



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379-2000

December 13, 2004

State of Tennessee  
Department of Environment and Conservation  
Division of Water Pollution Control  
Enforcement & Compliance Section  
6<sup>th</sup> 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  
NOVEMBER 2004**

Enclosed is the November 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

Handwritten initials "JERS" in a stylized, cursive font.

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 101 G  
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL  
 DIFFUSER DISCHARGE  
 EFFLUENT

MONITORING PERIOD  
 From YEAR MO DAY To YEAR MO DAY  
 04 11 01 04 11 30

\*\*\* 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, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	21.6	04	0	30 / 30	MODEL
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	35.3	04	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	*****	*****	**	7.2	*****	7.5	12	0	8 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	5	6	19	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	<5	<5	19	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	*****	1490	03	*****	*****	*****	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT DAILY MX	MGD	*****	*****	*****	***		CONTINUOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.015	<0.025	19	0	32 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	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	12	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following injections occurred: 1. PCL-222 (max. calc. conc. was 0.049mg/L--limit 0.100mg/L) 2. PCL-222/PCL-401 (max. calc. conc. was 0.030mg/L--limit 0.100mg/L) 3. H-130M (max. calc. conc. was 0.043mg/L--limit 0.050mg/L) 4. 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 PLANTAddress P.O. BOX 2000(INTEROFFICE SB-2A)SODDY - DAISY TN 37384Facility TVA - SEQUOYAH NUCLEAR PLANTLocation HAMILTON COUNTYNATIONAL 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	11	01	To	04	11	30

\*\*\* 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	*****	*****	**	*****	*****	0.2	62	0	30 / 30	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	*****	*****	**	*****	*****	1.3	04	0	30 / 30	CALCTD
00016 1 W 0	PERMIT REQUIREMENT	*****	*****	***	*****	*****	5.0	DEG. C.		CONTINUOUS	CALCTD
EFFLUENT GROSS VALUE											
BORON, TOTAL	SAMPLE MEASUREMENT	*****	*****	**	<0.2	<0.2	<0.2	19	0	1 / 30	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										
	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 12 10

YEAR MO DAY

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

CCW data for November 2004 is attached.

---

**CCW TRENCH**

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
11/01/2004 1230	< 0.5 mg/L	11/02/2004 1416	CVS	EPA 8015B

---

---

**CCW CHANNEL**

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
11/01/2004 1225	< 0.5 mg/L	11/02/2004 1339	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)

MAJOR

(SUBR 01)

F - FINAL

BIOMONITORING FOR OUTFALL 101

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0026450

101 T

PERMIT NUMBER

DISCHARGE NUMBER

MONITORING PERIOD

YEAR MO DAY

YEAR MO DAY

From

04 11 01

To

04 11 30

\*\*\* 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

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

12

10

AREA CODE

NUMBER

YEAR

MO

DAY

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

Toxicity was sampled November 7-12, 2004. Report is attached.

December 8, 2004

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT  
NO. TN0026450, OUTFALL 101, NOVEMBER, 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 November 7-12, showed no toxic effects to fathead minnows or daphnids. The resulting  $IC_{25}$  values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

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

*Cynthia L. Russell*

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

Attachment  
cc (Attachment):  
Files, R&TA, CTR 1B-M

SQN November 2004M

TENNESSEE VALLEY AUTHORITY  
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: December 8, 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): 1531.8
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 3491.1
8. Outfall Tested: 101
9. Dates Sampled: November 7-12, 2004
10. Average Flow on Days Sampled (MGD): 860, 870, 873, 874, 868, 877
11. Pertinent Site Conditions: H-130M was injected from November 9-12, 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 (ET)	Date/Ending Time (ET)
Essential Raw Cooling Water (ERCW) Train A	11/09/2004 1000	11/12/2004 1800
12. Test Dates: November 9-16, 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:  $IC_{25} = 43.9\%$
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: Stephanie Howard Phone #: (423) 843-6700
19. Consulting / Testing Lab: Environmental Testing Solutions, Inc.
20. Lab Contact: Jim Sumner Phone #: (828) 350-9364
21. TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755
22. Notes: Outfall 101 samples collected November 7-12, 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. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.



## METHODS SUMMARY

### Samples:

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

Sample ID	Date (MM/DD/YY)/ Time (ET) Collected	Date (MM/DD/YY)/ Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (ET) Used By
101	11/07/04 0830 to 11/08/04 0730	11/08/04 1350	2.4 <sup>†</sup>	<0.10	11/09/04 1340 11/10/04 1307
Intake	11/07/04 0801 to 11/08/04 0701	11/08/04 1350	3.5	<0.10	11/09/04 1340 11/10/04 1307
101	11/09/04 0846 to 11/10/04 0746	11/10/04 1337	1.4 <sup>†</sup>	<0.10	11/11/04 1252 11/12/04 1400
Intake	11/09/04 0816 to 11/10/04 0716	11/10/04 1337	1.1	<0.10	11/11/04 1252 11/12/04 1400
101	11/11/04 0757 to 11/12/04 0657	11/12/04 1225	2.1 <sup>†</sup> 1.4	<0.10	11/13/04 1332 11/14/04 1326 11/15/04 1350
Intake	11/11/04 0729 to 11/12/04 0629	11/12/04 1225	1.0	<0.10	11/13/04 1332 11/14/04 1326 11/15/04 1350

\*TRC = Total Residual Chlorine

<sup>†</sup>Samples were collected in two 2.5 gallon cubitainers. Temperature was measured in each cubitainers 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<sup>®</sup> UV Sterilizer (manufactured by Emperor Aquatics, Inc.) for 2 minutes.

*Pimephales promelas*

*Ceriodaphnia dubia*

Test Organisms:

- |            |                                 |                          |
|------------|---------------------------------|--------------------------|
| 1. Source: | <u>Aquatic BioSystems, Inc.</u> | <u>In-house Cultures</u> |
| 2. Age:    | <u>22.0-23.5 hours old</u>      | <u>&lt;24-hours old</u>  |

Test Method Summary:

- |                                   |  |  |
|-----------------------------------|--|--|
| 1. Test Conditions:               | <u>Static, Renewal</u>                         | <u>Static, Renewal</u>                                     |
| 2. Test Duration:                 | <u>7 days</u>                                  | <u>Until at least 60% of control females have 3 broods</u> |
| 3. Control / Dilution Water:      | <u>Moderately Hard Synthetic Water</u>         | <u>Moderately Hard Synthetic Water</u>                     |
| 4. Number of Replicates:          | <u>4</u>                                       | <u>10</u>  |
| 5. Organisms per Replicate:       | <u>10</u>                                      | <u>1</u>   |
| 6. Test Initiation: (Date/Time)   |  |  |
| Outfall 101                       | <u>11/09/04 - 1322 ET</u>                      | <u>11/09/04 - 1340 ET</u>                                  |
| UV Treated Outfall 101            | <u>11/09/04 - 1310 ET</u>                      |  |
| 7. Test Termination: (Date/Time)  |  |  |
| Outfall 101                       | <u>11/16/04 - 1300 ET</u>                      | <u>11/16/04 - 1253 ET</u>                                  |
| UV Treated Outfall 101            | <u>11/16/04 - 1318 ET</u>                      |  |
| 8. Test Temperature: Outfall 101: | <u>Mean = 24.7°C</u><br><u>(24.2 - 25.4°C)</u> | <u>Mean = 25.0°C</u><br><u>(24.5 - 25.3°C)</u>             |

Test Temperature: UV-Treated Outfall 101: Mean = 24.9°C  
(24.2 - 25.4°C)

9. Physical / Chemical Measurements: Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.
10. Statistics: Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).

# TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted November 9-16, 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
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.571	0.556	0.618	0.546	0.573
10.98%	0.661	0.669	0.694	0.599	0.656
22.0%	0.658	0.520	0.533	0.600	0.578
43.9%	0.696	0.655	0.658	0.623	0.658
72.0%	0.626	0.635	0.607	0.525	0.598
100.0%	0.600	0.558	0.582	0.638	0.595
Intake	0.629	0.644	0.662	0.606	0.635

IC<sub>25</sub> Value: ≥ 100%  
Permit Limit: 43.9%

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

Calculated TU Estimates: ≤ 1.0 TUc\*

Permit Limit: 2.3 TUc

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

**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 November 9-16, 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
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	28	27	33	27	29	30	29	31	31	31	29.6
10.98%	34	31	33	34	32	31	28	27	29	31	31.0
22.0%	34	32	33	33	33	36	27	29	33	29	31.9
43.9%	32	31	34	34	32	34	35	31	30	32	32.5
72.0%	38	33	37	33	33	35	37	32	34	35	34.7
100.0%	30	34	35	31	36	33	30	35	31	36	33.1
IC <sub>25</sub> 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/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

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 November 9-16, 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	29	34	27	29	28	29	29	26	32	30	29.3
Intake	28	29	29	28	25	27	27	28	28	31	28.0
IC <sub>25</sub> 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>							

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

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 November 9-16, 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	98	98	98
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
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.613	0.686	0.677	0.569	0.636
10.98%	0.685	0.617	0.597	0.679	0.645
22.0%	0.604	0.679	0.649	0.652	0.646
43.9%	0.516	0.514	0.666	0.668	0.591
72.0%	0.592	0.639	0.666	0.715	0.653
100.0%	0.715	0.611	0.560	0.754	0.660
Intake	0.637	0.694	0.734	0.661	0.682
IC <sub>25</sub> Value: <u>≥ 100%</u>			Calculated TU Estimates: <u>&lt; 1.0 TUc*</u>		
95% Confidence Limits:					
Upper Limit: <u>NA</u>					
Lower Limit: <u>NA</u>					

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC <sub>25</sub> )
<i>Pimephales promelas</i>	November 9-16, 2004	1238	7-days	KCl	0.54 g/L
<i>Ceriodaphnia dubia</i>	November 2-9, 2004	1230	7-days	NaCl	1.06 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, November 9 -16, 2004.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO <sub>3</sub> )	Hardness (mg/L CaCO <sub>3</sub> )	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control	24.9	24.6	7.9	7.5	8.05	7.86	298	62	85	-
		24.7 - 25.3	24.3 - 24.9	7.8 - 8.0	6.9 - 8.0	7.98 - 8.12	7.72 - 7.96	293 - 306	61 - 63	83 - 89	- -
	10.98%	24.9	24.5	7.9	7.5	8.08	7.83	285	-	-	-
		24.7 - 25.3	24.3 - 24.8	7.8 - 8.0	6.9 - 7.9	7.99 - 8.15	7.65 - 7.94	280 - 290	- -	- -	- -
	22%	24.9	24.5	8.0	7.5	8.08	7.82	270	-	-	-
		24.8 - 25.1	24.2 - 24.7	7.7 - 8.2	6.8 - 8.0	8.02 - 8.13	7.66 - 7.94	262 - 283	- -	- -	- -
	43.9%	24.9	24.4	8.0	7.4	8.05	7.80	233	-	-	-
		24.6 - 25.2	24.2 - 24.7	7.7 - 8.2	6.8 - 8.0	8.01 - 8.09	7.66 - 7.93	225 - 238	- -	- -	- -
<i>Ceriodaphnia dubia</i>	72%	24.9	24.5	8.0	7.4	8.01	7.78	189	-	-	-
		24.5 - 25.3	24.2 - 24.7	7.7 - 8.2	6.9 - 8.0	7.97 - 8.04	7.64 - 7.91	181 - 194	- -	- -	- -
	100%	24.9	24.5	7.9	7.4	7.96	7.76	145	52	57	<0.10
		24.4 - 25.4	24.3 - 24.9	7.7 - 8.2	7.0 - 7.9	7.92 - 8.01	7.62 - 7.86	139 - 150	51 - 53	54 - 59	<0.10 - <0.10
	Intake	25.0	24.5	7.9	7.5	7.99	7.76	142	51	57	<0.10
		24.7 - 25.3	24.3 - 24.7	7.8 - 8.2	7.1 - 8.0	7.93 - 8.03	7.62 - 7.86	135 - 146	50 - 51	54 - 59	<0.10 - <0.10
	Control	25.0	25.0	7.9	7.9	8.05	8.00	298	62	85	-
		24.7 - 25.2	24.8 - 25.2	7.8 - 8.0	7.8 - 8.1	7.98 - 8.12	7.89 - 8.08	293 - 306	61 - 63	83 - 89	- -
<i>Pimephales promelas</i>	10.98%	24.9	25.0	7.9	7.9	8.08	8.01	285	-	-	-
		24.7 - 25.3	24.7 - 25.3	7.8 - 8.0	7.7 - 8.2	7.99 - 8.15	7.94 - 8.07	280 - 290	- -	- -	- -
	22%	24.9	24.9	8.0	7.9	8.08	8.01	270	-	-	-
		24.7 - 25.1	24.7 - 25.1	7.7 - 8.2	7.7 - 8.2	8.02 - 8.13	7.95 - 8.07	262 - 283	- -	- -	- -
	43.9%	24.9	24.9	8.0	7.9	8.05	8.01	233	-	-	-
		24.8 - 25.3	24.7 - 25.1	7.7 - 8.2	7.8 - 8.2	8.01 - 8.09	7.94 - 8.06	225 - 238	- -	- -	- -
	72%	24.9	25.0	8.0	8.0	8.01	7.99	189	-	-	-
		24.6 - 25.3	24.8 - 25.3	7.7 - 8.2	7.8 - 8.2	7.97 - 8.04	7.91 - 8.05	181 - 194	- -	- -	- -
<i>Ceriodaphnia dubia</i>	100%	25.0	25.0	7.9	7.9	7.96	7.96	145	52	57	<0.10
		24.5 - 25.2	24.7 - 25.3	7.7 - 8.2	7.7 - 8.2	7.92 - 8.01	7.88 - 8.03	139 - 150	51 - 53	54 - 59	<0.10 - <0.10
	Intake	24.9	25.0	7.9	7.9	7.99	7.93	142	51	57	<0.10
		24.5 - 25.2	24.7 - 25.2	7.8 - 8.2	7.7 - 8.1	7.93 - 8.03	7.86 - 8.01	135 - 146	50 - 51	54 - 59	<0.10 - <0.10

Overall temperature (°C)

*Pimephales promelas*

*Ceriodaphnia dubia*

Average

Minimum

Maximum

24.7 24.2 25.4

25.0 24.5 25.3

# PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV-Treated Outfall 101, November 9-16, 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	24.9	24.7	7.9	7.5	8.09	7.82	302
		24.8 - 25.3	24.3 - 25.1	7.8 - 8.1	6.9 - 8.1	8.04 - 8.15	7.66 - 7.95	285 - 310
	10.98%	25.0	24.7	7.9	7.5	8.08	7.80	284
		24.7 - 25.3	24.3 - 25.0	7.7 - 8.2	7.0 - 8.1	8.01 - 8.12	7.66 - 7.96	269 - 295
	22%	25.0	24.6	7.9	7.5	8.07	7.80	270
		24.7 - 25.4	24.2 - 24.9	7.7 - 8.2	6.9 - 8.2	7.99 - 8.12	7.64 - 7.96	262 - 284
	43.9%	25.0	24.7	7.9	7.5	8.05	7.78	237
		24.8 - 25.3	24.3 - 24.9	7.7 - 8.2	6.9 - 8.2	7.98 - 8.12	7.63 - 7.94	233 - 240
	72%	25.1	24.6	7.8	7.4	8.01	7.75	192
		24.8 - 25.4	24.2 - 24.9	7.5 - 8.2	6.8 - 8.2	7.94 - 8.05	7.59 - 7.92	187 - 194
	100%	25.1	24.8	7.8	7.4	7.97	7.76	146
		24.7 - 25.4	24.4 - 24.9	7.6 - 8.2	7.1 - 8.1	7.90 - 8.02	7.64 - 7.88	139 - 152
	Intake	25.0	24.7	7.9	7.3	7.99	7.73	145
		24.9 - 25.2	24.2 - 24.9	7.7 - 8.2	7.0 - 8.1	7.92 - 8.08	7.57 - 7.89	141 - 149

Overall temperature (°C)

Average

Minimum

Maximum

*Pimephales promelas*

24.9

24.2

25.4



## SUMMARY / CONCLUSIONS

Outfall 101 samples collected November 7-12, 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. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.

## Appendix A

### ADDITIONAL TOXICITY TEST INFORMATION

#### SUMMARY OF METHODS

1. *Pimephales promelas*

Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL polypropylene beakers, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

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

#### DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

None

2. *Ceriodaphnia dubia*

None

#### DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

None

2. *Ceriodaphnia dubia*

None

## PHYSICAL AND CHEMICAL METHODS

1. Regents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).
2. Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.
3. Temperature was measured by EPA Method 170.1.
4. Dissolved oxygen was measured by EPA Method 360.1.
5. The pH was measured by EPA Method 150.1.
6. Conductance was measured by EPA Method 120.1.
7. Alkalinity was measured by EPA Method 310.1.
8. Total Hardness was measured by EPA Method 130.2.
9. Total residual chlorine was measured by 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 IC<sub>25</sub> 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).
4. Quality Assurance Program: Standard Operating Procedures, Environmental Testing Solutions, Inc (most current version).

**Sequoyah Nuclear Plant Biomonitoring  
November 7-12, 2004**

**Appendix B**

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 - November 12, 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 - November 12, 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 - November 12, 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 - November 12, 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	-	-	-
07/04/2004	-	0.0217	0.057	0.019	-	-	-
07/05/2004	-	< 0.0085	0.057	0.020	0.009	-	-
07/06/2004	-	< 0.0077	0.058	0.020	-	-	0.031
07/07/2004	-	0.0252	0.056	0.019	-	-	0.031
07/08/2004	-	0.0223	0.057	0.019	0.009	-	-
07/09/2004	-	0.0182	0.057	0.020	0.009	-	-

March 12, 1998 - November 12, 2004

[illegible]

**Sequoyah Nuclear Plant Biomonitoring  
November 9-16, 2004**

**Appendix C**

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

## BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 3

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: <i># Custody seals intact. Samples received in good condition.</i> <i>J/umner</i>
Facility Sampled: Sequoyah NP		
NPDES Number: TN0026450		
Collected By: Wanda Allen		

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project #	Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance	
SQN-101-TOX	Comp	11/7/04 - 11/8/04	0830/0730	2 (2.5gal)	NA			✓		04110801	2.4°C	J	1350	\$ see	
SQN-INT-TOX	Comp	11/7/04 - 11/8/04	0801/0701	1 (2.5 gal)	NA			✓		04110802	3.5°C	J	1350	COMMENTS	

## Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	11/8/2004 0938	Express Courier <i>Lo Ro Henning</i>	11/8/2004 0946
Express Courier <i>Lo Ro Henning</i>	11/8/2004 1350	ETS <i>J/umner</i>	11/8/2004 1350

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

## BIOMONITORING CHAIN OF CUSTODY RECORD

Page 2 of 3

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 General Comments: <i>* Custody seals intact. Samples received in good condition. J. Luma</i>
P.O. Number: N/A		
Facility Sampled: Sequoyah NP		
NPDES Number: TN0026450		
Collected By: Wanda Allen		

Field Identification / Sample Description	Grab/Comp P.	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	11/9/04-11/10/04	0846/0746	2 (2.5gal)	NA			✓		041110.07	1.4°C	J	1337	4.562
SQN-INT-TOX	Comp	11/9/04 -11/10/04	0816/0716	1 (2.5 gal)	NA			✓		041110.08	1.1°C	J	1337	Comments

## Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	11/10/2004 0848	Express Courier <i>L. R. Stumpf</i>	11/10/2004 0848
Express Courier <i>L. R. Stumpf</i>	11/10/2004 1337 0848	ETS <i>J. Luma</i>	11/10/2004 1337

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 3 of 3

Client: TVA	Environmental Testing Solution, Inc. 351 Depot Street Ashville, 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: SAMPLE HAVE SEDIMENT AT THE BOTTOM DUE TO RAIN AND DIFFUSER POND LEVEL DROPPING ANN HURT 11/12/2004
NPDES Number: TN0026450		
Collected By: Wanda Allen		

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1557 Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	11/11/04 - 11/12/04	0757/ 0657	2 (2.5gal)	NA	✓				041112.01	2.1°C / 1.4°C	JL	1225	#see
SQN-INT-TOX	Comp	11/11/04 - 11/12/04	0729/ 0629	1 (2.5 gal)	NA	✓				041112.02	1.0°C	JL	1225	COMMON

Sample Custody - Fill In From Top Down

\* Custody seals intact. Samples received

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen <i>Wanda Allen</i>	11/12/2004 0830	Express Courier <i>L. A. Sturges</i>	11/12/2004 0830
Express Courier <i>L. A. Sturges</i>	11/12/2004 1225	ETS <i>Sturges</i>	11/12/2004 1225

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 #: 1557

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 23.5 HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number:	3D
Organism source:	ABS BATCH 11-08-04	Artemia lot number:	8610055
Transfer bowl information:	pH = 7.98      Temperature = 24.0 °C	Total drying time:	24 HOURS
Average transfer volume:	9.5 mL	Date / Time in:	11-16-04 1320
		Date / Time out:	11-17-04 1330
		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	11-09-04	—	1400	1310 <sup>8</sup> 1322	11-05-04	041108.01 / .02	JL
1	11-10-04	0850	1502	1241	11-07-04	041108.01 / .02	JL
2	11-11-04	0900	1505	1230	11-09-04	041110.07 / .08	JL
3	11-12-04	0913	1522	1236 <sup>8</sup> 1336	11-09-04	041110.07 / .08	JL
4	11-13-04	0900	1500	1233	11-09-04	041112.01 / .02	JL / KEK
5	11-14-04	0847	1506	1240	11-12-04	041112.01 / .02	KEK
6	11-15-04	0850	1500	1234	11-12-04	041112.01 / .02	KEK
7	11-16-04			1300			KEK

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC <sub>50</sub>	> 100%
Average weight per initial larvae:	0.513		NOEC	100%
Average weight per surviving larvae:	0.513	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC <sub>25</sub>	> 100%

Species: *Pimephales promelas*Date: 11-09-04

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	9.10	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	ISH 10	ISH 10	10
A = Pan weight (mg) Tray color code: <u>BROWN</u> Analyst: <u>CAJ BEAKER</u>												
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>												
Larvae weight (mg) = A - B												
Weight per initial number of larvae (mg) = C / Initial number of larvae												
Average weight per initial number of larvae (mg)	0.573				0.656				0.578			
Percent reduction from control (%)					-14.5%				-0.9%			

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

Calculations and data reviewed: dl

Comments:



Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

## 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 <sup>15H</sup>	10	10	10	10
A = Pan weight (mg) Tray color code: <u>BROWN</u> Analyst: <u>CAJ</u> <u>BEAKER</u>												
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>												
Larvae weight (mg) = A - B												
Weight per initial number of larvae (mg) = C / Initial number of larvae												
Average weight per initial number of larvae (mg)	Percent reduction from control (%)											
	0.658		-14.9%		0.598		-4.5%		0.595		-3.8%	

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

Calculations and data reviewed: *AL*

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

## 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) Tray color code:: <u>brown</u> Analyst: <u>CAJ</u> <u>BEAKER</u>		14.98	15.00	14.72	14.87
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>		21.27	21.50	21.34	20.93
Larvae weight (mg) = A - B		6.29	6.44	6.62	6.06
Weight per initial number of larvae (mg) = C / Initial number of larvae		0.629	0.644	0.662	0.606
Average weight per initial number of larvae (mg)	Percent reduction from control (%)	0.635		-10.9%	

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

Calculations and data reviewed: *JS*

Comments:

**TVA / Sequoyah Nuclear Plant, Outfall 101**  
**Non-treated**  
**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, Outfall 101 - Non-treated  
**Test dates:** November 9-16, 2004  
**Project number:** 1557

Reviewed by: *Jumma*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Final weight (mg)	B = Final + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Off 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 (Off mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	15.01	20.72	5.71	0.571	0.573	5.6	0.571	100.0	0.573	5.6	Not applicable
	B	10	10	14.64	20.20	5.56	0.556			0.556				
	C	10	10	15.04	21.22	6.18	0.618			0.618				
	D	10	10	14.38	19.84	5.46	0.546			0.546				
10.98%	E	10	10	14.28	20.89	6.61	0.661	0.656	6.2	0.661	100.0	0.656	6.2	-14.5
	F	10	10	14.96	21.65	6.69	0.669			0.669				
	G	10	10	14.32	21.26	6.94	0.694			0.694				
	H	10	10	15.18	21.17	5.99	0.599			0.599				
22%	I	10	10	14.91	21.49	6.58	0.658	0.578	11.1	0.658	100.0	0.578	11.1	-0.9
	J	10	10	14.78	19.98	5.20	0.520			0.520				
	K	10	10	14.80	20.13	5.33	0.533			0.533				
	L	10	10	14.44	20.44	6.00	0.600			0.600				
43.9%	M	10	10	14.37	21.33	6.96	0.696	0.658	4.5	0.696	100.0	0.658	4.5	-14.9
	N	10	10	14.36	20.91	6.55	0.655			0.655				
	O	10	10	14.90	21.48	6.58	0.658			0.658				
	P	10	10	14.88	21.11	6.23	0.623			0.623				
72%	Q	10	10	14.59	20.85	6.26	0.626	0.598	8.4	0.626	100.0	0.598	8.4	-4.5
	R	10	10	14.90	21.25	6.35	0.635			0.635				
	S	10	10	15.03	21.10	6.07	0.607			0.607				
	T	10	10	15.32	20.57	5.25	0.525			0.525				
100%	U	10	10	14.85	20.85	6.00	0.600	0.595	5.7	0.600	100.0	0.595	5.7	-3.8
	V	10	10	14.82	20.40	5.58	0.558			0.558				
	W	10	10	15.10	20.92	5.82	0.582			0.582				
	X	10	10	14.95	21.33	6.38	0.638			0.638				
100% Intake	Y	10	10	14.98	21.27	6.29	0.629	0.635	3.7	0.629	100.0	0.635	3.7	-10.9
	Z	10	10	15.06	21.50	6.44	0.644			0.644				
	AA	10	10	14.72	21.34	6.62	0.662			0.662				
	BB	10	10	14.87	20.93	6.06	0.606			0.606				

**Outfall 101:**  
Dunnett's MSD value: 0.0739  
PMSD: 12.9

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 15.6% 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.

# TVA / Sequoyah Nuclear Plant, Outfall 101 Non-treated

## Statistical Analyses

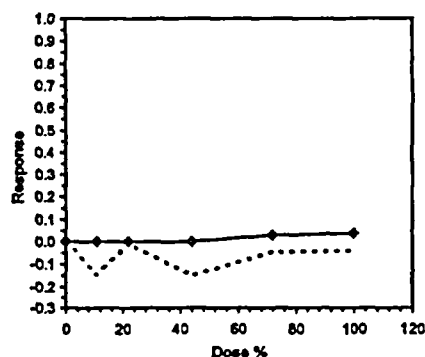
Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 11/9/2004	Test ID: PpPRCR	Sample ID: TVA/SQN 101 - Non-treated		
End Date: 11/16/2004	Lab ID: ETS-Bovk. Testing Sol	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: FWCHR-EPA-421-R-02-013	Test Species: PP-Pimephales promelas		
Comments:				

Conc-%	1	2	3	4
D-Control	0.5710	0.5560	0.6180	0.5460
10.98	0.6610	0.6690	0.6940	0.5990
22	0.6580	0.5200	0.5330	0.6000
43.9	0.6960	0.6330	0.6580	0.6230
72	0.6260	0.6330	0.6070	0.5250
100	0.6000	0.5580	0.5820	0.6380

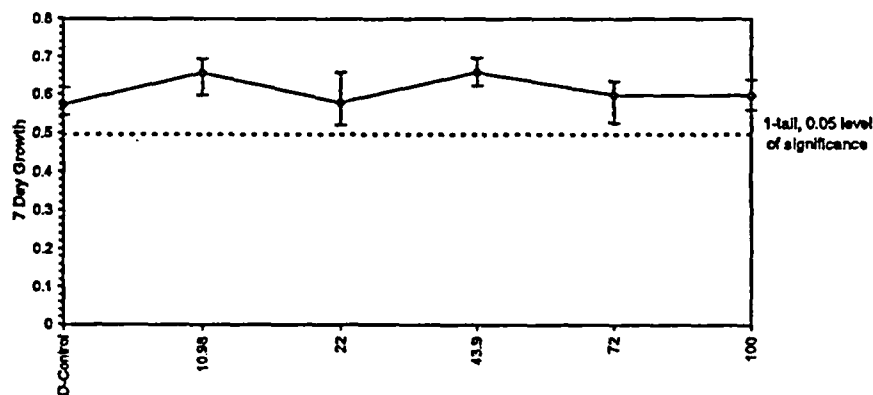
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.5728	1.0000	0.5728	0.5460	0.6180	5.564	4				0.6161	1.0000
10.98	0.6558	1.1449	0.6558	0.5990	0.6940	6.155	4	-2.706	2.410	0.0739	0.6161	1.0000
22	0.5778	1.0087	0.5778	0.5200	0.6580	11.071	4	-0.163	2.410	0.0739	0.6161	1.0000
43.9	0.6580	1.1488	0.6580	0.6230	0.6960	4.541	4	-2.780	2.410	0.0739	0.6161	1.0000
72	0.5983	1.0445	0.5983	0.5250	0.6350	8.393	4	-0.831	2.410	0.0739	0.5983	0.9711
100	0.5945	1.0380	0.5945	0.5580	0.6380	5.672	4	-0.709	2.410	0.0739	0.5945	0.9650

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )					0.980021954	0.884	-0.07339446	-0.45529025		
Bartlett's Test indicates equal variances ( $p = 0.78$ )					2.494269133	15.08627224				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	CAV	TU	MSD <sub>u</sub>	MSD <sub>p</sub>	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.073908152	0.129042082	0.0057612	0.001881	0.035764091	5, 18
Treatments vs D-Control										

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



Dose-Response Plot



# TVA / Sequoyah Nuclear Plant, Outfall 101 Non-treated

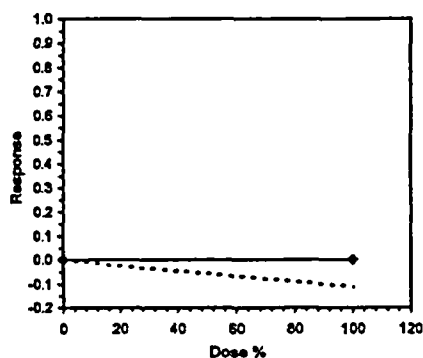
## Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 11/9/2004	Test ID: PpFRCR	Sample ID: TVA / SQN 101 Intake - Non-treated		
End Date: 11/16/2004	Lab ID: ETS-Envir. Testing Sol	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species: FP-Pimephales promelas		
Comments:				
Conc-%	1	2	3	4
D-Control	0.5710	0.5560	0.6180	0.5460
100	0.6290	0.6440	0.6620	0.6060

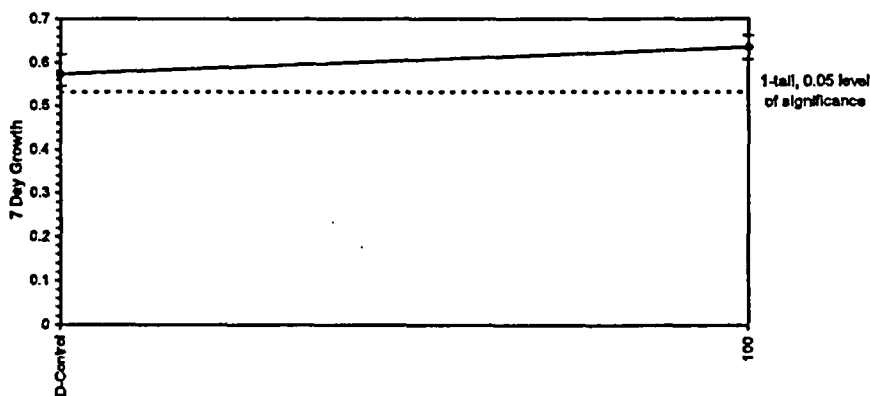
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.5728	1.0000	0.5728	0.5460	0.6180	5.564	4				0.6040	1.0000
100	0.6333	1.1091	0.6333	0.6060	0.6620	3.733	4	-3.147	1.943	0.0386	0.6040	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.940208614	0.749	0.686194278	-0.37521312		
F-Test indicates equal variances ( $p = 0.64$ )	1.806284308	47.46722794				
Hypothesis Test (1-tail, 0.05)	MSDn	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.034593456	0.067342726	0.0078125	0.000718917	0.019893471	1, 6
Treatments vs D-Control						

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



Dose-Response Plot



## 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 #: 1557

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:	Blue
Date and times organisms were born between:	11-09-04 0811 TO 1043	Incubator number and shelf location:	2C1
Organism source:	11-02-04 A-F	YCT batch:	10-05-04
Transfer bowl information:	pH = 8.06 Temperature = 25.1	Selenastrum batch:	10-26-04

## Daily renewal information:

Day	Date	Test Initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	11-09-04	1340	11-09-04	041108.01   .02	dl
1	11-10-04	1307	11-07-04	041108.01   .02	dl
2	11-11-04	1252	11-09-04	041110.07   .08	dl
3	11-12-04	1400	11-09-04	041110.07   .08	dl
4	11-13-04	1332	11-09-04	041112.01   .02	dl
5	11-14-04	1326	11-12-04	041112.01   .02	dl
6	11-15-04	1350	11-12-04	041112.01   .02	dl
7	11-16-04	1253			dl

Control #

Control information:	1	2	Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	> 100%
% Adults having 3 <sup>rd</sup> Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	> 100%
Mean Offspring/Female:	29.6	29.3	≥ 15.0 offspring/female	ChV	> 100%
% CV:	6.6%	7.9%	< 40.0 %	IC25	> 100%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

## 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	4	4	5	4	5	6	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	*4	0	0	9	0	11	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	8	*6	9	10	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	18	14	14	15	14	15	17	16
Total young produced		28	27	33	27	29	(30) 29*	29	31	31	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 <sup>rd</sup> Broods		X	X	X	X	X	X	X	X	X	X

\*SPLIT  
BROOD

## Concentration:

% Mortality:

0%

Mean Offspring/Female:

29.6

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	6	5	5	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	9	12	12	10	9	9	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	11	9	0	0	0	0	0	0	0	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	18	19	16	15	16	15	14	14	17
Total young produced		34	31	32 (33)	34	32	31	28	27	29	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:

0%

Mean Offspring/Female:

31.0

% Reduction from Control:

-4.7%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

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	6	5	5	4	5	5	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	6	11	10	0	13	9	9	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	9	0	0	11	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	18	17	19	17	18	14	15	17	14
Total young produced		34	32	33	33	33	36	27	29	33	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	31.9
% Reduction from Control:	-7.8%

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	5	4	4	5	6	5	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	11	11	10	0	9	11	10	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	10	0	0	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	19	19	16	20	19	16	15	16
Total young produced		32	31	34	34	32	34	35	31	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	32.5
% Reduction from Control:	-9.8%



Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

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	6	4	5	5	5	6	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	10	11	9	11	11	10	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	20	16	21	18	19	19	21	16	20	17
Total young produced		38	33	37	33	33	35	37	32	34	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	34.7
% Reduction from Control:	-17.2%

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	5	6	6	4	5	5	6	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	0	0	0	0	12	10	10	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	11	11	9	12	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	18	18	16	20	16	15	19	16	19
Total young produced		30	34	35	31	36	33	30	35	31	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	33.1
% Reduction from Control:	-11.8%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant - Non-treated

Date: 11-09-04

**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	4	5	3	4	3	4	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	10	10	9	9	11	11	9	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	19	14	16	16	14	14	13	18	17
Total young produced		29	34	27	29	28	29	29	26	32	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

**Concentration:**

% Mortality:	0%
Mean Offspring/Female:	29.3
% Reduction from Control:	—

**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	3	4	4	5	4	3	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	12	10	10	9	9	10	10	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	13	16	14	12	13	13	15	13	16
Total young produced		28	29	29	28	25	27	27	28	28	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

**Concentration:**

% Mortality:	0%
Mean Offspring/Female:	28.0
% Reduction from Control:	4.4%

## TVA / Sequoyah Nuclear Plant, Outfall 101

## Non-treated

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	5	4	5	6	5	5	4	5	47
5	0	0	4	0	0	9	0	11	10	10	44
6	9	8	6	9	10	0	10	0	0	0	52
7	15	15	18	14	14	15	14	15	17	16	153
Total	28	27	33	27	29	30	29	31	31	31	296

## 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	6	4	5	5	5	6	4	5	50
5	13	12	10	11	9	11	11	10	10	13	110
6	0	0	0	0	0	0	0	0	0	0	0
7	20	16	21	18	19	19	21	16	20	17	187
Total	38	33	37	33	33	35	37	32	34	35	347

## 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	6	5	5	4	4	5	5	48
5	0	0	9	12	12	10	9	9	10	0	71
6	11	9	0	0	0	0	0	0	0	9	29
7	18	18	19	16	15	16	15	14	14	17	162
Total	34	31	33	34	32	31	28	27	29	31	310

## 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	5	6	6	4	5	5	6	5	5	52
5	9	0	0	0	0	12	10	10	10	12	63
6	0	11	11	9	12	0	0	0	0	0	43
7	16	18	18	16	20	16	15	19	16	19	173
Total	30	34	35	31	36	33	30	35	31	36	331

## 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	6	5	5	4	5	5	4	5	5	5	49
5	12	0	11	10	0	13	9	9	11	10	85
6	0	9	0	0	11	0	0	0	0	0	20
7	16	18	17	19	17	18	14	15	17	14	165
Total	34	32	33	33	33	36	27	29	33	29	319

## 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	3	4	3	4	4	4	4	4	39
5	0	0	0	0	0	0	0	0	0	9	9
6	9	10	10	9	9	11	11	9	10	0	88
7	16	19	14	16	16	14	14	13	18	17	157
Total	29	34	27	29	28	29	29	26	32	30	293

## 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	5	4	4	5	6	5	5	5	5	5	49
5	11	11	11	10	0	9	11	10	0	11	84
6	0	0	0	0	10	0	0	0	10	0	20
7	16	16	19	19	16	20	19	16	15	16	172
Total	32	31	34	34	32	34	35	31	30	32	325

## 100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	4	5	4	3	5	5	41
5	0	0	0	0	0	0	0	0	0	0	0
6	10	12	10	10	9	9	10	10	10	10	100
7	14	13	16	14	12	13	13	15	13	16	139
Total	28	29	29	28	25	27	27	28	28	31	280

# TVA / Sequoyah Nuclear Plant, Outfall 101

## Non-treated

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, Outfall 101 - Non-treated  
 Test dates: November 9-16, 2004  
 Project number: 1557

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	28	27	33	27	29	30	29	31	31	31	100	29.6	6.6	Not applicable
10.98%	34	31	33	34	32	31	28	27	29	31	100	31.0	7.8	-4.7
22%	34	32	33	33	33	36	27	29	33	29	100	31.9	8.5	-7.8
43.9%	32	31	34	34	32	34	35	31	30	32	100	32.5	5.1	-9.8
72%	38	33	37	33	33	35	37	32	34	35	100	34.7	5.9	-17.2
100%	30	34	35	31	36	33	30	35	31	36	100	33.1	7.3	-11.8
Control - 2	29	34	27	29	28	29	29	26	32	30	100	29.3	7.9	Not applicable
100% Intake	28	29	29	28	25	27	27	28	28	31	100	28.0	5.6	4.4

**Outfall 101:**  
 Dunnett's MSD value: 2.282  
 PMSD: 7.7

**Intake:**  
 Dunnett's MSD value: 1.530  
 PMSD: 5.2

MSD = Minimum Significant Difference  
 PMSD = Percent Minimum Significant Difference  
 PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.0% from the control.  
 Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.  
 Upper PMSD bound determined by USEPA (90<sup>th</sup> 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.

# TVA / Sequoyah Nuclear Plant, Outfall 101 Non-treated

## Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction				
Start Date: 11/9/2004	Test ID: CdFRCR	Sample ID: TVA / SQN 101 - Non-treated		
End Date: 11/16/2004	Lab ID: ETS-Envir. Testing Sol	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species: CD-Ceriodaphnia dubia		
Comments:				

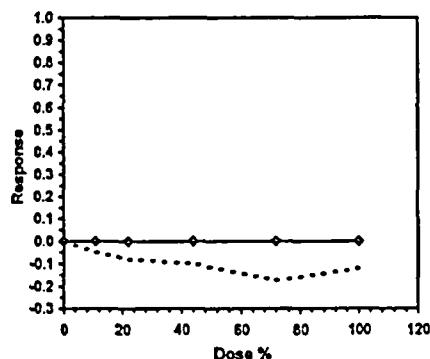
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	27.000	33.000	27.000	29.000	30.000	29.000	31.000	31.000	31.000
10.98	34.000	31.000	33.000	34.000	32.000	31.000	28.000	27.000	29.000	31.000
22	34.000	32.000	33.000	33.000	33.000	36.000	27.000	29.000	33.000	29.000
43.9	32.000	31.000	34.000	34.000	32.000	34.000	35.000	31.000	30.000	32.000
72	38.000	33.000	37.000	33.000	33.000	35.000	37.000	32.000	34.000	35.000
100	30.000	34.000	35.000	31.000	36.000	33.000	30.000	35.000	31.000	36.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	29.600	1.0000	29.600	27.000	33.000	6.605	10				32.133	1.0000
10.98	31.000	1.0473	31.000	27.000	34.000	7.754	10	-1.403	2.287	2.282	32.133	1.0000
22	31.900	1.0777	31.900	27.000	36.000	8.547	10	-2.305	2.287	2.282	32.133	1.0000
43.9	32.500	1.0980	32.500	30.000	35.000	5.077	10	-2.906	2.287	2.282	32.133	1.0000
72	34.700	1.1723	34.700	32.000	38.000	5.929	10	-5.111	2.287	2.282	32.133	1.0000
100	33.100	1.1182	33.100	30.000	36.000	7.325	10	-3.508	2.287	2.282	32.133	1.0000

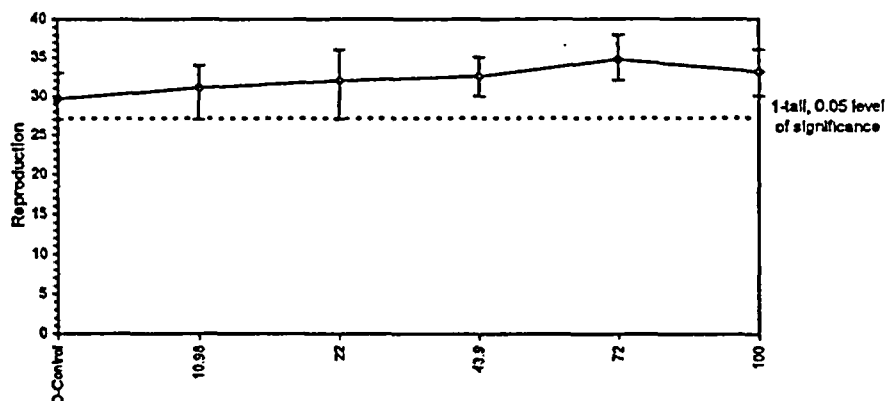
Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.760670602	1.035	-0.17547185	-0.85392101			
Bartlett's Test indicates equal variances (p = 0.73)					2.704277992	15.08627224					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDa	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	2.281579492	0.077080348	30.82666667	4.977777778	1.3E-04	5, 54
Treatments vs D-Control											

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



# TVA / Sequoyah Nuclear Plant, Outfall 101 Non-treated

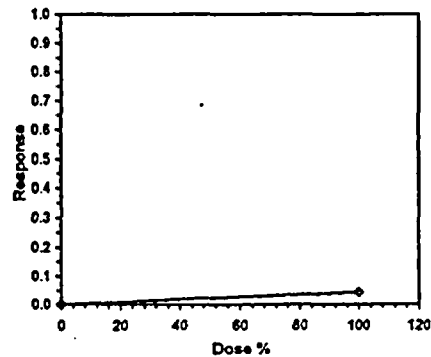
## Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date: 11/9/2004	Test ID: CdFRCR	Sample ID: TVA / SQN 101 Intake - Non-treated								
End Date: 11/16/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type: DMR-Discharge Monitoring Report								
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species: CD-Ceriodaphnia dubia								
Comments:										
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	29,000	34,000	27,000	29,000	28,000	29,000	29,000	26,000	32,000	30,000
100	28,000	29,000	29,000	28,000	25,000	27,000	27,000	28,000	28,000	31,000

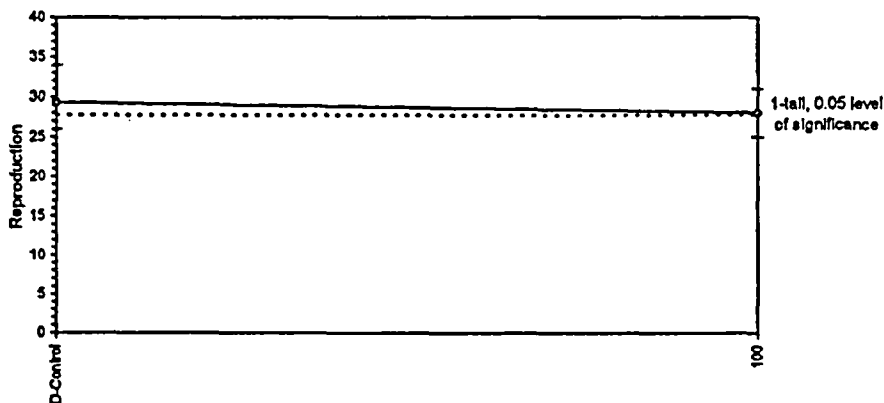
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	29.300	1.0000	29.300	26.000	34.000	7.890	10				29.300	1.0000
100	28.000	0.9556	28.000	25.000	31.000	5.584	10	1.473	1.734	1.530	28.000	0.9556

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.937893212	0.868	0.606024152	1.007873826
F-Test indicates equal variances ( $p = 0.26$ )	2.186363697	6.541089535		
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE
Homoscedastic Test indicates no significant differences	1.530392338	0.05223182	8.45	3.894444444
Treatments vs D-Control				F-Prob
				0.158020228
				df
				1, 18

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



Dose-Response Plot



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

Client: TVA  
 Facility: Sequoyah Nuclear Plant - UV-treated  
 NPDES #: TN 0026450  
 Project #: 1557

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:	21.75 TO 23.25 HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number:	3C
Organism source:	11-08-04 - ABS BATCH	Artemia lot number:	8610055
Transfer bowl information:	pH = 7.98      Temperature = 24.1 °C	Total drying time:	24 HOURS
Average transfer volume:	9.5 mL	Date / Time in:	11-16-04 1320
		Date / Time out:	11-17-04 1330
		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	11-09-04	—	1400	1310	11-05-04	041108.01 / .02	JF
1	11-10-04	0850	1502	1220	11-07-04	041108.01 / .02	JF
2	11-11-04	0900	1505	1214	11-09-04	041110.07 / .08	JF
3	11-12-04	0913	1522	1208 1307	11-09-04	041110.07 / .08	JF
4	11-13-04	0903	1500	1214	11-09-04	041112.01 / .02	JF/KEK
5	11-14-04	0847	1506	1227	11-12-04	041112.01 / .02	KEK
6	11-15-04	0850	1500	1214	11-12-04	041112.01 / .02	KEK
7	11-16-04			1318			KEK

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	2.5% <del>8%</del>	≤ 20%	7-day LC <sub>50</sub>	> 100%
Average weight per initial larvae:	0.636 <del>0.638</del>		NOEC	100%
Average weight per surviving larvae:	0.652	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC <sub>25</sub>	> 100%

Species: *Pimephales promelas*Date: 11-09-04

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	9 <sup>d</sup>	10	10	10	10	10	10	10	10
6	10	10	10	9	10	10	10	10	10	10	10	10
7	10	10	10	9	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code: <u>BLACK</u> Analyst: <u>CAS</u> <u>BEAKER</u>												
B = Pan + Larvae weight (mg) Analyst: <u>CAS</u>												
Larvae weight (mg) = A - B												
Weight per initial number of larvae (mg) = C / Initial number of larvae												
Average weight per initial number of larvae (mg)	0.636				0.645			-1.3%	0.646			-1.5%

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

Calculations and data reviewed: CH

Comments:



Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Date: 11-09-04

## 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	1SM 10	1SM 10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code: <u>BLACK</u> Analyst: <u>CAJ BEAKER</u>												
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>												
Larvae weight (mg) = A - B												
Weight per initial number of larvae (mg) = C / Initial number of larvae												
Average weight per initial number of larvae (mg)												
Percent reduction from control (%)												
<div>0.591</div> <div>7.1%</div> <div>0.653</div> <div>-2.6%</div> <div>0.660</div> <div>-3.7%</div>												

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

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Date: 11-09-04

## 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) Tray color code: <u>BLACK</u> Analyst: <u>CAJ BEAKER</u>				
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>				
Larvae weight (mg) = A - B				
Weight per initial number of larvae (mg) = C / Initial number of larvae				
Average weight per initial number of larvae (mg)	Percent reduction from control (%)			
	0.682		-7.1%	

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

Calculations and data reviewed: al

Comments:

**TVA / Sequoyah Nuclear Plant, Outfall 101**  
**UV-treated**  
**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, Outfall 101 - UV treated  
 Test dates: November 9-16, 2004  
 Project number: 1557

Reviewed by: *[Signature]*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pae weight (mg)	B = Pae + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.72	20.85	6.13	0.613	0.652	5.4	0.613	97.5	0.636	8.7	Not applicable
	B	10	10	14.98	21.84	6.86	0.686			0.686				
	C	10	10	14.99	21.76	6.77	0.677			0.677				
	D	10	9	15.05	20.74	5.69	0.632			0.569				
10.98%	E	10	10	14.71	21.56	6.85	0.685	0.645	6.8	0.685	100.0	0.645	6.8	-1.3
	F	10	10	15.13	21.30	6.17	0.617			0.617				
	G	10	10	14.66	20.63	5.97	0.597			0.597				
	H	10	10	14.64	21.43	6.79	0.679			0.679				
22%	I	10	10	15.04	21.08	6.04	0.604	0.646	4.8	0.604	100.0	0.646	4.8	-1.5
	J	10	10	14.96	21.75	6.79	0.679			0.679				
	K	10	10	14.83	21.32	6.49	0.649			0.649				
	L	10	10	14.59	21.11	6.52	0.652			0.652				
43.9%	M	10	10	14.85	20.01	5.16	0.516	0.591	14.9	0.516	100.0	0.591	14.9	7.1
	N	10	10	14.72	19.86	5.14	0.514			0.514				
	O	10	10	15.16	21.82	6.66	0.666			0.666				
	P	10	10	14.70	21.38	6.68	0.668			0.668				
72%	Q	10	10	14.66	20.58	5.92	0.592	0.653	7.9	0.592	100.0	0.653	7.9	-2.6
	R	10	10	14.87	21.26	6.39	0.639			0.639				
	S	10	10	14.61	21.27	6.66	0.666			0.666				
	T	10	10	14.91	22.06	7.15	0.715			0.715				
100%	U	10	10	14.56	21.71	7.15	0.715	0.660	13.6	0.715	100.0	0.660	13.6	-3.7
	V	10	10	14.75	20.86	6.11	0.611			0.611				
	W	10	10	16.05	21.65	5.60	0.560			0.560				
	X	10	10	14.15	21.69	7.54	0.754			0.754				
100% Intake	Y	10	10	14.49	20.86	6.37	0.637	0.682	6.2	0.637	100.0	0.682	6.2	-7.1
	Z	10	10	14.64	21.58	6.94	0.694			0.694				
	AA	10	10	14.87	22.21	7.34	0.734			0.734				
	BB	10	10	14.39	21.00	6.61	0.661			0.661				

Outfall 101:  
 Dunnett's MSD value: 0.1087  
 PMSD: 17.1

Intake:  
 Dunnett's MSD value: 0.0676  
 PMSD: 10.6

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 15.6% 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.

# TVA / Sequoyah Nuclear Plant, Outfall 101 UV-treated

## Statistical Analyses

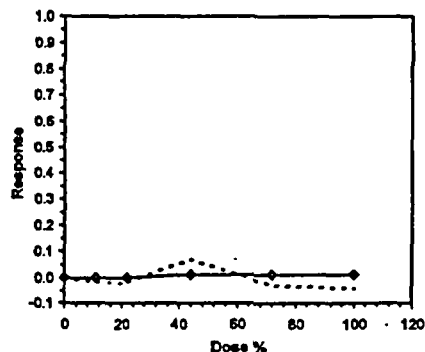
Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 11/9/2004	Test ID: PpFRCR	Sample ID: TVA / SQN 101 - UV-treated		
End Date: 11/16/2004	Lab ID: ETS-Bnvt. Testing Sol	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species: PP-Pimephales promelas		

Conc-%	1	2	3	4
D-Control	0.6130	0.6860	0.6770	0.5690
10.98	0.6445	0.6170	0.5970	0.6790
22	0.6040	0.6790	0.6490	0.6520
43.9	0.5160	0.5140	0.6660	0.6680
72	0.5920	0.6390	0.6660	0.7150
100	0.7150	0.6110	0.5600	0.7540

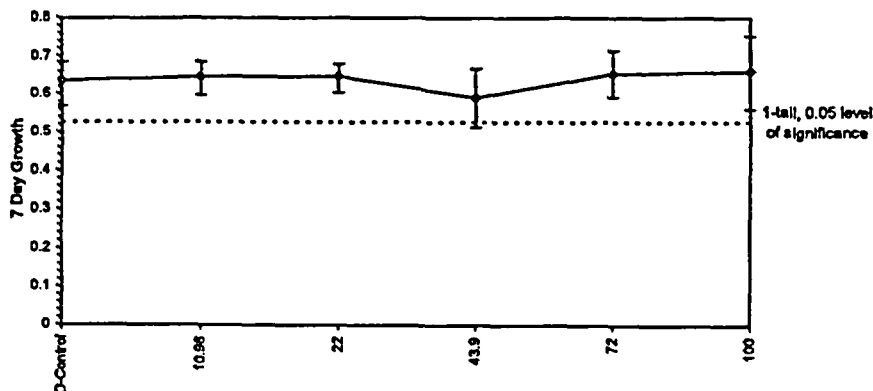
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.6363	1.0000	0.6363	0.5690	0.6860	8.703	4				0.6423	1.0000
10.98	0.6445	1.0130	0.6445	0.5970	0.6850	6.848	4	-0.183	2.410	0.1087	0.6423	1.0000
22	0.6460	1.0153	0.6460	0.6040	0.6790	4.811	4	-0.216	2.410	0.1087	0.6423	1.0000
43.9	0.5910	0.9289	0.5910	0.5140	0.6680	14.850	4	1.003	2.410	0.1087	0.6347	0.9882
72	0.6530	1.0263	0.6530	0.5920	0.7150	7.873	4	-0.371	2.410	0.1087	0.6347	0.9882
100	0.6600	1.0373	0.6600	0.5600	0.7540	13.626	4	-0.527	2.410	0.1087	0.6347	0.9882

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )		0.956519902	0.884	-0.07765099	-1.21340363
Bartlett's Test indicates equal variances ( $p = 0.53$ )		4.153034687	15.08627224		
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU
Dunnnett's Test		100	>100		1
Treatments vs D-Control					0.108702425
					0.170848606
					0.002420842
					0.004068875
					0.704186499
					5, 18

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



# TVA / Sequoyah Nuclear Plant, Outfall 101 UV-treated

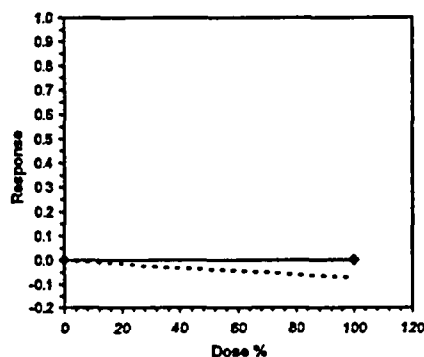
## Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth					
Start Date:	11/9/2004	Test ID:	PpFRCR	Sample ID:	TVA / SQN 101 Intake - UV-treated
End Date:	11/16/2004	Lab ID:	ETS-Brvk. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					
Conc.-%	1	2	3	4	
D-Control	0.6130	0.6860	0.6770	0.5690	
100	0.6370	0.6940	0.7340	0.6610	

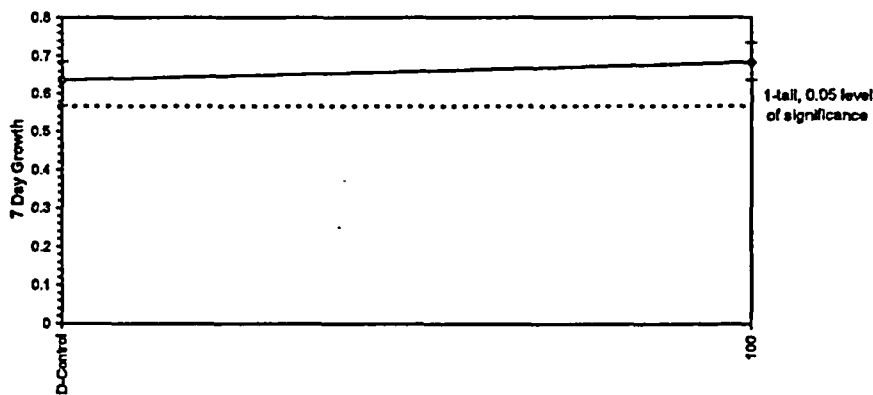
Conc.-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Levene's	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.6363	1.0000	0.6363	0.5690	0.6860	8.703	4				0.6589	1.0000
100	0.6815	1.0711	0.6815	0.6370	0.7340	6.175	4	-1.301	1.943	0.0676	0.6589	1.0000

Auxiliary Tests		Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )		0.916089833	0.749	-0.15333942	-1.60140066		
F-Test indicates equal variances ( $p = 0.66$ )		1.731366515	47.46722794				
Hypothesis Test (1-tail, 0.05)		MSDn	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences		0.067574427	0.106207352	0.004095125	0.002418625	0.240915015	1, 6
Treatments vs D-Control							

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



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: November 09 - 16, 2004

Project number: 1557

Reviewed by: 

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.06	7.96	8.02	7.91	7.98	7.92	8.03	7.73	8.12	7.72	8.05	7.82	8.11	7.96
	DO (mg/L)	7.8	7.8	7.8	7.5	7.9	7.4	7.8	7.0	7.8	6.9	8.0	7.7	7.9	8.0
	Conductivity (µmhos/cm)	299		295		296		306		301		293		293	
	Alkalinity (mg/L CaCO <sub>3</sub> )	63		61		62						61			
	Hardness (mg/L CaCO <sub>3</sub> )	89		83		83						83			
	Temperature (°C)	24.8	24.8	24.7	24.6	24.8	24.3	24.9	24.3	24.7	24.6	24.9	24.5	25.3	24.9
10.98%	pH (SU)	8.06	7.93	8.04	7.88	8.07	7.89	8.15	7.65	8.13	7.68	7.99	7.81	8.10	7.94
	DO (mg/L)	7.9	7.8	7.8	7.5	7.9	7.4	8.0	6.9	7.8	7.0	8.0	7.7	8.0	7.9
	Conductivity (µmhos/cm)	285		283		286		287		285		280		290	
	Temperature (°C)	24.7	24.5	24.9	24.5	24.9	24.3	25.1	24.6	24.7	24.6	24.9	24.3	25.3	24.8
22%	pH (SU)	8.06	7.92	8.04	7.86	8.07	7.89	8.13	7.66	8.13	7.68	8.02	7.80	8.11	7.94
	DO (mg/L)	8.0	7.8	7.8	7.4	8.0	7.5	8.0	6.8	7.7	7.0	8.0	7.7	8.2	8.0
	Conductivity (µmhos/cm)	271		263		267		272		271		262		283	
	Temperature (°C)	24.8	24.6	24.8	24.5	24.9	24.2	25.1	24.4	24.9	24.7	24.8	24.5	25.1	24.7
43.9%	pH (SU)	8.03	7.90	8.02	7.81	8.04	7.86	8.09	7.68	8.09	7.66	8.01	7.79	8.07	7.93
	DO (mg/L)	7.9	7.8	7.9	7.3	8.0	7.3	8.0	6.8	7.7	7.0	8.0	7.6	8.2	8.0
	Conductivity (µmhos/cm)	237		228		225		238		237		229		236	
	Temperature (°C)	24.6	24.6	24.9	24.3	25.2	24.2	24.9	24.4	24.9	24.5	24.8	24.4	25.1	24.7
72%	pH (SU)	8.00	7.84	7.98	7.78	7.98	7.87	8.03	7.66	8.04	7.64	7.97	7.78	8.04	7.91
	DO (mg/L)	7.9	7.6	7.9	7.2	8.0	7.3	8.0	6.9	7.7	7.1	8.0	7.5	8.2	8.0
	Conductivity (µmhos/cm)	193		181		191		194		192		182		191	
	Temperature (°C)	24.5	24.7	25.1	24.5	25.3	24.4	25.1	24.2	24.6	24.6	24.6	24.4	25.2	24.7
100%	pH (SU)	7.97	7.81	7.94	7.79	7.92	7.86	7.97	7.62	7.99	7.63	7.93	7.75	8.01	7.85
	DO (mg/L)	7.8	7.6	7.9	7.3	8.1	7.4	7.8	7.0	7.7	7.1	7.9	7.5	8.2	7.9
	Conductivity (µmhos/cm)	150		141		148		149		140		139		146	
	Alkalinity (mg/L CaCO <sub>3</sub> )	53				51				52					
	Hardness (mg/L CaCO <sub>3</sub> )	57				59				54					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.4	24.5	25.3	24.4	25.4	24.4	25.3	24.4	24.6	24.5	24.5	24.3	25.0	24.9
100% Intake	pH (SU)	7.98	7.80	7.95	7.81	7.93	7.86	8.03	7.62	8.03	7.62	7.96	7.74	8.02	7.85
	DO (mg/L)	7.8	7.7	8.0	7.5	8.2	7.6	7.8	7.1	7.8	7.3	8.0	7.6	8.0	8.0
	Conductivity (µmhos/cm)	145		142		135		143		146		140		144	
	Alkalinity (mg/L CaCO <sub>3</sub> )	51				50				51					
	Hardness (mg/L CaCO <sub>3</sub> )	59				54				59					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.7	24.5	24.9	24.3	25.2	24.4	25.1	24.4	24.8	24.6	24.9	24.3	25.3	24.7

Species: *Pimephales promelas*Date: 11-09-04

Client: TVA / Sequoyah Nuclear Plant - Non-treated

## Daily Chemistry:

		Day					
		0		1		2	
Analyst		CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	7.96	8.02	7.91	7.98	7.92
	DO (mg/L)	7.8	7.8	7.8	7.5	7.9	7.4
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg CaCO <sub>3</sub> /L)	63		61		62	
	Hardness (mg CaCO <sub>3</sub> /L)	89		83		83	
	Temperature (°C)	24.8	24.8	24.7	24.6	24.8	24.3
10.98%	pH (S.U.)	8.06	7.93	8.04	7.88	8.07	7.89
	DO (mg/L)	7.9	7.8	7.8	7.5	7.9	7.4
	Conductivity (µmhos/cm)	285		283		286	
	Temperature (°C)	24.7	24.5	24.9	24.5	24.9	24.3
22%	pH (S.U.)	8.06	7.92	8.04	7.86	8.07	7.89
	DO (mg/L)	8.0	7.8	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	271		263		267	
	Temperature (°C)	24.8	24.6	24.8	24.5	24.9	24.2
43.9%	pH (S.U.)	8.03	7.90	8.02	7.81	8.04	7.86
	DO (mg/L)	7.9	7.8	7.9	7.3	8.0	7.3
	Conductivity (µmhos/cm)	237		228		225	
	Temperature (°C)	24.6	24.6	24.9	24.3	25.2	24.2
72%	pH (S.U.)	8.00	7.84	7.98	7.78	7.98	7.87
	DO (mg/L)	7.9	7.6	7.9	7.2	8.0	7.3
	Conductivity (µmhos/cm)	193		181		191	
	Temperature (°C)	24.5	24.7	25.1	24.5	25.3	24.4
100%	pH (S.U.)	7.97	7.81	7.94	7.79	7.92	7.86
	DO (mg/L)	7.8	7.6	7.9	7.3	8.1	7.4
	Conductivity (µmhos/cm)	150		141		148	
	Alkalinity (mg CaCO <sub>3</sub> /L)	53				51	
	Hardness (mg CaCO <sub>3</sub> /L)	57				59	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.4	24.5	25.3	24.4	25.4	24.4
100% Intake	pH (S.U.)	7.98	7.80	7.95	7.81	7.93	7.86
	DO (mg/L)	7.8	7.7	8.0	7.5	8.2	7.6
	Conductivity (µmhos/cm)	145		142		135	
	Alkalinity (mg CaCO <sub>3</sub> /L)	51				50	
	Hardness (mg CaCO <sub>3</sub> /L)	59				54	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.7	24.5	24.9	24.3	25.2	24.4
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*Date: 11-09-04

Client: TVA / Sequoyah Nuclear Plant - Non-treated

		Day							
		3		4		5		6	
Analyst		CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.03	7.73	8.12	7.72	8.05	7.82	8.11	7.96
	DO (mg/L)	7.8	7.0	7.8	6.9	8.0	7.7	7.9	8.0
	Conductivity (µmhos/cm)	306		301		293		293	
	Alkalinity (mg CaCO <sub>3</sub> /L)					61			
	Hardness (mg CaCO <sub>3</sub> /L)					83			
	Temperature (°C)	24.9	24.3	24.7	24.6	24.9	24.5	25.3	24.9
10.98%	pH (S.U.)	8.15	7.65	8.13	7.68	7.99	7.81	8.10	7.94
	DO (mg/L)	8.0	6.9	7.8	7.0	8.0	7.7	8.0	7.9
	Conductivity (µmhos/cm)	287		285		280		296	
	Temperature (°C)	25.1	24.6	24.7	24.6	24.9	24.3	25.3	24.8
22%	pH (S.U.)	8.13	7.66	8.13	7.68	8.02	7.80	8.11	7.94
	DO (mg/L)	8.0	6.8	7.7	7.0	8.0	7.7	8.2	8.0
	Conductivity (µmhos/cm)	272		271		262		283	
	Temperature (°C)	25.1	24.4	24.9	24.7	24.8	24.5	25.1	24.7
43.9%	pH (S.U.)	8.09	7.68	8.09	7.66	8.01	7.79	8.07	7.93
	DO (mg/L)	8.0	6.8	7.7	7.0	8.0	7.6	8.2	8.0
	Conductivity (µmhos/cm)	238		237		229		236	
	Temperature (°C)	24.9	24.4	24.9	24.5	24.8	24.4	25.1	24.7
72%	pH (S.U.)	8.03	7.66	8.04	7.64	7.97	7.78	8.04	7.91
	DO (mg/L)	8.0	6.9	7.7	7.1	8.0	7.5	8.2	8.0
	Conductivity (µmhos/cm)	194		192		182		191	
	Temperature (°C)	25.1	24.2	24.6	24.6	24.6	24.4	25.2	24.7
100%	pH (S.U.)	7.97	7.62	7.99	7.63	7.93	7.75	8.01	7.85
	DO (mg/L)	7.8	7.0	7.7	7.1	7.9	7.5	8.2	7.9
	Conductivity (µmhos/cm)	149		140		139		146	
	Alkalinity (mg CaCO <sub>3</sub> /L)			52					
	Hardness (mg CaCO <sub>3</sub> /L)			54					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.3	24.4	24.6	24.5	24.5	24.3	25.0	24.9
100% Intake	pH (S.U.)	8.03	7.62	8.03	7.62	7.96	7.74	8.02	7.85
	DO (mg/L)	7.8	7.1	7.8	7.3	8.0	7.6	8.0	8.0
	Conductivity (µmhos/cm)	143		146		140		144	
	Alkalinity (mg CaCO <sub>3</sub> /L)			51					
	Hardness (mg CaCO <sub>3</sub> /L)			59					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.4	24.8	24.6	24.9	24.3	25.3	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final



# 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: November 09 - 16, 2004

Project number: 1557

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)	8.06	8.01	8.02	8.08	7.98	8.07	8.03	7.97	8.12	7.89	8.05	8.03	8.11	7.94
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.8	7.8	7.8	7.8	7.9	8.0	8.1	7.9	8.0
	Conductivity (µmhos/cm)	299		295		296		306		301		293		293	
	Alkalinity (mg/L CaCO <sub>3</sub> )	63		61		62						61			
	Hardness (mg/L CaCO <sub>3</sub> )	89		83		83						83			
	Temperature (°C)	24.9	24.9	24.9	25.0	24.7	25.2	25.2	25.0	25.2	24.9	25.0	25.1	24.8	24.8
10.98%	pH (SU)	8.06	7.98	8.04	8.07	8.07	8.07	8.15	8.00	8.13	7.94	7.99	8.06	8.10	7.95
	DO (mg/L)	7.9	7.8	7.8	7.8	7.9	7.8	8.0	7.8	7.8	7.7	8.0	8.2	8.0	8.0
	Conductivity (µmhos/cm)	285		283		286		287		285		280		290	
	Temperature (°C)	24.9	25.1	24.9	24.9	24.8	25.3	25.3	24.8	25.0	24.7	25.0	25.3	24.7	24.8
22%	pH (SU)	8.06	7.98	8.04	8.07	8.07	8.07	8.13	8.01	8.13	7.96	8.02	8.06	8.11	7.95
	DO (mg/L)	8.0	7.8	7.9	7.8	8.0	7.9	8.0	7.7	7.7	7.7	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	271		263		267		272		271		262		283	
	Temperature (°C)	24.8	25.1	25.1	24.7	24.7	25.1	25.1	24.9	25.0	24.7	24.9	25.1	24.7	24.8
43.9%	pH (SU)	8.03	7.98	8.02	8.06	8.04	8.06	8.09	8.02	8.09	7.97	8.01	8.06	8.07	7.94
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.8	7.7	7.8	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	237		228		225		238		237		229		236	
	Temperature (°C)	24.8	25.0	25.0	24.9	24.9	25.1	25.3	24.8	24.9	24.9	24.9	25.1	24.8	24.7
72%	pH (SU)	8.00	7.94	7.98	8.03	7.98	8.04	8.03	8.00	8.04	7.96	7.97	8.05	8.04	7.91
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.7	7.8	8.0	8.2	8.2	8.2
	Conductivity (µmhos/cm)	193		181		191		194		192		182		191	
	Temperature (°C)	24.6	25.0	24.9	24.8	24.9	25.2	25.3	25.1	24.9	24.8	25.2	25.3	24.8	24.8
100%	pH (SU)	7.97	7.91	7.94	8.01	7.92	8.02	7.97	7.98	7.99	7.92	7.93	8.03	8.01	7.88
	DO (mg/L)	7.8	7.8	7.9	7.9	8.1	7.9	7.8	7.7	7.7	7.7	7.9	8.2	8.2	8.2
	Conductivity (µmhos/cm)	150		141		148		149		140		139		146	
	Alkalinity (mg/L CaCO <sub>3</sub> )	53				51				52					
	Hardness (mg/L CaCO <sub>3</sub> )	57				59				54					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	25.2	25.1	24.9	24.9	25.1	25.2	25.1	25.1	24.7	25.1	25.3	24.9	24.8
100% Intake	pH (SU)	7.98	7.87	7.95	7.98	7.93	7.99	8.03	7.94	8.03	7.86	7.96	8.01	8.02	7.87
	DO (mg/L)	7.8	7.8	8.0	7.8	8.2	7.8	7.8	7.8	7.8	7.7	8.0	8.1	8.0	8.1
	Conductivity (µmhos/cm)	145		142		135		143		146		140		144	
	Alkalinity (mg/L CaCO <sub>3</sub> )	51				50				51					
	Hardness (mg/L CaCO <sub>3</sub> )	59				54				59					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	25.0	25.1	24.9	24.8	25.1	25.2	25.1	25.1	24.9	25.1	25.2	24.7	24.7

Species: *Ceriodaphnia dubia*

Date: 11-09-04

Client: Sequoyah Nuclear Plant - Non-treated

## Daily Chemistry:

		Day					
		0		1		2	
Analyst		CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	8.01	8.02	8.08	7.98	8.07
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.8
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg CaCO <sub>3</sub> /L)	63		61		62	
	Hardness (mg CaCO <sub>3</sub> /L)	89		83		83	
	Temperature (°C)	24.9	24.9	24.9	25.0	24.7	25.2
10.98%	pH (S.U.)	8.06	7.98	8.04	8.07	8.07	8.07
	DO (mg/L)	7.9	7.8	7.8	7.8	7.9	7.8
	Conductivity (µmhos/cm)	285		283		286	
	Temperature (°C)	24.9	25.1	24.9	24.9	24.8	25.3
22%	pH (S.U.)	8.06	7.98	8.04	8.07	8.07	8.07
	DO (mg/L)	8.0	7.8	7.8	7.8	8.0	7.9
	Conductivity (µmhos/cm)	271		263		267	
	Temperature (°C)	24.8	25.1	25.1	24.7	24.7	25.1
43.9%	pH (S.U.)	8.03	7.98	8.02	8.06	8.04	8.06
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9
	Conductivity (µmhos/cm)	237		228		225	
	Temperature (°C)	24.8	25.0	25.0	24.9	24.9	25.1
72%	pH (S.U.)	8.00	7.94	7.98	8.03	7.98	8.04
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9
	Conductivity (µmhos/cm)	193		181		191	
	Temperature (°C)	24.6	25.0	24.9	24.8	24.9	25.2
100%	pH (S.U.)	7.97	7.91	7.94	8.01	7.92	8.02
	DO (mg/L)	7.8	7.8	7.9	7.9	8.1	7.9
	Conductivity (µmhos/cm)	150		141		148	
	Alkalinity (mg CaCO <sub>3</sub> /L)	53				51	
	Hardness (mg CaCO <sub>3</sub> /L)	57				59	
	TR chlorine (mg/L)	20.10		k		<0.10	
	Temperature (°C)	24.5	25.2	25.1	24.9	24.9	25.1
100% Intake	pH (S.U.)	7.98	7.87	7.95	7.98	7.93	7.99
	DO (mg/L)	7.8	7.8	8.0	7.8	8.2	7.8
	Conductivity (µmhos/cm)	145		142		135	
	Alkalinity (mg CaCO <sub>3</sub> /L)	51				50	
	Hardness (mg CaCO <sub>3</sub> /L)	59				54	
	TR chlorine (mg/L)	20.10		k		<0.10	
	Temperature (°C)	24.5	25.0	25.1	24.9	24.8	25.1
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

Client: Sequoviah Nuclear Plant - Non-treated

Date: 11-09-04

		Day							
		3		4		5		6	
Analyst		CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.03	7.97	8.12	7.89	8.05	8.03	8.11	7.94
	DO (mg/L)	7.8	7.8	7.8	7.9	8.0	8.1	7.9	8.0
	Conductivity (µmhos/cm)	356		301		293		293	
	Alkalinity (mg CaCO <sub>3</sub> /L)					61			
	Hardness (mg CaCO <sub>3</sub> /L)					83			
	Temperature (°C)	25.2	25.0	25.2	24.9	25.0	25.1	24.8	24.8
10.98%	pH (S.U.)	8.15	8.00	8.13	7.94	7.99	8.06	8.10	7.95
	DO (mg/L)	8.0	7.8	7.8	7.7	8.0	8.2	8.0	8.0
	Conductivity (µmhos/cm)	287		285		280		290	
	Temperature (°C)	25.3	24.8	25.0	24.7	25.0	25.3	24.7	24.8
22%	pH (S.U.)	8.13	8.01	8.13	7.96	8.02	8.06	8.11	7.95
	DO (mg/L)	8.0	7.7	7.7	7.7	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	272		271		262		283	
	Temperature (°C)	25.1	24.9	25.0	24.7	24.9	25.1	24.7	24.8
43.9%	pH (S.U.)	8.09	8.02	8.09	7.97	8.01	8.06	8.07	7.94
	DO (mg/L)	8.0	7.8	7.7	7.8	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	238		237		229		236	
	Temperature (°C)	25.3	24.8	24.9	24.9	24.9	25.1	24.8	24.7
72%	pH (S.U.)	8.03	8.00	8.04	7.96	7.97	8.05	8.04	7.91
	DO (mg/L)	8.0	7.9	7.7	7.8	8.0	8.2	8.2	8.2
	Conductivity (µmhos/cm)	194		192		182		191	
	Temperature (°C)	25.3	25.1	24.9	24.8	25.2	25.3	24.8	24.8
100%	pH (S.U.)	7.97	7.98	7.99	7.92	7.93	8.03	8.01	7.88
	DO (mg/L)	7.8	7.7	7.7	7.7	7.9	8.2	8.2	8.2
	Conductivity (µmhos/cm)	149		140		139		146	
	Alkalinity (mg CaCO <sub>3</sub> /L)			52					
	Hardness (mg CaCO <sub>3</sub> /L)			54					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	25.1	25.1	24.7	25.1	25.3	24.9	24.8
100% Intake	pH (S.U.)	8.03	7.94	8.03	7.86	7.96	8.01	8.02	7.87
	DO (mg/L)	7.8	7.8	7.8	7.7	8.0	8.1	8.0	8.1
	Conductivity (µmhos/cm)	143		146		140		144	
	Alkalinity (mg CaCO <sub>3</sub> /L)			51					
	Hardness (mg CaCO <sub>3</sub> /L)			59					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	25.1	25.1	24.9	25.1	25.2	24.7	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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)	8.11	7.94	8.06	7.87	8.04	7.89	8.15	7.66	8.15	7.71	8.05	7.75	8.04	7.95
	DO (mg/L)	7.9	7.9	7.8	7.6	7.8	7.5	7.9	6.9	7.8	7.2	8.0	7.6	8.1	8.1
	Conductivity (µmhos/cm)	310		310		303		301		301		285		303	
	Alkalinity (mg/L CaCO <sub>3</sub> )														
	Hardness (mg/L CaCO <sub>3</sub> )														
	Temperature (°C)	24.9	24.6	24.9	24.3	24.9	24.7	24.8	24.7	24.9	24.6	24.9	25.1	25.3	24.9
10.98%	pH (SU)	8.09	7.88	8.05	7.85	8.01	7.86	8.12	7.66	8.12	7.66	8.04	7.73	8.10	7.96
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.5	8.0	7.0	7.7	7.2	8.0	7.6	8.2	8.1
	Conductivity (µmhos/cm)	290		277		283		280		291		269		295	
	Temperature (°C)	24.9	24.8	24.9	24.3	25.1	24.8	24.7	24.6	24.9	24.6	25.0	25.0	25.3	24.7
22%	pH (SU)	8.08	7.88	8.02	7.84	7.99	7.84	8.12	7.67	8.12	7.64	8.04	7.75	8.10	7.96
	DO (mg/L)	7.9	7.8	7.9	7.6	7.9	7.3	7.9	6.9	7.7	7.1	7.9	7.5	8.2	8.2
	Conductivity (µmhos/cm)	273		270		262		269		267		262		284	
	Temperature (°C)	24.7	24.6	24.7	24.2	25.0	24.8	24.8	24.7	25.2	24.6	25.0	24.9	25.4	24.7
43.9%	pH (SU)	8.07	7.86	8.03	7.82	7.98	7.83	8.08	7.66	8.12	7.63	8.01	7.72	8.06	7.94
	DO (mg/L)	7.9	7.8	8.0	7.6	7.9	7.3	7.8	6.9	7.7	7.0	8.0	7.5	8.2	8.2
	Conductivity (µmhos/cm)	240		235		236		240		235		233		240	
	Temperature (°C)	24.8	24.6	24.9	24.3	25.1	24.9	24.9	24.9	25.2	24.8	24.9	24.9	25.3	24.8
72%	pH (SU)	8.05	7.75	8.00	7.82	7.94	7.80	8.02	7.59	8.05	7.65	7.98	7.71	8.04	7.92
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.2	7.8	6.8	7.5	7.0	7.8	7.4	8.2	8.2
	Conductivity (µmhos/cm)	194		192		194		193		193		187		194	
	Temperature (°C)	24.8	24.7	25.1	24.2	25.3	24.6	25.1	24.9	25.2	24.6	24.8	24.8	25.4	24.7
100%	pH (SU)	8.02	7.73	7.94	7.80	7.90	7.80	7.97	7.65	8.00	7.64	7.96	7.81	7.99	7.88
	DO (mg/L)	7.8	7.5	7.8	7.5	7.9	7.2	7.6	7.1	7.6	7.2	7.9	7.4	8.2	8.1
	Conductivity (µmhos/cm)	152		145		150		149		139		142		145	
	Alkalinity (mg/L CaCO <sub>3</sub> )														
	Hardness (mg/L CaCO <sub>3</sub> )														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	24.7	24.7	25.1	24.4	25.3	24.9	25.1	24.8	25.4	24.9	24.8	24.7	25.2	24.9
100% Intake	pH (SU)	8.02	7.76	7.96	7.77	7.92	7.74	8.01	7.62	8.08	7.57	7.96	7.78	8.01	7.89
	DO (mg/L)	7.9	7.5	7.8	7.2	8.0	7.1	7.8	7.0	7.7	7.0	7.8	7.5	8.2	8.1
	Conductivity (µmhos/cm)	146		143		149		145		147		141		144	
	Alkalinity (mg/L CaCO <sub>3</sub> )														
	Hardness (mg/L CaCO <sub>3</sub> )														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	24.9	24.6	25.0	24.2	25.0	24.7	24.9	24.7	25.2	24.7	24.9	24.9	25.2	24.9

Species: *Pimephales promelas*Date: 11-09-04

Client: TVA / Sequoyah Nuclear Plant - UV-treated

## Daily Chemistry:

		Day					
		0		1		2	
Analyst		CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.11	7.94	8.06	7.87	8.04	7.89
	DO (mg/L)	7.9	7.9	7.8	7.6	7.8	7.5
	Conductivity (µmhos/cm)	301		310		303	
	Temperature (°C)	24.9	24.6	24.9	24.3	24.9	24.7
10.98%	pH (S.U.)	8.09	7.88	8.05	7.85	8.01	7.86
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.5
	Conductivity (µmhos/cm)	290		277		283	
	Temperature (°C)	24.9	24.8	24.9	24.3	25.1	24.8
22%	pH (S.U.)	8.08	7.88	8.02	7.84	7.99	7.84
	DO (mg/L)	7.9	7.8	7.9	7.6	7.9	7.3
	Conductivity (µmhos/cm)	273		270		262	
	Temperature (°C)	24.7	24.6	24.7	24.2	25.0	24.8
43.9%	pH (S.U.)	8.07	7.86	8.03	7.82	7.98	7.83
	DO (mg/L)	7.9	7.8	8.0	7.6	7.9	7.3
	Conductivity (µmhos/cm)	240		235		236	
	Temperature (°C)	24.8	24.6	24.9	24.3	25.1	24.9
72%	pH (S.U.)	8.05	7.75	8.00	7.82	7.94	7.80
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.2
	Conductivity (µmhos/cm)	194		192		194	
	Temperature (°C)	24.8	24.7	25.1	24.2	25.3	24.6
100%	pH (S.U.)	8.02	7.73	7.94	7.80	7.90	7.80
	DO (mg/L)	7.8	7.5	7.8	7.5	7.9	7.2
	Conductivity (µmhos/cm)	152		145		150	
	Temperature (°C)	24.7	24.7	25.1	24.4	25.3	24.9
100% Intake	pH (S.U.)	8.02	7.76	7.96	7.77	7.92	7.74
	DO (mg/L)	7.9	7.5	7.8	7.2	8.0	7.1
	Conductivity (µmhos/cm)	146		143		149	
	Temperature (°C)	24.9	24.6	25.0	24.2	25.0	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Date: 11-09-04

		Day							
		3		4		5		6	
Analyst		CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.15	7.66	8.15	7.71	8.05	7.75	8.04	7.95
	DO (mg/L)	7.9	7.469	7.8	7.2	8.0	7.6	8.1	8.1
	Conductivity (µmhos/cm)	301		301		285		303	
	Temperature (°C)	24.8	24.7	24.9	24.6	24.9	25.1	25.3	24.9
10.98%	pH (S.U.)	8.12	7.66	8.12	7.66	8.04	7.73	8.10	7.96
	DO (mg/L)	8.0	7.0	7.7	7.2	8.0	7.6	8.2	8.1
	Conductivity (µmhos/cm)	280		291		269		295	
	Temperature (°C)	24.7	24.6	24.9	24.6	25.0	25.0	25.3	24.7
22%	pH (S.U.)	8.12	7.67	8.12	7.64	8.04	7.75	8.10	7.96
	DO (mg/L)	7.9	6.9	7.7	7.1	7.9	7.5	8.2	8.2
	Conductivity (µmhos/cm)	269		267		262		284	
	Temperature (°C)	24.8	24.7	25.2	24.6	25.0	24.9	25.4	24.7
43.9%	pH (S.U.)	8.08	7.66	8.12	7.63	8.01	7.72	8.06	7.94
	DO (mg/L)	7.8	6.9	7.7	7.0	8.0	7.5	8.2	8.2
	Conductivity (µmhos/cm)	240		235		233		240	
	Temperature (°C)	24.9	24.9	25.2	24.8	24.9	24.9	25.3	24.8
72%	pH (S.U.)	8.02	7.59	8.05	7.65	7.98	7.71	8.04	7.92
	DO (mg/L)	7.8	6.8	7.5	7.0	7.8	7.4	8.2	8.2
	Conductivity (µmhos/cm)	193		193		187		194	
	Temperature (°C)	25.1	24.9	25.2	24.6	24.8	24.8	25.4	24.7
100%	pH (S.U.)	7.97	7.65	8.00	7.64	7.96	7.81	7.99	7.88
	DO (mg/L)	7.6	7.1	7.6	7.2	7.9	7.4	8.2	8.1
	Conductivity (µmhos/cm)	149		139		142		145	
	Temperature (°C)	25.1	24.8	25.4	24.9	24.8	24.7	25.2	24.9
100% Intake	pH (S.U.)	8.01	7.62	8.08	7.57	7.96	7.78	8.01	7.89
	DO (mg/L)	(7.8) 7.5	7.0	7.7	7.0	7.8	7.5	8.2	8.1
	Conductivity (µmhos/cm)	145		147		141		144	
	Temperature (°C)	24.9	24.7	25.2	24.7	24.9	24.9	25.2	24.9
		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 CAJ  
Date analyzed 11-09-04

Iodide reagent: INR 127  
Acid reagent: INR 138

**Calibration:**

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 197	INSS 197

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	0.525	105%

**Duplicate sample precision:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\{(S - D) / [(S + D) / 2]\} \times 100$ (acceptable range = $\pm 10\%$ )
041109.01	OWASA	PALE YELLOW, PARTICLES	S <0.00137	
J	Duplicate		D <0.000899	—

**Sample measurements:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = <0.10 mg/L)		<0.0180
041109.02	HERCULES INC.	PALE YELLOW, PARTICLES	<0.000189
041109.11	WBNT-113 INTAKE	PALE YELLOW, PARTICLES	<0.00540
041109.09	WBNT-101 INTAKE	PALE YELLOW, PARTICLES	<0.00419
041109.07	WBNT-112	PALE <sup>4</sup> YELLOW, PARTICLES	<0.00345
041109.03	WAYNESVILLE	NO COLOR, PARTICLES	0.381
041109.02	SON INTAKE	PALE YELLOW, PARTICLES	<0.0197
041109.08	WBNT-101	PALE YELLOW, CLEAR	<0.0161
041109.01	SON-101	NO COLOR, CLEAR	<0.00549
041109.10	WBNT-113	NO COLOR, CLEAR	<0.00513

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	0.458	91.6%

Reviewed by KCB  
Date reviewed 04-11-09-04

**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 11-11-04

Iodide reagent: INR 127  
Acid reagent: INR 138

**Calibration:**

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 197	INSS 197

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	0.493	98.6%

**Duplicate sample precision:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{(S - D)}{[(S + D)/2]} \times 100$ (acceptable range = $\pm 10\%$ )
04111.05	WBNT - 113	PALE YELLOW	S <0.00573	
↓	Duplicate	FEW PARTICLES	D <0.00513	

**Sample measurements:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0141
04111.03	WBNT - 101	PALE YELLOW, CLEAR	<0.00334
04111.07	SDN - 101	PALE YELLOW, FEW PARTICLES	<0.00193
04111.02	WBNT - 112	LIGHT YELLOW, FEW PARTICLES	<0.00175
04111.07	HERCULES	NO COLOR, PARTICLES	<0.00404
04111.04	WBNT-101 INTAKE	PALE YELLOW, PARTICLES	<0.00146
04111.10	WAYNESVILLE WWTP	PALE YELLOW, PARTICLES	0.160
04111.01	MARSHALL WWTP	PALE YELLOW, CLEAR	<0.00794
04111.06	WBNT - 113 INTAKE	PALE YELLOW, PARTICLES	<0.00445
04111.00	SDN <sup>101</sup> INTAKE	PALE YELLOW, PARTICLES	<0.00242

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	0.521	104.2%

Reviewed by KEV  
Date reviewed 11-11-04



Total Residual Chlorine  
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst PCB  
Date analyzed 11-13-2004Iodide reagent: INR 127  
Acid reagent: INR 138

## Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>IN55 197</u>	<u>IN55 197</u>

Note: For samples with a residual chlorine of &gt; 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>IN55 197</u>	<u>0.50</u>	<u>0.528</u>	<u>105.6%</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>04111201</u>	<u>SGN-101</u>	<u>Tan, large particles</u>	<u>S 0.232</u>	
<u>↓</u>	<u>Duplicate</u>		<u>D 0.231</u>	<u>+ 0.4%</u>

## Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	<u>Blank (should be &lt; 0.10 mg/L)</u>		<u>&lt; 0.00213</u>
<u>041112.02</u>	<u>SGN-intake</u>	<u>Pale yellow, particles</u>	<u>&lt; 0.00255</u>
<u>041113.07</u>	<u>WBN 101</u>	<u>Pale yellow, particles</u>	<u>&lt; 0.00206</u>
<u>041113.08</u>	<u>WBN <del>101</del> intake</u>	<u>Clear, particles</u>	<u>&lt; 0.000136</u>
<u>041113.09</u>	<u>WBN 112</u>	<u>Pale yellow, cloudy</u>	<u>&lt; 0.000871</u>
<u>041113.09</u>	<u>WBN 113</u>	<u>Clear, floating particles</u>	<u>&lt; 0.000746</u>
<u>041113.10</u>	<u>WBN 113- intake</u>	<u>Clear, floating particles</u>	<u>&lt; 0.000611</u>
<u>041112.03</u>	<u>OWASA</u>	<u>Clear, floating particles</u>	<u>&lt; 0.000942</u>
<u>041112.06</u>	<u>Baxter</u>	<u>Clear, particles</u>	<u>&lt; 0.00133</u>
<u>041112.07</u>	<u>Corrim- scope</u>	<u>Pale yellow, particles</u>	<u>&lt; 0.000429</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>IN55 197</u>	<u>0.50</u>	<u>0.486</u>	<u>97.2%</u>

Reviewed by  
Date reviewedJL  
11-13-04

Total Residual Chlorine  
(EPA Method 330.5)Matrix: Water, MDL = 0.10 mg/L  
Meter: Accumet Model AR25 pH/Ion MeterAnalyst: PCB  
Date analyzed: 11-13-2004Iodide reagent: INR 127  
Acid reagent: INR 138~~Calibration:~~

	0.10 mg/L	1.00 mg/L
Reference standard number		

~~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%)
	0.50		

~~Duplicate sample precision:~~

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{(S - D)}{((S + D)/2)} \times 100$ (acceptable range = $\pm 10\%$ )
041112.04	Waynesville	Clear, particles	S < 0.000412	
041112.05	Duplicate		D < 0.000932	-

## Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		
041113.00	Spruce Pine WWTP	Clear, particles	< 0.000807
041113.01	AAF McGraw	Pale yellow, particles	< 0.000165
041113.02	Dyre	Pale yellow, opaque	< 0.000113
041113.03	Johnston Co.	Pale yellow, particles	< 0.000265
041113.05	S. Cary WWTP	Pale yellow, particles	< 0.000308
041113.04	N. Cary WWTP	Clear, particles	< 0.000284

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	0.453	90.6%

Reviewed by  
Date reviewedPCB  
11-13-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAS  
Date analyzed 11-08-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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
4.50	112R121	112R105	0.0	12.4	12.4	0.0202	10.1

## Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
112SS 224	100	100	12.4	22.3	9.9	10.1	100	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S+D)/2)) x 100 (acceptable range = ± 10%)
11-01-04	mHS H <sub>2</sub> O A	100	22.3	28.4	6.1	10.1	S 62	
↓	Duplicate	↓	28.4	34.6	6.2	↓	D 63	1.6%

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
112SS 224	50	100	28.4	39.4	11.0	10.1	111

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
63	48	96.1

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
10-26-04	mHS H <sub>2</sub> O	100	39.4	45.3	5.9	10.1	60
1101-04	mHS H <sub>2</sub> O A	↓	2.0	7.9	5.9	↓	60
↓	↓ C	↓	7.9	13.9	6.0	↓	61
↓	SSW H <sub>2</sub> O	↓	13.9	17.2	3.3	↓	33
11-05-04	SSW H <sub>2</sub> O	↓	17.2	20.5	3.3	↓	33
↓	mHS H <sub>2</sub> O	↓	20.5	26.7	6.2	↓	63
11-07-04	mHS H <sub>2</sub> O	↓	26.7	32.7	6.0	↓	61
↓	SSW H <sub>2</sub> O	↓	32.7	36.0	3.3	↓	33
04 1104.03	ENFIELD Z	↓	36.0	40.2	4.2	↓	42

Reviewed by: dDate reviewed: 11-18-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-08-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 224	100	100	0.6	10.2	9.6	10.1	97	97%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
041102.01	ENFIELD 1	100	10.2	14.4	4.2	10.1	S 42	
J	Duplicate	↓	14.4	18.6	4.2	↓	D 42	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS 224	50	100	14.4	23.4	9.0	10.1	91

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
42	49	98%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
041106.19	ENFIELD 3	100	23.4	27.4	40	10.1	40
041102.06	JOHNSONVILLE OGI		27.4	36.2	8.8		89
041102.07	JOHNSON, UPSTREAM		36.2	41.5	5.3		54
041102.05	INT'L PAPER		1.8	36.5	34.7		350
10-26-04	SALT H <sub>2</sub> O		36.5	47.5	11.0		110
11-01-04	SALT H <sub>2</sub> O		0.4	13.7	13.3		130
11-03-04	SALT H <sub>2</sub> O		13.7	27.3	13.6		140
11-06-04	SALT H <sub>2</sub> O		27.3	40.7	13.4		140
11-07-04	SALT H <sub>2</sub> O	↓	33.4	45.0	11.6	↓	120

Reviewed by:

CAJ

Date reviewed:

11-18-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAS  
Date analyzed 11-15-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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
4.39	NR 121	NR 105	0.0	12.5	12.5	0.0200	10.0

## Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 224	100	100	12.5	22.2	97	10.0	97	97%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D) / 2)] x 100 (acceptable range = ± 10%)
11-09-04	MHS H <sub>2</sub> O A	100	22.2	28.4	6.2	10.0	S 62	
	Duplicate	↓	28.4	34.6	6.2	↓	D 62	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS 224	50	100	28.4	39.5	11.1	10.0	111

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
62	49	98%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
11-08-04	MHS H <sub>2</sub> O	100	39.5	45.5	6.0	10.0	60
11-09-04	MHS H <sub>2</sub> O B		0.6	6.7	6.1		61
11-12-04	MHS H <sub>2</sub> O A		6.7	12.8	6.1		61
	↓ B		12.8	18.8	6.0		60
	↓ C		18.8	24.7	5.9		59
↓	SSW H <sub>2</sub> O		24.7	28.1	3.4		34
11-14-04	MHS H <sub>2</sub> O		28.1	34.1	6.0		60
041108.03	WAYNESVILLE 1		34.1	35.7	1.6		16
041110.09	↓ 2	↓	35.7	37.5	1.8	↓	18

Reviewed by:

HL

Date reviewed:

11-18-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 224	100	100	37.5	47.2	97	10.0	97	97%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D) / 2)] x 100 (acceptable range = ± 10%)
041112.04	WAYNESVILLE 3	100	38	50	12	10.0	<sup>S</sup> 12	
↓	Duplicate	+	50	62	12	+	<sup>D</sup> 12	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS 224	50	100	5.0	16.0	6.0	10.0	60

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
12	48	96%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
041108.01	SON 1	100	16.0	16.3	5.3	10.0	53
041110.07	↓ 2		16.3	21.4	5.1		51
041112.01	↓ 3		21.4	26.6	5.2		52
041108.02	SON WTAKE 1		26.6	31.7	5.1		51
041110.08	↓ 2		31.7	36.7	5.0		50
041112.02	↓ 3		36.7	41.8	5.1		51
041109.08	WBN 101 1		41.8	47.4	5.6		56
041111.03	↓ 2		47.4	10.7	6.3		63
041113.07	↓ 3		10.7	17.3	6.6		66

Reviewed by:

CAJ

Date reviewed:

11-18-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 224	100	100	17.3	27.0	9.7	10.0	97	97%

*Duplicate sample precision:*

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = {(S - D) / [(S+D)/2]} x 100 (acceptable range = ± 10%)
041109.09	WBN 101 INT.	100	27.0	32.3	53	10.0	S 53	
↓	Duplicate 1	100	32.3	37.6	53	10.0	D 53	

*Matrix spike recovery:*

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS 224	50	100	32.3	42.4	10.1	10.0	101

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
53	48	96%

*Sample measurements:*

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
041111.04	WBN INT. 101 2	100	3.3	9.2	59	10.0	59
041113.08	↓ 3			9.2	15.3	6.1	61
041109.07	WBN 112 1			15.3	26.2	10.9	110 (109)
041111.02	↓ 2			26.2	38.1	11.9	120 (119)
041113.02	↓ 3			14	8.9	7.5	75
041109.10	WBN 113 1			8.9	14.5	5.6	56
041111.05	↓ 2			14.5	20.9	6.4	64
041113.09	↓ 3			20.9	27.3	6.4	64
041109.11	WBN 113 INT. 1			27.3	32.6	5.3	53

Reviewed by: CAJDate reviewed: 11-18-04

Alkalinity  
(EPA Method 310.1)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

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 <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 224	100	100	32.6	42.3	9.7	10.0	97	97%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D) / 2)] x 100 (acceptable range = ± 10%)
04111.06	WBN 113 WT. 2	100	10.5	16.6	6.1	10.0	S 61	
↓	Duplicate	+	16.6	22.6	6.0	+	D 60	1.6%

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS 224	50	100	16.6	27.4	10.8	10.0	108 <u>16.4%</u>

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
60	48	96%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
041113.10	WBN 113 WT. 3	100	27.4	33.3	5.9	10.0	59
041106.03	HERCULES 1	↓	3.5	15.0	11.5	↓	120
041109.02	↓ 2	↓	15.0	27.2	12.2	↓	120
041111.07	↓ 3	↓	27.2	40.3	13.1	↓	130

Reviewed by: CAJDate reviewed: 11-18-04



Total Hardness  
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAS  
Date analyzed 11-08-04Time started 1352  
End time 1481

## 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
1NR125	1NSS 172	0.0	9.9	9.9	0.0202	20.2

## Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
1NSS 160	40	50	9.9	11.9	2.0	20.2	40	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = {(S - D) / [(S + D) / 2]} x 100 (acceptable range = ± 10%)
10-26-04	MHS H <sub>2</sub> O	50	11.9	16.0	4.1	20.2	<sup>S</sup> 83	
↓	Duplicate	↓	16.0	20.1	4.1	↓	<sup>D</sup> 83	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
1NSS 160	40	50	16.0	22.2	6.2	20.2	125

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
83	42	105%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
TV = ND	Blank (should be = 0 mg CaCO <sub>3</sub> /L)	50	0.0	0.0	0.0	20.2	ND
11-01-04	MHS H <sub>2</sub> O A		22.2	26.3	4.1		83 <sup>11-01-04</sup>
↓	↓ B		26.3	30.1	4.1 <sup>(5.8)</sup>		83 <sup>(77)*</sup>
↓	↓ C		30.1	34.4	4.3		87
↓	SSW H <sub>2</sub> O		34.4	36.4	2.0		40 <sup>11-30-04</sup>
11-05-04	SSW H <sub>2</sub> O		36.4	38.1	2.1 <sup>(1.7)</sup>		42 <sup>(34)</sup>
↓	MHS H <sub>2</sub> O		38.1	42.5	4.4		89
11-07-04	MHS H <sub>2</sub> O		42.5	46.6	4.1		83
↓	SSW H <sub>2</sub> O		46.6	48.6	2.0		40
04 110201	ENFIELD 1	↓	26	4.3	17	↓	34

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

Date reviewed

11-18-04

\* Below EPA acceptance criteria. Initial quick check = 86 mg/L for same water batch. Jensen 86 mg/L for same

Total Hardness  
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-08-04

## 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: CAJ

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
1555 160	40	50	4.3	6.3	2.0	20.2	40	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
<del>1555 160</del>	ENFIELD 2	50	6.3	7.9	1.6	20.2	<sup>S</sup> 32	
04110403	Duplicate	↓	7.9	9.6	1.7	↓	<sup>D</sup> 34	6.1%

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
1555 160	40	50	7.9	11.6	3.7	20.2	75

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
34	41	102.5%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)						CAJ —
041106.19	ENFIELD 3	50	11.6	13.3	1.7	20.2	34
041102.06	JOHNSONVILLE 001	↓	13.3	20.0	6.7	↓	140 (135)
041102.07	JOHNSONVILLE UPSTREAM	↓	20.0	23.0	3.0	↓	61
041102.05	INT'L PAPER	25	23.0	27.7	4.7	(2) ↓	190
17826	RUTHERFORDTON	50	27.7	29.3	1.6	↓	32

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

dl

Date reviewed

11-18-04

Total Hardness  
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

## 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
INR 125	INSS 172	0.0	9.9	9.9	0.0202	20.2

## Laboratory control standard:

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 160	40	50	9.9	11.9	20	20.2	40	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
11-08-04	MHS H <sub>2</sub> O	50	11.9	16.0	4.1	20.2	<sup>S</sup> 83	
↓	Duplicate	↓	16.0	20.1	4.1	↓	<sup>D</sup> 83	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
INSS 160	40	50	16.0	22.1	6.1	20.2	123

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
83	40	100%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)	50	0.0	22.1	0.0	20.2	ND
11-09-04	MHS H <sub>2</sub> O A		22.1	26.2	4.1		83
↓	↓ B		26.2	30.3	4.1		83
11-12-04	MHS H <sub>2</sub> O A		30.3	34.4	4.1		83
↓	↓ B		34.4	38.5	4.1		83
↓	↓ C		38.5	42.6	4.1		83
	SSW H <sub>2</sub> O		42.6	44.7	2.1		42
11-14-04	MHS H <sub>2</sub> O		44.7	48.8	4.1		83
17890	WAYNESVILLE EFF	25	0.1	9.3	9.2	(2)	370
041108.03	WAYNESVILLE I	50	9.3	15.4	6.1		120

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

Reviewed

CAJ

Date reviewed

11-18-04

Total Hardness  
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

## 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 166	40	50	15.4	17.4	2.0	20.2	40	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D) / 2)] x 100 (acceptable range = ± 10%)
041110.09	WAYNESVILLE 2	50	17.4	26.9	9.5	20.2	S 190	
↓	Duplicate	↓	26.9	36.4	9.5	↓	D 190	—

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
INSS 160	40	50	26.9	38.4	11.5	20.2	230

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
190	40	100%

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)						CAJ
041112.04	WAYNESVILLE 3	250 <sup>4</sup>	5.1	13.5	8.4	20.2	340
041108.01	SQW 1	50	13.5	16.3	2.8		57
041110.07	↓ 2		16.3	19.2	2.9		59
041112.01	↓ 3		19.2	21.9	2.7		54
041108.02	SQW WTAKE 1		21.9	24.8	2.9		59
041110.08	↓ 2		24.8	27.5	2.7		54
041112.02	↓ 3		27.5	30.4	2.9		59
041109.08	WBN 101 1		30.4	33.6	3.2		65
041111.03	↓ 2		33.6	37.0	3.4		69

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

JI

Date reviewed

11-18-04

Total Hardness  
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/LAnalyst CAJ  
Date analyzed 11-15-04

## 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 <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
WSS 160	40	50	37.0	39.0	20	20.2	40	100%

## Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D) / 2)] x 100 (acceptable range = ± 10%)
041113.07	WBN 101 3	50	39.0	42.6	3.6	20.2	S 73	
↓	Duplicate	↓	42.6	46.3	3.7	↓	D 75	27%

## Matrix spike recovery:

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
WSS 160	40	50	42.6	48.3	5.7	20.2	115

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

## Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)						CAJ
041109.09	WBN 101 INT. 1	50	0.9	3.8	2.9	20.2	456 59
041111.04	↓ 2		3.8	7.2	3.4		69
041113.08	↓ 3		7.2	10.6	3.4		69
041109.07	WBN 112 1		10.6	17.0	6.4		130 (129)
041111.02	↓ 2		17.0	24.0	7.0		140 (141)
041113.06	↓ 3		24.0	28.7	4.7		95
041109.10	WBN 113 1		28.7	31.8	3.1		63
041111.05	↓ 2		31.8	35.3	3.5		71
041113.09	↓ 3	↓	35.3	38.8	3.5	↓	71

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

dl

Date reviewed

11-18-04

Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/L

**Analyst****Date analyzed**

~~GA~~

**Laboratory control standard:**

**Duplicate sample precision:**

**Matrix spike recovery:**

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
59	40	100%

**Sample measurements:**

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

Reviewed

Date reviewed

11:18.04

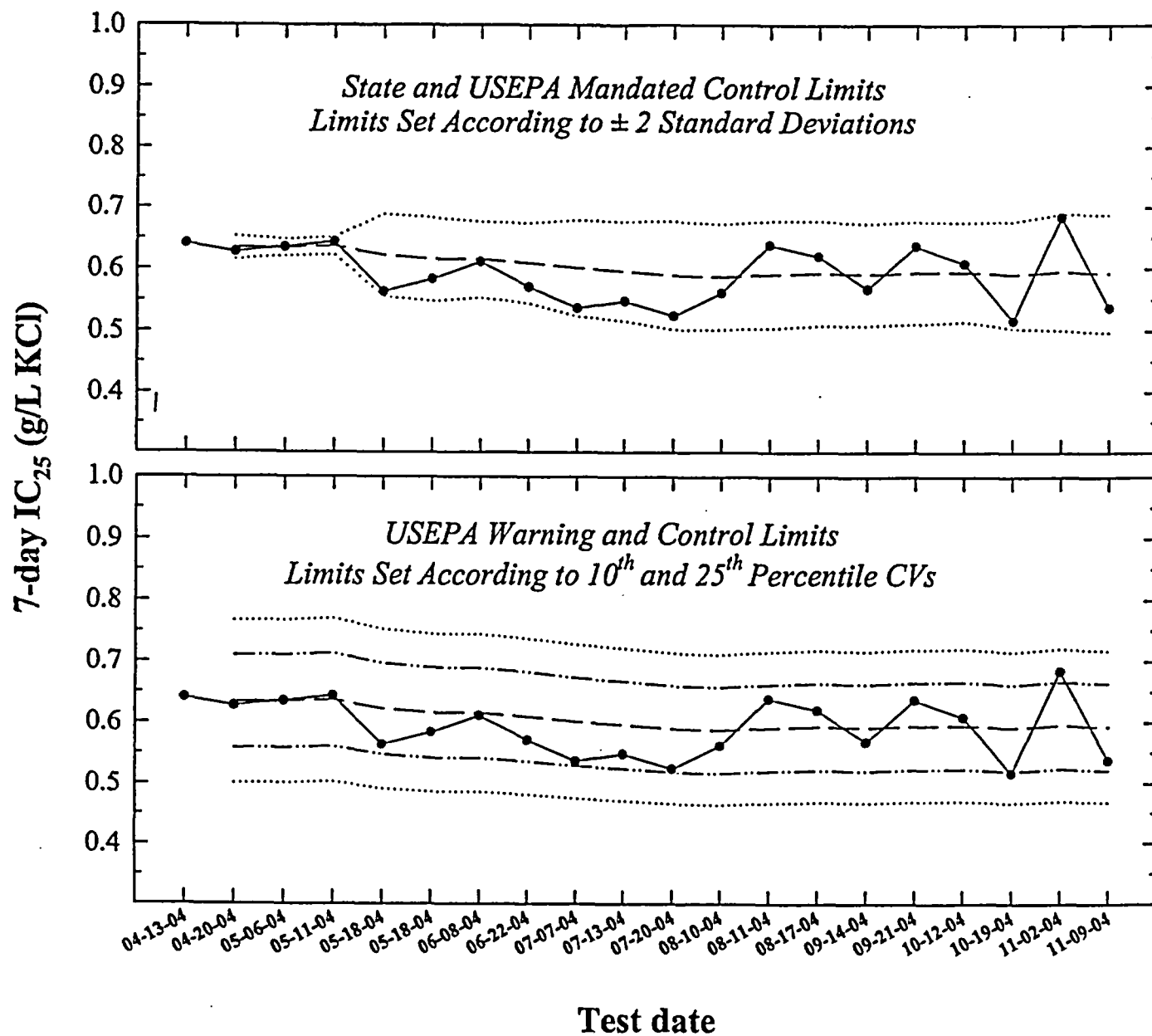
**Sequoyah Nuclear Plant Biomonitoring  
November 9-16, 2004**

**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 <sub>25</sub> (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits		S <sub>A10</sub>	Laboratory Warning Limits		S <sub>A25</sub>	Laboratory Control Limits		S <sub>A75</sub>	USEPA Warning Limits		S <sub>A90</sub>	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S <sub>A10</sub>	CT + S <sub>A10</sub>		CT - S <sub>A25</sub>	CT + S <sub>A25</sub>		CT - S <sub>A75</sub>	CT + S <sub>A75</sub>		CT - S <sub>A90</sub>	CT + S <sub>A90</sub>	
1	04-13-04	0.64																	
2	04-20-04	0.63	0.63	0.01	0.61	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.87	0.29	0.35	0.92	0.01
3	05-06-04	0.63	0.63	0.01	0.62	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.87	0.29	0.35	0.92	0.01
4	05-11-04	0.64	0.64	0.01	0.62	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.88	0.29	0.35	0.92	0.01
5	05-18-04	0.56	0.62	0.03	0.56	0.69	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.39	0.86	0.28	0.34	0.90	0.05
6	05-18-04	0.58	0.62	0.03	0.55	0.68	0.07	0.54	0.69	0.13	0.49	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.05
7	06-08-04	0.61	0.61	0.03	0.55	0.68	0.07	0.54	0.69	0.13	0.49	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.05
8	06-22-04	0.57	0.61	0.03	0.54	0.67	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.33	0.88	0.05
9	07-07-04	0.54	0.60	0.04	0.52	0.68	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.06
10	07-13-04	0.55	0.60	0.04	0.52	0.68	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
11	07-20-04	0.52	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.85	0.07
12	08-10-04	0.56	0.59	0.04	0.50	0.67	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.07
13	08-11-04	0.64	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.07
14	08-17-04	0.62	0.59	0.04	0.51	0.68	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
15	09-14-04	0.57	0.59	0.04	0.51	0.67	0.07	0.52	0.66	0.12	0.47	0.72	0.22	0.37	0.82	0.27	0.33	0.86	0.07
16	09-21-04	0.64	0.59	0.04	0.51	0.68	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
17	10-12-04	0.61	0.59	0.04	0.51	0.68	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
18	10-19-04	0.52	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.07
19	11-02-04	0.68	0.60	0.05	0.50	0.69	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.08
20	11-09-04	0.54	0.59	0.05	0.50	0.69	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.08

Note: 7-d IC<sub>25</sub> = 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<sub>25</sub>).

S = Standard deviation of the IC<sub>25</sub> values.

### Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC<sub>25</sub> 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<sub>A10</sub> = Standard deviation corresponding to the 10<sup>th</sup> percentile CV. (S<sub>A10</sub> = 0.12)

S<sub>A25</sub> = Standard deviation corresponding to the 25<sup>th</sup> percentile CV. (S<sub>A25</sub> = 0.21)

### USEPA Control and Warning Limits

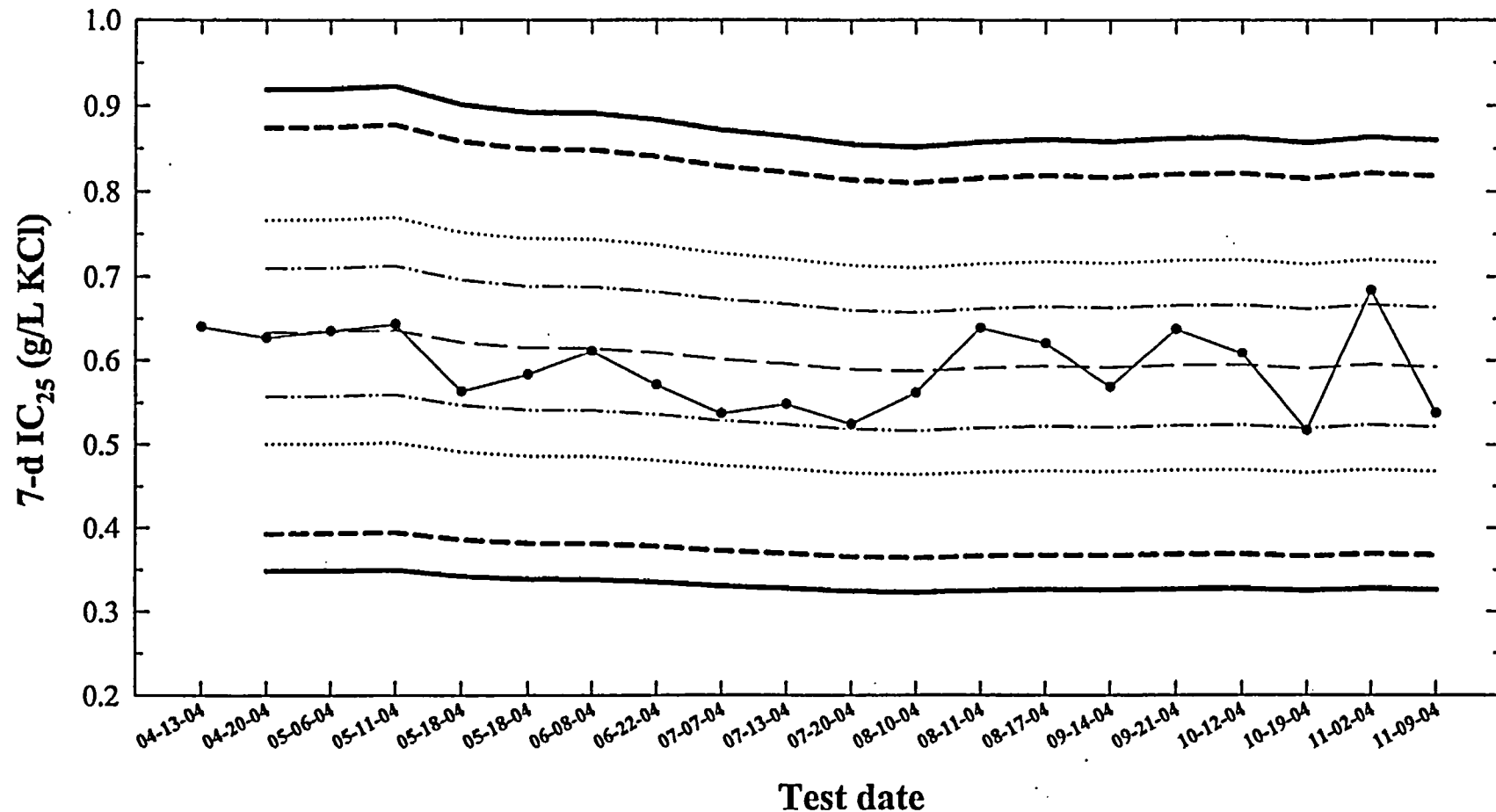
S<sub>A75</sub> = Standard deviation corresponding to the 75<sup>th</sup> percentile CV. (S<sub>A75</sub> = 0.38)

S<sub>A90</sub> = Standard deviation corresponding to the 90<sup>th</sup> percentile CV. (S<sub>A90</sub> = 0.45)

CV = Coefficient of variation of the IC<sub>25</sub> 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	04-13-04	100	0.780		9.8		0.11	13.9	
2	04-20-04	100	0.784	0.782	5.5	7.6	0.08	10.2	12.1
3	05-06-04	100	0.832	0.799	5.5	6.9	0.10	12.2	12.1
4	05-11-04	97.5	0.655	0.763	13.1	8.5	0.11	17.1	13.4
5	05-18-04	100	0.718	0.754	4.4	7.7	0.08	10.5	12.8
6	05-18-04	100	0.681	0.742	9.3	7.9	0.12	17.8	13.6
7	06-08-04	100	0.859	0.758	1.3	7.0	0.08	9.6	13.0
8	06-22-04	100	0.700	0.751	15.1	8.0	0.12	16.8	13.5
9	07-07-04	100	0.610	0.735	11.1	8.4	0.08	13.6	13.5
10	07-13-04	100	0.805	0.742	10.2	8.5	0.12	15.4	13.7
11	07-20-04	100	0.727	0.741	15.6	9.2	0.17	23.4	14.6
12	08-10-04	100	0.490	0.720	11.6	9.4	0.07	14.7	14.6
13	08-11-04	100	0.673	0.716	3.6	8.9	0.12	18.4	14.9
14	08-17-04	100	0.682	0.714	7.4	8.8	0.10	14.4	14.9
15	09-14-04	100	0.825	0.721	12.9	9.1	0.13	15.4	14.9
16	09-21-04	97.5	0.700	0.720	15.8	9.5	0.12	16.4	15.0
17	10-12-04	100	0.759	0.722	12.9	9.7	0.17	22.1	15.4
18	10-19-04	100	0.757	0.724	1.1	9.2	0.09	12.3	15.2
19	11-02-04	100	0.756	0.726	10.9	9.3	0.15	19.3	15.4
20	11-09-04	100	0.609	0.720	7.8	9.2	0.11	18.0	15.6

Note: CV = Coefficient of variation for control growth.

On average, the CV for control growth is 9.2% in Environmental Testing Solutions, Inc. *Pimephales* chronic toxicity tests.

Lower CV bound determined by USEPA (10<sup>th</sup> percentile) = 3.5%.

Upper CV bound determined by USEPA (90<sup>th</sup> 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 15.6% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 9.4%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 35%.

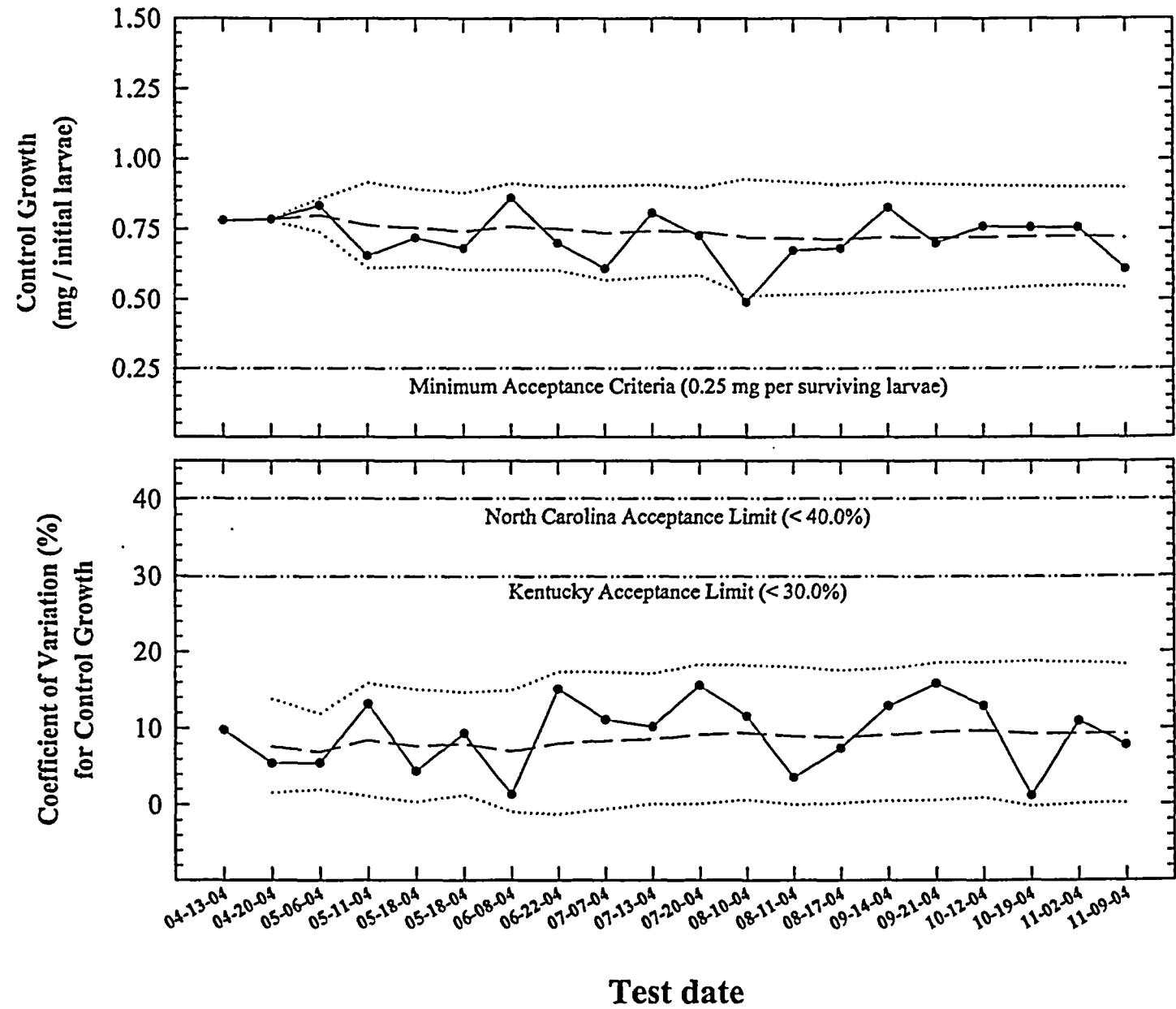
CT = Central Tendency (mean Control Growth, CV, or PMSD)

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

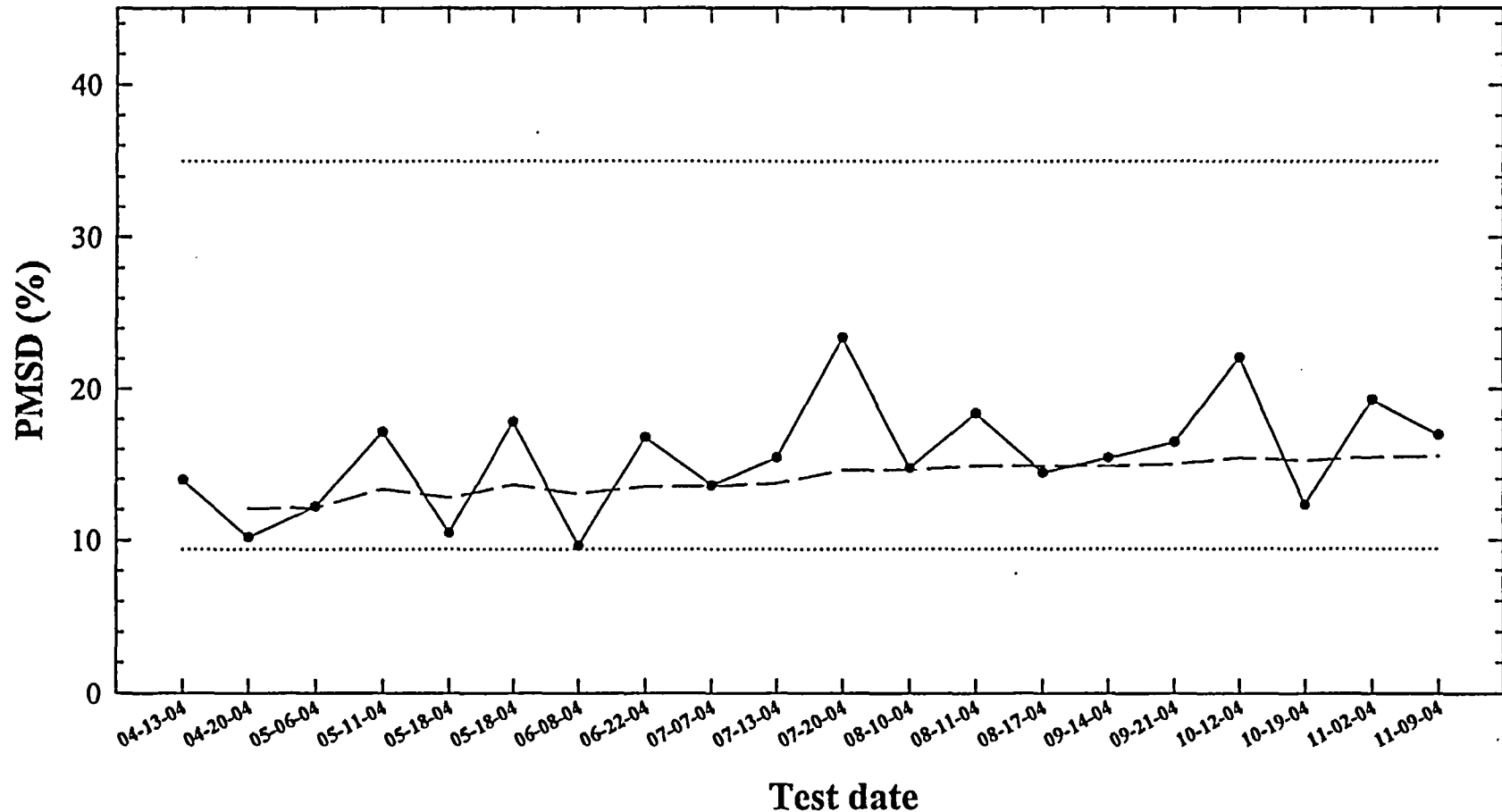


- Control Growth or Coefficient of Variation (CV)
- — Central Tendency (mean Control Growth or CV)
- ..... Control Limits (mean Control Growth or CV  $\pm$  2 Standard Deviations)

# 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 (10<sup>th</sup> percentile) = 9.4%, Upper PMSD Bound (90<sup>th</sup> percentile) = 35%  
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

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

PpKCICR Test Number: 49

<b>Dilution preparation information:</b>						<b>Comments:</b>
KCl CHM number:	CHM 142					
Stock preparation:	50 g KCVL: 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	

<b>Test organism information:</b>		<b>Test information:</b>	
Organism age:	21.25 TO 22.75 HOURS OLD	Randomizing template:	RED
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number and shelf location:	3F
Organism source:	ABS BATCH 11-08-04	Artemia lot number:	8610055
Transfer bowl information:	pH = 7.98 SU Temperature = 24.0 °C	Total drying time:	24 HOURS
Average transfer volume:	9.5 mL	Date / Time in:	11-16-04 1320
		Date / Time out:	11-17-04 1330
		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	11-09-04	— 8 <sup>00</sup>	1400	1238	11-05-04	JH
1	11-10-04	0850	1502	1150	11-07-04	JH
2	11-11-04	0900	1505	1142	11-09-04	JH
3	11-12-04	0913	1522	1145	11-09-04	JH
4	11-13-04	0903	1500	1140	11-09-04	JH
5	11-14-04	0847	1506	1151	11-12-04	KEK
6	11-15-04	0850	1500	1143	11-12-04	JH
7	11-16-04			1149		KEK

<b>Control information:</b>		<b>Acceptance criteria</b>	<b>Summary of test endpoints:</b>	
% Mortality:	0%	≤ 20%	7-day LC <sub>50</sub>	699.1
Average weight per initial larvae:	0.609		NOEC	450
Average weight per surviving larvae:	0.609	≥ 0.25 mg/larvae	LOEC	600
			ChV	519.6
			IC <sub>25</sub>	537.6

Species: *Pimephales promelas*PpKCICR Test Number: 49

## Survival and Growth Data

Day	Control				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	9 <sup>id</sup>	10	10	10	10	10
3	10	10	10	10	10	10	9	10	10	10	10	10
4	10	10	10	10	10	10	9	10	10	10	10	10
5	10	10	10	10	10	10	9	10	10	10	10	10
6	10	10	10	10	10	10	9	10	10	10	10	10
7	10	10	10	10	10	10	9 <sup>sk</sup>	10	10	10	9 <sup>id</sup>	10
A = Pan weight (mg) Tray color code: <u>BLACK</u> Analyst: <u>CAS TAM</u>												
14.93 14.92 14.55 14.81 15.03 14.51 15.23 15.19 14.73 14.72 14.70 14.85												
B = Pan + Larvae weight (mg) Analyst: <u>CAS</u>												
20.31 21.18 20.97 21.10 20.76 20.56 18.81 20.66 20.33 19.92 19.74 19.96												
Larvae weight (mg) = A - B												
5.38 6.26 6.42 6.29 5.73 6.05 3.58 5.47 5.60 5.20 5.04 5.11												
Weight per Initial number of larvae (mg) = C / Initial number of larvae												
0.538 0.626 0.642 0.629 0.573 0.605 0.358 0.547 0.560 0.520 0.504 0.511												
Average weight per Initial number of larvae (mg)	0.609				0.521				0.524			
Percent reduction from control (%)					14.5%				14.0%			

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

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas*PpKCICR Test Number: 49

## 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	8 <sup>2d</sup>	10	10	10	8 <sup>2d</sup>	9 <sup>1d</sup>	8 <sup>2d</sup>	9 <sup>1d</sup>	6 <sup>4d</sup>	5 <sup>5d</sup>	6 <sup>4d</sup>	6 <sup>4d</sup>
2	8	10	9 <sup>1d</sup>	10	8	9	8	9	6	4 <sup>1d</sup>	4 <sup>2d</sup>	5 <sup>1d</sup>
3	8	10	9	10	8	9	7 <sup>1d</sup>	9	5 <sup>1d</sup>	3 <sup>1d</sup>	4	4 <sup>1d</sup>
4	8	10	9	10	8	9	7	9	4 <sup>1d</sup>	3	4	4
5	8	9 <sup>1d</sup>	9	10	7 <sup>1d</sup>	9	7	9	4	2 <sup>1d</sup>	3 <sup>2d</sup>	4
6	8	9	9	10	7	9	7	9	3 <sup>1d</sup>	1 <sup>1d</sup>	3	4
7	8	8 <sup>1d</sup>	8 <sup>1d</sup>	8 <sup>2d</sup>	3 <sup>4d</sup>	4 <sup>5d</sup>	4 <sup>2d</sup>	3 <sup>6d</sup>	1 <sup>2d</sup>	0 <sup>1d</sup>	3	2 <sup>2d</sup>
A = Pan weight (mg) Tray color code: <u>BLACK</u> Analyst: <u>CAJ</u>												
14.72 14.98 14.92 14.42 14.63 14.63 10.91 14.80 15.22 15.21 14.70 14.45												
B = Pan + Larvae weight (mg) Analyst: <u>CAJ</u>												
19.15 18.74 18.69 19.17 18.42 16.10 16.25 19.27 14.22 16.04 0 17.51 15.89												
Larvae weight (mg) = A - B												
4.43 3.71 4.25 4.00 1.47 1.62 2.36 1.42 0.82 0 2.81 1.44												
Weight per initial number of larvae (mg) = C / Initial number of larvae												
0.443 0.371 0.425 0.400 0.147 0.162 0.236 0.142 0.82 0 0.281 0.144												
Average weight per initial number of larvae (mg)												
Percent reduction from control (%)												
0.410 32.7% 0.172 71.8% 0.127 79.2%												

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

Calculations and data reviewed: df

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: PpKCICR # 89 (#49 at 351 Depot St.)  
Test dates: November 9-16, 2004

Reviewed by: *J. J. J.*

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pao weight (mg)	B = Pao + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.93	20.31	5.38	0.538	0.609	7.8	0.538	100.0	0.609	7.8	Not applicable
	B	10	10	14.92	21.18	6.26	0.626			0.626				
	C	10	10	14.55	20.97	6.42	0.642			0.642				
	D	10	10	14.81	21.10	6.29	0.629			0.629				
300	E	10	10	15.03	20.76	5.73	0.573	0.531	17.3	0.573	97.5	0.521	21.3	14.5
	F	10	10	14.51	20.56	6.05	0.605			0.605				
	G	10	9	15.23	18.81	3.58	0.398			0.358				
	H	10	10	15.19	20.66	5.47	0.547			0.547				
450	I	10	10	14.73	20.33	5.60	0.560	0.538	4.8	0.560	97.5	0.524	4.8	14.0
	J	10	10	14.72	19.92	5.20	0.520			0.520				
	K	10	9	14.70	19.74	5.04	0.560			0.504				
	L	10	10	14.85	19.96	5.11	0.511			0.511				
600	M	10	8	14.72	19.15	4.43	0.554	0.512	7.6	0.443	80.0	0.410	7.6	32.7
	N	10	8	14.98	18.69	3.71	0.464			0.371				
	O	10	8	14.92	19.17	4.25	0.531			0.425				
	P	10	8	14.42	18.42	4.00	0.500			0.400				
750	Q	10	3	14.63	16.10	1.47	0.490	0.490	15.6	0.147	35.0	0.172	25.4	71.8
	R	10	4	14.63	16.25	1.62	0.405			0.162				
	S	10	4	16.91	19.27	2.36	0.590			0.236				
	T	10	3	14.80	16.22	1.42	0.473			0.142				
900	U	10	1	15.22	16.04	0.82	0.820	0.826	13.1	0.082	15.0	0.127	93.5	79.2
	V	10	0	0.00	0.00	0.00	0.000			0.000				
	W	10	3	14.70	17.51	2.81	0.937			0.281				
	X	10	2	14.45	15.89	1.44	0.720			0.144				

Dunnnett's MSD value:  
PMSD:

0.1098  
18.0

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 15.6% from the control (determined through reference toxicant testing).

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

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

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

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

# Environmental Testing Solutions, Inc.

## Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival				
Start Date: 11/9/2004	Test ID: PpKICCR	Sample ID: REP-Ref Toxicant		
End Date: 11/16/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species: PP-Pimephales promelas		
Comments:				

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
300	1.0000	1.0000	0.9000	1.0000
450	1.0000	1.0000	0.9000	1.0000
600	0.8000	0.8000	0.8000	0.8000
750	0.3000	0.4000	0.4000	0.3000
900	0.1000	0.0000	0.3000	0.2000

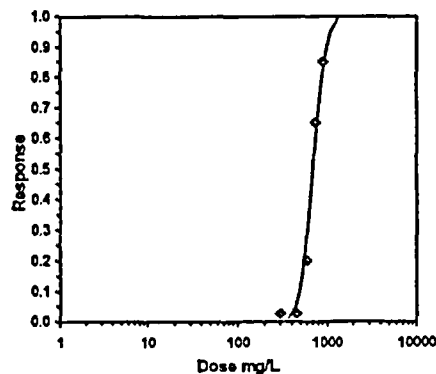
Transform: Arcsin Square Root									
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Rank Sum	1-Tailed Critical
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
300	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
450	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
*600	0.8000	0.8000	1.1071	1.1071	1.1071	0.000	4	10.00	10.00
*750	0.3500	0.3500	0.6322	0.5796	0.6847	9.597	4	10.00	10.00
*900	0.1500	0.1500	0.3810	0.1588	0.5796	47.729	4	10.00	10.00

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )		0.895331535	0.884	-0.5410818	2.596877193
Equality of variance cannot be confirmed					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test		450	600	519.6152423	
Treatments vs D-Control					

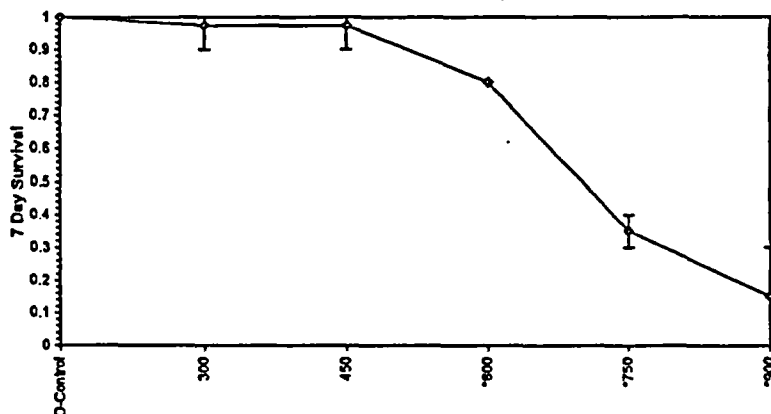
Maximum Likelihood-Probit									
Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma
Slope	8.398696931	3.366205684	-2.3140717 19.11146556	0	25.42745675	7.814727783	1.3E-05	2.844518145	0.119066089
Intercept	-18.8902458	9.550874232	-49.2853196 11.50489799						

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	369.4273116	
EC05	3.355	445.3196461	
EC10	3.718	491.9588902	
EC15	3.964	526.155457	
EC20	4.158	555.0212338	
EC25	4.326	581.0443574	
EC40	4.747	652.1584076	
EC50	5.000	699.0659461	
EC60	5.253	749.3473942	
EC75	5.674	841.0600443	
EC80	5.842	880.4946016	
EC85	6.036	928.8000412	
EC90	6.282	993.3618147	
EC95	6.645	1097.39865	
EC99	7.326	1322.840041	

Significant heterogeneity detected ( $p = 1.26E-05$ )



Dose-Response Plot



# Environmental Testing Solutions, Inc.

## Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 11/9/2004	Test ID: PpKCICR	Sample ID:	REF-Ref Toxicant	
End Date: 11/16/2004	Lab ID: ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date:	Protocol: FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas	
Comments:				

Conc.-mg/L	1	2	3	4
D-Control	0.5380	0.6260	0.6420	0.6290
300	0.5730	0.6050	0.3580	0.5470
450	0.5600	0.5200	0.5040	0.5110
600	0.4430	0.3710	0.4250	0.4000
750	0.1470	0.1620	0.2360	0.1420
900	0.0820	0.0000	0.2810	0.1440

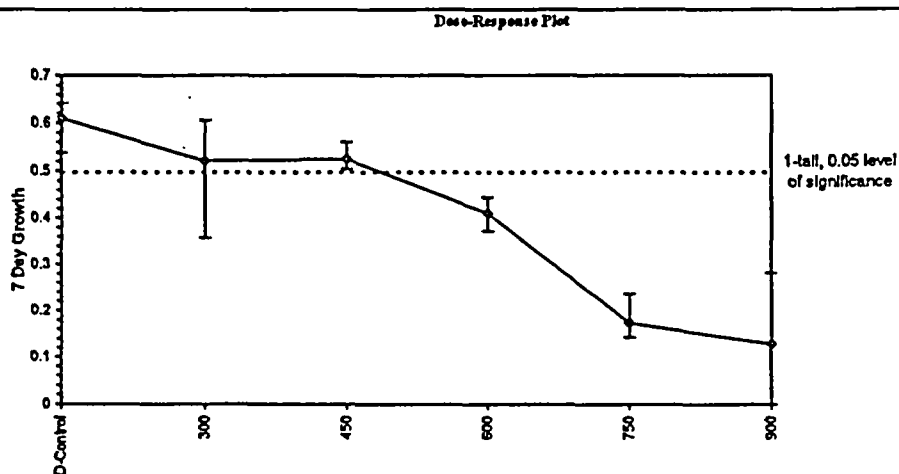
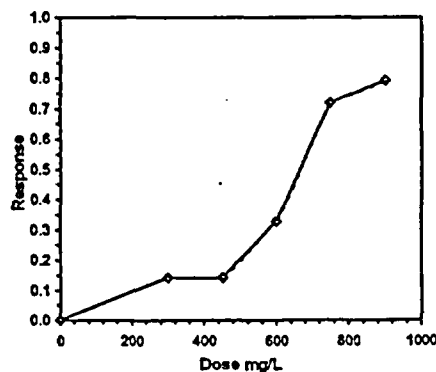
Conc.-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.6088	1.0000	0.6088	0.5380	0.6420	7.832	4				0.6088	1.0000
300	0.5208	0.8354	0.5208	0.3580	0.6050	21.327	4	1.746	2.180	0.1098	0.5223	0.8579
450	0.5238	0.8604	0.5238	0.5040	0.5600	4.781	4	1.687	2.180	0.1098	0.5223	0.8579
600	0.4098	0.6731	0.4098	0.3710	0.4430	7.633	4				0.4098	0.6731
750	0.1718	0.2821	0.1718	0.1420	0.2360	25.425	4				0.1718	0.2821
900	0.1268	0.2082	0.1268	0.0000	0.2810	93.527	4				0.1268	0.2082

Auxiliary Tests					Statistic		Critical		Skew		Kurt	
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.870173097		0.805		-1.55527319		3.162416858	
Bartlett's Test indicates equal variances (p = 0.07)					5.247608185		9.2103405					
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDa	MSDp	MSB	MSE
Dunnett's Test					450	>450			0.109849617	0.180451116	0.009985333	0.00507825
F-Prob												0.195662111
df												2, 9

Linear Interpolation (100 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05*	105.36	93.66	42.68	529.28
IC10*	211.13	108.23	35.36	614.46
IC15	456.42	108.32	44.21	532.87
IC20	497.00	77.10	125.88	576.38
IC25	537.58	42.08	439.61	624.40
IC40	628.05	10.95	596.86	663.02
IC50	666.41	9.76	640.69	699.57

\* Indicates IC estimate less than the lowest concentration



Species: *Pimephales promelas*

PpKCICR Test Number: 49

## Daily Chemistry:

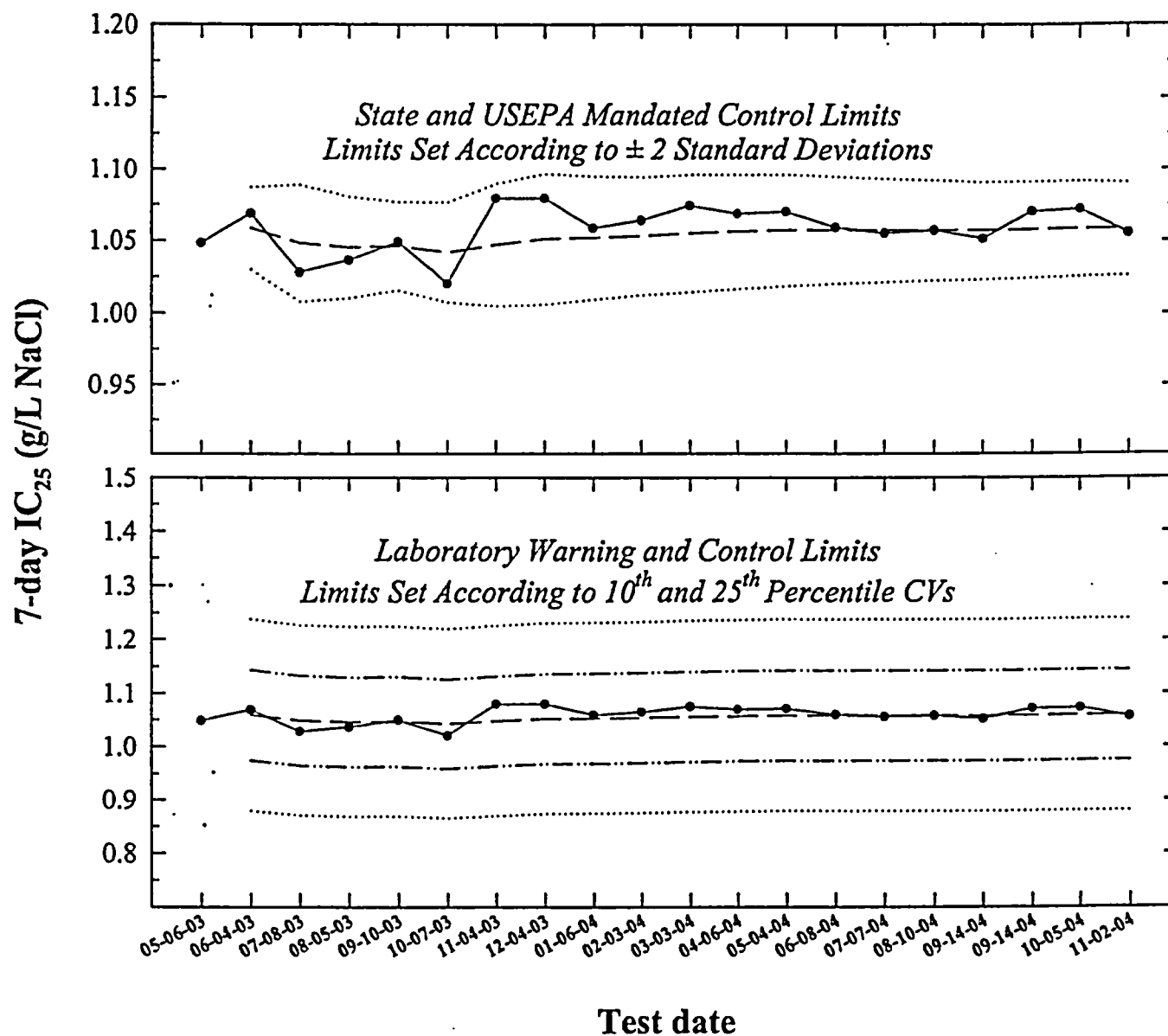
		Day					
		0		1		2	
Analyst		CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	7.89	8.02	7.87	7.98	7.84
	DO (mg/L)	7.8	7.7	7.8	7.5	7.9	7.0
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg CaCO <sub>3</sub> /L)	63		61		62	
	Hardness (mg CaCO <sub>3</sub> /L)	89		83		83	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.9	24.4
300 mg KC/L	pH (S.U.)	8.11	7.92	8.04	7.91	8.05	7.88
	DO (mg/L)	7.8	7.7	7.8	7.4	8.0	7.0
	Conductivity (µmhos/cm)	860		835		819	
	Temperature (°C)	24.8	24.4	24.7	24.3	24.8	24.5
450 mg KC/L	pH (S.U.)	8.10	7.95	8.05	7.89	8.07	7.90
	DO (mg/L)	8.0	7.7	8.0	7.5	8.0	7.0
	Conductivity (µmhos/cm)	1200		1220		1110	
	Temperature (°C)	24.8	24.3	24.9	24.2	24.9	24.5
600 mg KC/L	pH (S.U.)	8.10	7.93	8.05	7.88	8.07	7.90
	DO (mg/L)	8.0	7.8	8.0	7.5	8.1	7.1
	Conductivity (µmhos/cm)	1470		1530		1370	
	Temperature (°C)	25.1	24.5	24.9	24.4	24.8	24.7
750 mg KC/L	pH (S.U.)	8.10	7.94	8.04	7.90	8.08	7.86
	DO (mg/L)	7.9	7.8	8.0	7.4	8.0	7.1
	Conductivity (µmhos/cm)	1730		1800		1620	
	Temperature (°C)	24.9	24.3	24.9	24.3	24.6	24.3
900 mg KC/L	pH (S.U.)	8.09	7.95	8.05	7.95	8.09	7.91
	DO (mg/L)	8.0	7.9	8.0	7.4	8.0	7.2
	Conductivity (µmhos/cm)	2000		2020		1890	
	Temperature (°C)	24.8	24.5	24.9	24.2	24.8	24.5
STOCK	Conductivity (µmhos/cm)	79500		80700		76700	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*PpKICR Test Number: 49

		Day							
		3		4		5		6	
Analyst		CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.03	7.67	8.12	7.65	8.05	7.75	8.11	7.86
	DO (mg/L)	7.8	7.0	7.8	7.0	8.0	7.3	7.9	7.7
	Conductivity (µmhos/cm)	306		301		293		293	
	Alkalinity (mg CaCO <sub>3</sub> /L)					61			
	Hardness (mg CaCO <sub>3</sub> /L)					83			
	Temperature (°C)	24.9	24.5	24.9	24.8	24.9	24.9	25.3	25.4
300 mg KCl/L	pH (S.U.)	8.13	7.61	8.18	7.58	8.05	7.80	8.13	7.93
	DO (mg/L)	7.8	7.0	7.8	7.1	8.1	7.3	7.9	7.7
	Conductivity (µmhos/cm)	825		815		811		828	
	Temperature (°C)	25.0	24.5	24.9	25.1	25.0	24.9	25.2	25.4
450 mg KCl/L	pH (S.U.)	8.15	7.72	8.18	7.63	8.06	7.78	8.13	7.95
	DO (mg/L)	7.7	7.1	7.7	7.0	8.0	7.4	7.9	7.9
	Conductivity (µmhos/cm)	1180		1070		1090		1140	
	Temperature (°C)	25.1	24.5	24.7	24.8	25.0	25.0	25.4	25.4
600 mg KCl/L	pH (S.U.)	8.16	7.65	8.18	7.65	8.05	7.79	8.13	7.93
	DO (mg/L)	7.8	7.2	7.7	7.1	8.0	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1460		1430		1420		1420	
	Temperature (°C)	25.1	24.5	24.7	25.0	25.0	24.9	25.2	25.1
750 mg KCl/L	pH (S.U.)	8.17	7.68	8.19	7.65	8.05	7.77	8.13	7.93
	DO (mg/L)	7.8	7.2	7.7	7.1	7.9	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1740		1720		1680		1670	
	Temperature (°C)	24.8	24.4	24.6	24.7	24.9	24.9	25.2	25.5
900 mg KCl/L	pH (S.U.)	8.16	7.68	8.18	7.67	8.05	7.78	8.13	7.95
	DO (mg/L)	7.8	7.2	7.8	7.1	8.0	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1980		1990		1950		1910	
	Temperature (°C)	25.1	24.4	24.8	24.8	24.9	24.7	25.2	25.3
STOCK	Conductivity (µmhos/cm)	81600		78600		79700		716300	
		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 <sub>25</sub> (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits		S <sub>A10</sub>	Laboratory Warning Limits		S <sub>A25</sub>	Laboratory Control Limits		S <sub>A75</sub>	USEPA Warning Limits		S <sub>A90</sub>	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S <sub>A10</sub>	CT + S <sub>A10</sub>		CT - S <sub>A25</sub>	CT + S <sub>A25</sub>		CT - S <sub>A75</sub>	CT + S <sub>A75</sub>		CT - S <sub>A90</sub>	CT + S <sub>A90</sub>	
1	05-06-03	1.05																	
2	06-04-03	1.07	1.06	0.01	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.01
3	07-08-03	1.03	1.05	0.02	1.01	1.09	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.02
4	08-05-03	1.04	1.05	0.02	1.01	1.08	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.52	0.65	0.40	1.69	0.02
5	09-10-03	1.05	1.05	0.02	1.02	1.08	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.58	1.52	0.65	0.40	1.69	0.01
6	10-07-03	1.02	1.04	0.02	1.01	1.08	0.08	0.96	1.13	0.18	0.86	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.02
7	11-04-03	1.08	1.05	0.02	1.00	1.09	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.02
8	12-04-03	1.08	1.05	0.02	1.01	1.10	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.02
9	01-06-04	1.06	1.05	0.02	1.01	1.09	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.53	0.65	0.40	1.70	0.02
10	02-03-04	1.06	1.05	0.02	1.01	1.09	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.53	0.65	0.40	1.71	0.02
11	03-03-04	1.07	1.06	0.02	1.01	1.10	0.08	0.97	1.14	0.18	0.88	1.23	0.47	0.58	1.53	0.65	0.40	1.71	0.02
12	04-06-04	1.07	1.06	0.02	1.02	1.10	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.65	0.40	1.71	0.02
13	05-04-04	1.07	1.06	0.02	1.02	1.10	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
14	06-08-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
15	07-07-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
16	08-10-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
17	09-14-04	1.05	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
18	09-14-04	1.07	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
19	10-05-04	1.07	1.06	0.02	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
20	11-02-04	1.06	1.06	0.02	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02

Note: 7-d IC<sub>25</sub> = 7-day 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

CT = Central tendency (mean IC<sub>25</sub>).

S = Standard deviation of the IC<sub>25</sub> values.

### Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC<sub>25</sub> 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<sub>A10</sub> = Standard deviation corresponding to the 10<sup>th</sup> percentile CV. (S<sub>A10</sub> = 0.08)

S<sub>A25</sub> = Standard deviation corresponding to the 25<sup>th</sup> percentile CV. (S<sub>A25</sub> = 0.17)

### USEPA Control and Warning Limits

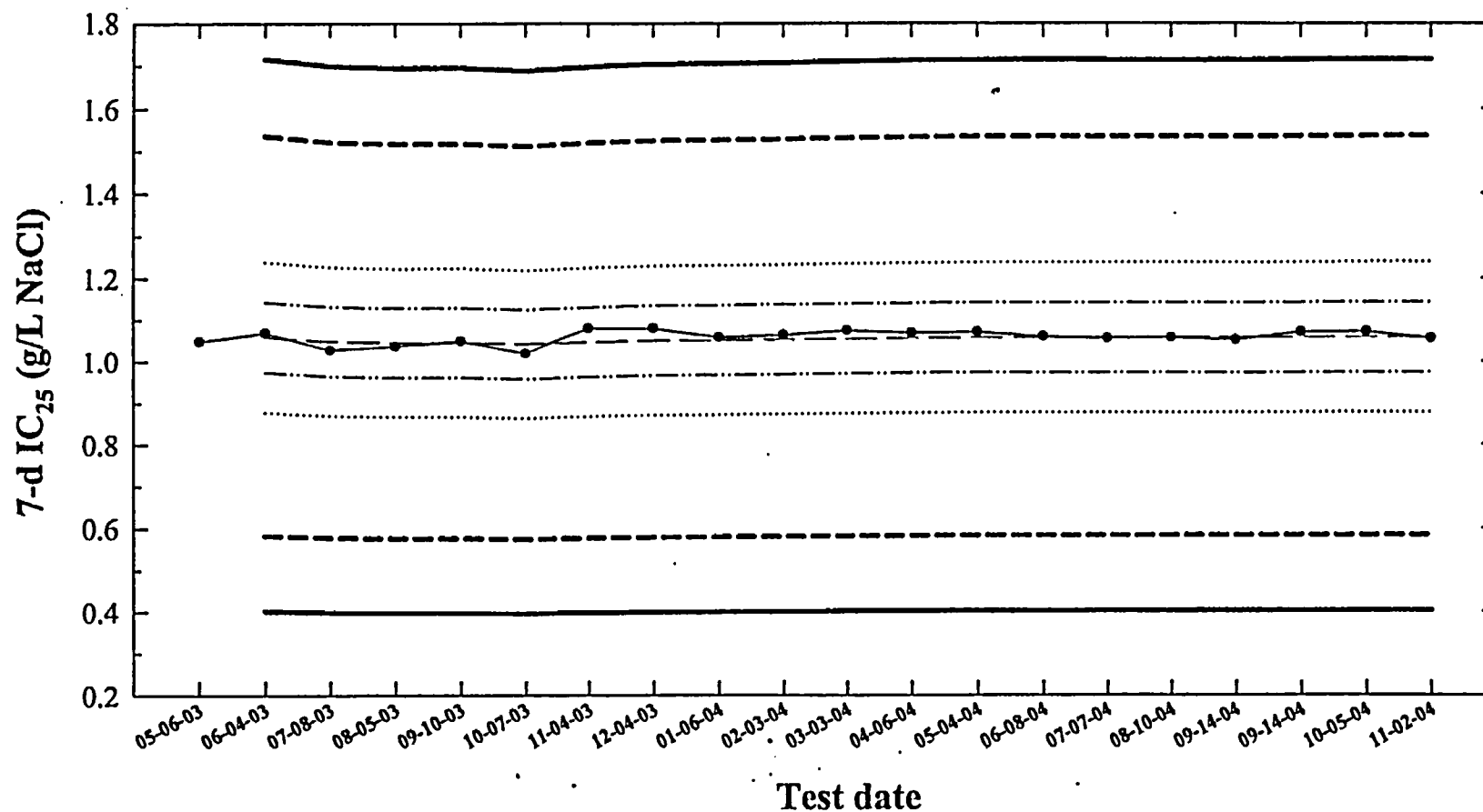
S<sub>A75</sub> = Standard deviation corresponding to the 75<sup>th</sup> percentile CV. (S<sub>A75</sub> = 0.45)

S<sub>A90</sub> = Standard deviation corresponding to the 90<sup>th</sup> percentile CV. (S<sub>A90</sub> = 0.62)

CV = Coefficient of variation of the IC<sub>25</sub> 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.**  
**Sodium Chloride Chronic Reference Toxicant Control Chart**  
**for *Ceriodaphnia dubia***  
**using Moderately Hard Synthetic Water**



- 7-day IC<sub>25</sub> = 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<sub>25</sub>)
- Laboratory Warning Limits (mean IC<sub>25</sub> ± S<sub>A,10</sub>, S<sub>A,10</sub> = 0.08)
- ..... Laboratory Control Limits (mean IC<sub>25</sub> ± S<sub>A,25</sub>, S<sub>A,25</sub> = 0.17)
- - - USEPA Warning Limits (mean IC<sub>25</sub> ± S<sub>A,75</sub>, S<sub>A,75</sub> = 0.45)
- — USEPA Control Limits (mean IC<sub>25</sub> ± S<sub>A,90</sub>, S<sub>A,90</sub> = 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 for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
		(%)	(offspring/female)						
1	05-06-03	100	27.6		10.8		3.2	11.5	
2	06-04-03	100	25.9	26.8	5.9	8.4	2.6	10.1	10.8
3	07-08-03	100	29.0	27.5	11.6	9.4	3.2	10.9	10.8
4	08-05-03	100	33.3	29.0	6.6	8.7	4.7	14.1	11.6
5	09-10-03	100	29.3	29.0	4.3	7.8	3.1	10.7	11.5
6	10-07-03	100	33.4	29.8	8.0	7.9	3.2	9.5	11.1
7	11-04-03	100	31.0	29.9	7.3	7.8	2.6	8.3	10.7
8	12-04-03	100	30.4	30.0	9.7	8.0	3.6	11.8	10.8
9	01-06-04	100	30.6	30.1	4.4	7.6	3.5	11.5	10.9
10	02-03-04	100	30.7	30.1	7.2	7.6	2.7	8.8	10.7
11	03-03-04	100	29.0	30.0	7.8	7.6	3.0	10.3	10.7
12	04-06-04	100	28.1	29.9	6.2	7.5	2.8	10.0	10.6
13	05-04-04	100	32.5	30.1	6.4	7.4	3.3	10.1	10.6
14	06-08-04	100	32.9	30.3	6.8	7.4	3.0	9.0	10.5
15	07-07-04	100	33.3	30.5	6.3	7.3	2.6	7.8	10.3
16	08-10-04	100	27.4	30.3	5.8	7.2	2.3	8.6	10.2
17	09-14-04	100	28.7	30.2	4.9	7.1	2.4	8.2	10.1
18	09-14-04	100	28.8	30.1	7.5	7.1	3.0	10.5	10.1
19	10-05-04	100	29.6	30.1	8.2	7.1	2.8	9.6	10.1
20	11-02-04	100	30.5	30.1	8.5	7.2	2.7	8.8	10.0

**Note:** CV = Coefficient of variation for control reproduction.  
On average, the CV for control reproduction is 7.2% in Environmental Testing Solutions, Inc. *Ceriodaphnia* chronic toxicity tests.  
Lower CV bound determined by USEPA (10<sup>th</sup> percentile) = 8.9%.  
Upper CV bound determined by USEPA (90<sup>th</sup> 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 10.0% from the control.  
Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.  
Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 37%.

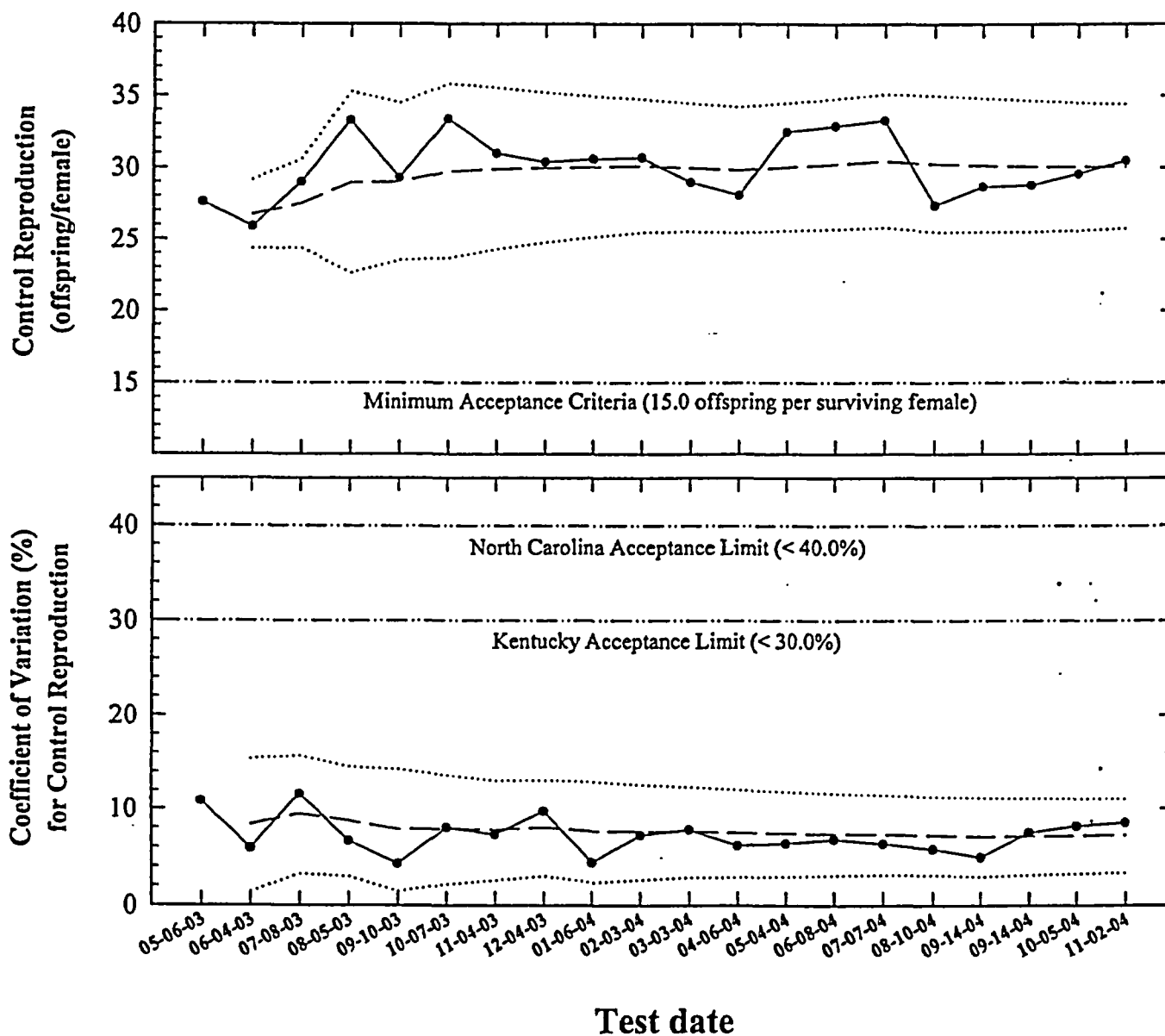
CT = Central Tendency (Mean Control Reproduction, CV, or PMSD)

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

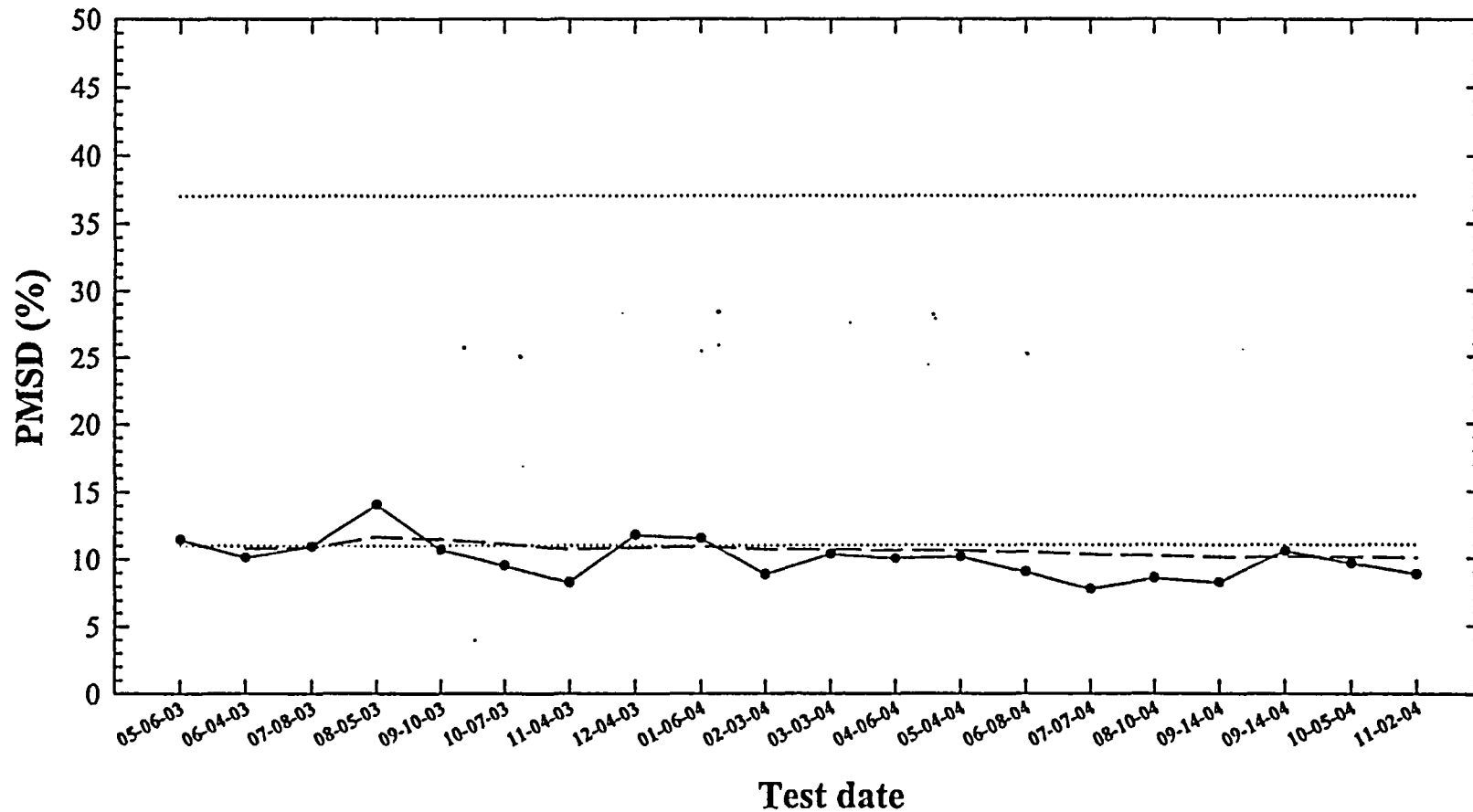


- Control Reproduction or Coefficient of Variation (CV)
- — Central Tendency (mean Control Reproduction or CV)
- ..... Control Limits (mean Control Reproduction or CV  $\pm 2$  Standard Deviations)

# 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 (10<sup>th</sup> percentile) = 11%, Upper PMSD Bound (90<sup>th</sup> percentile) = 37%  
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

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

CdNaCLCR #: 29

Dilution preparation information:						Comments:
NaCl CHM number:		CHH120				
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:	PURE
Date and times organisms were born between:	11-02-04 0905 TO 1122	Incubator number and shelf location:	281
Organism source:	10-26-04 A-F	YCT batch:	ABS8 10-05-04
Transfer bowl information:	pH = 7.91 SU Temperature = 24.9°C	Selenastrum batch:	ABS 10-25-04

## Daily renewal information:

Day	Date	Test Initiation, renewal, or termination time	Control water batch used	Analyst
0	11-02-04	1230	11-01-04	JH
1	11-03-04	1142	11-01-04	KEK
2	11-04-04	1135	11-01-04	JH
3	11-05-04	1136	11-01-04	JH
4	11-06-04	1140	11-01-04	JH
5	11-07-04	1152	11-01-04	KEK
6	11-08-04	1138	11-05-04	JH
7	11-09-04	1133		JH

Control information:		Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 1400
% Adults having 3 <sup>rd</sup> Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	30.5	≥ 15.0 offspring/female	ChV	894.4
% CV:	8.5%	< 40.0 %	IC25	1055.3

Species: *Ceriodaphnia dubia*CdNaCLCR #: 29**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	4	5	4	4	4	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	10	11	10	12	11	9	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	16	14	16	15	13	18	14	18	16
Total young produced		31	31	28	31	29	29	<del>31</del> 27	27	31	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 <sup>rd</sup> Broods		X	X	X	X	X	X	X	X	X	X

**Concentration:**

% Mortality:	0%
Mean Offspring/Female:	30.5

**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	4	4	4	4	4	4	4	4	3	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	9	10	12	11	0	11	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	16	14	18	17	14	15	15	16	14
Total young produced		32	30	27	32	33	29	29	30	32	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

**Concentration:**

% Mortality:	0%
Mean Offspring/Female:	30.3
% Reduction from Control:	0.1%

Species: *Ceriodaphnia dubia*CdNaCLCR #: 29

800 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	4	4	5	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	10	0	11	11	0	0	0	13	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	12	0	0	11	9	12	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	13	14	19	16	15	15	17	15	13
Total young produced		33	27	30	34	31	31	29	33	32	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality: 0%

Mean Offspring/Female: 30.8

% Reduction from Control: -1.0%

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	3	4	4	4	4	4	4	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	8	10	10	0	11	0	9	12	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	7	0	12	0	0	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	14	16	16	13	12	14	10	15
Total young produced		28	26	28	30	27	28	28	26	26	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

\* SPLIT BROOD

## Concentration:

% Mortality: 0%

Mean Offspring/Female: 27.6

% Reduction from Control: 9.5%

Species: *Ceriodaphnia dubia*CdNaCLCR #: 29

1200 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	2	3	4	4	3	4	2	4	2	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	0	1	4	3	3	0	7	5	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	3	0	0	0	0	3	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	3	3	2	0	6	3	0	8	4	6
Total young produced		9	9	7	8	12	10	5	19	11	16
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	10%
Mean Offspring/Female:	10.6
% Reduction from Control:	65.2%

1400 mg NaCl/L

## Survival and Reproduction Data

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

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	4.2
% Reduction from Control:	86.2%

# 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	4	5	4	4	4	4	4	4	5	4	42
5	10	10	10	11	10	12	11	9	13	10	106
6	0	0	0	0	0	0	0	0	0	0	0
7	17	16	14	16	15	13	18	14	18	16	157
Total	31	31	28	31	29	29	33	27	36	30	305

### 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	3	4	4	4	4	4	4	3	4	4	38
5	11	8	10	10	0	11	0	9	12	8	79
6	0	0	0	0	0	7	0	12	0	2	21
7	14	14	14	16	16	13	12	14	10	15	138
Total	28	26	28	30	27	28	28	26	26	29	276

### 600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	3	5	40
5	11	10	9	10	12	11	0	11	13	10	97
6	0	0	0	0	0	0	10	0	0	0	10
7	17	16	14	18	17	14	15	15	16	14	156
Total	32	30	27	32	33	29	29	30	32	29	303

### 1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	2	3	4	4	3	4	2	4	2	3	31
5	4	0	1	4	3	3	0	7	5	7	34
6	0	3	0	0	0	0	3	0	0	0	6
7	3	3	2	0	6	3	0	8	4	6	35
Total	9	9	7	8	12	10	5	19	11	16	106

### 800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	4	5	5	4	4	4	43
5	12	10	0	11	11	0	0	0	13	11	68
6	0	0	12	0	0	11	9	12	0	0	44
7	16	13	14	19	16	15	15	17	15	13	153
Total	33	27	30	34	31	31	29	33	32	28	308

### 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	3	3	1	0	3	2	0	2	1	2	17
5	0	0	4	0	0	0	0	0	2	1	7
6	1	4	0	0	0	1	0	0	0	0	6
7	2	3	0	3	1	1	0	2	0	0	12
Total	6	10	5	3	4	4	0	4	3	3	42



# 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: CdNaCICR #58 (#29 at 351 Depot St.)

Test dates: November 2-9, 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	31	28	31	29	29	33	27	36	30	100	30.5	8.5	Not applicable
600	32	30	27	32	33	29	29	30	32	29	100	30.3	6.2	0.7
800	33	27	30	34	31	31	29	33	32	28	100	30.8	7.5	-1.0
1000	28	26	28	30	27	28	28	26	26	29	100	27.6	4.9	9.5
1200	9	9	7	8	12	10	5	19	11	16	90	10.6	39.6	65.2
1400	6	10	5	3	4	4	0	4	3	3	100	4.2	61.3	86.2

Dunnett's MSD value: 2.693

PMSD: 8.8

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 10.0% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> 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.

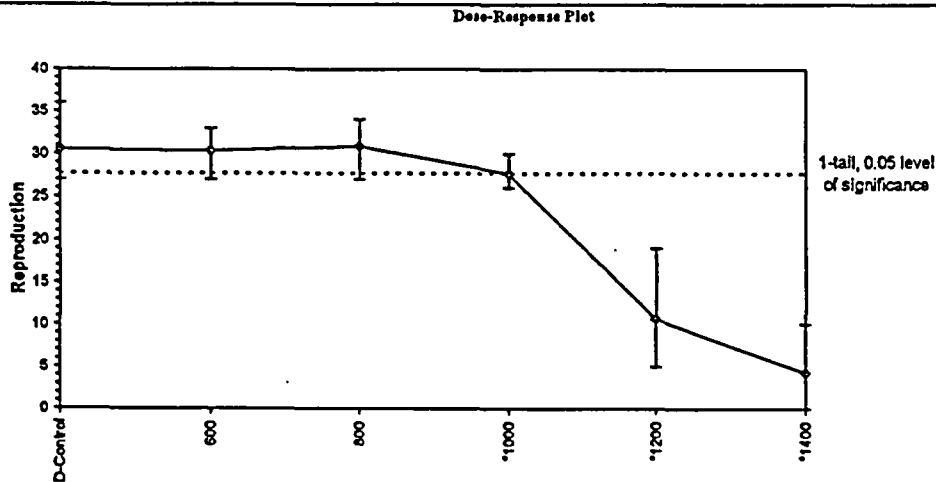
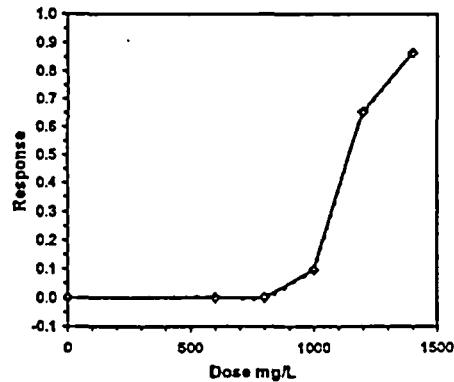
## Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date:	11/2/2004	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant					
End Date:	11/9/2004	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	NaCl-Sodium 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	31.000	28.000	31.000	29.000	29.000	33.000	27.000	36.000	30.000
600	32.000	30.000	27.000	32.000	33.000	29.000	29.000	30.000	32.000	29.000
800	33.000	27.000	30.000	34.000	31.000	31.000	29.000	33.000	32.000	28.000
1000	28.000	26.000	28.000	30.000	27.000	28.000	28.000	26.000	26.000	29.000
1200	9.000	9.000	7.000	8.000	12.000	10.000	5.000	19.000	11.000	16.000
1400	6.000	10.000	5.000	3.000	4.000	4.000	0.000	4.000	3.000	3.000

Transform: Untransformed													
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	1-Tailed Critical	MSD	Mean	N-Mean	Isotonic
D-Control	30.500	1.0000	30.500	27.000	36.000	8.501	10				30.533	1.0000	
600	30.300	0.9934	30.300	27.000	33.000	6.233	10	0.170	2.287	2.693	30.533	1.0000	
800	30.800	1.0098	30.800	27.000	34.000	7.467	10	-0.255	2.287	2.693	30.533	1.0000	
*1000	27.600	0.9049	27.600	26.000	30.000	4.891	10	2.462	2.287	2.693	27.600	0.9039	
*1200	10.600	0.3475	10.600	5.000	19.000	39.578	10	16.895	2.287	2.693	10.600	0.3472	
*1400	4.200	0.1377	4.200	0.000	10.000	61.271	10	22.328	2.287	2.693	4.200	0.1376	

Auxiliary Tests					Statistic		Critical		Skew		Kurt			
Kolmogorov D Test indicates normal distribution ( $p > 0.01$ )					0.9521032		1.035		0.78107399		1.6606005			
Bartlett's Test indicates equal variances ( $p = 0.03$ )					12.2524052		15.0862722							
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSD <sub>a</sub>	MSD <sub>p</sub>	MSB	MSE	F-Prob	df
Dunnett's Test					800	1000	894.427191		2.69342483	0.08830901	1392.14667	6.93703704	1.4E-33	5, 54
Treatments vs D-Control														

Linear Interpolation (200 Resamples)					
Point	mg/L	SD	95% CL		Skew
IC05	904.090909	70.321427	714.476471	942.65625	-3.8589
IC10	1001.41176	29.4310854	903.551627	1011.38664	-1.6769
IC15	1019.37255	8.11342372	995.465195	1029.798	-1.3950
IC20	1037.33333	7.10725691	1018.79069	1049.32607	-0.3208
IC25	1055.29412	7.37316969	1039.31161	1068.45042	-0.0324
IC40	1109.17647	9.79468145	1093.36587	1127.94776	0.4878
IC50	1145.09804	12.192936	1126.10741	1170.73816	0.6180



Species: *Ceriodaphnia dubia*CdNaCLCR #: 29

## Daily Chemistry:

		Day					
		0		1		2	
Analyst		CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	7.97	8.03	8.04	8.03	7.90	8.13
	DO (mg/L)	8.2	7.9	8.0	8.0	7.8	7.8
	Conductivity (µmhos/cm)	285		305		297	
	Alkalinity (mg CaCO <sub>3</sub> /L)	62					
	Hardness (mg CaCO <sub>3</sub> /L)	83					
	Temperature (°C)	24.6	25.3	24.9	25.0	24.7	25.1
600 mg NaCl/L	pH (S.U.)	7.97	7.98	8.03	7.99	8.03	8.09
	DO (mg/L)	8.1	7.9	8.1	8.0	7.9	7.9
	Conductivity (µmhos/cm)	1590		1560		1550	
	Temperature (°C)	24.7	25.5	24.8	25.0	24.7	25.1
800 mg NaCl/L	pH (S.U.)	7.97	7.98	8.03	7.98	8.05	8.08
	DO (mg/L)	8.1	7.8	8.1	8.0	7.9	8.0
	Conductivity (µmhos/cm)	1970		1970		1960	
	Temperature (°C)	24.5	25.1	24.7	24.9	24.7	25.3
1000 mg NaCl/L	pH (S.U.)	7.97	7.97	8.03	7.99	8.04	8.08
	DO (mg/L)	8.1	7.9	8.1	8.0	7.9	8.0
	Conductivity (µmhos/cm)	2390		2360		2340	
	Temperature (°C)	24.4	25.2	24.7	24.9	24.8	25.1
1200 mg NaCl/L	pH (S.U.)	7.97	7.96	8.02	7.96	8.04	8.07
	DO (mg/L)	8.1	8.0	8.2	8.0	7.9	8.0
	Conductivity (µmhos/cm)	2810		2800		2770	
	Temperature (°C)	24.6	25.2	24.9	24.9	24.7	25.0
1400 mg NaCl/L	pH (S.U.)	7.96	7.96	8.02	7.98	8.02	8.06
	DO (mg/L)	8.2	7.9	8.2	7.9	8.0	8.0
	Conductivity (µmhos/cm)	3190		3230		3120	
	Temperature (°C)	24.6	25.2	24.9	24.9	24.9	25.0
STOCK	Conductivity (µmhos/cm)	135000					
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*CdNaCLCR #: 29

		Day							
		3		4		5		6	
Analyst		CAJ	KHL	KHL	PLB	PLB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.) (8.12)	8.44	8.09	8.03	8.06	7.99	8.04	8.09	8.03
	DO (mg/L)	8.3 (7.9)	8.3	7.8	7.7	7.8	7.9	7.8	7.8
	Conductivity (µmhos/cm)	300		300		295		303	
	Alkalinity (mg CaCO <sub>3</sub> /L)							63	
	Hardness (mg CaCO <sub>3</sub> /L)							89	
	Temperature (°C)	24.8	25.1	25.5	25.3	24.8	25.1	24.7	25.2
600 mg NaCl/L	pH (S.U.)	8.10	8.02	8.01	8.00	8.01	8.03	8.10	8.05
	DO (mg/L)	8.0	8.1	7.7	7.8	7.7	7.9	7.8	7.8
	Conductivity (µmhos/cm)	1450		1430		1250		1490	
	Temperature (°C)	24.9	25.1	25.3	25.0	24.9	25.1	24.8	25.2
800 mg NaCl/L	pH (S.U.)	8.09	8.00	8.02	7.99	8.03	8.02	8.11	8.05
	DO (mg/L)	8.0	8.0	7.9	7.8	7.7	8.0	7.9	7.8
	Conductivity (µmhos/cm)	1850		1830		1930		1820	
	Temperature (°C)	24.9	25.1	25.3	25.0	25.1	24.9	24.8	25.0
1000 mg NaCl/L	pH (S.U.)	8.10	7.98	8.01	7.98	8.02	8.02	8.11	8.06
	DO (mg/L)	8.1	8.0	7.7	7.8	7.8	8.0	7.9	7.8
	Conductivity (µmhos/cm)	2230		2200		2370		2300	
	Temperature (°C)	24.7	24.9	25.2	24.9	24.8	25.1	24.8	25.3
1200 mg NaCl/L	pH (S.U.)	8.09	7.98	8.01	7.97	8.02	8.02	8.11	8.04
	DO (mg/L)	8.1	8.0	8.0	7.7	7.8	8.0	7.9	7.8
	Conductivity (µmhos/cm)	2680		2590		2830		2710	
	Temperature (°C)	24.7	24.9	25.4	25.2	24.9	25.2	24.9	25.1
1400 mg NaCl/L	pH (S.U.)	8.08	7.97	8.01	7.99	8.01	8.03	8.10	8.06
	DO (mg/L)	8.0	8.1	8.2	7.7	7.9	8.0	8.0	7.9
	Conductivity (µmhos/cm)	3070		2980		3210		3150	
	Temperature (°C)	24.9	25.2	25.2	24.9	24.8	25.0	24.8	25.2
STOCK	Conductivity (µmhos/cm)								
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

Name **TVA - SEQUOYAH NUCLEAR PLANT**

Address **P.O. BOX 2000**

(INTEROFFICE SB-2A)

**SODDY - DAISY TN 37384**

Facility **TVA - SEQUOYAH NUCLEAR PLANT**

Location **HAMILTON COUNTY**

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

\*\*\* NO DISCHARGE ☐ \*\*\*

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 04	11	01	To 04	11	30

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.1	*****	8.7	12	0	18 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	**	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	89	132	26	*****	7	12	19	0	9 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<71	<113	26	*****	<5	<5	19	0	9 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.375	2.696	03	*****	*****	*****	**	0	30 / 30	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	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	12	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

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

The Turbine Building Sump was discharged directly to the Yard Drainage Pond on November 1 and 4-7, 2004.

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

Form Approved.  
OMB No. 2040-0004

TN0026450

107 G

PERMIT NUMBER

DISCHARGE NUMBER

## MONITORING PERIOD

YEAR	MO	DAY	YEAR	MO	DAY	
04	11	01	To	04	11	30

\*\*\* 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			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.9	*****	8.1	12	0	3 / 30	GRAB
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	*****	*****	**	*****	*****	3	19	0	3 / 30	COMPOS
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	<5	19	0	3 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.002	19	0	3 / 30	COMPOS
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.11	19	0	3 / 30	COMPOS
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	0.032	0.033	03	*****	*****	*****	**	0	3 / 30	CALCTD
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		423	843-6700	04	12	10
Site Vice President						
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

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

The Lined Metal Pond was discharged directly to the LWTP (Outfall 103) on November 1-3, 2004. No phosphorous bearing cleaning solutions were used.

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	110 G
PERMIT NUMBER	DISCHARGE NUMBER

F - FINAL  
 RECYCLED COOLING WATER  
 EFFLUENT

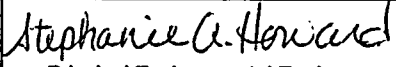
MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 04	11	01	To 04	11	30

\*\*\* 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			
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  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	TELEPHONE		DATE		
			423	843-6700	04	12	10
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		AREA CODE	NUMBER	YEAR	MO	DAY	

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

No Discharge this Period

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

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

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

MAJOR

(SUBR 01)

F - FINAL

BACKWASH

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 04	11	01	To 04	11	30

\*\*\* 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 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	*****	0	94	*****	*****	*****	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT MO TOTAL	YES=1 NO=0	*****	*****	*****	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	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		423	843-6700	04	12	10
Site Vice President		Principal Environmental Engineer				
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		AREA CODE	NUMBER	YEAR MO DAY

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

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	117 G
PERMIT NUMBER	DISCHARGE NUMBER

F - FINAL  
 BACKWASH  
 EFFLUENT

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 04	11	01	To 04	11	30

\*\*\* 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			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0	9A	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	*****	0	94	*****	*****	*****	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT MO TOTAL	YES=1 NO=0	*****	*****	*****	***		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	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	12	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 PLANTAddress P.O. BOX 2000(INTEROFFICE SB-2A)SODDY - DAISY TN 37384Facility TVA - SEQUOYAH NUCLEAR PLANTLocation HAMILTON COUNTYNATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)

MAJOR

(SUBR 01)

F - FINAL

WASTEWATER &amp; STORM WATER

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0026450

118 G

PERMIT NUMBER

DISCHARGE NUMBER

## MONITORING PERIOD

YEAR	MO	DAY	YEAR	MO	DAY
04	11	01	04	11	30

\*\*\* 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			
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.

Stephanie A. Howard

Principal Environmental Engineer

SIGNATURE OF PRINCIPAL EXECUTIVE  
OFFICER OR AUTHORIZED AGENT

TELEPHONE

423 843-6700

AREA  
CODE

NUMBER

DATE

04 12 10

YEAR MO DAY

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

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