64 ca		—	
	Hardness (mg CaCO ₃ /L)	82 ca		85 ca		—	
	Temperature (°C)	25.4	24.8	25.4	24.6	25.3	24.7
	10.98%	pH (S.U.)	7.72	7.47	7.63	7.68	7.76
DO (mg/L)		7.9	7.2	7.6	7.4	7.5	7.6
Conductivity (µmhos/cm)		300		279		279	
Temperature (°C)		25.4	24.8	25.3	24.6	25.3	24.7
22%	pH (S.U.)	7.71	7.44	7.61	7.68	7.76	7.66
	DO (mg/L)	7.8	7.2	7.6	7.4	7.6	7.7
	Conductivity (µmhos/cm)	284		269		266	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
43.9%	pH (S.U.)	7.70	7.45	7.59	7.68	7.73	7.64
	DO (mg/L)	7.9	7.1	7.6	7.4	7.7	7.5
	Conductivity (µmhos/cm)	248		234		235	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
72%	pH (S.U.)	7.67	7.42	7.57	7.65	7.70	7.60
	DO (mg/L)	7.9	7.1	7.6	7.5	7.7	7.5
	Conductivity (µmhos/cm)	216		200		200	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
100%	pH (S.U.)	7.63	7.42	7.52	7.64	7.67	7.58
	DO (mg/L)	7.9	7.1	7.6	7.6	7.7	7.4
	Conductivity (µmhos/cm)	170		163		163	
	Alkalinity (mg CaCO ₃ /L)	57 ca		—		58 ca	
	Hardness (mg CaCO ₃ /L)	63 ca		—		67 ca	
	TR chlorine (mg/L)	40.10 ca		—		40 ca	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
100% INTAKE	pH (S.U.)	7.63	7.43	7.52	7.63	7.67	7.57
	DO (mg/L)	7.9	7.2	7.6	7.3	7.6	7.5
	Conductivity (µmhos/cm)	166		160		162	
	Alkalinity (mg CaCO ₃ /L)	58		—		58	
	Hardness (mg CaCO ₃ /L)	65		—		67	
	TR chlorine (mg/L)	40.10 ca		—		40.10 ca	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Client: TVA - Sequoyah

Date: 06-17-03

UV-TREATED

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.75	7.64	7.77	7.53	7.75	7.57	7.71	7.57
	DO (mg/L)	8.0	7.5	7.9	7.1	7.8	7.5	8.0	7.8
MHS	Conductivity (µmhos/cm)	300		298		295		302	
	Alkalinity (mg CaCO ₃ /L)	—		—		41		—	
	Hardness (mg CaCO ₃ /L)	—		—		85		—	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
	pH (S.U.)	7.70	7.59	7.77	7.52	7.76	7.49	7.72	7.52
10.98%	DO (mg/L)	8.0	7.5	7.8	7.0	7.8	7.3	8.0	7.6
	Conductivity (µmhos/cm)	296		288		287		294	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
	pH (S.U.)	7.70	7.60	7.77	7.48	7.76	7.49	7.73	7.49
22%	DO (mg/L)	8.0	7.4	7.8	6.9	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	282		275		274		280	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.2	24.6
	pH (S.U.)	7.73	7.58	7.76	7.43	7.77	7.48	7.69	7.48
43.9%	DO (mg/L)	7.8	7.4	7.9	6.9	7.8	7.4	8.0	7.6
	Conductivity (µmhos/cm)	249		242		240		244	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
	pH (S.U.)	7.67	7.54	7.70	7.42	7.75	7.43	7.67	7.46
72%	DO (mg/L)	7.7	7.4	7.8	6.7	7.8	7.4	7.9	7.6
	Conductivity (µmhos/cm)	210		203		204		206	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
	pH (S.U.)	7.62	7.50	7.66	7.46	7.74	7.47	7.64	7.49
100%	DO (mg/L)	7.7	7.5	7.9	6.8	7.6	7.5	7.9	7.8
	Conductivity (µmhos/cm)	169		166		167		168	
	Alkalinity (mg CaCO ₃ /L)			57					
	Hardness (mg CaCO ₃ /L)			63					
	TR Chlorine (mg/L)			60.10					
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	24.8	24.6
	pH (S.U.)	7.59	7.54	7.61	7.44	7.69	7.36	7.54	7.46
	DO (mg/L)	7.8	7.4	7.9	6.9	7.7	7.1	7.8	7.7
100% INTAKE	Conductivity (µmhos/cm)	165		166		164		161	
	Alkalinity (mg CaCO ₃ /L)			57					
	Hardness (mg CaCO ₃ /L)			63					
	TR chlorine (mg/L)			60.10					
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

**Alkalinity
(EPA Method 310.1)**

Matrix: Water, MDL = 1.0 mg CaCO₃/L

Analyst CAJ/KEL
Date analyzed 06-24-03

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 ₂ SO ₄ = (5 ml Na ₂ CO 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
4.05	1NRO74	1NRO79	0.0	12.2	12.2	0.0205	10.2

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%)
1NSS136	100	100	12.2	21.8	9.6	10.2	98	98%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
06-17-03 B	MHS H ₂ O	100	21.8	27.6	5.8	10.2	^S 59	
	Duplicate	↓	27.6	33.8	6.2	↓	^D 63	6.6%

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)
1NSS 136	50	33.8/100	27.6	38.7	11.1	10.2	113

Sample alkalinity (B) (mg CaCO ₃ /L)	Measured spike value (MV) (mg CaCO ₃ /L) MV = A - B	% R = MV / SV x 100 (acceptable range = 75 to 125%)
63	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
06-17-03 A	MHS H ₂ O	100	18.7	24.7	6.0	10.2	61.2
06-17-03 C	MHS H ₂ O	100	24.7	30.8	6.1		62.2
06-21-03 A	↓	100	30.8	36.8	6.0		61.2
06-21-03 B	↓	100	36.8	42.7	5.9		60.2
	DMRQA CdAC	100	12.1	18.0	5.9		60
	CdCR	100	18.0	23.8	5.8		59
	PPAC	100	23.8	30.5	6.7		68
	↓ PPCL	100	30.5	36.4	6.1		62
030617-03	Tryon 1	100	36.6	1.1	14.5	↓	148

Reviewed by: Jf

Date reviewed: 06-26-03

Alkalinity
(EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg CaCO₃/L

Analyst PAJ/KCK
Date analyzed 06-24-03

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 ₂ SO ₄ = (5 ml Na ₂ CO 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%)
1155136	100	100	1.1	10.8	9.7	10.2	99	99%

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%)
030619.10	Tryon 2	100	10.8	22.4	11.6	10.2	^S 118	
↓	Duplicate	↓	22.4	34.0	11.6	↓	^D 118	—

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)
1155136	50	100	22.4	39.0	16.6	10.2	169

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%)
118	51	102%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
030621.06	Tryon 3	100	39.0	65	17.5	10.2	178
030617.01	TVA SON 101	100	6.5	12.1	5.6		57.1
030619.01	↓	2	100	12.1	17.8	5.7	58.1
030621.06	↓	3	100	17.8	23.4	5.6	57.1
030617.02	TVA SON 111	100	23.5	29.2	5.7		58.1
030619.02	↓	2	100	29.2	34.9	5.7	58.1
030621.07	↓	3	100	40.7	46.3	5.6	57.1

Reviewed by: JJ

Date reviewed: 06-26-03

Total Hardness
(EPA Method 130.2)
 Matrix: Water, MDL = 1.0 mg CaCO₃/L

Analyst CA
 Date analyzed 06-23-03

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
INR078	INSS 092	0.1	10.0	9.9	0.0202	20.2

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS101	40	50	10.0	12.0	2.0	20.2	40.4	101%

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%)
06-17-03A	MHS H ₂ O	50	12.0	16.2	42	20.2	^S 85	
↓	Duplicate	↓	16.2	20.5	43	↓	^D 87	2.3%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO ₃ /L)
INSS101	40	50	20.5	22.4	19	20.2	38

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%)
87	38	95%

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)	50	0.0	0.1	0.1	20.2	2.0
06-17-03 B	MHS H ₂ O	50	22.4	26.5	4.1		83 82.8
06-17-03 C	↓	50	26.5	32.7	4.2		85 84.8
06-21-03 A	↓	50	30.7	34.9	4.2		85 84.8
06-21-03 B	↓	50	34.9	39.0	4.1		83 82.8
	DMEQA cd AC	50	39.0	43.1	4.1		83
	ca ce	50	9.0	13.0	4.0		81
	pp ac	50	13.0	17.1	4.1		83
	pp ce	50	17.1	21.0	3.9		79
	Tryon-comp	50	21.0	22.9	1.9	↓	38

Note: If >15ml of titrant is used, sample must be diluted.

Reviewed by: J

Date reviewed 06-26-03

**Total Hardness
(EPA Method 130.2)**

Matrix: Water, MDL = 1.0 mg CaCO₃/L

Analyst CA
Date analyzed 06-23-03

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 = 0.010 - 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%)
INSS 101	40	50	22.9	25.0	2.1	20.2	42	105%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
030617.03	Tryon 1	50	25.0	27.1	2.1	20.2	^S 42	
↓	Duplicate	50	27.1	29.1	2.0	↓	^D 40	4.9%

Matrix spike recovery: Tryon 2

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO ₃ /L)
INSS 101	40	50	30.9	32.9	2.0	20.2	40

Sample hardness (B) (mg CaCO ₃ /L)	Measured spike value (MV) (mg CaCO ₃ /L) MV = A - B	% R = MV / SV x 100 (acceptable range = 75 to 125%)
36	40	100

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)					20.2	—
030618.10	Tryon 2	50	29.1	30.9	1.8		36
030621.08	↓ 3	50	32.9	34.8	1.9		38
030617.01	TVA SQN 101 1	50	34.8	37.9	3.1		63 62.6
030619.01	↓ 2	50	37.9	41.2	3.3		67 66.7
030621.06	↓ 3	50	41.2	44.3	3.1		63 62.6
030617.02	TVA SQN 1N 1	50	44.3	47.5	3.2		65 64.6
030619.02	↓ 2	50	33.5	36.6	3.1		63 62.6
030621.07	↓ 3	50	36.6	39.7	3.1	↓	63 62.6

Note: If >15ml of titrant is used, sample must be diluted.

Reviewed by: JL

Date reviewed 0306-26-03

**Total Residual Chlorine
(EPA Method 330.5)**

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst CAJ
Date analyzed 06-17-03

Iodide reagent: NR084
Acid reagent: NR083

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 134</u>	<u>INSS 134</u>

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%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.549</u>	<u>109.8%</u>

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{ S - D }{\{(S+D)/2\}} \times 100$ (acceptable range = ± 10%)
<u>030617.03</u>	<u>Tryon WWTP</u>	<u>pale yellow & boiling</u>	<u>S < 0.00195</u>	
<u>↓</u>	<u>Duplicate</u>	<u>particulates</u>	<u>D < 0.00209</u>	<u>-</u>

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<u>< 0.0154</u>
<u>030617.01</u>	<u>NA-SQN 101</u>	<u>no color, fine particles</u>	<u>< 0.0122</u>
<u>030617.02</u>	<u>↓ Intake</u>	<u>no color, fine particles</u>	<u>< 0.019</u>
<u>030616.01</u>	<u>Coenerstone #1</u>	<u>no color, fine particles</u>	<u>< 0.00462</u>
<u>030616.02</u>	<u>↓ 2</u>	<u>no color, fine particles</u>	<u>< 0.00294</u>
<u>030616.03</u>	<u>↓ 3</u>	<u>pale yellow, clear</u>	<u>< 0.00124</u>
<u>030616.04</u>	<u>↓ 4</u>	<u>lt. yellow, fine particles</u>	<u>< 0.00913</u>
		<u>JP</u>	

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%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.544</u>	<u>108.8%</u>

Reviewed by JP
Date reviewed 06-26-03

Total Residual Chlorine
(EPA Method 330.5)
Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model AR25 pH/Ion Meter

Analyst CAH
Date analyzed 06.19.03

Iodide reagent: INR 084
Acid reagent: INR 083

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 134</u>	<u>INSS 134</u>

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%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.521</u>	<u>104.2</u>

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{(S - D)}{((S+D)/2)} \times 100$ (acceptable range = ± 10%)
<u>030618.10</u>	<u>Tryon WWTP</u>	<u>tan floating</u>	<u>S 0.145</u>	
<u>↓</u>	<u>Duplicate</u>	<u>particles</u>	<u>D 0.148</u>	<u>2.05%</u>

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	<u>Blank (should be = < 0.10 mg/L)</u>		<u>0.0214</u>
<u>030619.01</u>	<u>TVA SQN 101</u>	<u>no color, clear</u>	<u>0.00</u>
<u>030619.02</u>	<u>↓ Intake</u>	<u>tan, floating particles</u>	<u>0.0662</u>

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%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.468</u>	<u>93.6%</u>

Reviewed by J
Date reviewed 06-26-03

**Total Residual Chlorine
 (EPA Method 330.5)**

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst KBL
 Date analyzed 06-21-03

Iodide reagent: INR084
 Acid reagent: INR085

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS134</u>	<u>INSS134</u>

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%)
<u>INSS134</u>	<u>0.50</u>	<u>0.502</u>	<u>100.4%</u>

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = ((S - D) / ((S+D)/2)) x 100 (acceptable range = ± 10%)
<u>030621.09</u>	<u>Tryon WWP</u>	<u>pale yellow, clear</u>	<u>S 10.0589</u>	
<u>↓</u>	<u>Duplicate</u>		<u>D 10.0585</u>	<u>-</u>

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	<u>Blank (should be = < 0.10 mg/L)</u>		<u>10.00945</u>
<u>030621.06</u>	<u>TVA-SAN 101</u>	<u>no color, slightly cloudy</u>	<u>10.0121</u>
<u>030621.07</u>	<u>TVA-SAN intake</u>	<u>brown, cloudy, dirt</u>	<u>10.0620</u>
<u>030621.05</u>	<u>Scotland neck</u>	<u>no color, clear</u>	<u>10.0226</u>
<u>030621.01</u>	<u>Express Food</u>	<u>no color, clear, lg flakes</u>	<u>10.00872</u>
<u>030621.02</u>	<u>Quantum - w/o</u>	<u>no color, clear</u>	<u>10.00644</u>
<u>030621.03</u>	<u>Quantum - with</u>	<u>no color, clear</u>	<u>10.00620</u>
<u>030621.04</u>	<u>Progress - Lec</u>	<u>no color, clear</u>	<u>10.00467</u>
<u>030621.08</u>	<u>Tryon PF</u>	<u>pale yellow, clear</u>	<u>10.0592</u>

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%)
<u>INSS134</u>	<u>0.50</u>	<u>0.493</u>	<u>98.6%</u>

Reviewed by JH
 Date reviewed 06-26-03

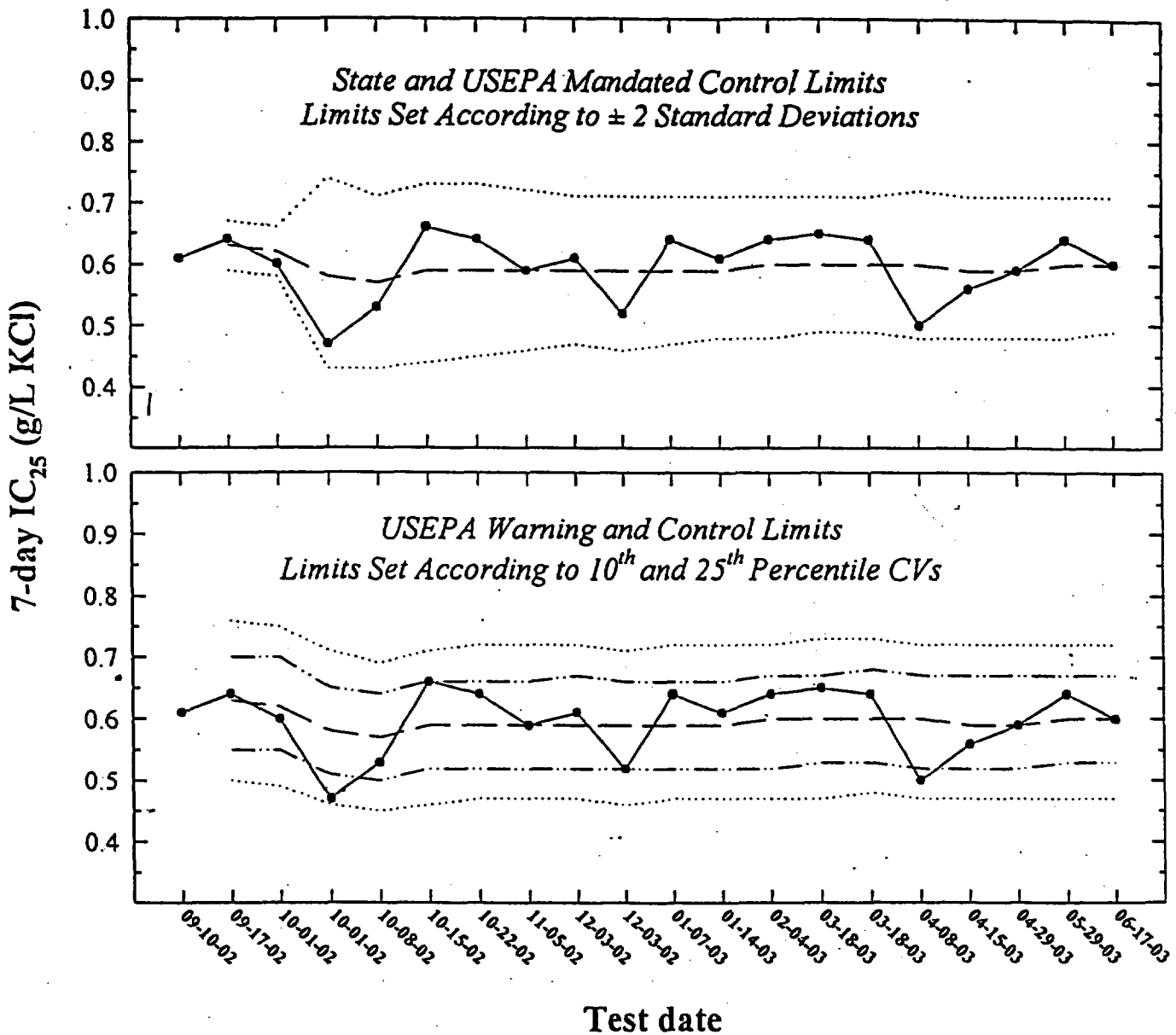
**Sequoyah Nuclear Plant Biomonitoring
June 17 - 24, 2003**

Appendix D

**Reference Toxicant Test and
Control Chart**

Environmental Testing Solutions, LLC

Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water



—●— 7-day IC₂₅ = 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 IC₂₅)
 - · - · - Warning Limits (mean IC₂₅ \pm S_{A,10})
 ····· Control Limits (mean IC₂₅ \pm S_{A,25} or 2 Standard Deviations)

Environmental Testing Solutions, LLC

Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water

Test number	Test date	7-day IC ₂₅ (g KC/L)	CT (g/L KCl)	S	State and USEPA Control Limits		S _{A,10}	Laboratory Warning Limits		S _{A,25}	Laboratory Control Limits		S _{A,75}	USEPA Warning Limits		S _{A,90}	USEPA Control Limits		CV	
					CT - 2S	CT + 2S		CT - S _{A,10}	CT + S _{A,10}		CT - S _{A,25}	CT + S _{A,25}		CT - S _{A,75}	CT + S _{A,75}		CT - S _{A,90}	CT + S _{A,90}		
1	09-10-02	0.61																		
2	09-17-02	0.64	0.63	0.02	0.59	0.67	0.08	0.55	0.70	0.13	0.50	0.76	0.24	0.39	0.87	0.28	0.35	0.91	0.03	
3	10-01-02	0.60	0.62	0.02	0.58	0.66	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.38	0.86	0.28	0.34	0.90	0.03	
4	10-01-02	0.47	0.58	0.08	0.43	0.74	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.80	0.26	0.32	0.85	0.13	
5	10-04-02	0.53	0.57	0.07	0.43	0.71	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.35	0.79	0.26	0.31	0.83	0.13	
6	10-15-02	0.66	0.59	0.07	0.44	0.73	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.12	
7	10-22-02	0.64	0.59	0.07	0.45	0.73	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.12	
8	11-05-02	0.59	0.59	0.06	0.46	0.72	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.11	
9	12-03-02	0.61	0.59	0.06	0.47	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10	
10	12-03-02	0.52	0.59	0.06	0.46	0.71	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.11	
11	01-07-03	0.64	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.72	0.22	0.37	0.82	0.27	0.33	0.86	0.10	
12	01-14-03	0.61	0.59	0.06	0.48	0.71	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10	
13	02-04-03	0.64	0.60	0.06	0.48	0.71	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.10	
14	03-18-03	0.65	0.60	0.06	0.49	0.71	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.09	
15	03-18-03	0.64	0.60	0.06	0.49	0.71	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.09	
16	04-08-03	0.50	0.60	0.06	0.48	0.72	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10	
17	04-15-03	0.56	0.59	0.06	0.48	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10	
18	04-29-03	0.59	0.59	0.06	0.48	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10	
19	05-29-03	0.64	0.60	0.06	0.48	0.71	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.09	
20	06-17-03	0.60	0.60	0.05	0.49	0.71	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.09	

Note: 7-d IC₂₅ = 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 IC₂₅).

S = Standard deviation of the IC₂₅ values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC₂₅ 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)

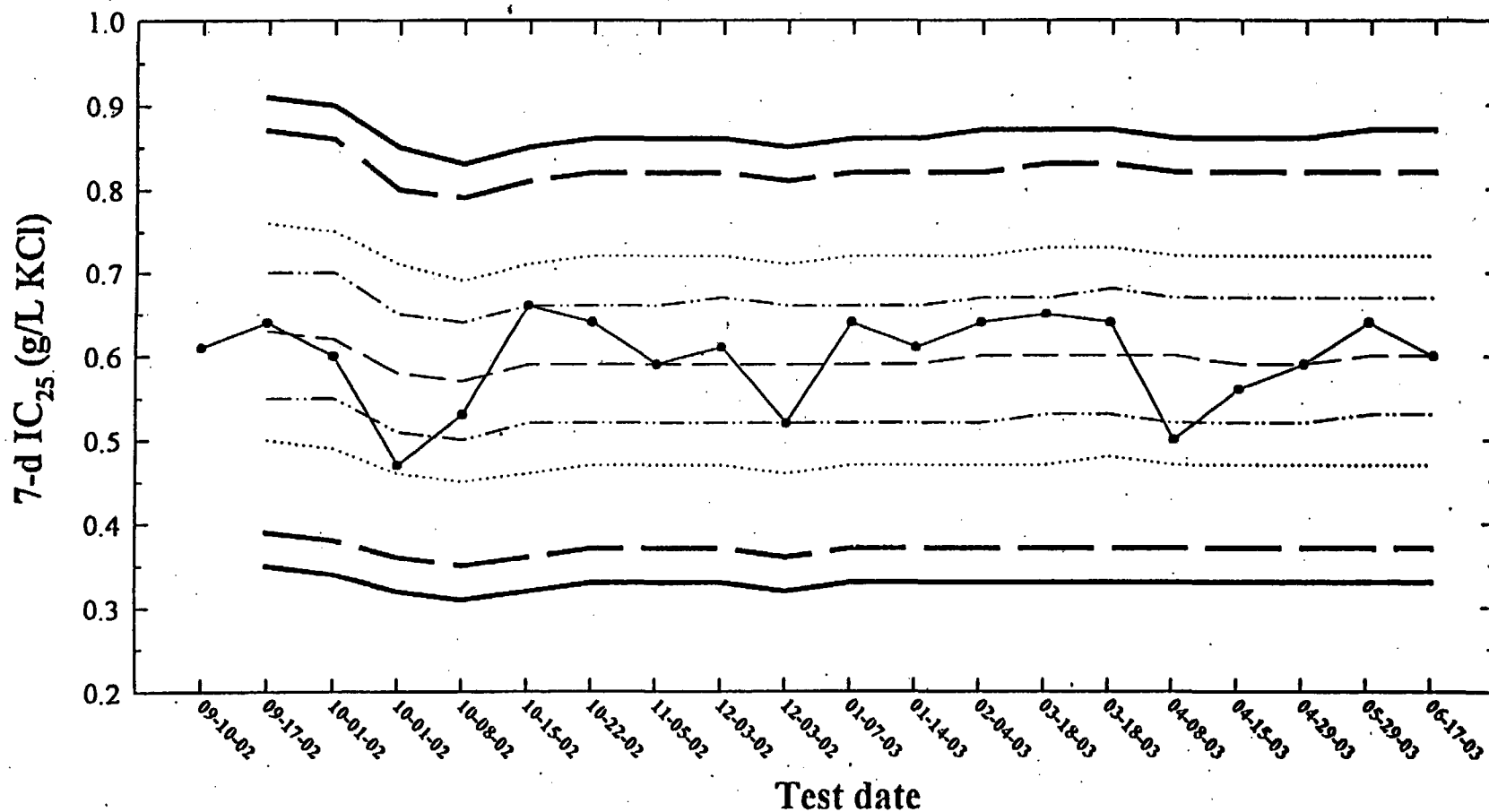
S_{A,90} = Standard deviation corresponding to the 90th percentile CV. (S_{A,90} = 0.45)

CV = Coefficient of variation of the IC₂₅ 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, LLC

Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water



- 7-day IC₂₅ = 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 IC₂₅)
- · — Laboratory Warning Limits (mean IC₂₅ ± S_{A.10}, S_{A.10} = 0.12)
- Laboratory Control Limits (mean IC₂₅ ± S_{A.25}, S_{A.25} = 0.21)
- — — USEPA Warning Limits (mean IC₂₅ ± S_{A.75}, S_{A.75} = 0.38)
- — — USEPA Control Limits (mean IC₂₅ ± S_{A.90}, S_{A.90} = 0.45)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

Potassium Chloride Chronic Reference Toxicant Data for *Pimephales promelas* using Moderately Hard Synthetic Water

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	09-10-02	100	0.854		1.2		0.11	12.5	
2	09-17-02	100	0.824	0.839	13.4	7.3	0.12	14.6	13.6
3	10-01-02	97.5	0.750	0.809	18.4	11.0	0.19	25.4	17.5
4	10-01-02	100	0.975	0.851	12.7	11.4	0.13	12.8	16.3
5	10-08-02	97.5	0.929	0.866	8.0	10.7	0.18	19.5	17.0
6	10-15-02	100	1.037	0.895	16.9	11.8	0.23	21.9	17.8
7	10-22-02	100	0.822	0.884	10.6	11.6	0.13	15.6	17.5
8	11-05-02	100	0.874	0.883	2.8	10.5	0.12	13.8	17.0
9	12-03-02	100	0.852	0.880	9.1	10.3	0.12	13.7	16.6
10	12-03-02	100	0.668	0.858	10.4	10.4	0.15	22.4	17.2
11	01-07-03	100	0.886	0.861	4.1	9.8	0.14	15.7	17.1
12	01-14-03	100	0.677	0.846	3.0	9.2	0.07	11.0	16.6
13	02-04-03	97.5	0.933	0.852	14.1	9.6	0.15	16.5	16.6
14	03-18-03	100	0.838	0.851	8.0	9.5	0.15	18.5	16.7
15	03-18-03	100	0.803	0.848	21.3	10.3	0.21	26.5	17.4
16	04-08-03	100	1.083	0.863	6.1	10.0	0.09	8.0	16.8
17	04-15-03	100	0.892	0.864	17.0	10.4	0.17	18.7	16.9
18	04-29-03	97.5	1.021	0.873	6.7	10.2	0.18	17.5	16.9
19	05-29-03	100	1.005	0.880	7.9	10.1	0.11	11.1	16.6
20	06-17-03	97.5	0.888	0.880	4.2	9.8	0.18	20.7	16.8

Note: CV = Coefficient of variation for control growth.

On average, the CV for control growth is 9.8% in Environmental Testing Solutions, LLC *Pimephales* chronic toxicity tests.

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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.

Upper PMSD bound determined by USEPA (90th percentile) = 35%.

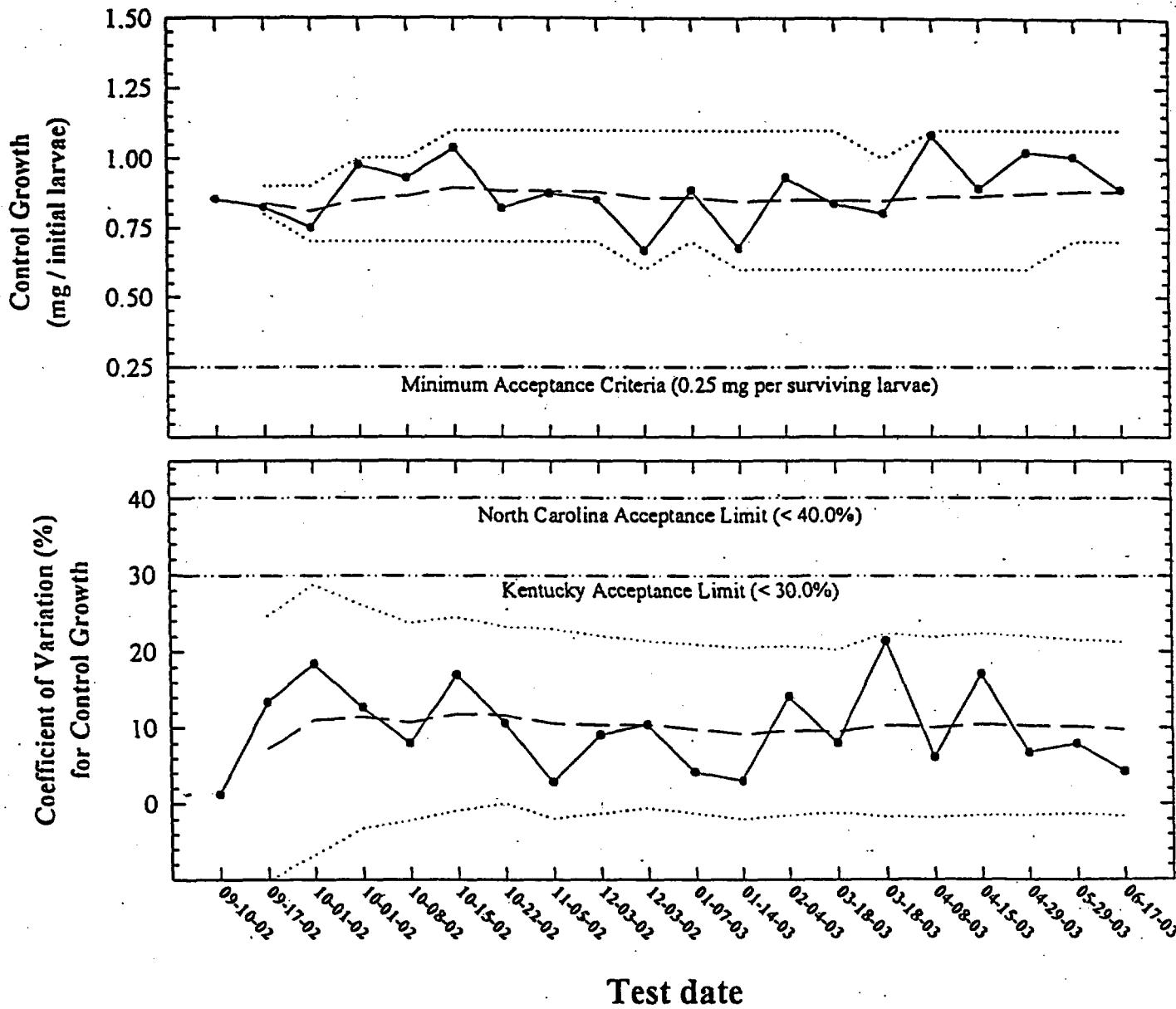
CT = Central Tendency (mean Control Growth, CV, or PMSD)

The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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, LLC

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

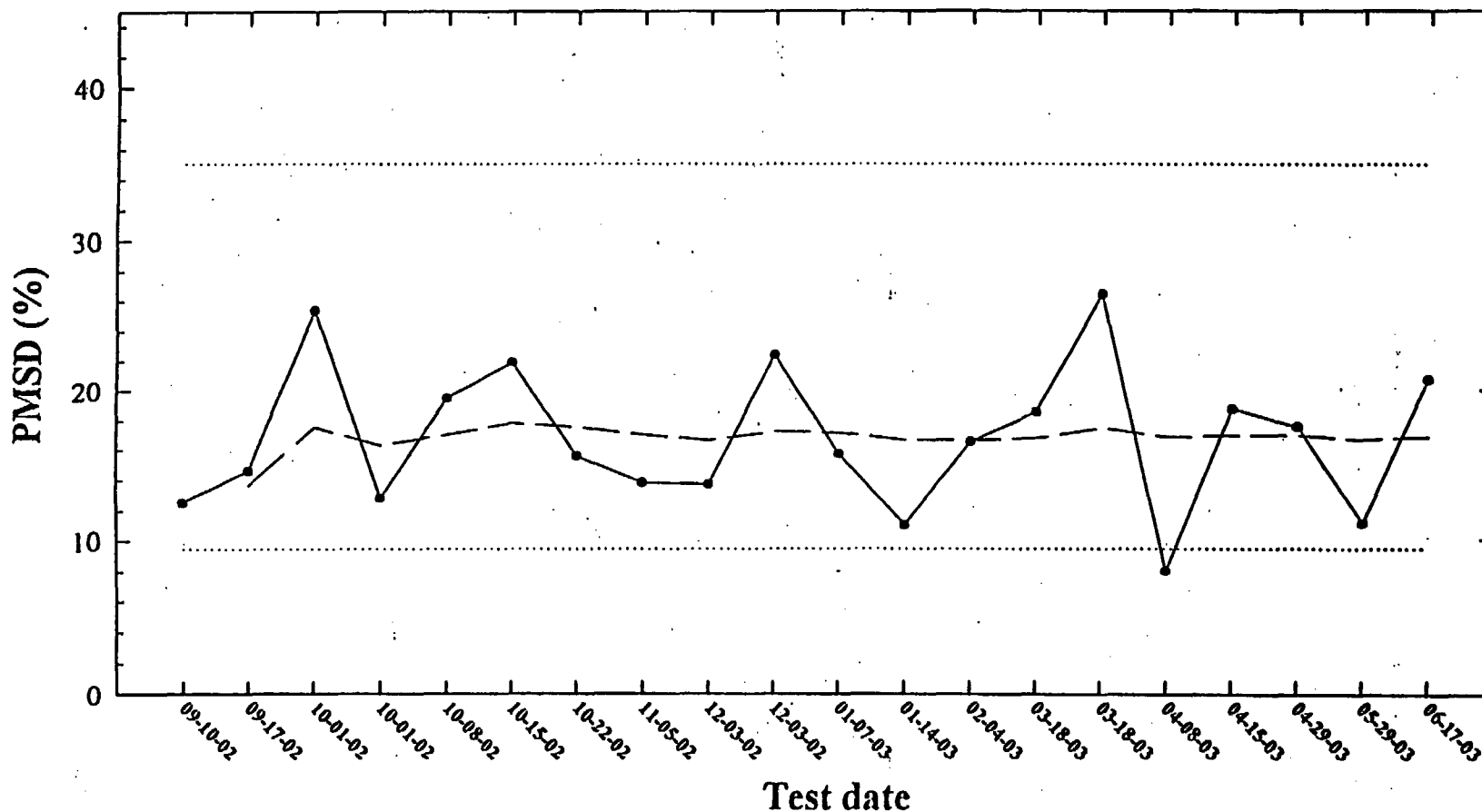


- Control Growth or Coefficient of Variation (CV)
- - - Central Tendency (mean Control Growth or CV)
- Control Limits (mean Control Growth or CV \pm 2 Standard Deviations)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water



—●— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.
- - - Central Tendency (mean PMSD)
..... Lower and Upper PMSD Bounds
Lower PMSD Bound (10th percentile) = 9.4%, Upper PMSD Bound (90th percentile) = 35%
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

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

PpKCICR Test Number: 11

Dilution preparation information:						Comments:
KCl CHM number:	CHM 067					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		Test information:	
Organism age:	26.75 - 28.75 hours (21)	Randomizing template:	RED
Date and times organisms were born between:	06-16-03 1100 TO 1300 MDT	Incubator number:	3
Organism source:	ABS BATCH 06-16-03	Artemia lot number:	860403 G
Transfer bowl information:	pH = 8.00 Temperature = 24.7 °C	Total drying time:	PHK
		Date / Time in:	062403 1520
Average transfer volume:	10.4 mL	Date / Time out:	062503 1030
		Oven temperature:	103°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Analyst
0	06-17-03	— J	1500	1346	06-16-03 MHS	J
1	06-18-03	0900	1500	1300	06-17-03	J
2	06-19-03	0900	1500	1300	06-17-03	J
3	06-20-03	1030	1635	1346	06-17-03	J
4	06-21-03	0900	1500	1320	06-17-03	J
5	06-22-03	0913	1520	1319	06-21-03	J
6	06-23-03	0852	1500	1310	06-21-03	J
7	06-24-03			1340		J

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	2.5%	≤ 20%	7-day LC ₅₀	736.7
Average weight per initial larvae:	0.8878		NOEC	300
Average weight per surviving larvae:	0.9139	≥ 0.25 mg/larvae	LOEC	450
			ChV	367.4
			IC ₂₅	602.2

PpKCICR Test Number: 11

Survival and Growth Data

Day	CONTROL				300 mg KC/L				450 mg KC/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	9 ^d	10	10	10	9 ^d
3	10	9 ^d	10	10	10	10	10	9	10	10	10	9
4	10	9	10	10	10	10	10	9	10	10	10	9
5	10	9	10	10	10	10	10	9	10	9 ^d	10	9
6	10	9	10	10	10	10	10	9	10	9	10	9
7	10	9	10	10	10	10	10	9	10	9	10	9
A = Pan weight (mg) TRAY	15.284	15.160	14.809	14.647	15.106	14.874	14.686	15.047	14.791	14.659	15.303	14.801
B = Pan + Larvae weight (mg)	23.98	24.56	23.69	23.18	22.63	22.36	22.74	21.79	22.89	20.93	22.76	21.01
Larvae weight (mg) = A - B	1.0561	0.9731	0.8894	1.0585	1.0140	0.9885	0.9928	0.8540	1.0044	0.999	0.8877	0.9844

0.0694 0.9400 0.8891 0.8533 0.7524 0.7324 0.7404 0.8054 0.8745 0.8094 0.8271 0.7457 0.8204
 Calculations and data reviewed: *[Signature]*
 8.1694 9.400 8.881 8.533 7.524 7.480 8.084 4.743 8.099 6.271 7.457 6.209

Comments:

PpKCICR Test Number: 11

Survival and Growth Data

Day	600 mg KC/L				750 mg KC/L				900 mg KC/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	9 ^{1d}	8 ^{2d}	10	8 ^{2d}	8 ^{2d}	3 ^{7d}	1 ^{9d}	1 ^{9d}	1 ^{9d}
2	8 ^{2d}	10	10	9	5 ^{3d}	8 ^{2d}	8	6 ^{2d}	2 ^{1d}	1	1	1
3	8^{2d}	10	10	7 ^{8nd}	4 ^{1d}	8	8	4 ^{2d}	2	1	1	1
4	8	10	10	5 ^{3d}	4	7 ^{1d}	7 ^{1d}	4	2	1	1	1
5	8	10	10	5	4	7	7 ^{8nd}	4	2	1	1	1
6	8	10	10	5	4	6 ^{1d}	6	4	2	1	0 ^{1d}	1
7	8	10	10	5	4	6	6	4	2	1	—	1
A = Pan weight (mg)	15.151	14.835	14.766	14.798	15.110	15.098	15.042	14.910	15.053	15.122	—	14.801
B = Pan + Larvae weight (mg)	21.03	22.81	23.41	19.14	17.70	18.37	19.89	17.09	16.52	15.74	—	15.36
Larvae weight (mg) = A - B	0.5874	0.7975	0.8444	0.6914	0.2590	0.3272	0.4016	0.2180	0.1467	0.0613	—	0.0559

Calculations and data reviewed: *[Signature]*
 — Per INITIAL WEIGHT

Comments:

Environmental Testing Solutions, LLC

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

Test number: PpKCICR # 51

Test dates: June 17-24, 2003

Reviewed by: Jumper

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 / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.284	23.980	8.696	0.8696	97.5	0.8878	4.3	Net applicable
	B	10	9	15.160	24.560	9.400	0.9400				
	C	10	10	14.809	23.690	8.881	0.8881				
	D	10	10	14.647	23.180	8.533	0.8533				
300	E	10	10	15.106	22.630	7.524	0.7524	97.5	0.7452	7.2	16.1
	F	10	10	14.874	22.360	7.486	0.7486				
	G	10	10	14.686	22.740	8.054	0.8054				
450	H	10	9	15.047	21.790	6.743	0.6743	95.0	0.7009	13.2	21.0
	I	10	10	14.791	22.890	8.099	0.8099				
	J	10	9	14.659	20.930	6.271	0.6271				
600	K	10	10	15.303	22.760	7.457	0.7457	82.5	0.6710	29.4	24.4
	L	10	9	14.801	21.010	6.209	0.6209				
	M	10	8	15.151	21.030	5.879	0.5879				
	N	10	10	14.835	22.810	7.975	0.7975				
750	O	10	10	14.766	23.410	8.644	0.8644	50.0	0.3223	36.4	63.7
	P	10	5	14.798	19.140	4.342	0.4342				
	Q	10	4	15.110	17.700	2.590	0.2590				
	R	10	6	15.098	18.370	3.272	0.3272				
900	S	10	6	15.042	19.890	4.848	0.4848	10.0	0.0660	91.8	92.6
	T	10	4	14.910	17.090	2.180	0.2180				
	U	10	2	15.053	16.520	1.467	0.1467				
	V	10	1	15.127	15.740	0.613	0.0613				
	W	10	0	0.000	0.000	0.000	0.0000				
	X	10	1	14.801	15.360	0.559	0.0559				

Dunnett's MSD value: 0.1841
 PMSD: 20.7

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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing).

Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.

Upper PMSD bound determined by USEPA (90th percentile) = 35%.

The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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, LLC

Statistical Analyses

Larval Fish Growth and Survival Test 7 Day Survival

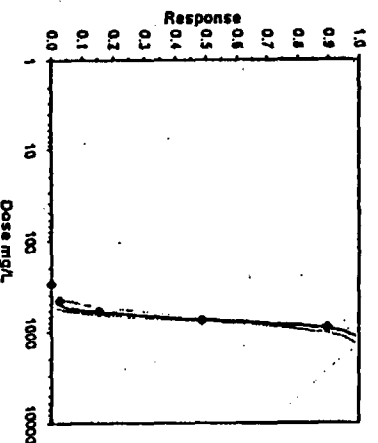
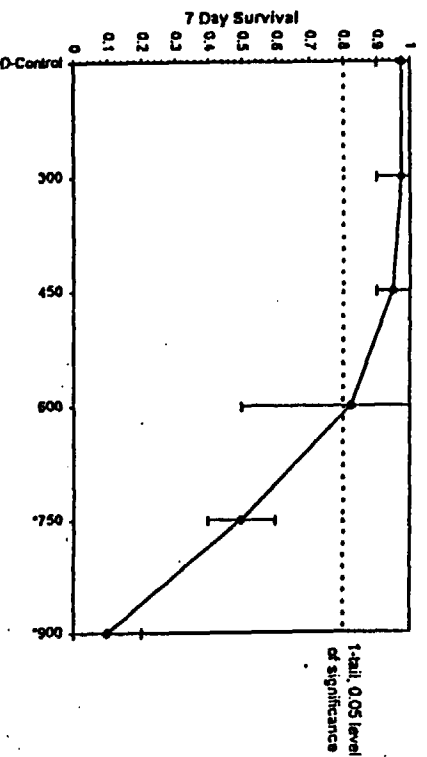
Start Date: 01/20/13 Test ID: PFKICR
 End Date: 07/03/13 Lab ID: ETS-Bov. Testing Solutions
 Sample Date: Protocol: CRONING (EPA-821-R-02-013)
 Comments: Test Specie: *PP-Ferugichthys promelas*
 Reference Treatment: KCl-Potassium chloride
 Reference Treatment: PP-Ferugichthys promelas

Conc-mg/L	Transform: Arcsinh Square Root				N	LSM	L-Tailed Critical	MSD	Number Rep	Total Number
	Mean	N-Mean	Mean	Min						
D-Control	1.0000	0.5000	1.0000	1.0000	40					
300	1.0000	1.0000	1.0000	0.9000	40					
450	1.0000	0.9000	1.0000	0.9000	40					
600	0.8000	0.8000	1.0000	0.9000	40					
750	0.4000	0.6000	0.6000	0.4000	40					
900	0.2000	0.1000	0.0000	0.1000	40					

Auxiliary Tests
 Shapiro-Wilk's Test indicates normal distribution ($p > 0.11$) Statistic: 0.931890067 Critical: 0.884 Sluwer: 0.76534356 Kurt: 1.340949504
 Bartlett's Test indicates equal variances ($p = 0.14$) Statistic: 8.292373657 Critical: 13.08631706
 Hypothesis Test (Lilief, 0.05) NOEC LOEC CNV TU MSDu MSDp MSE MSE F-P-Prob df
 Duplicates Test: 600 750 670.8703932 0.158215764 0.164685239 0.727507143 0.021433798 3.0E-08 5, 18
 Treatments vs D-Control

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Prob	Critical	Pre-value	Mu	Sigma	tcr
			Lower	Upper						
Slope	12.89518778	2.318388761	8.547535664	17.244221178	0.035	1.208930539	7.814726972	0.75	2.86723176	0.07544701
Intercept	-31.97578	6.38054283	-44.4819931	-19.4696638						
TSCR	0.031770836	0.016772867	0.00010397	0.063647636						
F-ratio	95% Fiducial Limits									
EC01	1.674	466.2681328	383.1186616	548.0502718						
EC03	1.335	549.1893128	461.3114678	607.0006752						
EC10	1.718	583.9934329	507.6910213	633.5088092						
EC15	1.964	612.2120114	541.0378473	656.1462229						
EC20	4.128	633.8821102	568.7841983	675.1280313						
EC25	4.336	653.0834138	593.330797	692.286985						
EC40	4.747	704.0863597	637.1836683	740.6047299						
EC30	5.000	706.6879256	695.5037102	775.0073213						
EC60	5.233	770.370724	732.3567234	815.3186902						
EC75	5.674	830.9499493	788.8186136	896.7146961						
EC80	5.842	856.1207614	810.1674501	933.9040839						
EC85	6.036	886.4243628	834.7208564	980.4493315						
EC90	6.282	926.0816561	865.523235	1043.709396						
EC95	6.645	988.146722	911.7407714	1146.996606						
EC99	7.326	1116.009103	1002.401815	1372.207238						

Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test: 7 Day Growth

Start Date: 6/17/03	Test ID: P9KCCR	EEF-Rat Treatment
End Date: 6/24/03	Lab ID: RT5-Env. Testing Solutions	KCL-Potassium chloride
Sample Date:	Protocol: CHRONIC-EPA-611-R-02-013)	PF-Fenpropyltin promethas
Comments:	Test Species:	

Conc-mg/L	1	2	3	4
D-Control	0.6596	0.9400	0.8881	0.8333
300	0.7324	0.7486	0.8034	0.6743
430	0.8099	0.6871	0.7457	0.6309
600	0.5879	0.7975	0.8644	0.4342
730	0.1290	0.1272	0.4848	0.2180
900	0.1467	0.0513	0.0000	0.0359

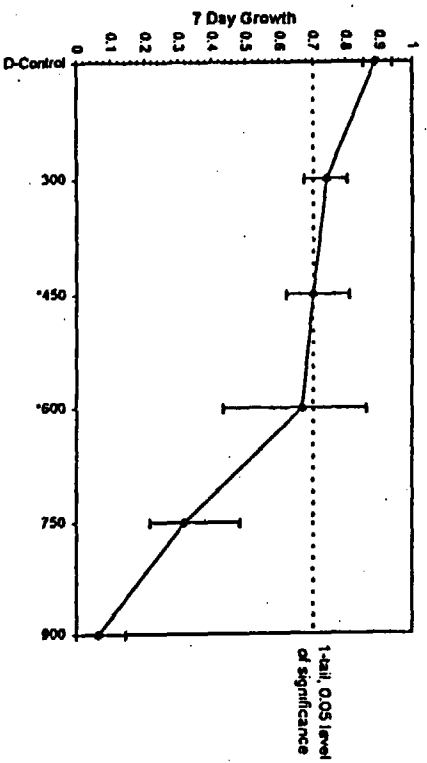
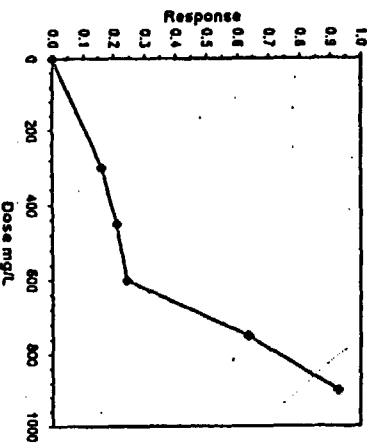
Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	Skat	1-Tailed Critical	MSD	Levene	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8378	1.0000	0.8378	0.8333	0.9400	4.238	4	1.774	2.390	0.1841	0.8378	1.0000
300	0.7452	0.8394	0.7452	0.6743	0.8054	7.233	4	2.374	2.390	0.1841	0.7452	0.8394
*430	0.7009	0.7895	0.7009	0.6709	0.8099	13.214	4	2.696	2.390	0.1841	0.7009	0.7895
*600	0.6710	0.7338	0.6710	0.4342	0.8644	39.334	4			0.1841	0.6710	0.7338
730	0.2723	0.3630	0.2723	0.2180	0.4848	36.417	4				0.2723	0.3630
900	0.0660	0.0743	0.0660	0.0000	0.1467	91.731	4				0.0660	0.0743

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.96798382	0.844	-0.30183013	1.054611001
Bartlett's Test indicates equal variances ($p = 0.05$)	794131108	11.34488201		
Dunnnett's Test	NOEC	LOEC	CV	TU
Treatments vs D-Control	300	430	367.4234614	
			0.184080939	0.207356734
			0.036839111	0.0129234
			0.081833921	1.12

Linear Interpolation (200 Fenpropyltin)

Point	mg/L	SD	95% CLE(Exp)	Skew
IC05*	93.40	20.07	53.25	173.71
IC10*	186.80	39.92	106.51	0.7703
IC15*	280.19	88.40	159.76	796.37
IC20	418.49	108.66	186.08	-0.0163
IC25	602.23	72.70	287.69	660.99
IC40	639.31	22.66	575.95	-1.0307
IC50	697.69	20.49	636.15	771.18

* indicates IC estimate less than the lowest concentration



PpKCICR Test Number: 11

Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.58	7.77	7.61	7.63	7.67
	DO (mg/L)	7.7	7.3	7.6	7.5	7.6	7.5
	Conductivity (µmhos/cm)	306		294		290	
	Alkalinity (mg CaCO ₃ /L)	60		61		—	
	Hardness (mg CaCO ₃ /L)	82		85		—	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
300 mg KCl/L	pH (S.U.)	7.83	7.64	7.80	7.69	7.81	7.73
	DO (mg/L)	7.6	7.3	7.6	7.4	7.9	7.6
	Conductivity (µmhos/cm)	844		856		847	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
450 mg KCl/L	pH (S.U.)	7.85	7.66	7.82	7.72	7.82	7.75
	DO (mg/L)	7.6	7.4	7.7	7.5	8.0	7.5
	Conductivity (µmhos/cm)	1100		1130		1103	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
600 mg KCl/L	pH (S.U.)	7.87	7.70	7.83	7.72	7.84	7.74
	DO (mg/L)	7.6	7.4	7.7	7.4	7.9	7.4
	Conductivity (µmhos/cm)	1373		1381		1376	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
750 mg KCl/L	pH (S.U.)	7.87	7.69	7.84	7.76	7.85	7.77
	DO (mg/L)	7.6	7.4	7.7	7.6	7.9	7.5
	Conductivity (µmhos/cm)	1635		1656		1618	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
900 mg KCl/L	pH (S.U.)	7.87	7.68	7.85	7.78	7.86	7.84
	DO (mg/L)	7.7	7.4	7.8	7.6	7.9	7.5
	Conductivity (µmhos/cm)	1879		1870		1853	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
		Initial	Final	Initial	Final	Initial	Final

Stock
46100

46300

45500

PpKCICR Test Number: 11

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.64	7.41	7.73	7.29	7.73	7.46	7.74	7.48
	DO (mg/L)	7.6	7.0	7.6	6.7	7.6	7.4	7.7	7.7
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO ₃ /L)	—		—		61		—	
	Hardness (mg CaCO ₃ /L)	—		—		85		—	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
300 mg KCl/L	pH (S.U.)	7.77	7.57	7.87	7.52	7.82	7.49	7.76	7.53
	DO (mg/L)	7.7	7.2	7.7	7.2	7.9	7.3	7.8	7.4
	Conductivity (µmhos/cm)	872		864		856		874	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
450 mg KCl/L	pH (S.U.)	7.84	7.59	7.89	7.54	7.84	7.53	7.78	7.57
	DO (mg/L)	7.7	7.3	7.7	7.1	7.8	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1140		1131		1119		1141	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
600 mg KCl/L	pH (S.U.)	7.84	7.60	7.90	7.51	7.86	7.53	7.81	7.59
	DO (mg/L)	7.8	7.3	7.8	6.8	7.9	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1404		1379		1377		1406	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
750 mg KCl/L	pH (S.U.)	7.86	7.68	7.92	7.53	7.86	7.56	7.82	7.62
	DO (mg/L)	7.9	7.2	7.8	6.8	7.9	7.2	8.0	7.5
	Conductivity (µmhos/cm)	1676		1663		1649		1672	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
900 mg KCl/L	pH (S.U.)	7.88	7.67	7.92	7.55	7.86	7.57	7.84	7.63
	DO (mg/L)	7.9	7.4	7.9	7.0	7.9	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1888		1892		1870		1895	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Stock

45100

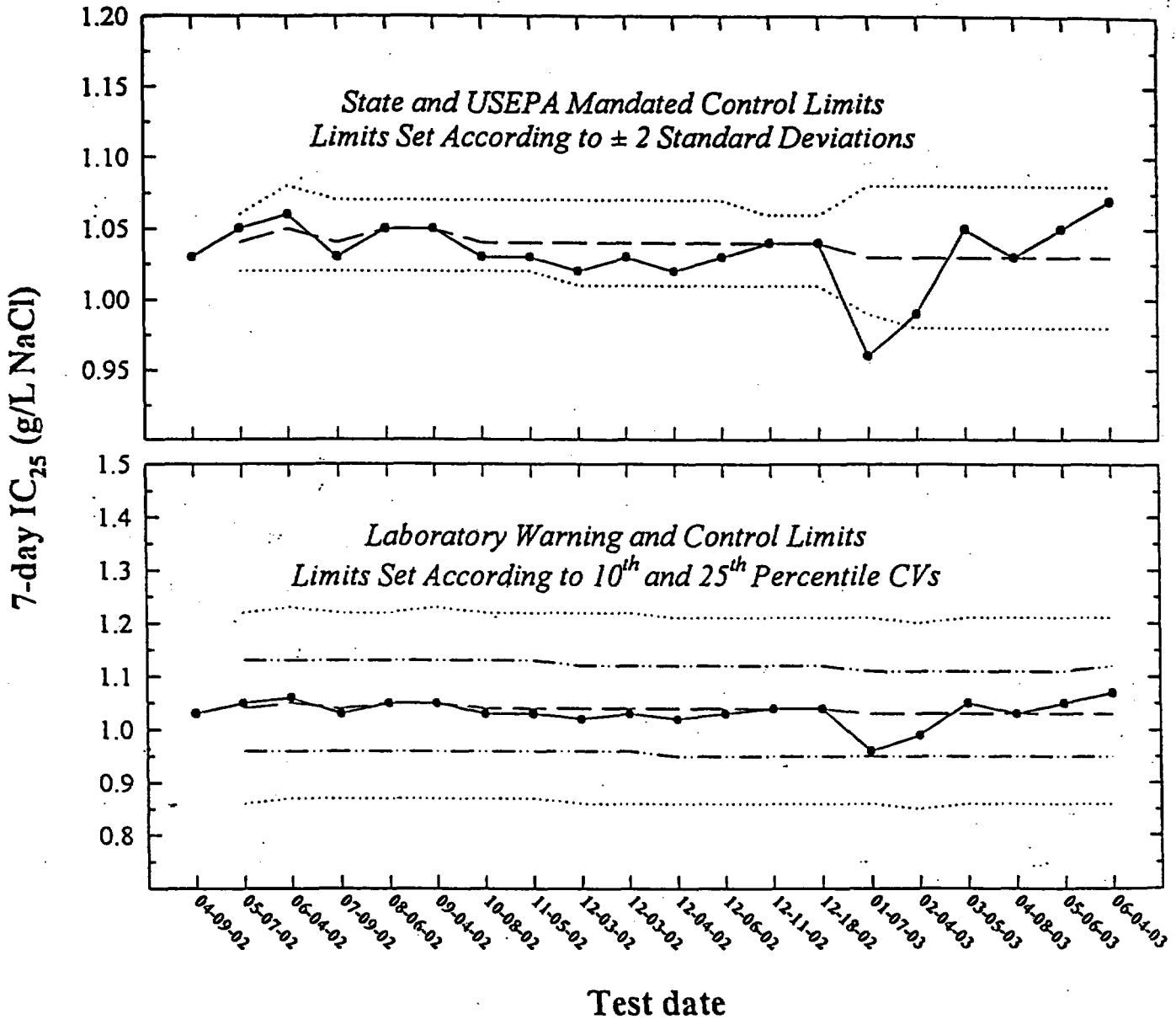
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Environmental Testing Solutions, LLC

Sodium Chloride Chronic Reference Toxicant Control Chart for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water



- 7-day IC₂₅ = 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 IC₂₅)
- · — Warning Limits (mean IC₂₅ ± S_{A,10})
- · · · Control Limits (mean IC₂₅ ± S_{A,25} or 2 Standard Deviations)

Environmental Testing Solutions, LLC

Sodium Chloride Chronic Reference Toxicant Control Chart for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water

Test number	Test date	7-day IC ₂₅ (g NaCl/L)	CT (g/L NaCl)	S	State and USEPA Control Limits		S _{A,10}	Laboratory Warning Limits		S _{A,25}	Laboratory Control Limits		S _{A,75}	USEPA Warning Limits		S _{A,90}	USEPA Control Limits		CV	
					CT - 2S	CT + 2S		CT - S _{A,10}	CT + S _{A,10}		CT - S _{A,25}	CT + S _{A,25}		CT - S _{A,75}	CT + S _{A,75}		CT - S _{A,90}	CT + S _{A,90}		
1	04-09-02	1.03																		
2	05-07-02	1.05	1.04	0.01	1.02	1.06	0.08	0.96	1.13	0.18	0.86	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01	
3	06-04-02	1.06	1.05	0.01	1.02	1.08	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01	
4	07-09-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01	
5	08-06-02	1.05	1.05	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.58	1.52	0.65	0.40	1.70	0.01	
6	09-04-02	1.05	1.05	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01	
7	10-08-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01	
8	11-05-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01	
9	12-03-02	1.02	1.04	0.01	1.01	1.07	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.64	0.40	1.69	0.01	
10	12-03-02	1.03	1.04	0.01	1.01	1.07	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.64	0.39	1.68	0.01	
11	12-04-02	1.02	1.04	0.02	1.01	1.07	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01	
12	12-06-02	1.03	1.04	0.01	1.01	1.07	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01	
13	12-11-02	1.04	1.04	0.01	1.01	1.06	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01	
14	12-18-02	1.04	1.04	0.01	1.01	1.06	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01	
15	01-07-03	0.96	1.03	0.02	0.99	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02	
16	02-04-03	0.99	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.17	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.02	
17	03-05-03	1.05	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.02	
18	04-08-03	1.03	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.02	
19	05-06-03	1.05	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02	
20	06-04-03	1.07	1.03	0.02	0.98	1.08	0.08	0.95	1.12	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02	

Note: 7-d IC₂₅ = 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 IC₂₅).

S = Standard deviation of the IC₂₅ values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC₂₅ 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)

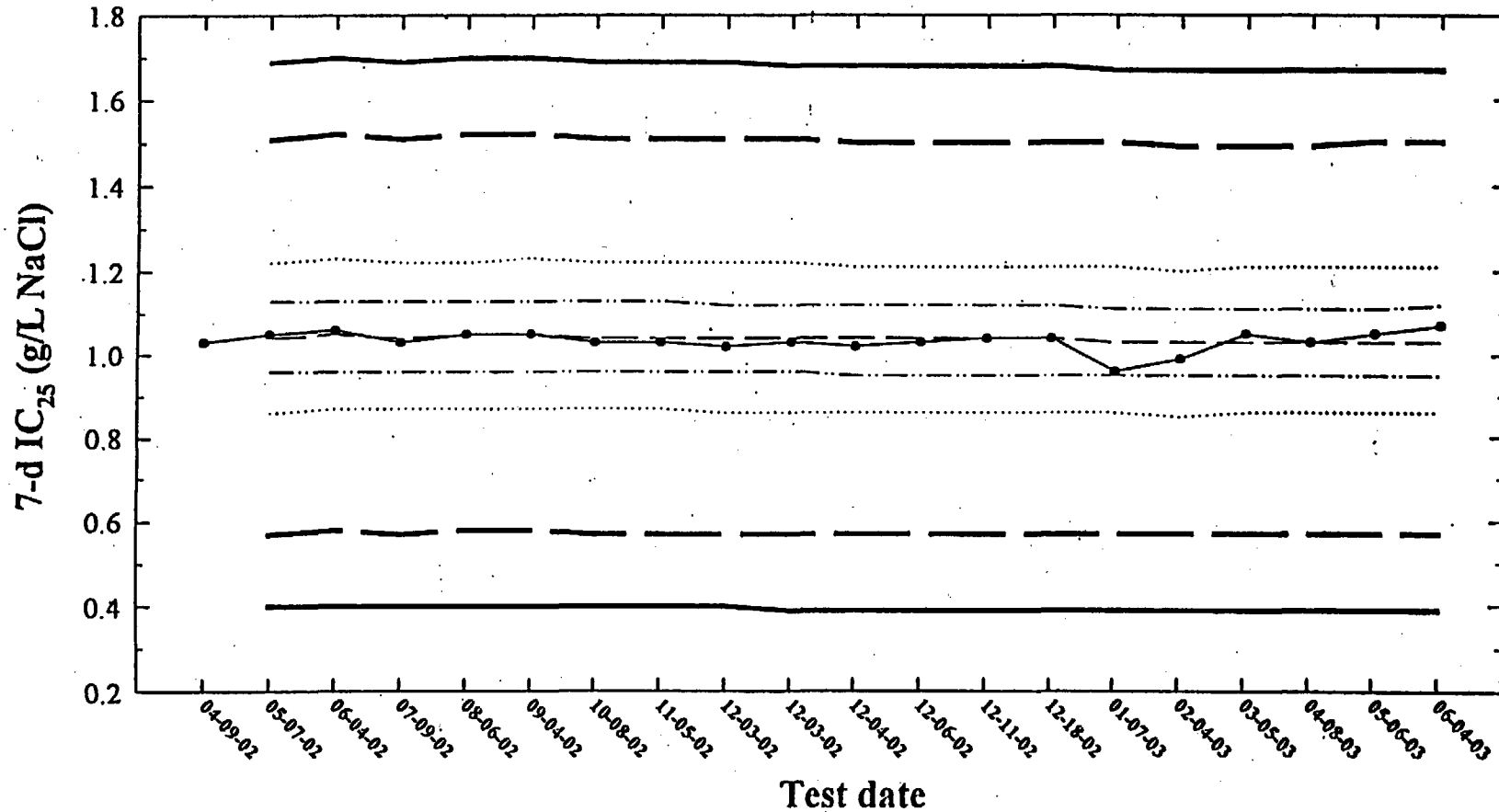
USEPA Control and Warning Limits

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 IC₂₅ values.

Environmental Testing Solutions, LLC
Sodium Chloride Chronic Reference Toxicant Control Chart
for Ceriodaphnia dubia
using Moderately Hard Synthetic Water



- 7-day IC₂₅ = 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 IC₂₅)
- · — Laboratory Warning Limits (mean IC₂₅ ± S_{A,10}, S_{A,10} = 0.08)
- Laboratory Control Limits (mean IC₂₅ ± S_{A,25}, S_{A,25} = 0.17)
- · — USEPA Warning Limits (mean IC₂₅ ± S_{A,75}, S_{A,75} = 0.45)
- — USEPA Control Limits (mean IC₂₅ ± S_{A,90}, S_{A,90} = 0.62)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

Sodium Chloride Chronic Reference Toxicant Data for *Ceriodaphnia dubia* 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	04-09-02	100	26.2		8.6		2.8	10.7	
2	05-07-02	100	27.3	26.8	12.3	10.5	2.3	8.4	9.5
3	06-04-02	100	26.0	26.5	8.1	9.7	3.8	14.7	11.2
4	07-09-02	100	29.5	27.3	9.9	9.7	3.5	11.7	11.4
5	08-06-02	100	28.4	27.5	8.0	9.4	2.7	9.5	11.0
6	09-04-02	100	31.4	28.1	10.4	9.6	3.0	9.5	10.7
7	10-08-02	100	31.1	28.6	6.7	9.2	2.9	9.4	10.5
8	11-05-02	100	29.5	28.7	9.2	9.2	2.5	8.4	10.3
9	12-03-02	90	34.0	29.3	8.0	9.0	2.7	8.0	10.0
10	12-03-02	100	33.2	29.7	6.2	8.7	3.3	9.9	10.0
11	12-04-02	100	32.5	29.9	6.0	8.5	3.2	9.8	10.0
12	12-06-02	100	29.7	29.9	11.0	8.7	3.0	10.0	10.0
13	12-11-02	100	33.8	30.2	13.7	9.1	2.9	8.5	9.9
14	12-18-02	100	30.5	30.2	7.4	9.0	2.9	9.4	9.8
15	01-07-03	100	33.2	30.4	7.0	8.8	2.9	8.6	9.8
16	02-04-03	100	32.3	30.5	8.1	8.8	2.7	8.4	9.7
17	03-05-03	100	28.7	30.4	5.1	8.6	3.5	12.1	9.8
18	04-11-03	100	26.3	30.2	6.2	8.4	2.5	9.6	9.8
19	05-06-03	100	27.6	30.1	10.8	8.6	3.2	11.5	9.9
20	06-04-03	100	25.9	29.9	5.9	8.4	2.6	10.1	9.9

Note: CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 8.4% in Environmental Testing Solutions, LLC *Ceriodaphnia* chronic.
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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 11%.

Upper PMSD bound determined by USEPA (90th percentile) = 37%.

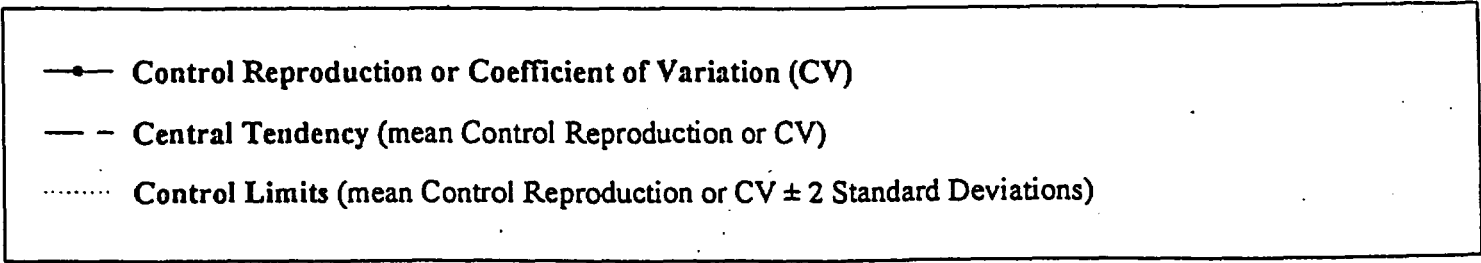
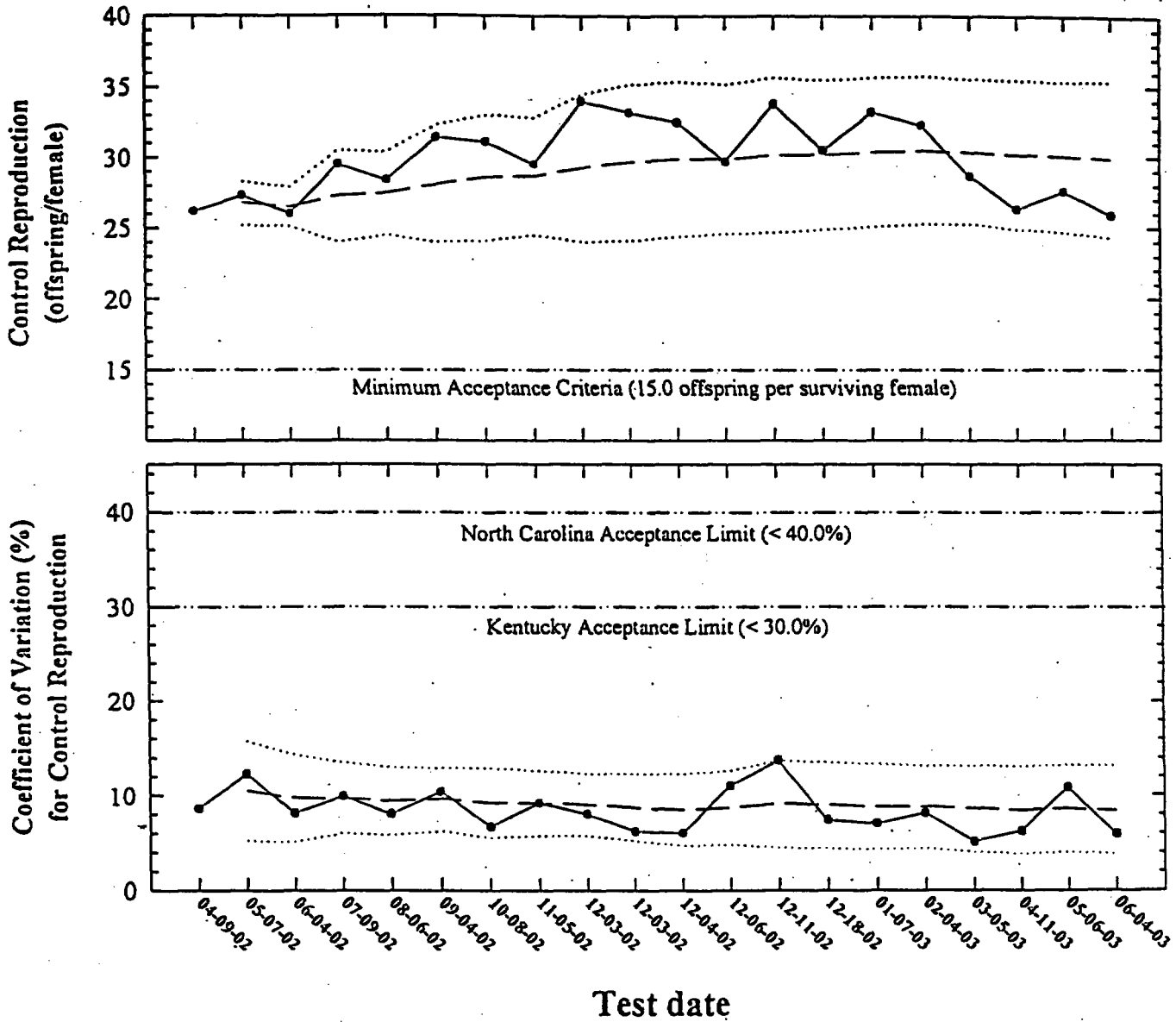
CT = Central Tendency (Mean Control Reproduction, CV, or PMSD)

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

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.

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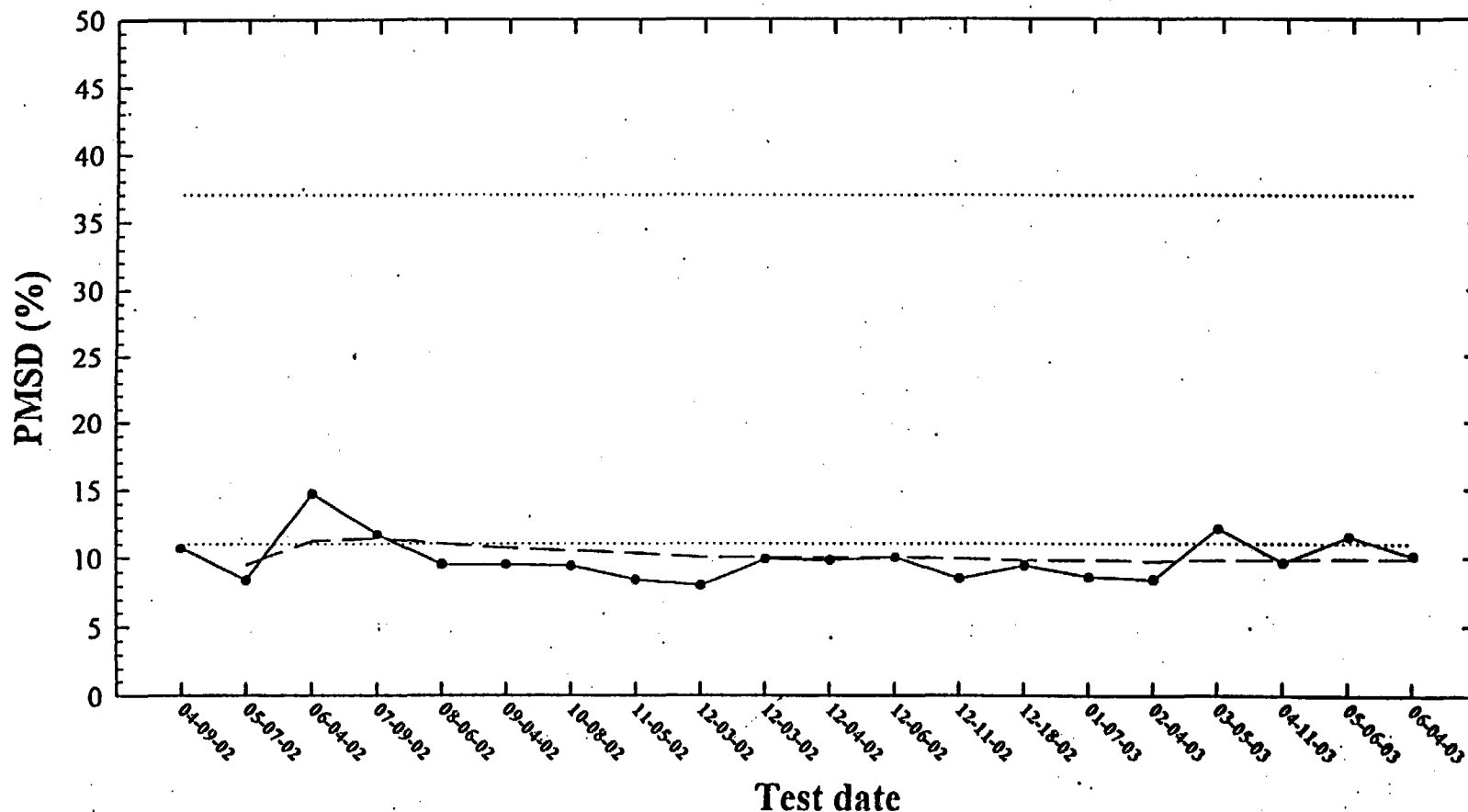
Ceriodaphnia dubia Control Reproduction and Coefficient of Variation in Sodium Chloride Chronic Reference Toxicant Tests



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Precision of Endpoint Measurements

Sodium Chloride Chronic Reference Toxicant Control Chart
for *Ceriodaphnia dubia*
using Moderately Hard Synthetic Water



—●— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.
- - - Central Tendency (mean PMSD)
..... Lower and Upper PMSD Bounds
Lower PMSD Bound (10th percentile) = 11%, Upper PMSD Bound (90th percentile) = 37%
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

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

CdNaCLCR #: 11

Dilution preparation information:						Comments:
NaCl CHM number:		CHM 060				
Stock preparation:		100 g NaCl (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 information:		Test information:	
Organism age:	< 24-Hours Old	Randomizing template:	BWE
Date and times organisms were born between:	06-03-03 1458 TO 1734 06-04-03 0811 TO 1020	Incubator number and shelf location:	B1
Organism source:	05-27-03 A-D	YCT batch:	ABS 05-23-03
Transfer bowl information:	pH = 8.03 Temperature = 24.9	Selenastrum batch:	PES 05-23-03

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Analyst
0	06-04-03	1310	06-03-03	JF
1	06-05-03	1300	06-04-03	JF
2	06-06-03	1311	06-04-03	JF
* 3	06-07-03	0916	06-04-03	JF
* 4	06-08-03	1926	06-04-03	JF
5	06-09-03	1322	06-04-03	JF
6	06-10-03	1300	06-04-03	JF
7	06-11-03	1253	— JF	JF

* test was not renewed within 1-hour of initiation due to a scheduling conflict.

Control information:		Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 1400
% Adults having 3 rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	25.9	≥ 15.0 offspring/female	ChV	894.4
% CV:	5.9%	< 40.0 %	IC25	1068.6

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 11

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	3	3	4	4	4	3	4	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	11	11	12	10	10	11	8	10	10
	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	11	12	11	11	11	14	13	14	10	12
Total young produced		23	26	26	27	25	27	28	27	24	26
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 rd Broods		X	X	X	X	X	X	X	X	X	X

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	259

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	5	4	4	4	3	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	10	8	10	10	11	10	12	10
	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	10	10	12	11	14	10	11	11	13
Total young produced		32	27	24	24	25	27	25	25	27	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	263
% Reduction from Control:	-15%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 11

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	3	3	5	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	10	7	12	10	11	11	13	10
	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	10	13	11	15	10	12	12	10	9
Total young produced		25	24	27	21	30	25	27	26	27	23
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	25.6
% Reduction from Control:	1.2%

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	3	3	4	4	2	3	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	10	10	8	10	9	12	9	7
	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	8	13	10	12	10	10	10	11	14
Total young produced		24	22	26	24	24	22	22	26	24	25
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	23.9
% Reduction from Control:	7.7

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 11

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	2	0	4	4	0	3	3	4	2	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	4	7	10	3	8	0	10	10	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	4	1	0	0	0	0	8	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	3	0	5	2	1	0	0	5
Total young produced		6	5	14	14	8	13	12	14	12	15
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	11.3
% Reduction from Control:	56.4%

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	1	3	2	3	2	3	2	4	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	0	6	0	5	6	1	5	0	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	2	2	7	1	0	0	3	6	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	3	0	0	0	0
Total young produced		5	5	10	10	8	12	3	12	9	10
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	8.4
% Reduction from Control:	67.1%

Environmental Testing Solutions, LLC

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: CdNaCICR #40
Test dates: June 4-11, 2003

Received by: *J. Moore*

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	23	26	26	27	25	27	28	27	24	26	100	25.9	5.9	Not applicable
600	32	27	24	24	25	27	25	25	27	27	100	26.3	9.0	-1.5
800	25	24	27	21	30	25	27	27	27	23	100	25.6	10.0	1.2
1000	24	22	26	24	24	22	22	26	24	25	100	23.9	6.4	7.7
1200	6	5	14	14	8	13	12	14	12	15	100	11.3	32.1	56.4
1400	5	5	10	10	8	12	3	12	9	10	100	8.4	36.9	67.6

Dunnett's MSD value: 2.621
PMSD: 10.1

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. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 11%.

Upper PMSD bound determined by USEPA (90th percentile) = 37%.

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

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, LLC

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	3	3	4	4	4	3	4	5	4	4	38
5	9	11	11	12	10	10	11	8	10	10	102
6	0	0	0	0	0	0	0	0	0	0	0
7	11	12	11	11	11	14	13	14	10	12	119
Total	23	26	26	27	25	27	28	27	24	26	259

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	3	3	4	4	2	3	4	4	4	35
5	10	11	10	10	8	10	9	12	9	7	96
6	0	0	0	0	0	0	0	0	0	0	0
7	10	8	13	10	12	10	10	10	11	14	108
Total	24	22	26	24	24	22	22	26	24	25	239

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	5	4	4	4	3	4	4	4	4	40
5	13	12	10	8	10	10	11	10	12	10	106
6	0	0	0	0	0	0	0	0	0	0	0
7	15	10	10	12	11	14	10	11	11	13	117
Total	32	27	24	24	25	27	25	25	27	27	263

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	2	0	4	4	0	3	3	4	2	4	26
5	0	4	7	10	3	8	0	10	10	6	58
6	4	1	0	0	0	0	8	0	0	0	13
7	0	0	3	0	5	2	1	0	0	5	16
Total	6	5	14	14	8	13	12	14	12	15	113

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	3	3	5	4	4	4	4	40
5	10	10	10	7	12	10	11	11	13	10	104
6	0	0	0	0	0	0	0	0	0	0	0
7	10	10	13	11	15	10	12	12	10	9	112
Total	25	24	27	21	30	25	27	27	27	23	256

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	1	3	2	3	2	3	2	4	3	3	26
5	4	0	6	0	5	6	1	5	0	7	34
6	0	2	2	7	1	0	0	3	6	0	21
7	0	0	0	0	0	3	0	0	0	0	3
Total	5	5	10	10	8	12	3	12	9	10	84

Environmental Testing Solutions, LLC

Statistical Analyses

Cardelaphis Survival and Reproduction Test: Reproduction

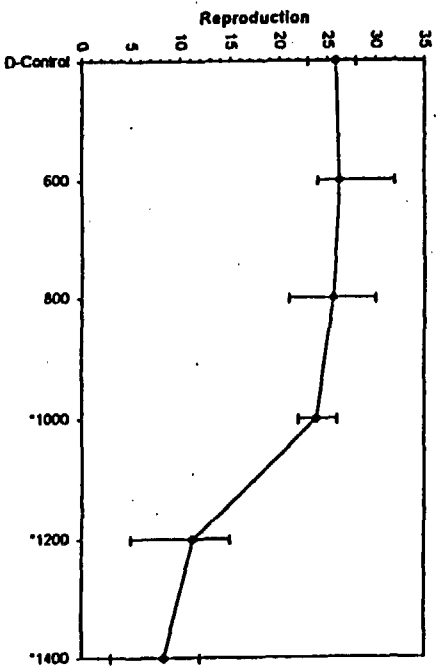
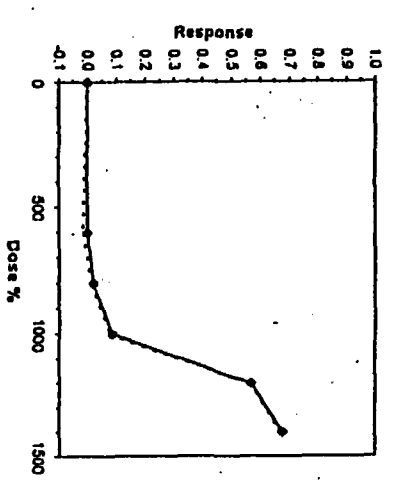
Start Date: 6/4/03 Test ID: CAN-CCR REF-Rat Toxicant
 End Date: 6/11/03 Lab ID: ETS-Env Testing Solutions NACL Sodium chloride
 Sample Date Protocol: CHRONIC (EPA-821-R-02-013) Test Species: CD-Cardelaphis dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	21,000	26,000	26,000	27,000	25,000	27,000	28,000	27,000	24,000	26,000
600	32,000	27,000	24,000	24,000	25,000	27,000	25,000	23,000	27,000	27,000
800	25,000	24,000	27,800	21,000	30,000	25,000	27,000	27,000	27,000	21,000
1000	24,000	22,000	26,000	24,000	24,000	22,000	26,000	24,000	24,000	25,000
1200	6,000	5,000	14,000	14,000	8,000	13,000	12,000	14,000	12,000	15,000
1400	5,000	5,000	10,000	10,000	8,000	12,000	12,000	12,000	9,000	10,000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Mean	N-Mean
			Mean	Min	Max	CV%	N				
D-Control	25,900	1,0000	25,900	23,000	23,000	28,000	3,884	10	103.50	26,100	1,0000
600	26,300	1,0154	26,300	24,000	32,000	8,971	10	102.00	75.00	26,100	1,0000
800	25,600	0,9884	25,600	21,000	30,000	9,931	10	72.50	75.00	25,600	0,9808
1000	23,900	0,9728	23,900	22,000	26,000	6,376	10	55.00	75.00	23,900	0,9157
1200	11,300	0,4363	11,300	5,000	15,000	32,037	10	55.00	75.00	11,300	0,4130
1400	8,400	0,3243	8,400	3,000	12,000	36,886	10	55.00	75.00	8,400	0,3218

Auxiliary Tests
 Kolmogorov D Test indicates non-normal distribution (p <= 0.01)
 Bartlett's Test indicates equal variances (p = 0.07)
 Hypothesis Test (1-tail, 8.05)
 Student's Many-One Rank Test
 Treatments vs D-Control

Point	%	SD	95% CL	Skew	Kurt
IC03	894.703882	80.1969472	704.731793	1005.58276	-1.0173
IC10	1006.50794	27.9708697	909.763158	1023.90205	-2.2883
IC15	1027.22222	8.67486762	1007.94967	1043.98612	0.0354
IC20	1047.93631	8.5336821	1029.73966	1065.08412	0.1383
IC25	1068.65079	8.840911	1050.73864	1087.31222	0.1735
IC40	1130.79363	11.8651207	1108.8382	1154.53188	0.1560
IC50	1172.22222	13.6686963	1146.73334	1192.57609	0.3500



Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only. **Ceriodaphnia Survival and Reproduction Test-Reproduction**

Start Date: 6/4/03	Test ID: CdNaCICR	Sample ID: REF-Ref Toxicant
End Date: 6/11/03	Lab ID: ETS-Env. Testing Solutions	Sample Type: NaCl-Sodium chloride
Sample Date:	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species: CD-Ceriodaphnia dubia

Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	23.000	26.000	26.000	27.000	25.000	27.000	28.000	27.000	24.000	26.000
600	32.000	27.000	24.000	24.000	25.000	27.000	25.000	25.000	27.000	27.000
800	25.000	24.000	27.000	21.000	30.000	25.000	27.000	27.000	27.000	23.000
1000	24.000	22.000	26.000	24.000	24.000	22.000	22.000	26.000	24.000	25.000
1200	6.000	5.000	14.000	14.000	8.000	13.000	12.000	14.000	12.000	15.000
1400	5.000	5.000	10.000	10.000	8.000	12.000	3.000	12.000	9.000	10.000

Conc-%	Transform: Untransformed							I-Tailed		
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	25.900	1.0000	25.900	23.000	28.000	5.884	10			
600	26.300	1.0154	26.300	24.000	32.000	8.971	10	-0.349	2.287	2.621
800	25.600	0.9884	25.600	21.000	30.000	9.951	10	0.262	2.287	2.621
1000	23.900	0.9228	23.900	22.000	26.000	6.376	10	1.745	2.287	2.621
*1200	11.300	0.4363	11.300	5.000	15.000	32.057	10	12.736	2.287	2.621
*1400	8.400	0.3243	8.400	3.000	12.000	36.886	10	15.266	2.287	2.621

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)					1.04293382	1.035	-0.40063805	0.21968436			
Bartlett's Test indicates equal variances (p = 0.07)					10.2440815	15.0863171					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnnett's Test		1000	1200	1095.44512	0.1	2.62127616	0.10120757	661.986667	6.57037037	4.1E-26	5, 54
Treatments vs D-Control											

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 11

Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.79	7.76	7.74	7.84	7.82	7.85
	DO (mg/L)	7.8	7.7	8.2	7.6	7.7	7.8
	Conductivity (µmhos/cm)	313		311		291	
	Alkalinity (mg CaCO ₃ /L)	59		—		—	
	Hardness (mg CaCO ₃ /L)	86		—		—	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
600 mg NaCl/L	pH (S.U.)	7.78	7.77	7.77	7.89	7.83	7.88
	DO (mg/L)	8.3	7.7	8.0	7.8	8.1	7.8
	Conductivity (µmhos/cm)	1440		1432		1401	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
800 mg NaCl/L	pH (S.U.)	7.80	7.79	7.78	7.90	7.84	7.89
	DO (mg/L)	8.1	7.8	8.2	8.0	8.0	7.8
	Conductivity (µmhos/cm)	1797		1802		1774	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1000 mg NaCl/L	pH (S.U.)	7.78	7.81	7.79	7.88	7.84	7.91
	DO (mg/L)	8.0	7.8	8.2	7.8	8.1	7.8
	Conductivity (µmhos/cm)	2163		2173		1774 ^{ca}	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1200 mg NaCl/L	pH (S.U.)	7.80	7.80	7.80	7.88	7.85	7.91
	DO (mg/L)	8.1	7.8	8.2	7.8	8.2	7.8
	Conductivity (µmhos/cm)	2513		2509		2451	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1400 mg NaCl/L	pH (S.U.)	7.80	7.80	7.80	7.88	7.85	7.92
	DO (mg/L)	8.4	7.8	8.4	8.0	8.2	7.8
	Conductivity (µmhos/cm)	2812		2825		2760	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
		Initial	Final	Initial	Final	Initial	Final

stock

76000

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 11

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.80	7.78	7.82	8.16	7.75	8.10	7.78	7.86
	DO (mg/L)	7.7	7.8	7.7	7.7	7.8	8.0	7.8	8.2
	Conductivity (µmhos/cm)	296		300		308		311	
	Alkalinity (mg CaCO ₃ /L)	—		—		—		—	
	Hardness (mg CaCO ₃ /L)	—		—		—		—	
	Temperature (°C)	25.1	24.7	25.0	24.8	25.2	24.4	25.1	24.3
600 mg NaCl/L	pH (S.U.)	7.81	7.78	7.83	8.33	7.93	8.10	7.83	7.96
	DO (mg/L)	7.7	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	1409		1400		1392		1400	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
800 mg NaCl/L	pH (S.U.)	7.81	7.79	7.83	8.34	7.93	8.11	7.83	7.95
	DO (mg/L)	7.8	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	1776		1770		1755		1760	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1000 mg NaCl/L	pH (S.U.)	7.81	7.79	7.83	8.36	7.96	8.11	7.85	7.94
	DO (mg/L)	7.8	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	2050		2040		2101		2100	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1200 mg NaCl/L	pH (S.U.)	7.82	7.79	7.83	8.38	7.94	8.11	7.85	7.93
	DO (mg/L)	7.8	7.8	7.8	7.7	7.6	7.9	7.8	8.2
	Conductivity (µmhos/cm)	2470		2460		2444		2440	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1400 mg NaCl/L	pH (S.U.)	7.82	7.79	7.84	8.36	7.96	8.11	7.85	7.93
	DO (mg/L)	7.8	7.8	7.8	7.7	7.6	7.9	7.8	8.1
	Conductivity (µmhos/cm)	2800		2770		2757		2760	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
		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**

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

MAJOR
 (SUBR 01)

Form Approved.
 OMB No. 2040-0004

TN0026450 **103 G**
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL
 LOW VOL. WASTE TREATMENT POND
 EFFLUENT

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
03	06	01	03	06	30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	X	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.2	*****	8.9	12	0	12 / 30	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	113	140	26	*****	10	12	19	0	4 / 30	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	<57	<61	26	*****	<5	<5	19	0	4 / 30	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	1.232	1.453	03	*****	*****	*****	**	0	30 / 30	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	**		DAILY	TOTAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	<i>Stephanie A. Howard</i> Acting Environmental Supervisor	TELEPHONE		DATE		
			423	843-6700	03	07	14
		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**

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

MAJOR
 (SUBR 01)

Form Approved.
 OMB No. 2040-0004

TN0026450 **107 G**
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL
 METAL CLEANING WASTE POND
 EFFLUENT

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
03	06	01	03	06	30

From

To

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT <i>Stephanie A. Howard</i> Acting Environmental Supervisor	TELEPHONE		DATE		
			AREA CODE	NUMBER	YEAR	MO	DAY
			423	843-6700	03	07	14

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

No phosphorous bearing cleaning solutions were used. 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

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

TN0026450 110 G
 PERMIT NUMBER DISCHARGE NUMBER

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

Form Approved.
 OMB No. 2040-0004

MONITORING PERIOD
 YEAR MO DAY YEAR MO DAY
 From 03 06 01 To 03 06 30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	SAMPLE MEASUREMENT	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	15 DAILY MX	MG/L		DAILY	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
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00665 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 Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	<i>Stephanie A. Howard</i> Acting Environmental Supervisor	TELEPHONE		DATE		
			423	843-6700	03	07	14
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

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

MAJOR (SUBR 01)
 F - FINAL
 BACKWASH
 EFFLUENT

Form Approved.
 OMB No. 2040-0004

TN0026450 116 G
 PERMIT NUMBER DISCHARGE NUMBER


MONITORING PERIOD
 From 03 06 01 To 03 06 30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	SAMPLE MEASUREMENT	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 / 30	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 / 30	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 Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	 Acting Environmental Supervisor	TELEPHONE		DATE		
			423	843-6700	03	07	14
		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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

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

MAJOR (SUBR 01)
 F - FINAL
 BACKWASH
 EFFLUENT

Form Approved.
 OMB No. 2040-0004

TN0026450 117 G
 PERMIT NUMBER DISCHARGE NUMBER

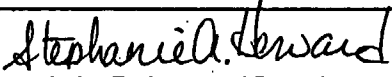
MONITORING PERIOD
 From 03 06 01 To 03 06 30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER	X	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 / 30	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 / 30	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 Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	 Acting Environmental Supervisor	TELEPHONE		DATE		
			423	843-6700	03	07	14
		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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

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

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

Form Approved.
 OMB No. 2040-0004

TN0026450 118 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From

YEAR	MO	DAY
03	06	01

 To


YEAR	MO	DAY
03	06	30

*** NO DISCHARGE ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	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.	 Acting Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
			423	843-6700	03	07	14
			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.