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

March 9, 2004

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

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR FEBRUARY 2004

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

Sincerely,

Stephanie A. Howard

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant

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

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

IE25

Printed on recycled paper

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

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 101 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING AVERAGE | QUANTITY OR LOADING MAXIMUM | UNITS | QUALITY OR CONCENTRATION MINIMUM | QUALITY OR CONCENTRATION AVERAGE | QUALITY OR CONCENTRATION MAXIMUM | UNITS | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 10.3 | 04 | 0 | 29 / 29 | MODELD |
| 00010 Z 0 0 INSTREAM MONITORING | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 30.5 DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 22.9 | 04 | 0 | 29 / 29 | RCORDR |
| 00010 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | REPORT DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.4 | ******** | 7.8 | 12 | 0 | 8 / 29 | GRAB |
| 00400 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 6.0 MINIMUM | ******** | 9.0 MAXIMUM | SU | | WEEKLY | GRAB |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | 7 | 10 | 19 | 0 | 4 / 29 | 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 / 29 | 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 | ******** | 1581 | 03 | ******** | ******** | ******** | ** | 0 | 29 / 29 | RCORDR |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | REPORT DAILY MX | MGD | ******** | ******** | ******** | **** | | CONTIN UOUS | RCORDR |
| CHLORINE, TOTAL RESIDUAL | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | <0.006 | 0.014 | 19 | 0 | 29 / 29 | 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 | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A. Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

No closed mode operation. The following injections occured: 1. PCL-222 (max. calc. conc. was 0.027mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.010mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.027mg/L--limit 0.100mg/L)

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

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 101 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| TEMPERATURE - C, RATE OF CHANGE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0.2 | 62 | 0 | 29 / 29 | CALCTD |
| 82234 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 2.0 | DEG C /HR | | CONTIN UOUS | CALCTD |
| TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 2.9 | 04 | 0 | 29 / 29 | CALCTD |
| 00016 1 W 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 5.0 | DEG. C. | | CONTIN UOUS | CALCTD |
| BORON, TOTAL | SAMPLE MEASUREMENT | ******** | ******** | ** | <0.2 | <0.2 | <0.2 | 19 | 0 | 1 / 29 | GRAB |
| 01022 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | REPORT | REPORT | REPORT | MG/L | | ONCE/ MONTH | GRAB |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A. Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| 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)*

CCW data for February 2004 is attached.

CCW CHANNEL

| Date/Time Collected | Extractable Petroleum Hydrocarbons | Analysis Date/Time | Analyst | Method |
|---|---|---|---|---|
| 2/23/2004 1030 | < 0.5 mg/L | 2/28/2004 0230 | CVS | EPA 8015B |

CCW TRENCH

| Date/Time Collected | Extractable Petroleum Hydrocarbons | Analysis Date/Time | Analyst | Method |
|---|---|---|---|---|
| 2/23/2004 1040 | < 0.5 mg/L | 2/28/2004 0308 | 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

ATTN: Stephanie A. Howard

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

| TN0026450 | 101 T |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

MAJOR
(SUBR 01)
F - FINAL
BIOMONITORING FOR OUTFALL 101
EFFLUENT
*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| IC25 STATRE 7DAY CHR CERIODAPHNIA | SAMPLE MEASUREMENT | ******** | ******** | ** | >100 | ******** | ******** | 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 MIMINUM | ******** | ******** | 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 | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

Toxicity was sampled from 2/1/2004 to 2/6/2004. Report is attached.

March 4, 2004

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, OUTFALL 101, FEBRUARY, 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 February 1-6, showed no toxic effects to fathead minnows or daphnids. The resulting $IC_{25}$ values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

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

Cynthia L. Russell

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

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

SQN February 2004M

# TENNESSEE VALLEY AUTHORITY
# TOXICITY TEST REPORT

## INTRODUCTION / EXECUTIVE SUMMARY

Report Date: March 4, 2004

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: February 1-6, 2004
10. Average Flow on Days Sampled (MGD): 1569, 1567, 1565
11. Pertinent Site Conditions: H130M was not injected from February 1-6, 2004. No unusual conditions reported. Production / operation data will be provided upon request.
12. Test Dates: February 3-10, 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: Ruth Ann Hurt Phone #: (423) 843-6714

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

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

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

22. Notes: Outfall 101 samples collected February 1-6, 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 (EST) Collected | Date (MM/DD/YY)/ Time (EST) Received | Arrival Temp. (°C) | Initial TRC* (mg/L) | Date (MM/DD/YY)/ Time (EST) Used By |
|---|---|---|---|---|---|
| 101 | 02/01/04 0734 to 02/02/04 0634 | 02/02/04 1453 | 1.2† | <0.10 | 02/03/04 1509<br>02/04/04 1513 |
| Intake | 02/01/04 0719 to 02/02/04 0619 | 02/02/04 1453 | 1.0 | <0.10 | 02/03/04 1509<br>02/04/04 1513 |
| 101 | 02/03/04 0847 to 02/04/04 0747 | 02/04/04 1400 | 0.6† | <0.10 | 02/05/04 1526<br>02/06/04 1502 |
| Intake | 02/03/04 0804 to 02/04/04 0704 | 02/04/04 1400 | 0.8 | <0.10 | 02/05/04 1526<br>02/06/04 1502 |
| 101 | 02/05/04 0713 to 02/06/04 0613 | 02/06/04 1320 | 0.3† | <0.10 | 02/07/04 1500<br>02/08/04 1509<br>02/09/04 1502 |
| Intake | 02/05/04 0733 to 02/06/04 0633 | 02/06/04 1320 | 0.1 | <0.10 | 02/07/04 1500<br>02/08/04 1509<br>02/09/04 1502 |

*TRC = Total Residual Chlorine

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

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

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

| | *Pimephales promelas* | *Ceriodaphnia dubia* |
|---|---|---|
| Test Organisms: | | |
| 1. Source: | Aquatic BioSystems, Inc. | In-house Cultures |
| 2. Age: | 23.5-26 hours old | <24-hours old |
| Test Method Summary: | | |
| 1. Test Conditions: | Static, Renewal | Static, Renewal |
| 2. Test Duration: | 7 days | Until at least 60% of control females have 3 broods |
| 3. Control / Dilution Water: | Moderately Hard Synthetic | Moderately Hard Synthetic |
| 4. Number of Replicates: | 4 | 10 |
| 5. Organisms per Replicate: | 10 | 1 |
| 6. Test Initiation: (Date/Time) | | |
| Outfall 101 | 02/03/04 - 1509 EST | 02/03/04 - 1147 EST |
| UV Treated Outfall 101 | 02/03/04 - 1446 EST | |
| 7. Test Termination: (Date/Time) | | |
| Outfall 101 | 02/10/04 - 1521 EST | 02/10/04 - 1150 EST |
| UV Treated Outfall 101 | 02/10/04 - 1453 EST | |
| 8. Test Temperature: Outfall 101: | Mean = 25.0°C (24.6 - 25.3°C) | Mean = 24.7°C (24.4 - 25.3°C) |

Test Temperature: UV-Treated Outfall 101: Mean = 24.9°C (24.6 - 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)

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

Conducted February 3-10, 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 | 98 | 98 | 90 | 90 | 90 | 90 |
| Intake | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

| Test Solutions (% Effluent) | Mean Dry Weight (mg) (replicate number) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Mean |
| Control | 0.845 | 0.937 | 0.851 | 0.960 | 0.899 |
| 10.98% | 0.942 | 1.069 | 1.064 | 1.068 | 1.036 |
| 22.0% | 1.131 | 1.005 | 1.015 | 1.045 | 1.049 |
| 43.9% | 0.932 | 1.027 | 1.006 | 0.994 | 0.990 |
| 72.0% | 0.950 | 1.032 | 0.960 | 1.003 | 0.986 |
| 100.0% | 0.941 | 1.147 | 0.925 | 0.893 | 0.977 |
| Intake | 1.058 | 1.057 | 1.090 | 1.027 | 1.058 |

| | |
|---|---|
| $IC_{25}$ Value: ≥ 100%<br>Permit Limit: 43.9%<br><br>95% Confidence Limits:<br>Upper Limit: NA<br>Lower Limit: NA | Calculated TU Estimates: ≤ 1.0 TUc*<br>Permit Limit: 2.3 TUc |

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)
Conducted February 3-10, 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 | 31 | 32 | 27 | 28 | 31 | 33 | 27 | 32 | 30 | 29 | 30.0 |
| 10.98% | 32 | 34 | 32 | 28 | 31 | 32 | 30 | 34 | 30 | 32 | 31.5 |
| 22.0% | 35 | 31 | 33 | 36 | 33 | 39 | 34 | 34 | 29 | 34 | 33.8 |
| 43.9% | 36 | 31 | 40 | 31 | 33 | 35 | 32 | 31 | 33 | 34 | 33.6 |
| 72.0% | 34 | 29 | 29 | 37 | 36 | 35 | 36 | 37 | 29 | 34 | 33.6 |
| 100.0% | 31 | 32 | 31 | 36 | 36 | 32 | 38 | 35 | 34 | 33 | 33.8 |

| | |
|---|---|
| $IC_{25}$ Value: ≥ 100%<br>Permit Limit: 43.9%<br><br>95% Confidence Limits:<br>Upper Limit: NA<br>Lower Limit: NA | Calculated TU Estimates: < 1.0 TUc*<br>Permit Limit: 2.3 TUc |

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)
Conducted February 3-10, 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 | 33 | 32 | 32 | 32 | 33 | 34 | 29 | 30 | 30 | 30 | 31.5 |
| Intake | 34 | 38 | 32 | 34 | 28 | 32 | 34 | 35 | 28 | 36 | 33.1 |

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

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

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

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

Conducted February 3-10, 2004 using effluent from UV Treated Outfall 101.

| Test Solutions (% Effluent) | Percent Surviving (time interval used – days) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Control | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 10.98% | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 22.0% | 100 | 100 | 98 | 98 | 98 | 98 | 98 |
| 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 | 98 | 98 | 98 | 98 | 98 |

| Test Solutions (% Effluent) | Mean Dry Weight (mg) (replicate number) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Mean |
| Control | 0.856 | 0.925 | 1.007 | 0.924 | 0.928 |
| 10.98% | 0.776 | 0.812 | 0.866 | 1.053 | 0.877 |
| 22.0% | 0.942 | 1.061 | 0.939 | 0.832 | 0.944 |
| 43.9% | 0.964 | 0.971 | 0.908 | 0.895 | 0.934 |
| 72.0% | 1.052 | 0.965 | 1.079 | 0.968 | 1.016 |
| 100.0% | 0.973 | 1.020 | 0.952 | 0.983 | 0.982 |
| Intake | 1.068 | 0.903 | 0.980 | 0.916 | 0.967 |

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

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

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

| Species | Date | Time | Duration | Toxicant | Results ($IC_{25}$) |
|---|---|---|---|---|---|
| *Pimephales promelas* | February 3-10, 2004 | 1400 | 7-days | KCl | 655.8 mg/L |
| *Ceriodaphnia dubia* | February 3-10, 2004 | 1127 | 7-days | NaCl | 1063.9 mg/L |

## PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, February 3 - 10, 2004.

| Test | Sample ID | Temperature (°C) | | Dissolved Oxygen (mg/L) | | pH (S.U.) | | Conductance | Alkalinity | Hardness | Total Residual |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | (µmhos/cm) | (mg/L $CaCO_3$) | (mg/L $CaCO_3$) | Chlorine (mg/L) |
| *Pimephales promelas* | Control | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.0<br>7.8 - 8.2 | 7.8<br>7.5 - 8.0 | 8.10<br>8.02 - 8.21 | 7.87<br>7.73 - 7.96 | 300<br>287 - 307 | 61<br>61 - 62 | 84<br>84 - 84 | -<br>- - |
| | 10.98% | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.2<br>8.0 - 8.3 | 7.9<br>7.6 - 8.1 | 8.11<br>8.03 - 8.17 | 7.85<br>7.69 - 7.94 | 284<br>270 - 302 | -<br>- - | -<br>- - | -<br>- - |
| | 22.0% | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.2<br>8.0 - 8.3 | 7.9<br>7.5 - 8.1 | 8.10<br>8.02 - 8.17 | 7.87<br>7.70 - 7.94 | 273<br>262 - 289 | -<br>- - | -<br>- - | -<br>- - |
| | 43.9% | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.3<br>8.1 - 8.4 | 7.9<br>7.5 - 8.1 | 8.10<br>8.01 - 8.16 | 7.89<br>7.76 - 7.98 | 251<br>240 - 265 | -<br>- - | -<br>- - | -<br>- - |
| | 72.0% | 24.9<br>24.6 - 25.2 | 25.1<br>25.0 - 25.3 | 8.3<br>8.0 - 8.4 | 7.9<br>7.7 - 8.2 | 8.09<br>8.01 - 8.14 | 7.91<br>7.74 - 7.99 | 222<br>216 - 233 | -<br>- - | -<br>- - | -<br>- - |
| | 100.0% | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.3<br>7.9 - 8.5 | 7.9<br>7.4 - 8.2 | 8.09<br>8.02 - 8.13 | 7.94<br>7.82 - 8.05 | 192<br>184 - 198 | 71<br>67 - 73 | 82<br>80 - 84 | <0.10<br><0.10 - <0.10 |
| | Intake | 24.9<br>24.6 - 25.3 | 25.1<br>25.0 - 25.3 | 8.3<br>7.8 - 8.5 | 8.0<br>7.7 - 8.2 | 8.09<br>8.04 - 8.13 | 7.94<br>7.74 - 8.02 | 191<br>179 - 197 | 71<br>68 - 73 | 83<br>80 - 86 | <0.10<br><0.10 - <0.10 |
| *Ceriodaphnia dubia* | Control | 24.8<br>24.4 - 25.3 | 24.6<br>24.5 - 24.7 | 8.0<br>7.8 - 8.2 | 8.0<br>7.7 - 8.2 | 8.10<br>8.02 - 8.21 | 8.02<br>7.96 - 8.11 | 300<br>287 - 307 | 61<br>61 - 62 | 84<br>84 - 84 | -<br>- - |
| | 10.98% | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.2<br>8.0 - 8.3 | 8.0<br>7.7 - 8.3 | 8.11<br>8.03 - 8.17 | 8.01<br>7.92 - 8.10 | 284<br>270 - 302 | -<br>- - | -<br>- - | -<br>- - |
| | 22.0% | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.2<br>8.0 - 8.3 | 8.1<br>7.7 - 8.3 | 8.10<br>8.02 - 8.17 | 8.03<br>7.93 - 8.11 | 273<br>262 - 289 | -<br>- - | -<br>- - | -<br>- - |
| | 43.9% | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.3<br>8.1 - 8.4 | 8.1<br>7.7 - 8.4 | 8.10<br>8.01 - 8.16 | 8.04<br>7.95 - 8.11 | 251<br>240 - 265 | -<br>- - | -<br>- - | -<br>- - |
| | 72.0% | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.3<br>8.0 - 8.4 | 8.1<br>7.7 - 8.4 | 8.09<br>8.01 - 8.14 | 8.07<br>7.96 - 8.13 | 222<br>216 - 233 | -<br>- - | -<br>- - | -<br>- - |
| | 100.0% | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.3<br>7.9 - 8.5 | 8.1<br>7.8 - 8.3 | 8.09<br>8.02 - 8.13 | 8.09<br>8.00 - 8.16 | 192<br>184 - 198 | 71<br>67 - 73 | 82<br>80 - 84 | <0.10<br><0.10 - <0.10 |
| | Intake | 24.8<br>24.5 - 25.3 | 24.6<br>24.5 - 24.7 | 8.3<br>7.8 - 8.5 | 8.1<br>7.8 - 8.4 | 8.09<br>8.04 - 8.13 | 8.09<br>8.00 - 8.16 | 191<br>179 - 197 | 71<br>68 - 73 | 83<br>80 - 86 | <0.10<br><0.10 - <0.10 |

| Overall temperature (°C) | Average | Minimum | Maximum |
|---|---|---|---|
| *Pimephales promelas* | 25.0 | 24.6 | 25.3 |
| *Ceriodaphnia dubia* | 24.7 | 24.4 | 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, February 3 - 10, 2003.

| Test | Sample ID | Temperature (°C) | | Dissolved Oxygen (mg/L) | | pH (S.U.) | | Conductance (µmhos/cm) |
|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | |
| *Pimephales promelas* | Control | 24.9<br>24.6 - 25.3 | 24.9<br>24.8 - 25.2 | 8.1<br>7.8 - 8.3 | 7.8<br>7.5 - 8.0 | 8.08<br>8.03 - 8.14 | 7.86<br>7.65 - 7.94 | 288<br>276 - 309 |
| | 10.98% | 25.0<br>24.6 - 25.4 | 24.9<br>24.8 - 25.2 | 8.2<br>7.9 - 8.4 | 7.8<br>7.6 - 8.0 | 8.08<br>8.04 - 8.14 | 7.85<br>7.68 - 7.93 | 285<br>272 - 303 |
| | 22.0% | 25.0<br>24.6 - 25.4 | 24.9<br>24.8 - 25.2 | 8.2<br>7.9 - 8.4 | 7.8<br>7.6 - 8.0 | 8.08<br>8.04 - 8.15 | 7.87<br>7.81 - 7.94 | 272<br>261 - 289 |
| | 43.9% | 25.0<br>24.6 - 25.4 | 24.9<br>24.8 - 25.2 | 8.2<br>7.9 - 8.3 | 7.8<br>7.3 - 8.1 | 8.08<br>8.03 - 8.14 | 7.87<br>7.67 - 7.93 | 249<br>241 - 262 |
| | 72.0% | 24.9<br>24.6 - 25.3 | 24.9<br>24.8 - 25.2 | 8.1<br>7.9 - 8.3 | 7.9<br>7.7 - 8.1 | 8.07<br>8.03 - 8.13 | 7.92<br>7.79 - 7.97 | 222<br>214 - 232 |
| | 100.0% | 25.0<br>24.6 - 25.4 | 24.9<br>24.8 - 25.2 | 8.2<br>8.0 - 8.4 | 7.9<br>7.6 - 8.1 | 8.07<br>8.03 - 8.13 | 7.92<br>7.66 - 7.98 | 192<br>183 - 199 |
| | Intake | 25.0<br>24.6 - 25.4 | 24.9<br>24.8 - 25.2 | 8.2<br>8.0 - 8.4 | 8.0<br>7.8 - 8.2 | 8.07<br>8.02 - 8.12 | 7.92<br>7.73 - 7.98 | 193<br>182 - 204 |

| Overall temperature (°C) | Average | Minimum | Maximum |
|---|---|---|---|
| *Pimephales promelas* | 24.9 | 24.6 | 25.4 |

## SUMMARY / CONCLUSIONS

Outfall 101 samples collected February 1-6, 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 using EPA Method 170.1.

4. Dissolved oxygen was measured using EPA Method 360.1.

5. The pH was measured EPA Method 150.1.

6. Conductance was measured EPA Method 120.1.

7. Alkalinity was measured using EPA Method 310.1.

8. Total Hardness was measured EPA Method 130.2.

9. Total residual chlorine was measured using EPA Method 330.5.

## QUALITY ASSURANCE

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

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

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1. NPDES Permit No. TN0026450.

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

3. Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

Sequoyah Nuclear Plant Biomonitoring
February 3-10, 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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-February 6, 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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-February 6, 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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-February 6, 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 Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-February 6, 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 | - | - |

Sequoyah Nuclear Plant Biomonitoring
February 3-10, 2004

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen, Ronnie Hankins

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:
& Custody seals intact. Samples received in good condition
Jsumner

| Field Identification / Sample Description | Grab/Comp. | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use Project # 1012 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | Time | | | Yes | If Yes, Inches | No | Trace | ETS Log Number | Arrival Temp (°C) | By | Time | Appearance |
| SQN-101-TOX | Comp | 2/1/04 – 2/2/04 | 0734/0634 | 2(2.5gal) | NA | | | ✓ | | 040202.08 | 1.2°C | HEK | 1453 | |
| SQN-INT-TOX | Comp | 2/1/04 – 2/2/04 | 0719/0619 | 1(2.5 gal) | NA | | | ✓ | | 040202.09 | 1.0°C | HEK | 1453 | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| Wanda Allen Wanda Allen | 2/2/2004 | Express Courier | 2/2/2004 |
| Ronnie Hankins Ronnie Hankins | 0945 | | |
| Express Courier L. R. Stinnett | 2/2/2004 0946 | Express courier - 02-02-04 1453 K Kellenar ETS | 02-02-04 1453 |
| | | | |
| | | | |
| | | | |

Jim Sumner

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

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen, Ronnie Hankins

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:
1 Custody seals intact. Samples received in good condition
J Turner

| Field Identification / Sample Description | Grab/Comp. | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use project 1042 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Date | Time | | | Yes | If Yes, Inches | No | Trace | ETS Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | Comp | 2/3/04 - 2/4/04 | 0347/0747 | 2(2.5gal) | NA | | | ✓ | | 040204.10 | 0.6°C | KEK | 1400 | |
| SQN-INT-TOX | Comp | 2/3/04 – 2/4/04 | 0304/0704 | 1(2.5 gal) | NA | | | ✓ | | 040204.19 | 0.8°C | KEK | 1400 | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| Wanda Allen Wanda Allen | 2/4/2004 | Express Courier | 2/4/2004 |
| Ronnie Hankins Ronnie Hankins | 0939 | L. A. Hunsinger 0940 | |
| Express Courier L. A. Hunsinger | 2/4/2004 1359 | K Kleman ETS | 02-04-04 1400 |
| | | | |
| | | | |
| | | | |

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

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen, Ronnie Hankins

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:

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

| Field Identification / Sample Description | Grab/Comp. | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use Project # 1042 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | — | Date | Time | — | — | Yes | If Yes, Inches | No | Trace | ETS Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | Comp | 2/5/04 -2/6/04 | 0713/0413 | 2(2.5gal) | NA | ✓ | | | | 040206.01 | 0.3°C | JH | 1320 | * see comments |
| SQN-INT-TOX | Comp | 2/5/04 – 2/6/04 | 0733/0633 | 1(2.5 gal) | NA | ✓ | | | | 040206.02 | 0.1°C | JH | 1320 | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| Wanda Allen Wanda Allen | 2/6/2004 | Express Courier | 2/6/2004 |
| Ronnie Hankins Ronnie Hankins | | | |
| Express Courier R. Q. Hankins 120 | 2/6/2004 0846 | R. Q. Hankins 846 | |
| | | JHumner 1320 02-06-04 | |
| | | | |
| | | | |

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

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

Client: TVA
Facility: Sequoyah Nuclear Plant - Non-treated
NPDES #: TN 0026450
Project #: 1042

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 23.5 TO 26-HOURS OLD | Randomizing template: | YELLOW |
| Date and times organisms were born between: | 02-02-04 1100 TO 1330 MST | Incubator number: | 3C |
| Organism source: | ABS BATCH 02-02-04 | *Artemia* lot number: | BS 3010Q |
| Transfer bowl information: | pH = 7.88 Temperature = 24.3 °C | Total drying time: | 24-HOURS |
| | | Date / Time in: 02-10-04 | 1530 |
| Average transfer volume: | 10.4 ml | Date / Time out: 02-11-04 | 1530 |
| | | Oven temperature: | 60C |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Control water batch used HAS | Sample numbers used | Analyst |
|---|---|---|---|---|---|---|---|
| 0 | 02-03-04 | — | 1700 | 1509 | 02-02-04 | 040202.08 / .09 | dl |
| 1 | 02-04-04 | 0951 | 1652 | 1513 | 02-02-04 | 040202.08 / .09 | KEL |
| 2 | 02-05-04 | 0946 | 1659 | 1526 | 02-02-04 | 040204.18 / .19 | KEL |
| 3 | 02-06-04 | 0956 | 1703 | 1502 | 02-02-04 | 040204.18 / .19 | KEL |
| 4 | 02-07-04 | 1002 | 1710 | 1500 | 02-04-04 | 040206.01 / .02 | KEL |
| 5 | 02-08-04 | 1010 | 1646 | 1509 | 02-04-04 | 040206.01 / .02 | KEL |
| 6 | 02-09-04 | 0952 | 1706 | 1502 | 02-06-04 | 040206.01 / .03 | KEL |
| 7 | 02-10-04 | | | 1521 | | | KEL |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % Mortality: | 0% | ≤20% | 7-day $LC_{50}$ | >100% |
| Average weight per initial larvae: | 0.899 | | NOEC | 100% |
| Average weight per surviving larvae: | 0.899 | ≥0.25 mg/larvae | LOEC | >100% |
| | | | ChV | >100% |
| | | | $IC_{25}$ | >100% |

Species: *Pimephales promelas* Date: 02-08-04

Client: TVA / Sequoyah Nuclear Plant
Non-treated

*Survival and Growth Data*

| Day | CONTROL | | | | 10.98% | | | | 22% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) Lt. Purple | 14.054 | 14.809 | 14.837 | 14.388 | 14.927 | 15.144 | 14.801 | 14.592 | 14.523 | 14.980 | 14.553 | 14.494 |
| B = Pan + Larvae weight (mg) | 23.11 | 24.24 | 23.35 | 24.39 | 24.34 | 25.83 | 25.44 | 25.27 | 25.83 | 25.03 | 24.70 | 24.94 |
| Larvae weight (mg) = A – B | 8.454 | 9.371 | 8.513 | 9.602 | 9.419 | 10.686 | 10.639 | 10.678 | 11.307 | 10.050 | 10.147 | 10.446 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.845 | 0.937 | 0.851 | 0.960 | 0.942 | 1.069 | 1.064 | 1.068 | 1.131 | 1.005 | 1.015 | 1.045 |
| Average weight per initial number of larvae (mg) | 0.899 | | | | 1.036 | | | | 1.049 | | | |

% RED = -15.3% % RED = -16.7%

Calculations and data reviewed: JH

*Comments:*

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
Non-treated

Date: 02-03-04

*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 | 9 id | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 7 39 | 10 | 9 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 7 | 10 | 9 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 7 | 10 | 9 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 7 | 10 | 9 | 10 |
| A = Pan weight (mg) | 5.097 | 14.764 | 15.088 | 14.580 | 14.553 | 14.868 | 14.642 | 14.765 | 14.818 | 14.930 | 14.832 | 14.760 |
| B = Pan + Larvae weight (mg) | 24.42 | 25.03 | 25.15 | 24.52 | 24.05 | 25.19 | 24.24 | 24.79 | 24.23 | 26.41 | 24.08 | 23.69 |
| Larvae weight (mg) = A – B | 9.323 | 10.266 | 10.062 | 9.940 | 9.497 | 10.322 | 9.598 | 10.025 | 9.412 | 11.474 | 9.248 | 8.926 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.932 | 1.027 | 1.006 | 0.994 | 0.950 | 1.032 | 0.960 | 1.003 | 0.941 | 1.147 | 0.925 | 0.893 |
| Average weight per initial number of larvae (mg) | 0.990 | | | | 0.986 | | | | 0.977 | | | |

% Red. = -10.2% % Red = -9.7% % Red. = -8.7%

Calculations and data reviewed: dl

Comments: * Organisms in the 100% concentration that died were heavily fungused. Pathogenic growth was observed on the minnows before death.

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
Non-treated

Date: 02-03-04

*Survival and Growth Data*

| Day | 100% Intake | | | |
|---|---|---|---|---|
| | Y | Z | AA | BB |
| 0 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.630 | 15.216 | 14.889 | 14.535 |
| B = Pan + Larvae weight (mg) | 25.22 | 25.79 | 25.79 | 24.79 |
| Larvae weight (mg) = A – B | 10.584 | 10.574 | 10.901 | 10.265 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 1.058 | 1.057 | 1.090 | 1.027 |
| Average weight per initial number of larvae (mg) | 1.058 | | | |

% RED = -17.8%

Calculations and data reviewed: [illegible]

*Comments:*

# Environmental Testing Solutions, Inc.

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

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

**Client:** TVA, Sequoyah Nuclear Plant - Nontreated
**Test dates:** February 3-10, 2004
**Project number:** 1042

Reviewed by: [signature]

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Surviving number of larvae (mg) | Mean weight / Surviving number of larvae (mg) | Coefficient of variation (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 | 14.656 | 23.11 | 8.454 | 0.845 | 0.899 | 6.5 | 0.845 | 100.0 | 0.899 | 6.5 | Not applicable |
| | B | 10 | 10 | 14.869 | 24.24 | 9.371 | 0.937 | | | 0.937 | | | | |
| | C | 10 | 10 | 14.837 | 23.35 | 8.513 | 0.851 | | | 0.851 | | | | |
| | D | 10 | 10 | 14.788 | 24.39 | 9.602 | 0.960 | | | 0.960 | | | | |
| 10.98% | E | 10 | 10 | 14.921 | 24.34 | 9.419 | 0.942 | 1.036 | 6.0 | 0.942 | 100.0 | 1.036 | 6.0 | -15.3 |
| | F | 10 | 10 | 15.144 | 25.83 | 10.686 | 1.069 | | | 1.069 | | | | |
| | G | 10 | 10 | 14.801 | 25.44 | 10.639 | 1.064 | | | 1.064 | | | | |
| | H | 10 | 10 | 14.592 | 25.27 | 10.678 | 1.068 | | | 1.068 | | | | |
| 22% | I | 10 | 10 | 14.523 | 25.83 | 11.307 | 1.131 | 1.049 | 5.5 | 1.131 | 100.0 | 1.049 | 5.5 | -16.7 |
| | J | 10 | 10 | 14.980 | 25.03 | 10.050 | 1.005 | | | 1.005 | | | | |
| | K | 10 | 10 | 14.553 | 24.70 | 10.147 | 1.015 | | | 1.015 | | | | |
| | L | 10 | 10 | 14.494 | 24.94 | 10.446 | 1.045 | | | 1.045 | | | | |
| 43.9% | M | 10 | 10 | 15.097 | 24.42 | 9.323 | 0.932 | 0.990 | 4.1 | 0.932 | 100.0 | 0.990 | 4.1 | -10.2 |
| | N | 10 | 10 | 14.764 | 25.03 | 10.266 | 1.027 | | | 1.027 | | | | |
| | O | 10 | 10 | 15.088 | 25.15 | 10.062 | 1.006 | | | 1.006 | | | | |
| | P | 10 | 10 | 14.580 | 24.52 | 9.940 | 0.994 | | | 0.994 | | | | |
| 72% | Q | 10 | 10 | 14.553 | 24.05 | 9.497 | 0.950 | 0.986 | 3.9 | 0.950 | 100.0 | 0.986 | 3.9 | -9.7 |
| | R | 10 | 10 | 14.868 | 25.19 | 10.322 | 1.032 | | | 1.032 | | | | |
| | S | 10 | 10 | 14.642 | 24.24 | 9.598 | 0.960 | | | 0.960 | | | | |
| | T | 10 | 10 | 14.765 | 24.79 | 10.025 | 1.003 | | | 1.003 | | | | |
| 100% | U | 10 | 7 | 14.818 | 24.23 | 9.412 | 1.345 | 1.103 | 17.4 | 0.941 | 90.0 | 0.977 | 11.8 | -8.7 |
| | V | 10 | 10 | 14.936 | 26.41 | 11.474 | 1.147 | | | 1.147 | | | | |
| | W | 10 | 9 | 14.832 | 24.08 | 9.248 | 1.028 | | | 0.925 | | | | |
| | X | 10 | 10 | 14.764 | 23.69 | 8.926 | 0.893 | | | 0.893 | | | | |
| 100% Intake | Y | 10 | 10 | 14.636 | 25.22 | 10.584 | 1.058 | 1.058 | 2.5 | 1.058 | 100.0 | 1.058 | 2.5 | -17.8 |
| | Z | 10 | 10 | 15.216 | 25.79 | 10.574 | 1.057 | | | 1.057 | | | | |
| | AA | 10 | 10 | 14.889 | 25.79 | 10.901 | 1.090 | | | 1.090 | | | | |
| | BB | 10 | 10 | 14.525 | 24.79 | 10.265 | 1.027 | | | 1.027 | | | | |

**Outfall 101:**
Dunnett's MSD value: 0.1146
PMSD: 12.8

**Intake:**
Dunnett's MSD value: 0.0624
PMSD: 6.9

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Survival**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Outfall 101 Nontreated |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 10.98 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 22 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 43.9 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 72 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 100 | 0.7000 | 1.0000 | 0.9000 | 1.0000 |

| | | | Transform: Arcsin Square Root | | | | | Rank | 1-Tailed |
|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical |
| D-Control | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | | |
| 10.98 | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | 18.00 | 10.00 |
| 22 | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | 18.00 | 10.00 |
| 43.9 | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | 18.00 | 10.00 |
| 72 | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | 18.00 | 10.00 |
| 100 | 0.9000 | 0.9000 | 1.2661 | 0.9912 | 1.4120 | 15.696 | 4 | 14.00 | 10.00 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) | 0.48450965 | 0.884 | -1.8682549 | 10.6517865 |
| Equality of variance cannot be confirmed | | | | |

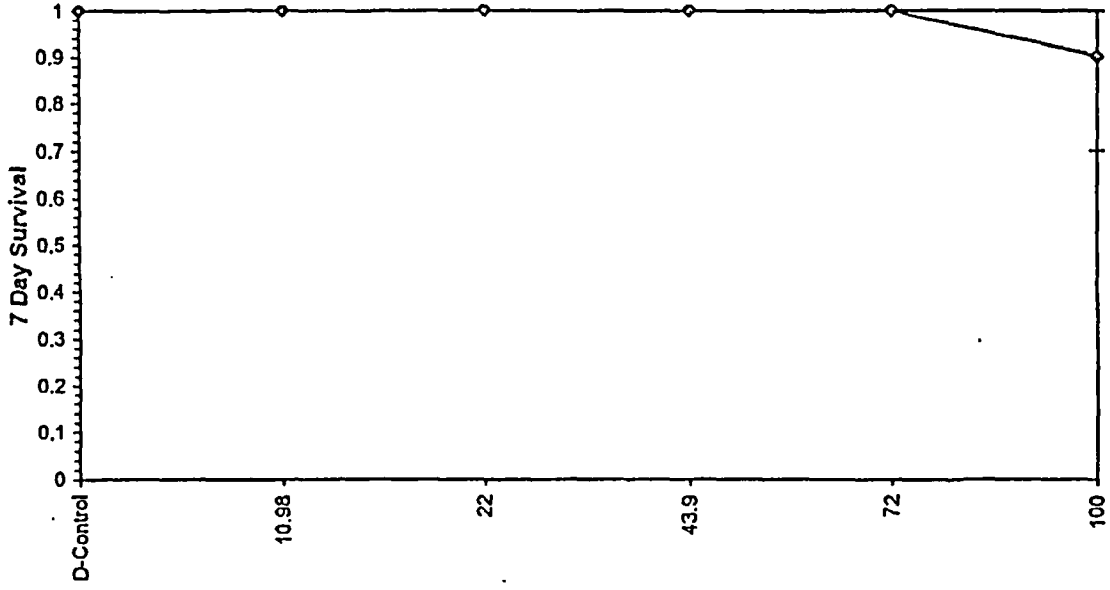
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU |
|---|---|---|---|---|
| Steel's Many-One Rank Test | 100 | >100 | | 1 |
| Treatments vs D-Control | | | | |

*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

## Statistical Analyses

Dose-Response Plot




*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Outfall 101 Nontreated |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.8454 | 0.9371 | 0.8513 | 0.9602 |
| 10.98 | 0.9419 | 1.0686 | 1.0639 | 1.0678 |
| 22 | 1.1307 | 1.0050 | 1.0147 | 1.0446 |
| 43.9 | 0.9323 | 1.0266 | 1.0062 | 0.9940 |
| 72 | 0.9497 | 1.0322 | 0.9598 | 1.0025 |
| 100 | 0.9412 | 1.1474 | 0.9248 | 0.8926 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.8985 | 1.0000 | 0.8985 | 0.8454 | 0.9602 | 6.535 | 4 | | | | 0.9943 | 1.0000 |
| 10.98 | 1.0356 | 1.1525 | 1.0356 | 0.9419 | 1.0686 | 6.032 | 4 | -2.883 | 2.410 | 0.1146 | 0.9943 | 1.0000 |
| 22 | 1.0488 | 1.1672 | 1.0488 | 1.0050 | 1.1307 | 5.452 | 4 | -3.160 | 2.410 | 0.1146 | 0.9943 | 1.0000 |
| 43.9 | 0.9898 | 1.1016 | 0.9898 | 0.9323 | 1.0266 | 4.103 | 4 | -1.920 | 2.410 | 0.1146 | 0.9898 | 0.9955 |
| 72 | 0.9861 | 1.0974 | 0.9861 | 0.9497 | 1.0322 | 3.889 | 4 | -1.841 | 2.410 | 0.1146 | 0.9861 | 0.9917 |
| 100 | 0.9765 | 1.0868 | 0.9765 | 0.8926 | 1.1474 | 11.849 | 4 | -1.641 | 2.410 | 0.1146 | 0.9765 | 0.9821 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.93901283 | 0.884 | 0.86888714 | 1.48343183 |
| Bartlett's Test indicates equal variances (p = 0.45) | 4.75047112 | 15.0862722 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 0.11458425 | 0.12752838 | 0.01127405 | 0.00452112 | 0.06963139 | 5, 18 |
| Treatments vs D-Control | | | | | | | | | | |

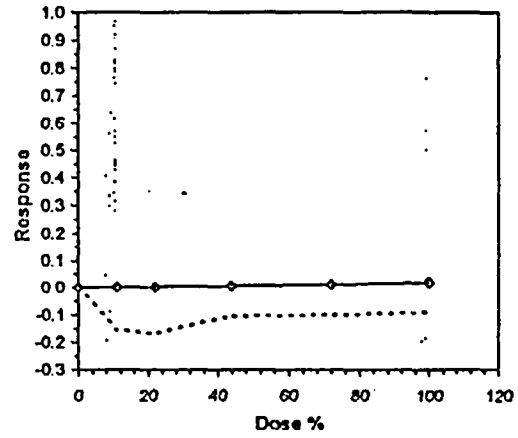
*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

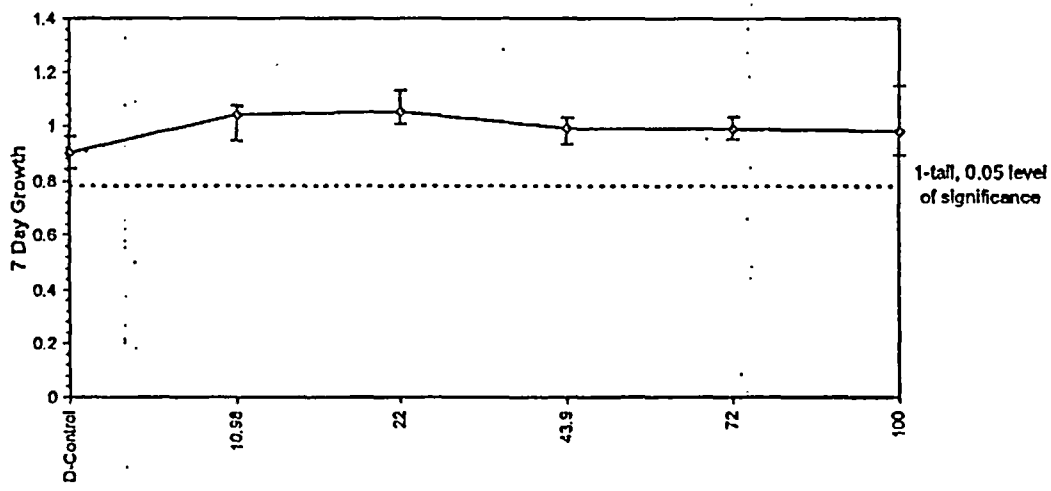
## Statistical Analyses

Linear Interpolation (200 Resamples)

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




Dose-Response Plot




*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Intake Nontreated |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.8454 | 0.9371 | 0.8513 | 0.9602 |
| 100 | 1.0584 | 1.0574 | 1.0901 | 1.0265 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.8985 | 1.0000 | 0.8985 | 0.8454 | 0.9602 | 6.535 | 4 | | | | 0.9783 | 1.0000 |
| 100 | 1.0581 | 1.1776 | 1.0581 | 1.0265 | 1.0901 | 2.454 | 4 | -4.971 | 1.943 | 0.0624 | 0.9783 | 1.0000 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.93903327 | 0.749 | 0.09935192 | -1.4212827 |
| F-Test indicates equal variances (p = 0.21) | 5.11299276 | 47.4672279 | | |

| Hypothesis Test (1-tail, 0.05) | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|
| Homoscedastic t Test indicates no significant differences Treatments vs D-Control | 0.06238244 | 0.06942954 | 0.05094432 | 0.00206124 | 0.00252317 | 1, 6 |

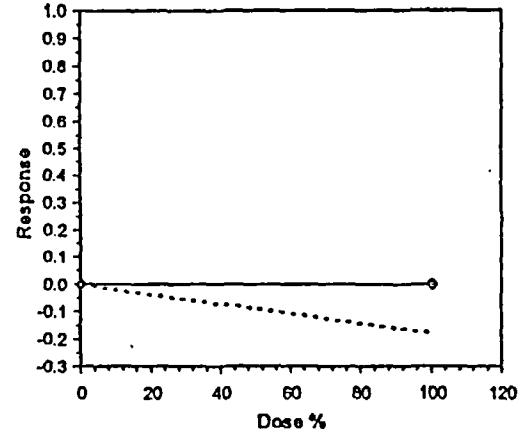
*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

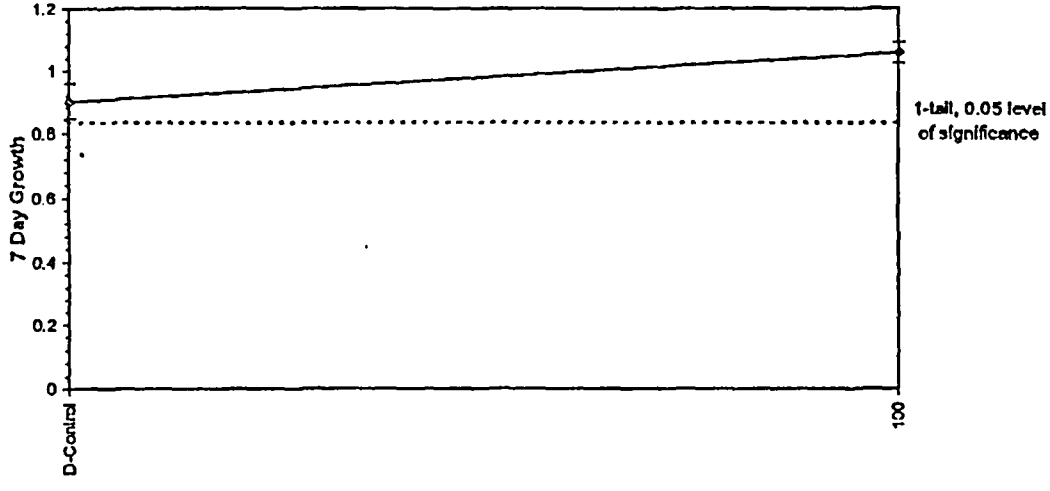
## Statistical Analyses

Linear Interpolation (200 Resamples)

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




Dose-Response Plot




*sqn_02-03-04data*

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

**Client:** TVA
**Facility:** Sequoyah Nuclear Plant - Non-treated
**NPDES #:** TN 0026450
**Project #:** 1042

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | <24-HOURS OLD | Randomizing template: | GREEN |
| Date and times organisms were born between: | 02-03-04 0837 TO 1018 | Incubator number and shelf location: | 2D2 |
| Organism source: | 01-27-04 A-D | YCT batch: ABS | 01-22-04 |
| Transfer bowl information: | pH = 8.11 Temperature = 24.7°C | *Selenastrum* batch: ABS | 01-22-04 |

*Daily renewal information:*

| Day | Date | Test initiation, renewal, or termination time | Control water batch used MHS | Sample numbers used | Analyst |
|---|---|---|---|---|---|
| 0 | 02-03-04 | 1147 | 02-02-04 | 040202.01/.09 | JS |
| 1 | 02-04-04 | 1138 | 02-02-04 | 040202.01/.09 | JS |
| 2 | 02-05-04 | 1120 | 02-02-04 | 040204.18/.19 | JS |
| 3 | 02-06-04 | 1124 | 02-02-04 | 040204.18/.19 | JS |
| 4 | 02-07-04 | 1130 | 02-04-04 | 040206.01/.02 | JS |
| 5 | 02-08-04 | 1113 | 02-04-04 | 040206.01/.02 | JS |
| 6 | 02-~~08~~ 09-04 | 1120 | 02-06-04 | 040206.01/.02 | JS |
| 7 | 02-10-04 | 1150 | | | JS |

| *Control information:* | CONTROL #1 | CONTROL #2 | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|---|
| % of Male Adults: | 0% | 0% | ≤ 20% | 7-day LC50 | >100% |
| % Adults having 3rd Broods: | 100% | 100% | ≥ 80% | NOEC | 100% |
| % Mortality: | 0% | 0% | ≤ 20% | LOEC | >100% |
| Mean Offspring/Female: | 30.0 | 31.5 | ≥ 15.0 offspring/female | ChV | >100% |
| % CV: | 7.2% | 5.2% | < 40.0 % | IC25 | >100% |

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant – Non-treated Date: 02-03-04

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 | 4 | 4 | 4 | 4 | 0 | 0 | 5 | 6 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 0 | 0 | 4 | 6 | 0 | 0 | 5 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 12 | 10 | 11 | 11 | 12 | 10 | 10 | 10 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 16 | 16 | 13 | 13 | 16 | 15 | 12 | 16 | 15 | 15 |
| Total young produced | | 31 | 32 | 27 | 28 | 31 | 33 | 27 | 32 | 30 | 29 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |
| X for 3rd Broods | | X | X | X | X | X | X | X | X | X | X |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 30.0 |

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 | 5 | 0 | 5 | 5 | 4 | 6 | 4 | 5 | 4 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 12 | 11 | 10 | 10 | 12 | 10 | 11 | 13 | 10 | 12 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | *1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 15 | 18 | 17 | 13 | 15 | 16 | 15 | 16 | 16 | 16 |
| Total young produced | | 32 | 34 | 32 | 28 | 31 | 32 | 30 | 34 | 30 | 32 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

* CARRY OVER

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 31.5 |
| % Reduction from Control: | -5.0% |

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant – Non-treated Date: 02-03.04

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 | 4 | 5 | 0 | 6 | 5 | 6 | 4 | 5 | 5 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 13 | 12 | 10 | 13 | 12 | 14 | 11 | 11 | 10 | 12 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 18 | 14 | 17 | 17 | 16 | 19 | 19 | 18 | 14 | 17 |
| Total young produced | | 35 | 31 | 33 | 36 | 33 | 39 | 34 | 34 | 29 | 34 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 33.8 |
| % Reduction from Control: | -12.7% |

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 | 6 | 0 | 6 | 0 | 4 | 5 | 5 | 4 | 5 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 13 | 10 | 14 | 10 | 11 | 13 | 10 | 10 | 12 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 17 | 16 | 20 | 16 | 18 | 17 | 17 | 17 | 16 | 19 |
| Total young produced | | 36 | 31 | 40 | 31 | 33 | 35 | 32 | 31 | 33 | 34 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 33.6 |
| % Reduction from Control: | -12.0% |

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-03-04

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 | 5 | 5 | 0 | 6 | 0 | 5 | 6 | 5 | 4 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 5 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 10 | 10 | 12 | 14 | 12 | 12 | 12 | 10 | 13 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 18 | 14 | 14 | 19 | 16 | 18 | 18 | 20 | 15 | 17 |
| Total young produced | | 34 | 29 | 29 | 37 | 36 | 35 | 36 | 37 | 29 | 34 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 33.6 |
| % Reduction from Control: | -12.0% |

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 | 5 | 4 | 0 | 5 | 4 | 4 | 0 | 4 | 5 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | *1 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 12 | 12 | 14 | 15 | 13 | 14 | 13 | 10 | 12 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 16 | 15 | 15 | 17 | 17 | 15 | 20 | 18 | 19 | 16 |
| Total young produced | | 31 | 32 | 31 | 36 | 36 | 32 | 38 | 35 | 34 | 33 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

* carry over

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 33.8 |
| % Reduction from Control: | -12.7% |

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-03-04

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 | 5 | 0 | 5 | 4 | 5 | 4 | 4 | 4 | 3 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 12 | 12 | 10 | 10 | 11 | 12 | 11 | 10 | 10 | 12 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | *2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 16 | 16 | 17 | 16 | 17 | 18 | 14 | 16 | 17 | 14 |
| Total young produced | | 33 | 32 | 32 | 32 | 33 | 34 | 29 | 30 | 30 | 30 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

* SPLIT BROOD

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 31.5 |
| % Reduction from Control: | NA |

CONC: 100% Intake *Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 5 | 5 | 5 | 0 | 4 | 5 | 4 | 4 | 3 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 14 | 12 | 12 | 10 | 10 | 14 | 13 | 10 | 11 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | *1 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 18 | 19 | 15 | 18 | 14 | 17 | 16 | 18 | 15 | 19 |
| Total young produced | | 34 | 38 | 32 | 34 | 28 | 32 | 34 | 35 | 28 | 36 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

* CARRY OVER

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 33.1 |
| % Reduction from Control: | -5.1% |

# Environmental Testing Solutions, Inc.

## Verification of *Ceriodaphnia* Reproduction Totals

### Control-1

| Day | Replicate number | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 4 | 4 | 4 | 4 | 0 | 0 | 5 | 6 | 0 | 0 | 27 |
| 4 | 0 | 0 | 0 | 0 | 4 | 6 | 0 | 0 | 5 | 4 | 19 |
| 5 | 11 | 12 | 10 | 11 | 11 | 12 | 10 | 10 | 10 | 10 | 107 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 16 | 16 | 13 | 13 | 16 | 15 | 12 | 16 | 15 | 15 | 147 |
| Total | 31 | 32 | 27 | 28 | 31 | 33 | 27 | 32 | 30 | 29 | 300 |

### 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 | 5 | 5 | 0 | 6 | 0 | 5 | 6 | 5 | 4 | 4 | 40 |
| 4 | 0 | 0 | 5 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 11 |
| 5 | 11 | 10 | 10 | 12 | 14 | 12 | 12 | 12 | 10 | 13 | 116 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 18 | 14 | 14 | 19 | 16 | 18 | 18 | 20 | 15 | 17 | 169 |
| Total | 34 | 29 | 29 | 37 | 36 | 35 | 36 | 37 | 29 | 34 | 336 |

### 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 | 5 | 0 | 5 | 5 | 4 | 6 | 4 | 5 | 4 | 4 | 42 |
| 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5 | 12 | 11 | 10 | 10 | 12 | 10 | 11 | 13 | 10 | 12 | 111 |
| 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7 | 15 | 18 | 17 | 13 | 15 | 16 | 15 | 16 | 16 | 16 | 157 |
| Total | 32 | 34 | 32 | 28 | 31 | 32 | 30 | 34 | 30 | 32 | 315 |

### 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 | 5 | 4 | 0 | 5 | 4 | 4 | 0 | 4 | 5 | 5 | 36 |
| 4 | 0 | 1 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 9 |
| 5 | 10 | 12 | 12 | 14 | 15 | 13 | 14 | 13 | 10 | 12 | 125 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 16 | 15 | 15 | 17 | 17 | 15 | 20 | 18 | 19 | 16 | 168 |
| Total | 31 | 32 | 31 | 36 | 36 | 32 | 38 | 35 | 34 | 33 | 338 |

### 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 | 4 | 5 | 0 | 6 | 5 | 6 | 4 | 5 | 5 | 0 | 40 |
| 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 11 |
| 5 | 13 | 12 | 10 | 13 | 12 | 14 | 11 | 11 | 10 | 12 | 118 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 18 | 14 | 17 | 17 | 16 | 19 | 19 | 18 | 14 | 17 | 169 |
| Total | 35 | 31 | 33 | 36 | 33 | 39 | 34 | 34 | 29 | 34 | 338 |

### 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 | 5 | 0 | 5 | 4 | 5 | 4 | 4 | 4 | 3 | 0 | 34 |
| 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 |
| 5 | 12 | 12 | 10 | 10 | 11 | 12 | 11 | 10 | 10 | 12 | 110 |
| 6 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7 | 16 | 16 | 17 | 16 | 17 | 18 | 14 | 16 | 17 | 14 | 161 |
| Total | 33 | 32 | 32 | 32 | 33 | 34 | 29 | 30 | 30 | 30 | 315 |

### 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 | 6 | 0 | 6 | 0 | 4 | 5 | 5 | 4 | 5 | 5 | 40 |
| 4 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| 5 | 13 | 10 | 14 | 10 | 11 | 13 | 10 | 10 | 12 | 10 | 113 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 17 | 16 | 20 | 16 | 18 | 17 | 17 | 17 | 16 | 19 | 173 |
| Total | 36 | 31 | 40 | 31 | 33 | 35 | 32 | 31 | 33 | 34 | 336 |

### 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 | 5 | 5 | 5 | 0 | 4 | 5 | 4 | 4 | 3 | 0 | 35 |
| 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 5 | 9 |
| 5 | 11 | 14 | 12 | 12 | 10 | 10 | 14 | 13 | 10 | 11 | 117 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 7 | 18 | 19 | 15 | 18 | 14 | 17 | 16 | 18 | 15 | 19 | 169 |
| Total | 34 | 38 | 32 | 34 | 28 | 32 | 34 | 35 | 28 | 36 | 331 |

# Environmental Testing Solutions, Inc.

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

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

**Client:** TVA Sequoyah Nuclear Plant, Nontreated
**Test dates:** February 3-10, 2004
**Project number:** 1042

Revelwed by: [signature]

| Concentration (%) | Replicate number | | | | | | | | | | Survival (%) | Average reproduction (offspring/female) | Coefficient of variation (%) | Percent reduction from pooled controls (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | |
| Control - 1 | 31 | 32 | 27 | 28 | 31 | 33 | 27 | 32 | 30 | 29 | 100 | 30.0 | 7.2 | Not applicable |
| 10.98% | 32 | 34 | 32 | 28 | 31 | 32 | 30 | 34 | 30 | 32 | 100 | 31.5 | 5.8 | -5.0 |
| 22% | 35 | 31 | 33 | 36 | 33 | 39 | 34 | 34 | 29 | 34 | 100 | 33.8 | 8.0 | -12.7 |
| 43.9% | 36 | 31 | 40 | 31 | 33 | 35 | 32 | 31 | 33 | 34 | 100 | 33.6 | 8.4 | -12.0 |
| 72% | 34 | 29 | 29 | 37 | 36 | 35 | 36 | 37 | 29 | 34 | 100 | 33.6 | 9.9 | -12.0 |
| 100% | 31 | 32 | 31 | 36 | 36 | 32 | 38 | 35 | 34 | 33 | 100 | 33.8 | 7.1 | -12.7 |
| Control - 2 | 33 | 32 | 32 | 32 | 33 | 34 | 29 | 30 | 30 | 30 | 100 | 31.5 | 5.2 | Not applicable |
| 100% Intake | 34 | 38 | 32 | 34 | 28 | 32 | 34 | 35 | 28 | 36 | 100 | 33.1 | 9.7 | -5.1 |

**Outfall 101:**
**Dunnett's MSD value:** 2.650
**PMSD:** 8.8

**Intake:**
**Dunnett's MSD value:** 1.981
**PMSD:** 6.3

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.1% from the control.

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

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

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

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

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | CdFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Outfall 101 Nontreated |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | CD-Ceriodaphnia dubia |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 31.000 | 32.000 | 27.000 | 28.000 | 31.000 | 33.000 | 27.000 | 32.000 | 30.000 | 29.000 |
| 10.98 | 32.000 | 34.000 | 32.000 | 28.000 | 31.000 | 32.000 | 30.000 | 34.000 | 30.000 | 32.000 |
| 22 | 35.000 | 31.000 | 33.000 | 36.000 | 33.000 | 39.000 | 34.000 | 34.000 | 29.000 | 34.000 |
| 43.9 | 36.000 | 31.000 | 40.000 | 31.000 | 33.000 | 35.000 | 32.000 | 31.000 | 33.000 | 34.000 |
| 72 | 34.000 | 29.000 | 29.000 | 37.000 | 36.000 | 35.000 | 36.000 | 37.000 | 29.000 | 34.000 |
| 100 | 31.000 | 32.000 | 31.000 | 36.000 | 36.000 | 32.000 | 38.000 | 35.000 | 34.000 | 33.000 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 30.000 | 1.0000 | 30.000 | 27.000 | 33.000 | 7.201 | 10 | | | | 32.717 | 1.0000 |
| 10.98 | 31.500 | 1.0500 | 31.500 | 28.000 | 34.000 | 5.844 | 10 | -1.295 | 2.287 | 2.650 | 32.717 | 1.0000 |
| 22 | 33.800 | 1.1267 | 33.800 | 29.000 | 39.000 | 7.988 | 10 | -3.280 | 2.287 | 2.650 | 32.717 | 1.0000 |
| 43.9 | 33.600 | 1.1200 | 33.600 | 31.000 | 40.000 | 8.441 | 10 | -3.107 | 2.287 | 2.650 | 32.717 | 1.0000 |
| 72 | 33.600 | 1.1200 | 33.600 | 29.000 | 37.000 | 9.940 | 10 | -3.107 | 2.287 | 2.650 | 32.717 | 1.0000 |
| 100 | 33.800 | 1.1267 | 33.800 | 31.000 | 38.000 | 7.084 | 10 | -3.280 | 2.287 | 2.650 | 32.717 | 1.0000 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates normal distribution (p > 0.01) | 0.6445598 | 1.035 | 0.07266985 | -0.2130522 |
| Bartlett's Test indicates equal variances (p = 0.59) | 3.74186516 | 15.0862722 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 2.64956744 | 0.08831891 | 25.5366667 | 6.71296296 | 0.00503867 | 5, 54 |
| Treatments vs D-Control | | | | | | | | | | |

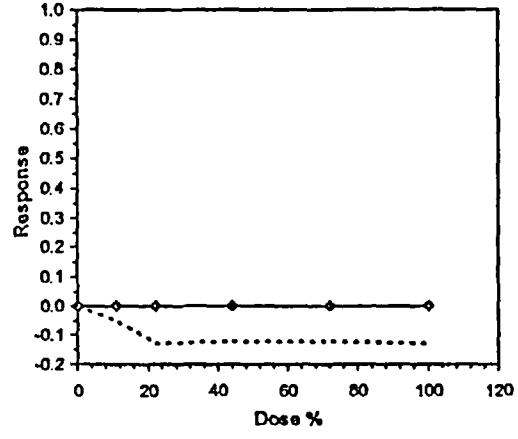
*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

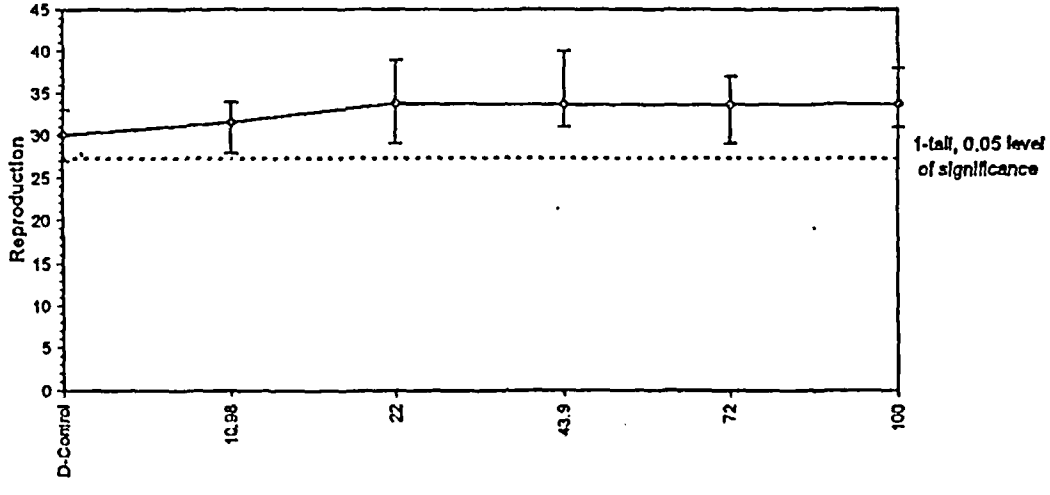
## Statistical Analyses

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




*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | CdFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Intake Nontreated |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | CD-Ceriodaphnia dubia |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 33.000 | 32.000 | 32.000 | 32.000 | 33.000 | 34.000 | 29.000 | 30.000 | 30.000 | 30.000 |
| 100 | 34.000 | 38.000 | 32.000 | 34.000 | 28.000 | 32.000 | 34.000 | 35.000 | 28.000 | 36.000 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 31.500 | 1.0000 | 31.500 | 29.000 | 34.000 | 5.238 | 10 | | | | 32.300 | 1.0000 |
| 100 | 33.100 | 1.0508 | 33.100 | 28.000 | 38.000 | 9.706 | 10 | -1.401 | 1.734 | 1.981 | 32.300 | 1.0000 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.95019853 | 0.868 | -0.4564349 | 0.47545684 |
| F-Test indicates equal variances (p = 0.06) | 3.79183674 | 6.54108953 | | |

| Hypothesis Test (1-tail, 0.05) | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|
| Homoscedastic t Test indicates no significant differences Treatments vs D-Control | 1.98051357 | 0.06287345 | 12.8 | 6.52222222 | 0.17824842 | 1, 18 |

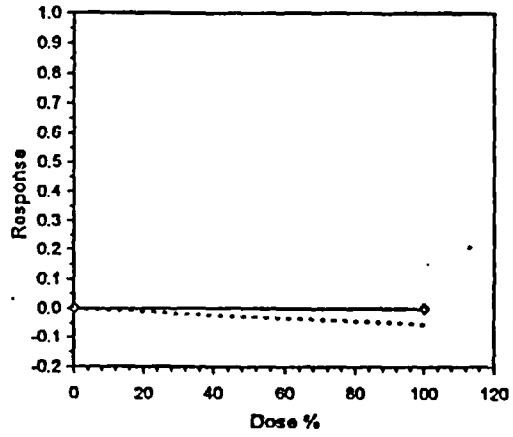
*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

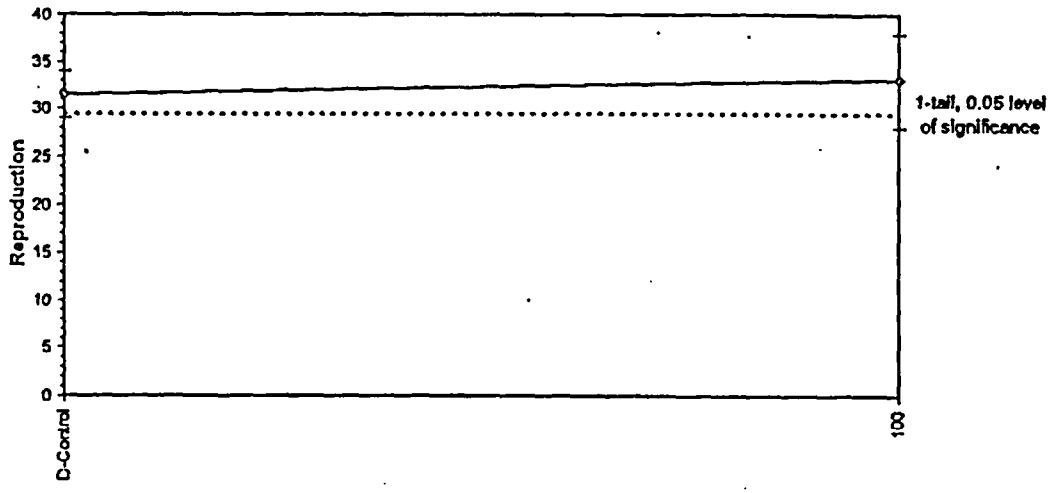
## Statistical Analyses

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




*sqn_02-03-04data*

# 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 #:** 1042

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 23.25 TO 25.75 - HOURS OLD | Randomizing template: | BLUE |
| Date and times organisms were born between: | 02-02-04 1100 TO 1330 MST | Incubator number: | 3B |
| Organism source: | ABS 02-02-04 | *Artemia* lot number: | B630100 |
| Transfer bowl information: | pH = 7.88 Temperature = 24.3 °C | Total drying time: | 24 HOURS |
| | | Date / Time in: 02-10-04 | 1530 |
| Average transfer volume: | 10.4 ml | Date / Time out: 02-11-04 | 1530 |
| | | Oven temperature: | 60°C |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Control water batch used MHS | Sample numbers used | Analyst |
|---|---|---|---|---|---|---|---|
| 0 | 02.03.04 | — | 1700 | 1446 | 02-02-04 | 040202.08/.09 | JF |
| 1 | 02.04.04 | 0951 | 1652 | 1441 | 02-02-04 | 040202.08/.09 | KEK |
| 2 | 02.05.04 | 0946 | 1659 | 1447 | 02-02-04 | 040204.18/.19 | KEK |
| 3 | 02-06.04 | 0956 | 1703 | 1456 | 02-02-04 | 040204.18/.19 | KEK |
| 4 | 02-07.04 | 1002 | 1710 | 1433 | 02.04.04 | 040206.01/.02 | KEK |
| 5 | 02-08.04 | 1010 | 1646 | 1449 | 02.04.04 | 040206.01/.02 | KEK |
| 6 | 02-09.04 | 0952 | 1706 | ~~1507~~ 1441 | 02-06-04 | 040206.01/.02 | KEK |
| 7 | 02-10.04 | | | 1453 | | | KEK |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % Mortality: | 0% | ≤ 20% | 7-day $LC_{50}$ | >100% |
| Average weight per initial larvae: | 0.928 | | NOEC | 100% |
| Average weight per surviving larvae: | 0.928 | ≥ 0.25 mg/larvae | LOEC | >100% |
| | | | ChV | >100% |
| | | | $IC_{25}$ | >100% |

Species: *Pimephales promelas* Date: 02-03-04

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 | 9[1d] | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| A = Pan weight (mg) KEK Blue | 5.116 | 14.861 | 14.992 | 14.683 | 14.806 | 14.643 | 15.076 | 14.654 | 14.527 | 14.667 | 14.996 | 14.796 |
| B = Pan + Larvae weight (mg) CAJ | 23.68 | 24.11 | 26.06 | 23.93 | 22.57 | 22.76 | 23.69 | 25.18 | 23.95 | 25.28 | 24.39 | 23.12 |
| Larvae weight (mg) = A – B | 8.564 | 9.249 | 10.068 | 9.237 | 7.764 | 8.117 | 8.664 | 10.526 | 9.423 | 10.613 | 9.394 | 8.324 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.856 | 0.925 | 1.007 | 0.924 | 0.776 | 0.812 | 0.866 | 1.053 | 0.942 | 1.061 | 0.939 | 0.832 |
| Average weight per initial number of larvae (mg) | 0.928 | | | | 0.877 | | | | 0.944 | | | |

% Red. = 5.5% % Red. = 1.7%

Calculations and data reviewed: JL

*Comments:*

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
UV-treated

Date: 02-05-04

*Survival and Growth Data*

| Day | 43.9% | | | | 72% | | | | 100% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | N | O | P | Q | R | S | T | U | V | W | X |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.632 | 15.149 | 14.593 | 14.864 | 14.999 | 14.576 | 15.029 | 14.525 | 15.048 | 14.873 | 14.734 | 14.918 |
| B = Pan + Larvae weight (mg) | 24.27 | 24.86 | 23.67 | 23.81 | 25.52 | 24.23 | 25.82 | 24.20 | 24.78 | 25.07 | 24.25 | 24.75 |
| Larvae weight (mg) = A – B | 9.638 | 9.711 | 9.077 | 8.946 | 10.521 | 9.654 | 10.791 | 9.675 | 9.732 | 10.197 | 9.516 | 9.832 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.964 | 0.971 | 0.908 | 0.895 | 1.052 | 0.965 | 1.079 | 0.968 | 0.973 | 1.020 | 0.952 | 0.983 |
| Average weight per initial number of larvae (mg) | 0.934 | | | | 1.016 | | | | 0.982 | | | |

% RED = -0.7% % RED. = -9.5% % RED. = -5.8%

Calculations and data reviewed: dl

*Comments:*

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
UV-treated

Date: 02-03-04

*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 | 9 1d |
| 4 | 10 | 10 | 10 | 9 |
| 5 | 10 | 10 | 10 | 9 |
| 6 | 10 | 10 | 10 | 9 |
| 7 | 10 | 10 | 10 | 9 |
| A = Pan weight (mg) | 15.056 | 14.607 | 14.822 | 14.486 |
| B = Pan + Larvae weight (mg) | 25.74 | 23.64 | 24.62 | 23.65 |
| Larvae weight (mg) = A – B | 10.684 | 9.033 | ~~9.74~~ 9.798 | 9.164 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 1.068 | 0.903 | 0.980 | 0.916 |
| Average weight per initial number of larvae (mg) | 0.967 | | | |

% RED. = -4.2%

Calculations and data reviewed: JH

*Comments:*

# Environmental Testing Solutions, Inc.

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

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

**Client:** TVA, Sequoyah Nuclear Plant - UV treated
**Test dates:** February 3-10, 2004
**Project number:** 1042

Reviewed by: [signature]

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Surviving number of larvae (mg) | Mean weight / Surviving number of larvae (mg) | Coefficient of variation (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 | 15.116 | 23.68 | 8.564 | 0.856 | 0.928 | 6.6 | 0.856 | 100.0 | 0.928 | 6.6 | Not applicable |
| | B | 10 | 10 | 14.861 | 24.11 | 9.249 | 0.925 | | | 0.925 | | | | |
| | C | 10 | 10 | 14.992 | 25.06 | 10.068 | 1.007 | | | 1.007 | | | | |
| | D | 10 | 10 | 14.693 | 23.93 | 9.237 | 0.924 | | | 0.924 | | | | |
| 16.98% | E | 10 | 10 | 14.806 | 22.57 | 7.764 | 0.776 | 0.877 | 14.0 | 0.776 | 100.0 | 0.877 | 14.0 | 5.5 |
| | F | 10 | 10 | 14.643 | 22.76 | 8.117 | 0.812 | | | 0.812 | | | | |
| | G | 10 | 10 | 15.026 | 23.69 | 8.664 | 0.866 | | | 0.866 | | | | |
| | H | 10 | 10 | 14.654 | 25.18 | 10.526 | 1.053 | | | 1.053 | | | | |
| 22% | I | 10 | 9 | 14.527 | 23.95 | 9.423 | 1.047 | 0.970 | 11.0 | 0.942 | 97.5 | 0.944 | 9.9 | -1.7 |
| | J | 10 | 10 | 14.667 | 25.28 | 10.613 | 1.061 | | | 1.061 | | | | |
| | K | 10 | 10 | 14.996 | 24.39 | 9.394 | 0.939 | | | 0.939 | | | | |
| | L | 10 | 10 | 14.796 | 23.12 | 8.324 | 0.832 | | | 0.832 | | | | |
| 43.9% | M | 10 | 10 | 14.632 | 24.27 | 9.638 | 0.964 | 0.934 | 4.1 | 0.964 | 100.0 | 0.934 | 4.1 | -0.7 |
| | N | 10 | 10 | 15.149 | 24.86 | 9.711 | 0.971 | | | 0.971 | | | | |
| | O | 10 | 10 | 14.593 | 23.67 | 9.077 | 0.908 | | | 0.908 | | | | |
| | P | 10 | 10 | 14.864 | 23.81 | 8.946 | 0.895 | | | 0.895 | | | | |
| 72% | Q | 10 | 10 | 14.999 | 25.52 | 10.521 | 1.052 | 1.016 | 5.7 | 1.052 | 100.0 | 1.016 | 5.7 | -9.5 |
| | R | 10 | 10 | 14.576 | 24.23 | 9.654 | 0.965 | | | 0.965 | | | | |
| | S | 10 | 10 | 15.029 | 25.82 | 10.791 | 1.079 | | | 1.079 | | | | |
| | T | 10 | 10 | 14.525 | 24.20 | 9.675 | 0.968 | | | 0.968 | | | | |
| 100% | U | 10 | 10 | 15.048 | 24.78 | 9.732 | 0.973 | 0.982 | 2.9 | 0.973 | 100.0 | 0.982 | 2.9 | -5.8 |
| | V | 10 | 10 | 14.873 | 25.07 | 10.197 | 1.020 | | | 1.020 | | | | |
| | W | 10 | 10 | 14.734 | 24.25 | 9.516 | 0.952 | | | 0.952 | | | | |
| | X | 10 | 10 | 14.918 | 24.75 | 9.832 | 0.983 | | | 0.983 | | | | |
| 100% Intake | Y | 10 | 10 | 15.056 | 25.74 | 10.684 | 1.068 | 0.992 | 7.0 | 1.068 | 97.5 | 0.967 | 7.8 | -4.2 |
| | Z | 10 | 10 | 14.607 | 23.64 | 9.033 | 0.903 | | | 0.903 | | | | |
| | AA | 10 | 10 | 14.822 | 24.62 | 9.798 | 0.980 | | | 0.980 | | | | |
| | BB | 10 | 9 | 14.486 | 23.65 | 9.164 | 1.018 | | | 0.916 | | | | |

**Outfall 101:**
Dunnett's MSD value: 0.1271
PMSD: 13.7

**Intake:**
Dunnett's MSD value: 0.0945
PMSD: 10.2

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 *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPFRCR | Sample ID: | TVA/Sequoyah Nuclear Plant - Outfall 101 UV-treatec |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.8564 | 0.9249 | 1.0068 | 0.9237 |
| 10.98 | 0.7764 | 0.8117 | 0.8664 | 1.0526 |
| 22 | 0.9423 | 1.0613 | 0.9394 | 0.8324 |
| 43.9 | 0.9638 | 0.9711 | 0.9077 | 0.8946 |
| 72 | 1.0521 | 0.9654 | 1.0791 | 0.9675 |
| 100 | 0.9732 | 1.0197 | 0.9516 | 0.9832 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.9280 | 1.0000 | 0.9280 | 0.8564 | 1.0068 | 6.633 | 4 | | | | 0.9468 | 1.0000 |
| 10.98 | 0.8768 | 0.9449 | 0.8768 | 0.7764 | 1.0526 | 14.020 | 4 | 0.971 | 2.410 | 0.1271 | 0.9468 | 1.0000 |
| 22 | 0.9439 | 1.0171 | 0.9439 | 0.8324 | 1.0613 | 9.908 | 4 | -0.302 | 2.410 | 0.1271 | 0.9468 | 1.0000 |
| 43.9 | 0.9343 | 1.0068 | 0.9343 | 0.8946 | 0.9711 | 4.149 | 4 | -0.120 | 2.410 | 0.1271 | 0.9468 | 1.0000 |
| 72 | 1.0160 | 1.0949 | 1.0160 | 0.9654 | 1.0791 | 5.738 | 4 | -1.671 | 2.410 | 0.1271 | 0.9468 | 1.0000 |
| 100 | 0.9819 | 1.0582 | 0.9819 | 0.9516 | 1.0197 | 2.895 | 4 | -1.024 | 2.410 | 0.1271 | 0.9468 | 1.0000 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.95740587 | 0.884 | 0.75709063 | 1.10743652 |
| Bartlett's Test indicates equal variances (p = 0.22) | 7.06173706 | 15.0862722 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 0.12705863 | 0.13692401 | 0.00915971 | 0.0055591 | 0.19831203 | 5, 18 |
| Treatments vs D-Control | | | | | | | | | | |

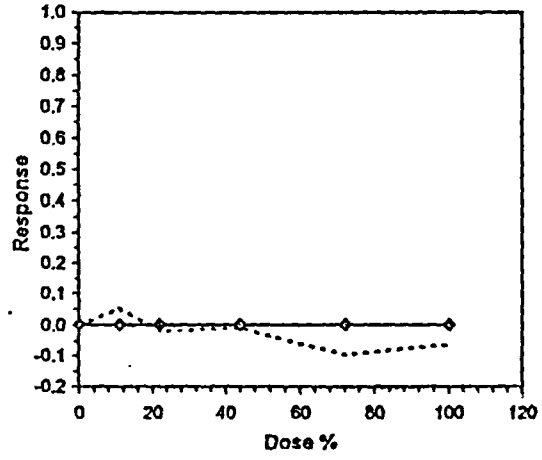
*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

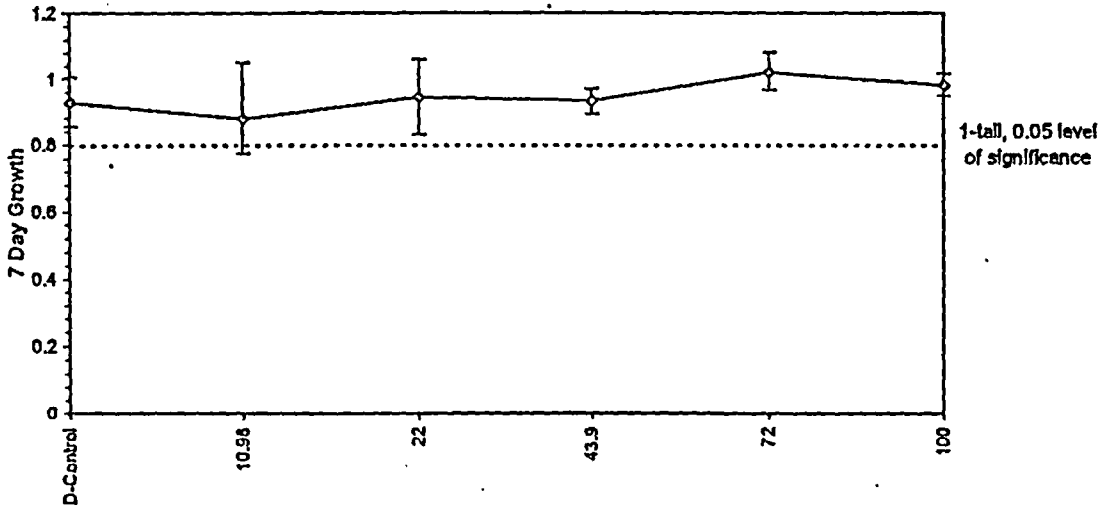
## Statistical Analyses

Linear Interpolation (200 Resamples)

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




Dose-Response Plot




*sqn_02-03-04data*

# Environmental Testing Solutions, Inc.

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

### Daily Chemical Analyses

**Client:** Sequoyah Nuclear Plant Non-Treated

**Test dates:** February 03 - 10, 2004

**Project number:** 1042

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) | 8.09 | 7.88 | 8.02 | 7.94 | 8.05 | 7.96 | 8.12 | 7.80 | 8.11 | 7.96 | 8.21 | 7.81 | 8.10 | 7.73 |
| | DO (mg/L) | 8.1 | 8.0 | 8.0 | 7.8 | 8.2 | 7.8 | 7.9 | 7.7 | 8.2 | 7.9 | 7.8 | 7.5 | 7.8 | 7.8 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg/L $CaCO_3$) | 61 | | | | | | | | 62 | | | | 61 | |
| | Hardness (mg/L $CaCO_3$) | 84 | | | | | | | | 84 | | | | 84 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 10.98% | pH (SU) | 8.13 | 7.83 | 8.11 | 7.90 | 8.03 | 7.94 | 8.09 | 7.91 | 8.09 | 7.93 | 8.17 | 7.78 | 8.12 | 7.69 |
| | DO (mg/L) | 8.3 | 8.1 | 8.3 | 7.8 | 8.1 | 7.9 | 8.0 | 8.1 | 8.2 | 8.0 | 8.1 | 7.6 | 8.2 | 7.9 |
| | Conductivity (µmhos/cm) | 278 | | 279 | | 302 | | 282 | | 294 | | 283 | | 270 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 22% | pH (SU) | 8.11 | 7.93 | 8.11 | 7.89 | 8.02 | 7.94 | 8.09 | 7.91 | 8.08 | 7.93 | 8.17 | 7.77 | 8.13 | 7.70 |
| | DO (mg/L) | 8.3 | 8.1 | 8.3 | 7.9 | 8.1 | 7.8 | 8.0 | 7.9 | 8.3 | 7.9 | 8.1 | 7.5 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 270 | | 275 | | 289 | | 263 | | 278 | | 271 | | 262 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 43.9% | pH (SU) | 8.11 | 7.98 | 8.11 | 7.88 | 8.01 | 7.91 | 8.09 | 7.93 | 8.08 | 7.91 | 8.16 | 7.85 | 8.11 | 7.76 |
| | DO (mg/L) | 8.4 | 8.1 | 8.4 | 7.9 | 8.1 | 7.8 | 8.1 | 7.9 | 8.2 | 7.8 | 8.2 | 7.5 | 8.4 | 8.0 |
| | Conductivity (µmhos/cm) | 249 | | 256 | | 265 | | 246 | | 256 | | 243 | | 240 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 72% | pH (SU) | 8.11 | 7.98 | 8.11 | 7.88 | 8.01 | 7.93 | 8.09 | 7.96 | 8.09 | 7.99 | 8.14 | 7.88 | 8.09 | 7.74 |
| | DO (mg/L) | 8.3 | 8.2 | 8.4 | 7.7 | 8.1 | 7.8 | 8.0 | 7.9 | 8.3 | 7.8 | 8.3 | 7.7 | 8.4 | 8.1 |
| | Conductivity (µmhos/cm) | 220 | | 223 | | 233 | | 217 | | 225 | | 217 | | 216 | |
| | Temperature (°C) | 25.2 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 100% | pH (SU) | 8.12 | 8.05 | 8.11 | 7.94 | 8.02 | 7.98 | 8.07 | 8.01 | 8.10 | 7.99 | 8.13 | 7.82 | 8.08 | 7.82 |
| | DO (mg/L) | 8.4 | 8.2 | 8.4 | 7.6 | 7.9 | 8.0 | 8.2 | 8.0 | 8.3 | 7.9 | 8.3 | 7.4 | 8.5 | 8.1 |
| | Conductivity (µmhos/cm) | 192 | | 196 | | 198 | | 184 | | 195 | | 191 | | 189 | |
| | Alkalinity (mg/L $CaCO_3$) | 72 | | | | 67 | | | | 73 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 82 | | | | 80 | | | | 84 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0.10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 100% Intake | pH (SU) | 8.11 | 8.02 | 8.11 | 7.93 | 8.04 | 8.01 | 8.07 | 8.01 | 8.13 | 8.02 | 8.11 | 7.84 | 8.07 | 7.74 |
| | DO (mg/L) | 8.4 | 8.2 | 8.5 | 7.7 | 7.8 | 8.1 | 8.2 | 8.1 | 8.4 | 8.0 | 8.5 | 7.7 | 8.5 | 8.2 |
| | Conductivity (µmhos/cm) | 190 | | 194 | | 197 | | 179 | | 197 | | 190 | | 189 | |
| | Alkalinity (mg/L $CaCO_3$) | 72 | | | | 68 | | | | 73 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 86 | | | | 80 | | | | 84 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0.10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |

Species: *Pimephales promelas* Date: 02-03-04
Client: TVA / Sequoyah Nuclear Plant – Non-treated

*Daily Chemistry:*

| | | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| | Analyst | KEK | CAJ | CAJ | KEK | KEK | CAJ |
| Concentration | Parameter | | | | | | |
| CONTROL | pH (S.U.) | 8.09 | 7.88 | 8.02 | 7.94 | 8.05 | 7.96 |
| | DO (mg/L) | 8.1 | 8.0 | 8.0 | 7.8 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | |
| | Alkalinity (mg $CaCO_3$/L) | 61 | | | | | |
| | Hardness (mg $CaCO_3$/L) | 84 | | | | | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 10.98% | pH (S.U.) | 8.13 | 7.83 | 8.11 | 7.90 | 8.03 | 7.94 |
| | DO (mg/L) | 8.3 | 8.1 | 8.3 | 7.8 | 8.1 | 7.9 |
| | Conductivity (µmhos/cm) | 270 | | 279 | | 302 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 22% | pH (S.U.) | 8.11 | 7.93 | 8.11 | 7.89 | 8.02 | 7.94 |
| | DO (mg/L) | 8.3 | 8.1 | 8.3 | 7.9 | 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 270 | | 275 | | 289 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 43.9% | pH (S.U.) | 8.11 | 7.98 | 8.11 | 7.88 | 8.01 | 7.91 |
| | DO (mg/L) | 8.4 | 8.1 | 8.4 | 7.9 | 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 249 | | 256 | | 265 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 72% | pH (S.U.) | 8.11 | 7.98 | 8.11 | 7.88 | 8.01 | 7.93 |
| | DO (mg/L) | 8.3 | 8.2 | 8.4 | 7.7 | 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 220 | | 223 | | 233 | |
| | Temperature (°C) | 25.2 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 100% | pH (S.U.) | 8.12 | 8.05 | 8.11 | 7.94 | 8.02 | 7.98 |
| | DO (mg/L) | 8.4 | 8.2 | 8.4 | 7.6 | 7.9 | 8.0 |
| | Conductivity (µmhos/cm) | 192 | | 196 | | 198 | |
| | Alkalinity (mg $CaCO_3$/L) | 72 | | | | 67 | |
| | Hardness (mg $CaCO_3$/L) | 82 | | | | 80 | |
| | TR chlorine (mg/L) | <0.10 | | | | <0.10 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| 100% Intake | pH (S.U.) | 8.11 | 8.02 | 8.11 | 7.93 | 8.04 | 8.01 |
| | DO (mg/L) | 8.4 | 8.2 | 8.5 | 7.7 | 7.8 | 8.1 |
| | Conductivity (µmhos/cm) | 190 | | 194 | | 197 | |
| | Alkalinity (mg $CaCO_3$/L) | 72 | | | | 68 | |
| | Hardness (mg $CaCO_3$/L) | 86 | | | | 80 | |
| | TR chlorine (mg/L) | <0.10 | | | | <0.10 | |
| | Temperature (°C) | 25.3 | 25.2 | 24.9 | 25.1 | 25.0 | 25.3 |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Pimephales promelas* Date: 02-03-04
Client: TVA / Sequoyah Nuclear Plant – Non-treated

| | | Day | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | 6 LT | |
| | Analyst | CAJ | CAJ | CAJ | KBL | KBL | KBL | KBL | KBL |
| Concentration | Parameter | | | | | | | | |
| CONTROL | pH (S.U.) | 8.12 | 7.80 | 8.11 | 7.96 | 8.21 | 7.81 | 8.10 | 7.73 |
| | DO (mg/L) | 7.9 | 7.7 | 8.2 | 7.9 | 7.8 | 7.5 | 7.8 | 7.8 |
| | Conductivity (µmhos/cm) | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 62 | | | | 61 | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | 84 | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 10.98% | pH (S.U.) | 8.09 | 7.91 | 8.09 | 7.93 | 8.17 | 7.78 | 8.12 | 7.69 |
| | DO (mg/L) | 8.0 | 8.1 | 8.2 | 9.0 | 8.1 | 7.6 | 8.2 | 7.9 |
| | Conductivity (µmhos/cm) | 282 | | 294 | | 283 | | 270 | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 22% | pH (S.U.) | 8.09 | 7.91 | 8.08 | 7.93 | 8.17 | 7.77 | 8.13 | 7.70 |
| | DO (mg/L) | 8.0 | 7.9 | 8.3 | 7.9 | 8.1 | 7.5 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 263 | | 278 | | 271 | | 262 | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 43.9% | pH (S.U.) | 8.09 | 7.93 | 8.08 | 7.91 | 8.16 | 7.85 | 8.11 | 7.76 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.8 | 8.2 | 7.5 | 8.4 | 8.0 |
| | Conductivity (µmhos/cm) | 246 | | 256 | | 243 | | 240 | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 72% | pH (S.U.) | 8.09 | 7.96 | 8.09 | 7.99 | 8.14 | 7.88 | 8.09 | 7.74 |
| | DO (mg/L) | 8.0 | 7.9 | 8.3 | 7.8 | 8.3 | 7.7 | 8.4 | 8.1 |
| | Conductivity (µmhos/cm) | 217 | | 225 | | 217 | | 216 | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 100% | pH (S.U.) | 8.07 | 8.01 | 8.10 | 7.99 | 8.13 | 7.82 | 8.08 | 7.82 |
| | DO (mg/L) | 8.2 | 8.0 | 8.3 | 7.9 | 8.3 | 7.4 | 8.5 | 8.1 |
| | Conductivity (µmhos/cm) | 184 | | 195 | | 191 | | 189 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 73 | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | | |
| | TR Chlorine (mg/L) | | | <0.10 | | | | | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| 100% Intake | pH (S.U.) | 8.07 | 8.01 | 8.13 | 8.02 | 8.11 | 7.84 | 8.07 | 7.74 |
| | DO (mg/L) | 8.2 | 8.1 | 8.4 | 8.0 | 8.5 | 7.7 | 8.5 | 8.2 |
| | Conductivity (µmhos/cm) | 179 | | 197 | | 190 | | 189 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 73 | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | | |
| | TR chlorine (mg/L) | | | <0.10 | | | | | |
| | Temperature (°C) | 24.7 | 25.0 | 25.2 | 25.3 | 24.6 | 25.1 | 24.9 | 25.0 |
| | | 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:** Sequoyah Nuclear Plant Non-Treated

**Test dates:** February 03 - 10, 2004

**Project number:** 1042

**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) | 8.09 | 8.04 | 8.02 | 7.96 | 8.05 | 8.02 | 8.12 | 7.98 | 8.11 | 8.00 | 8.21 | 8.11 | 8.10 | 8.03 |
| | DO (mg/L) | 8.1 | 8.2 | 8.0 | 8.0 | 8.2 | 7.8 | 7.9 | 8.2 | 8.2 | 7.7 | 7.8 | 8.1 | 7.8 | 8.2 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg/L $CaCO_3$) | 61 | | | | | | | | 62 | | | | 61 | |
| | Hardness (mg/L $CaCO_3$) | 84 | | | | | | | | 84 | | | | 84 | |
| | Temperature (°C) | 24.8 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.4 | 24.5 | 24.6 | 24.5 |
| 10.98% | pH (SU) | 8.13 | 8.07 | 8.11 | 7.92 | 8.03 | 8.02 | 8.09 | 7.93 | 8.09 | 8.00 | 8.17 | 8.10 | 8.12 | 8.06 |
| | DO (mg/L) | 8.3 | 8.3 | 8.3 | 8.0 | 8.1 | 7.8 | 8.0 | 8.1 | 8.2 | 7.7 | 8.1 | 8.1 | 8.2 | 8.2 |
| | Conductivity (µmhos/cm) | 278 | | 279 | | 302 | | 282 | | 294 | | 283 | | 270 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 22% | pH (SU) | 8.11 | 8.07 | 8.11 | 7.93 | 8.02 | 8.04 | 8.09 | 8.00 | 8.08 | 8.00 | 8.17 | 8.11 | 8.13 | 8.07 |
| | DO (mg/L) | 8.3 | 8.3 | 8.3 | 7.9 | 8.1 | 7.9 | 8.0 | 8.2 | 8.3 | 7.7 | 8.1 | 8.2 | 8.3 | 8.3 |
| | Conductivity (µmhos/cm) | 270 | | 275 | | 289 | | 263 | | 278 | | 271 | | 262 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 43.9% | pH (SU) | 8.11 | 8.08 | 8.11 | 7.95 | 8.01 | 8.05 | 8.09 | 8.00 | 8.08 | 8.00 | 8.16 | 8.11 | 8.11 | 8.06 |
| | DO (mg/L) | 8.4 | 8.3 | 8.4 | 8.0 | 8.1 | 7.9 | 8.1 | 8.2 | 8.2 | 7.7 | 8.2 | 8.3 | 8.4 | 8.4 |
| | Conductivity (µmhos/cm) | 249 | | 256 | | 265 | | 246 | | 256 | | 243 | | 240 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 72% | pH (SU) | 8.11 | 8.11 | 8.11 | 7.96 | 8.01 | 8.06 | 8.09 | 8.01 | 8.09 | 8.08 | 8.14 | 8.13 | 8.09 | 8.12 |
| | DO (mg/L) | 8.3 | 8.3 | 8.4 | 8.0 | 8.1 | 7.9 | 8.0 | 8.0 | 8.3 | 7.7 | 8.3 | 8.3 | 8.4 | 8.4 |
| | Conductivity (µmhos/cm) | 220 | | 223 | | 233 | | 217 | | 225 | | 217 | | 216 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 100% | pH (SU) | 8.12 | 8.13 | 8.11 | 8.00 | 8.02 | 8.09 | 8.07 | 8.03 | 8.10 | 8.08 | 8.13 | 8.15 | 8.08 | 8.16 |
| | DO (mg/L) | 8.4 | 8.3 | 8.4 | 7.9 | 7.9 | 7.8 | 8.2 | 8.2 | 8.3 | 7.8 | 8.3 | 8.2 | 8.5 | 8.3 |
| | Conductivity (µmhos/cm) | 192 | | 196 | | 198 | | 184 | | 195 | | 191 | | 189 | |
| | Alkalinity (mg/L $CaCO_3$) | 72 | | | | 67 | | | | 73 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 82 | | | | 80 | | | | 84 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0.10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 100% Intake | pH (SU) | 8.11 | 8.13 | 8.11 | 8.00 | 8.04 | 8.02 | 8.07 | 8.09 | 8.13 | 8.09 | 8.11 | 8.16 | 8.07 | 8.11 |
| | DO (mg/L) | 8.4 | 8.2 | 8.5 | 8.1 | 7.8 | 7.8 | 8.2 | 8.1 | 8.4 | 8.0 | 8.5 | 8.3 | 8.5 | 8.4 |
| | Conductivity (µmhos/cm) | 190 | | 194 | | 197 | | 179 | | 197 | | 190 | | 189 | |
| | Alkalinity (mg/L $CaCO_3$) | 72 | | | | 68 | | | | 73 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 86 | | | | 80 | | | | 84 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0.10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |

Species: *Ceriodaphnia dubia* Date: 02-03-04

Client: Sequoyah Nuclear Plant - Non-treated

*Daily Chemistry:*

| | | Day | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | | 1 | | 2 | |
| | Analyst | KEK | CAJ | CAJ | KEK | KEK | CAJ |
| Concentration | Parameter | | | | | | |
| CONTROL | pH (S.U.) | 8.09 | 8.04 | 8.02 | 7.96 | 8.05 | 8.02 |
| | DO (mg/L) | 8.1 | 8.2 | 8.0 | 8.0 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | |
| | Alkalinity (mg $CaCO_3$/L) | 61 | | | | | |
| | Hardness (mg $CaCO_3$/L) | 84 | | K | | K | |
| | Temperature (°C) | 24.8 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 10.98% | pH (S.U.) | 8.13 | 8.07 | 8.11 | 7.92 | 8.03 | 8.02 |
| | DO (mg/L) | 8.3 | 8.3 | 8.3 | 8.0 | 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 278 | | 279 | | 302 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 22% | pH (S.U.) | 8.11 | 8.07 | 8.11 | 7.93 | 8.02 | 8.04 |
| | DO (mg/L) | 8.3 | 8.3 | 8.3 | 7.9 | 8.1 | 7.9 |
| | Conductivity (µmhos/cm) | 270 | | 275 | | 289 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 43.9% | pH (S.U.) | 8.11 | 8.08 | 8.11 | 7.95 | 8.01 | 8.05 |
| | DO (mg/L) | 8.4 | 8.3 | 8.4 | 8.0 | 8.1 | 7.9 |
| | Conductivity (µmhos/cm) | 249 | | 256 | | 265 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 72% | pH (S.U.) | 8.11 | 8.11 | 8.11 | 7.96 | 8.01 | 8.06 |
| | DO (mg/L) | 8.3 | 8.3 | 8.4 | 8.0 | 8.1 | 7.9 |
| | Conductivity (µmhos/cm) | 220 | | 223 | | 233 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 100% | pH (S.U.) | 8.12 | 8.13 | 8.11 | 8.00 | 8.02 | 8.09 |
| | DO (mg/L) | 8.4 | 8.3 | 8.4 | 7.9 | 7.9 | 7.8 |
| | Conductivity (µmhos/cm) | 192 | | 196 | | 198 | |
| | Alkalinity (mg $CaCO_3$/L) | 72 | | | | 67 | |
| | Hardness (mg $CaCO_3$/L) | 82 | | | | 80 | |
| | TR chlorine (mg/L) | <0.10 | | K | | <0.10 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| 100% Intake | pH (S.U.) | 8.11 | 8.13 | 8.11 | 8.00 | 8.04 | 8.02 |
| | DO (mg/L) | 8.4 | 8.2 | 8.5 | 8.1 | 7.8 | 7.8 |
| | Conductivity (µmhos/cm) | 190 | | 194 196 CAJ | | 197 | |
| | Alkalinity (mg $CaCO_3$/L) | 72 | | | | 68 | |
| | Hardness (mg $CaCO_3$/L) | 86 | | | | 80 | |
| | TR chlorine (mg/L) | <0.10 | | K | | <0.10 | |
| | Temperature (°C) | 24.9 | 24.6 | 24.8 | 24.5 | 24.6 | 24.5 |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-03-04

| | | Day | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | 6 | LT |
| | Analyst | CAJ | CAJ | CAJ | KEK | KEK | KEK | KEK | KEK |
| Concentration | Parameter | | | | | | | | |
| CONTROL | pH (S.U.) | 8.12 | 7.98 | 8.11 | 8.00 | 8.21 | 8.11 | 8.10 | 8.03 |
| | DO (mg/L) | 7.9 | 8.2 | 8.2 | 7.7 | 7.8 | 8.1 | 7.8 | 8.2 |
| | Conductivity (µmhos/cm) | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 62 | | | | 61 | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | 84 | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.4 | 24.5 | 24.6 | 24.5 |
| 10.98% | pH (S.U.) | 8.09 | 7.93 | 8.09 | 8.00 | 8.17 | 8.10 | 8.12 | 8.06 |
| | DO (mg/L) | 8.0 | 8.1 | 8.2 | 7.7 | 8.1 | 8.1 | 8.2 | 8.2 |
| | Conductivity (µmhos/cm) | 282 | | 294 | | 283 | | 270 | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 22% | pH (S.U.) | 8.09 | 8.00 | 8.08 | 8.00 | 8.17 | 8.11 | 8.13 | 8.07 |
| | DO (mg/L) | 8.0 | 8.2 | 8.3 | 7.7 | 8.1 | 8.2 | 8.3 | 8.3 |
| | Conductivity (µmhos/cm) | 263 | | 278 | | 271 | | 262 | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 43.9% | pH (S.U.) | 8.09 | 8.00 | 8.08 | 8.00 | 8.16 | 8.11 | 8.11 | 8.06 |
| | DO (mg/L) | 8.1 | 8.2 | 8.2 | 7.7 | 8.2 | 8.3 | 8.4 | 8.4 |
| | Conductivity (µmhos/cm) | 246 | | 256 | | 243 | | 240 | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 72% | pH (S.U.) | 8.09 | 8.01 | 8.09 | 8.08 | 8.14 | 8.13 | 8.09 | 8.12 |
| | DO (mg/L) | 8.0 | ~~8.29~~ | 8.3 | 7.7 | 8.3 | 8.3 | 8.4 | 8.4 |
| | Conductivity (µmhos/cm) | 217 | 8.0 | 225 | | 217 | | 216 | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 100% | pH (S.U.) | 8.07 | 8.03 | 8.10 | 8.08 | 8.13 | 8.15 | 8.08 | 8.16 |
| | DO (mg/L) | 8.2 | 8.2 | 8.3 | 7.8 | 8.3 | 8.2 | 8.5 | 8.3 |
| | Conductivity (µmhos/cm) | 184 | | 195 | | 191 | | 189 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 73 | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | | |
| | TR Chlorine (mg/L) | | | <0.10 | | | | | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| 100% Intake | pH (S.U.) | 8.07 | 8.09 | 8.13 | 8.09 | 8.11 | 8.16 | 8.07 | 8.11 |
| | DO (mg/L) | 8.2 | 8.1 | 8.4 | 8.0 | 8.5 | 8.3 | 8.5 | 8.4 |
| | Conductivity (µmhos/cm) | 179 | | 197 | | 190 | | 189 | |
| | Alkalinity (mg $CaCO_3$/L) | | | 73 | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | 84 | | | | | |
| | TR chlorine (mg/L) | | | <0.10 | | | | | |
| | Temperature (°C) | 25.3 | 24.7 | 25.1 | 24.6 | 24.5 | 24.5 | 24.6 | 24.5 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

# Environmental Testing Solutions, Inc.

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

### Daily Chemical Analyses

**Client:** Sequoyah Nuclear Plant UV-Treated

**Test dates:** February 03 - 10, 2004

**Project number:** 1042

Reviewed by: [signature]

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Control | pH (SU) | 8.05 | 7.87 | 8.08 | 7.88 | 8.03 | 7.94 | 8.08 | 7.92 | 8.09 | 7.94 | 8.14 | 7.80 | 8.09 | 7.65 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.7 | 8.0 | 7.8 | 7.8 | 7.9 | 8.3 | 7.9 | 8.3 | 7.5 | 8.1 | 8.0 |
| | Conductivity (µmhos/cm) | 283 | | 292 | | 309 | | 279 | | 297 | | 283 | | 276 | |
| | Alkalinity (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Temperature (°C) | 25.3 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 10.98% | pH (SU) | 8.05 | 7.88 | 8.10 | 7.85 | 8.04 | 7.91 | 8.09 | 7.91 | 8.09 | 7.93 | 8.14 | 7.81 | 8.08 | 7.68 |
| | DO (mg/L) | 8.3 | 8.0 | 8.2 | 7.7 | 7.9 | 7.7 | 7.9 | 7.8 | 8.4 | 7.9 | 8.2 | 7.6 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 278 | | 289 | | 303 | | 279 | | 294 | | 279 | | 272 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 22% | pH (SU) | 8.05 | 7.87 | 8.09 | 7.88 | 8.04 | 7.94 | 8.08 | 7.88 | 8.08 | 7.89 | 8.15 | 7.85 | 8.08 | 7.81 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.6 | 8.0 | 7.8 | 7.9 | 7.8 | 8.4 | 7.8 | 8.2 | 7.7 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 268 | | 280 | | 289 | | 268 | | 273 | | 268 | | 261 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 43.9% | pH (SU) | 8.04 | 7.90 | 8.09 | 7.91 | 8.03 | 7.93 | 8.08 | 7.93 | 8.08 | 7.90 | 8.14 | 7.84 | 8.09 | 7.67 |
| | DO (mg/L) | 8.3 | 8.0 | 8.2 | 7.7 | 8.1 | 7.8 | 7.9 | 7.8 | 8.3 | 7.8 | 8.2 | 7.3 | 8.2 | 8.1 |
| | Conductivity (µmhos/cm) | 246 | | 254 | | 262 | | 245 | | 254 | | 244 | | 241 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 72% | pH (SU) | 8.04 | 7.95 | 8.10 | 7.93 | 8.03 | 7.97 | 8.07 | 7.96 | 8.09 | 7.96 | 8.13 | 7.86 | 8.05 | 7.79 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.7 | 8.1 | 7.8 | 7.9 | 7.8 | 8.3 | 7.8 | 8.2 | 7.8 | 8.1 | 8.1 |
| | Conductivity (µmhos/cm) | 219 | | 224 | | 232 | | 214 | | 230 | | 217 | | 215 | |
| | Temperature (°C) | 25.3 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 100% | pH (SU) | 8.03 | 7.95 | 8.10 | 7.97 | 8.04 | 7.97 | 8.06 | 7.94 | 8.10 | 7.98 | 8.13 | 7.94 | 8.05 | 7.66 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.6 | 8.1 | 7.9 | 8.0 | 7.8 | 8.4 | 7.9 | 8.3 | 7.8 | 8.2 | 8.1 |
| | Conductivity (µmhos/cm) | 187 | | 196 | | 199 | | 183 | | 197 | | 196 | | 189 | |
| | Alkalinity (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Total Residual Chlorine (mg/L) | | | | | | | | | | | | | | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 100% Intake | pH (SU) | 8.04 | 7.96 | 8.09 | 7.98 | 8.05 | 7.98 | 8.05 | 7.95 | 8.12 | 7.94 | 8.11 | 7.90 | 8.02 | 7.73 |
| | DO (mg/L) | 8.4 | 8.1 | 8.3 | 7.9 | 8.0 | 7.9 | 8.0 | 7.8 | 8.4 | 8.1 | 8.3 | 7.9 | 8.1 | 8.2 |
| | Conductivity (µmhos/cm) | 187 | | 194 | | 197 | | 182 | | 204 | | 201 | | 185 | |
| | Alkalinity (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | | | | | | | | | | | | | | |
| | Total Residual Chlorine (mg/L) | | | | | | | | | | | | | | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |

Species: *Pimephales promelas* Date: 02-03.04
Client: TVA / Sequoyah Nuclear Plant – UV-treated

*Daily Chemistry:*

| | | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| | Analyst | KEX | CAJ | CAJ | KEX | KEX | CAJ |
| Concentration | Parameter | | | | | | |
| CONTROL | pH (S.U.) | 8.05 | 7.87 | 8.08 | 7.88 | 8.03 | 7.94 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.7 | 8.0 | 7.8 |
| | Conductivity (µmhos/cm) | 283 | | 292 | | 309 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | |
| | Hardness (mg $CaCO_3$/L) | K | | K | | K | |
| | Temperature (°C) | 25.3 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 10.98% | pH (S.U.) | 8.05 | 7.88 | 8.10 | 7.85 | ~~7.88~~ K | 7.91 |
| | DO (mg/L) | 8.3 | 8.0 | 8.2 | 7.7 | 8.04 7.9 | 7.7 |
| | Conductivity (µmhos/cm) | 278 | | 289 | | 303 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 22% | pH (S.U.) | 8.05 | 7.87 | 8.09 | 7.88 | ~~7.85~~ K | 7.94 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.6 | 8.04 8.0 | 7.8 |
| | Conductivity (µmhos/cm) | 268 | | 280 | | 289 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 43.9% | pH (S.U.) | 8.04 | 7.90 | 8.09 | 7.91 | ~~7.88~~ K | 7.93 |
| | DO (mg/L) | 8.3 | 8.0 | 8.2 | 7.7 | 8.03 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 246 | | 254 | | 262 | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 72% | pH (S.U.) | 8.04 | 7.95 | 8.10 | 7.93 | ~~7.91~~ K | 7.97 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 7.7 | 8.03 8.1 | 7.8 |
| | Conductivity (µmhos/cm) | 219 | | 224 | | 232 | |
| | Temperature (°C) | 25.3 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 100% | pH (S.U.) | 8.03 | 7.95 | 8.10 | 7.97 | ~~7.93~~ K | 7.97 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.6 | 8.04 8.1 | 7.9 |
| | Conductivity (µmhos/cm) | 187 | | 196 | | 199 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | | | | |
| | TR chlorine (mg/L) | K | | K | | K | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| 100% Intake | pH (S.U.) | 8.04 | 7.96 | 8.09 | 7.98 | 8.05 | 7.98 |
| | DO (mg/L) | 8.4 | 8.1 | 8.3 | 7.9 | 8.0 | 7.9 |
| | Conductivity (µmhos/cm) | 187 | | 194 | | 197 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | | | | |
| | TR chlorine (mg/L) | K | | K | | K | |
| | Temperature (°C) | 25.4 | 25.0 | 24.7 | 24.9 | 25.2 | 25.2 |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Pimephales promelas* Date: 02-03-04
Client: TVA / Sequoyah Nuclear Plant – UV-treated

| | | Day | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | 6 | LT |
| | Analyst | CAJ | CAJ | CAJ | KEK | KEK | KEK | KEK | KEK |
| Concentration | Parameter | | | | | | | | |
| CONTROL | pH (S.U.) | 8.08 | 7.92 | 8.09 | 7.94 | 8.14 | 7.80 | 8.09 | 7.65 |
| | DO (mg/L) | 7.8 | 7.9 | 8.3 | 7.9 | 8.3 | 7.5 | 8.1 | 8.0 |
| | Conductivity (µmhos/cm) | 279 | | 297 | | 283 | | 276 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | | | |
| | Hardness (mg $CaCO_3$/L) | K | | K | | K | | K | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 10.98% | pH (S.U.) | 8.09 | 7.91 | 8.09 | 7.93 | 8.14 | 7.81 | 8.08 | 7.68 |
| | DO (mg/L) | 7.9 | 7.8 | 8.4 | 7.9 | 8.2 | 7.6 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 279 | | 294 | | 279 | | 272 | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 22% | pH (S.U.) | 8.08 | 7.88 | 8.08 | 7.89 | 8.15 | 7.85 | 8.08 | 7.81 |
| | DO (mg/L) | 7.9 | 7.8 | 8.4 | 7.8 | 8.2 | 7.7 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 268 | | 273 | | 268 | | 261 | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 43.9% | pH (S.U.) | 8.08 | 7.93 | 8.08 | 7.90 | 8.14 | 7.84 | 8.09 | 7.67 |
| | DO (mg/L) | 7.9 | 7.8 | 8.3 | 7.8 | 8.2 | 7.3 | 8.2 | 8.1 |
| | Conductivity (µmhos/cm) | 245 | | 254 | | 244 | | 241 | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 72% | pH (S.U.) | 8.07 | 7.96 | 8.09 | 7.96 | 8.13 | 7.86 | 8.05 | 7.79 |
| | DO (mg/L) | 7.9 | 7.8 | 8.3 | 7.8 | 8.2 | 7.8 | 8.1 | 8.1 |
| | Conductivity (µmhos/cm) | 214 | | 230 | | 244 217 | | 215 | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 100% | pH (S.U.) | 8.06 | 7.94 | 8.10 | 7.98 | 8.13 | 7.94 | 8.05 | 7.66 |
| | DO (mg/L) | 8.0 | 7.8 | 8.4 | 7.9 | 8.3 | 7.8 | 8.2 | 8.1 |
| | Conductivity (µmhos/cm) | 183 | | 197 | | 24 196 | | 189 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | | | | | | |
| | TR Chlorine (mg/L) | K | | K | | K | | K | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| 100% Intake | pH (S.U.) | 8.05 | 7.95 | 8.12 | 7.94 | 8.11 | 7.90 | 8.02 | 7.73 |
| | DO (mg/L) | 8.0 | 7.9 | 8.4 | 8.1 | 8.3 | 7.9 | 8.1 | 8.2 |
| | Conductivity (µmhos/cm) | 182 | | 204 | | 201 | | 185 | |
| | Alkalinity (mg $CaCO_3$/L) | | | | | | | | |
| | Hardness (mg $CaCO_3$/L) | | | | | | | | |
| | TR chlorine (mg/L) | K | | K | | K | | K | |
| | Temperature (°C) | 25.0 | 24.8 | 25.1 | 24.9 | 24.7 | 24.9 | 24.6 | 24.8 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

Environmental Testing Solutions, Inc.

# Alkalinity
## (EPA Method 310.1)

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

Analyst: CAJ
Date analyzed: 02-09-04

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 $H_2SO_4$ = (5 ml $Na_2CO_3$ x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500 |
|---|---|---|---|---|---|---|---|
| 4.49 | INR097 | INR079 | 0.0 | 12.5 | 12.5 | 0.0200 | 10.0 |

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS 185 | 100 | 100 | 12.5 | 22.4 | 9.9 | 10.0 | 99 | 99% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 02-02-04 | MHS H2O B | 100 | 22.4 | 28.4 | 6.0 | 10.0 | S 60 | |
| ↓ | Duplicate | ↓ | 28.4 | 34.4 | 6.0 | ↓ | D 60 | — |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS 185 | 50 | 100 | 28.4 | 39.4 | 11 | 10.0 | 110 |

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

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 02-02-04 | MHS H2O A | 100 | 39.4 | 45.5 | 6.1 | 10.0 | 61 |
| 02-02-04 | SSW H2O A | | 45.5 | 48.8 | 3.3 | | 33 |
| 02-02-04 | ↓ B | | 3.9 | 7.3 | 3.4 | | 34 |
| 02-04-04 | MHS H2O | | 7.3 | 13.5 | 6.2 | | 62 |
| 02-04-04 | SSW H2O | | 13.5 | 16.9 | 3.4 | | 34 |
| 02-06-04 | MHS H2O | | 16.9 | 23.0 | 6.1 | | 61 |
| 02-06-04 | SSW H2O | | 23.0 | 26.4 | 3.4 | | 34 |
| 040202.09 | SQN INT 1 | | 26.4 | 33.6 | 7.2 | | 72 |
| 040204.19 | ↓ 2 | ↓ | 33.6 | 40.4 | 6.8 | ↓ | 68 |

Reviewed by: KEK  Date reviewed: 02-09-04

# Alkalinity
## (EPA Method 310.1)

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

Analyst: CAJ
Date analyzed: 02-09-04

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 $H_2SO_4$ = (5 ml $Na_2CO_3$ x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS 185 | 100 | 100 | 3.5 | 13.5 | 10.0 | 10.0 | 100 | 100% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 040202.08 | SQN 101 1 | 100 | 13.5 | 20.7 | 7.2 | 10.0 | S 72 | |
| ↓ | Duplicate | ↓ | 20.7 | 27.8 | 7.1 | ↓ | D 71 | 1.4% |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS185 | 50 | 100 | 20.7 | 32.8 | 12.1 | 10.0 | 121 |

| Sample alkalinity (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 71 | 50 | 100% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 040206.02 | SQN INT 3 | 100 | 32.8 | 40.1 | 7.3 | 10.0 | 73 |
| 040204.10 | SQN 101 2 | | 0.3 | 7.0 | 6.7 | | 67 |
| 040206.01 | ↓ 3 | | 7.0 | 14.3 | 7.3 | | 73 |
| 040203.09 | Greenville 1 | | 14.3 | 17.7 | 3.4 | | 34 |
| 040205.02 | ↓ 2 | | 17.7 | 21.7 | 4.0 | | 40 |
| 040207.03 | ↓ 3 | | 21.7 | 26.5 | 4.8 | | 48 |
| 040203.01 | Fairmont 1 | | 26.5 | 29.7 | 3.2 | | 32 |
| 040205.01 | ↓ 2 | | 29.7 | 32.9 | 3.2 | | 32 |
| 040207.02 | ↓ 3 | ↓ | 32.9 | 36.0 | 3.1 | ↓ | 31 |

Reviewed by: KEL Date reviewed: 02-09-04

Environmental Testing Solutions, Inc.

# Total Hardness
## (EPA Method 130.2)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

| | |
|---|---|
| Analyst | CAJ |
| Date analyzed | 02.07.04 |

*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 |
|---|---|---|---|---|---|---|
| INR078 | INSS 172 | 0.0 | 9.8 | 9.8 | 0.0204 | 20.4 |

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS160 | 40 | 50 | 9.8 | 11.8 | 2.0 | 20.4 | 41 | 102.5% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = [(S - D) /[(S+D)/2]] x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 02.02.04 | MHS H2O A | 50 | 16.9 ~~17.9~~ | 21.0 | 4.1 | 20.4 | S 84 | |
| ↓ | Duplicate | ↓ | 21.0 | 25.1 | 4.1 | ↓ | D 84 | — |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS160 | 40 | 50 | 21.0 | 27.0 | 6.0 | 20.4 | 122 |

| Sample hardness (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 84 | 38 | 95% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| TV = ND | Blank (should be = 0 mg $CaCO_3$/L) | 50 | 0.0 | 0.0 | 0.0 | 20.4 | ND |
| 02.02.04 | MHS H2O B | | 27.0 | 31.1 | 4.1 | | 84 |
| | SSW H2O A | | 31.1 | 33.2 | 2.1 | | 43 |
| ↓ | ↓ B | | 33.2 | 35.3 | 2.1 | | 43 |
| 02.04.04 | MHS H2O | | 35.3 | 39.4 | 4.1 | | 84 |
| ↓ | SSW H2O | | 39.4 | 41.4 | 2.0 | | 41 |
| 02.06.04 | MHS H2O | | ~~43.4~~ 41.4 | 45.5 | 4.1 | | 84 |
| ↓ | SSW H2O | | 45.5 | 47.6 | 2.1 | | 43 |
| 040202.09 | SQN IN 1 | | 5.3 | 9.5 | 4.2 | | 86 |
| 040204.19 | ↓ 2 | ✓ | 9.5 | 13.4 | 3.9 | | 80 |

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

Reviewed by: KEN

Date reviewed: 02-07-04

Environmental Testing Solutions, Inc.

# Total Hardness
## (EPA Method 130.2)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst: CAJ
Date analyzed: 02-07-03-04

*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 |
|---|---|---|---|---|---|---|
| | | | | | | |

CAJ

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS160 | 40 | 50 | 13.4 | 15.4 | 2.0 | 20.4 | 41 | 102.5% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = [(S - D) / [(S+D)/2]] x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 040206.02 | SQN IN 3 | 50 | 15.4 | 19.5 | 4.1 | 20.4 | S 84 | |
| ↓ | Duplicate | ↓ | 19.5 | 23.7 | 4.2 | ↓ | D 86 | 2.4% |

*Matrix spike recovery:* SQN1

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS160 | 40 | 50 | 23.7 | 29.7 | 6.0 | 20.4 | 122 |

| Sample hardness (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 82 | 40 | 100% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| | Blank (should be = 0 mg $CaCO_3$/L) | | | | | | CAJ |
| 040202.08 | SQN 1 | 50 | 23.7 | 27.7 | 4.0 | 20.4 | 82 |
| 040204.18 | 2 | | 29.7 | 33.6 | 3.9 | | 80 |
| 040206.01 | 3 | | 33.6 | 37.7 | 4.1 | | 84 |
| 040203.09 | Greenville 1 | | 37.7 | 39.5 | 1.8 | | 37 |
| 040205.02 | 2 | | 39.5 | 41.3 | 1.8 | | 37 |
| 040203.01 | Fairmount 1 | | 2.1 | 3.5 | 1.4 | | 28 |
| 040205.01 | 2 | | 3.5 | 4.9 | 1.4 | | 28 |
| 040203.06 | Terrup 001 | | 4.9 | 9.7 | 4.8 | | 98 |
| 040203.05 | Terr 001 | ↓ | 9.7 | 21.0 | 11.3 | ↓ | 230 |

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

Reviewed by: KER

Date reviewed: 02-07-04

# Total Residual Chlorine
## (EPA Method 330.5)

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

| | | | |
|---|---|---|---|
| Analyst | KEL | Iodide reagent: | INR100 |
| Date analyzed | 02-03-04 | Acid reagent: | INR101 |

*Calibration:*

| | 0.10 mg/L | 1.00 mg/L |
|---|---|---|
| Reference standard number | INSS134 | INSS134 |

*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%) |
|---|---|---|---|
| INSS134 | 0.50 | 0.495 | 99% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 040203.01 | Fairmont WWTP | no color, clear | S <0.00277 | |
| ↓ | Duplicate | | D <0.00173 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00921 |
| 040203.09 | Greenville WWTP | pale yellow, slightly cloudy | <0.000581 |
| 040203.02 | Lumberton WWTP | pink/red, floating particles | <0.000137 |
| 040203.10 | Monroe WWTP | no color, clear | <0.000143 |
| 040203.13 | Rocky Mnt WWTP | no color, clear | <0.000368 |
| 040203.11 | PCS Phos. 007 | pale yellow, clear | <0.000371 |
| 040203.12 | ↓ 100 | no color, clear | <0.000186 |
| 040203.05 | BEK 001 | pale tan, slightly cloudy | 0.00563 |
| 040203.07 | ↓ 002 | no color, clear | 0.0442 |
| 040203.06 | ↓ UP001 | pale tan, cloudy | <0.0186 |

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

*Laboratory control standard:*

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

| | |
|---|---|
| Reviewed by | dt |
| Date reviewed | 02-03-04 |

Environmental Testing Solutions, Inc.



# Total Residual Chlorine
## (EPA Method 330.5)

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

| | |
|---|---|
| Analyst | KEK |
| Date analyzed | 02-03-04 |

| | |
|---|---|
| Iodide reagent: | |
| Acid reagent: | |

*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%) |
|---|---|---|---|
| INS5134 | 0.50 | 0.486 | 97.2% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 040203.08 | Backup 002 | pale tan slightly | S <0.00555 | |
| ↓ | Duplicate | cloudy | D <0.00495 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | |
| 040203.04 | Corr - McQuay cd | no color, clear | <0.00318 |
| 040203.03 | ↓ PP | no color, clear | <0.00641 |
| 040203.08 | TVA SQN 101 | no color, clear | <0.00943 |
| 040203.09 | ↓ INT | no color clear | <0.00770 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

*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%) |
|---|---|---|---|
| INS5134 | 0.50 | 0.475 | 95% |

| | |
|---|---|
| Reviewed by | |
| Date reviewed | 02-03-04 |

# Total Residual Chlorine
## (EPA Method 330.5)

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

Analyst: CHG
Date analyzed: 02-05-04

Iodide reagent: INR 100
Acid reagent: INR 101

*Calibration:*

| | 0.10 mg/L | 1.00 mg/L |
|---|---|---|
| Reference standard number | INSS 134 | INSS 134 |

*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 134 | 0.50 | 0.519 | 103.8% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 040204.19 | SQN INT | pale yellow, clear | S <0.0124 | |
| ↓ | Duplicate | | D <0.000608 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00827 |
| 040205.03 | McQuay Pp | no color clear | <0.00411 |
| 040205.01 | Fairmont | pale yellow, particles | <0.000267 |
| 040205.02 | Lumberton | pink particles | <0.000107 |
| 040205.04 | McQuay Cd | no color, particles | <0.000827 |
| 040205.05 | Greenville | pale yellow, particles | <0.000417 |
| 040205.06 | Monroe | pale yellow, particles | <0.0000798 |
| 040205.08 | Rocky Mount | pale yellow, particles | <0.0000537 |
| 040204.18 | SQN 101 | pale yellow, particles | <0.000827 |
| 040205.07 | Silverline | pale yellow, particles | <0.0000329 |

*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 134 | 0.50 | 0.523 | 104.6% |

Reviewed by: KEL
Date reviewed: 02-07-04

Environmental Testing Solutions, Inc. -50.2 %



# Total Residual Chlorine
## (EPA Method 330.5)

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

| | | | |
|---|---|---|---|
| Analyst | CAJ | Iodide reagent: | INR 100 |
| Date analyzed | 02.07.04 | Acid reagent: | INR 101 |

*Calibration:*

| | 0.10 mg/L | 1.00 mg/L |
|---|---|---|
| Reference standard number | INSS 134 | INSS 134 |

*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 134 | 0.50 | 0.535 | 107% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 040206.06 | Baxter | pale yellow particles | S <0.0193 | |
| ↓ | Duplicate | | D <0.00896 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00690 |
| 040207.14 | Enfield | pale yellow, particles | <0.000690 |
| 040207.15 | Raeford | light yellow, slightly cloudy | 0.00954 |
| 040206.08 | Spruce Pine | pale yellow, clear | <0.00865 |
| 040207.01 | Wilson | pale yellow, particles | <0.00445 |
| 040207.10 | Monroe | pale yellow, particles | <0.000290 |
| 040207.13 | Bladenboro | pale yellow, particles | <0.000223 |
| 040207.02 | Fairmont | no color, clear | <0.0000945 |
| 040207.16 | Scotland Neck | pale yellow, floating particles | <0.00369 |
| 040207.07 | Marshall | no color ~~opte~~ sinking particles | 0.0180 |

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

~~*Laboratory control standard:*~~

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

| | |
|---|---|
| Reviewed by | KOL |
| Date reviewed | 02.07.04 |

# Total Residual Chlorine
## (EPA Method 330.5)

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

| | |
|---|---|
| Analyst | [illegible] |
| Date analyzed | 02-07-04 |

| | |
|---|---|
| Iodide reagent: | |
| Acid reagent: | |

*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%) |
|---|---|---|---|
| INSS 134 | 0.50 | 0.492 | 98.4% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 040207.05 | McQuay | lgt yellow cd particles | S <0.0412 | |
| ↓ | Duplicate | | D <0.0157 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = <0.10 mg/L) | | — |
| 040207.04 | McQuay ln pp | no color, particles | <0.00769 |
| 040206.01 | SQN - 401 | pale yellow, particles | <0.00438 |
| 040206.02 | SQN - lnt | pale yellow, particles | <0.00366 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

*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 134 | 0.50 | 0.470 | 94% |

| | |
|---|---|
| Reviewed by | KGR |
| Date reviewed | 02-07-04 |

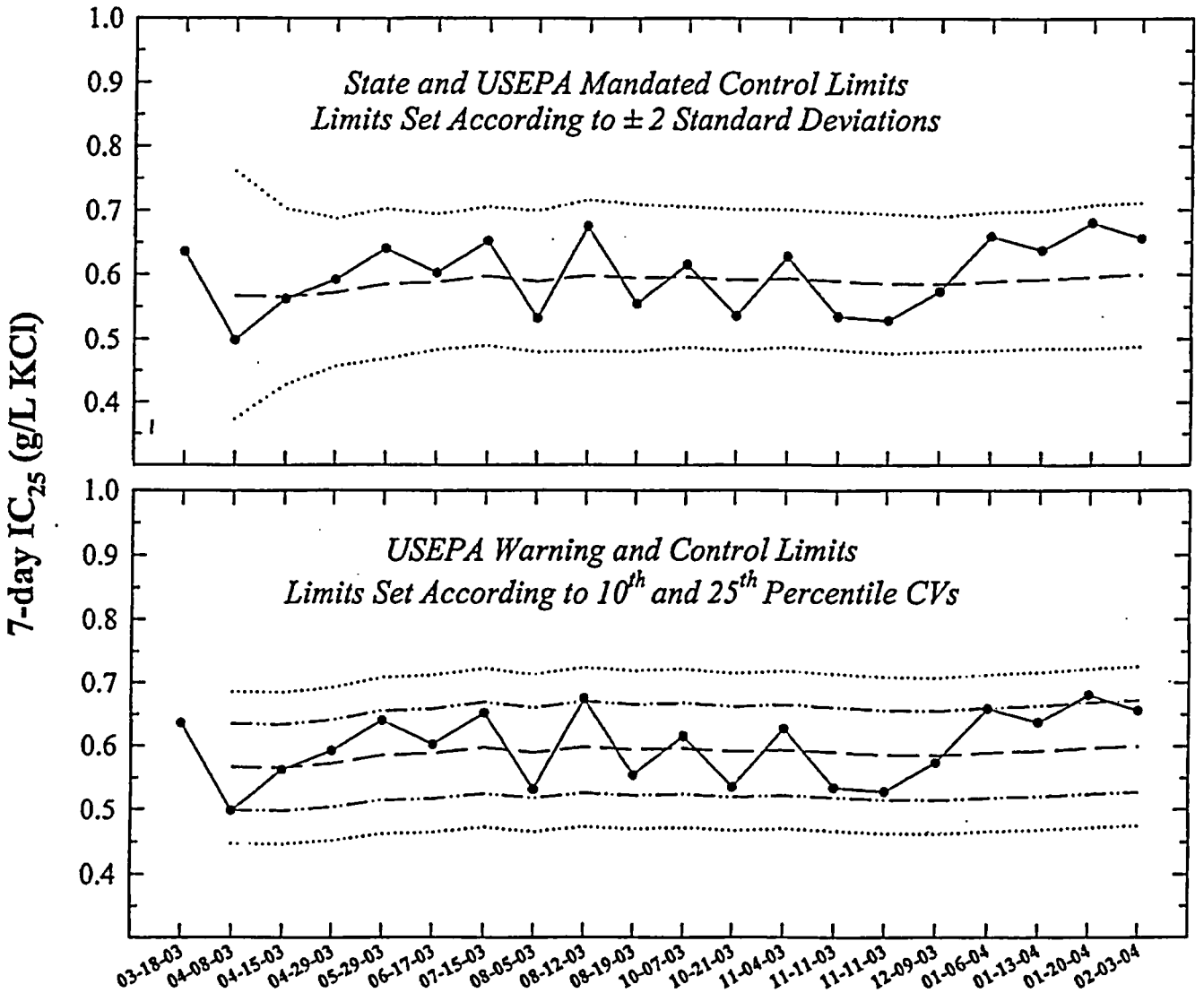
Sequoyah Nuclear Plant Biomonitoring
February 3-10, 2004

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 $IC_{25}$ (g/L KCl) | CT (g/L KCl) | S | State and USEPA Control Limits CT - 2S | CT + 2S | $S_{A10}$ | Laboratory Warning Limits $CT - S_{A10}$ | $CT + S_{A10}$ | $S_{A25}$ | Laboratory Control Limits $CT - S_{A25}$ | $CT + S_{A25}$ | $S_{A75}$ | USEPA Warning Limits $CT - S_{A75}$ | $CT + S_{A75}$ | $S_{A90}$ | USEPA Control Limits $CT - S_{A90}$ | $CT + S_{A90}$ | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-18-03 | 0.64 | | | | | | | | | | | | | | | | | |
| 2 | 04-08-03 | 0.50 | 0.57 | 0.10 | 0.37 | 0.76 | 0.07 | 0.50 | 0.63 | 0.12 | 0.45 | 0.69 | 0.22 | 0.35 | 0.78 | 0.26 | 0.31 | 0.82 | 0.17 |
| 3 | 04-15-03 | 0.56 | 0.57 | 0.07 | 0.43 | 0.70 | 0.07 | 0.50 | 0.63 | 0.12 | 0.45 | 0.68 | 0.21 | 0.35 | 0.78 | 0.25 | 0.31 | 0.82 | 0.12 |
| 4 | 04-29-03 | 0.59 | 0.57 | 0.06 | 0.46 | 0.69 | 0.07 | 0.50 | 0.64 | 0.12 | 0.45 | 0.69 | 0.22 | 0.35 | 0.79 | 0.26 | 0.31 | 0.83 | 0.10 |
| 5 | 05-29-03 | 0.64 | 0.59 | 0.06 | 0.47 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.46 | 0.71 | 0.22 | 0.36 | 0.81 | 0.26 | 0.32 | 0.85 | 0.10 |
| 6 | 06-17-03 | 0.60 | 0.59 | 0.05 | 0.48 | 0.69 | 0.07 | 0.52 | 0.66 | 0.12 | 0.46 | 0.71 | 0.22 | 0.36 | 0.81 | 0.26 | 0.32 | 0.85 | 0.09 |
| 7 | 07-15-03 | 0.65 | 0.60 | 0.05 | 0.49 | 0.70 | 0.07 | 0.53 | 0.67 | 0.13 | 0.47 | 0.72 | 0.23 | 0.37 | 0.82 | 0.27 | 0.33 | 0.87 | 0.09 |
| 8 | 08-05-03 | 0.53 | 0.59 | 0.05 | 0.48 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.47 | 0.71 | 0.22 | 0.37 | 0.81 | 0.27 | 0.32 | 0.85 | 0.09 |
| 9 | 08-12-03 | 0.67 | 0.60 | 0.06 | 0.48 | 0.72 | 0.07 | 0.53 | 0.67 | 0.13 | 0.47 | 0.72 | 0.23 | 0.37 | 0.83 | 0.27 | 0.33 | 0.87 | 0.10 |
| 10 | 08-19-03 | 0.55 | 0.59 | 0.06 | 0.48 | 0.71 | 0.07 | 0.52 | 0.67 | 0.12 | 0.47 | 0.72 | 0.23 | 0.37 | 0.82 | 0.27 | 0.33 | 0.86 | 0.10 |
| 11 | 10-07-03 | 0.61 | 0.60 | 0.05 | 0.49 | 0.71 | 0.07 | 0.52 | 0.67 | 0.13 | 0.47 | 0.72 | 0.23 | 0.37 | 0.82 | 0.27 | 0.33 | 0.86 | 0.09 |
| 12 | 10-21-03 | 0.54 | 0.59 | 0.05 | 0.48 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.47 | 0.72 | 0.22 | 0.37 | 0.82 | 0.27 | 0.33 | 0.86 | 0.09 |
| 13 | 11-04-03 | 0.63 | 0.59 | 0.05 | 0.49 | 0.70 | 0.07 | 0.52 | 0.67 | 0.12 | 0.47 | 0.72 | 0.23 | 0.37 | 0.82 | 0.27 | 0.33 | 0.86 | 0.09 |
| 14 | 11-11-03 | 0.53 | 0.59 | 0.05 | 0.48 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.47 | 0.71 | 0.22 | 0.37 | 0.81 | 0.27 | 0.32 | 0.86 | 0.09 |
| 15 | 11-11-03 | 0.53 | 0.59 | 0.05 | 0.48 | 0.69 | 0.07 | 0.52 | 0.66 | 0.12 | 0.46 | 0.71 | 0.22 | 0.36 | 0.81 | 0.26 | 0.32 | 0.85 | 0.09 |
| 16 | 12-09-03 | 0.57 | 0.58 | 0.05 | 0.48 | 0.69 | 0.07 | 0.51 | 0.66 | 0.12 | 0.46 | 0.71 | 0.22 | 0.36 | 0.81 | 0.26 | 0.32 | 0.85 | 0.09 |
| 17 | 01-06-04 | 0.66 | 0.59 | 0.05 | 0.48 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.47 | 0.71 | 0.22 | 0.37 | 0.81 | 0.27 | 0.32 | 0.85 | 0.09 |
| 18 | 01-13-04 | 0.64 | 0.59 | 0.05 | 0.49 | 0.70 | 0.07 | 0.52 | 0.66 | 0.12 | 0.47 | 0.72 | 0.22 | 0.37 | 0.82 | 0.27 | 0.33 | 0.86 | 0.09 |
| 19 | 01-20-04 | 0.68 | 0.60 | 0.06 | 0.49 | 0.71 | 0.07 | 0.52 | 0.67 | 0.13 | 0.47 | 0.72 | 0.23 | 0.37 | 0.82 | 0.27 | 0.33 | 0.87 | 0.09 |
| 20 | 02-03-04 | 0.66 | 0.60 | 0.06 | 0.49 | 0.71 | 0.07 | 0.53 | 0.67 | 0.13 | 0.47 | 0.73 | 0.23 | 0.37 | 0.83 | 0.27 | 0.33 | 0.87 | 0.09 |

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

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

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

**Laboratory Control and Warning Limits**

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

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

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

***USEPA Control and Warning Limits***

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

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

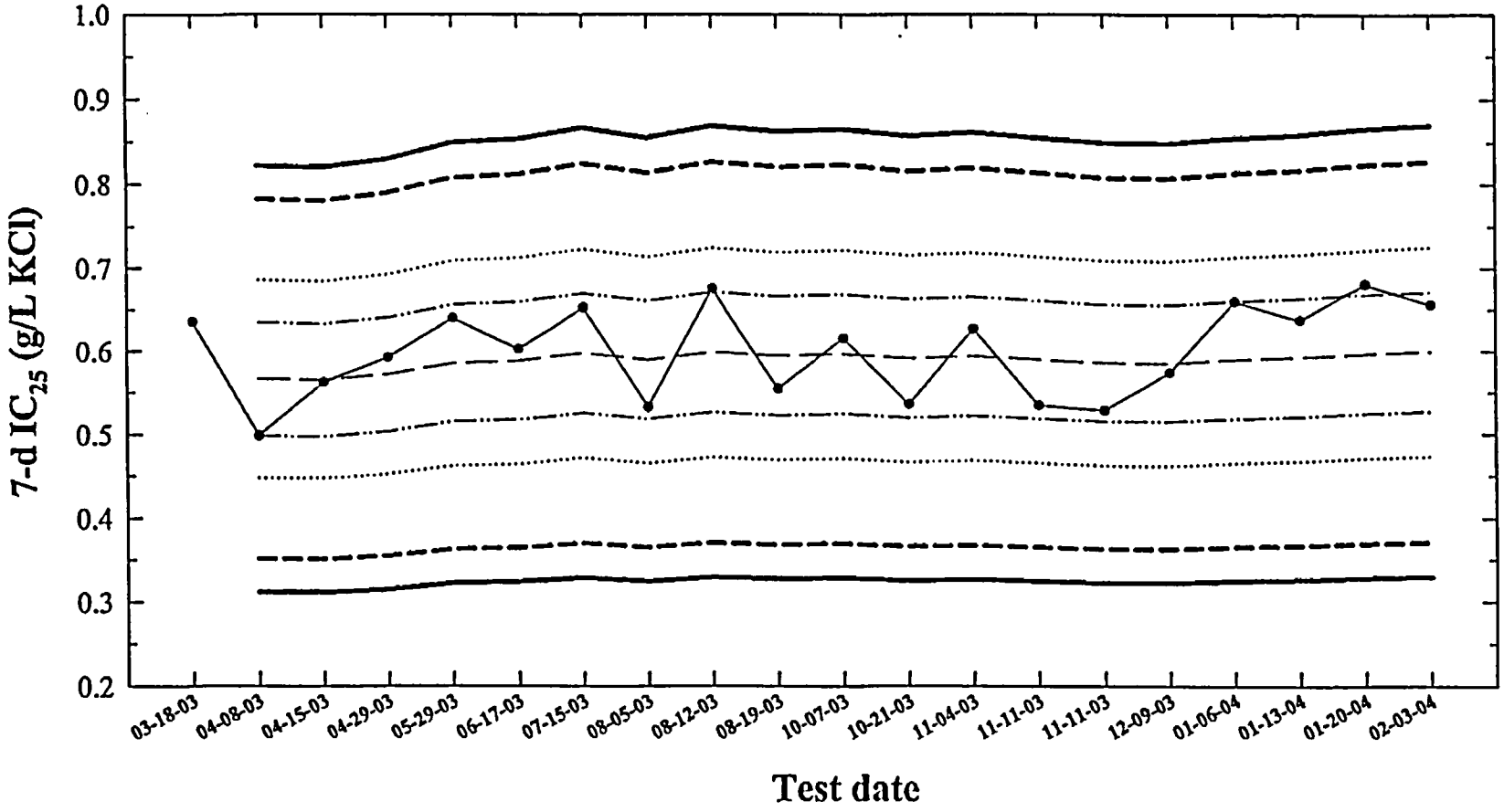
CV = Coefficient of variation of the $IC_{25}$ values.

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

*Organisms obtained from Aquatic BioSystems, Inc.*

# 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 (mg/larvae) | CT for Control Growth (mg/larvae) | CV (%) | CT for Control Growth CV (%) | MSD | PMSD (%) | CT for PMSD (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 03-18-03 | 100 | 0.803 | | 21.3 | | 0.21 | 26.5 | |
| 2 | 04-08-03 | 100 | 1.083 | 0.943 | 6.1 | 13.7 | 0.09 | 8.0 | 17.2 |
| 3 | 04-15-03 | 100 | 0.892 | 0.926 | 17.0 | 14.8 | 0.17 | 18.7 | 17.7 |
| 4 | 04-29-03 | 97.5 | 1.021 | 0.950 | 6.7 | 12.8 | 0.18 | 17.5 | 17.7 |
| 5 | 05-29-03 | 100 | 1.005 | 0.961 | 7.9 | 11.8 | 0.11 | 11.1 | 16.4 |
| 6 | 06-17-03 | 97.5 | 0.888 | 0.949 | 4.2 | 10.6 | 0.18 | 20.7 | 17.1 |
| 7 | 07-15-03 | 100 | 0.910 | 0.943 | 6.7 | 10.0 | 0.12 | 13.7 | 16.6 |
| 8 | 08-05-03 | 97.5 | 1.092 | 0.962 | 6.5 | 9.6 | 0.13 | 11.8 | 16.0 |
| 9 | 08-12-03 | 100 | 0.693 | 0.932 | 9.7 | 9.6 | 0.20 | 28.2 | 17.4 |
| 10 | 08-19-03 | 100 | 0.745 | 0.913 | 2.9 | 8.9 | 0.08 | 10.7 | 16.7 |
| 11 | 10-07-03 | 97.5 | 0.762 | 0.899 | 20.0 | 9.9 | 0.18 | 23.1 | 17.3 |
| 12 | 10-21-03 | 100 | 0.803 | 0.891 | 5.7 | 9.6 | 0.13 | 16.4 | 17.2 |
| 13 | 11-04-03 | 100 | 0.895 | 0.892 | 7.4 | 9.4 | 0.10 | 11.6 | 16.8 |
| 14 | 11-11-03 | 100 | 0.895 | 0.892 | 7.5 | 9.3 | 0.12 | 13.6 | 16.5 |
| 15 | 11-11-03 | 100 | 0.953 | 0.896 | 11.6 | 9.4 | 0.20 | 21.3 | 16.9 |
| 16 | 12-09-03 | 100 | 0.744 | 0.886 | 2.2 | 9.0 | 0.18 | 24.2 | 17.3 |
| 17 | 01-06-04 | 97.5 | 0.816 | 0.882 | 4.6 | 8.7 | 0.13 | 15.5 | 17.2 |
| 18 | 01-13-04 | 100 | 0.807 | 0.878 | 3.3 | 8.4 | 0.10 | 12.5 | 17.0 |
| 19 | 01-20-04 | 100 | 0.770 | 0.872 | 16.5 | 8.8 | 0.13 | 17.0 | 17.0 |
| 20 | 02-03-04 | 100 | 0.847 | 0.871 | 5.2 | 8.6 | 0.11 | 13.0 | 16.8 |

*Note:* CV = Coefficient of variation for control growth.
On average, the CV for control growth is 8.6% in Environmental Testing Solutions, Inc. *Pimephales* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

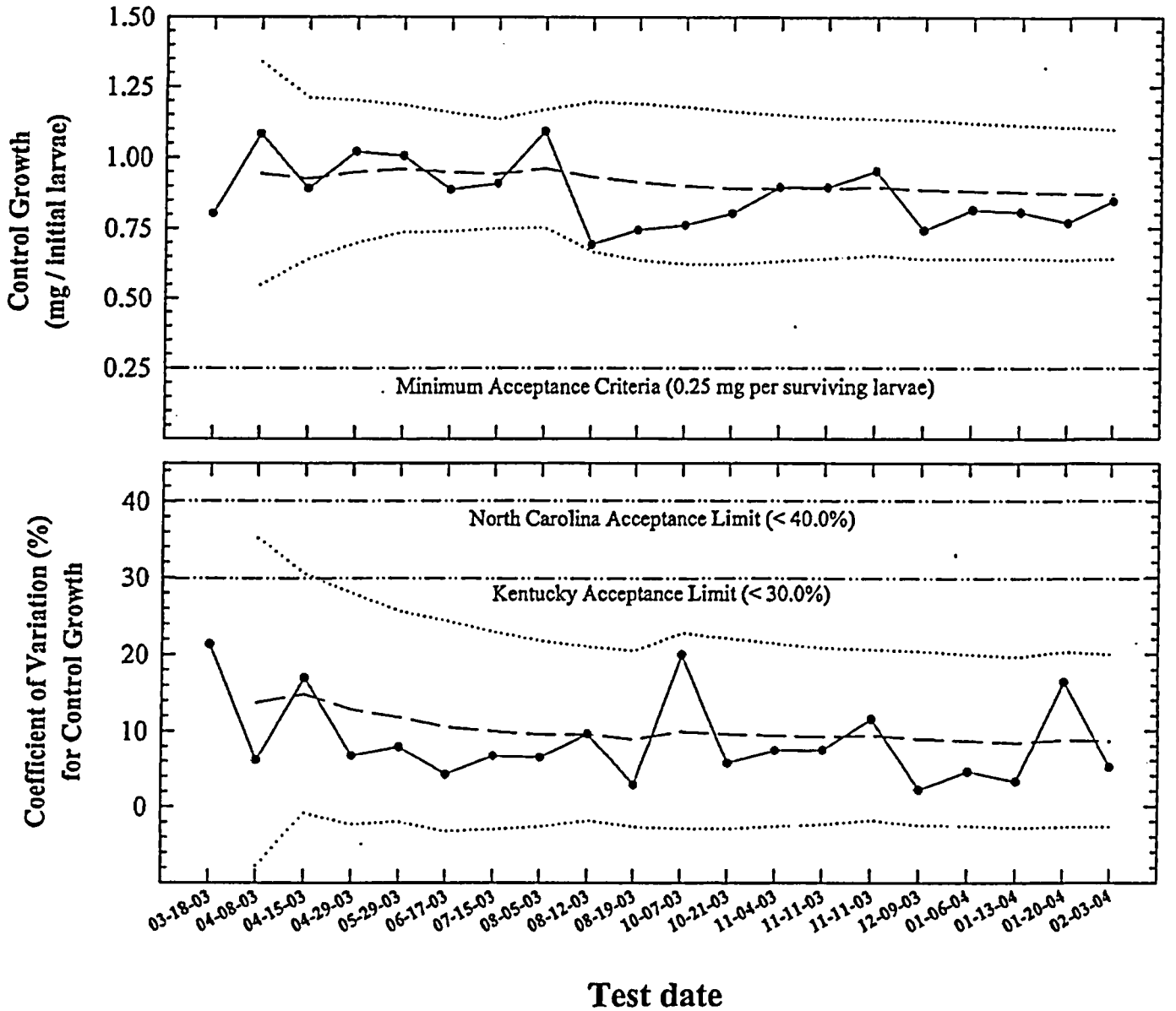
CT = Central Tendancy (mean Control Growth, CV, or PMSD)

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)

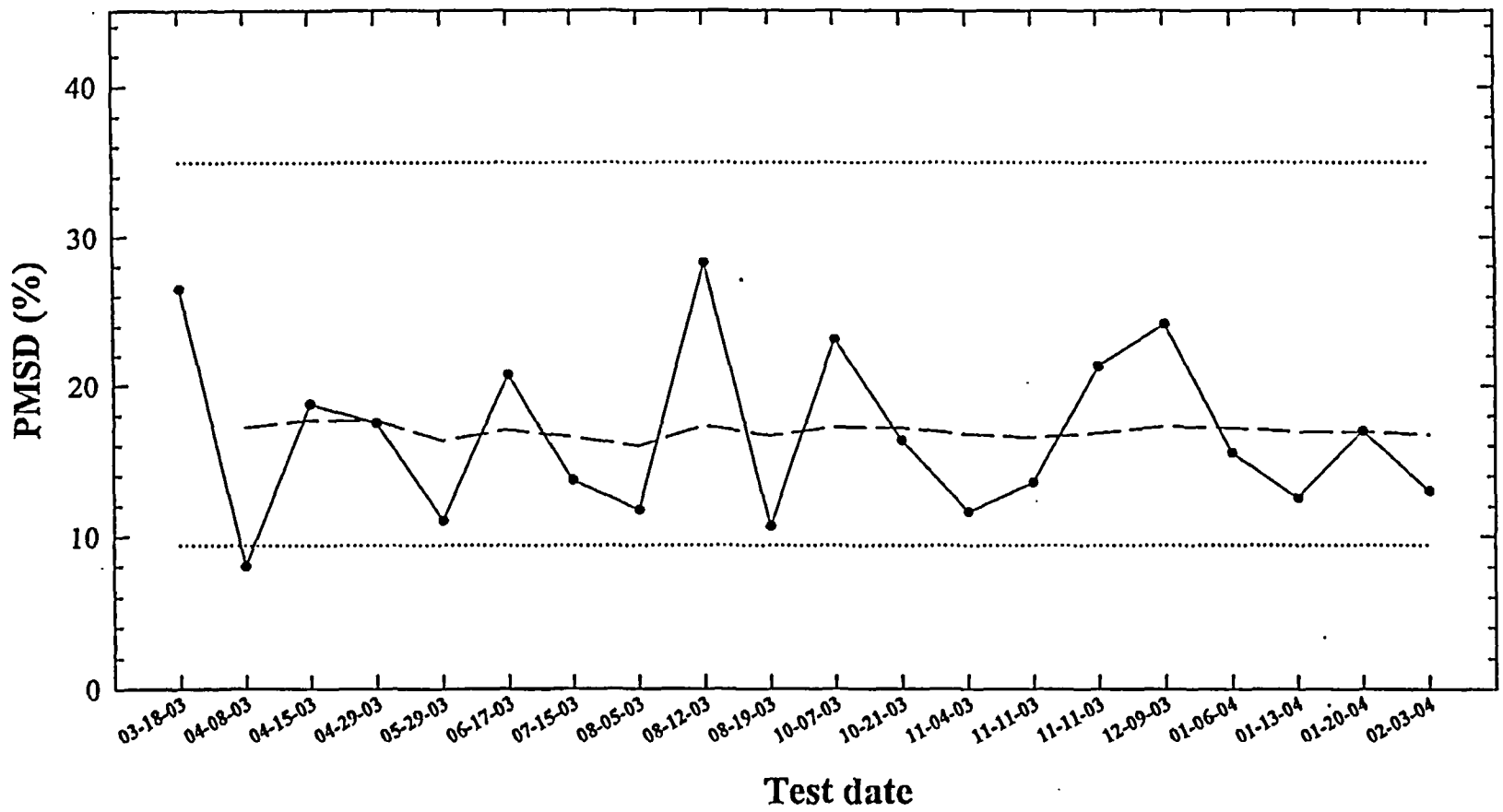
— — Central Tendency (mean Control Growth or CV)

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

# Environmental Testing Solutions, Inc.

## Precision of Endpoint Measurements

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




—•— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— — Central Tendency (mean PMSD)

····· Lower and Upper PMSD Bounds

Lower PMSD Bound (10th percentile) = 9.4%, Upper PMSD Bound (90th percentile) = 35%

(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

Jim Sumner
I attest to the accuracy and integrity of this document
2004.02.14 17:07:05 -05'00'

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

PpKClCR Test Number: 26

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 22.5 TO 25-HOURS OLD | Randomizing template: | BLUE |
| Date and times organisms were born between: | 02-02-04 1100 TO 1330 HST | Incubator number and shelf location: | 3A |
| Organism source: | ABS BATCH 02-02-04 | *Artemia* lot number: | B63010Q |
| Transfer bowl information: | pH = 7.88 SU Temperature = 24.2 °C | Total drying time: | 24-HOURS |
| | | Date / Time in: 02-10-04 | 1530 |
| Average transfer volume: | 10.4 ml | Date / Time out: 02-11-04 | 1530 |
| | | Oven temperature: | 60°C |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Control water batch used | Analyst |
|---|---|---|---|---|---|---|
| 0 | 02-03-04 | — | 1700 | 1400 | 02-02-04 | JH |
| 1 | 02-04-04 | 0951 | 1652 | 1356 | 02-02-04 | KEK |
| 2 | 02-05-04 | 0946 | 1659 | 1403 | 02-02-04 | KEK |
| 3 | 02-06-04 | 0956 | 1703 | 1410 | 02-02-04 | KEK |
| 4 | 02-07-04 | 1002 | 1710 | 1403 | 02-04-04 | KEK |
| 5 | 02-08-04 | 1010 | 1646 | 1400 | 02-04-04 | KEK |
| 6 | 02-09-04 | 0952 | 1706 | 1403 | 02-06-04 | KEK |
| 7 | 02-10-04 | | | 1348 | | KEK |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % Mortality: | 0% | ≤ 20% | 7-day $LC_{50}$ | 732.8 |
| Average weight per initial larvae: | 0.847 | | NOEC | 600 |
| Average weight per surviving larvae: | 0.847 | ≥ 0.25 mg/larvae | LOEC | 750 |
| | | | ChV | 670.8 |
| | | | $IC_{25}$ | 655.8 |

**Species:** *Pimephales promelas* PpKClCR Test Number: 26

*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 | 10 | 10 | 10 | 9'd | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| A = Pan weight (mg) | 14.803 | 15.047 | 14.904 | 14.862 | 14.926 | 14.786 | 15.023 | 15.029 | 14.715 | 14.574 | 14.771 | 14.585 |
| B = Pan + Larvae weight (mg) | 23.37 | 23.25 | 23.94 | 22.92 | 23.47 | 22.76 | 23.09 | 22.21 | 23.73 | 22.43 ~~23.01~~ | 23.22 | 22.50 |
| C = Larvae weight (mg) = A – B | 8.567 | 8.203 | 9.036 | 8.058 | 8.544 | 7.974 | 8.067 | 7.181 | 9.015 | 7.856 | 8.449 | 7.915 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.857 | 0.820 | 0.904 | 0.806 | 0.854 | 0.797 | 0.807 | 0.718 | 0.902 | 0.786 | 0.845 | 0.792 |
| Average weight per initial number of larvae (mg) | 0.847 | | | | 0.794 | | | | 0.831 | | | |

% RED = 6.2% % RED = 1.9%

Calculations and data reviewed: JH

| *Comments:* |
|---|
| |
| |
| |
| |
| |

Species: *Pimephales promelas* PpKClCR Test Number: 26

*Survival and Growth Data*

| Day | 600 mg KCl/L | | | | 750 mg KCl/L | | | | 900 mg KCl/L | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | N | O | P | Q | R | S | T | U | V | W | X |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 7 3d | 5 5d | 5 5d | 4 6d | 3 7d | 2 8d | 2 8d | 3 7d |
| 2 | 10 | 10 | 10 | 9 1d | 6 1d | 4 1d | 5 | 4 | 2 1d | 2 | 1 1d | 2 1d |
| 3 | 10 | 10 | 9 1d | 9 | 6 | 4 | 4 1d | 4 | 2 | 2 | 1 | 2 |
| 4 | 10 | 10 | 9 | 9 | 6 | 4 | 4 | 4 | 2 | 2 | 1 | 2 |
| 5 | 10 | 10 | 8 1d | 8 1d | 6 | 4 | 4 | 4 | 2 | 1 1d | 1 | 2 |
| 6 | 10 | 10 | 8 | 8 | 6 | 4 | 4 | 4 | 2 | 1 | 1 | 2 |
| 7 | 10 | 10 | 8 | 8 | 6 | 4 | 4 | 4 | 1 1d | 1 | 1 | 2 |
| A = Pan weight (mg) | 15.086 | 14.871 | 14.814 | 15.098 | 14.586 | 14.398 | 14.620 | 14.983 | 14.496 | 15.033 | 14.578 | 14.712 |
| B = Pan + Larvae weight (mg) | 22.49 | 23.93 | 21.61 | 22.12 | 20.25 | 17.97 | 18.53 | 18.98 | 15.58 | 16.00 | 15.57 | 16.98 |
| Larvae weight (mg) = A – B | 7.404 | 9.059 | 6.796 | 7.022 | 5.664 | 3.572 | 3.910 | 3.997 | 1.084 | 0.967 | 0.992 | 2.268 |
| Weight per initial number of larvae (mg) = C / Initial number of larvae | 0.740 | 0.906 | 0.680 | 0.702 | 0.566 | 0.357 | 0.391 | 0.400 | 0.108 | 0.097 | 0.099 | 0.227 |
| Average weight per initial number of larvae (mg) | 0.757 | | | | 0.429 | | | | 0.133 | | | |

% RED. = 10.6% % RED. = 49.4% % RED. = 84.3%

Calculations and data reviewed: [illegible]

*Comments:*

# Environmental Testing Solutions, Inc.

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

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

**Test number:** PpKCICR # 66 (#26 at 351 Depot St.)

**Test dates:** February 3-10, 2004

Reveiwed by: [illegible]

| Concentration (mg/L KCl) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Surviving number of larvae (mg) | Mean weight/ Surviving number of larvae (mg) | Coefficient of variation (Mean weight per surviving number of larvae) (%) | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight/ Initial number of larvae (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 14.803 | 23.37 | 8.567 | 0.857 | 0.847 | 5.2 | 0.857 | 100.0 | 0.847 | 5.2 | Not applicable |
| | B | 10 | 10 | 15.047 | 23.25 | 8.203 | 0.820 | | | 0.820 | | | | |
| | C | 10 | 10 | 14.904 | 23.94 | 9.036 | 0.904 | | | 0.904 | | | | |
| | D | 10 | 10 | 14.862 | 22.92 | 8.058 | 0.806 | | | 0.806 | | | | |
| 300 | E | 10 | 10 | 14.926 | 23.47 | 8.544 | 0.854 | 0.794 | 7.1 | 0.854 | 100.0 | 0.794 | 7.1 | 6.2 |
| | F | 10 | 10 | 14.786 | 22.76 | 7.974 | 0.797 | | | 0.797 | | | | |
| | G | 10 | 10 | 15.023 | 23.09 | 8.067 | 0.807 | | | 0.807 | | | | |
| | H | 10 | 10 | 15.029 | 22.21 | 7.181 | 0.718 | | | 0.718 | | | | |
| 450 | I | 10 | 10 | 14.715 | 23.73 | 9.015 | 0.902 | 0.853 | 5.5 | 0.902 | 97.5 | 0.831 | 6.5 | 1.9 |
| | J | 10 | 9 | 14.574 | 22.43 | 7.856 | 0.873 | | | 0.786 | | | | |
| | K | 10 | 10 | 14.771 | 23.22 | 8.449 | 0.845 | | | 0.845 | | | | |
| | L | 10 | 10 | 14.585 | 22.50 | 7.915 | 0.792 | | | 0.792 | | | | |
| 600 | M | 10 | 10 | 15.086 | 22.49 | 7.404 | 0.740 | 0.843 | 8.6 | 0.740 | 90.0 | 0.757 | 13.5 | 10.6 |
| | N | 10 | 10 | 14.871 | 23.93 | 9.059 | 0.906 | | | 0.906 | | | | |
| | O | 10 | 8 | 14.814 | 21.61 | 6.796 | 0.850 | | | 0.680 | | | | |
| | P | 10 | 8 | 15.098 | 22.12 | 7.022 | 0.878 | | | 0.702 | | | | |
| 750 | Q | 10 | 6 | 14.586 | 20.25 | 5.664 | 0.944 | 0.953 | 4.9 | 0.566 | 45.0 | 0.429 | 21.9 | 49.4 |
| | R | 10 | 4 | 14.398 | 17.97 | 3.572 | 0.893 | | | 0.357 | | | | |
| | S | 10 | 4 | 14.620 | 18.53 | 3.910 | 0.978 | | | 0.391 | | | | |
| | T | 10 | 4 | 14.983 | 18.98 | 3.997 | 0.999 | | | 0.400 | | | | |
| 900 | U | 10 | 1 | 14.496 | 15.58 | 1.084 | 1.084 | 1.044 | 7.5 | 0.108 | 12.5 | 0.133 | 47.4 | 84.3 |
| | V | 10 | 1 | 15.033 | 16.00 | 0.967 | 0.967 | | | 0.097 | | | | |
| | W | 10 | 1 | 14.578 | 15.57 | 0.992 | 0.992 | | | 0.099 | | | | |
| | X | 10 | 2 | 14.712 | 16.98 | 2.268 | 1.134 | | | 0.227 | | | | |

**Dunnett's MSD value:** 0.1101

**PMSD:** 13.0

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing).

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

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

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

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

*Organisms obtained from Aquatic BioSystems, Inc.*

# Environmental Testing Solutions, Inc.
## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Survival**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPKClCR | Sample ID: | REF-Ref Toxicant |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | KCL-Potassium chloride |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 300 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 450 | 1.0000 | 0.9000 | 1.0000 | 1.0000 |
| 600 | 1.0000 | 1.0000 | 0.8000 | 0.8000 |
| 750 | 0.6000 | 0.4000 | 0.4000 | 0.4000 |
| 900 | 0.1000 | 0.1000 | 0.1000 | 0.2000 |

| | | | Transform: Arcsin Square Root | | | | | Rank | 1-Tailed | Number | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical | Resp | Number |
| D-Control | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | | | 0 | 40 |
| 300 | 1.0000 | 1.0000 | 1.4120 | 1.4120 | 1.4120 | 0.000 | 4 | 18.00 | 10.00 | 0 | 40 |
| 450 | 0.9750 | 0.9750 | 1.3713 | 1.2490 | 1.4120 | 5.942 | 4 | 16.00 | 10.00 | 1 | 40 |
| 600 | 0.9000 | 0.9000 | 1.2596 | 1.1071 | 1.4120 | 13.974 | 4 | 14.00 | 10.00 | 4 | 40 |
| *750 | 0.4500 | 0.4500 | 0.7351 | 0.6847 | 0.8861 | 13.697 | 4 | 10.00 | 10.00 | 22 | 40 |
| *900 | 0.1250 | 0.1250 | 0.3572 | 0.3218 | 0.4636 | 19.861 | 4 | 10.00 | 10.00 | 35 | 40 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.91562915 | 0.884 | 0.20833591 | 0.21327986 |
| Equality of variance cannot be confirmed | | | | |

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

*Organisms obtained from Aquatic BioSystems, Inc.*

01-20-04

# Environmental Testing Solutions, Inc.

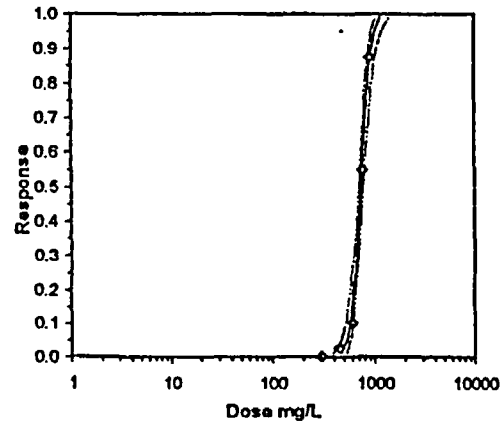
## Statistical Analyses

**Maximum Likelihood-Probit**

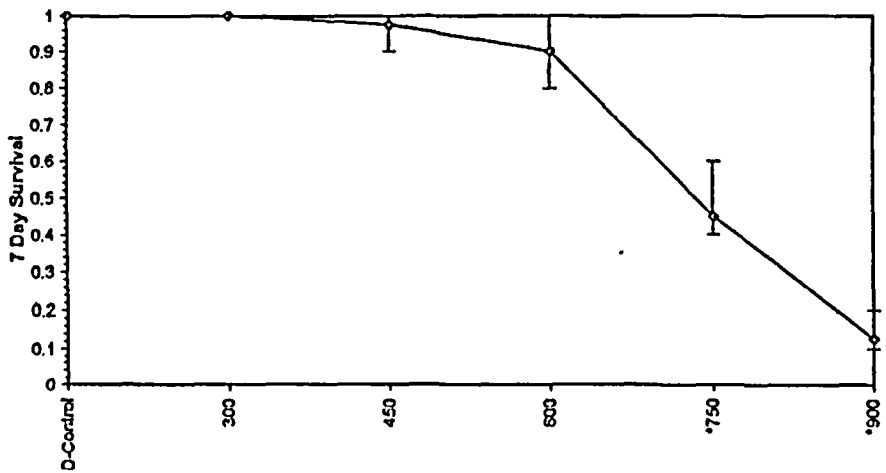
| Parameter | Value | SE | 95% Fiducial Limits | |
|---|---|---|---|---|
| Slope | 11.861861 | 1.68483649 | 8.55958142 | 15.1641406 |
| Intercept | -28.98372 | 4.82457641 | -38.43989 | -19.52755 |
| TSCR | | | | |

| Control | Chi-Sq | Critical | P-value | Mu | Sigma | Iter |
|---|---|---|---|---|---|---|
| 0 | 3.37020517 | 7.81472778 | 0.34 | 2.86495685 | 0.0843038 | 4 |

| Point | Probits | mg/L | 95% Fiducial Limits | |
|---|---|---|---|---|
| EC01 | 2.674 | 466.484129 | 389.144941 | 518.820784 |
| EC05 | 3.355 | 532.462994 | 465.818241 | 577.392508 |
| EC10 | 3.718 | 571.369662 | 512.060168 | 612.024097 |
| EC15 | 3.964 | 599.213479 | 545.340404 | 637.122405 |
| EC20 | 4.158 | 622.307419 | 572.874119 | 658.321118 |
| EC25 | 4.326 | 642.828016 | 597.131193 | 677.601535 |
| EC40 | 4.747 | 697.587555 | 659.604031 | 732.376546 |
| EC50 | 5.000 | 732.751724 | 696.871674 | 771.205248 |
| EC60 | 5.253 | 769.688464 | 733.120462 | 815.553611 |
| EC75 | 5.674 | 835.254644 | 791.488734 | 901.896482 |
| EC80 | 5.842 | 862.797189 | 814.442003 | 940.347615 |
| EC85 | 6.036 | 896.049768 | 841.340175 | 988.060218 |
| EC90 | 6.282 | 939.715753 | 875.661298 | 1052.4946 |
| EC95 | 6.645 | 1008.38008 | 928.006347 | 1157.19612 |
| EC99 | 7.326 | 1151.00405 | 1032.59031 | 1385.44355 |




**Dose-Response Plot**




*Organisms obtained from Aquatic BioSystems, Inc.*

01-20-04

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | PPKCICR | Sample ID: | REF-Ref Toxicant |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | KCL-Potassium chloride |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.8567 | 0.8203 | 0.9036 | 0.8058 |
| 300 | 0.8544 | 0.7974 | 0.8067 | 0.7181 |
| 450 | 0.9015 | 0.7856 | 0.8449 | 0.7915 |
| 600 | 0.7404 | 0.9059 | 0.6796 | 0.7022 |
| 750 | 0.5664 | 0.3572 | 0.3910 | 0.3997 |
| 900 | 0.1084 | 0.0967 | 0.0992 | 0.2268 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.8466 | 1.0000 | 0.8466 | 0.8058 | 0.9036 | 5.152 | 4 | | | | 0.8466 | 1.0000 |
| 300 | 0.7942 | 0.9380 | 0.7942 | 0.7181 | 0.8544 | 7.116 | 4 | 1.091 | 2.290 | 0.1101 | 0.8125 | 0.9597 |
| 450 | 0.8309 | 0.9814 | 0.8309 | 0.7856 | 0.9015 | 6.513 | 4 | 0.327 | 2.290 | 0.1101 | 0.8125 | 0.9597 |
| 600 | 0.7570 | 0.8942 | 0.7570 | 0.6796 | 0.9059 | 13.523 | 4 | 1.862 | 2.290 | 0.1101 | 0.7570 | 0.8942 |
| 750 | 0.4286 | 0.5062 | 0.4286 | 0.3572 | 0.5664 | 21.862 | 4 | | | | 0.4286 | 0.5062 |
| 900 | 0.1328 | 0.1568 | 0.1328 | 0.0967 | 0.2268 | 47.362 | 4 | | | | 0.1328 | 0.1568 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.92996466 | 0.844 | 0.93001388 | 0.86128606 |
| Bartlett's Test indicates equal variances (p = 0.50) | 2.3672061 | 11.3448668 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 600 | >600 | | | 0.1101369 | 0.1300932 | 0.00640092 | 0.0046262 | 0.2951633 | 3, 12 |
| Treatments vs D-Control | | | | | | | | | | |

*Organisms obtained from Aquatic BioSystems, Inc.*

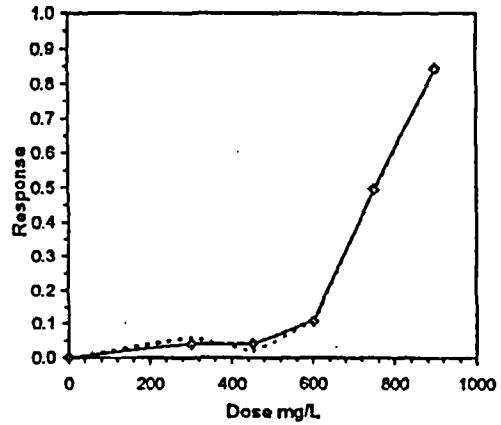
02-03-04

# Environmental Testing Solutions, Inc.

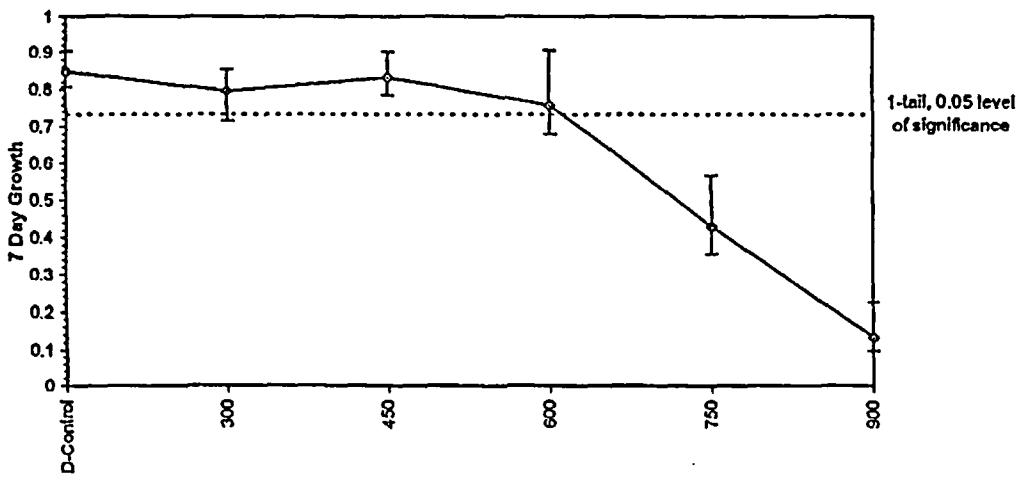
## Statistical Analyses

**Linear Interpolation (200 Resamples)**

| Point | mg/L | SD | 95% CL(Exp) | | Skew |
|---|---|---|---|---|---|
| IC05 | 472.28 | 147.80 | 0.00 | 690.63 | -0.4393 |
| IC10 | 586.71 | 68.26 | 124.28 | 650.82 | -2.2563 |
| IC15 | 617.09 | 26.83 | 511.60 | 664.04 | -1.1768 |
| IC20 | 636.42 | 16.75 | 583.92 | 684.53 | -0.1181 |
| IC25 | 655.75 | 15.47 | 611.28 | 705.25 | 0.1191 |
| IC40 | 713.75 | 17.32 | 671.43 | 780.64 | 0.7958 |
| IC50 | 752.67 | 17.31 | 708.72 | 810.13 | 0.5158 |




**Dose-Response Plot**




*Organisms obtained from Aquatic BioSystems, Inc.*

02-03-04

Species: *Pimephales promelas* PpKClCR Test Number: 26

*Daily Chemistry:*

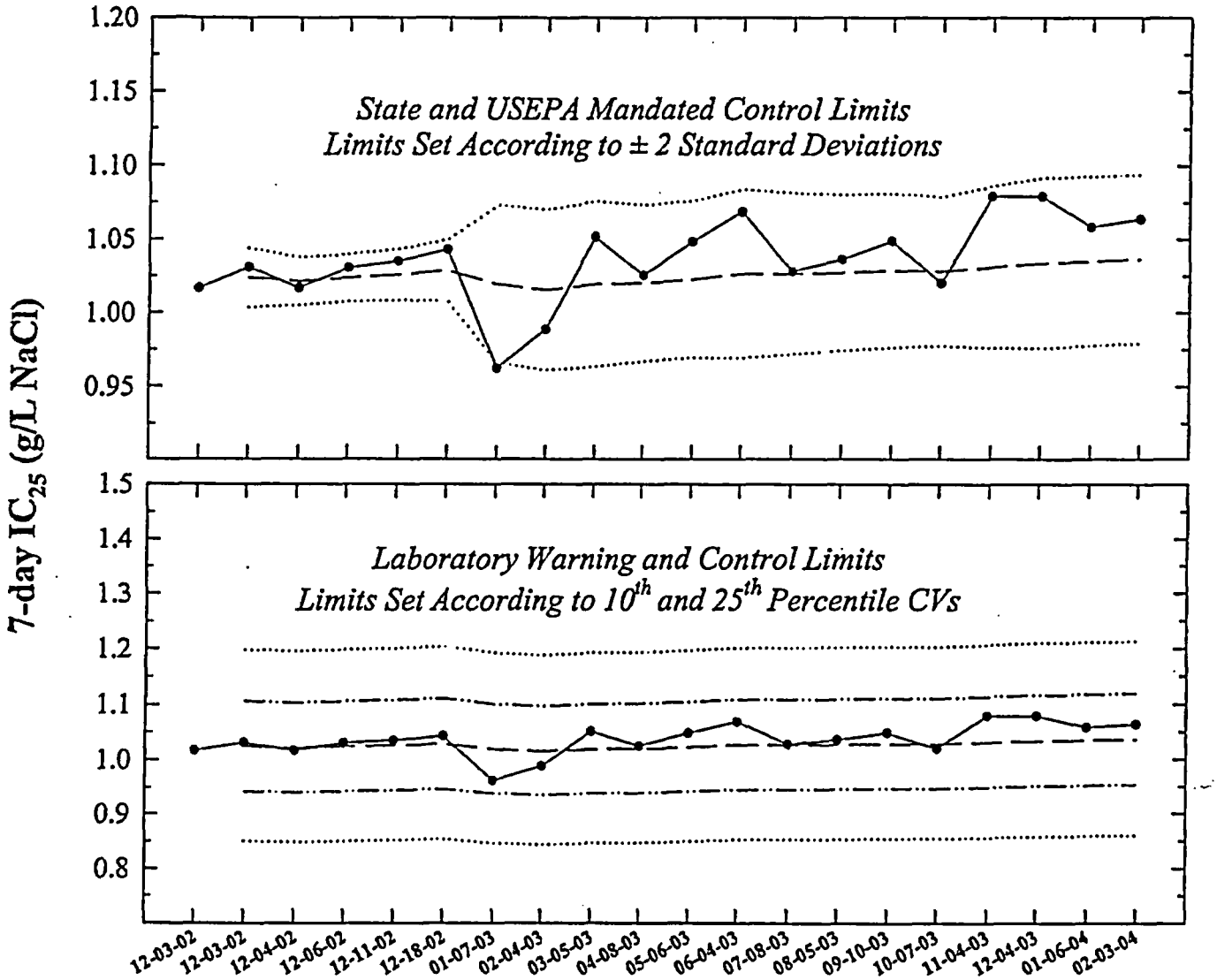
| | | Day | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | | 1 | | 2 | |
| | Analyst | KEL | CAJ | CAJ | CAJ | CAJ | CAJ |
| Concentration | Parameter | | | | | | |
| CONTROL | pH (S.U.) | 8.09 | 7.79 | 8.02 | 7.83 | 8.05 | 7.94 |
| | DO (mg/L) | 8.1 | 7.6 | 8.0 | 7.6 | 8.2 | 7.7 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | |
| | Alkalinity (mg $CaCO_3$/L) | 61 | | | | | |
| | Hardness (mg $CaCO_3$/L) | 84 | | | | | |
| | Temperature (°C) | 25.2 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| 300 mg KCl/L | pH (S.U.) | 8.09 | 7.82 | 8.03 | 7.84 | 8.03 | 7.87 |
| | DO (mg/L) | 8.1 | 7.7 | 8.0 | 7.5 | 8.2 | 7.6 |
| | Conductivity (µmhos/cm) | 841 | | 825 | | 850 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| 450 mg KCl/L | pH (S.U.) | 8.09 | 7.87 | 8.04 | 7.82 | 8.02 | 7.80 |
| | DO (mg/L) | 8.2 | 7.8 | 8.0 | 7.5 | 8.1 | 7.5 |
| | Conductivity (µmhos/cm) | 1050 | | 1090 | | 1070 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| 600 mg KCl/L | pH (S.U.) | 8.09 | 7.89 | 8.05 | 7.85 | 8.01 | 7.81 |
| | DO (mg/L) | 8.2 | 7.8 | 8.0 | 7.6 | 8.2 | 7.6 |
| | Conductivity (µmhos/cm) | 1360 | | 1330 | | 1340 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| 750 mg KCl/L | pH (S.U.) | 8.08 | 7.91 | 8.05 | 7.87 | 8.01 | 7.93 |
| | DO (mg/L) | 8.2 | 7.8 | 8.0 | 7.8 | 8.2 | 7.7 |
| | Conductivity (µmhos/cm) | 1620 | | 1600 | | 1580 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| 900 mg KCl/L | pH (S.U.) | 8.08 | 7.90 | 8.06 | 7.91 | 8.01 | 7.98 |
| | DO (mg/L) | 8.3 | 7.8 | 8.1 | 8.0 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 1890 | | 1880 | | 1870 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.9 | 24.8 | 25.1 | 25.3 |
| STOCK | Conductivity (µmhos/cm) | 75400 | | — | | 74800 | |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Pimephales promelas* PpKClCR Test Number: 26

| | | Day | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | 6 LT | |
| | Analyst | CAJ | CAJ | CAJ | KEL | KEL | KEL | KEL | KEL |
| Concentration | Parameter | | | | | | | | |
| CONTROL | pH (S.U.) | 8.12 | 7.80 | 8.11 | 7.93 | 8.21 | 7.78 | 8.10 | 7.58 |
| | DO (mg/L) | 7.9 | 7.6 | 8.2 | 7.7 | 7.8 | 7.4 | 7.8 | 7.8 |
| | Conductivity (µmhos/cm) | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg $CaCO_3$/L) | K | | 62 | | K | | 61 | |
| | Hardness (mg $CaCO_3$/L) | K | | 84 | | K | | 84 | |
| | Temperature (°C) | 25.1 | 24.4 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| 300 mg KCl/L | pH (S.U.) | 8.10 | 7.77 | 7.97 | 7.85 | 8.10 | 7.76 | 8.18 | 7.63 |
| | DO (mg/L) | 8.0 | 7.6 | 8.0 | 7.5 | 7.8 | 7.4 | 8.2 | 7.8 |
| | Conductivity (µmhos/cm) | 807 | | 814 | | 810 | | 804 | |
| | Temperature (°C) | 25.1 | 24.4 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| 450 mg KCl/L | pH (S.U.) | 8.10 | 7.78 | 7.98 | 7.82 | 8.10 | 7.74 | 8.17 | 7.68 |
| | DO (mg/L) | 8.0 | 7.5 | 8.1 | 7.6 | 8.0 | 7.4 | 8.0 | 8.0 |
| | Conductivity (µmhos/cm) | 1140 | | 1090 | | 1050 | | 1110 | |
| | Temperature (°C) | 25.1 | 24.4 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| 600 mg KCl/L | pH (S.U.) | 8.09 | 7.77 | 7.98 | 7.87 | 8.09 | 7.72 | 8.15 | 7.68 |
| | DO (mg/L) | 8.0 | 7.7 | 8.1 | 7.8 | 8.1 | 7.3 | 8.1 | 8.0 |
| | Conductivity (µmhos/cm) | 1360 | | 1320 | | 1320 | | 1330 | |
| | Temperature (°C) | 25.1 | 24.6 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| 750 mg KCl/L | pH (S.U.) | 8.10 | 7.88 | 7.99 | 7.92 | 8.08 | 7.77 | 8.14 | 7.76 |
| | DO (mg/L) | 8.0 | 7.8 | 8.1 | 7.8 | 8.1 | 7.2 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 1670 | | 1590 | | 1590 | | 1610 | |
| | Temperature (°C) | 25.1 | 24.6 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| 900 mg KCl/L | pH (S.U.) | 8.11 | 7.86 | 7.99 | 7.90 | 8.08 | 7.77 | 8.14 | 7.75 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 8.0 | 8.2 | 7.4 | 8.1 | 8.0 |
| | Conductivity (µmhos/cm) | 1900 | | 1850 | | 1840 | | 1860 | |
| | Temperature (°C) | 25.1 | 24.6 | 25.0 | 25.0 | 24.3 | 24.8 | 25.5 | 25.3 |
| STOCK | Conductivity (µmhos/cm) | K | | 75900 | | K | | 74400 | |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

# Environmental Testing Solutions, Inc.

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




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

— — Central Tendency (mean $IC_{25}$)

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

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

# Environmental Testing Solutions, Inc.

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

| Test number | Test date | 7-day $IC_{25}$ (g/L NaCl) | CT (g/L NaCl) | S | State and USEPA Control Limits CT - 2S | CT + 2S | $S_{A10}$ | Laboratory Warning Limits CT - $S_{A10}$ | CT + $S_{A10}$ | $S_{A25}$ | Laboratory Control Limits CT - $S_{A25}$ | CT + $S_{A25}$ | $S_{A75}$ | USEPA Warning Limits CT - $S_{A75}$ | CT + $S_{A75}$ | $S_{A90}$ | USEPA Control Limits CT - $S_{A90}$ | CT + $S_{A90}$ | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12-03-02 | 1.02 | | | | | | | | | | | | | | | | | |
| 2 | 12-03-02 | 1.03 | 1.02 | 0.01 | 1.00 | 1.04 | 0.08 | 0.94 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.66 | 0.01 |
| 3 | 12-04-02 | 1.02 | 1.02 | 0.01 | 1.01 | 1.04 | 0.08 | 0.94 | 1.10 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.65 | 0.01 |
| 4 | 12-06-02 | 1.03 | 1.02 | 0.01 | 1.01 | 1.04 | 0.08 | 0.94 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.66 | 0.01 |
| 5 | 12-11-02 | 1.04 | 1.03 | 0.01 | 1.01 | 1.04 | 0.08 | 0.94 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.49 | 0.64 | 0.39 | 1.66 | 0.01 |
| 6 | 12-18-02 | 1.04 | 1.03 | 0.01 | 1.01 | 1.05 | 0.08 | 0.95 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.57 | 1.49 | 0.64 | 0.39 | 1.67 | 0.01 |
| 7 | 01-07-03 | 0.96 | 1.02 | 0.03 | 0.97 | 1.07 | 0.08 | 0.94 | 1.10 | 0.17 | 0.85 | 1.19 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.65 | 0.03 |
| 8 | 02-04-03 | 0.99 | 1.02 | 0.03 | 0.96 | 1.07 | 0.08 | 0.93 | 1.10 | 0.17 | 0.84 | 1.19 | 0.46 | 0.56 | 1.47 | 0.63 | 0.39 | 1.65 | 0.03 |
| 9 | 03-05-03 | 1.05 | 1.02 | 0.03 | 0.96 | 1.08 | 0.08 | 0.94 | 1.10 | 0.17 | 0.85 | 1.19 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.65 | 0.03 |
| 10 | 04-08-03 | 1.03 | 1.02 | 0.03 | 0.97 | 1.07 | 0.08 | 0.94 | 1.10 | 0.17 | 0.85 | 1.19 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.65 | 0.03 |
| 11 | 05-06-03 | 1.05 | 1.02 | 0.03 | 0.97 | 1.08 | 0.08 | 0.94 | 1.10 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.48 | 0.63 | 0.39 | 1.66 | 0.03 |
| 12 | 06-04-03 | 1.07 | 1.03 | 0.03 | 0.97 | 1.08 | 0.08 | 0.94 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.49 | 0.64 | 0.39 | 1.66 | 0.03 |
| 13 | 07-08-03 | 1.03 | 1.03 | 0.03 | 0.97 | 1.08 | 0.08 | 0.94 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.56 | 1.49 | 0.64 | 0.39 | 1.66 | 0.03 |
| 14 | 08-05-03 | 1.04 | 1.03 | 0.03 | 0.97 | 1.08 | 0.08 | 0.95 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.57 | 1.49 | 0.64 | 0.39 | 1.66 | 0.03 |
| 15 | 09-10-03 | 1.05 | 1.03 | 0.03 | 0.98 | 1.08 | 0.08 | 0.95 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.57 | 1.49 | 0.64 | 0.39 | 1.67 | 0.03 |
| 16 | 10-07-03 | 1.02 | 1.03 | 0.03 | 0.98 | 1.08 | 0.08 | 0.95 | 1.11 | 0.17 | 0.85 | 1.20 | 0.46 | 0.57 | 1.49 | 0.64 | 0.39 | 1.67 | 0.02 |
| 17 | 11-04-03 | 1.08 | 1.03 | 0.03 | 0.98 | 1.09 | 0.08 | 0.95 | 1.11 | 0.18 | 0.86 | 1.21 | 0.46 | 0.57 | 1.50 | 0.64 | 0.39 | 1.67 | 0.03 |
| 18 | 12-04-03 | 1.08 | 1.03 | 0.03 | 0.98 | 1.09 | 0.08 | 0.95 | 1.12 | 0.18 | 0.86 | 1.21 | 0.47 | 0.57 | 1.50 | 0.64 | 0.39 | 1.67 | 0.03 |
| 19 | 01-06-04 | 1.06 | 1.04 | 0.03 | 0.98 | 1.09 | 0.08 | 0.95 | 1.12 | 0.18 | 0.86 | 1.21 | 0.47 | 0.57 | 1.50 | 0.64 | 0.39 | 1.68 | 0.03 |
| 20 | 02-03-04 | 1.06 | 1.04 | 0.03 | 0.98 | 1.09 | 0.08 | 0.95 | 1.12 | 0.18 | 0.86 | 1.21 | 0.47 | 0.57 | 1.50 | 0.64 | 0.39 | 1.68 | 0.03 |

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

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

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

**Laboratory Control and Warning Limits**

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

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

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

**USEPA Control and Warning Limits**

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

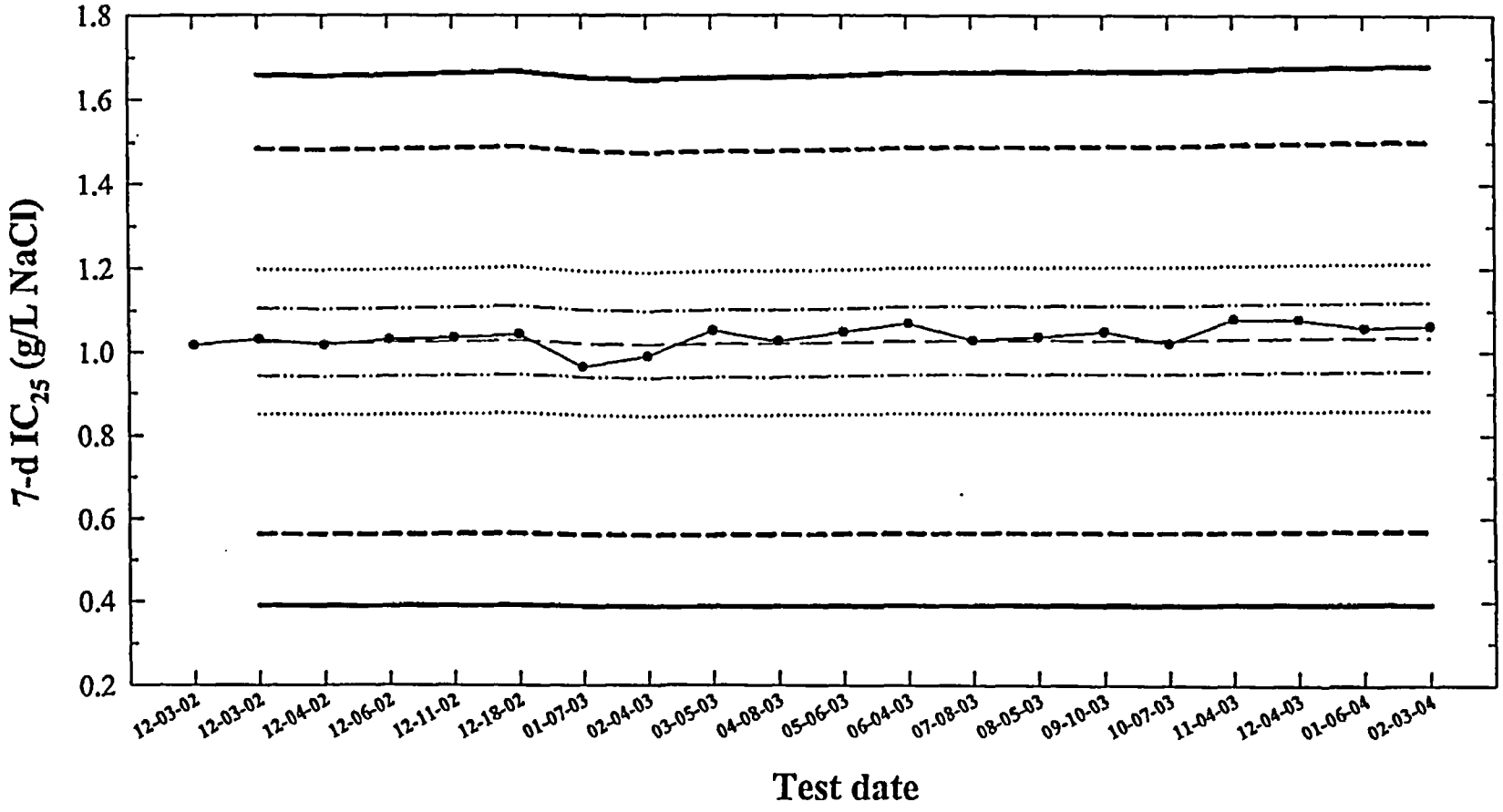
$S_{A90}$ = Standard deviation corresponding to the 90th percentile CV. ($S_{A90}$ = 0.62)

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

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

# Environmental Testing Solutions, Inc.

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




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

— — Central Tendency (mean $IC_{25}$)

—··— Laboratory Warning Limits (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.08$)

····· Laboratory Control Limits (mean $IC_{25} \pm S_{A.25}$, $S_{A.25} = 0.17$)

— — USEPA Warning Limits (mean $IC_{25} \pm S_{A.75}$, $S_{A.75} = 0.45$)

—— USEPA Control Limits (mean $IC_{25} \pm S_{A.90}$, $S_{A.90} = 0.62$)

# Environmental Testing Solutions, Inc.

## Precision of Endpoint Measurements

### Sodium Chloride Chronic Reference Toxicant Data for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water

| Test number | Test date | Control Survival (%) | Control Mean Reproduction (offspring/female) | CT for Control Mean Reproduction (offspring/female) | CV (%) | CT for Control Reproduction CV (%) | MSD | PMSD (%) | CT for PMSD (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 12-03-02 | 90 | 34.0 | | 8.0 | | 2.7 | 8.0 | |
| 2 | 12-03-02 | 100 | 33.2 | 33.6 | 6.2 | 7.1 | 3.3 | 9.9 | 9.0 |
| 3 | 12-04-02 | 100 | 32.5 | 33.2 | 6.0 | 6.7 | 3.2 | 9.8 | 9.2 |
| 4 | 12-06-02 | 100 | 29.7 | 32.4 | 11.0 | 7.8 | 3.0 | 10.0 | 9.4 |
| 5 | 12-11-02 | 100 | 33.8 | 32.6 | 13.7 | 9.0 | 2.9 | 8.5 | 9.2 |
| 6 | 12-18-02 | 100 | 30.5 | 32.3 | 7.4 | 8.7 | 2.9 | 9.4 | 9.3 |
| 7 | 01-07-03 | 100 | 33.2 | 32.4 | 7.0 | 8.5 | 2.9 | 8.6 | 9.2 |
| 8 | 02-04-03 | 100 | 32.3 | 32.4 | 8.1 | 8.4 | 2.7 | 8.4 | 9.1 |
| 9 | 03-05-03 | 100 | 28.7 | 32.0 | 5.1 | 8.0 | 3.5 | 12.1 | 9.4 |
| 10 | 04-11-03 | 100 | 26.3 | 31.4 | 6.2 | 7.9 | 2.5 | 9.6 | 9.4 |
| 11 | 05-06-03 | 100 | 27.6 | 31.1 | 10.8 | 8.1 | 3.2 | 11.5 | 9.6 |
| 12 | 06-04-03 | 100 | 25.9 | 30.6 | 5.9 | 7.9 | 2.6 | 10.1 | 9.7 |
| 13 | 07-08-03 | 100 | 29.0 | 30.5 | 11.6 | 8.2 | 3.2 | 10.9 | 9.8 |
| 14 | 08-05-03 | 100 | 33.3 | 30.7 | 6.6 | 8.1 | 4.7 | 14.1 | 10.1 |
| 15 | 09-10-03 | 100 | 29.3 | 30.6 | 4.3 | 7.9 | 3.1 | 10.7 | 10.1 |
| 16 | 10-07-03 | 100 | 33.4 | 30.8 | 8.0 | 7.9 | 3.2 | 9.5 | 10.1 |
| 17 | 11-04-03 | 100 | 31.0 | 30.8 | 7.3 | 7.8 | 2.6 | 8.3 | 10.0 |
| 18 | 12-04-03 | 100 | 30.4 | 30.8 | 9.7 | 7.9 | 3.6 | 11.8 | 10.1 |
| 19 | 01-06-04 | 100 | 30.6 | 30.8 | 4.4 | 7.7 | 3.5 | 11.5 | 10.1 |
| 20 | 02-03-04 | 100 | 30.7 | 30.8 | 7.2 | 7.7 | 2.7 | 8.8 | 10.1 |

*Note:*

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 7.7% in Environmental Testing Solutions, Inc. *Ceriodaphnia* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 10.1% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

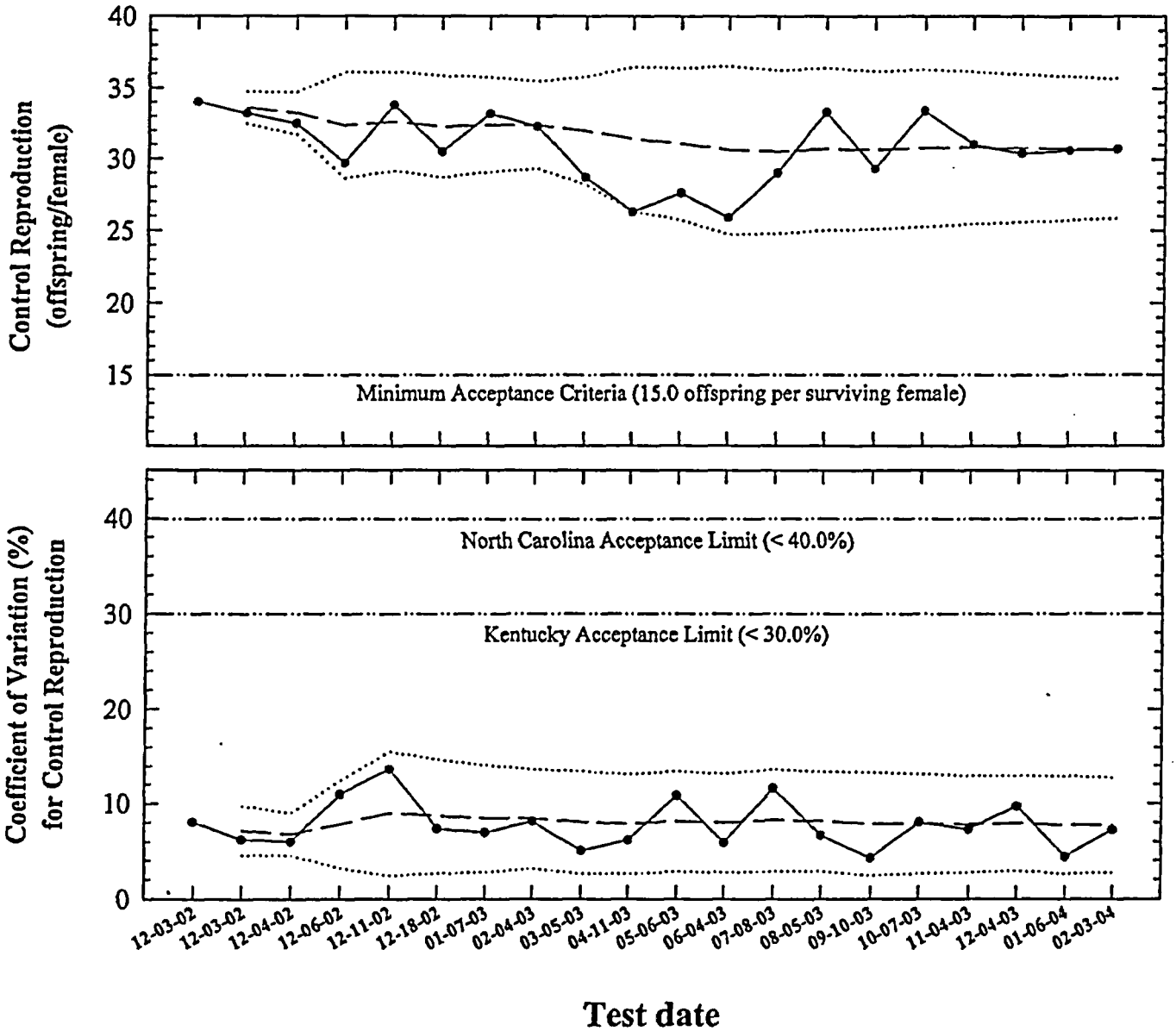
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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)**

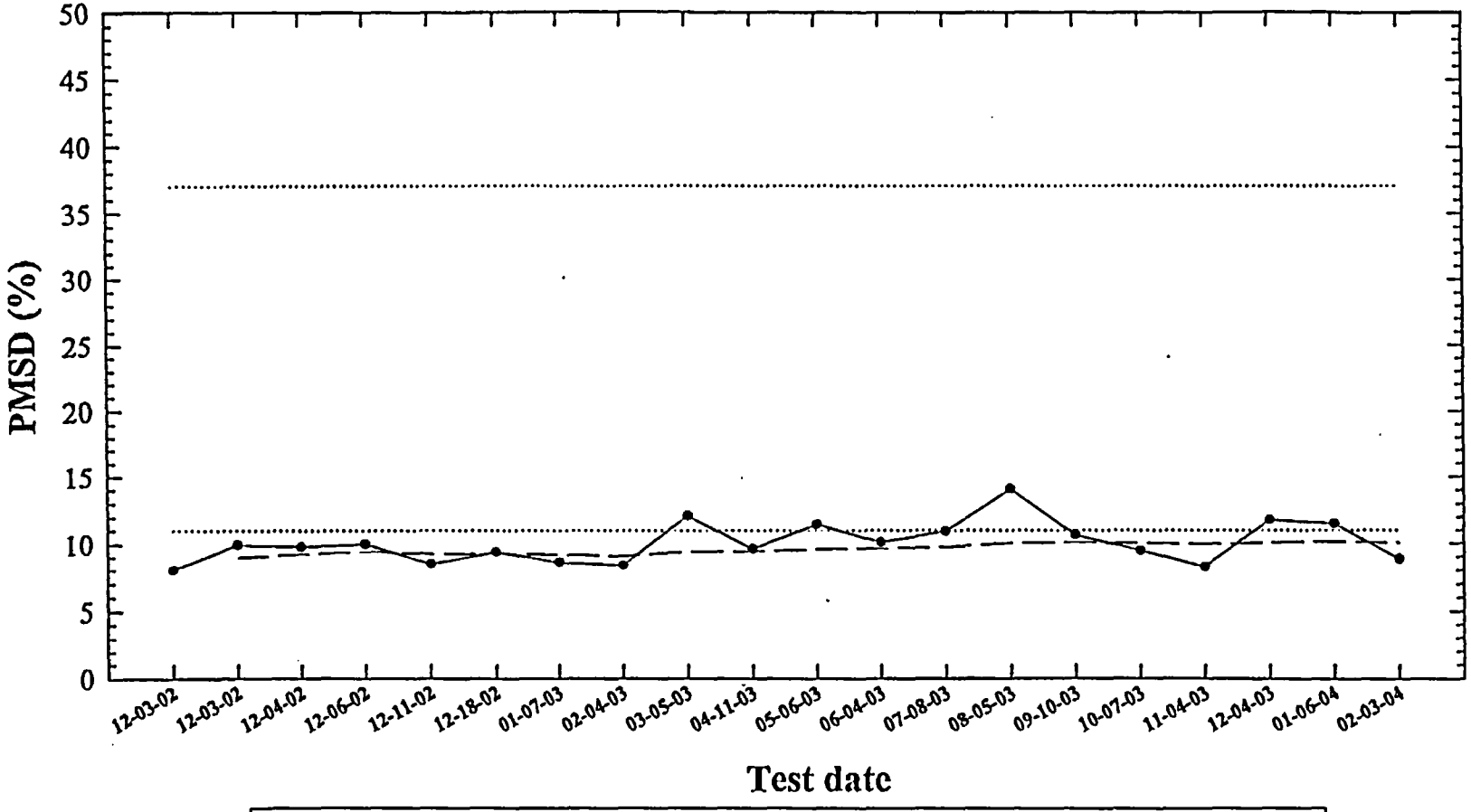
— — **Central Tendency** (mean Control Reproduction or CV)

····· **Control Limits** (mean Control Reproduction or CV ± 2 Standard Deviations)

# Environmental Testing Solutions, Inc.

## Precision of Endpoint Measurements

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




—•— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— — Central Tendency (mean PMSD)

····· Lower and Upper PMSD Bounds

Lower PMSD Bound (10th percentile) = 11%, Upper PMSD Bound (90th percentile) = 37%

(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

Jim Sumner
I attest to the accuracy and integrity of this document
2004.02.14 17:08:39 -05'00'

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

CdNaCLCR #: 19

| *Dilution preparation information:* | | | | | | *Comments:* |
|---|---|---|---|---|---|---|
| NaCl CHM number: | | CHM 000 | | | | |
| Stock preparation: | | 100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water) | | | | |
| Dilution prep (mg/L) | 600 | 800 | 1000 | 1200 | 1400 | |
| Stock volume (mL) | 9 | 12 | 15 | 18 | 21 | |
| Diluent volume (mL) | 1491 | 1488 | 1485 | 1482 | 1479 | |
| Total volume (mL) | 1500 | 1500 | 1500 | 1500 | 1500 | |

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | <24-hours old | Randomizing template: | Blue |
| Date and times organisms were born between: | 02-03-04 0857 TO 1018 | Incubator number and shelf location: | 2 D1 |
| Organism source: | 01-27-04 A-D | YCT batch: ABS | 01-22-04 |
| Transfer bowl information: | pH = 8.11 SU Temperature = 24.7°C | *Selenastrum* batch: ABS | 01-22-04 |

*Daily renewal information:*

| Day | Date | Test initiation, renewal, or termination time | Control water batch used | Analyst |
|---|---|---|---|---|
| 0 | 02-03-04 | 1127 | 02-02-04 | dl |
| 1 | 02-04-04 | 1040 | 02-02-04 | dl |
| 2 | 02-05-04 | 1051 | 02-02-04 | dl |
| 3 | 02-06-04 | 1100 | 02-02-04 | dl |
| 4 | 02-07-04 | 1101 | 02-04-04 | dl |
| 5 | 02-08-04 | 1048 | 02-04-04 | dl |
| 6 | 02-09-04 | 1040 | 02-06-04 | dl |
| 7 | 02-10-04 | 1100 | [illegible] | dl |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % of Male Adults: | 0% | ≤20% | 7-day LC50 | >1400 |
| % Adults having 3rd Broods: | 100% | ≥80% | NOEC | 1000 |
| % Mortality: | 0% | ≤20% | LOEC | 1200 |
| Mean Offspring/Female: | 30.7 | ≥15.0 offspring/female | ChV | 1095.4 |
| % CV: | 7.2% | <40.0% | IC25 | 1063.9 |

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 19

## 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 | 8*0 | 0 | 8*0 | 4 | 5 | 4 | 0 | 4 | 4 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 6 | 6 | 4 | 0 | 0 | *1 | 4 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 13 | 11 | 12 | 10 | 11 | 10 | 13 | 10 | 13 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 17 | 15 | 16 | 14 | 15 | 15 | 12 | 15 | 15 | 14 |
| Total young produced | | 33 | 34 | 31 | 30 | 30 | 31 | 26 | 32 | 29 | 31 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |
| X for 3rd Broods | | X | X | X | X | X | X | X | X | X | X |

* carry over

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 30.7 |

## 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 | 4 | 4 | 0 | 5 | 4 | 0 | 4 | 0 | 5 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 5 | 0 | *1 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 14 | 10 | 11 | 10 | 11 | 10 | 13 | 11 | 12 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 15 | 13 | 14 | 15 | 14 | 14 | 16 | 14 | 17 | 12 |
| Total young produced | | 29 | 31 | 29 | 31 | 28 | 30 | 30 | 32 | 33 | 29 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

* carryover

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 30.2 |
| % Reduction from Control: | 1.6% |

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 19

## 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 | 4 | 0 | 4 | 4 | 5 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 6 | 0 | 0 | 0 | 5 | 4 | 5 | 5 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 10 | 10 | 12 | 10 | 10 | 13 | 10 | 11 | 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 | 16 | 14 | 14 | 15 | 15 | 13 | 14 | 13 | 14 | 14 |
| Total young produced | | 31 | 30 | 28 | 31 | 30 | 28 | 31 | 28 | 30 | 28 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 29.5 |
| % Reduction from Control: | 3.9% |

## 1000 mg NaCl/L

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 4 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | +1 | 5 | 0 | 4 | 4 | 5 | 4 | 4 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 11 | 11 | 10 | 10 | 12 | 10 | 9 | 10 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 1* | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 16 | 15 | 15 | 16 | 12 | 13 | 12 | 15 | 12 | 14 |
| Total young produced | | 30 | 32 | 31 | 31 | 26 | 29 | 28 | 28 | 26 | 28 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

+ carry over

* carry over

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 28.9 |
| % Reduction from Control: | 5.9% |

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 19

## 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 | 3 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 8 | 5 | 7 | 6 | 0 | 6 | 2 | 5 | 0 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 10 | 10 | 6 | 0 | 5 | 4 | 6 | 4 | 2 | 6 |
| Total young produced | | 18 | 17 | 13 | 6 | 5 | 10 | 8 | 12 | 5 | 11 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 10.5 |
| % Reduction from Control: | 65.8% |

## 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 | 3 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 2 | 1 | 6 | 5 | 0 | 2 | 0 | 0 | 2 | 0 |
| | Adult mortality | L | L | L | L | L | L | D | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | ↓ | 1 | 0 | 2 |
| | Adult mortality | L | L | L | L | L | L | ↓ | L | L | L |
| 7 | Young produced | 0 | 0 | 0 | 0 | 2 | 0 | ↓ | 0 | 1 | 0 |
| Total young produced | | 2 | 3 | 9 | 7 | 2 | 2 | 0 | 4 | 3 | 2 |
| Final Adult Mortality | | L | L | L | L | L | L | D | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 10% |
| Mean Offspring/Female: | 3.4 |
| % Reduction from Control: | 88.9% |

# 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 | 4 | 5 | 4 | 0 | 4 | 4 | 4 | 25 |
| 4 | 6 | 6 | 4 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 21 |
| 5 | 10 | 13 | 11 | 12 | 10 | 11 | 10 | 13 | 10 | 13 | 113 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 17 | 15 | 16 | 14 | 15 | 15 | 12 | 15 | 15 | 14 | 148 |
| Total | 33 | 34 | 31 | 30 | 30 | 31 | 26 | 32 | 29 | 31 | 307 |

### 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 | 4 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 4 | 18 |
| 4 | 0 | 1 | 5 | 0 | 4 | 4 | 5 | 4 | 4 | 0 | 27 |
| 5 | 10 | 11 | 11 | 10 | 10 | 12 | 10 | 9 | 10 | 10 | 103 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7 | 16 | 15 | 15 | 16 | 12 | 13 | 12 | 15 | 12 | 14 | 140 |
| Total | 30 | 32 | 31 | 31 | 26 | 29 | 28 | 28 | 26 | 28 | 289 |

### 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 | 4 | 4 | 0 | 5 | 4 | 0 | 4 | 0 | 5 | 4 | 30 |
| 4 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 5 | 0 | 1 | 16 |
| 5 | 10 | 14 | 10 | 11 | 10 | 11 | 10 | 13 | 11 | 12 | 112 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 15 | 13 | 14 | 15 | 14 | 14 | 16 | 14 | 17 | 12 | 144 |
| Total | 29 | 31 | 29 | 31 | 28 | 30 | 30 | 32 | 33 | 29 | 302 |

### 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 | 3 | 0 | 3 |
| 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 |
| 5 | 8 | 5 | 7 | 6 | 0 | 6 | 2 | 5 | 0 | 5 | 44 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 10 | 10 | 6 | 0 | 5 | 4 | 6 | 4 | 2 | 6 | 53 |
| Total | 18 | 17 | 13 | 6 | 5 | 10 | 8 | 12 | 5 | 11 | 105 |

### 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 | 4 | 0 | 4 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 17 |
| 4 | 0 | 6 | 0 | 0 | 0 | 5 | 4 | 5 | 5 | 4 | 29 |
| 5 | 11 | 10 | 10 | 12 | 10 | 10 | 13 | 10 | 11 | 10 | 107 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 16 | 14 | 14 | 15 | 15 | 13 | 14 | 13 | 14 | 14 | 142 |
| Total | 31 | 30 | 28 | 31 | 30 | 28 | 31 | 28 | 30 | 28 | 295 |

### 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 | 3 | 0 | 0 | 3 |
| 4 | 0 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 5 | 2 | 1 | 6 | 5 | 0 | 2 | 0 | 0 | 2 | 0 | 18 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 3 |
| 7 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 3 |
| Total | 2 | 3 | 9 | 7 | 2 | 2 | 0 | 4 | 3 | 2 | 34 |

# Environmental Testing Solutions, Inc.

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

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

**Test number:** CdNaClCR #48 (#19 at 351 Depot St.)

**Test dates:** February 3-10, 2004

**Reveiwed by:**

| Concentration (mg/L NaCl) | Replicate number | | | | | | | | | | Survival (%) | Average reproduction (offspring/female) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | |
| Control | 33 | 34 | 31 | 30 | 30 | 31 | 26 | 32 | 29 | 31 | 100 | 30.7 | 7.2 | Not applicable |
| 600 | 29 | 31 | 29 | 31 | 28 | 30 | 30 | 32 | 33 | 29 | 100 | 30.2 | 5.1 | 1.6 |
| 800 | 31 | 30 | 28 | 31 | 30 | 28 | 31 | 28 | 30 | 28 | 100 | 29.5 | 4.6 | 3.9 |
| 1000 | 30 | 32 | 31 | 31 | 26 | 29 | 28 | 28 | 26 | 28 | 100 | 28.9 | 7.2 | 5.9 |
| 1200 | 18 | 17 | 13 | 6 | 5 | 10 | 8 | 12 | 5 | 11 | 100 | 10.5 | 44.3 | 65.8 |
| 1400 | 2 | 3 | 9 | 7 | 2 | 2 | 0 | 4 | 3 | 2 | 90 | 3.4 | 78.7 | 88.9 |

**Dunnett's MSD value:** 2.713

**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 10.1% from the control.

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

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

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

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

# Environmental Testing Solutions, Inc.

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | CdNaClCR | Sample ID: | REF-Ref Toxicant |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | NACL-Sodium chloride |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | CD-Ceriodaphnia dubia |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 33.000 | 34.000 | 31.000 | 30.000 | 30.000 | 31.000 | 26.000 | 32.000 | 29.000 | 31.000 |
| 600 | 29.000 | 31.000 | 29.000 | 31.000 | 28.000 | 30.000 | 30.000 | 32.000 | 33.000 | 29.000 |
| 800 | 31.000 | 30.000 | 28.000 | 31.000 | 30.000 | 28.000 | 31.000 | 28.000 | 30.000 | 28.000 |
| 1000 | 30.000 | 32.000 | 31.000 | 31.000 | 26.000 | 29.000 | 28.000 | 28.000 | 26.000 | 28.000 |
| 1200 | 18.000 | 17.000 | 13.000 | 6.000 | 5.000 | 10.000 | 8.000 | 12.000 | 5.000 | 11.000 |
| 1400 | 2.000 | 3.000 | 9.000 | 7.000 | 2.000 | 2.000 | 0.000 | 4.000 | 3.000 | 2.000 |

| | | | Transform: Untransformed | | | | | Rank | 1-Tailed | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical | Mean | N-Mean |
| D-Control | 30.700 | 1.0000 | 30.700 | 26.000 | 34.000 | 7.210 | 10 | | | 30.700 | 1.0000 |
| 600 | 30.200 | 0.9837 | 30.200 | 28.000 | 33.000 | 5.130 | 10 | 93.50 | 75.00 | 30.200 | 0.9837 |
| 800 | 29.500 | 0.9609 | 29.500 | 28.000 | 31.000 | 4.590 | 10 | 84.50 | 75.00 | 29.500 | 0.9609 |
| 1000 | 28.900 | 0.9414 | 28.900 | 26.000 | 32.000 | 7.194 | 10 | 82.00 | 75.00 | 28.900 | 0.9414 |
| *1200 | 10.500 | 0.3420 | 10.500 | 5.000 | 18.000 | 44.274 | 10 | 55.00 | 75.00 | 10.500 | 0.3420 |
| *1400 | 3.400 | 0.1107 | 3.400 | 0.000 | 9.000 | 78.676 | 10 | 55.00 | 75.00 | 3.400 | 0.1107 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates normal distribution (p > 0.01) | 0.86754763 | 1.035 | 0.426587 | 1.19887175 |
| Bartlett's Test indicates unequal variances (p = 2.50E-03) | 18.3882027 | 15.0862722 | | |

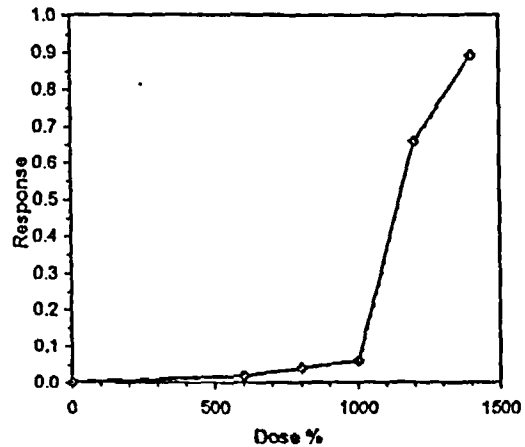
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU |
|---|---|---|---|---|
| Steel's Many-One Rank Test | 1000 | 1200 | 1095.44512 | 0.1 |
| Treatments vs D-Control | | | | |

# Environmental Testing Solutions, Inc.

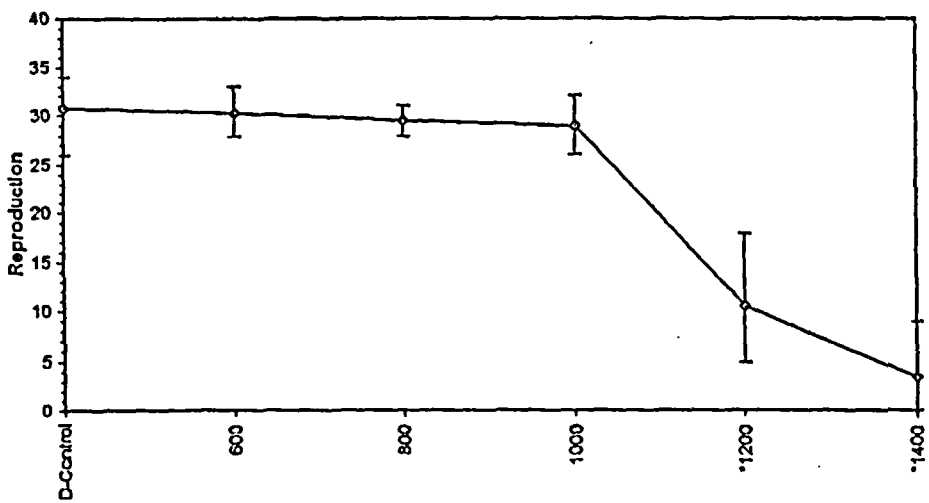
## Statistical Analyses

Linear Interpolation (200 Resamples)

| Point | % | SD | 95% CL | | Skew |
|---|---|---|---|---|---|
| IC05 | 911.666667 | 159.295919 | 443.616279 | 1011.1882 | -1.0361 |
| IC10 | 1013.80435 | 26.6511843 | 924.2 | 1026.83876 | -4.9868 |
| IC15 | 1030.48913 | 7.62826375 | 1012.93449 | 1043.2405 | -0.1793 |
| IC20 | 1047.17391 | 7.55412408 | 1030.88297 | 1059.54745 | -0.0737 |
| IC25 | 1063.8587 | 7.74712031 | 1048.91793 | 1076.13861 | 0.0293 |
| IC40 | 1113.91304 | 9.66174513 | 1097.05444 | 1132.31828 | 0.2778 |
| IC50 | 1147.28261 | 11.6603508 | 1128.27576 | 1171.16036 | 0.3831 |




Dose-Response Plot




02-03-04

# Environmental Testing Solutions, Inc.

## Statistical Analyses

| Used for PMSD calculation only. | | | | Ceriodaphnia Survival and Reproduction Test-Reproduction | |
|---|---|---|---|---|---|
| Start Date: | 2/3/2004 | Test ID: | CdNaClCR | Sample ID: | REF-Ref Toxicant |
| End Date: | 2/10/2004 | Lab ID: | ETS-Environ. Testing Sol. | Sample Type: | NACL-Sodium chloride |
| Sample Date: | | Protocol: | EPA-821-R02-013 | Test Species: | CD-Ceriodaphnia dubia |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 33.000 | 34.000 | 31.000 | 30.000 | 30.000 | 31.000 | 26.000 | 32.000 | 29.000 | 31.000 |
| 600 | 29.000 | 31.000 | 29.000 | 31.000 | 28.000 | 30.000 | 30.000 | 32.000 | 33.000 | 29.000 |
| 800 | 31.000 | 30.000 | 28.000 | 31.000 | 30.000 | 28.000 | 31.000 | 28.000 | 30.000 | 28.000 |
| 1000 | 30.000 | 32.000 | 31.000 | 31.000 | 26.000 | 29.000 | 28.000 | 28.000 | 26.000 | 28.000 |
| 1200 | 18.000 | 17.000 | 13.000 | 6.000 | 5.000 | 10.000 | 8.000 | 12.000 | 5.000 | 11.000 |
| 1400 | 2.000 | 3.000 | 9.000 | 7.000 | 2.000 | 2.000 | 0.000 | 4.000 | 3.000 | 2.000 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | |
|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD |
| D-Control | 30.700 | 1.0000 | 30.700 | 26.000 | 34.000 | 7.210 | 10 | | | |
| 600 | 30.200 | 0.9837 | 30.200 | 28.000 | 33.000 | 5.130 | 10 | 0.421 | 2.287 | 2.713 |
| 800 | 29.500 | 0.9609 | 29.500 | 28.000 | 31.000 | 4.590 | 10 | 1.012 | 2.287 | 2.713 |
| 1000 | 28.900 | 0.9414 | 28.900 | 26.000 | 32.000 | 7.194 | 10 | 1.517 | 2.287 | 2.713 |
| *1200 | 10.500 | 0.3420 | 10.500 | 5.000 | 18.000 | 44.274 | 10 | 17.027 | 2.287 | 2.713 |
| *1400 | 3.400 | 0.1107 | 3.400 | 0.000 | 9.000 | 78.676 | 10 | 23.012 | 2.287 | 2.713 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates normal distribution (p > 0.01) | 0.86754763 | 1.035 | 0.426587 | 1.19887175 |
| Bartlett's Test indicates unequal variances (p = 2.50E-03) | 18.3882027 | 15.0862722 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 1000 | 1200 | 1095.44512 | 0.1 | 2.71276873 | 0.0883638 | 1449.52 | 7.03703704 | 7.1E-34 | 5, 54 |
| Treatments vs D-Control | | | | | | | | | | |

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 19

*Daily Chemistry:*

| | | Day | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | | 1 | | 2 | |
| | Analyst | KEL | CAJ | CAJ | CAJ | CAJ | CAJ |
| Concentration | Parameter | | | | | | |
| CONTROL | pH (S.U.) | 8.09 | 8.09 | 8.02 | 8.04 | 8.05 | 7.98 |
| | DO (mg/L) | 8.1 | 7.8 | 8.0 | 7.8 | 8.2 | 7.9 |
| | Conductivity (µmhos/cm) | 298 | | 301 | | 305 | |
| | Alkalinity (mg $CaCO_3$/L) | 61 | | | | | |
| | Hardness (mg $CaCO_3$/L) | 84 | | K | | K | |
| | Temperature (°C) | 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| 600 mg NaCl/L | pH (S.U.) | 8.06 | 7.95 | 8.06 | 7.92 | 7.97 | 7.98 |
| | DO (mg/L) | 8.1 | 7.9 | 8.1 | 7.8 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 1390 | | 1350 | | 1380 | |
| | Temperature (°C) | 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| 800 mg NaCl/L | pH (S.U.) | 8.05 | 7.96 | 8.05 | 7.91 | 7.96 | 7.96 |
| | DO (mg/L) | 8.1 | 7.9 | 8.1 | 7.9 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 2070 | | 2040 | | 2050 | |
| | Temperature (°C) | 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| 1000 mg NaCl/L | pH (S.U.) | 8.05 | 7.97 | 8.07 | 7.90 | 7.99 | 7.97 |
| | DO (mg/L) | 8.1 | 7.8 | 8.1 | 7.9 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 2230 | | 2190 | | 2190 | |
| | Temperature (°C) | 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| 1200 mg NaCl/L | pH (S.U.) | 8.04 | 7.96 | 8.06 | 7.87 | 7.97 | 7.97 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 8.0 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 2520 | | 2540 | | 2510 | |
| | Temperature (°C) | 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| 1400 mg NaCl/L | pH (S.U.) | 8.04 | 7.96 | 8.06 | 7.90 | 7.97 | 7.96 |
| | DO (mg/L) | 8.2 | 8.0 | 8.2 | 8.1 | 8.4 | 8.0 |
| | Conductivity (µmhos/cm) | 2880 | | 2940 | | 2910 | |
| | Temperature (°C) | ~~25.8~~ 25.0 | 24.6 | 24.7 | 24.5 | 24.8 | 24.7 |
| STOCK | Conductivity (µmhos/cm) | 130000 | | K | | K | |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 19

| | | Day | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 3 | | 4 | | 5 | | 6 LT | |
| | Analyst | CAJ | CAJ | CAJ | KEK | KEK | KEK | KEK | KEK |
| Concentration | Parameter | | | | | | | | |
| CONTROL | pH (S.U.) | 8.12 | 8.06 | 8.11 | ~~7.95~~ | 8.21 | 8.05 | 8.10 | 8.00 |
| | DO (mg/L) | 7.9 | 7.9 | 8.2 | 8.03 8.1 | 7.8 | 8.0 | 7.8 | 8.1 |
| | Conductivity (µmhos/cm) | 295 | | 307 | | 305 | | 287 | |
| | Alkalinity (mg $CaCO_3$/L) | K | | 62 | | K | | 61 | |
| | Hardness (mg $CaCO_3$/L) | K | | 84 | | K | | 84 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| 600 mg NaCl/L | pH (S.U.) | 8.11 | 8.00 | 8.00 | ~~7.88~~ | 8.13 | 7.99 | 8.09 | 7.99 |
| | DO (mg/L) | 8.1 | 8.0 | 8.3 | 7.99 8.0 | 8.0 | 8.0 | 7.9 | 8.2 |
| | Conductivity (µmhos/cm) | 1490 | | 1440 | | 1360 | | ~~15~~ 1360 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| 800 mg NaCl/L | pH (S.U.) | 8.08 | 7.98 | 8.00 | ~~7.82~~ | 8.12 | 7.98 | 8.09 | 7.95 |
| | DO (mg/L) | 8.1 | 8.0 | 8.3 | 7.96 8.0 | 8.0 | 8.0 | 7.9 | 8.3 |
| | Conductivity (µmhos/cm) | 2090 | | 2000 | | 1840 | | 1880 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| 1000 mg NaCl/L | pH (S.U.) | 8.09 | 7.99 | 8.00 | ~~7.87~~ | 8.12 | 7.92 | 8.08 | 7.96 |
| | DO (mg/L) | 8.2 | 8.0 | 8.3 | 7.97 8.0 | 8.0 | 8.2 | 8.1 | 8.3 |
| | Conductivity (µmhos/cm) | 2290 | | 2220 | | 2170 | | 2160 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| 1200 mg NaCl/L | pH (S.U.) | 8.07 | 7.97 | 8.00 | ~~7.92~~ | 8.12 | 8.00 | 8.08 | 8.05 |
| | DO (mg/L) | 8.3 | 8.0 | 8.4 | 7.93 8.0 | 8.0 | 8.2 | 8.1 | 8.4 |
| | Conductivity (µmhos/cm) | 2660 | | 2570 | | 2530 | | 2540 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| 1400 mg NaCl/L | pH (S.U.) | 8.07 | 7.99 | 8.00 | ~~7.98~~ | 8.13 | ~~7.98~~ | 8.07 | 7.95 |
| | DO (mg/L) | 8.3 | 8.0 | 8.5 | 7.92 8.0 | 8.2 | 8.1 | 8.1 | 8.4 |
| | Conductivity (µmhos/cm) | 2870 | | 2910 | | 2890 | | 2920 | |
| | Temperature (°C) | 24.7 | 24.6 | 24.7 | 24.9 | 24.4 | 24.7 | 25.6 | 24.7 |
| STOCK | Conductivity (µmhos/cm) | K | | 131080 | | K | | K | |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 103 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
EFFLUENT
*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING AVERAGE | QUANTITY OR LOADING MAXIMUM | UNITS | QUALITY OR CONCENTRATION MINIMUM | QUALITY OR CONCENTRATION AVERAGE | QUALITY OR CONCENTRATION MAXIMUM | UNITS | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.0 | ******** | 8.5 | 12 | 0 | 14 / 29 | 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 | 184 | 301 | 26 | ******** | 17 | 24 | 19 | 0 | 6 / 29 | 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 | <54 | <68 | 26 | ******** | <5 | <5 | 19 | 0 | 6 / 29 | 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 | 1.182 | 1.640 | 03 | ******** | ******** | ******** | ** | 0 | 29 / 29 | 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 | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A. Howard<br>Principal Environmental Engineer<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
TBS was aligned to YP on 2/9/2004 from 0950-1610 and on 2/17/2004 from 1020-1707.

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 107 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

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

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING AVERAGE | QUANTITY OR LOADING MAXIMUM | UNITS | QUALITY OR CONCENTRATION MINIMUM | QUALITY OR CONCENTRATION AVERAGE | QUALITY OR CONCENTRATION MAXIMUM | UNITS | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.6 | ******** | 7.8 | 12 | 0 | 5 / 29 | 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 | ******** | ******** | ** | ******** | ******** | 14 | 19 | 0 | 5 / 29 | 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 | 5 / 29 | GRAB |
| 00556 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 15 DAILY MX | MG/L | | DAILY | GRAB |
| COPPER, TOTAL (AS CU) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0.010 | 19 | 0 | 5 / 29 | COMPOS |
| 01042 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 1.0 DAILY MX | MG/L | | DAILY | COMPOS |
| IRON, TOTAL (AS FE) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 1.00 | 19 | 0 | 5 / 29 | 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 | 0.045 | 0.046 | 03 | ******** | ******** | ******** | ** | 0 | 5 / 29 | CALCTD |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | REPORT MO AVG | REPORT DAILY MX | MGD | ******** | ******** | ******** | **** | | DAILY | CALCTD |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| 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)*

Metal Ponds were released from 2/12/2004 through 2/16/2004. No phosphorous bearing cleaning solutions were used.

... (Include Facility Name/Location if Different)

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 110 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

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

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| 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 | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A. Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

No Discharge this Period

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

ATTN: Stephanie A. Howard

DISCHARGE MONITORING REPORT (DMR)

| TN0026450 | 116 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

MONITORING PERIOD

| | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| DEBRIS, FLOATING (SEVERITY) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0 | 9A | 0 | 1 / 29 | 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 / 29 | VISUAL |
| 84066 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | REPORT MO TOTAL | YES=1 NO=0 | ******** | ******** | ******** | **** | | SEE PERMIT | VISUAL |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| 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.

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

Form Approved.
OMB No. 2040-0004

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

ATTN: Stephanie A. Howard

| TN0026450 | 117 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

*** 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 | | | |
| DEBRIS, FLOATING (SEVERITY) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0 | 9A | 0 | 1 / 29 | 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 / 29 | VISUAL |
| 84066 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | REPORT MO TOTAL | YES=1 NO=0 | ******** | ******** | ******** | **** | | SEE PERMIT | VISUAL |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A. Howard<br>Principal Environmental Engineer<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

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

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

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

ATTN: Stephanie A. Howard

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

| TN0026450 | 118 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 04 | 02 | 01 | To | 04 | 02 | 29 |

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | Stephanie A Howard<br>Principal Environmental Engineer | 423 | 843-6700 | 04 | 03 | 09 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

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