



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

June 9, 2004

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
MAY 2004

Enclosed is the May 2004 Discharge Monitoring Report for Sequoyah Nuclear Plant.
Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

A handwritten signature in cursive script that reads "Stephanie A. Howard".

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
J. Randy Douet
Site Vice President
Sequoyah Nuclear Plant

Enclosure

cc (Enclosure):

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

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

IE25

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

DIFFUSER DISCHARGE

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0026450

101 G

PERMIT NUMBER

DISCHARGE NUMBER

MONITORING PERIOD

YEAR	MO	DAY	YEAR	MO	DAY
04	05	01	04	05	31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	27.6	04	0	31 / 31	MODEL
00010 Z 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ.
INSTREAM MONITORING											
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	39.5	04	0	31 / 31	RCORDR
00010 1 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	*****	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ.
EFFLUENT GROSS VALUE											
PH	SAMPLE MEASUREMENT	*****	*****	**	7.0	*****	7.3	12	0	8 / 31	GRAB
00400 1 0 0	PERMIT REQUIREMENT	*****	*****	***	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	7	9	19	0	4 / 31	GRAB
00530 1 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	<5	<5	19	0	4 / 31	GRAB
00556 1 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	*****	1573	03	*****	*****	*****	**	0	31 / 31	RCORDR
50050 1 0 0	PERMIT REQUIREMENT	*****	REPORT DAILY MX	MGD	*****	*****	*****	***		CONTINUOUS	RCORDR
EFFLUENT GROSS VALUE											
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.016	0.027	19	0	31 / 31	GRAB
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	0.036	0.058 INST MAX	MG/L		WEEKLY	CALCTD
EFFLUENT GROSS VALUE											

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

J. Randy Douet

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.

Stephanie A. Howard
Principal Environmental Engineer

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE

423

843-6700

DATE

04

06

10

AREA CODE

NUMBER

YEAR

MO

DAY

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 0.060mg/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 0.021mg/L--limit 0.100mg/L) 4. H-130M (max. calc. conc. was 0.026mg/L--limit 0.050mg/L) 5. H-130M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L))

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

DIFFUSER DISCHARGE

EFFLUENT

Form Approved.
OMB No. 2040-0004

TN0026450

101 G

PERMIT NUMBER

DISCHARGE NUMBER

MONITORING PERIOD

From YEAR MO DAY
04 05 01

To YEAR MO DAY
04 05 31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER		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	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.1	62	0	31 / 31	CALCTD
82234 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	2.0	DEG C /HR		CONTINUOUS	CALCTD
EFFLUENT GROSS VALUE											
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	2.2	04	0	31 / 31	CALCTD
00016 1 S 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	3.0	DEG. C.		CONTINUOUS	CALCTD
EFFLUENT GROSS VALUE											
BORON, TOTAL	SAMPLE MEASUREMENT	*****	*****	**	<0.2	<0.2	<0.2	19	0	1 / 31	GRAB
01022 1 0 0	PERMIT REQUIREMENT	*****	*****	****	REPORT	REPORT	REPORT	MG/L		ONCE/MONTH	GRAB
EFFLUENT GROSS VALUE											
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

J. Randy Douet

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.

Stephanie A. Howard
Principal Environmental Engineer

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE

423 843-6700

AREA CODE

NUMBER

DATE

04 06 10

YEAR MO DAY

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

CCW data for May 2004 is attached.

CCW TRENCH

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
5/5/2004 1020	< 0.5 mg/L	5/6/2004 1926	CVS	EPA 8015B

CCW CHANNEL

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
5/5/2004 1015	< 0.5 mg/L	5/6/2004 1849	CVS	EPA 8015B

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 101 T
 PERMIT NUMBER DISCHARGE NUMBER

MAJOR
 (SUBR 01)

Form Approved.
 OMB No. 2040-0004

F - FINAL
 BIOMONITORING FOR OUTFALL 101
 EFFLUENT

MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 04 05 01 04 05 31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	23	0	1 / 0	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QTRLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	23	0	1 / 0	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QTRLY	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		
J. Randy Douet Site Vice President		423	843-6700	04	06	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

Stephanie A. Howard
 Principal Environmental Engineer
 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

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

Toxicity was sampled May 4-9, 2004. Report is attached.

June 4, 2004

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT
NO. TN0026450, OUTFALL 101, MAY, 2004

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 May 4-9, 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
Biologist
Environmental Engineering Services- West
CEB 3A-M

Attachment
cc (Attachment):
Files, ER&TA, CEB 1B-M

SQN May 2004M

**TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT**

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: June 4, 2004

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: May 4-9, 2004
10. Average Flow on Days Sampled (MGD): 1567, 1572, 1573, 1563, 1548, 1560
11. Pertinent Site Conditions:

H-130M molluscicide was injected from May 4-7, 2004. The dates and times for the H-130M injection are in the following table. See Appendix B for complete additional chemical application information during the sample collection period.

Injection Location	Date/Start Time (EDT)	Date/Ending Time (EDT)
Essential Raw Cooling Water (ERCW) B Train	05-04-2004/0905	05-07-2004/0904

12. Test Dates: May 6-13, 2004
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
Daphnids (*Ceriodaphnia dubia*)

15. Concentrations Tested (%): Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0

Intake: 100.0

Pimephales promelas: UV treated Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0

UV treated Intake: 100.0

16. Permit Limit Endpoint (%): Outfall 101: $IC_{25} \geq 43.9\%$

17. Test Results: Outfall 101: *Pimephales promelas*: $IC_{25} > 100\%$

Ceriodaphnia dubia: $IC_{25} > 100\%$

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

18. Facility Contact: Ruth Ann Hurt

Phone #: (423) 843-6714

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

20. Lab Contact: Jim Sumner

Phone #: (828) 350-9364

21. TVA Contact: Cynthia L. Russell

Phone #: (256) 386-2755

22. Notes: Outfall 101 samples collected May 4-9, 2004, 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. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of historic problems with WET tests for this effluent.

METHODS SUMMARY

Samples:

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

Sample ID	Date (MM/DD/YY) Time (EST) Collected	Date (MM/DD/YY) Time (EST) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY) Time (EST) Used By
101	05/04/04 0743 to 05/05/04 0643	05/05/04 1340	1.1 [†]	<0.10	05/06/04 1350 05/07/04 1426
Intake	05/04/04 0751 to 05/05/04 0651	05/05/04 1340	1.0	<0.10	05/06/04 1350 05/07/04 1426
101	05/06/04 0730 to 05/07/04 0630	05/07/04 1311	1.2 [†]	<0.10	05/08/04 1443 05/09/04 1340
Intake	05/06/04 0715 to 05/07/04 0615	05/07/04 1311	1.4	<0.10	05/08/04 1443 05/09/04 1340
101	05/08/04 0846 to 05/09/04 0746	05/09/04 1335	3.0 [†]	<0.10	05/10/04 1356 05/11/04 1340 05/12/04 1349
Intake	05/08/04 0859 to 05/09/04 0759	05/09/04 1335	3.5	<0.10	05/10/04 1356 05/11/04 1340 05/12/04 1349

*TRC = Total Residual Chlorine

[†]Samples were collected in two 2.5 gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

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

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

	<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>
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2. Age:	<u>22.0-24.5 hours old</u>	<u><24-hours old</u>
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Test Method Summary:

1. Test Conditions:	<u>Static, Renewal</u>	<u>Static, Renewal</u>
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2. Test Duration:	<u>7 days</u>	<u>Until at least 60% of control females have 3 broods</u>
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3. Control / Dilution Water:	<u>Moderately Hard Synthetic</u>	<u>Moderately Hard Synthetic</u>
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4. Number of Replicates:	<u>4</u>	<u>10</u>
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5. Organisms per Replicate:	<u>10</u>	<u>1</u>
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6. Test Initiation: (Date/Time)		
Outfall 101	<u>05/06/04 - 1350 EDT</u>	<u>05/06/04 - 1123 EDT</u>
UV Treated Outfall 101	<u>05/06/04 - 1334 EDT</u>	

7. Test Termination: (Date/Time)		
Outfall 101	<u>05/13/04 - 1322 EDT</u>	<u>05/13/04 - 1100 EDT</u>
UV Treated Outfall 101	<u>05/13/04 - 1345 EDT</u>	

8. Test Temperature: Outfall 101:	<u>Mean = 24.6°C</u> <u>(24.0 - 25.4°C)</u>	<u>Mean = 24.9°C</u> <u>(24.2 - 25.4°C)</u>
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Test Temperature: UV-Treated Outfall 101:	<u>Mean = 24.7°C</u> <u>(24.1 - 25.4°C)</u>
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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>
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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>
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TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted May 6 – 13, 2004 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
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	98	95	95	95	95

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.867	0.915	0.837	0.858	0.869
10.98%	0.825	0.898	0.958	0.786	0.867
22.0%	0.950	0.831	0.724	0.821	0.832
43.9%	0.764	0.819	0.942	0.694	0.805
72.0%	0.920	0.893	0.950	0.804	0.892
100%	0.822	0.875	0.936	0.947	0.895
Intake	0.973	0.770	0.922	0.954	0.905

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

*TU_a = 100/LC₅₀; TU_c = 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 May 6 - 13, 2004 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
22.0%	100	100	100	100	100	100	90
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100%	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	27	27	33	32	28	32	31	32	28	32	30.2
10.98%	32	32	30	35	32	31	31	32	36	30	32.1
22.0%	36	31	29	36	35	33	32	32	38	30	33.2
43.9%	35	34	34	39	33	33	36	32	37	32	34.5
72.0%	37	33	34	36	36	36	36	32	39	32	35.1
100%	36	36	35	37	36	39	39	33	38	35	36.4
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>							

*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 May 6 - 13, 2004 using water from Intake

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

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	32	32	29	28	35	31	36	28	36	31.7
Intake	28	31	30	31	35	30	34	34	29	32	31.4
IC ₂₅ Value: <u>> 100%</u> Permit Limit: <u>N/A</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>N/A</u>							

*TU_a = 100/LC₅₀; TU_c = 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 May 6 - 13, 2004 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	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	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)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.877	0.752	0.933	0.874	0.859
10.98%	0.824	0.693	0.856	0.837	0.803
22.0%	0.737	0.818	0.971	0.876	0.851
43.9%	0.851	0.827	0.820	0.897	0.849
72.0%	0.965	0.975	0.938	0.918	0.949
100%	0.992	0.959	0.755	0.927	0.908
Intake	0.896	0.879	0.952	0.938	0.916
IC ₂₅ Value: <u>≥ 100%</u>			Calculated TU Estimates: <u>≤ 1.0 TUc*</u>		
95% Confidence Limits:					
Upper Limit: <u>NA</u>					
Lower Limit: <u>NA</u>					

*TUa = 100/LC₅₀; TUc = 100/ IC₂₅

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC ₂₅)
<i>Pimephales promelas</i>	May 6 - 13, 2004	1419	7-days	KCl	0.63 g/L
<i>Ceriodaphnia dubia</i>	May 4 - 11, 2004	1355	7-days	NaCl	1.07 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, May 6-13, 2004.

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	25.1	24.2	8.1	7.8	7.76	7.45	304	62	82	-
		24.8 - 25.3	24.1 - 24.4	7.9 - 8.3	7.3 - 8.2	7.49 - 8.05	7.25 - 7.55	287 - 331	60 - 64	82 - 82	-
	10.98%	25.0	24.2	8.1	7.8	7.64	7.44	288	-	-	-
		24.9 - 25.2	24.1 - 24.5	7.9 - 8.3	7.3 - 8.2	7.52 - 7.76	7.26 - 7.53	273 - 300	-	-	-
	22%	25.1	24.2	8.1	7.8	7.62	7.43	278	-	-	-
		24.9 - 25.2	24.0 - 24.3	8.0 - 8.2	7.3 - 8.1	7.48 - 7.74	7.26 - 7.52	264 - 288	-	-	-
	43.9%	25.1	24.3	8.1	7.7	7.58	7.42	250	-	-	-
		24.8 - 25.4	24.1 - 24.4	7.9 - 8.3	7.3 - 8.2	7.44 - 7.72	7.26 - 7.48	239 - 262	-	-	-
<i>Ceriodaphnia dubia</i>	Control	25.1	24.2	8.2	7.8	7.55	7.42	218	-	-	-
		24.6 - 25.4	24.1 - 24.4	8.0 - 8.3	7.4 - 8.1	7.38 - 7.71	7.28 - 7.52	207 - 226	-	-	-
	100%	25.1	24.2	8.2	7.8	7.52	7.45	186	67	72	<0.10
		24.5 - 25.4	24.1 - 24.3	7.9 - 8.3	7.4 - 8.1	7.35 - 7.69	7.27 - 7.56	173 - 193	66 - 69	71 - 75	<0.10 - <0.10
	Intake	25.0	24.2	8.3	7.8	7.64	7.49	185	64	73	<0.10
		24.8 - 25.2	24.1 - 24.3	8.0 - 8.4	7.5 - 8.1	7.61 - 7.71	7.37 - 7.57	178 - 191	60 - 67	71 - 75	<0.10 - <0.10
	Control	25.1	24.9	8.1	8.1	7.76	7.63	304	62	82	-
		24.8 - 25.4	24.4 - 25.2	7.9 - 8.3	8.0 - 8.2	7.49 - 8.05	7.49 - 7.69	287 - 331	60 - 64	82 - 82	-
<i>Ceriodaphnia dubia</i>	10.98%	25.0	24.9	8.1	8.2	7.64	7.63	288	-	-	-
		24.7 - 25.4	24.3 - 25.2	7.9 - 8.3	8.0 - 8.2	7.52 - 7.76	7.52 - 7.69	273 - 300	-	-	-
	22%	25.0	24.9	8.1	8.2	7.62	7.62	278	-	-	-
		24.7 - 25.2	24.3 - 25.1	8.0 - 8.2	8.0 - 8.3	7.48 - 7.74	7.48 - 7.69	264 - 288	-	-	-
	43.9%	24.9	24.9	8.1	8.2	7.58	7.60	250	-	-	-
		24.5 - 25.2	24.4 - 25.2	7.9 - 8.3	8.0 - 8.3	7.44 - 7.72	7.40 - 7.68	239 - 262	-	-	-
	72%	24.9	24.8	8.2	8.2	7.55	7.60	218	-	-	-
		24.4 - 25.2	24.2 - 25.1	8.0 - 8.3	7.8 - 8.4	7.38 - 7.71	7.38 - 7.66	207 - 226	-	-	-
<i>Ceriodaphnia dubia</i>	100%	24.9	24.9	8.2	8.2	7.52	7.59	186	67	72	<0.10
		24.3 - 25.4	24.4 - 25.1	7.9 - 8.3	7.9 - 8.5	7.35 - 7.69	7.37 - 7.66	173 - 193	66 - 69	71 - 75	<0.10 - <0.10
<i>Ceriodaphnia dubia</i>	Intake	25.0	24.9	8.3	8.2	7.64	7.59	185	64	73	<0.10
		24.7 - 25.4	24.4 - 25.1	8.0 - 8.4	8.0 - 8.4	7.61 - 7.71	7.36 - 7.68	178 - 191	60 - 67	71 - 75	<0.10 - <0.10

Overall temperature (°C)	Average	Minimum	Maximum
<i>Pimephales promelas</i>	24.6	24.0	25.4
<i>Ceriodaphnia dubia</i>	24.9	24.2	25.4

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, May 6 - 13, 2004.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)
		Initial	Final	Initial	Final	Initial	Final	
<i>Pimephales promelas</i>	Control	25.1	24.3	8.1	7.7	7.65	7.47	289
		24.8 - 25.4	24.1 - 24.5	7.9 - 8.2	7.4 - 7.9	7.49 - 7.85	7.31 - 7.66	277 - 303
	10.98%	25.1	24.3	8.1	7.7	7.64	7.47	287
		24.9 - 25.4	24.1 - 24.5	7.9 - 8.2	7.5 - 8.0	7.50 - 7.85	7.34 - 7.66	267 - 301
	22%	25.0	24.3	8.1	7.7	7.63	7.47	271
		24.9 - 25.2	24.2 - 24.5	8.0 - 8.2	7.5 - 8.0	7.49 - 7.83	7.39 - 7.67	252 - 287
	43.9%	25.0	24.3	8.1	7.7	7.61	7.47	252
		24.9 - 25.3	24.1 - 24.5	8.0 - 8.3	7.5 - 8.0	7.47 - 7.81	7.36 - 7.64	241 - 263
	72%	25.0	24.3	8.2	7.7	7.60	7.48	219
		24.9 - 25.3	24.1 - 24.5	8.0 - 8.3	7.4 - 8.0	7.44 - 7.79	7.40 - 7.60	208 - 228
	100%	25.1	24.3	8.1	7.7	7.57	7.47	186
		24.9 - 25.4	24.1 - 24.5	8.0 - 8.3	7.6 - 8.0	7.40 - 7.76	7.38 - 7.61	177 - 195
	Intake	25.1	24.3	8.2	7.8	7.64	7.51	185
		24.9 - 25.4	24.1 - 24.5	7.9 - 8.4	7.4 - 8.2	7.54 - 7.78	7.44 - 7.62	178 - 191

Overall temperature (°C)

Average

Minimum

Maximum

Pimephales promelas

24.7

24.1

25.4

SUMMARY / CONCLUSIONS

Outfall 101 samples collected May 4 - 9, 2004, 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. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of historic problems with WET tests for this effluent.

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 mg/L KCl or NaCl.
2. Standard Toxicant: Potassium Chloride (KCl crystalline) for *Pimephales promelas*.
Sodium Chloride (NaCl crystalline) for *Ceriodaphnia dubia*.
3. Dilution Water Used: Moderately hard synthetic water.
4. Statistics: ToxCalc software Version 5.0 was used for statistical analyses.

REFERENCES

1. NPDES Permit No. TN0026450.
2. USEPA. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (October 2002).
3. Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

**Sequoyah Nuclear Plant Biomonitoring
May 6 -13, 2004**

Appendix B

**Diffuser Discharge Concentrations of Total Residual Chlorine,
Diffuser Discharge Concentrations of Chemicals Used to Control Growth
of Microbiologically Induced Bacteria and Mollusks,
During Toxicity Test Sampling,**

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-May 9, 2004

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-May 9, 2004

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-May 9, 2004

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-May 9, 2004

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

**Sequoyah Nuclear Plant Biomonitoring
May 6 - 13, 2004**

Appendix C

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 12 of 3
02-06-04-04

Client: TVA	Environmental Testing Solution, Inc. 351 Depot Street. Asheville, NC 28801 Phone: 828-350-9364 Fax: 828-350-9368	Delivered By (Circle One): FedEx UPS Bus Client
Project Name: Sequoyah NP Toxicity		Other (specify): Express Courier
P.O. Number: N/A		General Comments: * Custody seals intact. Samples received in good condition. JHansen
Facility Sampled: Sequoyah NP		
NPDES Number: TN0026450		
Collected By: Wanda Allen, Ronnie Hankins		

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1206 Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	5/4/04 - 5/5/04	0743 0643	2(2.5gal)	NA			✓		040505.23	1.1°C	KAC	1340	*see COMMENTS
SQN-INT-TOX	Comp	5/4/04 - 5/5/04	0751 10651	1(2.5 gal)	NA			✓		040505.24	1.0°C	KAC	1340	

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	5/5/2004	Express Courier	5/5/2004
Ronnie Hankins <i>Ronnie Hankins</i>	0930	<i>L. Q. Hankins Jr.</i>	9:30 AM
Express Courier <i>L. Q. Hankins Jr.</i>	5/5/2004 1340	ETS <i>K. K. Korman</i>	5/5/2004 1340

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 23 of 3
22 06-04-04

Client: TVA	Environmental Testing Solution, Inc. 351 Depot Street Ashville, NC 28801 Phone: 828-350-9364 Fax: 828-350-9368	Delivered By (Circle One): FedEx UPS Bus Client
Project Name: Sequoyah NP Toxicity		Other (specify): Express Courier
P.O. Number: N/A		General Comments: * Custody seals intact. Samples received in good condition. J. Hunter.
Facility Sampled: Sequoyah NP		
NPDES Number: TN0026450		
Collected By: Wanda Allen, Ronnie Hankins		

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project #1206 Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	5/6/04 - 5/7/04	0730/0630	2(2.5gal)	NA			✓		040507.04	1.2°C	KAL	1311	* See COMMENTS
SQN-INT-TOX	Comp	5/6/04 - 5/7/04	0715/0615	1(2.5 gal)	NA			✓		040507.05	1.4°C	KAL	1311	

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	5/7/2004	Express Courier	5/7/2004
Ronnie Hankins <i>Ronnie Hankins</i>	0930	<i>L. O. Hankins</i>	9:30
Express Courier <i>L. O. Hankins</i>	5/7/2004 1311	ETS <i>K. Keenan</i>	5/7/2004 1311

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 31 of 31
sub 16-01-2589

Client: TVA	Environmental Testing Solution, Inc. 351 Depot Street. Asheville, NC 28801 Phone: 828-350-9364 Fax: 828-350-9368	Delivered By (Circle One):
Project Name: Sequoyah NP Toxicity		FedEx UPS Bus Client
P.O. Number: N/A		Other (specify): Express Courier
Facility Sampled: Sequoyah NP		General Comments: <i>* Custody seals intact. Samples received in good condition</i> <i>J. Sumner</i>
NPDES Number: TN0026450		
Collected By: Wanda Allen, Ronnie Hankins		

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	5/8/04 - 5/9/04	0846/0746	2(2.5gal)	NA			✓		040509.01	3.0°C	JS	1335	* See
SQN-INT-TOX	Comp	5/8/04 - 5/9/04	0859/0759	1(2.5 gal)	NA			✓		040509.02	3.5°C	JS	1335	COMMENTS

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	5/9/2004	Express Courier	5/9/2004
Ronnie Hankins <i>aka 5/9/04</i>	0915	<i>LoLo Hankins</i>	915
Express Courier <i>LoLo Hankins</i>	5/9/2004 1335	ETS <i>Jim Sumner</i>	5/9/2004 1335

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

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

Species: *Pimephales promelas*Client: TVAFacility: Sequoyah Nuclear Plant - Non-treatedNPDES #: TN 0026450Project #: 1206

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		Test information:	
Organism age:	22 TO 24.5-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	05-05-04 1130 TO 1400 HST (1330 TO 1600 EST)	Incubator number:	3C
Organism source:	ABS BATCH 05-05-04	Artemia lot number:	BG50100
Transfer bowl information:	pH = 7.63 Temperature = 24.2 °C	Total drying time:	24-HOURS
Average transfer volume:	9.5 mL	Date / Time in:	05-13-04 1430
		Date / Time out:	05-14-04 1430
		Oven temperature:	61 °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	05-06-04	—dl	1600	1350	05-05-04	040505.23/.24	dl
1	05-07-04	1000	1606	1426	05-05-04	040505.23/.24	dl
2	05-08-04	1000	1557	1443	05-05-04	040507.04/.05	dl
3	05-09-04	0954	1602	1340	05-05-04	040507.04/.05	KEK
4	05-10-04	1003	1610	1356	05-07-04	040509.01/.02	KEK
5	05-11-04	1000	1604	1340	05-07-04	040509.01/.02	KEK
6	05-12-04	0950	1612	1349	05-11-04	040509.01/.02	KEK
7	05-13-04			1322			KEK

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC ₅₀	> 100%
Average weight per initial larvae:	0.869		NOEC	100%
Average weight per surviving larvae:	0.869	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC ₂₅	> 100%

Species: *Pimephales promelas*

Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - Non-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	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)	14.48	14.58	14.64	14.41	14.96	14.87	15.25	14.67	14.96	14.41	14.93	15.18
LIGHT BLUE B = Pan + Larvae weight (mg)	23.15	23.73	23.06	22.99	23.21	23.85	24.83	22.53	24.46	22.72	22.17	23.39
Larvae weight (mg) = A - B	8.67	9.15	8.37	8.58	8.25	8.98	9.58	7.86	9.50	8.31	7.24	8.21
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.867	0.915	0.837	0.858	0.825	0.898	0.958	0.786	0.950	0.831	0.724	0.821
Average weight per initial number of larvae (mg)	0.869				0.867				0.832			

Calculations and data reviewed: *al*

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

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)	15.03	15.11	15.10	15.02	14.98	14.80	14.77	14.70	14.87	14.62	14.61	14.33
B = Pan + Larvae weight (mg)	22.67	23.30	24.52	21.96	24.18	23.73	24.27	22.74	23.09	23.37	23.97	23.80
Larvae weight (mg) = A - B	7.64	8.19	9.42	6.94	9.20	8.93	9.50	8.04	8.22	8.75	9.36	9.47
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.764	0.819	0.942	0.694	0.920	0.893	0.950	0.804	0.822	0.875	0.936	0.947
Average weight per initial number of larvae (mg)	0.805				0.892				0.895			

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

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	9 ^{id}	10
4	10	9 ^{id}	9	10
5	10	9	9	10
6	10	9	9	10
7	10	9	9	10
A = Pan weight (mg)	14.91	14.91	14.92	14.57
B = Pan + Larvae weight (mg)	24.64	22.61	24.14	24.11
Larvae weight (mg) = A - B	9.73	7.70	9.22	9.54
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.973	0.770	0.922	0.954
Average weight per initial number of larvae (mg)	0.905			

Calculations and data reviewed: *sl*

Comments:

* Dead minnows in the intake were heavily
fungal.

Environmental Testing Solutions, Inc.

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 - Non-treated
 Test dates: May 06-13, 2004
 Project number: 1206

Reviewed by: *[Signature]*

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 / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (of mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (of mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.48	21.15	8.67	0.867	0.869	3.8	0.867	100.0	0.869	3.8	Not applicable
	B	10	10	14.58	23.73	9.15	0.915			0.915				
	C	10	10	14.69	23.06	8.37	0.837			0.837				
	D	10	10	14.41	22.99	8.58	0.858			0.858				
10.98%	E	10	10	14.96	23.21	8.25	0.825	0.867	8.8	0.825	100.0	0.867	8.8	0.3
	F	10	10	14.87	23.85	8.98	0.898			0.898				
	G	10	10	15.25	24.83	9.58	0.958			0.958				
	H	10	10	14.67	22.53	7.86	0.786			0.786				
22%	I	10	10	14.96	24.46	9.50	0.950	0.832	11.1	0.950	100.0	0.832	11.1	4.3
	J	10	10	14.41	22.72	8.31	0.831			0.831				
	K	10	10	14.93	22.17	7.24	0.724			0.724				
	L	10	10	15.18	23.39	8.21	0.821			0.821				
43.9%	M	10	10	15.03	22.67	7.64	0.764	0.805	13.0	0.764	100.0	0.805	13.0	7.4
	N	10	10	15.11	23.30	8.19	0.819			0.819				
	O	10	10	15.10	24.52	9.42	0.942			0.942				
	P	10	10	15.02	21.96	6.94	0.694			0.694				
72%	Q	10	10	14.98	24.18	9.20	0.920	0.892	7.1	0.920	100.0	0.892	7.1	-2.6
	R	10	10	14.80	23.73	8.93	0.893			0.893				
	S	10	10	14.77	24.27	9.50	0.950			0.950				
	T	10	10	14.70	22.74	8.04	0.804			0.804				
100%	U	10	10	14.87	23.09	8.22	0.822	0.895	6.5	0.822	100.0	0.895	6.5	-3.0
	V	10	10	14.62	23.37	8.75	0.875			0.875				
	W	10	10	14.61	23.97	9.36	0.936			0.936				
	X	10	10	14.33	23.80	9.47	0.947			0.947				
100% Intake	Y	10	10	14.91	24.64	9.73	0.973	0.952	7.4	0.973	95.0	0.905	10.2	-4.1
	Z	10	9	14.91	22.61	7.70	0.856			0.770				
	AA	10	9	14.92	24.14	9.22	1.024			0.922				
	BB	10	10	14.57	24.11	9.54	0.954			0.954				

Outfall 101:
 Dunnett's MSD value: 0.1280
 PMSD: 14.7
Intake:
 Dunnett's MSD value: 0.0952
 PMSD: 11.0

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, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.8% 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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 5/6/2004	Test ID: PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101	
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
Comments: NON-TREATED	Protocol: CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	

Conc-%	1	2	3	4
D-Control	0.8670	0.9150	0.8370	0.8580
10.98	0.8250	0.8980	0.9580	0.7860
22	0.9500	0.8310	0.7240	0.8210
43.9	0.7640	0.8190	0.9420	0.6940
72	0.9200	0.8930	0.9500	0.8040
100	0.8220	0.8750	0.9360	0.9470

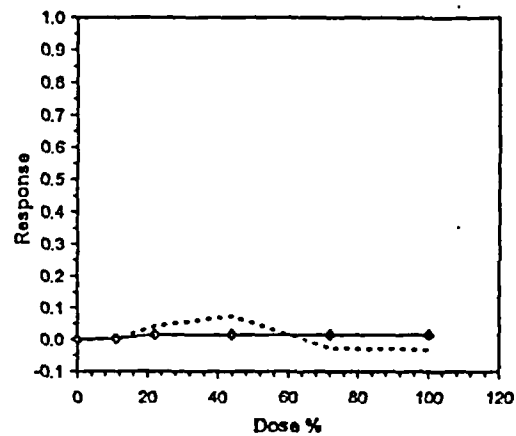
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8693	1.0000	0.8693	0.8370	0.9150	3.795	4				0.8693	1.0000
10.98	0.8668	0.9971	0.8668	0.7860	0.9580	8.829	4	0.047	2.410	0.1280	0.8668	0.9971
22	0.8315	0.9566	0.8315	0.7240	0.9500	11.133	4	0.711	2.410	0.1280	0.8558	0.9845
43.9	0.8048	0.9258	0.8048	0.6940	0.9420	13.026	4	1.215	2.410	0.1280	0.8558	0.9845
72	0.8918	1.0259	0.8918	0.8040	0.9500	7.061	4	-0.424	2.410	0.1280	0.8558	0.9845
100	0.8950	1.0296	0.8950	0.8220	0.9470	6.488	4	-0.485	2.410	0.1280	0.8558	0.9845

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.97593939	0.884	0.19275556	-0.3327248			
Bartlett's Test indicates equal variances ($p = 0.59$)					3.6894629	15.0862722					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	0.12797607	0.14722585	0.00498307	0.00563967	0.51204991	5, 18
Treatments vs D-Control											

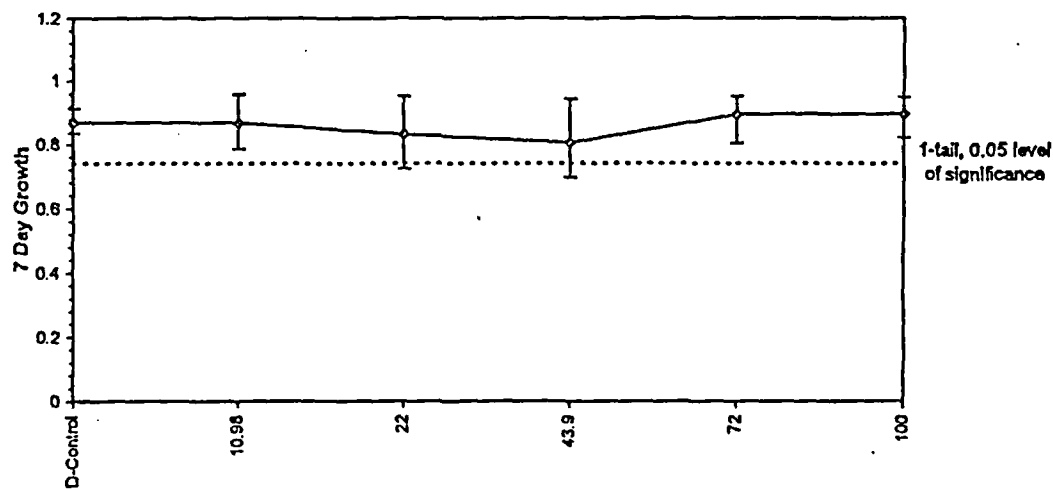
Environmental Testing Solutions, Inc.

Statistical Analyses

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



Dose-Response Plot



Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth					
Start Date:	5/6/2004	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Intake
End Date:	5/13/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
		Protocol:	CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	NON-TREATED				
Conc-%	1	2	3	4	
D-Control	0.8670	0.9150	0.8370	0.8580	
100	0.9730	0.7700	0.9220	0.9540	

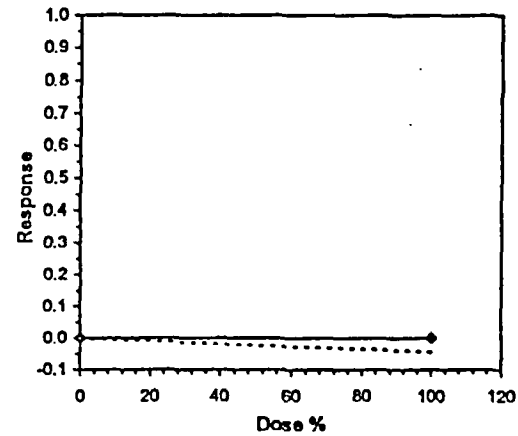
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8693	1.0000	0.8693	0.8370	0.9150	3.795	4				0.8870	1.0000
100	0.9048	1.0408	0.9048	0.7700	0.9730	10.198	4	-0.725	1.943	0.0952	0.8870	1.0000

Auxillary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.88513231		0.749		-1.4024664	2.44750925
F-Test indicates equal variances ($p = 0.13$)	7.82257462		47.4672279			
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.09520179	0.10952176	0.0025205	0.00480058	0.4959721	1, 6
Treatments vs D-Control						

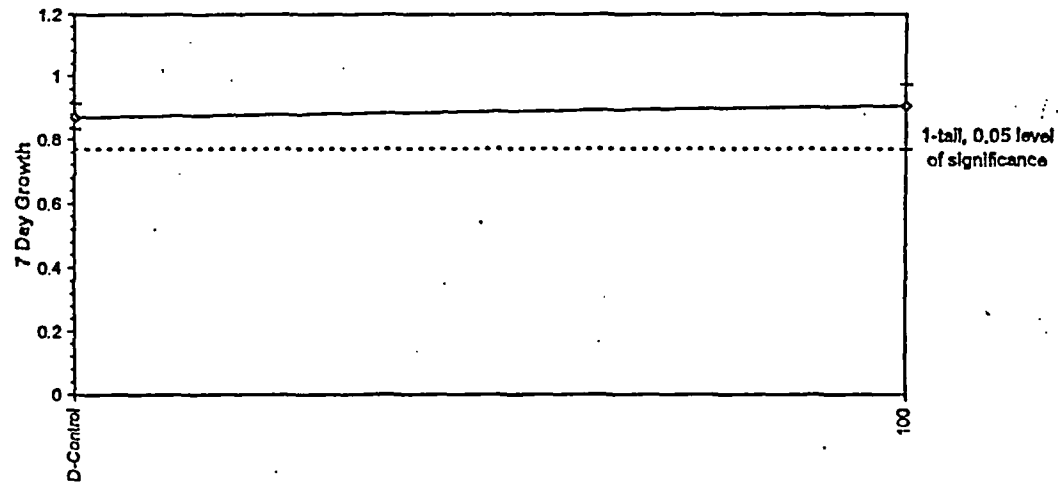
Environmental Testing Solutions, Inc.

Statistical Analyses

Point	%	SD	95% CL(Exp)	Linear Interpolation (200 Resamples)	
				Skew	
KC05	>100				
KC10	>100				
KC15	>100				
KC20	>100				
KC25	>100				
KC40	>100				
KC50	>100				



Dose-Response Plot



Environmental Testing Solutions, Inc.

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

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Non-treated

Test dates: May 06 - 13, 2004

Project number: 1206

Reviewed by: *Olunse*

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)	7.68	7.55	8.02	7.54	8.05	7.53	7.82	7.44	7.63	7.38	7.64	7.25	7.49	7.47
	DO (mg/L)	7.9	8.0	8.0	7.5	7.9	8.1	8.3	7.8	8.2	7.7	8.2	7.3	8.0	8.2
	Conductivity (µmhos/cm)	303		331		298		300		287		307		302	
	Alkalinity (mg/L CaCO ₃)	64								60				62	
	Hardness (mg/L CaCO ₃)	82								82				82	
	Temperature (°C)	25.3	24.2	25.0	24.4	25.2	24.3	25.2	24.1	24.8	24.2	25.0	24.2	25.2	24.1
10.98%	pH (SU)	7.76	7.52	7.70	7.51	7.68	7.53	7.69	7.37	7.58	7.40	7.56	7.26	7.52	7.47
	DO (mg/L)	7.9	8.0	8.1	7.5	8.1	8.1	8.3	7.8	8.2	7.7	8.2	7.3	8.0	8.2
	Conductivity (µmhos/cm)	299		300		276		288		287		273		294	
	Temperature (°C)	25.2	24.2	25.1	24.5	25.0	24.3	25.2	24.1	24.9	24.3	24.9	24.2	24.9	24.1
22%	pH (SU)	7.74	7.51	7.68	7.51	7.65	7.52	7.68	7.37	7.55	7.38	7.54	7.26	7.48	7.47
	DO (mg/L)	8.0	8.1	8.2	7.4	8.2	8.1	8.2	7.8	8.2	7.8	8.2	7.3	8.0	8.0
	Conductivity (µmhos/cm)	288		287		270		281		273		264		281	
	Temperature (°C)	25.2	24.1	25.1	24.3	25.0	24.3	25.2	24.0	24.9	24.3	25.1	24.2	25.1	24.1
43.9%	pH (SU)	7.72	7.44	7.67	7.48	7.62	7.48	7.64	7.40	7.49	7.41	7.50	7.26	7.44	7.48
	DO (mg/L)	7.9	7.8	8.2	7.4	8.2	8.2	8.2	7.8	8.3	7.8	8.2	7.3	8.0	7.9
	Conductivity (µmhos/cm)	262		262		248		252		249		240		239	
	Temperature (°C)	25.4	24.1	25.1	24.4	24.8	24.3	25.2	24.3	25.1	24.3	25.2	24.2	25.1	24.3
72%	pH (SU)	7.71	7.43	7.64	7.49	7.62	7.52	7.60	7.36	7.43	7.39	7.47	7.28	7.38	7.48
	DO (mg/L)	8.0	7.8	8.2	7.5	8.2	8.1	8.2	7.9	8.3	7.9	8.2	7.4	8.0	7.8
	Conductivity (µmhos/cm)	226		226		217		221		207		209		218	
	Temperature (°C)	25.4	24.1	25.1	24.4	24.6	24.3	25.2	24.1	25.3	24.2	25.2	24.2	25.0	24.1
100%	pH (SU)	7.69	7.48	7.62	7.51	7.61	7.56	7.57	7.41	7.36	7.44	7.43	7.27	7.35	7.47
	DO (mg/L)	7.9	7.8	8.1	7.6	8.3	8.1	8.3	7.9	8.3	7.9	8.2	7.4	8.0	7.8
	Conductivity (µmhos/cm)	192		193		188		190		179		173		186	
	Alkalinity (mg/L CaCO ₃)	66				67				69					
	Hardness (mg/L CaCO ₃)	71				75				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	25.4	24.1	25.2	24.3	24.5	24.3	25.2	24.1	25.3	24.2	25.4	24.2	24.8	24.2
	pH (SU)	7.68	7.57	7.61	7.57	7.61	7.47	7.61	7.37	7.71	7.53	7.62	7.46	7.67	7.48
	DO (mg/L)	8.0	8.0	8.3	7.5	8.3	8.0	8.4	7.8	8.4	8.1	8.3	7.6	8.2	7.9
	Conductivity (µmhos/cm)	191		191		183		183		183		178		189	
	Alkalinity (mg/L CaCO ₃)	60				66				67					
	Hardness (mg/L CaCO ₃)	75				73				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	25.2	24.2	25.1	24.2	24.8	24.3	25.2	24.1	25.1	24.3	24.9	24.2	24.9	24.2

Species: *Pimephales promelas*

Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
Analyst		MA	KRK	KRK	JL	JL	KRK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.68	7.55	8.02	7.54	8.05	7.53
	DO (mg/L)	7.9	8.0	8.0	7.5	7.9	8.1
	Conductivity (µmhos/cm)	303		331		298	
	Alkalinity (mg CaCO ₃ /L)	64					
	Hardness (mg CaCO ₃ /L)	82					
	Temperature (°C)	25.3	24.2	25.0	24.4	25.2	24.3
10.98%	pH (S.U.)	7.76	7.52	7.70	7.51	7.68	7.53
	DO (mg/L)	7.9	8.0	8.1	7.5	8.1	8.1
	Conductivity (µmhos/cm)	299		300		276	
	Temperature (°C)	25.2	24.2	25.1	24.5	25.0	24.3
22%	pH (S.U.)	7.74	7.51	7.68	7.51	7.65	7.52
	DO (mg/L)	8.0	8.1	8.2	7.4	8.2	8.1
	Conductivity (µmhos/cm)	288		287		210	
	Temperature (°C)	25.2	24.1	25.1	24.3	25.0	24.3
43.9%	pH (S.U.)	7.72	7.44	7.67	7.48	7.62	7.48
	DO (mg/L)	7.9	7.8	8.2	7.4	8.2	8.2
	Conductivity (µmhos/cm)	262		262		248	
	Temperature (°C)	25.4	24.1	25.1	24.4	24.8	24.3
72%	pH (S.U.)	7.71	7.43	7.64	7.49	7.62	7.52
	DO (mg/L)	8.0	7.8	8.2	7.5	8.2	8.1
	Conductivity (µmhos/cm)	226		226		217	
	Temperature (°C)	25.4	24.1	25.1	24.4	24.6	24.3
100%	pH (S.U.)	7.69	7.48	7.62	7.51	7.61	7.56
	DO (mg/L)	7.9	7.8	8.1	7.6	8.3	8.1
	Conductivity (µmhos/cm)	192		193		188	
	Alkalinity (mg CaCO ₃ /L)	66				67	
	Hardness (mg CaCO ₃ /L)	71				75	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.4	24.1	25.2	24.3	24.5	24.3
100% Intake	pH (S.U.)	7.68	7.57	7.61	7.57	7.61	7.47
	DO (mg/L)	8.0	8.0	8.3	7.5	8.3	8.0
	Conductivity (µmhos/cm)	191		191		183	
	Alkalinity (mg CaCO ₃ /L)	60				66	
	Hardness (mg CaCO ₃ /L)	75				73	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.2	24.2	25.1	24.2	24.8	24.3
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - Non-treated

		Day							
Analyst		3	4	5	6				
Concentration	Parameter	VEN	CM	CM	CM	CM	CM	CM	VEN
CONTROL	pH (S.U.)	7.02	7.44	7.63	7.38	7.64	7.25	7.49	7.47
	DO (mg/L)	8.3	7.8	8.2	7.7	8.2	7.3	8.0	8.2
	Conductivity (µmhos/cm)	300		287		307		302	
	Alkalinity (mg CaCO ₃ /L)			(60)				62	
	Hardness (mg CaCO ₃ /L)			(82)				82	
	Temperature (°C)	25.2	24.1	24.8	24.2	25.0	24.2	25.2	24.1
10.98%	pH (S.U.)	7.69	7.37	7.58	7.40	7.50	7.26	7.52	7.47
	DO (mg/L)	8.3	7.8	8.2	7.7	8.2	7.3	8.0	8.2
	Conductivity (µmhos/cm)	280		287		273		294	
	Temperature (°C)	25.2	24.1	24.9	24.3	24.9	24.2	24.9	24.1
22%	pH (S.U.)	7.68	7.37	7.55	7.38	7.54	7.26	7.48	7.47
	DO (mg/L)	8.2	7.8	8.2	7.8	8.2	7.3	8.0	8.0
	Conductivity (µmhos/cm)	281		273		264		281	
	Temperature (°C)	25.2	24.0	24.9	24.3	25.1	24.2	25.1	24.1
43.9%	pH (S.U.)	7.64	7.40	7.49	7.41	7.50	7.26	7.44	7.48
	DO (mg/L)	8.2	7.8	8.3	7.0	8.2	7.3	8.0	7.9
	Conductivity (µmhos/cm)	252		249		240		239	
	Temperature (°C)	25.2	24.3	25.1	24.3	25.2	24.2	25.1	24.3
72%	pH (S.U.)	7.60	7.36	7.43	7.39	7.47	7.28	7.38	7.40
	DO (mg/L)	8.2	7.9	8.3	7.9	8.2	7.4	8.0	7.8
	Conductivity (µmhos/cm)	221		207		209		218	
	Temperature (°C)	25.2	24.1	25.3	24.2	25.2	24.2	25.0	24.1
100%	pH (S.U.)	7.57	7.41	7.36	7.44	7.43	7.27	7.35	7.47
	DO (mg/L)	8.3	7.9	8.3	7.9	8.2	7.4	8.0	7.8
	Conductivity (µmhos/cm)	190		179		173		186	
	Alkalinity (mg CaCO ₃ /L)			69					
	Hardness (mg CaCO ₃ /L)			71					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.1	25.3	24.2	25.4	24.2	24.8	24.2
100% Intake	pH (S.U.)	7.61	7.37	7.71	7.53	7.62	7.46	7.67	7.48
	DO (mg/L)	8.4	7.8	8.4	8.1	8.3	7.6	8.2	7.9
	Conductivity (µmhos/cm)	183		183		178		189	
	Alkalinity (mg CaCO ₃ /L)			67					
	Hardness (mg CaCO ₃ /L)			71					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.1	25.1	24.3	24.9	24.2	24.9	24.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

Client: TVAFacility: Sequoyah Nuclear Plant - Non-treatedNPDES #: TN 0026450Project #: 1206

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		Test information:	
Organism age:	< 24-HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	05-06-04 0753 TO 1054	Incubator number and shelf location:	2 E 3
Organism source:	04-21-04 A-C	YCT batch:	ABS 04-21-04
Transfer bowl information:	pH = 7.77 Temperature = 24.9	Selenastrum batch:	ABS 04-21-04

Daily renewal information:

Day	Date	Test Initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	05-06-04	1123	05-03-04	040505.23 .24	dl
1	05-07-04	1106	05-05-04	040505.23 .24	dl
2	05-08-04	1113	05-05-04	040507.04 .05	dl
3	05-09-04	1100	05-05-04	040507.04 .05	dl
4	05-10-04	1115	05-05-04	040509.01 .02	dl
5	05-11-04	1100	05-07-04	040509.01 .02	dl
6	05-12-04	1104	05-11-04	040509.01 .02	dl
7	05-13-04	1100			dl

Control information:	CONTROL 1+2		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:	30.2	31.7	≥ 15.0 offspring/female	ChV	> 100%
% CV:	7.9%	9.8%	< 40.0 %	IC25	> 100%

CONTROL 1 CONTROL 2

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

CONTROL - 1

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	5	3	4	4	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	12	11	11	12	10	13	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	10	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	13	13	17	16	14	16	17	14	14	17
Total young produced		27	27	33	32	28	32	31	32	28	32
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:

30.2

CONC: 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	5	4	5	5	3	4	5	5	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	14	11	13	14	12	0	12	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	12	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	14	14	17	15	15	14	15	17	13
Total young produced		32	32	30	35	32	31	31	32	36	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

32.1

% Reduction from Control:

~6.3%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

CONC: 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	6	4	6	5	5	5	5	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	12	11	13	14	14	12	12	14	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	14
	Adult mortality	L	L	L	L	L	L	L	L	L	D
7	Young produced	17	13	14	17	16	14	15	15	18	↓
Total young produced		36	31	29	36	35	33	32	32	38	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	D

Concentration:

% Mortality: 10%

Mean Offspring/Female: 33.2

% Reduction from Control: -9.9%

CONC: 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	5	5	5	5	4	5	5	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	13	13	15	12	12	12	14	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	0	0	0	0	0	0	0	0	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	2	16	16	19	16	17	19	13	18	0
Total young produced		35	34	34	39	33	33	36	32	37	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* SPLIT
8 GOOD

Concentration:

% Mortality: 0%

Mean Offspring/Female: 34.5

% Reduction from Control: -14.2%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

CONC: 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	5	5	4	5	5	6	5	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	13	12	12	13	14	14	11	15	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	0	0	0	18	0	0	0	*1	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	*1	15	18	19	0	16	17	17	18	0
Total young produced		37	33	34	36	36	36	36	32	39	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over.

* carry over

Concentration:

% Mortality: 0%

Mean Offspring/Female: 35.1

% Reduction from Control: -16.2%

CONC: 100%

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	6	5	4	5	5	6	5	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	15	14	14	14	13	12	14	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	*1	0	0	19	0	0	0	0	0	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	17	15	0	17	20	18	16	18	0
Total young produced		36	36	35	37	36	39	39	33	38	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:

% Mortality: 0%

Mean Offspring/Female: 36.4

% Reduction from Control: -20.5%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

CONTROL - 2

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	6	4	5	5	4	6	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	11	10	10	13	12	12	11	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	0	0	0	0	0	0	0	0	*1
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	15	15	15	13	17	15	18	13	15
Total young produced		30	32	32	29	28	35	31	36	28	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:

% Mortality: 0%

Mean Offspring/Female: 31.7

% Reduction from Control: NA

CONC: 100% Intake

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	6	4	4	5	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	12	0	0	13	10	0	0	0	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	12	11	0	0	14	12	12	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	15	14	14	18	16	15	17	13	15
Total young produced		28	31	30	31	35	30	34	34	29	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality: 0%

Mean Offspring/Female: 31.4

% Reduction from Control: 0.9%

Environmental Testing Solutions, Inc.

Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	5	3	4	4	5	4	42
5	0	0	12	11	11	12	10	13	10	10	89
6	10	10	0	0	0	0	0	0	0	0	20
7	13	13	17	16	14	16	17	14	14	17	151
Total	27	27	33	32	28	32	31	32	28	32	302

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	5	5	4	5	5	6	5	4	5	5	49
5	15	13	12	12	13	14	14	11	15	12	131
6	16	0	0	0	18	0	0	0	1	15	50
7	1	15	18	19	0	16	17	17	18	0	121
Total	37	33	34	36	36	36	36	32	39	32	351

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	5	4	5	5	3	4	5	5	6	5	47
5	11	14	11	13	14	12	0	12	13	12	112
6	0	0	0	0	0	0	12	0	0	0	12
7	16	14	14	17	15	15	14	15	17	13	150
Total	32	32	30	35	32	31	31	32	36	30	321

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	6	5	4	5	5	6	5	6	5	52
5	12	13	15	14	14	14	15	12	14	14	137
6	1	0	0	19	0	0	0	0	0	16	36
7	18	17	15	0	17	20	18	16	18	0	139
Total	36	36	35	37	36	39	39	33	38	35	364

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	6	4	6	5	5	5	5	6	5	52
5	14	12	11	13	14	14	12	12	14	11	127
6	0	0	0	0	0	0	0	0	0	14	14
7	17	13	14	17	16	14	15	15	18	0	139
Total	36	31	29	36	35	33	32	32	38	30	332

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	6	4	5	5	4	6	4	6	49
5	12	12	11	10	10	13	12	12	11	14	117
6	14	0	0	0	0	0	0	0	0	1	15
7	0	15	15	15	13	17	15	18	13	15	136
Total	30	32	32	29	28	35	31	36	28	36	317

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	5	5	5	5	4	5	5	6	5	49
5	14	13	13	15	12	12	12	14	13	10	128
6	15	0	0	0	0	0	0	0	0	17	32
7	2	16	16	19	16	17	19	13	18	0	136
Total	35	34	34	39	33	33	36	32	37	32	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	4	6	4	4	5	5	4	4	44
5	10	12	0	0	13	10	0	0	0	13	58
6	0	0	12	11	0	0	14	12	12	0	61
7	14	15	14	14	18	16	15	17	13	15	151
Total	28	31	30	31	35	30	34	34	29	32	314

Environmental Testing Solutions, Inc.

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

Species: *Ceriodaphnia dubia*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA / Sequoyah Nuclear Plant - Non-treated
 Test dates: May 06-13, 2004
 Project number: 1206

Reviewed by: 

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	27	27	33	32	28	32	31	32	28	32	100	30.2	7.9	Not applicable
10.98%	32	32	30	35	32	31	31	32	36	30	100	32.1	6.1	-6.3
22%	36	31	29	36	35	33	32	32	38	30	90	33.2	8.8	-9.9
43.9%	35	34	34	39	33	33	36	32	37	32	100	34.5	6.6	-14.2
72%	37	33	34	36	36	36	36	32	39	32	100	35.1	6.5	-16.2
100%	36	36	35	37	36	39	39	33	38	35	100	36.4	5.2	-20.5
Control - 2	30	32	32	29	28	35	31	36	28	36	100	31.7	9.8	Not applicable
100% Intake	28	31	30	31	35	30	34	34	29	32	100	31.4	7.4	0.9

Outfall 101:
 Dunnett's MSD value: 2.369
 PMSD: 7.8

MSD = Minimum Significant Difference
 PMSD = Percent Minimum Significant Difference

Intake:
 Dunnett's MSD value: 2.120
 PMSD: 6.7

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, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.2% 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, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date: 5/6/2004	Test ID: CdFRCR		Sample ID:		TVA / Sequoyah Nuclear Plant - Outfall 101					
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.		Sample Type:		DMR-Discharge Monitoring Report					
Comments: NON-TREATED	Protocol: CHRONIC-EPA-821-R-02-013		Test Species:		CD-Ceriodaphnia dubia					
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	27.000	27.000	33.000	32.000	28.000	32.000	31.000	32.000	28.000	32.000
10.98	32.000	32.000	30.000	35.000	32.000	31.000	31.000	32.000	36.000	30.000
22	36.000	31.000	29.000	36.000	35.000	33.000	32.000	32.000	38.000	30.000
43.9	35.000	34.000	34.000	39.000	33.000	33.000	36.000	32.000	37.000	32.000
72	37.000	33.000	34.000	36.000	36.000	36.000	36.000	32.000	39.000	32.000
100	36.000	36.000	35.000	37.000	36.000	39.000	39.000	33.000	38.000	35.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	30.200	1.0000	30.200	27.000	33.000	7.929	10				33.583	1.0000
10.98	32.100	1.0629	32.100	30.000	36.000	6.135	10	-1.834	2.287	2.369	33.583	1.0000
22	33.200	1.0993	33.200	29.000	38.000	8.844	10	-2.895	2.287	2.369	33.583	1.0000
43.9	34.500	1.1424	34.500	32.000	39.000	6.588	10	-4.150	2.287	2.369	33.583	1.0000
72	35.100	1.1623	35.100	32.000	39.000	6.504	10	-4.729	2.287	2.369	33.583	1.0000
100	36.400	1.2053	36.400	33.000	39.000	5.213	10	-5.983	2.287	2.369	33.583	1.0000

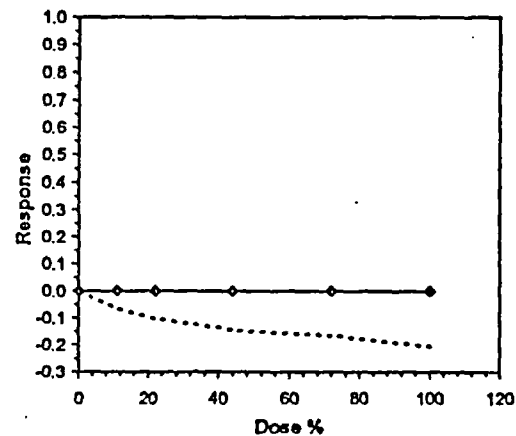
Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Kolmogorov D Test indicates normal distribution ($p > 0.01$)					0.70720047		1.035		0.2032235	-0.7907342	
Bartlett's Test indicates equal variances ($p = 0.82$)					2.18661237		15.0862722				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	2.36943653	0.07845816	49.7366667	5.36851852	2.1E-06	5, 54
Treatments vs D-Control											

Environmental Testing Solutions, Inc.

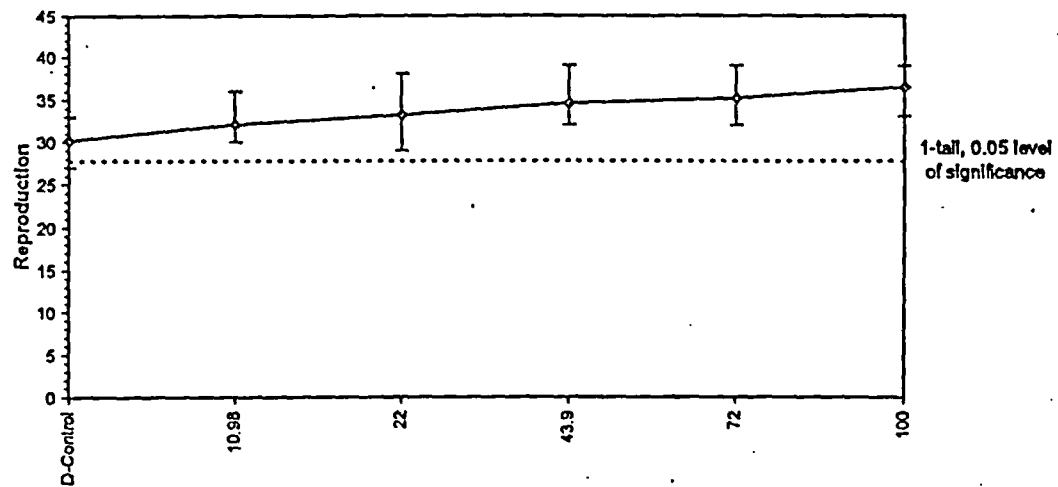
Statistical Analyses

Linear Interpolation (100 Resamples)

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



Dose-Response Plot



Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date: 5/6/2004	Test ID: CdFRCR	Sample ID: TVA / Sequoyah Nuclear Plant - Intake								
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type: DMR-Discharge Monitoring Report								
Comments: NON-TREATED	Protocol: CHRONIC-EPA-821-R-02-013	Test Species: CD-Ceriodaphnia dubia								
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	32.000	32.000	29.000	28.000	35.000	31.000	36.000	28.000	36.000
100	28.000	31.000	30.000	31.000	35.000	30.000	34.000	34.000	29.000	32.000

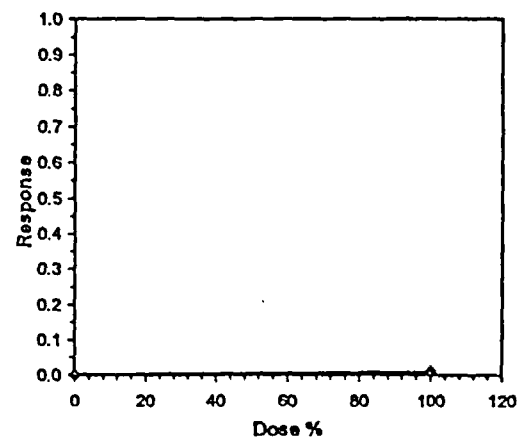
Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	31.700	1.0000	31.700	28.000	36.000	9.757	10				31.700	1.0000
100	31.400	0.9905	31.400	28.000	35.000	7.385	10	0.245	1.734	2.120	31.400	0.9905

Auxiliary Tests	Statistic		Critical	Skew	Kurt	
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.93010801		0.868	0.28577713	-1.1275073	
F-Test indicates equal variances ($p = 0.40$)	1.77892566		6.54108953			
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	2.11984895	0.06687221	0.45	7.47222222	0.80891991	1, 18
Treatments vs D-Control						

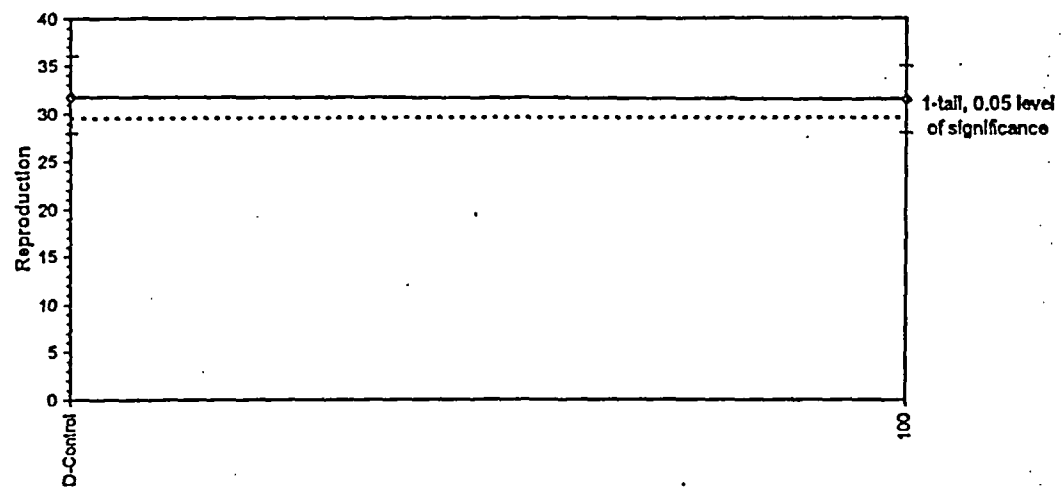
Environmental Testing Solutions, Inc.

Statistical Analyses

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



Dose-Response Plot



Environmental Testing Solutions, Inc.

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

Species: *Ceriodaphnia dubia*

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Non-treated

Test dates: May 06 - 13, 2004

Project number: 1206

Reviewed by: *Jumaer*

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)	7.68	7.67	8.02	7.66	8.05	7.66	7.82	7.59	7.63	7.69	7.64	7.49	7.49	7.63
	DO (mg/L)	7.9	8.0	8.0	8.1	7.9	8.2	8.3	8.2	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	303		331		298		300		287		307		302	
	Alkalinity (mg/L CaCO ₃)	64								60				62	
	Hardness (mg/L CaCO ₃)	82								82				82	
	Temperature (°C)	25.1	24.4	25.0	24.8	25.2	24.9	25.0	25.1	25.4	25.0	24.8	24.9	25.1	25.2
10.98%	pH (SU)	7.76	7.67	7.70	7.65	7.68	7.65	7.69	7.61	7.58	7.69	7.56	7.52	7.52	7.64
	DO (mg/L)	7.9	8.2	8.1	8.2	8.1	8.2	8.3	8.2	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	299		300		276		288		287		273		294	
	Temperature (°C)	24.7	24.3	24.9	24.6	25.0	24.9	25.0	25.0	25.4	25.1	24.8	24.9	25.0	25.2
22%	pH (SU)	7.74	7.67	7.68	7.64	7.65	7.64	7.68	7.62	7.55	7.69	7.54	7.48	7.48	7.63
	DO (mg/L)	8.0	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	288		287		270		281		273		264		281	
	Temperature (°C)	24.7	24.3	24.9	24.8	25.0	24.9	25.0	25.0	25.2	25.1	24.9	24.9	25.0	25.1
43.9%	pH (SU)	7.72	7.66	7.67	7.64	7.62	7.63	7.64	7.61	7.49	7.68	7.50	7.40	7.44	7.61
	DO (mg/L)	7.9	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.2	8.0	8.0	8.2
	Conductivity (µmhos/cm)	262		262		248		252		249		240		239	
	Temperature (°C)	24.5	24.4	24.9	24.7	25.0	24.9	25.0	25.0	25.2	25.0	24.8	25.0	25.0	25.2
72%	pH (SU)	7.71	7.65	7.64	7.64	7.62	7.62	7.60	7.60	7.43	7.66	7.47	7.38	7.38	7.62
	DO (mg/L)	8.0	8.2	8.2	8.2	8.2	8.2	8.2	8.4	8.3	8.3	8.2	7.8	8.0	8.1
	Conductivity (µmhos/cm)	226		226		217		221		207		209		218	
	Temperature (°C)	24.4	24.2	24.7	24.7	25.1	24.9	24.9	25.1	25.2	25.0	24.8	24.9	25.1	25.1
100%	pH (SU)	7.69	7.63	7.62	7.66	7.61	7.63	7.57	7.60	7.36	7.65	7.43	7.37	7.35	7.62
	DO (mg/L)	7.9	8.2	8.1	8.2	8.3	8.2	8.3	8.5	8.3	8.3	8.2	7.9	8.0	8.1
	Conductivity (µmhos/cm)	192		193		188		190		179		173		186	
	Alkalinity (mg/L CaCO ₃)	66				67				69					
	Hardness (mg/L CaCO ₃)	71				75				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.3	24.4	24.6	24.8	25.3	24.9	25.0	25.1	25.4	25.1	24.8	24.9	25.1	25.1
100% Intake	pH (SU)	7.68	7.61	7.61	7.68	7.61	7.60	7.61	7.59	7.71	7.65	7.62	7.36	7.67	7.63
	DO (mg/L)	8.0	8.0	8.3	8.2	8.3	8.0	8.4	8.4	8.4	8.4	8.3	8.0	8.2	8.1
	Conductivity (µmhos/cm)	191		191		183		183		183		178		189	
	Alkalinity (mg/L CaCO ₃)	60				66				67					
	Hardness (mg/L CaCO ₃)	75				73				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.7	24.4	24.7	24.8	25.2	24.9	24.9	25.1	25.4	25.0	24.8	24.9	25.1	25.1

Species: *Ceriodaphnia dubia*

Date: 05-06-04

Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
Analyst		AM	PM	AM	PM	AM	PM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.68	7.67	8.02	7.66	8.05	7.66
	DO (mg/L)	7.9	8.0	8.0	8.1	7.9	8.2
	Conductivity (umhos/cm)	303		331		298	
	Alkalinity (mg CaCO ₃ /L)	64					
	Hardness (mg CaCO ₃ /L)	82					
	Temperature (°C)	25.1	24.4	25.0	24.8	25.2	24.9
10.98%	pH (S.U.)	7.76	7.67	7.70	7.65	7.68	7.65
	DO (mg/L)	7.9	8.2	8.1	8.2	8.1	8.2
	Conductivity (umhos/cm)	299		300		276	
	Temperature (°C)	24.7	24.3	24.9	24.6	25.0	24.9
22%	pH (S.U.)	7.74	7.67	7.68	7.64	7.65	7.64
	DO (mg/L)	8.0	8.2	8.2	8.2	8.2	8.2
	Conductivity (umhos/cm)	288		287		270	
	Temperature (°C)	24.7	24.3	24.9	24.8	25.0	24.9
43.9%	pH (S.U.)	7.72	7.66	7.67	7.64	7.62	7.63
	DO (mg/L)	7.9	8.2	8.2	8.2	8.2	8.2
	Conductivity (umhos/cm)	262		262		248	
	Temperature (°C)	24.5	24.4	24.9	24.7	25.0	24.9
72%	pH (S.U.)	7.71	7.65	7.64	7.64	7.62	7.62
	DO (mg/L)	8.0	8.2	8.2	8.2	8.2	8.2
	Conductivity (umhos/cm)	226		226		217	
	Temperature (°C)	24.4	24.2	24.7	24.7	25.1	24.9
100%	pH (S.U.)	7.69	7.63	7.62	7.66	7.61	7.63
	DO (mg/L)	7.9	8.2	8.1	8.2	8.3	8.2
	Conductivity (umhos/cm)	192		193		188	
	Alkalinity (mg CaCO ₃ /L)	66				67	
	Hardness (mg CaCO ₃ /L)	71				75	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.3	24.4	24.6	24.8	25.3	24.9
100% Intake	pH (S.U.)	7.68	7.61	7.61	7.68	7.61	7.60
	DO (mg/L)	8.0	8.0	8.3	8.2	8.3	8.0
	Conductivity (umhos/cm)	191		191		183	
	Alkalinity (mg CaCO ₃ /L)	60				66	
	Hardness (mg CaCO ₃ /L)	75				73	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.7	24.4	24.7	24.8	25.2	24.9
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 05-06-04

		Day							
		3		4		5		6	
Analyst		KGL	KGL	CAJ	CAJ	KGL	KGL	KGL	KGL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.59	7.63	7.69	7.64	7.49	7.49	7.63
	DO (mg/L)	8.3	8.2	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	300		287		307		302	
	Alkalinity (mg CaCO ₃ /L)			60				62	
	Hardness (mg CaCO ₃ /L)	✓		82		✓		82	
	Temperature (°C)	25.0	25.1	25.4	25.0	24.8	24.9	25.1	25.2
10.98%	pH (S.U.)	7.69	7.61	7.58	7.69	7.50	7.52	7.52	7.64
	DO (mg/L)	8.3	8.2	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	280		287		273		294	
	Temperature (°C)	25.0	25.0	25.4	25.1	24.8	24.9	25.0	25.2
22%	pH (S.U.)	7.68	7.62	7.55	7.69	7.54	7.48	7.48	7.63
	DO (mg/L)	8.2	8.3	8.2	8.2	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	281		273		264		281	
	Temperature (°C)	25.0	25.0	25.2	25.1	24.9	24.9	25.0	25.1
43.9%	pH (S.U.)	7.64	7.61	7.49	7.68	7.58	7.40	7.44	7.61
	DO (mg/L)	8.2	8.3	8.3	8.3	8.2	8.0	8.0	8.2
	Conductivity (µmhos/cm)	252		249		240		239	
	Temperature (°C)	25.0	25.0	25.2	25.0	24.8	25.0	25.0	25.2
72%	pH (S.U.)	7.60	7.60	7.43	7.66	7.47	7.38	7.38	7.62
	DO (mg/L)	8.2	8.4	8.3	8.3	8.2	7.8	8.0	8.1
	Conductivity (µmhos/cm)	221		209 ²⁰¹		209		218	
	Temperature (°C)	24.9	25.1	25.2	25.0	24.8	24.9	25.1	25.1
100%	pH (S.U.)	7.57	7.60	7.36	7.65	7.43	7.37	7.35	7.62
	DO (mg/L)	8.3	8.5	8.3	8.3	8.2	7.9	8.0	8.1
	Conductivity (µmhos/cm)	190		179		173		186	
	Alkalinity (mg CaCO ₃ /L)			69					
	Hardness (mg CaCO ₃ /L)	✓		71		✓		✓	
	TR Chlorine (mg/L)	✓		<0.10		✓		✓	
	Temperature (°C)	25.0	25.1	25.4	25.1	24.8	24.9	25.1	25.1
100% Intake	pH (S.U.)	7.61	7.59	7.71	7.65	7.62	7.36	7.67	7.63
	DO (mg/L)	8.4	8.4	8.4	8.4	8.3	8.0	8.2	8.1
	Conductivity (µmhos/cm)	183		183		178		189	
	Alkalinity (mg CaCO ₃ /L)			67					
	Hardness (mg CaCO ₃ /L)	✓		71		✓		✓	
	TR chlorine (mg/L)	✓		<0.10		✓		✓	
	Temperature (°C)	24.9	25.1	25.4	25.0	24.8	24.9	25.1	25.1
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

Client: TVAFacility: Sequoyah Nuclear Plant - UV-treatedNPDES #: TN 0026450Project #: 1206

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	* Each concentration was UV treated for 2 minutes using a 40-WATT Sterilizer.
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		Test information:	
Organism age:	21.5 TO 24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	05-05-04 1130 TO 1400 MST (1330 TO 1600 EST)	Incubator number:	3 B
Organism source:	ABS BATCH 05-05-04	Artemia lot number:	863010Q
Transfer bowl information:	pH = 7.63 Temperature = 21.2 °C	Total drying time:	24-HOURS
Average transfer volume:	9.5 mL	Date / Time in:	05-13-04 1430
		Date / Time out:	05-14-04 1430
		Oven temperature:	61°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	05-06-04	— 81	1600	1334	05-05-04	040505.23/24	dl
1	05-07-04	1000	1606	1415	05-05-04	040505.23/24	dl
2	05-08-04	1000	1557	1430	05-05-04	040507.04/05	dl
3	05-09-04	0954	1602	1322	05-05-04	040507.04/05	KEK
4	05-10-04	1003	1610	1340	05-07-04	040509.01/02	KEK
5	05-11-04	1000	1604	1320	05-07-04	040509.01/02	KEK
6	05-12-04	0950	1612	1333	05-11-04	040509.01/02	KEK
7	05-13-04			1345			KEK

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC ₅₀	> 100%
Average weight per initial larvae:	0.859		NOEC	100%
Average weight per surviving larvae:	0.859	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC ₂₅	> 100%

Species: *Pimephales promelas*Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - 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	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)	14.66	15.01	14.73	15.11	14.43	14.83	15.01	14.91	15.04	14.54	14.69	15.11
B = Pan + Larvae weight (mg)	23.43	22.53	22.04	23.85	22.67	21.76	23.57	23.34	22.41	22.72	24.40	23.87
Larvae weight (mg) = A - B	8.77	7.52	9.33	8.74	8.24	6.93	8.56	8.37	7.37	8.18	9.71	8.76
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.877	0.752	0.933	0.874	0.824	0.693	0.856	0.837	0.737	0.818	0.971	0.876
Average weight per initial number of larvae (mg)	0.859				0.803				0.851			

Calculations and data reviewed: *JA*

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Date: 05-06-04

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)	1491	1494	1451	1501	1481	1476	1475	1454	1451	1505	1445	1482
B = Pan + Larvae weight (mg)	23.42	23.21	22.71	23.98	24.46	24.57	24.13	23.72	24.43	24.64	22.00	24.09
Larvae weight (mg) = A - B	8.51	8.27	8.20	8.97	9.65	9.75	9.38	9.18	9.92	9.59	7.55	9.27
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.851	0.827	0.820	0.897	0.965	0.975	0.938	0.918	0.992	0.959	0.755	0.927
Average weight per initial number of larvae (mg)	0.849				0.949				0.908			

Calculations and data reviewed: *dl*

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Date: 05-06-04

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)	14.61	14.96	14.89	14.47
B = Pan + Larvae weight (mg)	23.57	23.35	24.41	23.85
Larvae weight (mg) = A - B	8.96	8.79	9.52	9.38
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.896	0.879	0.952	0.938
Average weight per initial number of larvae (mg)	0.916			

Calculations and data reviewed: dl

Comments:

Environmental Testing Solutions, Inc.

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: May 06-13, 2004
 Project number: 1206

Reviewed by: *Jensen*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = B - A	Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.66	23.43	8.77	0.877	0.859	8.9	0.877	100.0	0.859	8.9	Not applicable
	B	10	10	15.01	22.53	7.52	0.752			0.752				
	C	10	10	14.73	24.06	9.33	0.933			0.933				
	D	10	10	15.11	23.85	8.74	0.874			0.874				
10.98%	E	10	10	14.43	22.67	8.24	0.824	0.803	9.2	0.824	100.0	0.803	9.2	6.6
	F	10	10	14.83	21.76	6.93	0.693			0.693				
	G	10	10	15.01	23.57	8.56	0.856			0.856				
	H	10	10	14.97	23.34	8.37	0.837			0.837				
22%	I	10	10	15.04	22.41	7.37	0.737	0.851	11.6	0.737	100.0	0.851	11.6	1.0
	J	10	10	14.54	22.72	8.18	0.818			0.818				
	K	10	10	14.69	24.40	9.71	0.971			0.971				
	L	10	10	15.11	23.87	8.76	0.876			0.876				
43.9%	M	10	10	14.91	23.42	8.51	0.851	0.849	4.1	0.851	100.0	0.849	4.1	1.2
	N	10	10	14.94	23.21	8.27	0.827			0.827				
	O	10	10	14.51	22.71	8.20	0.820			0.820				
	P	10	10	15.01	23.98	8.97	0.897			0.897				
72%	Q	10	10	14.81	24.46	9.65	0.965	0.949	2.7	0.965	100.0	0.949	2.7	-10.5
	R	10	10	14.76	24.51	9.75	0.975			0.975				
	S	10	10	14.75	24.13	9.38	0.938			0.938				
	T	10	10	14.54	23.72	9.18	0.918			0.918				
100%	U	10	10	14.51	24.43	9.92	0.992	0.908	11.6	0.992	100.0	0.908	11.6	-5.7
	V	10	10	15.05	24.64	9.59	0.959			0.959				
	W	10	10	14.45	22.00	7.55	0.755			0.755				
	X	10	10	14.82	24.09	9.27	0.927			0.927				
100% Intake	Y	10	10	14.61	23.57	8.96	0.896	0.916	3.8	0.896	100.0	0.916	3.8	-6.7
	Z	10	10	14.96	23.75	8.79	0.879			0.879				
	AA	10	10	14.89	24.41	9.52	0.952			0.952				
	BB	10	10	14.47	23.85	9.38	0.938			0.938				

Outfall 101:
 Dunnett's MSD value: 0.1284
 PMSD: 14.9

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, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.8% 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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 5/6/2004	Test ID: PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101	
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
Comments: UV-TREATED	Protocol: CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	

Conc-%	1	2	3	4
D-Control	0.8770	0.7520	0.9330	0.8740
10.98	0.8240	0.6930	0.8560	0.8370
22	0.7370	0.8180	0.9710	0.8760
43.9	0.8510	0.8270	0.8200	0.8970
72	0.9650	0.9750	0.9380	0.9180
100	0.9920	0.9590	0.7550	0.9270

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	I-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8590	1.0000	0.8590	0.7520	0.9330	8.885	4				0.8697	1.0000
10.98	0.8025	0.9342	0.8025	0.6930	0.8560	9.243	4	1.061	2.410	0.1284	0.8697	1.0000
22	0.8505	0.9901	0.8505	0.7370	0.9710	11.582	4	0.160	2.410	0.1284	0.8697	1.0000
43.9	0.8488	0.9881	0.8488	0.8200	0.8970	4.100	4	0.192	2.410	0.1284	0.8697	1.0000
72	0.9490	1.1048	0.9490	0.9180	0.9750	2.730	4	-1.689	2.410	0.1284	0.8697	1.0000
100	0.9083	1.0573	0.9083	0.7550	0.9920	11.622	4	-0.925	2.410	0.1284	0.8697	1.0000

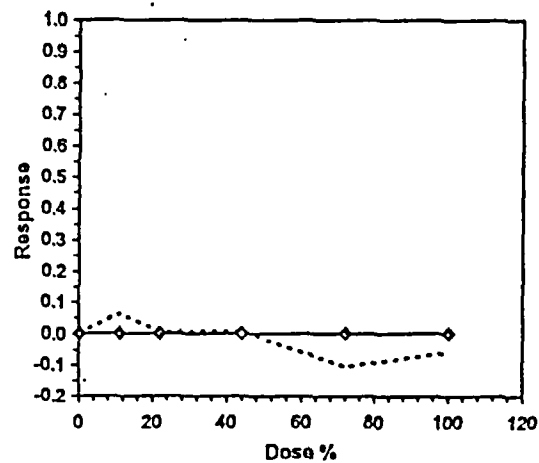
Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.93476695		0.884		-0.7138201	0.30966581	
Bartlett's Test indicates equal variances (p = 0.25)					6.56997252		15.0862722				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	0.12838357	0.149457	0.01056997	0.00567564	0.15134475	5, 18
Treatments vs D-Control											

Environmental Testing Solutions, Inc.

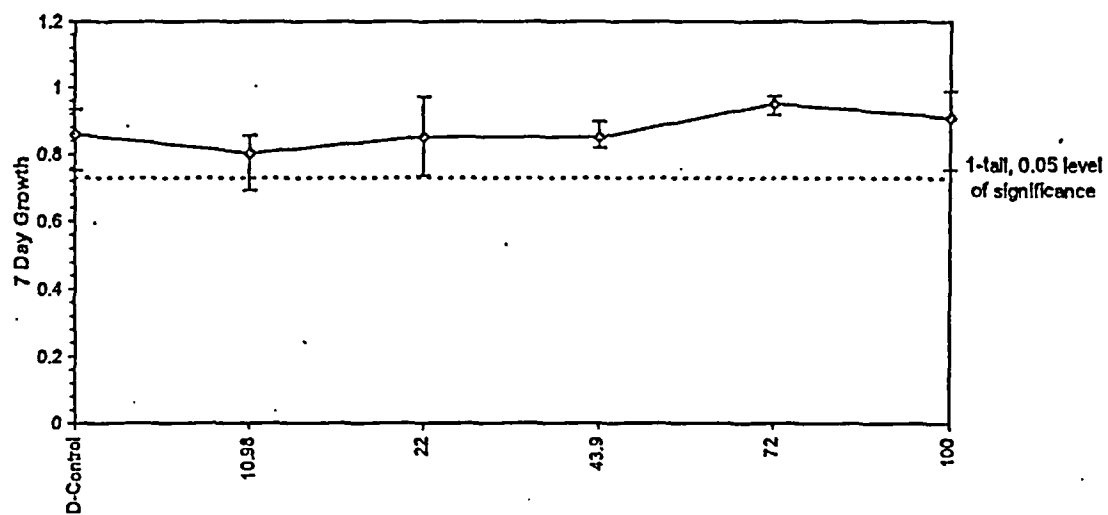
Statistical Analyses

Linear Interpolation (200 Resamples)
Skew

Point	%	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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 5/6/2004	Test ID: PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Intake	
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
	Protocol: CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	
Comments: UV-TREATED				
Conc-%	1	2	3	4
D-Control	0.8770	0.7520	0.9330	0.8740
100	0.8960	0.8790	0.9520	0.9380

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8590	1.0000	0.8590	0.7520	0.9330	8.885	4				0.8876	1.0000
100	0.9163	1.0666	0.9163	0.8790	0.9520	3.754	4	-1.368	1.943	0.0813	0.8876	1.0000

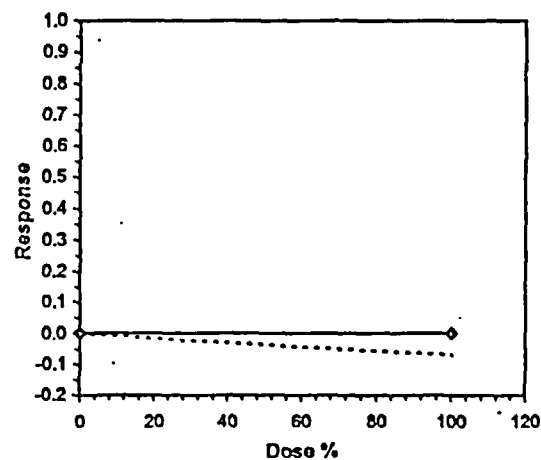
Auxiliary Tests		Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)		0.93401957		0.749		-0.9427791	1.3786742
F-Test indicates equal variances ($p = 0.22$)		4.92398739		47.4672279			
Hypothesis Test (1-tail, 0.05)		MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences		0.08133308	0.09468345	0.00655513	0.00350379	0.22039056	1, 6
Treatments vs D-Control							

Environmental Testing Solutions, Inc.

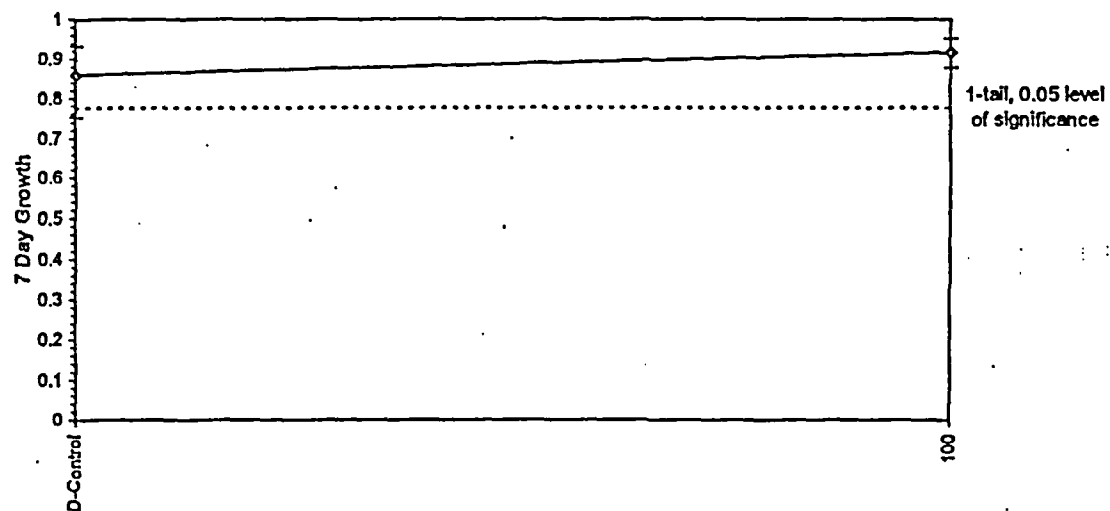
Statistical Analyses

Linear Interpolation (200 Resamples)

Point	%	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, Inc.

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

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, UV-Treated

Test dates: May 06 - 13, 2004

Project number: 1206

Reviewed by: *J. J. J.*

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)	7.68	7.66	7.85	7.58	7.80	7.43	7.63	7.31	7.55	7.35	7.52	7.44	7.49	7.49
	DO (mg/L)	8.0	7.8	8.2	7.4	7.9	7.7	8.0	7.7	8.2	7.8	8.2	7.8	8.0	7.9
	Conductivity (µmhos/cm)	303		301		280		288		284		277		292	
	Alkalinity (mg/L CaCO ₃)														
	Hardness (mg/L CaCO ₃)														
	Temperature (°C)	25.4	24.1	25.0	24.4	25.1	24.5	25.0	24.2	24.8	24.5	25.0	24.3	25.2	24.4
10.98%	pH (SU)	7.69	7.66	7.85	7.59	7.78	7.42	7.63	7.34	7.54	7.36	7.51	7.44	7.50	7.46
	DO (mg/L)	8.1	8.0	8.2	7.5	7.9	7.6	8.1	7.7	8.2	7.8	8.2	7.8	8.0	7.8
	Conductivity (µmhos/cm)	301		298		267		286		288		271		298	
	Temperature (°C)	25.4	24.1	25.1	24.4	25.1	24.5	25.0	24.1	25.0	24.5	24.9	24.3	25.0	24.4
22%	pH (SU)	7.69	7.67	7.83	7.59	7.76	7.42	7.62	7.40	7.53	7.39	7.50	7.40	7.49	7.45
	DO (mg/L)	8.1	8.0	8.2	7.5	8.0	7.6	8.2	7.8	8.2	7.8	8.2	7.7	8.0	7.7
	Conductivity (µmhos/cm)	287		286		252		274		265		264		272	
	Temperature (°C)	25.2	24.2	25.1	24.3	25.1	24.5	25.0	24.2	25.0	24.5	24.9	24.3	25.0	24.2
43.9%	pH (SU)	7.69	7.64	7.81	7.56	7.74	7.43	7.59	7.36	7.50	7.39	7.49	7.43	7.47	7.46
	DO (mg/L)	8.1	8.0	8.2	7.5	8.0	7.7	8.1	7.8	8.2	7.8	8.3	7.7	8.0	7.7
	Conductivity (µmhos/cm)	263		261		241		249		249		241		259	
	Temperature (°C)	25.3	24.1	25.0	24.3	25.0	24.5	25.0	24.2	24.9	24.3	25.0	24.4	25.0	24.4
72%	pH (SU)	7.68	7.59	7.79	7.60	7.73	7.45	7.58	7.40	7.48	7.41	7.48	7.45	7.44	7.46
	DO (mg/L)	8.2	8.0	8.1	7.4	8.0	7.6	8.2	7.8	8.3	7.8	8.3	7.7	8.0	7.7
	Conductivity (µmhos/cm)	226		228		214		220		214		208		221	
	Temperature (°C)	25.3	24.1	24.9	24.3	24.9	24.5	25.0	24.2	25.0	24.5	24.9	24.4	25.1	24.3
100%	pH (SU)	7.66	7.61	7.76	7.56	7.72	7.42	7.55	7.38	7.44	7.38	7.46	7.46	7.40	7.46
	DO (mg/L)	8.1	8.0	8.1	7.6	8.1	7.6	8.1	7.9	8.3	7.8	8.3	7.7	8.0	7.6
	Conductivity (µmhos/cm)	193		195		179		185		180		177		190	
	Alkalinity (mg/L CaCO ₃)														
	Hardness (mg/L CaCO ₃)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.4	24.1	25.1	24.4	24.9	24.5	25.0	24.1	25.1	24.5	24.9	24.5	25.1	24.3
100% Intake	pH (SU)	7.66	7.62	7.78	7.56	7.69	7.47	7.54	7.44	7.63	7.49	7.59	7.45	7.56	7.51
	DO (mg/L)	8.1	7.9	8.1	7.4	8.1	7.7	8.3	8.0	8.4	8.2	8.3	7.6	7.9	7.9
	Conductivity (µmhos/cm)	191		191		179		187		178		183		188	
	Alkalinity (mg/L CaCO ₃)														
	Hardness (mg/L CaCO ₃)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.4	24.1	25.1	24.3	25.1	24.5	25.0	24.2	25.2	24.5	25.1	24.3	24.9	24.3

Species: *Pimephales promelas*

Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Daily Chemistry:

		Day					
		0		1		2	
Analyst		CAI	CAI	CAI	JI	JI	KCH
Concentration	Parameter						
CONTROL	pH (S.U.)	7.68	7.66	7.85	7.58	7.80	7.43
	DO (mg/L)	8.0	7.8	8.2	7.4	7.9	7.7
	Conductivity (µmhos/cm)	303		301		280	
	Alkalinity (mg CaCO ₃ /L)						
	Hardness (mg CaCO ₃ /L)						
	Temperature (°C)	25.4	24.1	25.0	24.4	25.1	24.5
10.98%	pH (S.U.)	7.69	7.66	7.85	7.59	7.78	7.42
	DO (mg/L)	8.1	8.0	8.2	7.5	7.9	7.6
	Conductivity (µmhos/cm)	301		298		267	
	Temperature (°C)	25.4	24.1	25.1	24.4	25.1	24.5
22%	pH (S.U.)	7.69	7.67	7.83	7.59	7.76	7.42
	DO (mg/L)	8.1	8.0	8.2	7.5	8.0	7.6
	Conductivity (µmhos/cm)	287		286		252	
	Temperature (°C)	25.2	24.2	25.1	24.3	25.1	24.5
43.9%	pH (S.U.)	7.69	7.64	7.81	7.56	7.74	7.43
	DO (mg/L)	8.1	8.0	8.2	7.5	8.0	7.7
	Conductivity (µmhos/cm)	263		261		241	
	Temperature (°C)	25.3	24.1	25.0	24.3	25.0	24.5
72%	pH (S.U.)	7.68	7.57	7.79	7.60	7.73	7.45
	DO (mg/L)	8.2	8.0	8.1	7.4	8.0	7.6
	Conductivity (µmhos/cm)	226		228		214	
	Temperature (°C)	25.3	24.1	24.9	24.3	24.9	24.5
100%	pH (S.U.)	7.66	7.61	7.76	7.56	7.72	7.42
	DO (mg/L)	8.1	8.0	8.1	7.6	8.1	7.6
	Conductivity (µmhos/cm)	193		195		179	
	Alkalinity (mg CaCO ₃ /L)						
	Hardness (mg CaCO ₃ /L)						
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	25.4	24.1	25.1	24.4	24.9	24.5
100% Intake	pH (S.U.)	7.66	7.62	7.78	7.56	7.69	7.47
	DO (mg/L)	8.1	7.9	8.1	7.4	8.1	7.7
	Conductivity (µmhos/cm)	191		191		179	
	Alkalinity (mg CaCO ₃ /L)						
	Hardness (mg CaCO ₃ /L)						
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	25.4	24.1	25.1	24.3	25.1	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Date: 05-06-04

Client: TVA / Sequoyah Nuclear Plant - UV-treated

		Day							
		3		4		5 Ken		6	
Analyst		KGL	CAI	CAI	CAI	CAI	CAI	CAI	KGL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.43	7.31	7.55	7.35	7.52	7.44	7.49	7.49
	DO (mg/L)	8.0	7.7	8.2	7.8	8.2	7.8	8.0	7.9
	Conductivity (µmhos/cm)	200		284		277		292	
	Alkalinity (mg CaCO ₃ /L)								
	Hardness (mg CaCO ₃ /L)								
	Temperature (°C)	25.0	24.2	24.8	24.5	25.0	24.3	25.2	24.4
10.98%	pH (S.U.)	7.63	7.34	7.54	7.36	7.51	7.44	7.50	7.46
	DO (mg/L)	8.1	7.7	8.2	7.6	8.2	7.8	8.0	7.8
	Conductivity (µmhos/cm)	200		288		271		298	
	Temperature (°C)	25.0	24.1	25.0	24.5	24.9	24.3	25.0	24.4
22%	pH (S.U.)	7.62	7.40	7.53	7.39	7.50	7.40	7.49	7.45
	DO (mg/L)	8.2	7.8	8.2	7.8	8.2	7.7	8.0	7.7
	Conductivity (µmhos/cm)	274		265		264		272	
	Temperature (°C)	25.0	24.2	25.0	24.5	24.9	24.3	25.0	24.2
43.9%	pH (S.U.)	7.59	7.36	7.50	7.39	7.49	7.43	7.47	7.46
	DO (mg/L)	8.1	7.8	8.2	7.8	8.3	7.7	8.0	7.7
	Conductivity (µmhos/cm)	249		249		241		259	
	Temperature (°C)	25.0	24.2	24.9	24.3	25.0	24.4	25.0	24.4
72%	pH (S.U.)	7.58	7.40	7.48	7.41	7.48	7.45	7.44	7.46
	DO (mg/L)	8.2	7.8	8.3	7.8	8.3	7.7	8.0	7.7
	Conductivity (µmhos/cm)	220		214		208		221	
	Temperature (°C)	25.0	24.2	25.0	24.5	24.9	24.4	25.1	24.3
100%	pH (S.U.)	7.55	7.38	7.44	7.38	7.46	7.46	7.40	7.46
	DO (mg/L)	8.1	7.9	8.3	7.8	8.3	7.7	8.0	7.6
	Conductivity (µmhos/cm)	185		180		177		190	
	Alkalinity (mg CaCO ₃ /L)								
	Hardness (mg CaCO ₃ /L)								
	TR Chlorine (mg/L)								
100% Intake	Temperature (°C)	25.0	24.1	25.1	24.5	24.9	24.5	25.1	24.3
	pH (S.U.)	7.54	7.44	7.63	7.49	7.59	7.45	7.50	7.51
	DO (mg/L)	8.3	8.0	8.4	8.2	8.3	7.6	7.9	7.9
	Conductivity (µmhos/cm)	187		178		183		188	
	Alkalinity (mg CaCO ₃ /L)								
	Hardness (mg CaCO ₃ /L)								
100% Intake	TR Chlorine (mg/L)								
	Temperature (°C)	25.0	24.2	25.2	24.5	25.1	24.3	24.9	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst CAI
Date analyzed 05.06.04Iodide reagent: INR 106
Acid reagent: INR 107

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 197</u>	<u>INSS 197</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 197</u>	<u>0.50</u>	<u>0.537</u>	<u>107.4%</u>

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\{(S - D) / [(S + D) / 2]\} \times 100$ (acceptable range = $\pm 10\%$)
<u>040506.04</u>	<u>Shearon Harris</u>	<u>yellow particles</u>	<u>S 10.0506</u>	
<u>↓</u>	<u>Duplicate</u>		<u>D 10.0318</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><0.0687</u>
<u>040505.24</u>	<u>SON Intake</u>	<u>light yellow particles</u>	<u><0.0168</u>
<u>040505.23</u>	<u>SON 101</u>	<u>light yellow particles</u>	<u><0.00431</u>
<u>040506.02</u>	<u>McQuay Cd</u>	<u>no color particles</u>	<u><0.00562</u>
<u>040506.06</u>	<u>Warren</u>	<u>pale yellow, few particles</u>	<u><0.00265</u>
<u>040506.05</u>	<u>Farmville</u>	<u>light yellow, few particles</u>	<u><0.00110</u>
<u>040506.01</u>	<u>McGuire</u>	<u>no color, clear</u>	<u><0.00172</u>
<u>040506.03</u>	<u>McQuay Pp</u>	<u>no color, clear</u>	<u><0.00100</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 197</u>	<u>0.50</u>	<u>0.520</u>	<u>104.0%</u>

Reviewed by dl
Date reviewed 05-06-04

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst dl
Date analyzed 05-01-04Iodide reagent: INR 106
Acid reagent: INR 107

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INR INSS 197</u>	<u>INSS 197</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 197</u>	<u>0.50</u>	<u>0.523</u>	<u>104.6%</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 = $\pm 10\%$)
<u>040509.10</u>	<u>CORR cd</u>	<u>CLEAR, NO COLOR</u>	<u>S < 0.00296</u>	
<u>✓</u>	<u>Duplicate</u>		<u>D < 0.00265</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>< 0.000755</u>
<u>040508.09</u>	<u>CORR Pp</u>	<u>CLEAR, NO COLOR</u>	<u>< 0.000310</u>
<u>040508.08</u>	<u>FARMVILLE</u>	<u>YELLOW/BEIGE, PARTICLES</u>	<u>< 0.000515</u>
<u>040508.11</u>	<u>HERCULES</u>	<u>PALE YELLOW, PARTICLES</u>	<u>< 0.000535</u>
<u>040508.22</u>	<u>WARREN COUNTY</u>	<u>PALE YELLOW, PARTICLES</u>	<u>< 0.000410</u>
<u>040507.04</u>	<u>TVA / SQN 101</u>	<u>LIGHT YELLOW, PARTICLES</u>	<u>< 0.000216</u>
<u>040507.06</u>	<u>TVA / SQN INTAKE</u>	<u>LIGHT YELLOW, PARTICLES</u>	<u>< 0.000275</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 197</u>	<u>0.50</u>	<u>0.496</u>	<u>99.2%</u>

Reviewed by 1596
Date reviewed 05-09-04

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 05-10-04Iodide reagent: INR 106
Acid reagent: INR 107

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 197</u>	<u>INSS 197</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 197</u>	<u>0.50</u>	<u>0.531</u>	<u>106.2%</u>

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\{(S - D) / [(S + D) / 2]\} \times 100$ (acceptable range = $\pm 10\%$)
<u>040508.13</u>	<u>Roseboro</u>	<u>pale yellow</u>	<u>S <0.00166</u>	
<u>↓</u>	<u>Duplicate</u>	<u>particles</u>	<u>D <0.000948</u>	

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	<u>Blank (should be = <0.10 mg/L)</u>		<u><0.0337</u>
<u>040508.03</u>	<u>Marshall</u>	<u>no color, clear</u>	<u>0.0190</u>
<u>040508.04</u>	<u>Rae ford</u>	<u>light yellow, clear</u>	<u><0.00831</u>
<u>040507.08</u>	<u>Baxter</u>	<u>no color, particles</u>	<u><0.00252</u>
<u>040508.07</u>	<u>Lincoln</u>	<u>pale yellow, clear</u>	<u><0.000859</u>
<u>040508.05</u>	<u>BASF</u>	<u>yellow, many particles</u>	<u>0.00805</u>
<u>040508.17</u>	<u>Wilson</u>	<u>pale yellow, particles</u>	<u><0.00356</u>
<u>040508.15</u>	<u>Ingersoll / Schlagelock</u>	<u>no color, clear</u>	<u><0.00206</u>
<u>040507.06</u>	<u>Comm - Scope</u>	<u>yellow, sunken particles</u>	<u><0.00123</u>
<u>040508.01</u>	<u>M^c Quay</u>	<u>no color, clear</u>	<u><0.000845</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>0.50</u>		

Reviewed by CAJ
Date reviewed 05-10-04

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst dl
Date analyzed 05-10-04Iodide reagent: /
Acid reagent: /

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>/</u>	<u>/</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%)
INSS 197	0.50	0.498	99.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{ S - D }{(S + D)/2} \times 100$ (acceptable range = $\pm 10\%$)
040509.01	TVA			
	SQL 101	LIGHT YELLOW	S < 0.000269	
	Duplicate	PARTICLES	D < 0.000212	

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<u>/</u>
040509.02	TVA/SQL INTAKE	LIGHT YELLOW, PARTICLES	< 0.000713

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 197	0.50	0.513	102.6%

Reviewed by dl
Date reviewed 05-10-04

Alkalinity
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CAS
Date analyzed 05-13-04

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
4.44	INK 097	INK 105	0.0	12.3	12.3	0.0203	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%)
INSS 185	100	100	12.3	22.0	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 = $\frac{ (S-D) }{((S+D)/2)} \times 100$ (acceptable range = ± 10%)
05-03-04	SSW H ₂ O A	100	22.0	25.2	3.2	10.2	^S 33	
	Duplicate	↓	25.2	28.4	3.2	↓	^D 33	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO ₃ /L)
INSS 185	50	100	26.2	33.3	8.1	10.2	83

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%)
33	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
05-03-04	SSW H ₂ O B	100	33.3	36.7	3.4	10.2	35
↓	Salt SW A		0.2	13.7	13.5		138
↓	↓ B			13.7	27.8		144
05-05-04	MHS H ₂ O A		27.8	34.1	6.3		64
↓	↓ B		34.1	40.3	6.2		63
05-07-04	MHS H ₂ O A		40.3	46.2	5.9		60
↓	↓ B		13.6	19.7	6.1		62
↓	SS Salt SW		19.7	34.1	14.4		147
05-11-04	MHS H ₂ O A	↓	34.1	40.2	6.1	↓	62

Reviewed by:

JFDate reviewed: 05-19-04

Alkalinity
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CM
Date analyzed 05.13.04

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
	* INR 110						

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 185	100	100	0.0	9.9	9.9	10.2	101	101%

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%)
* 05.11.04	MHS H ₂ O 8	100	9.9	15.9	6.0	10.2	S 61	
↓	Duplicate	1	15.9	22.0	6.1	4	D 62	1.6%

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)
INSS 185	50	100	15.9	24.9	11.0	10.2	112

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%)
62	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
05.11.04	MHS H ₂ O 8 C	100	24.9	32.8	5.9	10.2	60
↓	SW H ₂ O		33.0	36.3	3.3		34
040506.03	Carr fp 1		36.3	52.0	9.9	23.6	241 = 240
040508.09	↓ 2		9.9	34.0	24.1		250
040511.03	↓ 3		1.0	22.8	21.8		220
040506.02	Carr Cd 1		22.8	46.7	18.9		190
040508.10	↓ 2		2.1	23.7	21.6		220
040511.02	↓ 3		23.7	40.2	16.5		170
040505.23	SON 1	1	40.2	46.7	6.5	↓	66

Reviewed by:

PTU

Date reviewed:

05-22-04

Alkalinity (EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg CaCO₃/L
 Analyst CAJ
 Date analyzed 05-13-04

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titration 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%)
1155 135	100	100	1.1	10.7	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%)
040507.04	SAN 2	100	10.7	17.3	6.6	10.2	S 67	
↓	Duplicate	↓	17.3	23.8	6.5	↓	D 66	1.5%

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)
1155 135	50	100	17.3	28.8	11.5	10.2	117

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%)
160	51	102.1%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
040511.02	SAN 3	100	28.8	35.6	6.8	10.2	69
040505.23	SAN Intake 1		35.6	41.5	5.9		60
040507.04	↓ 2		41.5	48.0	6.5		66
040509.01	↓ 3		0.0	6.6	6.6		67
040524.05	Farmville 1		6.6	18.4	11.8		120
040508.00	↓ 2		18.4	30.8	12.4		130
040511.07	↓ 3		30.8	44.1	13.3		140
040516.06	Warren 1		0.4	9.8	9.4		96
040508.22	↓ 2	↓	9.8	18.5	8.2	↓	84

Reviewed by:

KAT

Date reviewed:

05-22-04

Environmental Testing Solutions, Inc.

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Alkalinity
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CAJ
Date analyzed 05-13-04

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%)
1N55 186	100	100	18.5	28.3	9.8	10.2	100	100%

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%)
040511.09	Water 3	100	28.3	46.5	18.2	10.2	190	
↓	Duplicate	↓	0.6	18.7	19.1	↓	180	5.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO ₃ /L)
1N55 185	50	100	0.6	23.5	22.9	10.2	234

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%)
180	54	108%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO ₃ /L)
040511.04	Colbert 001	100	23.5	30.4	6.9	10.2	70
040511.05	↓ + taken		30.7	37.0	6.3		64
	TVA JOF (Boiler water)		37.0	37.1	0.1		1.0
040507.03	Int'l Paper		0.37	37.0	37.5		380
05-11-04	Salt SW		0.4	10.1	9.7		99
040508.11	Herwicks 1		10.1	22.0	11.9		120
040511.01	↓ 2		22.0	36.2	14.2		140
040513.03	↓ 3		21.5	36.0	14.5	↓	150

Reviewed by: CAJDate reviewed: 05-19-04

Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CAJ
Date analyzed 05-14-04

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
MR 103	1155 172	0.0	9.8	9.8	0.0204	20.4

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
1155 160	40	50	9.8	11.8	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
05-03-04	SSW H ₂ O B	50	11.8	14.0	2.2	20.4	S 45	
↓	Duplicate	↓	14.0	16.2	2.2	↓	D 45	—

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)
1155 160	40	50	14.0	18.1	4.1	20.4	84

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%)
45	39	97.5 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)
TV = ND	Blank (should be = 0 mg CaCO ₃ /L)	50	0.0	0.0	0.0	20.4	ND
05-03-04	SSW H ₂ O A		18.1	20.2	2.1		43
05-05-04	MHS H ₂ O A		20.2	24.2	4.0		82
↓	↓ B		24.2	28.5	4.3		88
05-07-04	MHS H ₂ O A		28.5	32.5	4.0		82
↓	↓ B		32.5	36.7	4.2		86
05-11-04	MHS H ₂ O A		36.7	40.7	4.0		82
↓	↓ B		40.7	44.9	4.2		86
↓	↓ C		44.9	49.1	4.2		86
↓	SSW H ₂ O	↓	0.9	3.0	2.1	↓	43

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

Date reviewed

05-19-04

Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CAJ
Date analyzed 05-14-04*Titrant normality and multiplier determination:*

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000) / 50 ml sample = N x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 160	40	50	3.0	5.0	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
040506.03	Corr Pp	50	5.0	17.4	12.4	20.4	S 263	
↓	Duplicate	↓	17.4	29.7	12.3	↓	D 251	0.79 %

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO ₃ /L)
INSS 160	40	50	17.4	31.7	14.3	20.4	292

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%)
251	41	102.5

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)
	Blank (should be = 0 mg CaCO ₃ /L)						
040508.09	Corr Pp 2	50	31.7	44.3	12.6	20.4	260
040511.03	↓ 3		0.4	12.0	11.6		240
040506.02	Corr Cd 1		12.0	22.0	10.0		200
040508.10	↓ 2		22.0	33.7	11.7		240
040511.02	↓ 3		33.7	42.5	8.8		180
040505.23	SON 1		1.1	4.6	3.5		71
040507.04	↓ 2		4.6	8.3	3.7		75
040509.01	↓ 3		8.3	11.8	3.5		71
040505.24	SON INJ 1	↓	11.8	15.5	3.7	↓	75

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

K9N

Date reviewed

05-22-04

Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CAJ
Date analyzed 05.14.04Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000) / 50 ml sample = N x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 160	40	50	15.5	17.5	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
040509.02	SON 2	50	17.5	21.1	3.6	20.4	S 73	
040507.05	Duplicate	4	21.1	24.7	3.6	1	D 73	

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO ₃ /L)
INSS 160	40	50	21.1	26.8	5.7	20.4	116

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%)
73	43	107.5 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)
	Blank (should be = 0 mg CaCO ₃ /L)						CAJ
040509.02	SON 3	50	26.8	30.3	3.5	20.4	71
040506.05	Farmville 1		30.3	31.4	1.1		22
040508.08	↓ 2		31.4	32.3	0.9		18
040511.07	↓ 3		32.3	33.2	0.9		18
040506.00	Warren 1		33.2	38.5	5.3		110
040508.22	↓ 2		38.5	44.5	6.0		120
040511.09	↓ 3		0.4	8.3	7.9		160
040507.03	Int'l Paper		8.3	16.4	8.1		160
040511.06	TVA JCF	4	16.4	16.5	0.1	↓	2.0

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

Reviewed

Ker

Date reviewed

05-22-04

Environmental Testing Solutions, Inc.

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Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst CPS
Date analyzed 05-14-04

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000) / 50 ml sample = N x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO ₃ /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 160	40	50	16.5	18.4	1.9	20.4	39	97.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
040511.05	Colbert	50	18.4	22.1	3.7	20.4	S 75	
↓	Duplicate ↓	50	22.1	23.8	3.7	↓	D 75	

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO ₃ /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO ₃ /L)
INSS 160	40	50	22.1	27.8	5.7	20.4	116

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%)
75	41	102.5%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO ₃ /L)
	Blank (should be ~ 0 mg CaCO ₃ /L)						
040511.04	Colbert 001	50	27.8	32.0	4.2	20.4	86

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

Reviewed

Date reviewed

05-19-04

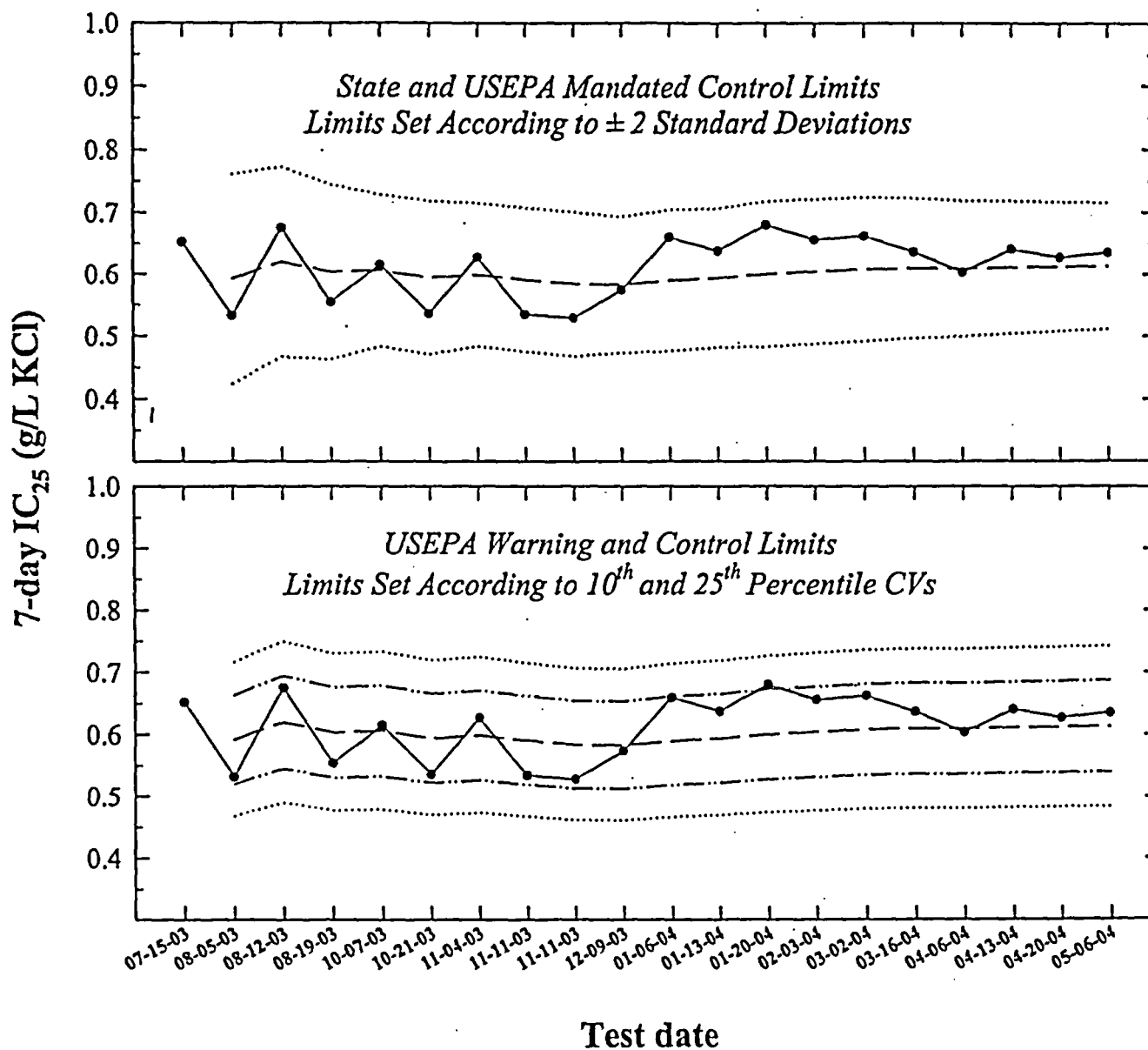
Sequoyah Nuclear Plant Biomonitoring
May 6 - 13, 2004

Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, Inc.

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



- 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- — Central Tendency (mean IC_{25})
- - - - Warning Limits (mean $IC_{25} \pm S_{A,10}$)
- Control Limits (mean $IC_{25} \pm S_{A,25}$ or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC_{15} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits		S_{A10}	Laboratory Warning Limits		S_{A25}	Laboratory Control Limits		S_{A75}	USEPA Warning Limits		S_{A90}	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S_{A10}	CT + S_{A10}		CT - S_{A25}	CT + S_{A25}		CT - S_{A75}	CT + S_{A75}		CT - S_{A90}	CT + S_{A90}	
1	07-15-03	0.65																	
2	08-05-03	0.53	0.59	0.08	0.42	0.76	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.14
3	08-12-03	0.67	0.62	0.08	0.47	0.77	0.07	0.55	0.69	0.13	0.49	0.75	0.24	0.38	0.86	0.28	0.34	0.90	0.12
4	08-19-03	0.55	0.60	0.07	0.46	0.74	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.12
5	10-07-03	0.61	0.61	0.06	0.48	0.73	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.38	0.84	0.27	0.33	0.88	0.10
6	10-21-03	0.54	0.59	0.06	0.47	0.72	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
7	11-04-03	0.63	0.60	0.06	0.48	0.71	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.83	0.27	0.33	0.87	0.10
8	11-11-03	0.53	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.10
9	11-11-03	0.53	0.58	0.06	0.47	0.70	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.10
10	12-09-03	0.57	0.58	0.05	0.47	0.69	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.80	0.26	0.32	0.85	0.09
11	01-06-04	0.66	0.59	0.06	0.48	0.70	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.86	0.10
12	01-13-04	0.64	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	0.09
13	01-20-04	0.68	0.60	0.06	0.48	0.72	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.10
14	02-03-04	0.66	0.60	0.06	0.49	0.72	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.88	0.10
15	03-02-04	0.66	0.61	0.06	0.49	0.72	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.33	0.88	0.10
16	03-16-04	0.64	0.61	0.06	0.50	0.72	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.34	0.88	0.09
17	04-06-04	0.60	0.61	0.05	0.50	0.72	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.34	0.88	0.09
18	04-13-04	0.64	0.61	0.05	0.50	0.72	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.28	0.34	0.89	0.09
19	04-20-04	0.63	0.61	0.05	0.51	0.72	0.07	0.54	0.69	0.13	0.48	0.74	0.23	0.38	0.84	0.28	0.34	0.89	0.09
20	05-06-04	0.63	0.61	0.05	0.51	0.72	0.07	0.54	0.69	0.13	0.48	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.08

Note: 7-d IC_{15} = 7-day 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

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

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

Laboratory Control and Warning Limits

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

S_{A10} = Standard deviation corresponding to the 10th percentile CV. (S_{A10} = 0.12)

S_{A25} = Standard deviation corresponding to the 25th percentile CV. (S_{A25} = 0.21)

USEPA Control and Warning Limits

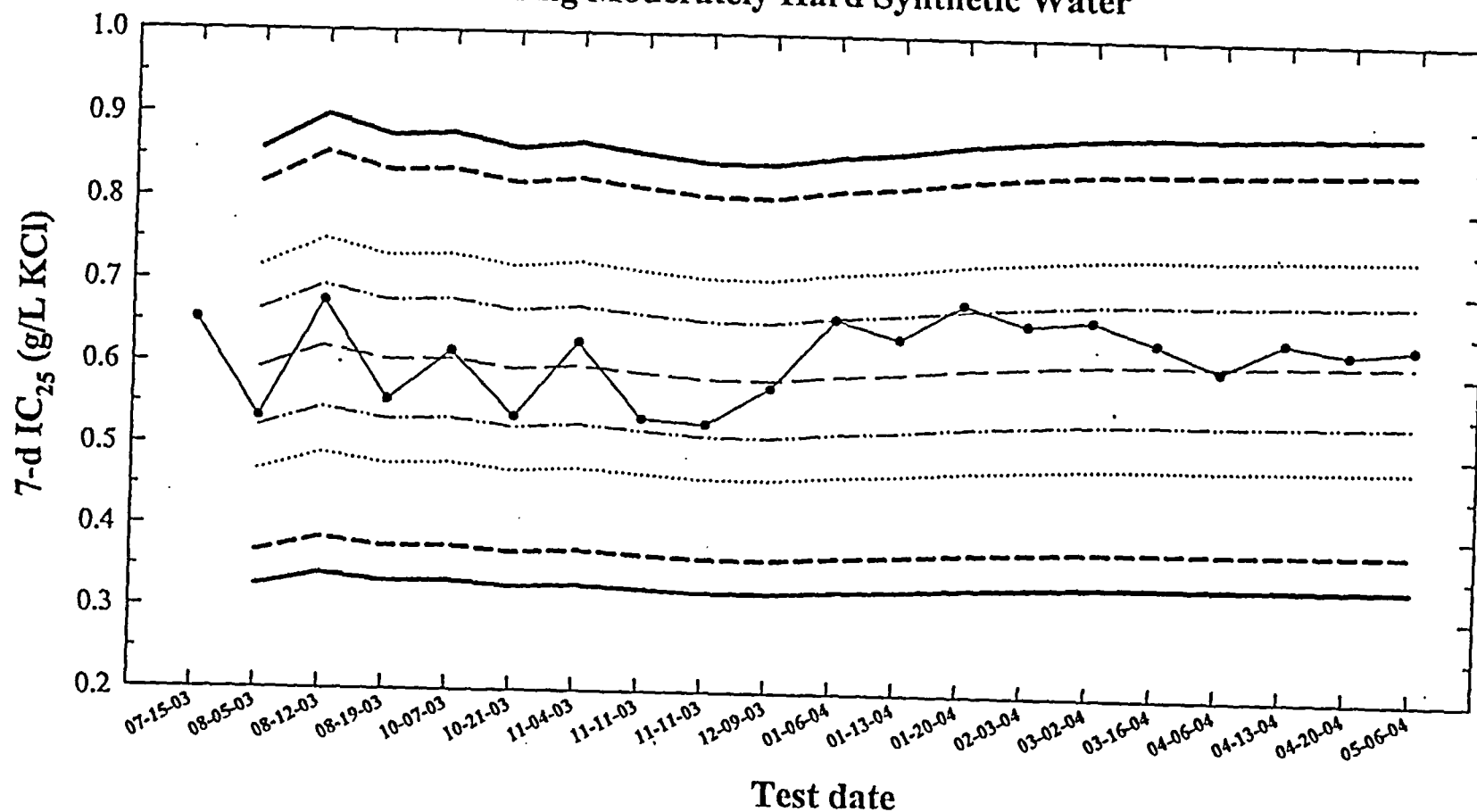
S_{A75} = Standard deviation corresponding to the 75th percentile CV. (S_{A75} = 0.38)

S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.45)

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

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

Environmental Testing Solutions, Inc.
Potassium Chloride Chronic Reference Toxicant Control Chart
for *Pimephales promelas*
using Moderately Hard Synthetic Water



- 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- — — Central Tendency (mean IC_{25})
- · · · Laboratory Warning Limits (mean $IC_{25} \pm S_{A,10}$, $S_{A,10} = 0.12$)
- · · · · Laboratory Control Limits (mean $IC_{25} \pm S_{A,25}$, $S_{A,25} = 0.21$)
- — — USEPA Warning Limits (mean $IC_{25} \pm S_{A,75}$, $S_{A,75} = 0.38$)
- — — USEPA Control Limits (mean $IC_{25} \pm S_{A,90}$, $S_{A,90} = 0.45$)

Environmental Testing Solutions, Inc.

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	CT	CV	CT	MSD	PMSD	CT
		(%)	(mg/larvae)	for Control Growth (mg/larvae)	(%)	for Control Growth CV (%)		(%)	for PMSD (%)
1	07-15-03	100	0.910		6.7		0.12	13.7	
2	08-05-03	97.5	1.092	1.001	6.5	6.6	0.13	11.8	12.7
3	08-12-03	100	0.693	0.898	9.7	7.6	0.20	28.2	17.9
4	08-19-03	100	0.745	0.860	2.9	6.4	0.08	10.7	16.1
5	10-07-03	97.5	0.762	0.840	20.0	9.1	0.18	23.1	17.5
6	10-21-03	100	0.803	0.834	5.7	8.6	0.13	16.4	17.3
7	11-04-03	100	0.895	0.843	7.4	8.4	0.10	11.6	16.5
8	11-11-03	100	0.895	0.849	7.5	8.3	0.12	13.6	16.1
9	11-11-03	100	0.953	0.861	11.6	8.7	0.20	21.3	16.7
10	12-09-03	100	0.744	0.849	2.2	8.0	0.18	24.2	17.5
11	01-06-04	97.5	0.816	0.846	4.6	7.7	0.13	15.5	17.3
12	01-13-04	100	0.807	0.843	3.3	7.3	0.10	12.5	16.9
13	01-20-04	100	0.770	0.837	16.5	8.0	0.13	17.0	16.9
14	02-03-04	100	0.847	0.838	5.2	7.8	0.11	13.0	16.6
15	03-02-04	97.5	0.566	0.820	4.8	7.6	0.08	14.8	16.5
16	03-16-04	100	0.686	0.811	7.3	7.6	0.08	12.2	16.2
17	04-06-04	100	0.708	0.805	12.0	7.9	0.14	19.3	16.4
18	04-13-04	100	0.780	0.804	9.8	8.0	0.11	13.9	16.3
19	04-20-04	100	0.784	0.803	5.5	7.8	0.08	10.2	15.9
20	05-06-04	100	0.832	0.804	5.5	7.7	0.10	12.2	15.8

Note: CV = Coefficient of variation for control growth.

On average, the CV for control growth is 7.7% in Environmental Testing Solutions, Inc. *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, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.8% from the control.

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

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

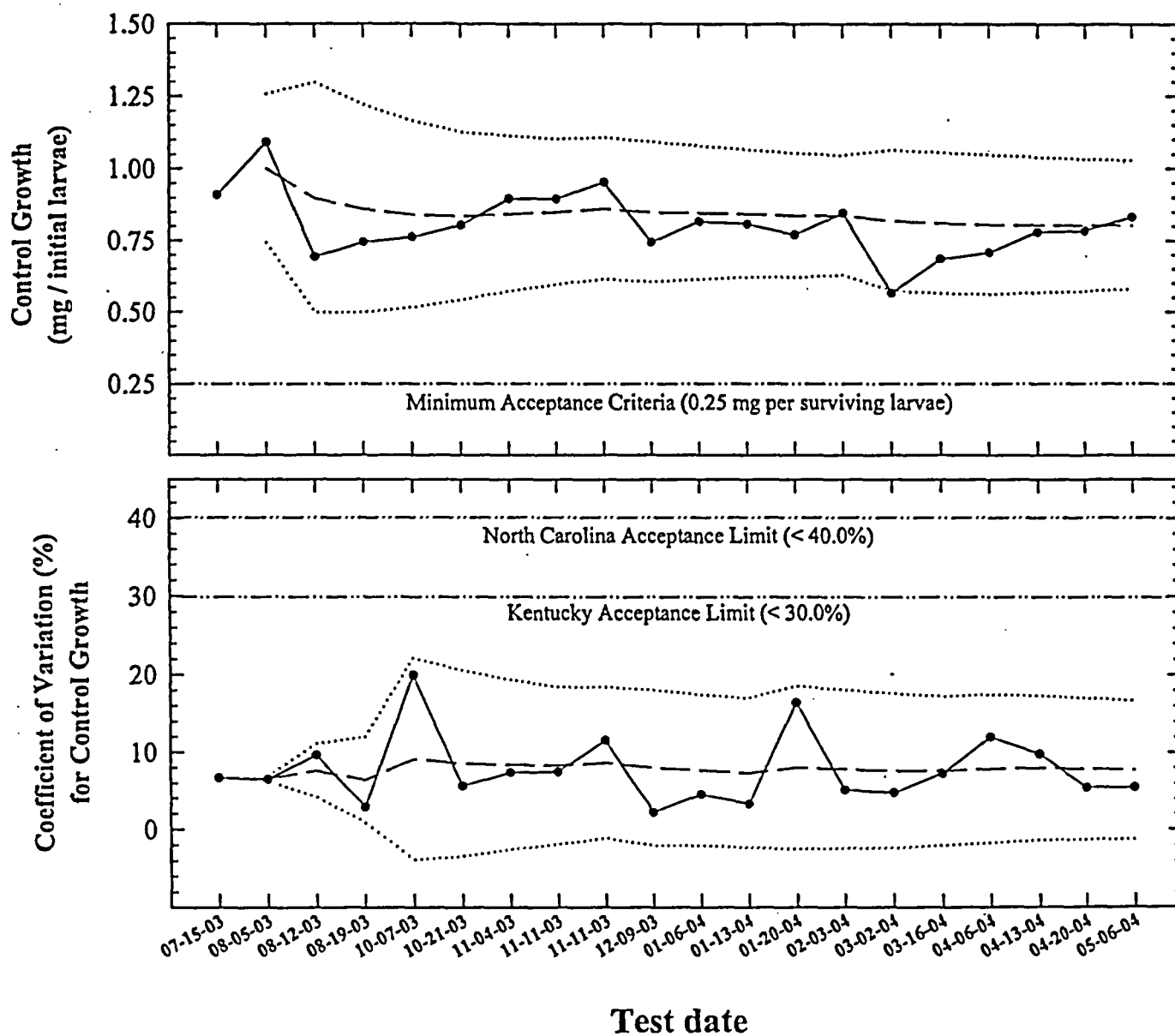
CT = Central Tendency (mean Control Growth, CV, or PMSD)

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, Inc.

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

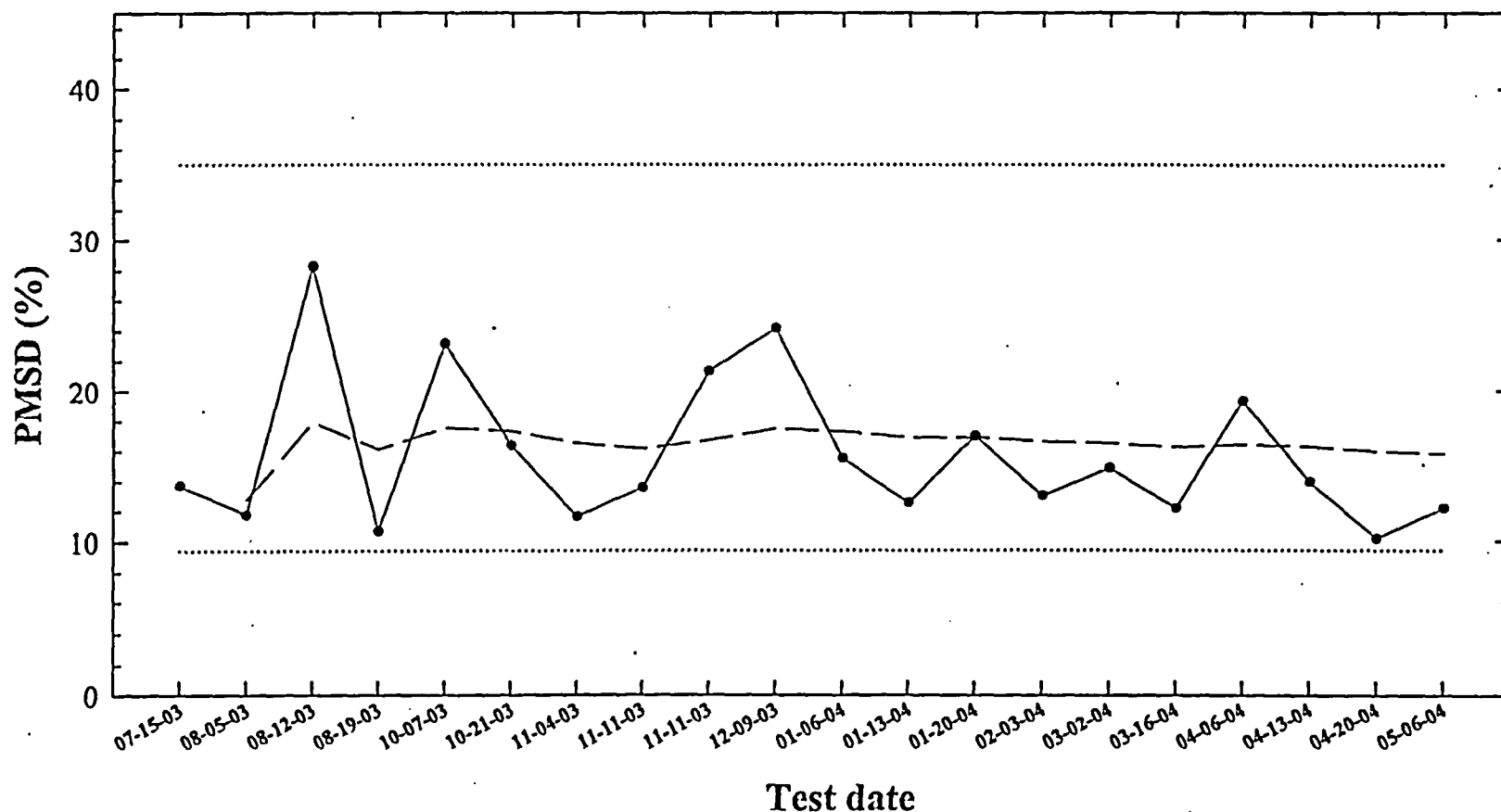


- Control Growth or Coefficient of Variation (CV)
- — Central Tendency (mean Control Growth or CV)
- Control Limits (mean Control Growth or CV $\pm$ 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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*

Jim
Sumner

Digitally signed by Jim Sumner
DN: cn = Jim Sumner, c = US,
o = Environmental Testing
Solutions, Inc.
Reason: I am the
owner and integrity of the
document
Date: 2004.05.19 10:41:06 -
04'00'

PpKCICR Test Number: 32

Dilution preparation information:						Comments:
KCl CHM number:	CHM 026					
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:	22.5 TO 25-HOURS OLD		Randomizing template:	RED
Date and times organisms were born between:	05-05-04 1130 TO 1400 MST (1230 TO 1600 EST)		Incubator number and shelf location:	3 F
Organism source:	ABS BATCH 05-05-04		Artemia lot number:	8530100
Transfer bowl information:	pH = 7.63 SU Temperature = 24.2 °C		Total drying time:	24 HOURS
Average transfer volume:	9.5 mL		Date / Time in:	05-13-04 1430
			Date / Time out:	05-14-04 1430
			Oven temperature:	61°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	05-06-04	—	1600	1419	05-05-04	dl
1	05-07-04	1000	1606	1440	05-05-04	dl
2	05-08-04	1000	1557	1451	05-05-04	dl
3	05-09-04	0954	1602	1422	05-05-04	KEK
4	05-10-04	1003	1610	1430	05-07-04	KEK
5	05-11-04	1000	1604	1414	05-07-04	KEK
6	05-12-04	0950	1612	1412	05-11-04	KEK
7	05-13-04			1423		KEK

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC ₅₀	735.4
Average weight per initial larvae:	0.832		NOEC	450
Average weight per surviving larvae:	0.832	≥ 0.25 mg/larvae	LOEC	600
			ChV	519.6
			IC ₂₅	634.7

Species: *Pimephales promelas*PpKCICR Test Number: 32

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	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	9 ^{1d}	10	10
5	10	10	10	10	10	10	10	10	10	9	10	10
6	10	10	10	10	10	10	10	10	10	9	10	10
7	10	10	10	10	10	10	10	10	9 ^{1d}	9	10	10
A = Pan weight (mg)												
TRAY	1496	1497	1500	1476	1491	1464	1490	1477	1492	1482	1487	1465
B = Pan + Larvae weight (mg)	2330	2326	2277	2365	2292	2304	2069	2235	2337	2299	2246	2233
C = Larvae weight (mg) = A - B	8340	8290	7770	8690	7980	8400	5990	7580	8450	8170	7590	7680
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.834	0.829	0.777	0.869	0.798	0.840	0.599	0.758	0.845	0.817	0.759	0.768
Average weight per initial number of larvae (mg)	0.832				0.749				0.797			

%RED = 10.0%

%RED = 4.2%

Calculations and data reviewed: *J*

Comments:

Species: *Pimephales promelas*PpKCICR Test Number: 32

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	10	8 ^{2d}	7 ^{3d}	9 ^{4d}	8 ^{2d}	4 ^{6d}	2 ^{8d}	2 ^{8d}	4 ^{4d}
2	10	10	10	10	7 ^{1d}	7	8 ^{1d}	8	4	2	2	4
3	9 ^{1d}	10	10	10	7	6 ^{1d}	8	6 ^{2d}	3 ^{1d}	2	2	3 ^{1d}
4	9	10	9 ^{1d}	10	7	6	8	5 ^{1d}	3	2	2	3
5	9	10	9	10	5 ^{2d}	6	7 ^{1d}	5	1 ^{2d}	1 ^{1d}	2	2 ^{1d}
6	9	9 ^{1d}	9	10	4 ^{1d}	6	8 ^{2d}	4 ^{1d}	0 ^{1d}	1	2	2
7	9	9	9	10	4	6	5	4	0	1	2	2
A = Pan weight (mg)	15.28	15.25	15.05	15.08	14.71	15.23	14.98	15.06	15.01	14.79	14.65	14.89
B = Pan + Larvae weight (mg)	22.42	22.05	21.68	22.33	17.82	20.55	19.41	17.69	—	15.86	16.27	16.66
Larvae weight (mg) = A - B	7.140	6.800	6.630	7.250	3.110	5.320	4.430	2.630	—	1.070	1.620	1.770
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.714	0.680	0.663	0.725	0.311	0.532	0.443	0.263	—	0.107	0.162	0.177
Average weight per initial number of larvae (mg)	0.696				0.387				0.112			

%RED = 16.4%

%RED = 53.5%

%RED = 86.6%

Calculations and data reviewed: *dl*

Comments:

Environmental Testing Solutions, Inc.

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

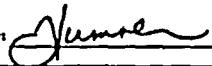
Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKICR # 72 (#32 at 351 Depot St.)

Test dates: May 6-13, 2004

Reviewed by: 

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pre weight (mg)	B = Post + Larvae weight (mg)	Larvae weight (mg) = B - A	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Pre weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.96	23.30	8.340	0.834	0.832	5.5	0.834	100.0	0.832	5.5	Not applicable
	B	10	10	14.97	23.26	8.290	0.829			0.829				
	C	10	10	15.00	22.77	7.770	0.777			0.777				
	D	10	10	14.76	23.65	8.890	0.889			0.889				
300	E	10	10	14.94	22.92	7.980	0.798	0.749	14.1	0.798	100.0	0.749	14.1	10.0
	F	10	10	14.64	23.04	8.400	0.840			0.840				
	G	10	10	14.90	20.89	5.990	0.599			0.599				
	H	10	10	14.77	22.35	7.580	0.758			0.758				
450	I	10	9	14.92	23.37	8.450	0.939	0.843	11.1	0.845	95.0	0.797	5.1	4.2
	J	10	9	14.82	22.99	8.170	0.908			0.817				
	K	10	10	14.87	22.46	7.590	0.759			0.759				
	L	10	10	14.65	22.33	7.680	0.768			0.768				
600	M	10	9	15.28	22.42	7.140	0.793	0.753	4.0	0.714	92.5	0.696	4.2	16.4
	N	10	9	15.25	22.05	6.800	0.756			0.680				
	O	10	9	15.05	21.68	6.630	0.737			0.663				
	P	10	10	15.08	22.33	7.250	0.725			0.725				
750	Q	10	4	14.71	17.82	3.110	0.778	0.802	13.6	0.311	47.5	0.387	31.7	53.5
	R	10	6	15.23	20.55	5.320	0.887			0.532				
	S	10	5	14.98	19.41	4.430	0.886			0.443				
	T	10	4	15.06	17.69	2.630	0.658			0.263				
900	U	10	0	0.00	0.00	0.000	0.000	0.691	68.5	0.000	12.5	0.112	71.9	86.6
	V	10	1	14.79	15.86	1.070	1.070			0.107				
	W	10	2	14.65	16.27	1.620	0.810			0.162				
	X	10	2	14.89	16.66	1.770	0.885			0.177				

Dussart's MSD value:

0.1014

MSD =

Minimum Significant Difference

PMDS:

12.2

PMDS =

Percent Minimum Significant Difference

PMDS is a measure of test precision. The PMDS 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, Inc.* chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.8% from the control (determined through reference toxicant testing).

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

Upper PMDS 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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival				
Start Date: 5/6/2004	Test ID: PpKCICR	Sample ID:	REF-Ref Toxicant	
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date:	Protocol: CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	
Comments:				

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
300	1.0000	1.0000	1.0000	1.0000
450	0.9000	0.9000	1.0000	1.0000
600	0.9000	0.9000	0.9000	1.0000
750	0.4000	0.6000	0.5000	0.4000
900	0.0000	0.1000	0.2000	0.2000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
300	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
450	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
600	0.9250	0.9250	1.2898	1.2490	1.4120	6.318	4	12.00	10.00	3	40
*750	0.4750	0.4750	0.7602	0.6847	0.8861	12.679	4	10.00	10.00	21	40
*900	0.1250	0.1250	0.3520	0.1588	0.4636	41.232	4	10.00	10.00	35	40

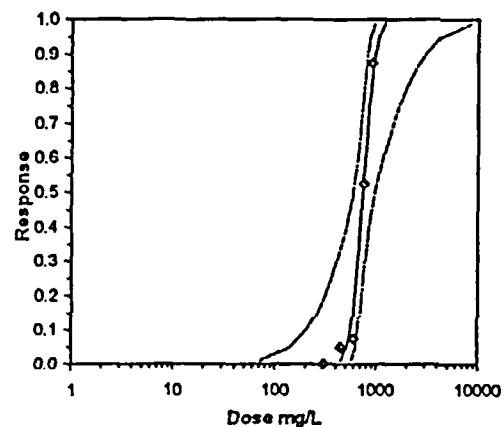
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.92857897	0.884	-0.1721673	0.40024071
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.820393	
Treatments vs D-Control				

Environmental Testing Solutions, Inc.

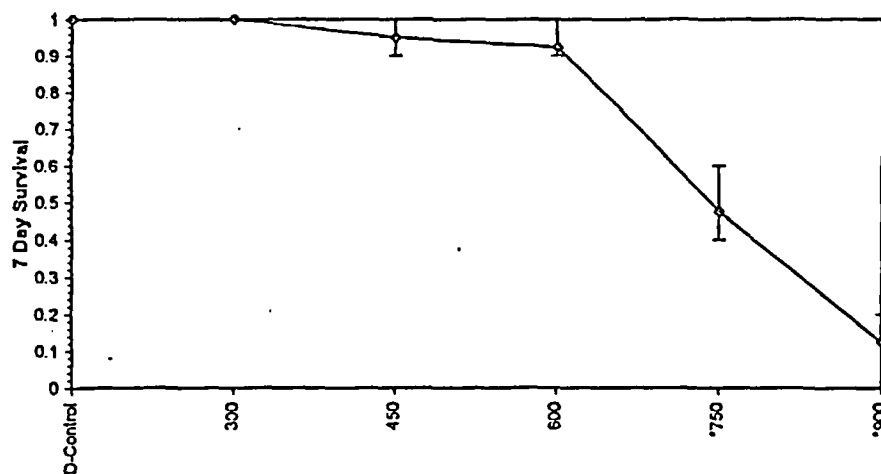
Statistical Analyses

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit					
					Control	Chi-Sq	Critical	P-value	Mu	Sigma
Slope	10.7818442	2.67549798	2.26721575	19.2964727	0	9.03329033	7.81472778	3.0E-02	2.8665481	0.09274851
Intercept	-25.906675	7.65442751	-50.266479	-1.546871						
TSCR										
Point	Probits	mg/L	95% Fiducial Limits							
EC01	2.674	447.489444	71.403081	568.981727						
EC05	3.355	517.595358	141.027223	624.332242						
EC10	3.718	559.353165	201.744515	659.152452						
EC15	3.964	589.414001	255.858799	686.442538						
EC20	4.158	614.453445	307.799656	711.799813						
EC25	4.326	636.781119	358.999996	737.750326						
EC40	4.747	696.707575	507.954201	840.925223						
EC50	5.000	735.441443	593.056733	960.193138						
EC60	5.253	776.328752	658.585098	1152.69887						
EC75	5.674	849.387799	733.427397	1669.35492						
EC80	5.842	880.252399	757.167534	1954.75218						
EC85	6.036	917.647234	782.852167	2358.4432						
EC90	6.282	966.963508	813.449247	2997.72321						
EC95	6.645	1044.97479	857.247706	4296.2007						
EC99	7.326	1208.68584	939.202499	8498.36393						

Significant heterogeneity detected (p = 3.00E-02)



Dose-Response Plot



Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 5/6/2004	Test ID: PpKCICR	Sample ID:	REF-Ref Toxicant	
End Date: 5/13/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date:	Protocol: CHRONIC-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	
Comments:				

Conc-mg/L	1	2	3	4
D-Control	0.8340	0.8290	0.7770	0.8890
300	0.7980	0.8400	0.5990	0.7580
450	0.8450	0.8170	0.7590	0.7680
600	0.7140	0.6800	0.6630	0.7250
750	0.3110	0.5320	0.4430	0.2630
900	0.0000	0.1070	0.1620	0.1770

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	0.8323	1.0000	0.8323	0.7770	0.8890	5.500	4				0.8323	1.0000
300	0.7488	0.8997	0.7488	0.5990	0.8400	14.063	4	1.886	2.290	0.1014	0.7730	0.9288
450	0.7973	0.9579	0.7973	0.7590	0.8450	5.115	4	0.791	2.290	0.1014	0.7730	0.9288
*600	0.6955	0.8357	0.6955	0.6630	0.7250	4.158	4	3.089	2.290	0.1014	0.6955	0.8357
750	0.3873	0.4653	0.3873	0.2630	0.5320	31.736	4				0.3873	0.4653
900	0.1115	0.1340	0.1115	0.0000	0.1770	71.922	4				0.1115	0.1340

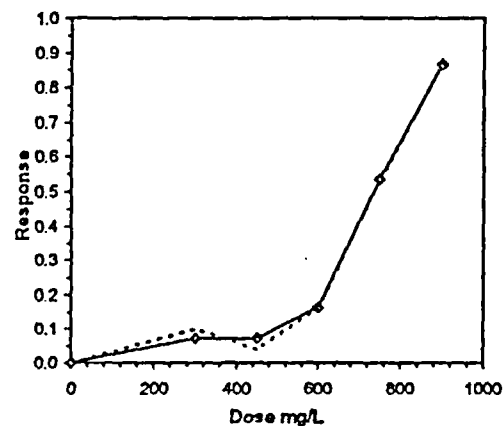
Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.93554729		0.844		-1.0559471	2.44966567	
Bartlett's Test indicates equal variances ($p = 0.16$)					5.24058199		11.3448668				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		450	600	519.615242		0.10139043	0.12182689	0.01414623	0.0039206	0.04582928	3, 12
Treatments vs D-Control											

Environmental Testing Solutions, Inc.

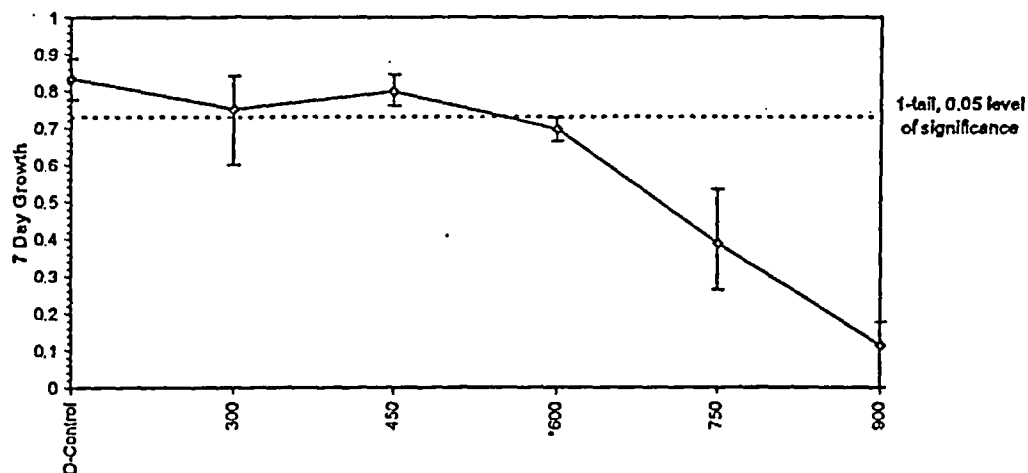
Statistical Analyses

Point	mg/L	SD	Linear Interpolation (200 Resamples)		
			95% CL(Exp)	Skew	
IC05*	210.70	145.29	35.59	680.44	0.4028
IC10	496.40	118.24	26.17	625.81	-1.1384
IC15	576.94	59.09	381.96	634.42	-3.1734
IC20	614.45	13.35	566.22	646.83	-1.4294
IC25	634.70	11.40	606.67	672.97	0.5436
IC40	695.45	19.33	652.43	773.70	0.7127
IC50	735.95	21.94	679.54	808.16	0.2319

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Species: *Pimephales promelas*PpKCICR Test Number: 32

Daily Chemistry:

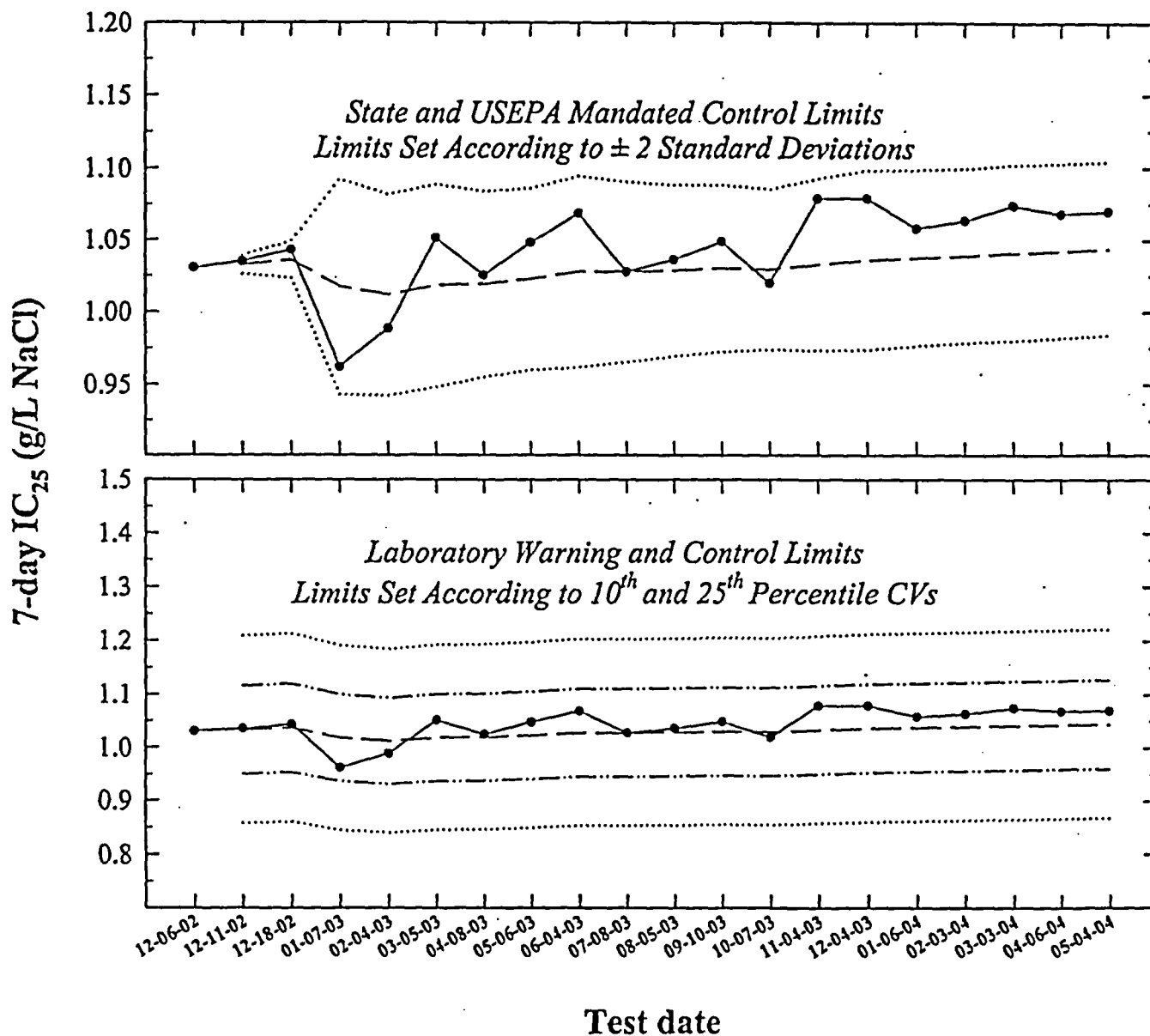
		Day					
		0	1	2	3	4	5
Analyst		CAJ	KEL	KEL	AL	AL	KEL
Concentration	Parameter						
CONTROL	pH (S.U.)	7.68	7.84	8.02	7.60	8.05	7.57
	DO (mg/L)	7.9	7.6	8.0	7.6	7.9	7.8
	Conductivity (µmhos/cm)	303		331		298	
	Alkalinity (mg CaCO ₃ /L)	64					
	Hardness (mg CaCO ₃ /L)	82		K		K	
	Temperature (°C)	25.3	24.1	25.0	24.4	25.2	24.2
300 mg KCl/L	pH (S.U.)	7.72	7.90	8.05	7.66	7.72	7.64
	DO (mg/L)	7.9	7.6	8.2	7.6	8.0	7.9
	Conductivity (µmhos/cm)	856		871		840	
	Temperature (°C)	25.3	24.1	25.1	24.4	25.1	24.2
450 mg KCl/L	pH (S.U.)	7.72	7.76	8.02	7.62	7.72	7.62
	DO (mg/L)	8.0	7.7	8.2	7.5	8.0	7.9
	Conductivity (µmhos/cm)	1070		1130		1120	
	Temperature (°C)	25.4	24.1	25.1	24.3	25.1	24.2
600 mg KCl/L	pH (S.U.)	7.73	7.78	8.01	7.62	7.72	7.61
	DO (mg/L)	8.0	7.7	8.2	7.5	8.0	7.8
	Conductivity (µmhos/cm)	1320		1330		1310	
	Temperature (°C)	25.2	24.1	25.1	24.3	25.2	24.2
750 mg KCl/L	pH (S.U.)	7.73	7.75	8.00	7.62	7.73	7.59
	DO (mg/L)	8.0	7.8	8.2	7.4	8.1	7.9
	Conductivity (µmhos/cm)	1580		1610		1540	
	Temperature (°C)	25.2	24.2	25.0	24.3	25.1	24.2
900 mg KCl/L	pH (S.U.)	7.74	7.77	7.99	7.65	7.73	7.70
	DO (mg/L)	8.0	7.8	8.3	7.5	8.1	7.9
	Conductivity (µmhos/cm)	1810		1870		1800	
	Temperature (°C)	25.3	24.1	25.0	24.2	25.1	24.2
STOCK	Conductivity (µmhos/cm)	77000		K		76000	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*PpKCICR Test Number: 32

		Day							
		3		4		5		6	
Analyst		KCK	CAI	CAI	CAI	CAI	CAI	CAI	KCK
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.50	7.63	7.43	7.64	7.32	7.49	7.43
	DO (mg/L)	8.3	7.6	8.2	7.6	8.2	7.5	8.0	7.7
	Conductivity (µmhos/cm)	300		287		307		302	
	Alkalinity (mg CaCO ₃ /L)			60				62	
	Hardness (mg CaCO ₃ /L)	✓		82	✓	✓		82	
	Temperature (°C)	24.8	24.3	24.9	24.3	25.0	24.4	25.3	24.2
300 mg KC/L	pH (S.U.)	7.82	7.34	7.79	7.49	7.70	7.32	7.61	7.46
	DO (mg/L)	8.1	7.6	7.9	7.6	7.9	7.3	7.8	7.6
	Conductivity (µmhos/cm)	821		833		823		849	
	Temperature (°C)	24.8	24.3	24.8	24.2	25.0	24.3	25.2	24.2
450 mg KC/L	pH (S.U.)	7.83	7.52	7.79	7.49	7.71	7.32	7.62	7.49
	DO (mg/L)	8.2	7.6	8.0	7.6	7.9	7.3	7.8	7.6
	Conductivity (µmhos/cm)	1120		1120		1150		1110	
	Temperature (°C)	24.8	24.3	24.8	24.2	25.0	24.3	25.3	24.1
600 mg KC/L	pH (S.U.)	7.83	7.61	7.79	7.46	7.72	7.35	7.64	7.48
	DO (mg/L)	8.2	7.8	8.1	7.6	7.9	7.4	7.8	7.5
	Conductivity (µmhos/cm)	1380		1330		1410		1400	
	Temperature (°C)	24.8	24.3	24.9	24.3	25.0	24.3	25.1	24.1
750 mg KC/L	pH (S.U.)	7.83	7.59	7.78	7.54	7.71	7.42	7.63	7.55
	DO (mg/L)	8.2	7.9	8.1	7.6	8.0	7.5	7.9	7.6
	Conductivity (µmhos/cm)	1650		1610		1700		1600	
	Temperature (°C)	24.8	24.2	24.9	24.3	25.0	24.3	25.3	24.1
900 mg KC/L	pH (S.U.)	7.83	7.61	7.77	7.53	7.72	7.44	7.65	7.57
	DO (mg/L)	8.1	7.9	8.2	7.8	8.1	7.7	8.0	7.4
	Conductivity (µmhos/cm)	1920		1880		1880		1810	
	Temperature (°C)	24.8	24.3	24.9	24.3	25.0	24.4	25.3	24.1
STOCK	Conductivity (µmhos/cm)	—K		74000		—K		74700	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

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



- 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.
- — Central Tendency (mean IC_{25})
- - - - Warning Limits (mean $IC_{25} \pm S_{A.10}$)
- Control Limits (mean $IC_{25} \pm S_{A.25}$ or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC ₂₅ (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits		S _{A10}	Laboratory Warning Limits		S _{A25}	Laboratory Control Limits		S _{A75}	USEPA Warning Limits		S _{A90}	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S _{A10}	CT + S _{A10}		CT - S _{A25}	CT + S _{A25}		CT - S _{A75}	CT + S _{A75}		CT - S _{A90}	CT + S _{A90}	
1	12-06-02	1.03																	
2	12-11-02	1.04	1.03	0.00	1.03	1.04	0.08	0.95	1.12	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.00
3	12-18-02	1.04	1.04	0.01	1.02	1.05	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
4	01-07-03	0.96	1.02	0.04	0.94	1.09	0.08	0.94	1.10	0.17	0.84	1.19	0.46	0.56	1.48	0.63	0.39	1.65	0.04
5	02-04-03	0.99	1.01	0.03	0.94	1.08	0.08	0.93	1.09	0.17	0.84	1.18	0.46	0.56	1.47	0.63	0.38	1.64	0.03
6	03-05-03	1.05	1.02	0.04	0.95	1.09	0.08	0.94	1.10	0.17	0.85	1.19	0.46	0.56	1.48	0.63	0.39	1.65	0.03
7	04-08-03	1.03	1.02	0.03	0.96	1.08	0.08	0.94	1.10	0.17	0.85	1.19	0.46	0.56	1.48	0.63	0.39	1.65	0.03
8	05-06-03	1.05	1.02	0.03	0.96	1.09	0.08	0.94	1.10	0.17	0.85	1.20	0.46	0.56	1.48	0.63	0.39	1.66	0.03
9	06-04-03	1.07	1.03	0.03	0.96	1.09	0.08	0.95	1.11	0.17	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.03
10	07-08-03	1.03	1.03	0.03	0.97	1.09	0.08	0.95	1.11	0.17	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.03
11	08-05-03	1.04	1.03	0.03	0.97	1.09	0.08	0.95	1.11	0.17	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.03
12	09-10-03	1.05	1.03	0.03	0.97	1.09	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.03
13	10-07-03	1.02	1.03	0.03	0.97	1.09	0.08	0.95	1.11	0.18	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.03
14	11-04-03	1.08	1.03	0.03	0.97	1.09	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.67	0.03
15	12-04-03	1.08	1.04	0.03	0.97	1.10	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.03
16	01-06-04	1.06	1.04	0.03	0.98	1.10	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.03
17	02-03-04	1.06	1.04	0.03	0.98	1.10	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.64	0.39	1.68	0.03
18	03-03-04	1.07	1.04	0.03	0.98	1.10	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.03
19	04-06-04	1.07	1.04	0.03	0.98	1.10	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.03
20	05-04-04	1.07	1.04	0.03	0.98	1.10	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.03

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_{A10} = Standard deviation corresponding to the 10th percentile CV. (S_{A10} = 0.08)

S_{A25} = Standard deviation corresponding to the 25th percentile CV. (S_{A25} = 0.17)

USEPA Control and Warning Limits

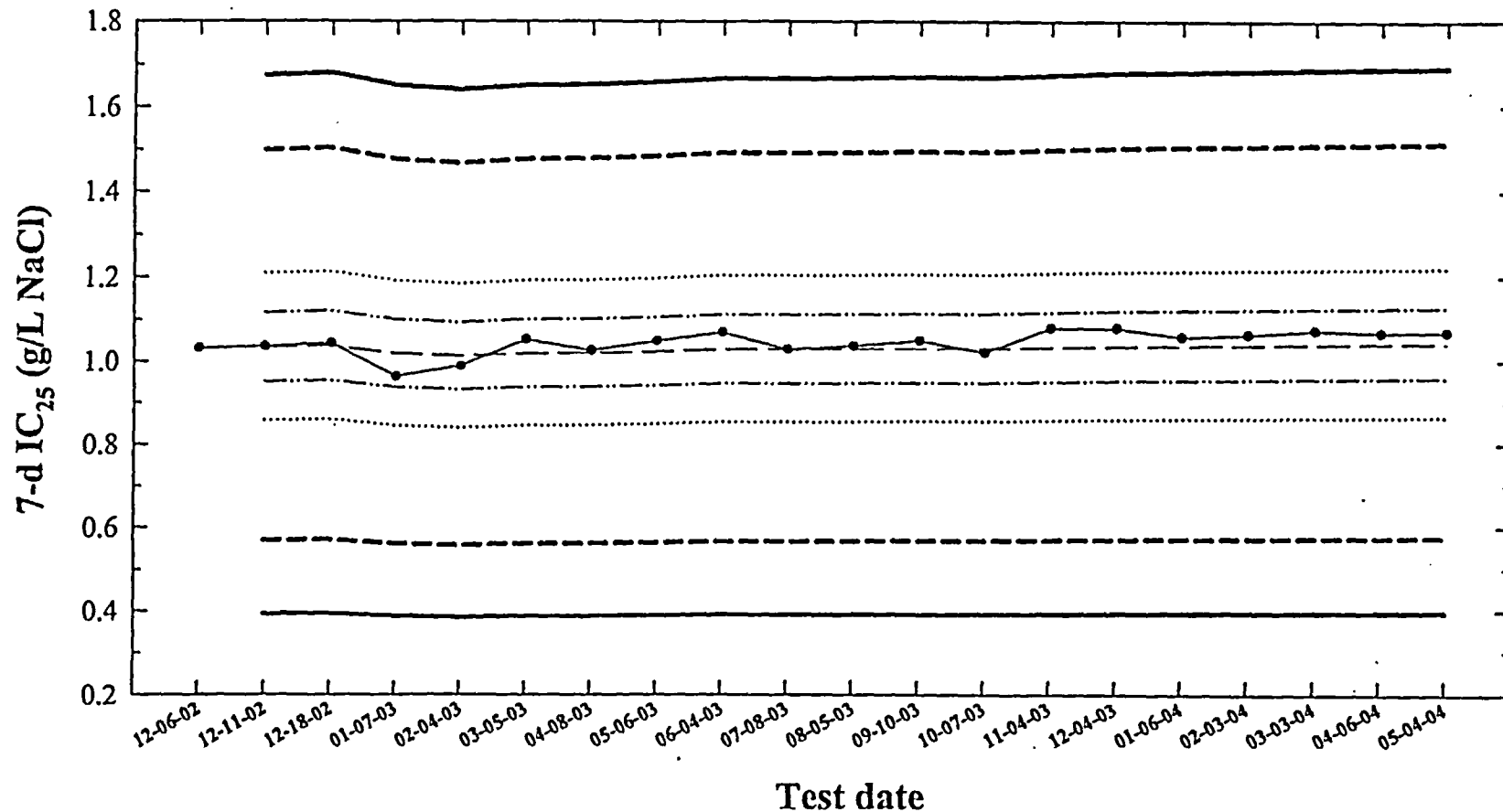
S_{A75} = Standard deviation corresponding to the 75th percentile CV. (S_{A75} = 0.45)

S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.62)

CV = Coefficient of variation of the IC₂₅ values.

Environmental Testing Solutions, Inc.

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



- 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.
- — Central Tendency (mean IC_{25})
- · — · — Laboratory Warning Limits (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.08$)
- · · · · Laboratory Control Limits (mean $IC_{25} \pm S_{A.25}$, $S_{A.25} = 0.17$)
- - - USEPA Warning Limits (mean $IC_{25} \pm S_{A.75}$, $S_{A.75} = 0.45$)
- — — USEPA Control Limits (mean $IC_{25} \pm S_{A.90}$, $S_{A.90} = 0.62$)

Environmental Testing Solutions, Inc.

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	CT	CV	CT	MSD	PMSD	CT
		(%)	(offspring/female)	for Control Mean Reproduction (offspring/female)	(%)	for Control Reproduction CV (%)		(%)	for PMSD (%)
1	12-06-02	100	29.7		11.0		3.0	10.0	
2	12-11-02	100	33.8	31.8	13.7	12.3	2.9	8.5	9.2
3	12-18-02	100	30.5	31.3	7.4	10.7	2.9	9.4	9.3
4	01-07-03	100	33.2	31.8	7.0	9.7	2.9	8.6	9.1
5	02-04-03	100	32.3	31.9	8.1	9.4	2.7	8.4	9.0
6	03-05-03	100	28.7	31.4	5.1	8.7	3.5	12.1	9.5
7	04-11-03	100	26.3	30.6	6.2	8.3	2.5	9.6	9.5
8	05-06-03	100	27.6	30.3	10.8	8.6	3.2	11.5	9.7
9	06-04-03	100	25.9	29.8	5.9	8.3	2.6	10.1	9.8
10	07-08-03	100	29.0	29.7	11.6	8.7	3.2	10.9	9.9
11	08-05-03	100	33.3	30.0	6.6	8.5	4.7	14.1	10.3
12	09-10-03	100	29.3	30.0	4.3	8.1	3.1	10.7	10.3
13	10-07-03	100	33.4	30.2	8.0	8.1	3.2	9.5	10.3
14	11-04-03	100	31.0	30.3	7.3	8.1	2.6	8.3	10.1
15	12-04-03	100	30.4	30.3	9.7	8.2	3.6	11.8	10.2
16	01-06-04	100	30.6	30.3	4.4	7.9	3.5	11.5	10.3
17	02-03-04	100	30.7	30.3	7.2	7.9	2.7	8.8	10.2
18	03-03-04	100	29.0	30.3	7.8	7.9	3.0	10.3	10.2
19	04-06-04	100	28.1	30.1	6.2	7.8	2.8	10.0	10.2
20	05-04-04	100	32.5	30.3	6.4	7.7	3.3	10.1	10.2

Note: CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 7.7% in Environmental Testing Solutions, Inc. *Ceriodaphnia* chronic toxicity tests.
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, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.2% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

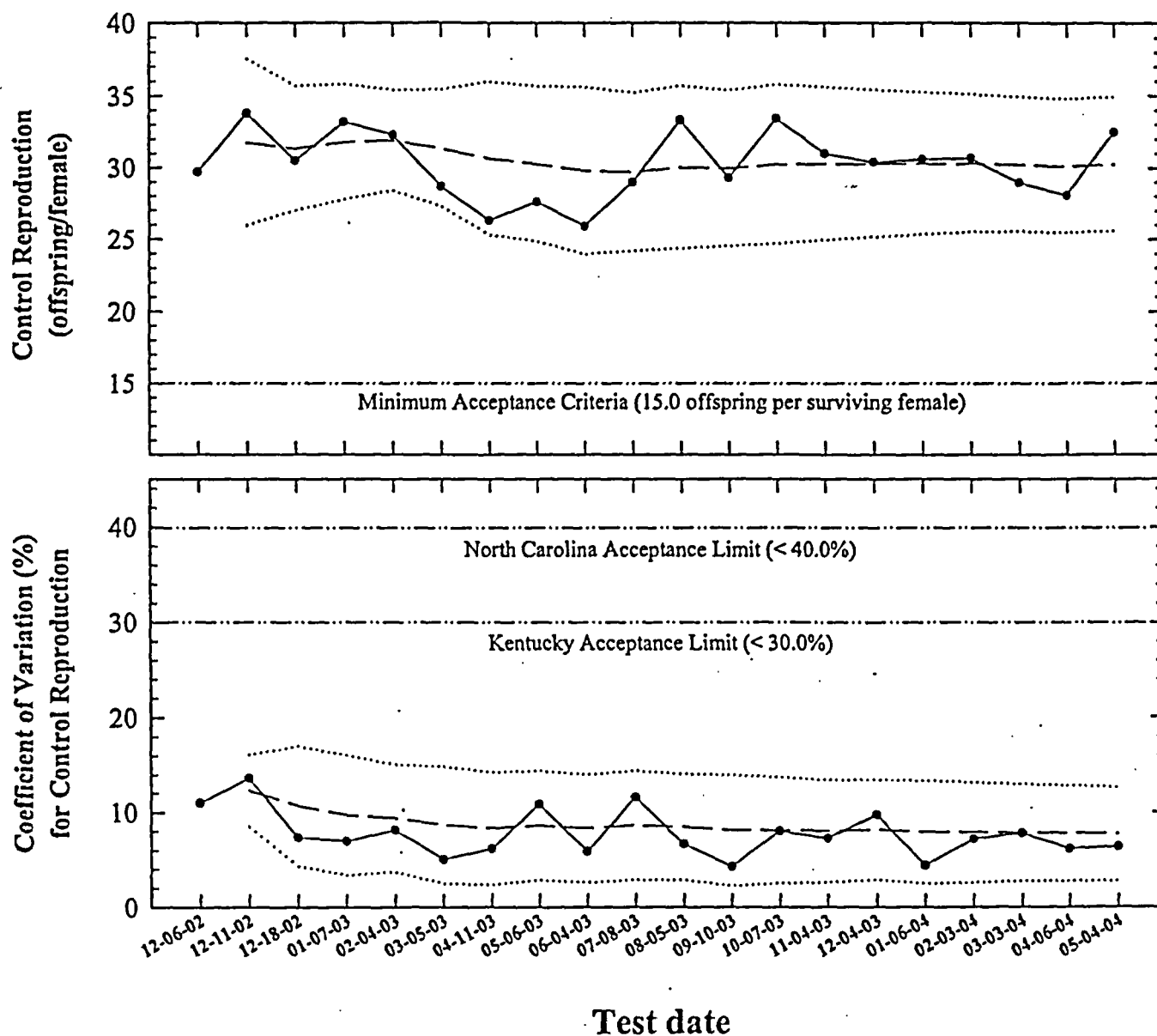
CT = Central Tendency (Mean Control Reproduction, CV, or PMSD)

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.

Environmental Testing Solutions, Inc.

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

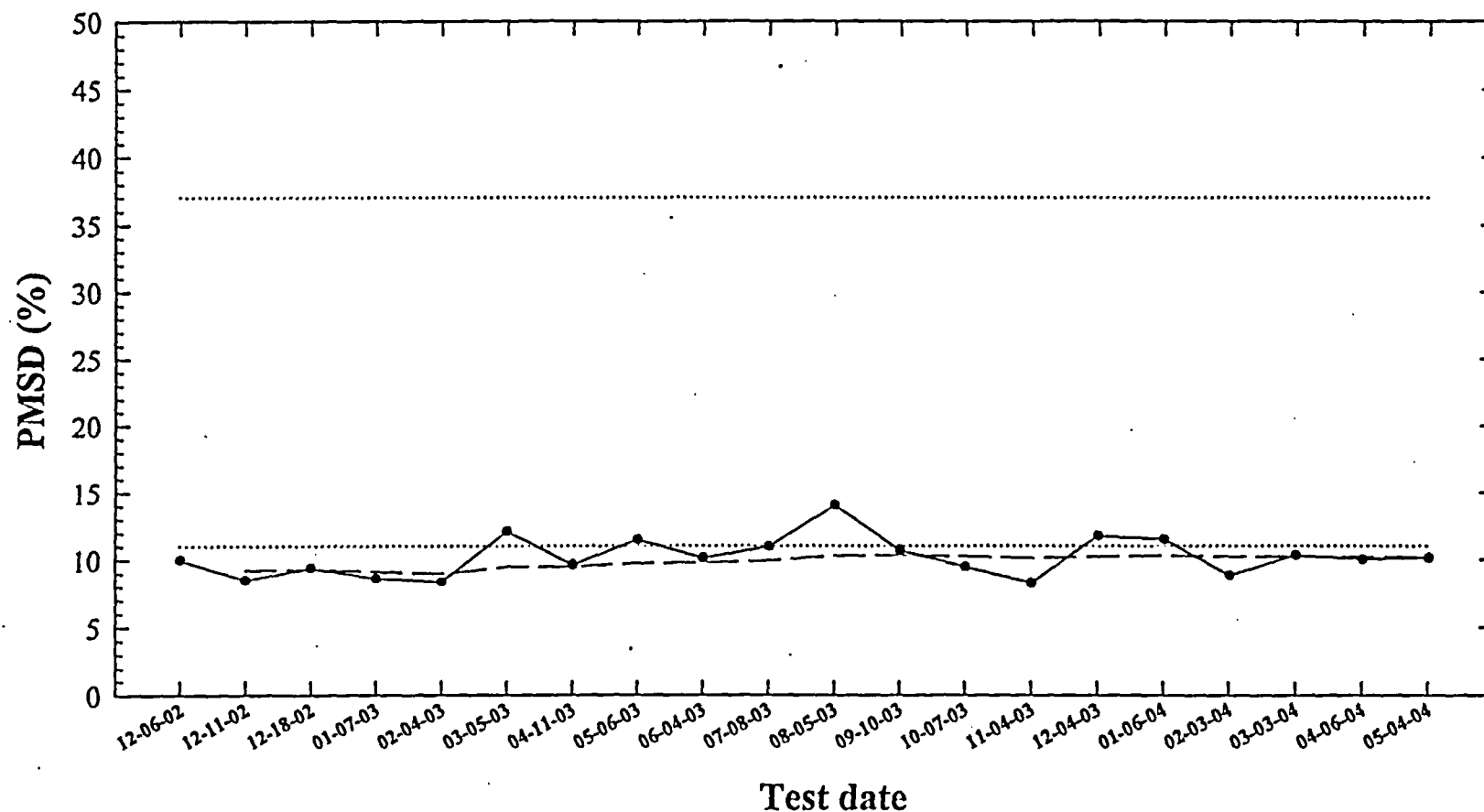


- Control Reproduction or Coefficient of Variation (CV)
- — Central Tendency (mean Control Reproduction or CV)
- Control Limits (mean Control Reproduction or CV $\pm$ 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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.)

Jim
Sumner

Digitally signed by Jim
Sumner
DN: cn = Jim Sumner, c =
US, o = Environmental
Testing Solutions, Inc.
Reason: I attest to the
accuracy and integrity of
this document
Date: 2004.05.19 10:44:04
+0400

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

CdNaCLCR #: 22

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:	BLUE
Date and times organisms were born between:	05-03-04 1422 TO 1619	Incubator number and shelf location:	2B1
Organism source:	04-21-04 A-F	YCT batch:	ABS 04-21-04
Transfer bowl information:	pH = 7.78 SU Temperature = 21.7°C	Selenastrum batch:	ABS 04-21-04

Daily renewal information:

Day	Date	Test Initiation, renewal, or termination time	Control water batch used	Analyst
0	05-04-04	1355	04-28-04	dl
1	05-05-04	1481/1416	04-28-04	dl
2	05-06-04	1400	04-28-04	dl
3	05-07-04	1348	05-05-04	dl
4	05-08-04	1401	05-05-04	dl
5	05-09-04	1343	05-05-04	dl
6	05-10-04	1350	05-05-04	dl
7	05-11-04	1400		dl

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	1000
% Mortality:	0%	≤ 20%	LOEC	1200
Mean Offspring/Female:	32.5	≥ 15.0 offspring/female	ChV	1095.4
% CV:	6.4%	< 40.0 %	IC25	1070.0

Species: *Ceriodaphnia dubia*CdNaCLCR #: 22

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	4	4	3	6	4	6	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	13	11	14	12	13	14	13	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	*5	0	0	0	0	0	0	15	15	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	*10	17	16	16	13	14	17	10	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
Total young produced		31	34	31	34	28	33	35	34	32	33
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

* SALT
BROOD

Concentration:

% Mortality:

0%

Mean Offspring/Female:

32.5

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	3	6	4	4	6	6	6	4	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	14	12	14	11	15	13	13	11	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	17	0	16	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	13	16	15	17	14	18	0	14	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
Total young produced		28	36	31	35	31	39	36	31	32	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

33/2

% Reduction from Control:

-2.2%

Species: *Ceriodaphnia dubia*CdNaCLCR #: 22

800 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	6	5	5	4	3	5	4	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	13	14	13	11	12	14	12	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	16	0	*1	0	0	15	18
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	15	15	0	17	15	17	13	0	0
Total young produced		30	34	33	35	34	30	34	31	33	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* CARRY OVER

Concentration:

% Mortality:	0%
Mean Offspring/Female:	32.8
% Reduction from Control:	-0.9%

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	6	3	3	4	4	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	15	10	13	13	11	14	10	10	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	16	*1	0	0	0	0	0	0	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	0	18	13	14	17	16	13	14	0
Total young produced		30	37	32	29	31	32	34	27	29	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* CARRY OVER

Concentration:

% Mortality:	0%
Mean Offspring/Female:	31.5
% Reduction from Control:	3.1%

Species: *Ceriodaphnia dubia*CdNaCLCR #: 22

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	0	0	2	3	0	3	3	2	2	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	1	6	4	7	3	6	2	3	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	6	0	0	7	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	7	10	3	0	7	9	10	4	0	2
Total young produced		14	16	9	17	10	18	15	9	6	5
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:	0%
Mean Offspring/Female:	11.9
% Reduction from Control:	63.4%

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	2	0	2	2	2	1	1	1	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	3	3	1	4	3	4	2	6	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	4	0	1
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	1	6	1	5	0	3	5	1	3	↓
Total young produced		2	11	4	8	6	8	10	8	10	0
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

+ carry over

Concentration:

% Mortality:	10%
Mean Offspring/Female:	6.7
% Reduction from Control:	79.4%

Environmental Testing Solutions, Inc.

Verification of *Ceriodaphnia* Reproduction Totals

Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	4	4	4	3	6	4	6	4	5	43
5	13	13	11	14	12	13	14	13	13	12	128
6	5	0	0	0	0	0	0	15	15	16	51
7	10	17	16	16	13	14	17	0	0	0	103
Total	31	34	31	34	28	33	35	34	32	33	325

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	6	3	3	4	4	4	4	5	5	42
5	12	15	10	13	13	11	14	10	10	14	122
6	0	16	1	0	0	0	0	0	0	15	32
7	14	0	18	13	14	17	16	13	14	0	119
Total	30	37	32	29	31	32	34	27	29	34	315

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	3	6	4	4	6	6	6	4	5	3	47
5	12	14	12	14	11	15	13	13	11	14	129
6	0	0	0	0	0	0	17	0	16	16	49
7	13	16	15	17	14	18	0	14	0	0	107
Total	28	36	31	35	31	39	36	31	32	33	332

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	0	0	2	3	0	3	3	2	2	0	15
5	1	6	4	7	3	6	2	3	4	3	39
6	6	0	0	7	0	0	0	0	0	0	13
7	7	10	3	0	7	9	10	4	0	2	52
Total	14	16	9	17	10	18	15	9	6	5	119

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	6	5	5	4	3	5	4	6	4	46
5	12	13	13	14	13	11	12	14	12	12	126
6	0	0	0	16	0	1	0	0	15	18	50
7	14	15	15	0	17	15	17	13	0	0	106
Total	30	34	33	35	34	30	34	31	33	34	328

1400 mg NaCl/L

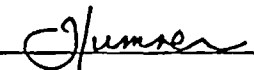
Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	1	2	0	2	2	2	1	1	1	0	12
5	0	3	3	1	4	3	4	2	6	0	26
6	0	0	0	0	0	0	0	4	0	0	4
7	1	6	1	5	0	3	5	1	3	0	25
Total	2	11	4	8	6	8	10	8	10	0	67

Environmental Testing Solutions, Inc.

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

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

Test number: CdNaClCR #51 (#22 at 351 Depot St.)
Test dates: May 4-11, 2004

Reviewed by: 

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	31	34	31	34	28	33	35	34	32	33	100	32.5	6.4	Not applicable
600	28	36	31	35	31	39	36	31	32	33	100	33.2	9.8	-2.2
800	30	34	33	35	34	30	34	31	33	34	100	32.8	5.5	-0.9
1000	30	37	32	29	31	32	34	27	29	34	100	31.5	9.4	3.1
1200	14	16	9	17	10	18	15	9	6	5	100	11.9	39.3	63.4
1400	2	11	4	8	6	8	10	8	10	0	90	6.7	54.5	79.4

Dunnett's MSD value: 3.291
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, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.2% 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, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction				
Start Date: 5/4/2004	Test ID: CdNaCICR	Sample ID: REF-Ref Toxicant		
End Date: 5/11/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type: KCL-Potassium chloride		
Sample Date:	Protocol: CHRONIC-EPA-821-R-02-013	Test Species: CD-Ceriodaphnia dubia		
Comments:				

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	34.000	31.000	34.000	28.000	33.000	35.000	34.000	32.000	33.000
600	28.000	36.000	31.000	35.000	31.000	39.000	36.000	31.000	32.000	33.000
800	30.000	34.000	33.000	35.000	34.000	30.000	34.000	31.000	33.000	34.000
1000	30.000	37.000	32.000	29.000	31.000	32.000	34.000	27.000	29.000	34.000
1200	14.000	16.000	9.000	17.000	10.000	18.000	15.000	9.000	6.000	5.000
1400	2.000	11.000	4.000	8.000	6.000	8.000	10.000	8.000	10.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	32.500	1.0000	32.500	28.000	35.000	6.364	10				32.850	1.0000
600	33.200	1.0215	33.200	28.000	39.000	9.817	10	-0.486	2.287	3.291	32.850	1.0000
800	32.800	1.0092	32.800	30.000	35.000	5.529	10	-0.208	2.287	3.291	32.800	0.9985
1000	31.500	0.9692	31.500	27.000	37.000	9.376	10	0.695	2.287	3.291	31.500	0.9589
*1200	11.900	0.3662	11.900	5.000	18.000	39.306	10	14.314	2.287	3.291	11.900	0.3623
*1400	6.700	0.2062	6.700	0.000	11.000	54.522	10	17.927	2.287	3.291	6.700	0.2040

Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.79752886		1.035		-0.2104094	-0.3540704	
Bartlett's Test indicates equal variances (p = 0.07)					10.1435528		15.0862722				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		1000	1200	1095.44512		3.29082322	0.1012561	1465.50667	10.3555556	9.4E-30	5, 54
Treatments vs D-Control											

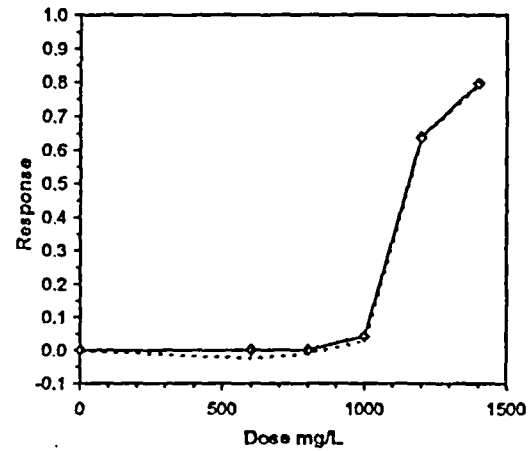
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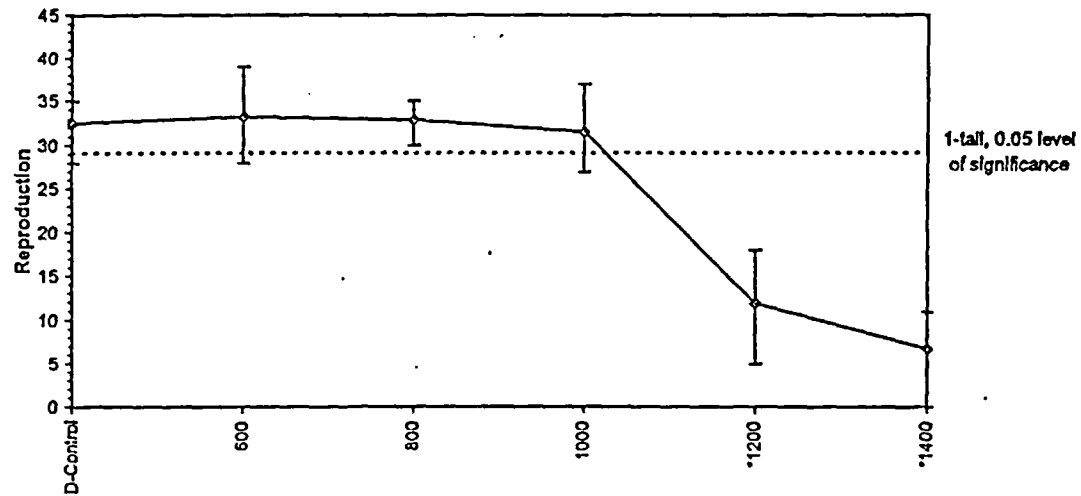
Statistical Analyses

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	1002.98469	47.1935868	866.356731	1016.02148	-1.2938
IC10	1019.7449	9.34608206	1001.68826	1032.79825	-1.7750
IC15	1036.5051	7.88352583	1019.86166	1049.58428	-0.2348
IC20	1053.26531	7.73480096	1037.9063	1067.17241	-0.1677
IC25	1070.02551	7.79416206	1054.95321	1086.16426	-0.0814
IC40	1120.30612	9.10946274	1103.66182	1140.86506	0.1764
IC50	1153.82653	10.6783798	1134.8475	1178.32457	0.2784



Dose-Response Plot



Species: *Ceriodaphnia dubia*CdNaCLCR #: 22

Daily Chemistry:

		Day					
		0		1		2	
Analyst		CA1	CA1	CA1	CA1	CA1	CA1
Concentration	Parameter						
CONTROL	pH (S.U.)	7.67	7.72	7.73	7.77	7.68	7.75
	DO (mg/L)	8.1	7.8	7.9	7.8	7.9	8.0
	Conductivity (µmhos/cm)	297		301		303	
	Alkalinity (mg CaCO ₃ /L)	61				(61)	
	Hardness (mg CaCO ₃ /L)	80				(82)	
	Temperature (°C)	24.8	25.4	25.3	24.7	25.0	24.3
600 mg NaCl/L	pH (S.U.)	7.75	7.69	7.70	7.69	7.69	7.66
	DO (mg/L)	8.2	7.8	8.1	7.6	8.0	8.0
	Conductivity (µmhos/cm)	1390		1370		1340	
	Temperature (°C)	24.7	25.4	25.3	24.7	25.1	24.3
800 mg NaCl/L	pH (S.U.)	7.78	7.66	7.69	7.65	7.68	7.66
	DO (mg/L)	8.2	8.0	8.2	7.6	8.0	8.0
	Conductivity (µmhos/cm)	1770		1780		1730	
	Temperature (°C)	24.7	25.3	25.3	24.7	25.1	24.2
1000 mg NaCl/L	pH (S.U.)	7.79	7.67	7.68	7.63	7.68	7.66
	DO (mg/L)	8.3	8.0	8.3	7.7	8.0	8.0
	Conductivity (µmhos/cm)	2220		2190		2110	
	Temperature (°C)	24.8	25.4	25.3	24.7	25.1	24.2
1200 mg NaCl/L	pH (S.U.)	7.81	7.67	7.67	7.65	7.67	7.61
	DO (mg/L)	8.4	8.0	8.3	7.7	8.0	8.0
	Conductivity (µmhos/cm)	2600		2550		2610	
	Temperature (°C)	24.9	25.3	25.3	24.6	25.3	24.4
1400 mg NaCl/L	pH (S.U.)	7.82	7.65	7.68	7.61	7.67	7.65
	DO (mg/L)	8.4	8.0	8.3	7.7	8.0	8.0
	Conductivity (µmhos/cm)	2980		2938		2950	
	Temperature (°C)	24.7	25.3	25.3	24.6	25.1	24.4
STOCK	Conductivity (µmhos/cm)	123000					
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*CdNaCLCR #: 22

		Day							
		3		4		5		6	
Analyst		CA1	dl	dl	KSL	KSL	CA1	CA1	CA1
Concentration	Parameter								
CONTROL	pH (S.U.)	8.02	7.78	8.05	7.81	7.82	7.63	7.63	7.64
	DO (mg/L)	8.0	8.1	7.9	8.1	8.3	8.3	8.2	8.2
	Conductivity (µmhos/cm)	331		298		300		287	
	Alkalinity (mg CaCO ₃ /L)								
	Hardness (mg CaCO ₃ /L)								
	Temperature (°C)	25.2	24.7	25.0	24.6	24.8	24.9	25.2	24.7
600 mg NaCl/L	pH (S.U.)	7.66	7.72	7.69	7.74	7.71	7.58	7.57	7.64
	DO (mg/L)	8.1	8.1	8.0	8.1	8.3	8.3	8.2	8.2
	Conductivity (µmhos/cm)	1490		1460		1440		1430	
	Temperature (°C)	25.2	24.6	24.9	24.6	24.8	24.9	25.2	24.6
800 mg NaCl/L	pH (S.U.)	7.65	7.69	7.70	7.70	7.69	7.57	7.59	7.62
	DO (mg/L)	8.1	8.1	8.1	8.2	8.3	8.3	8.2	8.2
	Conductivity (µmhos/cm)	1820		1720		1820		1750	
	Temperature (°C)	25.2	24.6	25.1	24.7	24.8	24.9	25.2	24.7
1000 mg NaCl/L	pH (S.U.)	7.65	7.69	7.70	7.72	7.69	7.59	7.59	7.61
	DO (mg/L)	8.2	8.1	8.1	8.2	8.3	8.4	8.2	8.2
	Conductivity (µmhos/cm)	2080		1960		2130		2100	
	Temperature (°C)	25.2	24.6	25.1	24.6	24.8	24.9	25.0	24.7
1200 mg NaCl/L	pH (S.U.)	7.64	7.67	7.68	7.70	7.68	7.57	7.59	7.62
	DO (mg/L)	8.2	8.2	8.1	8.2	8.2	8.5	8.2	8.2
	Conductivity (µmhos/cm)	2450		2320		2510		2500	
	Temperature (°C)	25.2	24.7	25.1	24.6	24.8	24.8	25.0	24.6
1400 mg NaCl/L	pH (S.U.)	7.63	7.67	7.68	7.70	7.70	7.59	7.60	7.61
	DO (mg/L)	8.2	8.2	8.1	8.2	9.2	8.6	8.2	8.2
	Conductivity (µmhos/cm)	2720		2690		2690		2850	
	Temperature (°C)	25.2	24.6	25.1	24.7	24.8	24.8	25.3	24.6
STOCK	Conductivity (µmhos/cm)	123000							
		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
 From

YEAR	MO	DAY
04	05	01

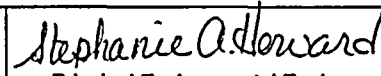
 To

YEAR	MO	DAY
04	05	31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.0	*****	9.0	12	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	**	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	134	175	26	*****	16	20	19	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<42	<45	26	*****	<5	<5	19	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.056	1.159	03	*****	*****	*****	**	0	31 / 31	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	**		DAILY	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER J. Randy Douet 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.	 Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
			423	843-6700	04	06	10
			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)

F - FINAL

METAL CLEANING WASTE POND

EFFLUENT

*** NO DISCHARGE ☒ ***

Form Approved.

OMB No. 2040-0004

TN0026450

107 G

PERMIT NUMBER

DISCHARGE NUMBER

MONITORING PERIOD

From

YEAR	MO	DAY
04	05	01

 To

YEAR	MO	DAY
04	05	31

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

J. Randy Douet

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.

Stephanie A. Howard
Principal Environmental Engineer
SIGNATURE OF PRINCIPAL EXECUTIVE
OFFICER OR AUTHORIZED AGENT

TELEPHONE

423

843-6700

DATE

04

06

10

AREA
CODE

NUMBER

YEAR

MO

DAY

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)

MAJOR
(SUBR 01)

F - FINAL

RECYCLED COOLING WATER

EFFLUENT

*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

TN0026450		110 G	
PERMIT NUMBER		DISCHARGE NUMBER	

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
04	05	01	04	05	31

ATTN: Stephanie A. Howard

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	15 DAILY MX	MG/L		DAILY	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	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		
J. Randy Douet Site Vice President		423	843-6700	04	06	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

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
 YEAR MO DAY YEAR MO DAY
 From 04 05 01 To 04 05 31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	*****	0	94	*****	*****	*****	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT MO TOTAL	YES=1 NO=0	*****	*****	*****	***		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	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		
J. Randy Douet Site Vice President		423	843-6700	04	06	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

Stephanie A. Howard
 Principal Environmental Engineer
 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

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 37384Facility **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

YEAR	MO	DAY	YEAR	MO	DAY
04	05	01	04	05	31

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

J. Randy Douet

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.

Stephanie A. Howard
Principal Environmental Engineer

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE

423 843-6700

AREA CODE

NUMBER

DATE

04 06 10

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)

Form Approved.
OMB No. 2040-0004

TN0026450
PERMIT NUMBER

118 G
DISCHARGE NUMBER

F - FINAL
WASTEWATER & STORM WATER
EFFLUENT

MONITORING PERIOD

YEAR	MO	DAY	YEAR	MO	DAY
04	05	01	04	05	31

From To

*** NO DISCHARGE ☒ ***

ATTN: Stephanie A. Howard

NOTE: Read Instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER J. Randy Douet 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	04	06	10
		AREA CODE	NUMBER	YEAR	MO	DAY

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT
Stephanie A. Howard
Principal Environmental Engineer

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.