



Tennessee Valley Authority, Post Office Box 2000, Scotts, Tennessee 37379-2000

January 16, 2002

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street, 6th Floor Annex
Nashville, Tennessee 37243-1534

Attention: Ms. Evelyn Haskin, Enforcement & Compliance

Dear Ms. Haskin:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR
SEQUOYAH NUCLEAR PLANT (SQN)

Please find enclosed the follow-up fourth quarter biomonitoring Discharge Monitoring Report (DMR) of January 2002 for SQN. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

A handwritten signature in cursive script that reads "Diedre B. Nida".

Diedre B. Nida
Environmental Supervisor
Signatory Authority
for Richard T. Purcell
Vice President
Sequoyah Nuclear Plant

Enclosures: 2 (original & copy)
cc (Enclosure):

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

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

IE25

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

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

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

MAJOR
 (SUBR 01)

Form Approved.
 OMB No. 2040-0004

TN0026450 101 T
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From

| | | |
|------|----|-----|
| YEAR | MO | DAY |
| 02 | 01 | 01 |

 To

| | | |
|------|----|-----|
| YEAR | MO | DAY |
| 02 | 03 | 31 |

F - FINAL
 DIFFUSER DISCHARGE
 EFFLUENT

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|-----------------------------------|--------------------|---------------------|---------|-------|--------------------------|---------|---------|---------|--------|-----------------------|-------------|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| IC25 STATRE 7DAY CHR CERIODAPHNIA | SAMPLE MEASUREMENT | ***** | ***** | ** | | ***** | ***** | (23) | | | |
| TRP3B 1 0 0 | PERMIT REQUIREMENT | ***** | ***** | **** | 43.9 MINIMUM | ***** | ***** | PERCENT | | QUART-ERLY | COMPOS |
| EFFLUENT GROSS VALUE | | | | | | | | | | | |
| IC25 STATRE 7DAY CHR PIMEPHALES | SAMPLE MEASUREMENT | ***** | ***** | ** | >100 | ***** | ***** | (23) | 0 | 1 / 90 | COMPOS |
| TRP6C 1 0 0 | PERMIT REQUIREMENT | ***** | ***** | **** | 43.9 MINIMUM | ***** | ***** | PERCENT | | QUART-ERLY | COMPOS |
| EFFLUENT GROSS VALUE | | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| | | | | | | |
|--|---|--|----------|------|----|-----|
| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | TELEPHONE | | DATE | | |
| Richard T. Purcell | | 423 | 843-6700 | 02 | 01 | 16 |
| Site Vice President | | AREA CODE | NUMBER | YEAR | MO | DAY |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | | | | |

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
 Repeat Fathead Minnow Test for fourth quarter 2001 was sampled from 1/2/2002 to 1/7/2002. Report is attached.

January 15, 2002

Diedre B. Nida, SB 2A-SQN

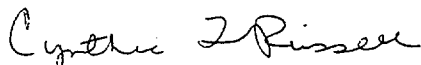
SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, REPAET FATHEAD MINNOW TEST, JANUARY, 2002

Attached are two copies of the subject report for submission to the state of Tennessee. The report provides results of compliance testing using fathead minnows. UV treated Outfall 101 samples were tested during this study, in addition to routine (non-treated) samples, to help determine the cause (eliminate the effect) of the low statistical sensitivity and highly variable survival among replicates within treatments that occurred in the study conducted with Outfall 101 samples collected December 9-14, 2001. Each UV Treated concentration was placed in a 40 WATT Rainbow Lifeguard UV Sterilizer for 1 minute to remove possible pathogenic interferences. I have also included a copy of the report for your records.

Side by side comparison of untreated Outfall 101 samples and ultra violet light (UV) treated Outfall 101 samples showed no toxic effects to fathead minnows in either test. The resulting IC_{25} values, for both tests, were > 100 percent.

Fathead minnow survival and growth in untreated and UV treated intake samples were not significantly different from the control, based on Homoscedastic t-Tests.

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



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

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

**TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT**

INTRODUCTION/EXECUTIVE SUMMARY

- 1) Facility/Discharger: Sequoyah Nuclear Plant/TVA Report Date: January 15, 2002
- 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) 1Q20: 2,992.4
- 8) Outfall Tested: 101 9) Dates Sampled: January 2-7, 2002
- 10) Flow on day(s) sampled (MGD): 1600, 1606, 1598, 1602, 1604, 1600
- 11) Pertinent site conditions: No unusual conditions reported.*
- 12) Test Dates: January 4-11, 2002 13) Test Type: Short-term Chronic-definitive
- 14) Test Species: Fathead Minnows (*Pimephales promelas*)
- 15) Concentrations Tested (%): Untreated Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0
Untreated Intake: 100.0

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 IC₂₅ = 43.9
- 17) Test Results (%): Untreated Outfall 101: *Pimephales promelas*: IC₂₅ > 100
UV Treated Outfall 101: *Pimephales promelas*: IC₂₅ > 100
- 18) Facility Contact: Diedre B. Nida 19) Phone #: (423) 843-6700
- 20) Testing Lab Name: Environmental Testing Solutions, LLC
- 21) Lab Contact: Jim Sumner 22) Phone #: (828) 862-8193
TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

*Production/operation data will be provided upon request or in the event toxicity exceeds permit limits

23) Notes:

UV treated Outfall 101 samples were tested during this study, in addition to routine (non-treated) samples, to help determine the cause (eliminate the effect) of the low statistical sensitivity and highly variable survival among replicates within treatments that occurred in the study conducted with Outfall 101 samples collected December 9-14, 2001. Each UV Treated concentration was placed in a 40 WATT Rainbow Lifeguard UV Sterilizer for 1 minute to remove possible pathogenic interferences.

Untreated and UV treated samples collected from Outfall 101 exhibited no toxicity to *P. promelas* based on the applicable permit limits, $IC_{25} = 43.9$ percent. Resulting IC_{25} values for both Untreated and UV treated effluent were > 100 percent. Fathead minnow survival and growth in Untreated and UV treated intake samples were not significantly different from the control, based on Homoscedastic t-Tests.

METHODS SUMMARY

Samples

- 1) Sampling Point: Outfall 101
- 2) Sample Type: Composite
- 3) Sample Information:

| ID | Date/Time Collected (MM-DD/Time) (EST) | Date/Time Received (MM-DD/Time) (EST) | Arrival Temp. (°C) | Initial TRC* (mg/L) | Date/Time Used (MM-DD/Time) (EST) |
|---------------|--|---|-----------------------|------------------------|---|
| 101 Intake | 01/02-0918 to 01/03 -0818 | 01/04 0814 | 0.8 | < 0.10 | 01/04 1403 |
| | 01/02- 1013 to 01/03- 0913 | 01/04 0814 | 0.6 | < 0.10 | 01/05 -1410 |
| | | | | | 01/04 1403 |
| | | | | | 01/05 -1410 |
| 101 Intake | 01/04- 0935 to 01/05-0939 | 01/05 1336 | 0.4 | < 0.10 | 01/06 -1400 |
| | 01/04- 1032 to 01/05- 0932 | 01/05 1336 | 0.6 | < 0.10 | 01/07 -1409 |
| | | | | | 01/06 -1400 |
| | | | | | 01/07 -1409 |
| 101 Intake | 01/06- 1328 to 01/07- 1234 | 01/08 0816 | 1.0 | < 0.10 | 01/08 -1407 |
| | | | | | 01/09 -1431 |
| | | | | | 01/10 -1217 |
| | 01/06- 1351 to 01/07- 1251 | 01/08 0816 | 0.8 | < 0.10 | 01/08 -1407 |
| | | | | | 01/09 -1431 |
| | | | | | 01/10 -1217 |

*Total residual chlorine.

- 4) Sample manipulation:

Untreated samples of Outfall 101 and Intake were warmed to test temperature ($25.0 \pm 1.0^{\circ}\text{C}$) in a warm water bath.

Test Organisms

Pimephales promelas

- 1) Source: Aquatic BioSystems, Inc.
- 2) Age: 23.5-25.5 hours

Test Method Summary (See Appendix A for additional information)

Pimephales promelas

- 1) Test Conditions Static, renewal
- 2) Test Duration 7 days
- 3) Dilution/Control Water Moderately Hard Synthetic Water
- 4) Number Replicates 4
- 5) Animals per Replicate 10
- 6) Test Initiation - (Date/Time) 01/04/02/1403 EST
- 7) Test Termination (Date/Time) 01/11/02/1420 EST
- 8) Test Temperature Mean = 24.6°C
(24.0°C-25.5°C)
- 9) Physical/Chemical Measurements: Hardness, alkalinity, total residual chlorine, and conductivity were measured at the laboratory in each 100 percent sample. Daily temperatures were measured in one replication per 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-d Toxicity Test
(Genus) (Species) (Type/Duration)

Conducted 01/04/02 - 01/11/02 Using Effluent From Untreated Outfall 101
(mm/dd/yy) (mm/dd/yy) (number)

| Test Solutions | Percent Surviving (time intervals used - days) | | | | | | |
|-----------------|---|------------|------------|------------|------------|------------|------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> |
| Control | <u>100</u> | <u>98</u> | <u>98</u> | <u>98</u> | <u>98</u> | <u>98</u> | <u>98</u> |
| 10.98% Effluent | <u>100</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>85</u> |
| 22.0% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>98</u> | <u>98</u> | <u>98</u> | <u>98</u> |
| 43.9% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 72% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 100% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| Intake | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |

| Test Solutions | IC ₂₅ Mean Dry Weight (mg) (Replication) | | | | <u>Mean</u> |
|---|--|--------------|---|--------------|--------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | |
| Control | <u>0.819</u> | <u>1.119</u> | <u>0.982</u> | <u>0.963</u> | <u>0.971</u> |
| 10.98% Effluent | <u>1.067</u> | <u>0.959</u> | <u>0.329</u> | <u>1.066</u> | <u>0.855</u> |
| 22.0% Effluent | <u>1.097</u> | <u>0.989</u> | <u>0.939</u> | <u>1.085</u> | <u>1.027</u> |
| 43.9% Effluent | <u>0.962</u> | <u>1.004</u> | <u>0.983</u> | <u>1.018</u> | <u>0.991</u> |
| 72% Effluent | <u>0.977</u> | <u>0.946</u> | <u>0.822</u> | <u>1.018</u> | <u>0.941</u> |
| 100% Effluent | <u>1.005</u> | <u>0.963</u> | <u>0.978</u> | <u>1.132</u> | <u>1.020</u> |
| Intake | <u>0.989</u> | <u>1.036</u> | <u>1.086</u> | <u>0.901</u> | <u>1.003</u> |
| IC ₂₅ Value \geq 100% | | | Calculated TU Estimates $<$ 1.0 TU _c | | |
| 95% Confidence Limits Upper Limit = <u>NA</u> Lower Limit = <u>NA</u> | | | Permit Limit <u>2.3 TU_c</u> | | |

*NOTE: TU_c = 100/ IC₂₅

2) Results of a Pimephales promelas Chronic/ 7-d Toxicity Test
(Genus) (Species) (Type/Duration)

Conducted 01/04/02 - 01/11/02 Using Effluent From UV Treated Outfall 101
(mm/dd/yy) (mm/dd/yy) (number)

| Test Solutions | Percent Surviving (time intervals used - days) | | | | | | |
|-----------------|---|------------|------------|------------|------------|------------|------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> |
| Control | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 10.98% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 22.0% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 43.9% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| 72% Effluent | <u>100</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>95</u> | <u>95</u> |
| 100% Effluent | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |
| Intake | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> | <u>100</u> |

| Test Solutions | IC ₂₅ Mean Dry Weight (mg) (Replication) | | | | Mean |
|---|--|---|--------------|--------------|--------------|
| | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | |
| Control | <u>1.089</u> | <u>1.041</u> | <u>0.987</u> | <u>1.161</u> | <u>1.070</u> |
| 10.98% Effluent | <u>0.914</u> | <u>1.146</u> | <u>1.042</u> | <u>1.157</u> | <u>1.065</u> |
| 22.0% Effluent | <u>0.927</u> | <u>1.003</u> | <u>0.994</u> | <u>1.043</u> | <u>0.992</u> |
| 43.9% Effluent | <u>1.004</u> | <u>0.928</u> | <u>1.055</u> | <u>1.026</u> | <u>1.003</u> |
| 72% Effluent | <u>0.685</u> | <u>1.058</u> | <u>1.000</u> | <u>1.022</u> | <u>0.941</u> |
| 100% Effluent | <u>1.031</u> | <u>0.981</u> | <u>0.891</u> | <u>0.796</u> | <u>0.925</u> |
| Intake | <u>1.009</u> | <u>0.838</u> | <u>0.956</u> | <u>0.980</u> | <u>0.946</u> |
| IC ₂₅ Value <u>> 100%</u> | | Calculated TU Estimates [†] <u>< 1.0 TU_c</u> | | | |
| 95% Confidence Limits | | Permit Limit <u>2.3 TU_c</u> | | | |
| Upper Limit = <u>NA</u> | | | | | |
| Lower Limit = <u>NA</u> | | | | | |

[†]NOTE: TU_c = 100/ IC₂₅

3) REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

| Species | Date | Time | Duration | Toxicant | Results (IC ₂₅) |
|----------------------------|----------|------|----------|----------|-----------------------------|
| <i>Pimephales promelas</i> | 01/04/02 | 1431 | 7-days | KCl | 487.8 mg/L |

SUMMARY/CONCLUSIONS

Untreated and UV treated samples collected from Outfall 101 exhibited no toxicity to *P. promelas* based on the applicable permit limits. Resulting IC_{25} values for both Untreated and UV treated effluent were > 100 percent. Fathead minnow survival and growth in Untreated and UV treated intake samples was not significantly different from the control, based on Homoscedastic t-Tests.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

Tests were conducted according to EPA/600/4-91/002 (July 1994) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL beakers, each containing 250 mL of test solution. [2]

DEVIATIONS/MODIFICATIONS TO TEST PROTOCOL

The third renewal using the last samples collected was conducted greater than 1 hour from the test initiation time to meet the required 72-hour hold time.

DEVIATIONS/MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

The concurrent reference toxicant test conducted on this batch of fish was just below control chart IC_{25} limits. The resulting endpoint was 0.015 mg lower than the -2SD lower boundary. Two SD allowed a reduction of 22.6 percent from controls, while the reference toxicant results were reduced 24.9 percent from controls. Previous reference toxicant tests conducted within 30-days by both ETS and the culture lab were within bounds and this was the first outlier in 18 tests ETS has performed (one outlier in twenty is expected). If animals were more sensitive, effects would have been more likely in the effluent tests and both effluent tests clearly showed no toxicity. Both tests far surpassed both survival and growth test acceptability criteria.

PHYSICAL AND CHEMICAL METHODS

- 1) Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).
- 2) Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.
- 3) Temperature was measured using EPA Method 170.1.
- 4) Dissolved oxygen was measured using EPA Method 360.1.
- 5) The pH was measured using EPA Method 150.1.
- 6) Conductance was measured using EPA Method 120.1.
- 7) Alkalinity was measured using EPA Method 310.1.
- 8) Hardness was measured using EPA Method 130.2.

- 9) Total residual chlorine was determined 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/600/4-91/002. [2] Any known deviations were noted during the study and are reported herein.

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

- 1) Test Type: 7-day chronic tests with results expressed as IC_{25} values in g KCl/L.
- 2) Standard Toxicant: Potassium Chloride (KCl crystalline)
- 3) Dilution Water Used: Moderately hard synthetic water.
- 4) Statistics: FoxCalc software Version 5.0 was used for statistical analyses.

REFERENCES

- 1) NPDES Permit No. TN0026450.
- 2) Lewis, P. A., D. J. Klemm, J. M. Lazorchak, T. J. Norberg-King, W. H. Peltier, M. A. Heber. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-91/002 (July 1994).
- 3) Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

Sequoyah Nuclear Plant Biomonitoring
January 4-11, 2001

Appendix B

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

And

Initial and Final Chemistry for Fathead Minnow 7-day and
Daphnid 3-brood Chronic Tests

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-January 7, 2002

| 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-January 7, 2002

| 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 | - | - | 0.021 |
| 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 | - | - | - |

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-January 7, 2002

| 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 |
|------------|---------------------------------|-----------------------|---------------------------|---------------------------|---------------------|----------------------------|---------------------|
| 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 | - | - |
| 01/02/02 | - | <0.0079 | 0.023 | 0.020 | 0.006 | - | - |
| 01/03/02 | - | <0.0042 | 0.026 | 0.014 | - | - | - |
| 01/04/02 | - | 0.0124 | 0.024 | 0.014 | 0.009 | - | - |
| 01/05/02 | - | <0.0042 | - | - | - | - | - |
| 01/06/02 | - | <0.0042 | - | - | - | - | - |
| 01/07/02 | - | <0.0089 | 0.024 | 0.014 | 0.006 | - | - |

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for Fathead Minnow Test, Sequoyah Nuclear Plant Effluent (SQN), Untreated Outfall 101,
January 4-11, 2002

| Test/ Sample ID | Temperature | | Dissolved Oxygen | | pH | | Conductance | Alkalinity | Hardness | Total Residual |
|-----------------------|---------------------|---------------------|------------------|------------------|---------------------|---------------------|------------------|------------------------|------------------------|------------------------|
| | Initial | Final | Initial | Final | Initial | Final | Initial | | | Chlorine |
| | (°C) | (°C) | (mg/L) | (mg/L) | S.U. | S.U. | (µmhos) | mg/L CaCO ₃ | mg/L CaCO ₃ | (mg/L) |
| Fathead/ Control | 24.8 (24.4-25.5) | 24.4 (24.1-24.8) | 8.0 (8.0-8.1) | 7.5 (7.0-7.8) | 8.06 (8.01-8.10) | 7.75 (7.62-7.84) | 308 (300-320) | 67 (65-68) | 90 (90-90) | - |
| Fathead/ 10.98% | 24.8 (24.4-25.4) | 24.4 (24.2-24.8) | 8.0 (7.9-8.1) | 7.4 (7.1-7.9) | 8.07 (8.03-8.11) | 7.73 (7.60-7.79) | 300 (290-315) | - | - | - |
| Fathead/ 22.0 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.6) | 8.1 (7.9-8.2) | 7.4 (7.1-7.9) | 8.06 (8.02-8.10) | 7.72 (7.57-7.86) | 290 (281-304) | - | - | - |
| Fathead/ 43.9 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.7) | 8.2 (8.0-8.4) | 7.4 (7.1-7.9) | 8.02 (7.92-8.08) | 7.69 (7.55-7.82) | 265 (257-277) | - | - | - |
| Fathead/ 72.0 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.8) | 8.3 (8.0-8.5) | 7.4 (7.0-7.8) | 7.99 (7.93-8.06) | 7.69 (7.54-7.79) | 232 (225-242) | - | - | - |
| Fathead/ 100% | 24.8 (24.4-25.4) | 24.4 (24.1-24.8) | 8.4 (8.1-8.6) | 7.4 (7.0-7.9) | 7.93 (7.85-8.05) | 7.66 (7.53-7.81) | 197 (192-207) | 65 (61-69) | 77 (74-80) | <0.10 (<0.10-<0.10) |
| Fathead/ Intake | 24.8 (24.4-25.4) | 24.4 (24.1-24.8) | 8.4 (8.1-8.6) | 7.4 (7.0-7.9) | 7.87 (7.76-8.03) | 7.74 (7.61-7.83) | 196 (192-206) | 64 (62-65) | 78 (74-80) | <0.10 (<0.10-<0.10) |

PHYSICAL/CHEMICAL SUMMARY (continued)

Water Chemistry Mean Values and Ranges for Fathead Minnow Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101,
January 4-11, 2002

| Test/ Sample ID | Temperature | | Dissolved Oxygen | | pH | | Conductance | Alkalinity | Hardness | Total Residual |
|-----------------------|---------------------|---------------------|------------------|------------------|---------------------|---------------------|------------------|------------------------|------------------------|------------------------|
| | Initial | Final | Initial | Final | Initial | Final | Initial | | | Chlorine |
| | (°C) | (°C) | (mg/L) | (mg/L) | S.U. | S.U. | (µmhos) | mg/L CaCO ₃ | mg/L CaCO ₃ | (mg/L) |
| Fathead/ Control | 24.8 (24.4-25.4) | 24.4 (24.2-24.7) | 8.0 (7.9-8.1) | 7.5 (7.2-7.8) | 7.92 (7.66-8.04) | 7.76 (7.68-7.88) | 307 (296-321) | 67 (65-68) | 90 (90-90) | - |
| Fathead/ 10.98% | 24.8 (24.4-25.4) | 24.4 (24.2-24.7) | 8.1 (7.9-8.2) | 7.6 (7.2-7.8) | 7.97 (7.81-8.03) | 7.77 (7.68-7.87) | 298 (289-318) | - | - | - |
| Fathead/ 22.0 % | 24.8 (24.4-25.4) | 24.4 (24.0-24.7) | 8.2 (8.0-8.3) | 7.6 (7.3-7.8) | 8.00 (7.93-8.06) | 7.74 (7.62-7.81) | 287 (278-305) | - | - | - |
| Fathead/ 43.9 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.7) | 8.3 (8.1-8.4) | 7.6 (7.2-7.9) | 8.02 (7.96-8.06) | 7.75 (7.64-7.83) | 263 (256-277) | - | - | - |
| Fathead/ 72.0 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.7) | 8.3 (8.1-8.5) | 7.6 (7.4-7.9) | 8.01 (7.96-8.06) | 7.72 (7.60-7.83) | 228 (220-244) | - | - | - |
| Fathead/ 100.0 % | 24.8 (24.4-25.4) | 24.4 (24.1-24.7) | 8.4 (8.1-8.6) | 7.6 (7.3-7.9) | 7.99 (7.95-8.07) | 7.72 (7.59-7.81) | 196 (189-207) | 65 (61-69) | 77 (74-80) | <0.10 (<0.10-<0.10) |
| Fathead/ Intake | 24.8 (24.4-25.4) | 24.4 (24.1-24.7) | 8.4 (8.1-8.7) | 7.6 (7.3-7.8) | 7.97 (7.91-8.05) | 7.71 (7.62-7.82) | 194 (189-207) | 64 (62-65) | 78 (74-80) | <0.10 (<0.10-<0.10) |

Sequoyah Nuclear Plant Biomonitoring
January 4 – 11, 2002

Appendix C

Chain of Custody Records and
Toxicity Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

Environmental Testing Solutions, LLC
Research Building
1 Ecusta Road, Brevard, NC 28712
Phone: 828-862-8193
Fax: 828-862-8195

Delivered By (Circle One):
FedEx UPS Bus Client

Other (specify): MAX COULTER

General Comments:

| Field Identification / Sample Description | Grab/ Comp. | Ship. Temp. (°C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|-------------|------------------|------------------------|------------------------|-------------------------------------|------------|-----------------------------------|----------------|----|-------|------------------|--------------------|----|------------------|-----------------------|
| | | | Start | End | | | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 0917 1/2/02 0918 | 0817 1/3/02 0818 | 2 (2.5g) | | | | ✓ | | 221 020104.01 | 0.8°C | J | 01-03-02 0814 | CUSTOMER SEALS INTACT |
| SQN-INT-TOX | comp | 4 | 1/2/02 1013 | 0913 1/3/02 | 1 (2.5g) | | | | ✓ | | 221 020104.02 | 0.6°C | J | 01-03-02 0814 | GOOD CONDITION ↓ |
| | | | | | | | | | | | | | | | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|------------------------------|-------------|--------------------------|---------------|
| <i>Wanda Allen</i> | 1/3/02 1000 | <i>J. J. J.</i> | 01-03-02 0814 |
| | | | |
| | | | |
| | | | |

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

| | | |
|--|--|---|
| Client: TVA | Environmental Testing Solutions, LLC Research Building 1 Ecusta Road, Brevard, NC 28712 Phone: 828-862-8193 Fax: 828-862-8195 | Delivered By (Circle One): FedEx UPS Bus Client |
| Project Name: TVA SQN | | Other (specify): <u>MAX COULTER</u> |
| P.O. Number: PO BOX 2000 | | General Comments: |
| Facility Sampled: SEQUOYAH NUCLEAR PLANT | | |
| NPDES Number: 0026450 | | |
| Collected By: WANDA ALLEN | | |

| Field Identification / Sample Description | Grab/ Comp. | Ship. Temp. (°C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|-------------|------------------|------------------------|------------------------|-------------------------------------|------------|-----------------------------------|----------------|----|-------|------------------|--------------------|----|------------------|---------------------|
| | | | Start | End | | | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 0935 1/4/02 1039 | 0835 1/5/02 0939 | 2 (2.5g) | | | | ✓ | | 221 020105.01 | 0.4°C | df | 01-05-02 1336 | CUSTOM SEALS INTACT |
| SQN-INT-TOX | comp | 4 | 1/4/02 1032 | 0932 1/5/02 | 1 (2.5g) | | | | ✓ | | 221 020105.02 | 0.6°C | df | 01-05-02 1336 | GOOD CONDITION ↓ |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Sample Custody - Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|------------------------------|-------------|--------------------------|---------------|
| <i>Wanda Allen</i> | 1/5/02 1015 | <i>dfumre</i> | 01-05-02 1336 |
| | | | |
| | | | |
| | | | |

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

| | | |
|--|--|-------------------------------------|
| Client: TVA | Environmental Testing Solutions, LLC Research Building 1 Ecusta Road, Brevard, NC 28712 Phone: 828-862-8193 Fax: 828-862-8195 | Delivered By (Circle One): |
| Project Name: TVA SQN | | FedEx UPS Bus Client |
| P.O. Number: PO BOX 2000 | | Other (specify): <u>MAX COULTER</u> |
| Facility Sampled: SEQUOYAH NUCLEAR PLANT | | General Comments: |
| NPDES Number: 0026450 | | |
| Collected By: WANDA ALLEN | | |

| Field Identification / Sample Description | Grab/ Comp. | Ship. Temp. (°C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|-------------|------------------|------------------------|------------------------|-------------------------------------|------------|-----------------------------------|----------------|----|-------|------------------|-------------------|----|------------------|-----------------------------|
| | | | Start | End | | | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp (°C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 1334 1/6/02 1328 | 1234 1228 1/7/02 | 2 (2.5g) | | | | | | 221 020108.01 | 1.0°C | J | 01-08-02 0816 | CUSTOMER SEALS INTACT |
| SQN-INT-TOX | comp | 4 | 1351 1/6/02 1334 | 1251 1/7/02 1257 | 1 (2.5g) | | | | | | 221 020108.02 | 0.8°C | J | 01-08-02 0816 | GOOD CONDITION ↓ |
| SQN | | | | | | | | | | | | | | | |

Sample Custody - Fill In From Top Down

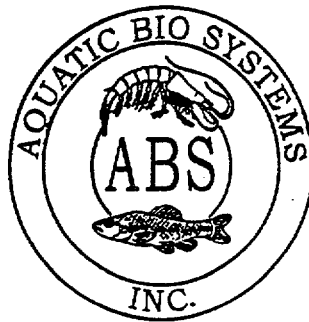
| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|------------------------------|--------------------------|--------------------------|---------------|
| Wanda Allen | 01-07-02 12/7/01 1330 | J/umre | 01-08-02 0816 |
| | | | |
| | | | |
| | | | |

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

Sample Receipt Log

| Date Received | Time Received | Received By | Received From | Sample Temperature (°C) | Project Number | Sample Number | Sample Name and Description | State | Comments |
|---------------|---------------|-------------|---------------------|-------------------------|----------------|---------------|--|-------|---|
| 12-13-01 | 1240 | KEKEENAN | Fed-ex | 0.7°C | 219 | 011213.03 | ALCOA ENGINEERED PRODUCTS | NC | |
| 12-15-01 | 1231 | KEKEENAN | Fedex | 1.8°C | 217 | 011215.01 | MONROE WWTP | NC | |
| 12-15-01 | 1231 | KEKEENAN | J. Burrell Fedex | 3.0°C | 214 | 011215.02 | TRYON WWTP | NC | |
| 12-15-01 | 1232 | KEKEENAN | M.LADD | 1.1°C | 211 | 011215.03 | TEST AMERICA - EARTH ENV. ANDREWS WWTP | NC | |
| 12-15-01 | 1232 | KEKEENAN | M.LADD | 1.1°C | 212 | 011215.04 | TEST AMERICA - EARTH ENV. FRANKLIN WWTP | NC | |
| 12-15-01 | 1233 | KEKEENAN | GREYHOUND | 1.5°C | 213 | 011215.05 | Precise ANALYTICAL NORFOLK SOUTHERN RAILWAY | NC | |
| 12-15-01 | 1234 | KEKEENAN | Fed-ex | 0.9°C | 216 | 011215.06 | CRAVEN COUNTY WOOD ENERGY | NC | |
| 12-18-01 | 1120 | J. Jumper | Fedex | 7.2°C | 220 | 011218.01 | GEORGETOWN STEEL- DRI PLANT | SC | * Sample exceeds acceptable temp. upon receipt. |
| 01-04-02 | 0814 | J. Jumper | M. COULTER | 0.8°C | 221 | 020104.01 | TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | * |
| 01-04-02 | 0814 | J. Jumper | M. COULTER | 0.6°C | 221 | 020104.02 | TVA SEQUOYAH NUCLEAR PLANT INTAKE | TN | * |
| 01-05-02 | 1336 | J. Jumper | M. COULTER | 0.4°C | 221 | 020105.01 | TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | * |
| 01-05-02 | 1336 | J. Jumper | M. COULTER | 0.6°C | 221 | 020105.02 | TVA SEQUOYAH NUCLEAR PLANT INTAKE | TN | * |
| 01-08-02 | 0816 | J. Jumper | M. COULTER | 1.0°C | 221 | 020108.01 | TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | * |
| 01-08-02 | 0816 | J. Jumper | M. COULTER | 0.8°C | 221 | 020108.02 | TVA SEQUOYAH NUCLEAR PLANT INTAKE | TN | * |
| 01-08-02 | 1010 | J. Jumper | KEKEENAN UPS | 1.4°C | 222 | 020108.03 | TRITEST - RDU AIRPORT OUTFALL 001 | NC | |
| 01-08-02 | 1010 | KEKEENAN | UPS | 1.4°C | 222 | 020108.04 | TRITEST - RDU AIRPORT OUTFALL 002 | NC | |
| 01-08-02 | 1010 | KEKEENAN | UPS | 1.4°C | 222 | 020108.05 | TRITEST - RDU AIRPORT OUTFALL 003 | NC | |
| 01-08-02 | 1010 | KEKEENAN | UPS | 1.4°C | 222 | 020108.06 | TRITEST - RDU AIRPORT OUTFALL 004 | NC | |
| 01-08-02 | 1107 | KEKEENAN | Fedex | 0.5°C | 223 | 020108.07 | ANDERSON COUNTY Sewer Authority | SC | |
| 01-09-02 | 0902 | J. Jumper | L. CARREIRO | 0.2°C | 224 | 020109.01 | ASHEVILLE - NORTH FORK WTP | NC | |
| | | J. Jumper | Fedex | 0.7°C | 225 | 020109.02 | PCS PHOSPHATE OUTFALL 007 | NC | |

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524



Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 1/3/02

SPECIES: Pimephales promelas

AGE: N/A

LIFE STAGE: Embryo

HATCH DATE: 1/3/02 Between 11:30 a.m. & 1:30 p.m. MST

BEGAN FEEDING: N/A

FOOD: N/A

Water Chemistry Record:

| | Mean | Range |
|---|-----------------|-----------|
| TEMPERATURE: | <u>25 °C</u> | <u>--</u> |
| SALINITY/CONDUCTIVITY: | <u>--</u> | <u>--</u> |
| TOTAL HARDNESS (as CaCO ₃): | <u>124 mg/l</u> | <u>--</u> |
| TOTAL ALKALINITY (as CaCO ₃): | <u>90 mg/l</u> | <u>--</u> |
| pH: | <u>8.09</u> | <u>--</u> |

Comments:

[Signature]

Facility Supervisor

Received:

01-04-02 1144 *[Signature]*
Temp = 22.8 °C
DO = 8.9 mg/L

Fed at 1150 JF.

Organisms appear healthy.

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA SEQUOYAH NUCLEAR PLANT
 Facility: OUTFALL 101 - NONTREATED
 NPDES #: TN 0026450

| Dilution preparation information: | | | | | | Comments: |
|-----------------------------------|---------------------|-----|-------|-----|------|-----------|
| MHS batch: | 01-03-02 / 01-06-02 | | | | | |
| Dilution prep (%) | 10.98 | 22 | 43.9 | 72 | 100 | |
| Effluent volume (mL) | 131.76 | 264 | 526.8 | 864 | 1200 | |
| Diluent volume (mL) | 1068.24 | 936 | 673.2 | 336 | 0 | |

| Test organism information: | | Test information: | |
|---|--|-----------------------|----------|
| Organism age: | 24-HOURS OLD | Randomizing template: | BLUE |
| Date and times organisms were born between: | 01-03-02 1130 TO 1330 MST (1330 TO 1530 EST) | Incubator number: | Z |
| Organism source: | ABS BATCH 01-03-02 | Artemia lot number: | BS0207P |
| Transfer bowl information: | pH = 7.87 Temperature = 24.1°C | Oven temperature: | 60°C |
| | | Drying time: | 24-HOURS |

Daily feeding and renewal information:

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|-----|----------|----------------------|------------------------|---|---------|
| 0 | 01-04-02 | — | 1438 | 1403 | J |
| 1 | 01-05-02 | 1000 | 1600 | 1410 | J |
| 2 | 01-06-02 | 1007 | 1610 | 1400 | KEK |
| 3 | 01-07-02 | 0955 | 1555 | 1409 | J |
| 4 | 01-08-02 | 1000 | 1600 | 1407 | J |
| 5 | 01-09-02 | 1016 | 1620 | 1431 | KEK |
| 6 | 01-10-02 | 0952 | 1550 | 1217 | KEK |
| 7 | 01-11-02 | — | — | 1420 | KEK |


* TEST WAS NOT RENEWED ± 1-HOUR
 FROM TEST INITIATION TO MEET 72-HOUR
 HOLD TIME

| Control information: | | Acceptance criteria | Summary of test endpoints: | |
|----------------------------|--------|---------------------|----------------------------|--------|
| % Mortality: | 2.5% | ≤ 20% | 7-day LC50 | > 100% |
| Average weight per larvae: | 0.9707 | ≥ 0.25 mg/larvae | NOEC | 100% |
| | | | LOEC | > 100% |
| | | | ChV | > 100% |
| | | | IC25 | > 100% |

Species: *Pimephales promelas*Client: TVA SEQUOYAH NUCLEAR PLANTDate: 01-04-02

OUTFALL 101 - NONTREATED

| Day | Survival and Growth Data | | | | | | | | | | | |
|------------------------------|--------------------------|--------|--------|--------|--------|--------|-----------------|--------|--------|--------|-----------------|--------|
| | 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 ^{1d} | 10 | 10 | 10 | 10 | 10 | 8 ^{2d} | 10 | 10 | 10 | 10 | 10 |
| 3 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 |
| 4 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 9 ^{1d} | 10 |
| 5 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 9 | 10 |
| 6 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 9 | 10 |
| 7 | 9 | 10 | 10 | 10 | 10 | 10 | 4 ^{4d} | 10 | 10 | 10 | 9 | 10 |
| A = Pan weight (mg) | 14.973 | 15.151 | 14.956 | 15.001 | 15.013 | 14.938 | 14.962 | 14.820 | 14.965 | 15.158 | 14.942 | 14.910 |
| B = Pan + Larvae weight (mg) | 23.16 | 26.34 | 24.78 | 24.63 | 25.68 | 24.53 | 18.25 | 25.48 | 25.93 | 25.05 | 24.33 | 25.76 |
| Larvae weight (mg) = A - B | 8.187 | 11.189 | 9.824 | 9.629 | 10.667 | 9.592 | 3.288 | 10.660 | 10.965 | 9.894 | 9.388 | 10.850 |


Calculations and data reviewed: 

Comments:

Species: *Pimephales promelas*Client: TVA SEQUOYAH NUCLEAR PLANT
OUTFALL 101 - NONTREATEDDate: 01-04-02

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) | 14.944 | 14.915 | 15.015 | 14.925 | 14.450 | 15.130 | 15.132 | 14.957 | 15.112 | 15.012 | 15.119 | 14.940 |
| B = Pan + Larvae weight (mg) | 24.57 | 25.00 | 24.84 | 25.10 | 24.72 | 24.59 | 23.35 | 25.14 | 25.16 | 24.67 | 24.90 | 26.27 |
| Larvae weight (mg) = A - B | 9.621 | 10.035 | 9.825 | 10.175 | 9.770 | 9.460 | 8.218 | 10.183 | 10.048 | 9.628 | 9.781 | 11.322 |

Calculations and data reviewed: 

Comments:

Species: *Pimephales promelas*Client: TVA SEQUOYAH NUCLEAR PLANT
OUTFALL 101- NONTREATEDDate: 01-04-02

| Day | 100% INTAKE | | | | Survival and Growth Data | | | | | | | |
|------------------------------|-------------|--------|--------|--------|--------------------------|----|----|----|----|----|----|----|
| | Y | Z | AA | BB | CC | DD | EE | FF | GG | HH | II | JJ |
| 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) | 15.012 | 14.995 | 15.162 | 14.902 | | | | | | | | |
| B = Pan + Larvae weight (mg) | 24.90 | 25.35 | 26.02 | 23.97 | | | | | | | | |
| Larvae weight (mg) = A - B | 9.888 | 10.355 | 10.858 | 9.008 | | | | | | | | |

Calculations and data reviewed: JA

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant - Nontreated
 Test dates: January 4 - 11, 2002
 Project number: 221

Reviewed by: Jumper

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|-------------------|-----------|--------------------------|------------------------|---------------------|------------------------------|----------------------------|--|-------------------|------------------|------------------------------|------------------------------------|
| Control | A | 10 | 9 | 14.973 | 23.160 | 8.187 | 0.8187 | 97.5 | 0.9707 | 12.7 | Not applicable |
| | B | 10 | 10 | 15.151 | 26.340 | 11.189 | 1.1189 | | | | |
| | C | 10 | 10 | 14.956 | 24.780 | 9.824 | 0.9824 | | | | |
| | D | 10 | 10 | 15.001 | 24.630 | 9.629 | 0.9629 | | | | |
| 10.98% | E | 10 | 10 | 15.013 | 25.680 | 10.667 | 1.0667 | 85.0 | 0.8552 | 41.5 | 11.9 |
| | F | 10 | 10 | 14.938 | 24.530 | 9.592 | 0.9592 | | | | |
| | G | 10 | 4 | 14.962 | 18.250 | 3.288 | 0.3288 | | | | |
| | H | 10 | 10 | 14.820 | 25.480 | 10.660 | 1.0660 | | | | |
| 22% | I | 10 | 10 | 14.965 | 25.930 | 10.965 | 1.0965 | 97.5 | 1.0274 | 7.4 | -5.8 |
| | J | 10 | 10 | 15.156 | 25.050 | 9.894 | 0.9894 | | | | |
| | K | 10 | 9 | 14.942 | 24.330 | 9.388 | 0.9388 | | | | |
| | L | 10 | 10 | 14.910 | 25.760 | 10.850 | 1.0850 | | | | |
| 43.9% | M | 10 | 10 | 14.949 | 24.570 | 9.621 | 0.9621 | 100.0 | 0.9914 | 2.4 | -2.1 |
| | N | 10 | 10 | 14.965 | 25.000 | 10.035 | 1.0035 | | | | |
| | O | 10 | 10 | 15.015 | 24.840 | 9.825 | 0.9825 | | | | |
| | P | 10 | 10 | 14.925 | 25.100 | 10.175 | 1.0175 | | | | |
| 72% | Q | 10 | 10 | 14.950 | 24.720 | 9.770 | 0.9770 | 100.0 | 0.9408 | 9.0 | 3.1 |
| | R | 10 | 10 | 15.130 | 24.590 | 9.460 | 0.9460 | | | | |
| | S | 10 | 10 | 15.132 | 23.350 | 8.218 | 0.8218 | | | | |
| | T | 10 | 10 | 14.957 | 25.140 | 10.183 | 1.0183 | | | | |
| 100% Outfall 101 | U | 10 | 10 | 15.112 | 25.160 | 10.048 | 1.0048 | 100.0 | 1.0195 | 7.6 | -5.0 |
| | V | 10 | 10 | 15.042 | 24.670 | 9.628 | 0.9628 | | | | |
| | W | 10 | 10 | 15.119 | 24.900 | 9.781 | 0.9781 | | | | |
| | X | 10 | 10 | 14.948 | 26.270 | 11.322 | 1.1322 | | | | |
| 100% Intake | Y | 10 | 10 | 15.012 | 24.900 | 9.888 | 0.9888 | 100.0 | 1.0027 | 7.8 | -3.3 |
| | Z | 10 | 10 | 14.995 | 25.350 | 10.355 | 1.0355 | | | | |
| | AA | 10 | 10 | 15.162 | 26.020 | 10.858 | 1.0858 | | | | |
| | BB | 10 | 10 | 14.962 | 23.970 | 9.008 | 0.9008 | | | | |

Outfall 101:

Dunnett's MSD value: 0.2785
 PMSD: 28.7

Intake:

Dunnett's MSD value: 0.1417
 PMSD: 14.6

MSD =
 PMSD =

Minimum Significant Difference

Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 19.1% from the control (determined through reference toxicant testing).

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

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

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

Environmental Testing Solutions, LLC

Statistical Analyses

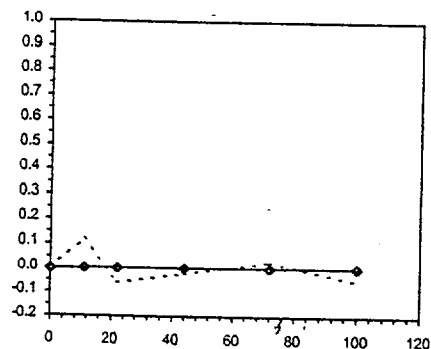
| Larval Fish Growth and Survival Test-7 Day Growth | | | | |
|---|------------------------------------|--|--|--|
| Start Date: 1/4/02 | Test ID: PpFRCR | Sample ID: TVA SQN - Outfall 101 Nontreated | | |
| End Date: 1/11/02 | Lab ID: ETS-Env. Testing Solutions | Sample Type: DMR-Discharge Monitoring Report | | |
| Sample Date: | Protocol: EPAF 91-EPA Freshwater | Test Species: PP-Pimephales promelas | | |
| Comments: | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 0.8187 | 1.1189 | 0.9824 | 0.9629 |
| 10.98 | 1.0667 | 0.9592 | 0.3288 | 1.0660 |
| 22 | 1.0965 | 0.9894 | 0.9388 | 1.0850 |
| 43.9 | 0.9621 | 1.0035 | 0.9825 | 1.0175 |
| 72 | 0.9770 | 0.9460 | 0.8218 | 1.0183 |
| 100 | 1.0043 | 0.9623 | 0.9781 | 1.1322 |

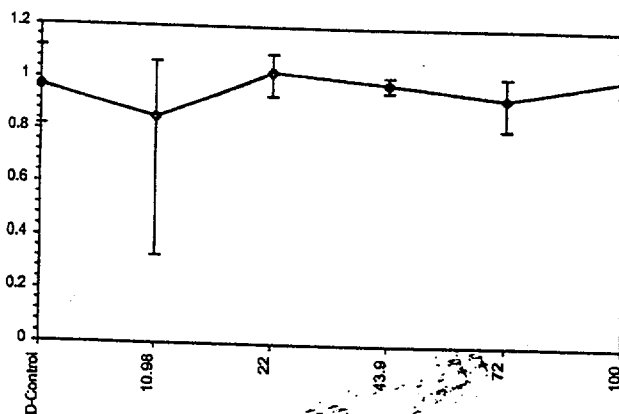
| Conc-% | Mean | N-Mean | Transform: Untransformed | | | | Rank Sum | I-Tailed Critical | Isotonic | |
|-----------|--------|--------|--------------------------|--------|--------|--------|----------|-------------------|----------|--------|
| | | | Mean | Min | Max | CV% | | | Mean | N-Mean |
| D-Control | 0.9707 | 1.0000 | 0.9707 | 0.8187 | 1.1189 | 12.654 | 4 | | 0.9707 | 1.0000 |
| 10.98 | 0.8552 | 0.8810 | 0.8552 | 0.3288 | 1.0667 | 41.457 | 4 | 17.00 | 0.9669 | 0.9960 |
| 22 | 1.0274 | 1.0584 | 1.0274 | 0.9388 | 1.0965 | 7.410 | 4 | 20.00 | 0.9669 | 0.9960 |
| 43.9 | 0.9914 | 1.0213 | 0.9914 | 0.9621 | 1.0175 | 2.447 | 4 | 20.00 | 0.9669 | 0.9960 |
| 72 | 0.9408 | 0.9691 | 0.9408 | 0.8218 | 1.0183 | 9.000 | 4 | 17.00 | 0.9669 | 0.9960 |
| 100 | 1.0195 | 1.0502 | 1.0195 | 0.9623 | 1.1322 | 7.565 | 4 | 20.00 | 0.9669 | 0.9960 |

| Auxiliary Tests | | | | |
|---|------|------|-----|----|
| Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) | | | | |
| Bartlett's Test indicates unequal variances (p = 1.86E-03) | | | | |
| Hypothesis Test (1-tail, 0.05) | | | | |
| Steel's Many-One Rank Test | NOEC | LOEC | ChV | TU |
| | 100 | >100 | | 1 |

| Point | % | SD | 95% CL(Exp) | Linear Interpolation (80 Resamples) |
|-------|------|----|-------------|-------------------------------------|
| IC05 | >100 | | | Skew |
| IC10 | >100 | | | |
| IC15 | >100 | | | |
| IC20 | >100 | | | |
| IC25 | >100 | | | |
| IC40 | >100 | | | |
| IC50 | >100 | | | |



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only.

Larval Fish Growth and Survival Test-7 Day Growth

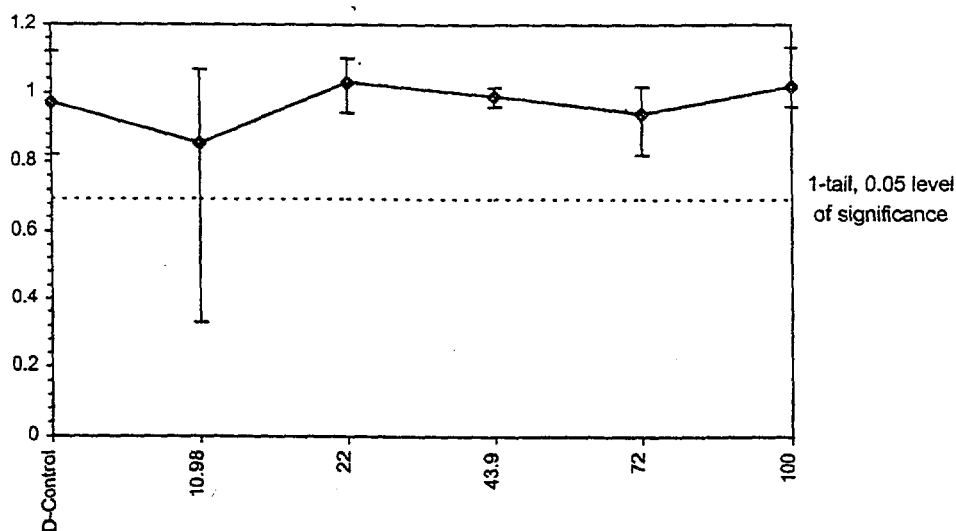
| | | |
|--------------------|------------------------------------|--|
| Start Date: 1/4/02 | Test ID: PpFRCR | Sample ID: TVA SQN - Outfall 101 Nontreated |
| End Date: 1/11/02 | Lab ID: ETS-Env. Testing Solutions | Sample Type: DMR-Discharge Monitoring Report |
| Sample Date: | Protocol: EPAF 91-EPA Freshwater | Test Species: PP-Pimephales promelas |
| Comments: | | |

| Conc-% | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 0.8187 | 1.1189 | 0.9824 | 0.9629 |
| 10.98 | 1.0667 | 0.9592 | 0.3288 | 1.0660 |
| 22 | 1.0965 | 0.9894 | 0.9388 | 1.0850 |
| 43.9 | 0.9621 | 1.0035 | 0.9825 | 1.0175 |
| 72 | 0.9770 | 0.9460 | 0.8218 | 1.0183 |
| 100 | 1.0048 | 0.9628 | 0.9781 | 1.1322 |

| Conc-% | Mean | N-Mean | Transform: Untransformed | | | | N | t-Stat | 1-Tailed Critical | MSD |
|-----------|--------|--------|--------------------------|--------|--------|--------|---|--------|-------------------|--------|
| | | | Mean | Min | Max | CV% | | | | |
| D-Control | 0.9707 | 1.0000 | 0.9707 | 0.8187 | 1.1189 | 12.654 | 4 | - | - | - |
| 10.98 | 0.8552 | 0.8810 | 0.8552 | 0.3288 | 1.0667 | 41.457 | 4 | 1.000 | 2.410 | 0.2785 |
| 22 | 1.0274 | 1.0584 | 1.0274 | 0.9388 | 1.0965 | 7.410 | 4 | -0.491 | 2.410 | 0.2785 |
| 43.9 | 0.9914 | 1.0213 | 0.9914 | 0.9621 | 1.0175 | 2.447 | 4 | -0.179 | 2.410 | 0.2785 |
| 72 | 0.9408 | 0.9691 | 0.9408 | 0.8218 | 1.0183 | 9.000 | 4 | 0.259 | 2.410 | 0.2785 |
| 100 | 1.0195 | 1.0502 | 1.0195 | 0.9628 | 1.1322 | 7.565 | 4 | -0.422 | 2.410 | 0.2785 |

| Auxiliary Tests | | | | | Statistic | Critical | Skew | Kurt | | | | | | |
|---|--|--|--|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|
| Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) | | | | | 0.827680886 | 0.884 | -1.98286024 | 7.208732712 | | | | | | |
| Bartlett's Test indicates unequal variances (p = 1.86E-03) | | | | | 19.07797623 | 15.08631706 | | | | | | | | |
| Hypothesis Test (1-tail, 0.05) | | | | | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
| Dunnert's Test | | | | | 100 | >100 | | 1 | 0.278529016 | 0.286928858 | 0.016164118 | 0.026713868 | 0.696975112 | 5, 18 |

Dose-Response Plot



Environmental Testing Solutions, LLC

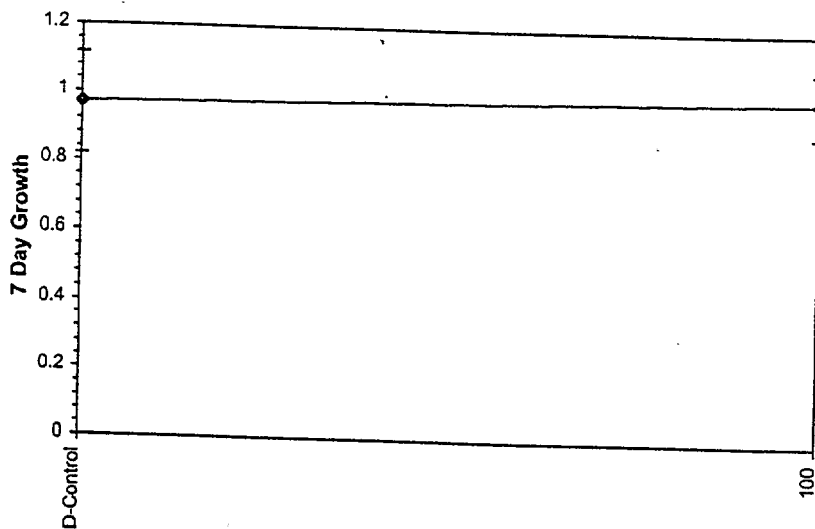
Statistical Analyses

| Larval Fish Growth and Survival Test-7 Day Growth | | | | | |
|---|---------|-----------|----------------------------|---------------|---------------------------------|
| Start Date: | 1/4/02 | Test ID: | PpPFCR | Sample ID: | TVA SQN - Intake Nontreated |
| End Date: | 1/11/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |
| Conc-% | 1 | 2 | 3 | 4 | |
| D-Control | 0.8187 | 1.1189 | 0.9824 | 0.9629 | |
| 100 | 0.9888 | 1.0355 | 1.0858 | 0.9008 | |

| Conc-% | Mean | N-Mean | Transform: Untransformed | | | | N | t-Stat | 1-Tailed Critical | MSD |
|-----------|--------|--------|--------------------------|--------|--------|--------|---|--------|----------------------|--------|
| | | | Mean | Min | Max | CV% | | | | |
| D-Control | 0.9707 | 1.0000 | 0.9707 | 0.8187 | 1.1189 | 12.654 | 4 | | | |
| 100 | 1.0027 | 1.0330 | 1.0027 | 0.9008 | 1.0858 | 7.844 | 4 | -0.439 | 1.943 | 0.1417 |

| Auxiliary Tests | | | | |
|--|-------------|-------------|-------------|-------------|
| Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) | Statistic | Critical | Skew | Kurt |
| F-Test indicates equal variances ($p = 0.48$) | 0.974953771 | 0.749 | -0.15580785 | -0.06228385 |
| Hypothesis Test (1-tail, 0.05) | 2.439072847 | 47.46834564 | | |
| Homoscedastic t Test indicates no significant differences | | | | |

Dose-Response Plot



Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA Sequoyah Nuclear Plant
 Facility: OUTFALL 101 - UNTREATED
 NPDES #: TN 0026450

| Dilution preparation information: | | | | | | Comments: |
|---|---|-----|-------|-----|------|---|
| MHS batch: | 01-03-02 / 01-06-02 | | | | | EACH DILUTION WAS UNTREATED FOR 1 MINUTE WITH A 40 WATT RAINBOW LIFE GUARD STERILIZER |
| Dilution prep (%) | 10.98 | 22 | 43.9 | 72 | 100 | |
| Effluent volume (mL) | 131.76 | 264 | 526.8 | 864 | 1200 | |
| Diluent volume (mL) | 1068.24 | 936 | 673.2 | 336 | 0 | |
| Test organism information: | | | | | | Test information: |
| Organism age: | 24-HOURS OLD | | | | | Randomizing template: |
| Date and times organisms were born between: | 01-03-02 1130 TO 1330 MST (0930 TO 1130 EST) <i>dl</i> | | | | | Incubator number: |
| Organism source: | ABS BATCH 01-03-02 | | | | | Artemia lot number: |
| Transfer bowl information: | pH = 7.87 Temperature = 24.1°C | | | | | Oven temperature: |
| | | | | | | Drying time: |

Daily feeding and renewal information:


| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|-----|----------|----------------------|------------------------|---|-----------|
| 0 | 01-04-02 | <i>dl</i> | 1438 | 1403 | <i>dl</i> |
| 1 | 01-05-02 | 1000 | 1600 | 1351 | <i>dl</i> |
| 2 | 01-06-02 | 1007 | 1610 | 1346 | KEK |
| 3 | 01-07-02 | 0955 | 1555 | 1350 | <i>dl</i> |
| 4 | 01-08-02 | 1000 | 1600 | 1353 | <i>dl</i> |
| 5 | 01-09-02 | 1016 | 1620 | 1402 | KEK |
| 6 | 01-10-02 | 0952 | 1550 | 1200 | KEK |
| 7 | 01-11-02 | | <i>dl</i> | 1344 | <i>dl</i> |

* TEST WAS NOT RENEWED ± 1-HOUR FROM TEST INITIATION TO MEET 72-HOUR HOLD TIME.

| Control information: | | Acceptance criteria | Summary of test endpoints: | |
|----------------------------|--------|---------------------|----------------------------|--------|
| % Mortality: | 0% | ≤ 20% | 7-day LC50 | > 100% |
| Average weight per larvae: | 1.0697 | ≥ 0.25 mg/larvae | NOEC | 100% |
| | | | LOEC | > 100% |
| | | | ChV | > 100% |
| | | | IC25 | > 100% |

Species: *Pimephales promelas*Client: SEQUOYA NUCLEAR PLANT
UV-TREATEDDate: 01-04-02

| Day | Survival and Growth Data | | | | | | | | | | | |
|------------------------------|--------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | CONTROL | | | | 10.98% | | | | 22% | | | |
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.021 | 14.799 | 14.797 | 15.124 | 15.005 | 14.938 | 14.990 | 15.052 | 14.833 | 14.793 | 14.987 | 14.816 |
| B = Pan + Larvae weight (mg) | 25.71 | 25.21 | 24.67 | 26.74 | 24.14 | 26.40 | 25.41 | 26.63 | 24.10 | 24.82 | 24.93 | 25.24 |
| Larvae weight (mg) = A - B | 10.829 | 10.413 | 9.873 | 11.611 | 9.135 | 11.462 | 10.420 | 11.573 | 9.267 | 10.027 | 9.743 | 10.430 |

Calculations and data reviewed: 

Comments:

Species: *Pimephales promelas*Client: SEQUOYA NUCLEAR PLANT
UV-TREATEDDate: 01-04-02

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 | 8 ^{2d} | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.813 | 14.794 | 14.794 | 14.817 | 15.121 | 14.896 | 14.892 | 14.912 | 14.807 | 15.090 | 14.806 | 14.790 |
| B = Pan + Larvae weight (mg) | 24.85 | 24.07 | 25.34 | 25.08 | 21.97 | 25.48 | 24.89 | 25.13 | 25.12 | 24.90 | 23.77 | 22.75 |
| Larvae weight (mg) = A - B | 10.057 | 9.716 | 10.546 | 10.263 | 6.849 | 10.584 | 9.998 | 10.218 | 10.313 | 9.810 | 8.905 | 7.960 |

Calculations and data reviewed: JF

Comments:

Species: *Pimephales promelas*Client: SEQUOIAH NUCLEAR PLANTDate: 01-04-02

| Day | Survival and Growth Data | | | | | | | | | | |
|------------------------------|--------------------------|-------|-------|--------|----|----|----|----|----|----|----|
| | 100% INTAKE | | | | | | | | | | |
| | Y | Z | AA | BB | CC | DD | EE | FF | GG | HH | IJ |
| 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) | 15.51 | 14.77 | 14.90 | 14.910 | | | | | | | |
| B = Pan + Larvae weight (mg) | 25.24 | 23.10 | 24.52 | 24.74 | | | | | | | |
| Larvae weight (mg) = A - B | 10.081 | 8.331 | 9.590 | 9.830 | | | | | | | |

Calculations and data reviewed: JJ

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant - UV Treated

Test dates: January 4 - 11, 2002

Project number: 221

Revelved by:

J. Hunter

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = B - A | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|-------------------|-----------|--------------------------|------------------------|---------------------|------------------------------|----------------------------|--|-------------------|------------------|------------------------------|------------------------------------|
| Control | A | 10 | 10 | 14.821 | 25.710 | 10.889 | 1.0889 | 100.0 | 1.0697 | 6.9 | Not applicable |
| | B | 10 | 10 | 14.797 | 25.210 | 10.413 | 1.0413 | | | | |
| | C | 10 | 10 | 14.797 | 24.670 | 9.873 | 0.9873 | | | | |
| | D | 10 | 10 | 15.129 | 26.740 | 11.611 | 1.1611 | | | | |
| 10.98% | E | 10 | 10 | 15.005 | 24.140 | 9.135 | 0.9135 | 100.0 | 1.0648 | 10.7 | 0.5 |
| | F | 10 | 10 | 14.938 | 26.400 | 11.462 | 1.1462 | | | | |
| | G | 10 | 10 | 14.990 | 25.410 | 10.420 | 1.0420 | | | | |
| | H | 10 | 10 | 15.057 | 26.630 | 11.573 | 1.1573 | | | | |
| 22% | I | 10 | 10 | 14.833 | 24.100 | 9.267 | 0.9267 | 100.0 | 0.9917 | 4.9 | 7.3 |
| | J | 10 | 10 | 14.793 | 24.820 | 10.027 | 1.0027 | | | | |
| | K | 10 | 10 | 14.987 | 24.930 | 9.943 | 0.9943 | | | | |
| | L | 10 | 10 | 14.810 | 25.240 | 10.430 | 1.0430 | | | | |
| 43.9% | M | 10 | 10 | 14.813 | 24.850 | 10.037 | 1.0037 | 100.0 | 1.0031 | 5.4 | 6.2 |
| | N | 10 | 10 | 14.794 | 24.070 | 9.276 | 0.9276 | | | | |
| | O | 10 | 10 | 14.794 | 25.340 | 10.546 | 1.0546 | | | | |
| | P | 10 | 10 | 14.817 | 25.080 | 10.263 | 1.0263 | | | | |
| 72% | Q | 10 | 8 | 15.121 | 21.970 | 6.849 | 0.6849 | 95.0 | 0.9412 | 18.3 | 12.0 |
| | R | 10 | 10 | 14.896 | 25.480 | 10.584 | 1.0584 | | | | |
| | S | 10 | 10 | 14.892 | 24.890 | 9.998 | 0.9998 | | | | |
| | T | 10 | 10 | 14.912 | 25.130 | 10.218 | 1.0218 | | | | |
| 100% Outfall 101 | U | 10 | 10 | 14.807 | 25.120 | 10.313 | 1.0313 | 100.0 | 0.9247 | 11.2 | 13.6 |
| | V | 10 | 10 | 15.090 | 24.900 | 9.810 | 0.9810 | | | | |
| | W | 10 | 10 | 14.865 | 23.770 | 8.905 | 0.8905 | | | | |
| | X | 10 | 10 | 14.790 | 22.750 | 7.960 | 0.7960 | | | | |
| 100% Intake | Y | 10 | 10 | 15.151 | 25.240 | 10.089 | 1.0089 | 100.0 | 0.9458 | 7.9 | 11.6 |
| | Z | 10 | 10 | 14.779 | 23.160 | 8.381 | 0.8381 | | | | |
| | AA | 10 | 10 | 14.960 | 24.520 | 9.560 | 0.9560 | | | | |
| | BB | 10 | 10 | 14.940 | 24.740 | 9.800 | 0.9800 | | | | |

Outfall 101:

Dunnett's MSD value: 0.1762
PMSD: 16.5

MSD =
PMSD =

Minimum Significant Difference
Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 19.1% 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.

Intake:

Dunnett's MSD value: 0.1022
PMSD: 9.6

Environmental Testing Solutions, LLC

Statistical Analyses

| Larval Fish Growth and Survival Test-7 Day Growth | | | | | |
|---|---------|-----------|----------------------------|---------------|----------------------------------|
| Start Date: | 1/4/02 | Test ID: | PpFRCR | Sample ID: | TVA SQN - Outfall 101 UV Treated |
| End Date: | 1/11/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

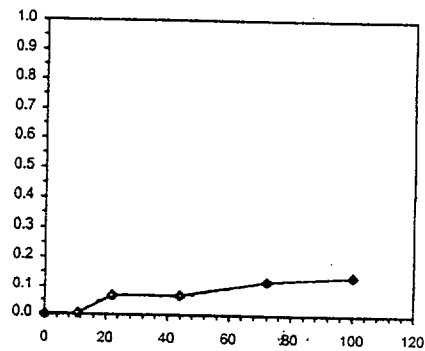
| Conc-% | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 1.0889 | 1.0413 | 0.9873 | 1.1611 |
| 10.98 | 0.9135 | 1.1462 | 1.0420 | 1.1573 |
| 22 | 0.9267 | 1.0027 | 0.9943 | 1.0430 |
| 43.9 | 1.0037 | 0.9276 | 1.0546 | 1.0263 |
| 72 | 0.6849 | 1.0584 | 0.9998 | 1.0218 |
| 100 | 1.0313 | 0.9810 | 0.8905 | 0.7960 |

| Transform: Untransformed | | | | | | | | | | | | |
|--------------------------|--------|--------|--------|--------|--------|--------|---|--------|-------------------|--------|---------------|--------|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | 1-Tailed Critical | MSD | Isotonic Mean | N-Mean |
| D-Control | 1.0697 | 1.0000 | 1.0697 | 0.9873 | 1.1611 | 6.895 | 4 | | | | 1.0697 | 1.0000 |
| 10.98 | 1.0648 | 0.9954 | 1.0648 | 0.9135 | 1.1573 | 10.652 | 4 | 0.067 | 2.410 | 0.1762 | 1.0648 | 0.9954 |
| 22 | 0.9917 | 0.9271 | 0.9917 | 0.9267 | 1.0430 | 4.866 | 4 | 1.067 | 2.410 | 0.1762 | 0.9974 | 0.9324 |
| 43.9 | 1.0031 | 0.9377 | 1.0031 | 0.9276 | 1.0546 | 5.427 | 4 | 0.911 | 2.410 | 0.1762 | 0.9974 | 0.9324 |
| 72 | 0.9412 | 0.8799 | 0.9412 | 0.6849 | 1.0584 | 18.336 | 4 | 1.757 | 2.410 | 0.1762 | 0.9412 | 0.8799 |
| 100 | 0.9247 | 0.8645 | 0.9247 | 0.7960 | 1.0313 | 11.215 | 4 | 1.983 | 2.410 | 0.1762 | 0.9247 | 0.8645 |

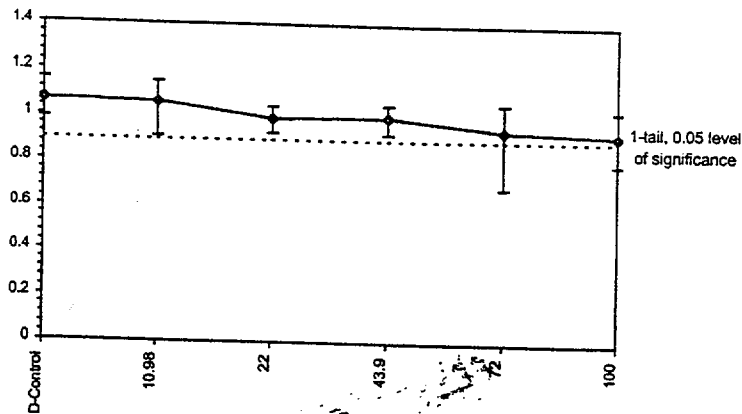
Auxiliary Tests

| | | | | | | | | | | |
|--|------|------|-----|----|-------------|-------------|-------------|-------------|-------------|-------|
| Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) | | | | | Statistic | Critical | Skew | Kurt | | |
| Bartlett's Test indicates equal variances ($p = 0.30$) | | | | | 0.921115994 | 0.884 | -1.09446415 | 1.241605879 | | |
| Hypothesis Test (1-tail, 0.05) | | | | | 6.01902914 | 15.08631706 | | | | |
| Dunn's Test | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
| | 100 | >100 | | 1 | 0.176189616 | 0.164717072 | 0.01459424 | 0.010689478 | 0.283319354 | 5, 18 |

| Linear Interpolation (80 Resamples) | | | | |
|-------------------------------------|--------|--------|-------------|---------|
| Point | % | SD | 95% CL(Exp) | Skew |
| IC05 | 18.925 | 17.057 | 0.000 | 107.683 |
| IC10 | 61.258 | | | 2.5989 |
| IC15 | >100 | | | |
| IC20 | >100 | | | |
| IC25 | >100 | | | |
| IC40 | >100 | | | |
| IC50 | >100 | | | |



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

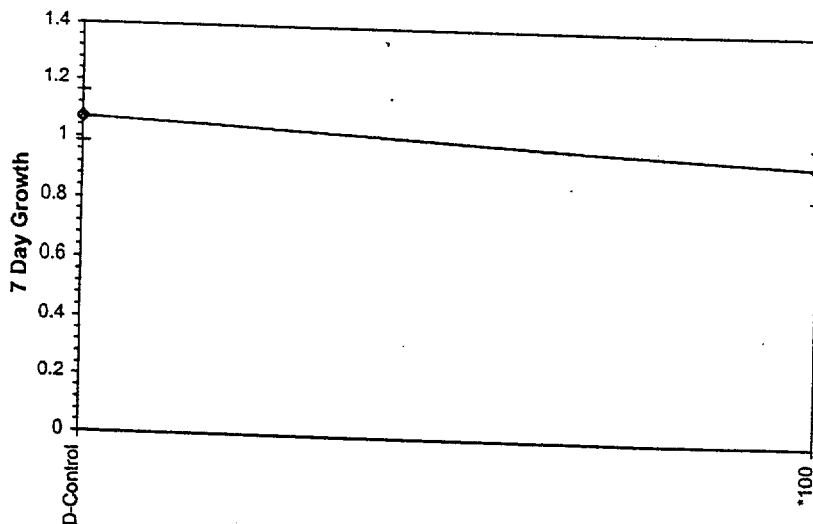
Start Date: 1/4/02 Test ID: PpPFCR Sample ID: TVA SQN - Intake UV Treated
 End Date: 1/11/02 Lab ID: ETS-Env. Testing Solutions Sample Type: DMR-Discharge Monitoring Report
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

| Conc-% | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 1.0889 | 1.0413 | 0.9873 | 1.1611 |
| 100 | 1.0089 | 0.8381 | 0.9560 | 0.9800 |

| Conc-% | Mean | N-Mean | Transform: Untransformed | | | | N | t-Stat | I-Tailed Critical | MSD |
|-----------|--------|--------|--------------------------|--------|--------|-------|---|--------|----------------------|--------|
| | | | Mean | Min | Max | CV% | | | | |
| D-Control | 1.0697 | 1.0000 | 1.0697 | 0.9873 | 1.1611 | 6.895 | 4 | | | |
| *100 | 0.9458 | 0.8842 | 0.9458 | 0.8381 | 1.0089 | 7.925 | 4 | 2.356 | 1.943 | 0.1022 |

| Auxiliary Tests | | | | |
|--|-------------|-------------|-------------|-------------|
| Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) | Statistic | Critical | Skew | Kurt |
| F-Test indicates equal variances ($p = 0.98$) | 0.954538047 | 0.749 | -0.44589651 | -0.80413952 |
| Hypothesis Test (1-tail, 0.05) | 1.032824516 | 47.46834564 | | |
| Homoscedastic t Test indicates significant differences | | | | |

Dose-Response Plot



Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Methods 1002.0)

Species: *Pimephales promelas*

Summary of Chemical Analyses

Client: TVA Sequoyah Nuclear Plant
Test dates: January 4 - 11, 2002
Project number: 221

Reviewed by: *Jumper*

| Concentration | Parameter | Initial Nontreated | | | | Final Nontreated | | | | Initial UV Treated | | | | Final UV Treated | | | |
|---|--------------------------------------|--------------------|---------|--------|------|------------------|---------|------|------|--------------------|---------|--------|------|------------------|---------|------|------|
| | | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S |
| Control | pH (SU) | 8.01 | 8.10 | 8.06 | 0.03 | 7.62 | 7.84 | 7.75 | 0.08 | 7.66 | 8.04 | 7.92 | 0.13 | 7.68 | 7.88 | 7.76 | 0.07 |
| | DO (mg/L) | 8.0 | 8.1 | 8.0 | 0.0 | 7.0 | 7.8 | 7.5 | 0.3 | 7.9 | 8.1 | 8.0 | 0.1 | 7.2 | 7.8 | 7.5 | 0.2 |
| | Conductivity (umhos/cm) | 300 | 320 | 308 | 8 | | | | | 296 | 321 | 307 | 8 | | | | |
| | Alkalinity (mg/L CaCO ₃) | 65 | 68 | 67 | 2 | | | | | 65 | 68 | 67 | 2 | | | | |
| | Hardness (mg/L CaCO ₃) | 90 | 90 | 90 | 0 | | | | | 90 | 90 | 90 | 0 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.5 | 24.8 | 0.4 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| | Final Temperature (°C) | | | | | 24.1 | 24.8 | 24.4 | 0.2 | | | | | 24.2 | 24.7 | 24.4 | 0.2 |
| 10.98% | pH (SU) | 8.03 | 8.11 | 8.07 | 0.03 | 7.60 | 7.79 | 7.73 | 0.06 | 7.81 | 8.03 | 7.97 | 0.08 | 7.68 | 7.87 | 7.77 | 0.07 |
| | DO (mg/L) | 7.9 | 8.1 | 8.0 | 0.1 | 7.1 | 7.9 | 7.4 | 0.3 | 7.9 | 8.2 | 8.1 | 0.1 | 7.2 | 7.8 | 7.6 | 0.2 |
| | Conductivity (umhos/cm) | 290 | 315 | 300 | 8 | | | | | 289 | 318 | 298 | 9 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.3 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| | Final Temperature (°C) | | | | | 24.2 | 24.8 | 24.4 | 0.2 | | | | | 24.2 | 24.7 | 24.4 | 0.2 |
| | pH (SU) | 8.02 | 8.10 | 8.06 | 0.03 | 7.57 | 7.86 | 7.72 | 0.09 | 7.93 | 8.06 | 8.00 | 0.05 | 7.62 | 7.81 | 7.74 | 0.07 |
| | DO (mg/L) | 7.9 | 8.2 | 8.1 | 0.1 | 7.1 | 7.9 | 7.4 | 0.3 | 8.0 | 8.3 | 8.2 | 0.2 | 7.3 | 7.8 | 7.6 | 0.2 |
| 22% | Conductivity (umhos/cm) | 281 | 304 | 290 | 8 | | | | | 278 | 305 | 287 | 9 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.3 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| | Final Temperature (°C) | | | | | 24.1 | 24.6 | 24.4 | 0.2 | | | | | 24.0 | 24.7 | 24.4 | 0.2 |
| | pH (SU) | 7.92 | 8.08 | 8.02 | 0.06 | 7.55 | 7.82 | 7.69 | 0.09 | 7.96 | 8.06 | 8.02 | 0.04 | 7.64 | 7.83 | 7.75 | 0.07 |
| | DO (mg/L) | 8.0 | 8.4 | 8.2 | 0.1 | 7.1 | 7.9 | 7.4 | 0.3 | 8.1 | 8.4 | 8.3 | 0.2 | 7.2 | 7.9 | 7.6 | 0.2 |
| | Conductivity (umhos/cm) | 257 | 277 | 265 | 6.8 | | | | | 256 | 277 | 263 | 7 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.4 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| 43.9% | Final Temperature (°C) | | | | | 24.1 | 24.7 | 24.4 | 0.2 | | | | | 24.1 | 24.7 | 24.4 | 0.2 |
| | pH (SU) | 7.93 | 8.06 | 7.99 | 0.06 | 7.54 | 7.79 | 7.69 | 0.08 | 7.96 | 8.06 | 8.01 | 0.04 | 7.60 | 7.83 | 7.72 | 0.07 |
| | DO (mg/L) | 8.0 | 8.5 | 8.3 | 0.2 | 7.0 | 7.8 | 7.4 | 0.3 | 8.1 | 8.5 | 8.3 | 0.2 | 7.4 | 7.9 | 7.6 | 0.2 |
| | Conductivity (umhos/cm) | 225 | 242 | 232 | 6 | | | | | 220 | 244 | 228 | 8 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.4 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| | Final Temperature (°C) | | | | | 24.1 | 24.8 | 24.4 | 0.2 | | | | | 24.1 | 24.7 | 24.4 | 0.2 |
| | pH (SU) | 7.85 | 8.05 | 7.93 | 0.08 | 7.53 | 7.81 | 7.66 | 0.10 | 7.95 | 8.07 | 7.99 | 0.05 | 7.59 | 7.81 | 7.72 | 0.08 |
| 100% Outfall 101 | DO (mg/L) | 8.1 | 8.6 | 8.4 | 0.2 | 7.0 | 7.9 | 7.4 | 0.3 | 8.1 | 8.6 | 8.4 | 0.2 | 7.3 | 7.9 | 7.6 | 0.2 |
| | Conductivity (umhos/cm) | 192 | 207 | 197 | 5 | | | | | 189 | 207 | 196 | 6 | | | | |
| | Alkalinity (mg/L CaCO ₃) | 61 | 69 | 65 | 4 | | | | | 61 | 69 | 65 | 4 | | | | |
| | Hardness (mg/L CaCO ₃) | 74 | 80 | 77 | 3 | | | | | 74 | 80 | 77 | 3 | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | < 0.10 | < 0.10 | 0 | | | | | < 0.10 | < 0.10 | < 0.10 | 0 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.3 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| | Final Temperature (°C) | | | | | 24.1 | 24.8 | 24.4 | 0.2 | | | | | 24.1 | 24.7 | 24.4 | 0.2 |
| 100% Intake | pH (SU) | 7.76 | 8.03 | 7.87 | 0.10 | 7.61 | 7.83 | 7.74 | 0.08 | 7.91 | 8.05 | 7.97 | 0.05 | 7.62 | 7.82 | 7.71 | 0.07 |
| | DO (mg/L) | 8.1 | 8.6 | 8.4 | 0.2 | 7.0 | 7.9 | 7.4 | 0.3 | 8.1 | 8.7 | 8.4 | 0.2 | 7.3 | 7.8 | 7.6 | 0.2 |
| | Conductivity (umhos/cm) | 192 | 206 | 196 | 5 | | | | | 189 | 207 | 194 | 6 | | | | |
| | Alkalinity (mg/L CaCO ₃) | 62 | 66 | 64 | 2 | | | | | 62 | 66 | 64 | 2 | | | | |
| | Hardness (mg/L CaCO ₃) | 74 | 80 | 78 | 3 | | | | | 74 | 80 | 78 | 3 | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | < 0.10 | < 0.10 | 0 | | | | | < 0.10 | < 0.10 | < 0.10 | 0 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 25.4 | 24.8 | 0.4 | | | | | 24.4 | 25.4 | 24.8 | 0.4 |
| Overall Temperature (°C) (including all concentrations for initial and final temperatures) | | | | | | 24.1 | 25.5 | 24.6 | 0.3 | | | | | 24.0 | 25.4 | 24.6 | 0.3 |

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: TVA Sequoyah Nuclear Plant - Nontreated

Test dates: January 4 - 11, 2002

Project number: 221

Reviewed by: J. Jensen

| 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) | 8.04 | 7.82 | 8.01 | 7.84 | 8.02 | 7.72 | 8.06 | 7.78 | 8.10 | 7.78 | 8.08 | 7.62 | 8.09 | 7.70 |
| | DO (mg/L) | 8.1 | 7.8 | 8.0 | 7.6 | 8.0 | 7.0 | 8.0 | 7.7 | 8.0 | 7.4 | 8.0 | 7.3 | 8.0 | 7.5 |
| | Conductivity (µmhos/cm) | 320 | | 304 | | 305 | | 302 | | 314 | | 314 | | 300 | |
| | Alkalinity (mg/L CaCO ₃) | 68 | | | | | | | | | | | | | |
| | Hardness (mg/L CaCO ₃) | 90 | | | | | | | | 65 | | | | | |
| | Temperature (°C) | 24.6 | 24.1 | 24.5 | 24.6 | 24.9 | 24.3 | 24.4 | 24.8 | 25.5 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 10.98% | pH (SU) | 8.06 | 7.79 | 8.03 | 7.77 | 8.04 | 7.71 | 8.07 | 7.75 | 8.11 | 7.73 | 8.10 | 7.60 | 8.07 | 7.75 |
| | DO (mg/L) | 7.9 | 7.9 | 8.1 | 7.5 | 8.0 | 7.2 | 8.0 | 7.6 | 8.0 | 7.1 | 8.0 | 7.2 | 8.1 | 7.5 |
| | Conductivity (µmhos/cm) | 315 | | 290 | | 298 | | 297 | | 303 | | 302 | | | |
| | Temperature (°C) | 24.7 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 | 24.4 | 24.8 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 22% | pH (SU) | 8.07 | 7.86 | 8.03 | 7.76 | 8.02 | 7.64 | 8.06 | 7.74 | 8.09 | 7.77 | 8.10 | 7.57 | 8.06 | 7.70 |
| | DO (mg/L) | 8.1 | 7.9 | 8.1 | 7.5 | 8.1 | 7.1 | 8.0 | 7.4 | 8.1 | 7.1 | 7.9 | 7.1 | 8.2 | 7.6 |
| | Conductivity (µmhos/cm) | 304 | | 281 | | 288 | | 283 | | 289 | | 295 | | | |
| | Temperature (°C) | 24.7 | 24.1 | 24.5 | 24.6 | 24.9 | 24.3 | 24.4 | 24.6 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 43.9% | pH (SU) | 8.06 | 7.82 | 7.99 | 7.76 | 7.98 | 7.63 | 8.03 | 7.71 | 8.06 | 7.73 | 8.08 | 7.55 | 7.92 | 7.65 |
| | DO (mg/L) | 8.2 | 7.9 | 8.3 | 7.5 | 8.1 | 7.1 | 8.1 | 7.4 | 8.2 | 7.2 | 8.0 | 7.2 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 277 | | 257 | | 261 | | 261 | | 264 | | 271 | | 263 | |
| | Temperature (°C) | 24.6 | 24.1 | 24.4 | 24.6 | 24.9 | 24.3 | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.7 | 24.2 |
| 72% | pH (SU) | 8.06 | 7.79 | 7.94 | 7.72 | 7.93 | 7.63 | 7.97 | 7.69 | 8.03 | 7.76 | 8.06 | 7.54 | 7.96 | 7.67 |
| | DO (mg/L) | 8.3 | 7.8 | 8.5 | 7.5 | 8.2 | 7.1 | 8.3 | 7.4 | 8.3 | 7.0 | 8.0 | 7.1 | 8.4 | 7.7 |
| | Conductivity (µmhos/cm) | 242 | | 225 | | 229 | | 226 | | 231 | | 236 | | 232 | |
| | Temperature (°C) | 24.7 | 24.1 | 24.4 | 24.6 | 25.0 | 24.3 | 24.4 | 24.8 | 25.4 | 24.4 | 24.9 | 24.5 | 24.7 | 24.2 |
| 100% Outfall 101 | pH (SU) | 8.05 | 7.81 | 7.88 | 7.67 | 7.85 | 7.55 | 7.89 | 7.67 | 7.97 | 7.73 | 7.99 | 7.53 | 7.85 | 7.64 |
| | DO (mg/L) | 8.5 | 7.9 | 8.5 | 7.5 | 8.2 | 7.0 | 8.4 | 7.4 | 8.3 | 7.1 | 8.1 | 7.2 | 8.6 | 7.8 |
| | Conductivity (µmhos/cm) | 207 | | 194 | | 192 | | 192 | | 198 | | 199 | | 200 | |
| | Alkalinity (mg/L CaCO ₃) | 64 | | | | 61 | | | | | | | | | |
| | Hardness (mg/L CaCO ₃) | 78 | | | | 74 | | | | 69 | | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | | | | < 0.10 | | | | 80 | | | | | |
| | Temperature (°C) | 24.7 | 24.1 | 24.5 | 24.5 | 25.0 | 24.3 | 24.4 | 24.8 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 100% Intake | pH (SU) | 8.03 | 7.81 | 7.83 | 7.71 | 7.78 | 7.61 | 7.83 | 7.76 | 7.91 | 7.77 | 7.94 | 7.83 | 7.76 | 7.69 |
| | DO (mg/L) | 8.5 | 7.9 | 8.6 | 7.5 | 8.1 | 7.0 | 8.4 | 7.5 | 8.3 | 7.0 | 8.2 | 7.2 | 8.6 | 7.7 |
| | Conductivity (µmhos/cm) | 206 | | 193 | | 193 | | 192 | | 195 | | 198 | | 198 | |
| | Alkalinity (mg/L CaCO ₃) | 65 | | | | 65 | | | | | | | | | |
| | Hardness (mg/L CaCO ₃) | 80 | | | | 80 | | | | 62 | | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | | | | < 0.10 | | | | 74 | | | | | |
| | Temperature (°C) | 24.7 | 24.1 | 24.4 | 24.6 | 25.0 | 24.3 | 24.4 | 24.8 | 25.4 | 24.4 | 24.9 | 24.5 | 24.7 | 24.2 |

Species: *Pimephales promelas*Client: TVA SEQUOYAH NUCLEAR PLANTDate: 01-04-02Full-strength Chemistry: OUTFALL 101 NONTREATED

| Parameter | Sample Number: | | | Control Batch: | | |
|--------------------------------------|----------------------|----------------------|---|----------------|----------|--|
| | 1 | 2 | 3 | 01-03-02 | 01-06-02 | |
| pH (S.U.) | 8.05 | 7.85 | 7.97 | 8.04 | 8.10 | |
| DO (mg/L) | 8.5 | 8.2 | 8.3 | 8.1 | 8.0 | |
| Conductivity (µmhos/cm) | 206 | 192 | 198 | 320 | 314 | |
| Alkalinity (mg CaCO ₃ /L) | 64 | 61 | 69 | 68 | 65 | |
| Hardness (mg CaCO ₃ /L) | 78 | 74 | 80 | 90 | 90 | |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 01-02-02 | 01-04-02 | 01-06-02 | | | |
| Collection end time | 0818 | 0939 | 1234 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.8°C | 0.4°C | 1.0°C | | | |
| Physical characteristics | LIGHT BEIGE CLEAR | CLEAR NO COLOR | CLEAR NO COLOR FLOATING BLACK PARTICLES | | | |
| Dates sample used | 01-04-02 01-05-02 | 01-06-02 01-07-02 | 01-08-02 01-09-02 01-10-02 | | | |
| ETS Project and Sample numbers | 221 02-01-04.01 | 020105.01 | 020108.01 | | | |

Species: *Pimephales promelas*Client: TVA SEQUOYAH NUCLEAR PLANTDate: 01-04-02Full-strength Chemistry: INTAKE - NONTREATED

| Parameter | Sample Number: | | | Control Batch: | | |
|---|---|----------------------|--|----------------|----------|--|
| | 1 | 2 | 3 | 01-03-02 | 01-06-02 | |
| pH (S.U.) | 8.03 | 7.78 | 7.91 | 8.04 | 8.10 | |
| DO (mg/L) | 8.5 | 8.1 | 8.3 | 8.1 | 8.0 | |
| Conductivity (µmhos/cm) | 206 | 193 | 195 | 320 | 314 | |
| Alkalinity (mg CaCO ₃ /L) | 65 | 65 | 62 | 68 | 65 | |
| Hardness (mg CaCO ₃ /L) | 80 | 80 | 74 | 90 | 90 | |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 01-02-02 | 01-04-02 | 01-06-02 | | | |
| Collection end time | 0913 | 0932 | 1251 | | | |
| Grab or Composite (duration) | 24 ^h 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.6°C | 0.6°C | 0.8°C | | | |
| Physical characteristics | LIGHT BEIGE CLEAR FLOATING PARTICLES | CLEAR NO COLOR | CLEAR NO COLOR FLOATING BLACK PARTICLES | | | |
| Dates sample used | 01-04-02 01-05-02 | 01-06-02 01-07-02 | 01-08-02 01-09-02 01-10-02 | | | |
| ETS Project and Sample numbers | 221 020104.02 | 020105.02 | 020108.02 | | | |

Species: *Pimephales promelas*Client: SEQUOYAH NUCLEAR PLANTDate: 01-04-02

NONTREATED

Daily Chemistry:

| Concentration | Parameter | Day | | | | | |
|----------------|-------------------------|---------|-------|------------|-------|---------|-------|
| | | 0 | | 1 | | 2 | |
| CONTROL MHS | pH (S.U.) | 8.04 | 7.82 | 8.01 | 7.84 | 8.02 | 7.72 |
| | DO (mg/L) | 8.1 | 7.8 | 8.0 | 7.6 | 8.0 | 7.0 |
| | Conductivity (µmhos/cm) | 320 | | 296 304 | | 305 | |
| | Temperature (°C) | 24.6 | 24.1 | 24.5 | 24.6 | 24.9 | 24.3 |
| | | | | | | | |
| 10.98% | pH (S.U.) | 8.06 | 7.79 | 8.03 | 7.77 | 8.04 | 7.71 |
| | DO (mg/L) | 7.9 | 7.9 | 8.1 | 7.5 | 8.0 | 7.2 |
| | Conductivity (µmhos/cm) | 315 | | 290 | | 298 | |
| | Temperature (°C) | 24.7 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 |
| | | | | | | | |
| 22% | pH (S.U.) | 8.07 | 7.86 | 8.03 | 7.76 | 8.02 | 7.64 |
| | DO (mg/L) | 8.1 | 7.9 | 8.1 | 7.5 | 8.1 | 7.1 |
| | Conductivity (µmhos/cm) | 304 | | 281 | | 288 | |
| | Temperature (°C) | 24.7 | 24.1 | 24.5 | 24.6 | 24.9 | 24.3 |
| | | | | | | | |
| 43.9% | pH (S.U.) | 8.06 | 7.82 | 7.99 | 7.76 | 7.90 | 7.63 |
| | DO (mg/L) | 8.2 | 7.9 | 8.3 | 7.5 | 8.1 | 7.1 |
| | Conductivity (µmhos/cm) | 277 | | 257 | | 261 | |
| | Temperature (°C) | 24.6 | 24.1 | 24.4 | 24.6 | 24.9 | 24.3 |
| | | | | | | | |
| 72% | pH (S.U.) | 8.06 | 7.79 | 7.94 | 7.72 | 7.93 | 7.63 |
| | DO (mg/L) | 8.3 | 7.8 | 8.5 | 7.5 | 8.2 | 7.1 |
| | Conductivity (µmhos/cm) | 242 | | 225 | | 229 | |
| | Temperature (°C) | 24.7 | 24.1 | 24.4 | 24.6 | 25.0 | 24.3 |
| | | | | | | | |
| 100% | pH (S.U.) | 8.05 | 7.81 | 7.88 | 7.67 | 7.85 | 7.55 |
| | DO (mg/L) | 8.5 | 7.9 | 8.5 | 7.5 | 8.2 | 7.0 |
| | Conductivity (µmhos/cm) | 207 | | 194 | | 192 | |
| | Temperature (°C) | 24.7 | 24.1 | 24.5 | 24.5 | 25.0 | 24.3 |
| | | | | | | | |
| 100% INTAKE | pH (S.U.) | 8.03 | 7.81 | 7.83 | 7.71 | 7.78 | 7.61 |
| | DO (mg/L) | 8.5 | 7.9 | 8.6 | 7.5 | 8.1 | 7.0 |
| | Conductivity (µmhos/cm) | 206 | | 193 | | 193 | |
| | Temperature (°C) | 24.7 | 24.1 | 24.4 | 24.6 | 25.0 | 24.3 |
| | | | | | | | |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Pimephales promelas*Client: SEQUOYAH NUCLEAR PLANT
NONTREATEDDate: 01-04-02

| Concentration | Parameter | Day | | | | | | | |
|----------------|-------------------------|---------|-------|---------|-------|---------|-------|---------|-------|
| | | 3 | | 4 | | 5 | | 6 | |
| CONTROL | pH (S.U.) | 8.06 | 7.78 | 8.10 | 7.78 | 8.08 | 7.62 | 8.09 | 7.70 |
| | DO (mg/L) | 8.0 | 7.7 | 8.0 | 7.4 | 8.0 | 7.3 | 8.0 | 7.5 |
| | Conductivity (µmhos/cm) | 302 | | 314 | | 314 | | 300 | |
| | Temperature (°C) | 24.4 | 24.8 | 25.5 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 10.95% | pH (S.U.) | 8.07 | 7.75 | 8.11 | 7.73 | 8.10 | 7.60 | 8.07 | 7.75 |
| | DO (mg/L) | 8.0 | 7.6 | 8.0 | 7.1 | 8.0 | 7.2 | 8.1 | 7.5 |
| | Conductivity (µmhos/cm) | 297 | | 303 | | 302 | | 297 | |
| | Temperature (°C) | 24.4 | 24.8 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 22% | pH (S.U.) | 8.06 | 7.74 | 8.09 | 7.77 | 8.10 | 7.57 | 8.06 | 7.70 |
| | DO (mg/L) | 8.0 | 7.4 | 8.1 | 7.1 | 7.9 | 7.1 | 8.06 | 7.6 |
| | Conductivity (µmhos/cm) | 283 | | 289 | | 295 | | 289 | |
| | Temperature (°C) | 24.4 | 24.6 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 43.9% | pH (S.U.) | 8.03 | 7.71 | 8.06 | 7.73 | 8.08 | 7.55 | 7.92 | 7.65 |
| | DO (mg/L) | 8.1 | 7.4 | 8.2 | 7.2 | 8.0 | 7.2 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 261 | | 264 | | 271 | | 263 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.7 | 24.2 |
| 72% | pH (S.U.) | 7.97 | 7.69 | 8.03 | 7.76 | 8.06 | 7.54 | 7.96 | 7.67 |
| | DO (mg/L) | 8.3 | 7.4 | 8.3 | 7.0 | 8.0 | 7.1 | 8.4 | 7.7 |
| | Conductivity (µmhos/cm) | 226 | | 231 | | 236 | | 232 | |
| | Temperature (°C) | 24.4 | 24.8 | 25.4 | 24.4 | 24.9 | 24.5 | 24.7 | 24.2 |
| 100% | pH (S.U.) | 7.89 | 7.67 | 7.97 | 7.73 | 7.99 | 7.53 | 7.85 | 7.64 |
| | DO (mg/L) | 8.4 | 7.4 | 8.3 | 7.1 | 8.1 | 7.2 | 8.6 | 7.8 |
| | Conductivity (µmhos/cm) | 192 | | 198 | | 199 | | 200 | |
| | Temperature (°C) | 24.4 | 24.8 | 25.4 | 24.4 | 25.0 | 24.5 | 24.7 | 24.2 |
| 100% INTAKE | pH (S.U.) | 7.83 | 7.76 | 7.91 | 7.77 | 7.94 | 7.83 | 7.76 | 7.69 |
| | DO (mg/L) | 8.4 | 7.5 | 8.3 | 7.0 | 8.2 | 7.2 | 8.6 | 7.7 |
| | Conductivity (µmhos/cm) | 192 | | 195 | | 198 | | 198 | |
| | Temperature (°C) | 24.4 | 24.8 | 25.4 | 24.4 | 24.9 | 24.5 | 24.7 | 24.2 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: TVA Sequoyah Nuclear Plant - UV Treated

Test dates: January 4 - 11, 2002

Project number: 221

Reviewed by:

Hunter

| 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) | 8.00 | 7.77 | 8.03 | 7.74 | 7.66 | 7.69 | 7.86 | 7.83 | 7.93 | 7.88 | 8.04 | 7.68 | 7.90 | 7.76 |
| | DO (mg/L) | 8.1 | 7.8 | 8.1 | 7.5 | 8.0 | 7.2 | 8.0 | 7.8 | 7.9 | 7.3 | 8.0 | 7.7 | 8.0 | 7.5 |
| | Conductivity (µmhos/cm) | 321 | | 296 | | 305 | | 301 | | 309 | | 310 | | 304 | |
| | Alkalinity (mg/L CaCO ₃) | 68 | | | | | | | | | | | | | |
| | Hardness (mg/L CaCO ₃) | 90 | | | | | | | | 65 | | | | | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.3 | 24.9 | 24.5 | 24.7 | 24.2 |
| 10.98% | pH (SU) | 8.03 | 7.68 | 7.99 | 7.87 | 7.81 | 7.75 | 7.96 | 7.80 | 8.01 | 7.81 | 8.03 | 7.69 | 7.95 | 7.78 |
| | DO (mg/L) | 8.2 | 7.8 | 8.1 | 7.4 | 8.0 | 7.2 | 8.2 | 7.8 | 7.9 | 7.5 | 8.0 | 7.7 | 8.2 | 7.5 |
| | Conductivity (µmhos/cm) | 318 | | 289 | | 296 | | 294 | | 300 | | 296 | | 293 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.3 | 24.9 | 24.5 | 24.6 | 24.2 |
| 22% | pH (SU) | 8.06 | 7.76 | 7.99 | 7.81 | 7.93 | 7.70 | 8.01 | 7.80 | 8.05 | 7.78 | 8.05 | 7.62 | 7.94 | 7.70 |
| | DO (mg/L) | 8.2 | 7.8 | 8.3 | 7.4 | 8.0 | 7.3 | 8.3 | 7.8 | 8.0 | 7.5 | 8.0 | 7.8 | 8.3 | 7.5 |
| | Conductivity (µmhos/cm) | 305 | | 278 | | 286 | | 282 | | 289 | | 285 | | 285 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.6 | 24.0 |
| 43.9% | pH (SU) | 8.06 | 7.71 | 7.99 | 7.83 | 7.98 | 7.71 | 8.02 | 7.79 | 8.06 | 7.80 | 8.06 | 7.64 | 7.96 | 7.79 |
| | DO (mg/L) | 8.3 | 7.9 | 8.4 | 7.4 | 8.1 | 7.2 | 8.4 | 7.8 | 8.1 | 7.7 | 8.1 | 7.7 | 8.4 | 7.5 |
| | Conductivity (µmhos/cm) | 277 | | 256 | | 261 | | 257 | | 264 | | 263 | | 264 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.6 | 24.1 |
| 72% | pH (SU) | 8.06 | 7.74 | 7.99 | 7.83 | 7.98 | 7.68 | 8.00 | 7.76 | 8.05 | 7.75 | 8.06 | 7.60 | 7.96 | 7.70 |
| | DO (mg/L) | 8.5 | 7.9 | 8.3 | 7.4 | 8.1 | 7.4 | 8.5 | 7.7 | 8.1 | 7.7 | 8.1 | 7.6 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 244 | | 220 | | 228 | | 222 | | 231 | | 222 | | 226 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 24.9 | 24.3 | 24.4 | 24.7 | 25.4 | 24.4 | 25.0 | 24.5 | 24.6 | 24.2 |
| 100% Outfall 101 | pH (SU) | 8.04 | 7.71 | 7.97 | 7.81 | 7.95 | 7.67 | 7.96 | 7.72 | 8.02 | 7.80 | 8.07 | 7.59 | 7.95 | 7.77 |
| | DO (mg/L) | 8.6 | 7.9 | 8.3 | 7.4 | 8.2 | 7.3 | 8.6 | 7.7 | 8.1 | 7.7 | 8.2 | 7.6 | 8.5 | 7.6 |
| | Conductivity (µmhos/cm) | 207 | | 190 | | 194 | | 189 | | 198 | | 196 | | 198 | |
| | Alkalinity (mg/L CaCO ₃) | 64 | | | | 61 | | | | 69 | | | | | |
| | Hardness (mg/L CaCO ₃) | 78 | | | | 74 | | | | 80 | | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | | | | < 0.10 | | | | < 0.10 | | | | | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.3 | 25.0 | 24.5 | 24.7 | 24.1 |
| 100% Intake | pH (SU) | 8.05 | 7.68 | 7.97 | 7.82 | 7.92 | 7.62 | 7.94 | 7.71 | 8.01 | 7.76 | 8.01 | 7.64 | 7.91 | 7.74 |
| | DO (mg/L) | 8.7 | 7.7 | 8.4 | 7.5 | 8.1 | 7.3 | 8.5 | 7.7 | 8.1 | 7.7 | 8.3 | 7.6 | 8.4 | 7.8 |
| | Conductivity (µmhos/cm) | 207 | | 190 | | 189 | | 189 | | 194 | | 195 | | 195 | |
| | Alkalinity (mg/L CaCO ₃) | 66 | | | | 65 | | | | 62 | | | | | |
| | Hardness (mg/L CaCO ₃) | 80 | | | | 80 | | | | 74 | | | | | |
| | Total Residual Chlorine (mg/L) | < 0.10 | | | | < 0.10 | | | | < 0.10 | | | | | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 | 24.4 | 24.7 | 25.4 | 24.3 | 25.0 | 24.5 | 24.6 | 24.1 |

Species: *Pimephales promelas*Client: SEQUOYAH NUCLEAR PLANTDate: 01-04-02

Daily Chemistry:

UV TREATED

| Concentration | Parameter | Day | | | | | |
|----------------|-------------------------|---------|-------|--------------------|-------|---------|-------|
| | | 0 | | 1 | | 2 | |
| CONTROL | pH (S.U.) | 8.00 | 7.77 | 8.03 | 7.74 | 7.66 | 7.69 |
| | DO (mg/L) | 8.1 | 7.8 | 8.1 | 7.5 | 8.0 | 8.0 |
| | Conductivity (µmhos/cm) | 321 | | 304 ²⁹⁶ | | 305 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 |
| 10.98% | pH (S.U.) | 8.03 | 7.68 | 7.99 | 7.87 | 7.81 | 7.75 |
| | DO (mg/L) | 8.2 | 7.8 | 8.1 | 7.4 | 8.0 | 7.2 |
| | Conductivity (µmhos/cm) | 318 | | 289 | | 296 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 |
| 22% | pH (S.U.) | 8.06 | 7.76 | 7.99 | 7.81 | 7.93 | 7.70 |
| | DO (mg/L) | 8.2 | 7.8 | 8.3 | 7.4 | 8.0 | 7.3 |
| | Conductivity (µmhos/cm) | 305 | | 278 | | 286 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 |
| 43.9% | pH (S.U.) | 8.06 | 7.71 | 7.99 | 7.83 | 7.93 | 7.71 |
| | DO (mg/L) | 8.3 | 7.9 | 8.4 | 7.4 | 8.1 | 7.2 |
| | Conductivity (µmhos/cm) | 277 | | 256 | | 261 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.4 | 24.6 | 25.0 | 24.3 |
| 72% | pH (S.U.) | 8.06 | 7.74 | 7.99 | 7.83 | 7.98 | 7.68 |
| | DO (mg/L) | 8.5 | 7.9 | 8.3 | 7.4 | 8.1 | 7.4 |
| | Conductivity (µmhos/cm) | 244 | | 220 | | 228 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 24.9 | 24.3 |
| 100% | pH (S.U.) | 8.04 | 7.71 | 7.97 | 7.81 | 7.95 | 7.67 |
| | DO (mg/L) | 8.6 | 7.9 | 8.3 | 7.4 | 8.2 | 7.3 |
| | Conductivity (µmhos/cm) | 207 | | 190 | | 194 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 |
| 100% INTAKE | pH (S.U.) | 8.05 | 7.68 | 7.97 | 7.82 | 7.92 | 7.62 |
| | DO (mg/L) | 8.7 | 7.7 | 8.4 | 7.5 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 207 | | 190 | | 189 | |
| | Temperature (°C) | 24.6 | 24.2 | 24.5 | 24.6 | 25.0 | 24.3 |
| | | Initial | Final | Initial | Final | Initial | Final |

Species: *Pimephales promelas*Client: SEQUOIAH NUCLEAR PLANT
UV TREATEDDate: 01-04-02

| Concentration | Parameter | Day | | | | | | | |
|---------------|-------------------------|-------|------|-------------------------|------|-------|------|---------|------|
| | | 3 | | 4 | | 5 | | 7.90 | 6 |
| CONTROL | pH (S.U.) | 7.86 | 7.83 | 7.93 | 7.88 | 8.05 | 7.64 | 7.68 | 7.76 |
| | DO (mg/L) | 8.0 | 7.8 | 7.9 | 7.3 | 8.0 | 7.7 | 8.0 | 7.5 |
| | Conductivity (µmhos/cm) | 301 | | 314 ⁸ 309 | | 310 | | 304 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.3 | 24.9 | 24.5 | 24.7 | 24.2 |
| 10.98% | pH (S.U.) | 7.96 | 7.80 | 8.01 | 7.81 | 8.03 | 7.69 | 7.95 | 7.78 |
| | DO (mg/L) | 8.2 | 7.8 | 7.9 | 7.5 | 8.0 | 7.7 | 8.2 | 7.5 |
| | Conductivity (µmhos/cm) | 294 | | 303 ⁸ 300 | | 296 | | 293 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.3 | 24.9 | 24.5 | 24.6 | 24.2 |
| 22% | pH (S.U.) | 8.01 | 7.80 | 8.05 | 7.78 | 8.05 | 7.62 | 7.94 | 7.76 |
| | DO (mg/L) | 8.3 | 7.8 | 8.0 | 7.5 | 8.0 | 7.8 | 8.3 | 7.5 |
| | Conductivity (µmhos/cm) | 282 | | 289 | | 285 | | 285 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.6 | 24.0 |
| 43.97% | pH (S.U.) | 8.02 | 7.79 | 8.06 | 7.80 | 8.06 | 7.64 | 7.96 | 7.79 |
| | DO (mg/L) | 8.4 | 7.8 | 8.1 | 7.7 | 8.1 | 7.7 | 8.4 | 7.5 |
| | Conductivity (µmhos/cm) | 257 | | 264 | | 263 | | 264 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.4 | 25.1 | 24.5 | 24.6 | 24.1 |
| 72% | pH (S.U.) | 8.00 | 7.76 | 8.05 | 7.75 | 8.06 | 7.60 | 7.96 | 7.70 |
| | DO (mg/L) | 8.5 | 7.7 | 8.1 | 7.7 | 8.1 | 7.6 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 222 | | 231 | | 222 | | 226 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.4 | 25.0 | 24.5 | 24.6 | 24.2 |
| 100% | pH (S.U.) | 7.96 | 7.72 | 8.02 | 7.80 | 8.05 | 7.59 | 7.95 | 7.79 |
| | DO (mg/L) | 8.6 | 7.7 | 8.1 | 7.7 | 8.2 | 7.6 | 8.5 | 7.6 |
| | Conductivity (µmhos/cm) | 189 | | 198 | | 196 | | 198 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.3 | 25.0 | 24.5 | 24.7 | 24.1 |
| 100% INTAKE | pH (S.U.) | 7.94 | 7.71 | 8.01 | 7.76 | 8.01 | 7.64 | 7.91 | 7.74 |
| | DO (mg/L) | 8.5 | 7.7 | 8.1 | 7.7 | 8.3 | 7.6 | 8.4 | 7.8 |
| | Conductivity (µmhos/cm) | 189 | | 195 ⁸ 194 | | 195 | | 195 | |
| | Temperature (°C) | 24.4 | 24.7 | 25.4 | 24.3 | 25.0 | 24.5 | 24.6 | 24.1 |
| Initial | | Final | | Initial | | Final | | Initial | |
| | | | | | | | | | |

Alkalinity (EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg CaCO₃/L
Analyst KHL
Date analyzed 01.14.02

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

| pH of Deionized water = 4.5 S.U. | Titrant reference number | Normality check standard number | Begin ml | End ml | Total ml (E) | Normality (N) of H ₂ SO ₄ = (5 ml Na ₂ CO ₃ x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500 |
|----------------------------------|--------------------------|---------------------------------|----------|--------|--------------|--|--|
| 5.0 | 1NR030 | 1NS5070 | 0.1 | 12.5 | 12.4 | 0.0202 | 10.1 |

Blank correction - 0.0 - 0.1 = 0.1 ml

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%) |
|---------------------------|--|--------------------|----------|--------|----------|------------|--|---|
| 1NS5079 | 100 | 100 | 12.5 | 22.2 | 9.7 | 10.1 | 90 | 90.2 |

Duplicate sample precision:

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg CaCO ₃ /L) | %RPD = {(S - D) / [(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---------------|----------------------|--------------------|----------|--------|----------|------------|--------------------------------------|---|
| 12-22-01 | MHS H ₂ O | 100 | 22.2 | 29.1 | 6.9 | 10.1 | S 70 | |
| 12-22-01 | Duplicate | 100 | 29.1 | 36.0 | 6.9 | 10.1 | D 70 | - |

Matrix spike recovery:

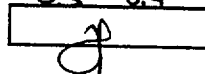
| Reference standard number | Spike value (SV) (mg CaCO ₃ /L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg CaCO ₃ /L) |
|---------------------------|---|--------------------|----------|--------|----------|------------|---|
| 1NS5079 | 50 | 100 | 29.1 | 40.7 | 11.6 | 10.1 | 117 |

| Sample alkalinity (B) (mg CaCO ₃ /L) | Measured spike value (MV) MV = A - B (mg CaCO ₃ /L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|--|--|--|
| 70 | 47 | 94.70 |

Sample measurements:

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg CaCO ₃ /L) |
|---------------|----------------------|--------------------|----------|--------|----------|------------|--------------------------------------|
| 12.17.01 | MHS H ₂ O | 100 | 41.0 | 47.9 | 6.9 | 10.1 | 70 |
| 01-02-02 | | | 0.2 | 7.1 | 6.9 | | 70 |
| 01.03.02 | | | 7.1 | 13.0 | 6.7 | | 68 |
| 01.06.02 | | | 13.0 | 20.2 | 6.4 | | 65 |
| 01.07.02 | | | 20.5 | 26.9 | 6.4 | | 65 |
| 01.09.02 | | | 26.9 | 33.2 | 6.3 | | 64 |
| 01.07.02 | SSW H ₂ O | | 33.2 | 36.5 | 3.3 | | 33 |
| 01.13.02 | | | 36.5 | 39.5 | 3.0 | | 30 |
| 02.01.02 | Anderson 1 | | 39.5 | 50.0 | 10.5 | | 110 |

Reviewed by:



Date reviewed:

01-14-02

Alkalinity **(EPA Method 310.1)**

Matrix: Water, MDL = 1.0 mg CaCO₃/L
 Analyst KEL
 Date analyzed 01-14-02

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

| pH of Deionized water = 4.5 S.U. | Titrant reference number | Normality check standard number | Begin ml | End ml | Total ml (E) | Normality (N) of H ₂ SO ₄ = (5 ml Na ₂ CO ₃ x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500 |
|----------------------------------|--------------------------|---------------------------------|----------|--------|--------------|--|--|
| | | | | | | | |

Laboratory control standard:

| Reference standard number | True value (TV) (mg CaCO ₃ /L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg CaCO ₃ /L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---------------------------|--|--------------------|----------|--------|----------|------------|--|---|
| 1N55079 | 100 | 100 | 0.5 | 10.2 | 9.7 | 10.1 | 90 | 90% |

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%) |
|---------------|------------|--------------------|----------|--------|----------|------------|--------------------------------------|---|
| 020112.01 | Anderson 3 | 100 | 10.5 | 21.3 | 10.8 | 10.1 | S 110 | |
| 020112.01 | Duplicate | 100 | 21.3 | 32.0 | 10.7 | ↓ | D 110 | — |

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) |
|---------------------------|---|--------------------|----------|--------|----------|------------|---|
| 1N55079 | 50 | 100 | 21.3 | 36.9 | 15.6 | 10.1 | 160 |

| Sample alkalinity (B) (mg CaCO ₃ /L) | Measured spike value (MV) MV = A - B (mg CaCO ₃ /L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|--|--|--|
| 110 | 50 | 100% |

Sample measurements:

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg CaCO ₃ /L) |
|---------------|------------|--------------------|----------|--------|----------|------------|--------------------------------------|
| 020110.02 | Anderson 2 | 100 | 36.9 | 47.0 | 10.1 | 10.1 | 100 |
| 020104.01 | SQN 1 | | 0.8 | 7.1 | 6.3 | | 64 |
| 020105.01 | ↓ 2 | | 7.2 | 13.2 | 6.0 | | 61 |
| 020108.01 | ↓ 3 | | 13.2 | 20.0 | 6.8 | | 69 |
| 020104.02 | Intake 1 | | 20.1 | 26.6 | 6.5 | | 66 |
| 020105.02 | ↓ 2 | | 26.6 | 33.0 | 6.4 | | 65 |
| 020108.01 | ↓ 3 | | 33.0 | 39.1 | 6.1 | | 62 |
| | | | | | | | |
| | | | | | | | |

Reviewed by:

JS

Date reviewed:

01-14-02

Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst KEN
Date analyzed 01-14-02

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 |
|--------------------------|---------------------------------|----------|--------|--------------|--|---|
| 1N2011 | 1AR009 | 0.1 | 10.1 | 10.0 | 0.020 | 20 |

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%) |
|---------------------------|--|--------------------|----------|--------|----------|------------|--|---|
| 1N55008 | 40 | 50 | 10.4 | 12.4 | 2.0 | 20 | 40 | 100% |

Duplicate sample precision:

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg CaCO ₃ /L) | %RPD = {(S - D) / [(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---------------|----------------------|--------------------|----------|--------|----------|------------|------------------------------------|---|
| 12-17-01 | MHS H ₂ O | 50 | 13.0 | 17.0 | 4.0 | 20 | S 96 | |
| 12-17-01 | Duplicate | 50 | 17.8 | 22.0 | 4.0 | 20 | D 96 | - |

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) |
|---------------------------|---|--------------------|----------|--------|----------|------------|---|
| 1N55008 | 40 | 50 | 17.8 | 24.6 | 6.0 | 20 | 136 |

| 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%) |
|--|--|--|
| 96 | 40 | 100% |

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 | ND |
| 12-22-01 | MHS H ₂ O | | 24.0 | 29.0 | 4.0 | | 92 |
| 01-02-02 | | | 29.6 | 34.2 | 4.0 | | 92 |
| 01-03-02 | | | 34.2 | 38.7 | 4.5 | | 90 |
| 01-06-02 | | | 38.7 | 43.2 | 4.5 | | 90 |
| 01-07-02 | | | 43.2 | 47.5 | 4.3 | | 86 |
| 01-09-02 | | | 0.0 | 4.3 | 4.3 | | 86 |
| 01-07-02 | SSW H ₂ O | | 4.3 | 6.5 | 2.2 | | 44 |
| 01-13-02 | | | 6.5 | 8.9 | 2.4 | | 40 |
| 02-01-08-07 | Anderson 1 | | 8.9 | 17.3 | 8.4 | | 170 |

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

Reviewed by: gDate reviewed 01-14-02

Total Hardness
(EPA Method 130.2)Matrix: Water, MDL = 1.0 mg CaCO₃/LAnalyst KLM
Date analyzed 01-14-02

Titrant normality and multiplier determination:

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

Laboratory control standard:

| Reference standard number | True value (TV) (mg CaCO ₃ /L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg CaCO ₃ /L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---------------------------|--|--------------------|----------|--------|----------|------------|--|---|
| 1NSS008 | 40 | 50 | 17.3 | 19.5 | 7.2 | 20 | 44 | 110% |

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%) |
|---------------|------------|--------------------|----------|--------|----------|------------|------------------------------------|---|
| 020110-02 | Anderson 2 | 50 | 19.5 | 27.1 | 7.6 | 20 | S 150 | |
| 020110-02 | Duplicate | | 27.1 | 34.6 | 7.5 | 20 | D 150 | |

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) |
|---------------------------|---|--------------------|----------|--------|----------|------------|---|
| 1NSS008 | 40 | 50 | 27.1 | 36.6 | 9.5 | 20 | 90 |

| 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%) |
|--|--|--|
| 150 | 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) | | | | | | |
| 020112.01 | Anderson 3 | 50 | 36.6 | 44.6 | 8.0 | 20 | 160 |
| 020104.01 | SAN 1 | | 5.4 | 9.3 | 3.9 | | 78 |
| 020105.01 | 2 | | 9.3 | 13.0 | 3.7 | | 74 |
| 020108.01 | 3 | | 13.0 | 17.0 | 4.0 | | 80 |
| 020104.02 | Intake 1 | | 17.0 | 21.0 | 4.0 | | 80 |
| 020105.02 | 2 | | 21.0 | 25.0 | 4.0 | | 80 |
| 020108.02 | 3 | | 25.0 | 28.7 | 3.7 | | 74 |

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

Reviewed by: [Signature]

Date reviewed

01-14-02

Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model 25 pH/Ion Meter

| | |
|---------------|----------|
| Analyst | KER |
| Date analyzed | 01-06-02 |

| | |
|-----------------|---------|
| Iodide reagent: | IN R041 |
| Acid reagent: | IN R013 |
| Slope: | 26.2 |

| | | |
|---------------------------|-----------|-----------|
| | 0.10 mg/L | 1.00 mg/L |
| Reference standard number | 1N5505 | 1N5505 |

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.

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---------------------------|---------------------------|-------------------------------|---|
| INSEOS | 0.50 | 0.507 | 101.4% |

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = $\{(S - D) / [(S+D)/2]\} \times 100$ (acceptable range = $\pm 10\%$) |
|---------------|--------------|------------------------|--------------------------|---|
| 020105.02 | SQN-101-INT. | NOODLE, CLEAR | S 10.00810 | |
| ↓ | Duplicate | | D 10.00784 | — |

[illegible]

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

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = $MV / TV \times 100$ (acceptable range = 90 to 110%) |
|---------------------------|---------------------------|-------------------------------|--|
| 1N5505 | 0.50 | 0.522 | 104.4% |

| | |
|---------------|----------|
| Reviewed by | J |
| Date reviewed | 01-12-02 |

Total Residual Chlorine (EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model 25 pH/Ion Meter

Analyst KE
Date analyzed 01-08-02

Iodide reagent: INRDY1
Acid reagent: INRDZ3
Slope: 28.0

Calibration:

| | 0.10 mg/L | 1.00 mg/L |
|---------------------------|----------------|----------------|
| Reference standard number | <u>INSS005</u> | <u>INSS005</u> |

Note: For samples with a residual chlorine of > 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

Laboratory control standard:

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---------------------------|---------------------------|-------------------------------|---|
| <u>INSS005</u> | <u>0.50</u> | <u>0.510</u> | <u>102.0</u> |

Duplicate sample precision:

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = $\{(S - D) / [(S + D) / 2]\} \times 100$ (acceptable range = $\pm 10\%$) |
|------------------|------------------------|---|-----------------------------|---|
| <u>020108.07</u> | <u>Anderson Co. SA</u> | <u>slightly cloudy, pale yellow, floating particles</u> | <u>S 0.00073</u> | |
| <u>↓</u> | <u>Duplicate</u> | | <u>D 0.00010</u> | |

Sample measurements:

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|------------------|---|--|-----------------------------|
| | <u>Blank (should be = < 0.10 mg/L)</u> | | <u>0.00452</u> |
| <u>020108.03</u> | <u>RDV-001 - Tritest, Inc</u> | <u>tan, slightly cloudy</u> | <u>0.00369</u> |
| <u>020108.04</u> | <u>002</u> | <u>pale tan, slightly cloudy</u> | <u>0.00145</u> |
| <u>020108.05</u> | <u>003</u> | <u>orange, cloudy</u> | <u>0.00849</u> |
| <u>020108.06</u> | <u>004</u> | <u>pale yellow, slightly cloudy</u> | <u>0.00197</u> |
| <u>020108.02</u> | <u>TYA intake - SAN-101-INT</u> | <u>no color, clear, floating blk particles</u> | <u>0.00272</u> |
| <u>020108.01</u> | <u>TYA out fall 101 - SAN-101-EH</u> | <u>no color, clear, floating blk particles</u> | <u>0.00530</u> |
| | | | |
| | | | |
| | | | |

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

Laboratory control standard:

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---------------------------|---------------------------|-------------------------------|---|
| <u>INSS005</u> | <u>0.50</u> | <u>0.528</u> | <u>105.6%</u> |

Reviewed by JK
Date reviewed 01-12-02

Sequoyah Nuclear Plant Biomonitoring
January 4 – 11, 2002

Appendix D

Reference Toxicant Tests and
Control Chart Information

Environmental Testing Solutions, LLC

potassium Chloride Chronic Reference Toxicant Control Cha for *Pimephales promelas* using Moderately Hard Synthetic Water

| Test number | Test date | 7-day IC25 (g KCl/L) | CT (g/L KCl) | S | CV | CT - 2S | CT + 2S | 2SD |
|-------------|-----------|-------------------------|-----------------|--------|--------|---------|---------|--------|
| 1 | 03-07-00 | 0.5845 | | | | | | |
| 2 | 03-17-00 | 0.6755 | 0.6300 | 0.0643 | 10.21% | 0.5013 | 0.7587 | 0.1287 |
| 3 | 05-23-00 | 0.6873 | 0.6491 | 0.0563 | 8.67% | 0.5366 | 0.7616 | 0.1125 |
| 4 | 06-13-00 | 0.7239 | 0.6678 | 0.0592 | 8.87% | 0.5493 | 0.7863 | 0.1185 |
| 5 | 06-13-00 | 0.7014 | 0.6745 | 0.0535 | 7.92% | 0.5676 | 0.7814 | 0.1069 |
| 6 | 09-19-00 | 0.6570 | 0.6716 | 0.0483 | 7.20% | 0.5749 | 0.7683 | 0.0967 |
| 7 | 10-24-00 | 0.7678 | 0.6853 | 0.0572 | 8.34% | 0.5710 | 0.7997 | 0.1144 |
| 8 | 11-07-00 | 0.6523 | 0.6812 | 0.0542 | 7.96% | 0.5728 | 0.7896 | 0.1084 |
| 9 | 03-13-01 | 0.6874 | 0.6819 | 0.0508 | 7.44% | 0.5804 | 0.7834 | 0.1015 |
| 10 | 06-26-01 | 0.5334 | 0.6671 | 0.0670 | 10.05% | 0.5330 | 0.8011 | 0.1341 |
| 11 | 07-17-01 | 0.7438 | 0.6740 | 0.0677 | 10.04% | 0.5387 | 0.8094 | 0.1354 |
| 12 | 08-21-01 | 0.6179 | 0.6694 | 0.0665 | 9.94% | 0.5363 | 0.8024 | 0.1331 |
| 13 | 09-25-01 | 0.6008 | 0.6641 | 0.0665 | 10.01% | 0.5311 | 0.7970 | 0.1329 |
| 14 | 11-01-01 | 0.7105 | 0.6674 | 0.0651 | 9.75% | 0.5373 | 0.7975 | 0.1301 |
| 15 | 11-06-01 | 0.6573 | 0.6667 | 0.0627 | 9.41% | 0.5412 | 0.7922 | 0.1255 |
| 16 | 11-27-01 | 0.5741 | 0.6609 | 0.0649 | 9.82% | 0.5312 | 0.7907 | 0.1298 |
| 17 | 12-12-01 | 0.6324 | 0.6593 | 0.0632 | 9.59% | 0.5328 | 0.7857 | 0.1264 |
| 18 | 01-04-02 | 0.4878 | 0.6497 | 0.0734 | 11.30% | 0.5029 | 0.7966 | 0.1469 |

Note: 7-d IC25 = 7-day 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

CT = Central tendency (mean IC25).

S = Standard deviation of the IC25 values.

$S_{A.75}$ = Standard deviation corresponding to the the 75th percentile CV.

$S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint.

$S_{A.90}$ = Standard deviation corresponding to the the 90th percentile CV.

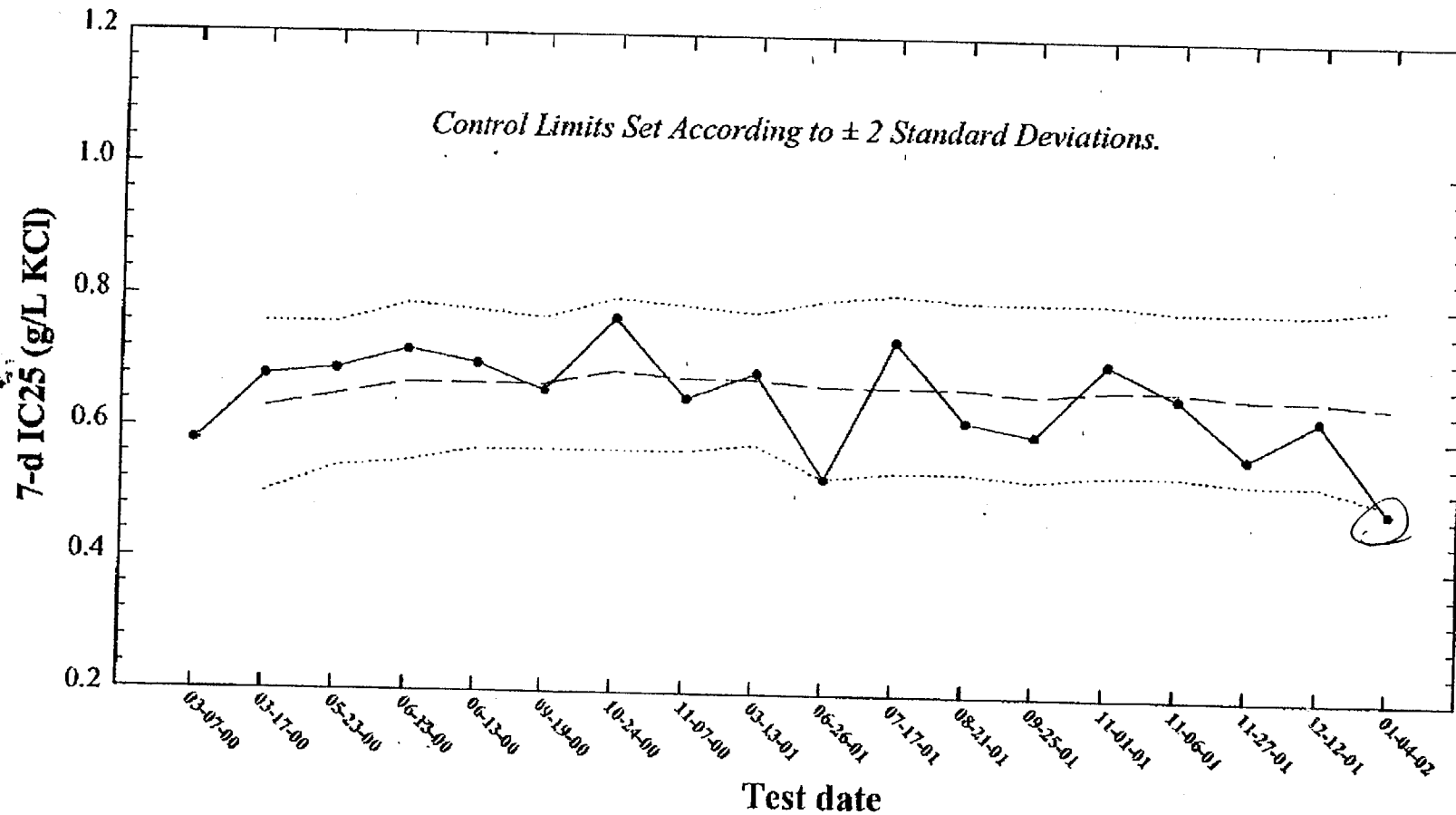
$S_{A.90}$ = 0.45, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values.

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

Environmental Testing Solutions, LLC

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



- 7-day IC25 = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- Central Tendency (mean IC25)
- Control Limits (mean IC25 ± 2 Standard Deviations)

Environmental Testing Solutions, LLC

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

| Test number | Test date | 7-day IC25 (g KCl/L) | CT (g/L KCl) | S | S _{A,75} | S _{A,90} | CV | CT - S _{A,75} | CT - S _{A,75} | CT - S _{A,90} | CT + S _{A,90} | CT - 2S | CT - 2S |
|-------------|-----------|-------------------------|-----------------|------|-------------------|-------------------|------|------------------------|------------------------|------------------------|------------------------|---------|---------|
| 1 | 03-07-00 | 0.58 | | | | | | | | | | | |
| 2 | 03-17-00 | 0.68 | 0.63 | 0.06 | 0.24 | 0.28 | 0.10 | 0.25 | 1.01 | 0.18 | 1.08 | 0.50 | 0.76 |
| 3 | 05-23-00 | 0.69 | 0.65 | 0.06 | 0.25 | 0.29 | 0.09 | 0.27 | 1.03 | 0.20 | 1.10 | 0.54 | 0.76 |
| 4 | 06-13-00 | 0.72 | 0.67 | 0.06 | 0.25 | 0.30 | 0.09 | 0.29 | 1.05 | 0.22 | 1.12 | 0.55 | 0.79 |
| 5 | 06-13-00 | 0.70 | 0.67 | 0.05 | 0.26 | 0.30 | 0.08 | 0.29 | 1.05 | 0.22 | 1.12 | 0.57 | 0.78 |
| 6 | 09-19-00 | 0.66 | 0.67 | 0.05 | 0.26 | 0.30 | 0.07 | 0.29 | 1.05 | 0.22 | 1.12 | 0.57 | 0.77 |
| 7 | 10-24-00 | 0.77 | 0.69 | 0.06 | 0.26 | 0.31 | 0.08 | 0.31 | 1.07 | 0.24 | 1.14 | 0.57 | 0.80 |
| 8 | 11-07-00 | 0.65 | 0.68 | 0.05 | 0.26 | 0.31 | 0.08 | 0.30 | 1.06 | 0.23 | 1.13 | 0.57 | 0.79 |
| 9 | 03-13-01 | 0.69 | 0.68 | 0.05 | 0.26 | 0.31 | 0.07 | 0.30 | 1.06 | 0.23 | 1.13 | 0.58 | 0.78 |
| 10 | 06-26-01 | 0.53 | 0.67 | 0.07 | 0.25 | 0.30 | 0.10 | 0.29 | 1.05 | 0.22 | 1.12 | 0.53 | 0.80 |
| 11 | 07-17-01 | 0.74 | 0.67 | 0.07 | 0.26 | 0.30 | 0.10 | 0.29 | 1.05 | 0.22 | 1.12 | 0.54 | 0.81 |
| 12 | 08-21-01 | 0.62 | 0.67 | 0.07 | 0.25 | 0.30 | 0.10 | 0.29 | 1.05 | 0.22 | 1.12 | 0.54 | 0.80 |
| 13 | 09-25-01 | 0.60 | 0.66 | 0.07 | 0.25 | 0.30 | 0.10 | 0.28 | 1.04 | 0.21 | 1.11 | 0.53 | 0.80 |
| 14 | 11-01-01 | 0.71 | 0.67 | 0.07 | 0.25 | 0.30 | 0.10 | 0.29 | 1.05 | 0.22 | 1.12 | 0.54 | 0.80 |
| 15 | 11-06-01 | 0.66 | 0.67 | 0.06 | 0.25 | 0.30 | 0.09 | 0.29 | 1.05 | 0.22 | 1.12 | 0.54 | 0.79 |
| 16 | 11-27-01 | 0.57 | 0.66 | 0.06 | 0.25 | 0.30 | 0.10 | 0.28 | 1.04 | 0.21 | 1.11 | 0.53 | 0.79 |
| 17 | 12-12-01 | 0.63 | 0.66 | 0.06 | 0.25 | 0.30 | 0.10 | 0.28 | 1.04 | 0.21 | 1.11 | 0.53 | 0.79 |
| 18 | 01-04-02 | 0.49 | 0.65 | 0.07 | 0.25 | 0.29 | 0.11 | 0.27 | 1.03 | 0.20 | 1.10 | 0.50 | 0.80 |

Note: 7-d IC25 = 7-day 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

CT = Central tendency (mean IC25).

S = Standard deviation of the IC25 values.

S_{A,75} = Standard deviation corresponding to the 75th percentile CV.

S_{A,75} = 0.38, as determined by USEPA for the method and endpoint.

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

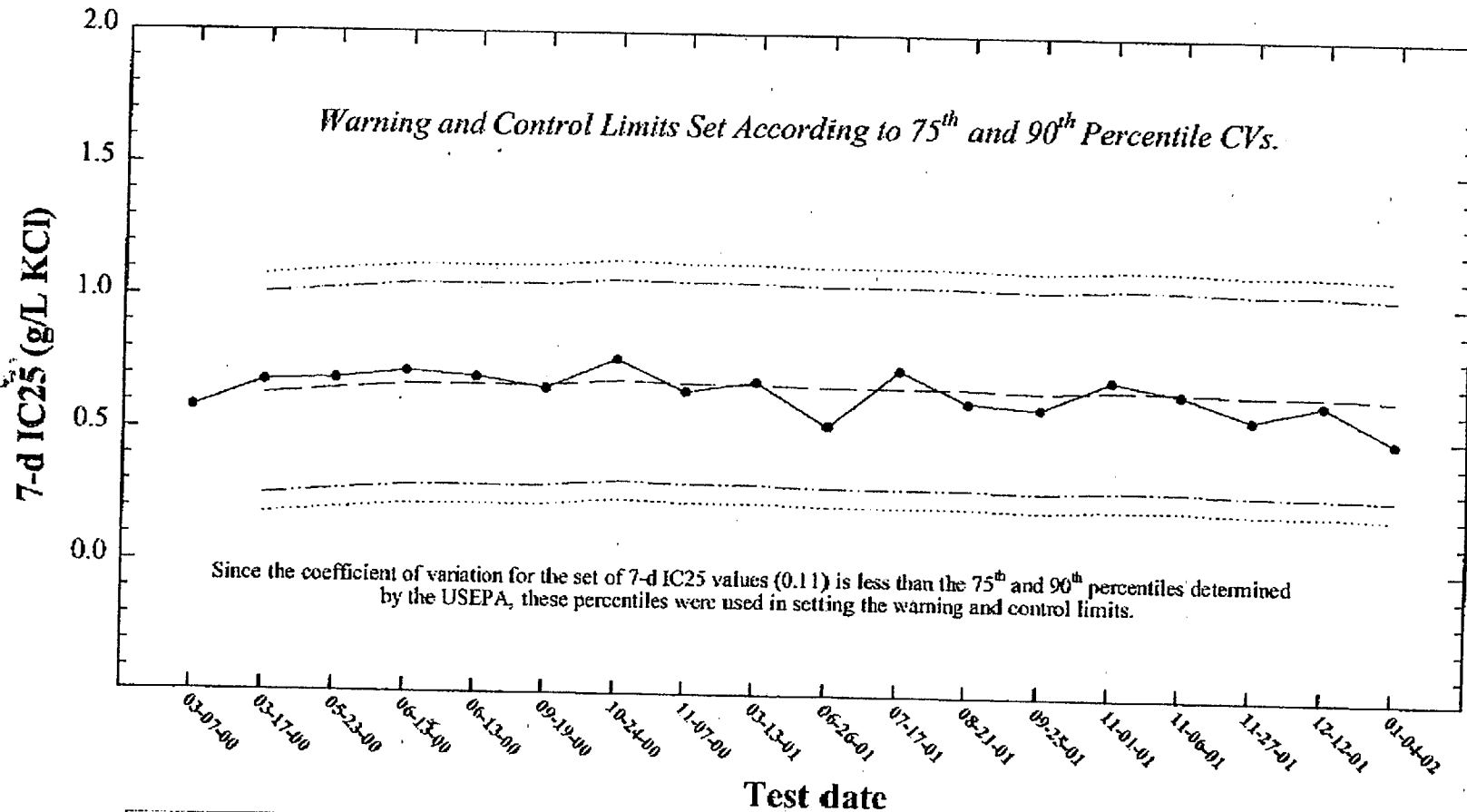
S_{A,90} = 0.45, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values.

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

Environmental Testing Solutions, LLC

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



- 7-day IC25 = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- — Central Tendency (mean IC25)
- · — Warning Limits (mean IC25 \pm $S_{A,75}$, $S_{A,75}$ = 0.38, as determined by USEPA for the method and endpoint)
- Control Limits (mean IC25 \pm $S_{A,90}$, $S_{A,90}$ = 0.45, as determined by USEPA for the method and endpoint)

Potassium Chloride Chronic Reference Toxicant Test
(EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

PpKCICR Test Number: 10

| | | | | | | |
|---|-----|--|-----|-----|-----|--|
| Dilution preparation information: | | | | | | Comments: |
| KCI CHM number: | | CHM 067 | | | | Outlier: IC25 < ± 2 SD AROUND MEAN IC25 |
| Stock preparation: | | 50 g KCI/L: Dissolve 50 g KCI in 1-L. Deionized water | | | | |
| MHS batch: | | 01-03-02 01-06-02 | | | | |
| 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 | |
| Test organism information: | | | | | | Test information: |
| Organism age: | | 24-HOURS OLD | | | | Randomizing template: |
| Date and times organisms were born between: | | 01-03-02 1130 TO 1330 MST 1330 - 1530 EST | | | | Incubator number: |
| Organism source: | | ABS BATCH 01-03-02 | | | | Artemia lot number: |
| Transfer bowl information: | | pH = 7.87 Temperature = 24.3°C | | | | Oven temperature: |
| | | | | | | Drying time: |
| | | | | | | 24-Hours |

Daily feeding and renewal information:

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|-----|----------|----------------------|------------------------|---|---------|
| 0 | 01-04-02 | — | 1428 | 1431 | JL |
| 1 | 01-05-02 | 1000 | 1600 | 1428 | JL |
| 2 | 01-06-02 | 1007 | 1610 | 1422 | KEK |
| 3 | 01-07-02 | 0955 | 1555 | 1419 | JL |
| 4 | 01-08-02 | 1000 | 1600 | 1426 | JL |
| 5 | 01-09-02 | 1016 | 1620 | 1500 | KEK |
| 6 | 01-10-02 | 0952 | 1550 | 1436 | KEK |
| 7 | 01-11-02 | — | — | 1508 | KEK |

| Control information: | | Acceptance criteria | Summary of test endpoints: | |
|----------------------------|------|-----------------------|----------------------------|-------|
| % Mortality: | 5% | $\leq 20\%$ | 7-day LC50 | 669.1 |
| Average weight per larvae: | 0.80 | ≥ 0.25 mg/larvae | NOEC | 450 |
| | | | LOEC | 600 |
| | | | ChV | 519.6 |
| | | | IC25 | 487.8 |

PpKCICR Test Number: 10

| Day | Survival and Growth Data | | | | | | | | | | | |
|------------------------------|--------------------------|-----------------|-----------------|--------|-----------------|-----------------|--------|--------|-----------------|--------|-----------------|-----------------|
| | 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 | 8 rd | 10 | 10 | 10 | 10 | 9 th | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | 10 | 10 | 9 | 10 |
| 4 | 10 | 10 | 9 th | 10 | 9 th | 8 | 10 | 10 | 10 | 10 | 9 | 10 |
| 5 | 10 | 9 th | 9 | 10 | 8 th | 8 | 10 | 10 | 10 | 10 | 9 | 9 th |
| 6 | 10 | 9 | 9 | 10 | 7 th | 8 | 10 | 10 | 9 th | 10 | 7 th | 9 |
| 7 | 10 | 9 | 9 | 10 | 7 | 8 | 10 | 10 | 8 th | 10 | 7 | 9 |
| A = Pen weight (mg) | 14.972 | 14.996 | 14.941 | 14.851 | 15.011 | 15.011 | 14.828 | 14.983 | 14.858 | 14.825 | 15.055 | 14.979 |
| B = Pen + Larvae weight (mg) | 23.10 | 21.81 | 23.40 | 23.42 | 20.24 | 20.50 | 22.07 | 22.68 | 22.13 | 22.64 | 19.87 | 21.53 |
| Larvae weight (mg) = A - B | 8.122 | 6.814 | 8.459 | 8.569 | 5.199 | 5.489 | 7.242 | 7.697 | 7.272 | 7.815 | 4.815 | 6.551 |

T = 31.57
 \bar{x} = 0.7993
 CV = 10.1032

T = 25.627
 \bar{x} = 0.407
 CV = 19.4395
 RC = 14.84

Calculations and data reviewed: *df*
 T = 26.453
 \bar{x} = 0.6613
 CV = 19.7467
 RC = 17.2651

Comments:

PpKCICR Test Number: 10

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 | 9 ^{1d} | 10 | 10 | 9 ^{1d} | 7 ^{3d} | 9 ^{1d} | 7 ^{3d} | 9 ^{1d} | 5 ^{5d} | 4 ^{6d} | 4 ^{6d} | 4 ^{6d} |
| 2 | 6 ^{3d} | 8 ^{2d} | 10 | 9 ^{2d} | 6 ^{1d} | 9 | 6 ^{1d} | 9 | 1 ^{4d} | 4 | 4 | 3 ^{1d} |
| 3 | 6 | 8 | 10 | 7 | 6 | 9 | 6 | 8 ^{1d} | 1 | 4 | 4 | 3 |
| 4 | 6 | 8 | 9 ^{1d} | 7 | 6 | 9 | 6 | 6 ^{2d} | 1 | 4 | 2 ^{2d} | 2 ^{1d} |
| 5 | 6 | 7 ^{1d} | 8 ^{1d} | 7 | 6 | 9 | 1 ^{5d} | 5 ^{1d} | 0 ^{1d} | 2 ^{2d} | 1 ^{1d} | 1 ^{1d} |
| 6 | 6 | 7 | 8 | 6 ^{1d} | 6 | 9 | 0 ^{1d} | 2 ^{3d} | — | 0 ^{2d} | 1 | 1 |
| 7 | 5 ^{1d} | 7 | 6 ^{2d} | 6 | 3 ^{3d} | 9 | ↓ | 2 | ↓ | ↓ | 1 | ↓ |
| A = Pan weight (mg) | 4.931 | 4.877 | 5.052 | 4.901 | 4.832 | 4.847 | — | 4.870 | — | — | 4.906 | 4.905 |
| B = Pan + Larvae weight (mg) | 17.47 | 20.78 | 19.71 | 19.66 | 15.86 | 19.60 | — | 16.21 | — | — | 15.56 | 15.54 |
| Larvae weight (mg) = A - B | 2.539 | 5.903 | 4.658 | 4.759 | 1.028 | 4.731 | — | 1.340 | — | — | 0.564 | 0.555 |

T = 17.854

Z = 0.4465

CV = 31.4109

RC = 44.138

T = 7.0940

Z = 0.1775

CV = 115.6

RC = 77.7931

Calculations and data reviewed:

T = 7.1190

Z = 0.0220

CV = 115.4569

RC = 96.4969

Comments:

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

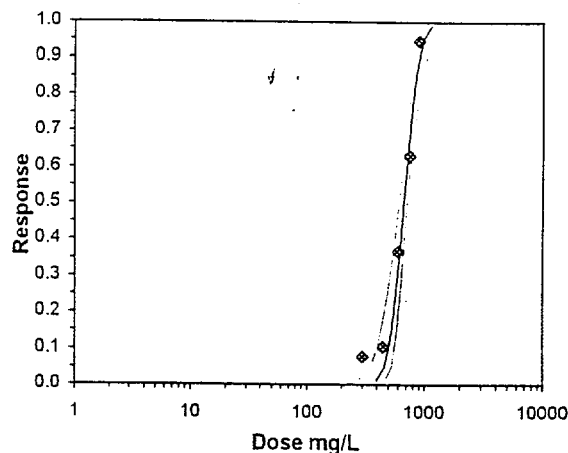
| | | |
|--------------------|------------------------------------|--------------------------------------|
| Start Date: 1/4/02 | Test ID: PpKCICR | Sample ID: REF-Ref Toxicant |
| End Date: 1/11/02 | Lab ID: ETS-Env. Testing Solutions | Sample Type: KCL-Potassium chloride |
| Sample Date: | Protocol: EPAF 91-EPA Freshwater | Test Species: PP-Pimephales promelas |
| Comments: | | |

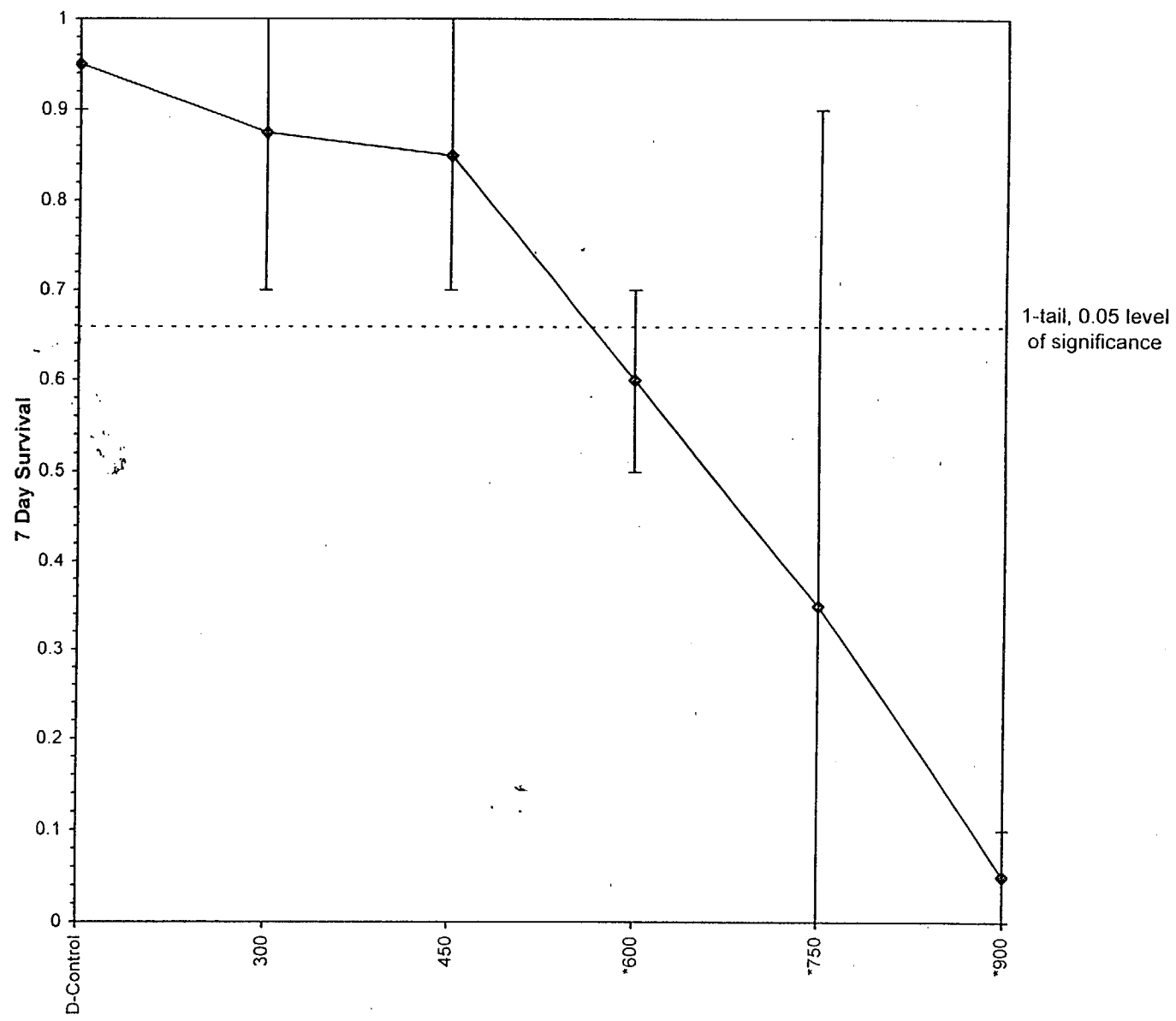
| Conc-mg/L | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 1.0000 | 0.9000 | 0.9000 | 1.0000 |
| 300 | 0.7000 | 0.8000 | 1.0000 | 1.0000 |
| 450 | 0.8000 | 1.0000 | 0.7000 | 0.9000 |
| 600 | 0.5000 | 0.7000 | 0.6000 | 0.6000 |
| 750 | 0.3000 | 0.9000 | 0.0000 | 0.2000 |
| 900 | 0.0000 | 0.0000 | 0.1000 | 0.1000 |

| Conc-mg/L | Mean | N-Mean | Transform: Arcsin Square Root | | | | N | t-Stat | 1-Tailed Critical | MSD | Number Resp | Total Number |
|-----------|--------|--------|-------------------------------|--------|--------|--------|---|--------|-------------------|--------|-------------|--------------|
| | | | Mean | Min | Max | CV% | | | | | | |
| D-Control | 0.9500 | 1.0000 | 1.3305 | 1.2490 | 1.4120 | 7.072 | 4 | | | | 2 | 40 |
| 300 | 0.8750 | 0.9211 | 1.2306 | 0.9912 | 1.4120 | 17.454 | 4 | 0.617 | 2.410 | 0.3907 | 5 | 40 |
| 450 | 0.8500 | 0.8947 | 1.1898 | 0.9912 | 1.4120 | 15.281 | 4 | 0.868 | 2.410 | 0.3907 | 6 | 40 |
| *600 | 0.6000 | 0.6316 | 0.8872 | 0.7854 | 0.9912 | 9.469 | 4 | 2.735 | 2.410 | 0.3907 | 16 | 40 |
| *750 | 0.3500 | 0.3684 | 0.6128 | 0.1588 | 1.2490 | 75.038 | 4 | 4.427 | 2.410 | 0.3907 | 26 | 40 |
| *900 | 0.0500 | 0.0526 | 0.2403 | 0.1588 | 0.3218 | 39.161 | 4 | 6.725 | 2.410 | 0.3907 | 38 | 40 |

| Auxiliary Tests | | | | | Statistic | | Critical | | Skew | | Kurt | | | |
|--|--|--|--|--|-------------|------|-------------|----|-------------|-------------|-------------|-------------|---------|---------|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | | | | | 0.912736952 | | 0.884 | | 0.908581907 | | 3.811713373 | | | |
| Levene's Test indicates equal variances (p = 0.03) | | | | | 12.67539597 | | 15.08651706 | | | | | | | |
| Hypothesis Test (1-tail, 0.05) | | | | | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
| Dunn-Sidak's Test | | | | | 450 | 600 | 519.6152423 | | 0.291389424 | 0.308879788 | 0.716140872 | 0.052564329 | 1.4E-05 | - 5, 18 |

| Parameter | Value | SE | 95% Fiducial Limits | | Maximum Likelihood-Probit | | | | | | |
|-----------|--------------|-------------|---------------------|--------------|---------------------------|-------------|-------------|-------|-------------|-------------|---|
| | | | Control | Chi-Sq | Critical | P-value | Mu | Sigma | Iter | | |
| Intercept | 10.12820705 | 1.891366178 | 6.42112927 | 13.83528483 | 0.05 | 2.342762563 | 7.814724922 | 0.5 | 2.825479568 | 0.098734158 | 7 |
| CR | -23.61704209 | 5.3945961 | -34.19045065 | -13.04363353 | | | | | | | |
| int | 0.094023334 | 0.030778369 | 0.033697731 | 0.154348938 | | | | | | | |
| Conc | Probits | mg/L | 95% Fiducial Limits | | | | | | | | |
| 01 | 2.674 | 394.2662185 | 274.4358598 | 468.8424496 | | | | | | | |
| 05 | 3.355 | 460.3374728 | 349.3406584 | 526.7559271 | | | | | | | |
| 10 | 3.718 | 499.9731179 | 396.9361633 | 561.0171676 | | | | | | | |
| 15 | 3.964 | 528.6256032 | 432.3835662 | 585.7579873 | | | | | | | |
| 20 | 4.158 | 552.5642792 | 462.5425809 | 606.5348106 | | | | | | | |
| 25 | 4.326 | 573.9636523 | 489.8144023 | 625.2941241 | | | | | | | |
| 40 | 4.747 | 631.6340829 | 563.7161328 | 677.7697729 | | | | | | | |
| 50 | 5.000 | 669.0823441 | 610.5906447 | 714.7586265 | | | | | | | |
| 60 | 5.253 | 708.7508417 | 657.3746155 | 758.3392309 | | | | | | | |
| 75 | 5.674 | 779.964338 | 730.2949578 | 851.539691 | | | | | | | |
| 80 | 5.842 | 810.170332 | 757.2813023 | 896.5085251 | | | | | | | |
| 85 | 6.036 | 846.8587038 | 787.8892431 | 954.4793911 | | | | | | | |
| 90 | 6.282 | 895.3904742 | 825.8761911 | 1035.63639 | | | | | | | |
| 95 | 6.645 | 972.4847434 | 882.5994399 | 1172.726823 | | | | | | | |
| 99 | 7.326 | 1135.454154 | 994.5752609 | 1488.379701 | | | | | | | |





Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

| | | |
|--------------------|------------------------------------|--------------------------------------|
| Start Date: 1/4/02 | Test ID: PpKCICR | Sample ID: REF-Ref Toxicant |
| End Date: 1/11/02 | Lab ID: ETS-Env. Testing Solutions | Sample Type: KCL-Potassium chloride |
| Sample Date: | Protocol: EPAF 91-EPA Freshwater | Test Species: PP-Pimephales promelas |

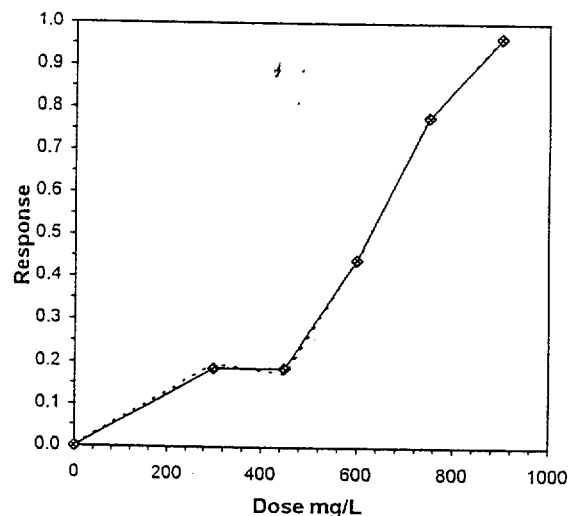
| Conc-mg/L | 1 | 2 | 3 | 4 |
|-----------|--------|--------|--------|--------|
| D-Control | 0.8128 | 0.6814 | 0.8459 | 0.8569 |
| 300 | 0.5199 | 0.5489 | 0.7242 | 0.7697 |
| 450 | 0.7272 | 0.7815 | 0.4815 | 0.6551 |
| 600 | 0.2539 | 0.5903 | 0.4658 | 0.4759 |
| 750 | 0.1028 | 0.4731 | 0.0000 | 0.1340 |
| 900 | 0.0000 | 0.0000 | 0.0564 | 0.0555 |

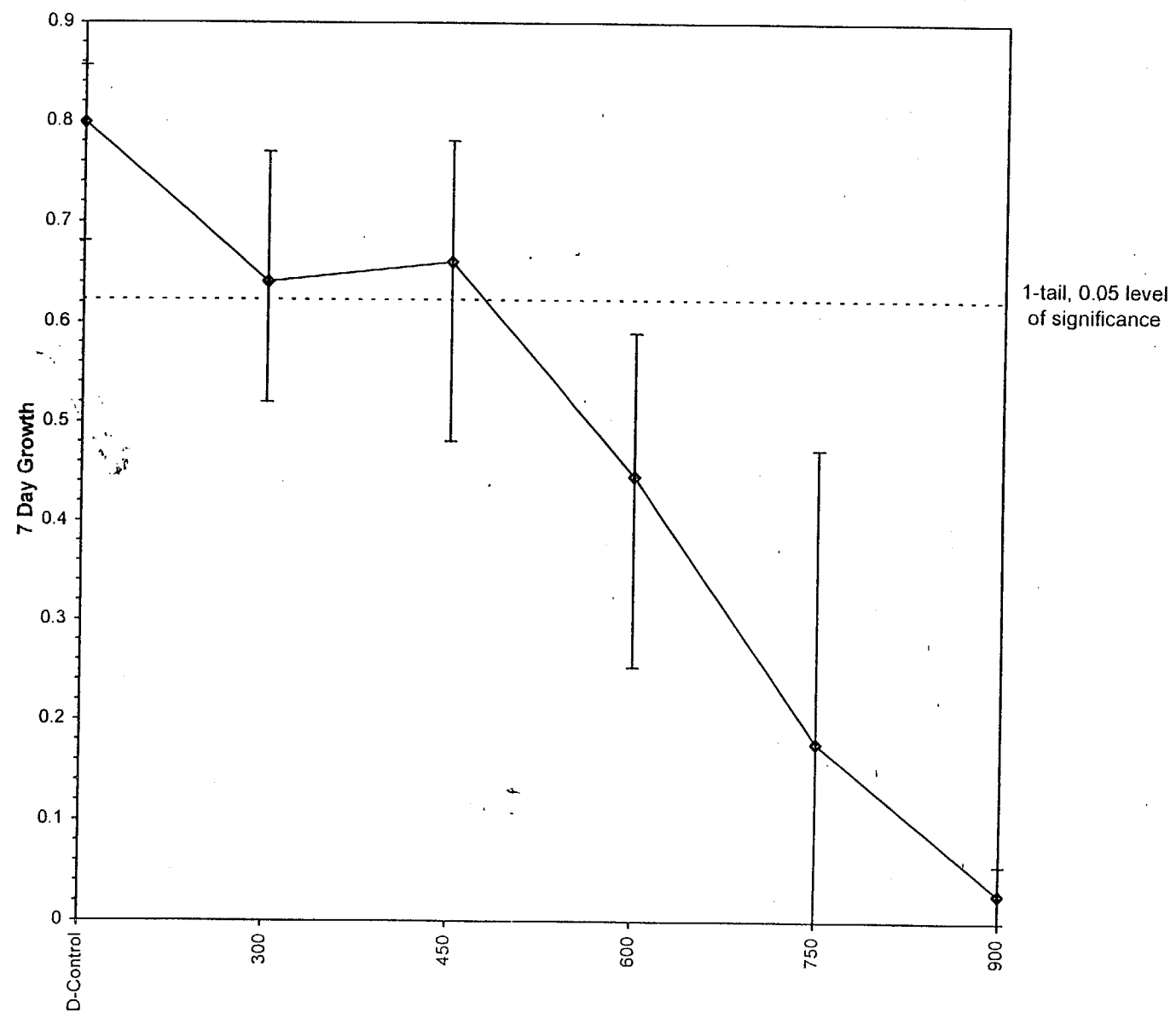
| Conc-mg/L | Mean | N-Mean | Transform: Untransformed | | | | | t-Stat | 1-Tailed Critical | MSD | Isotonic | |
|-----------|--------|--------|--------------------------|--------|--------|---------|---|--------|-------------------|--------|----------|--------|
| | | | Mean | Min | Max | CV% | N | | | | Mean | N-Mean |
| D-Control | 0.7993 | 1.0000 | 0.7993 | 0.6814 | 0.8569 | 10.106 | 4 | | | | 0.7993 | 1.0000 |
| 300 | 0.6407 | 0.8016 | 0.6407 | 0.5199 | 0.7697 | 19.460 | 4 | 1.964 | 2.180 | 0.1760 | 0.6510 | 0.8145 |
| 450 | 0.6613 | 0.8274 | 0.6613 | 0.4815 | 0.7815 | 19.746 | 4 | 1.708 | 2.180 | 0.1760 | 0.6510 | 0.8145 |
| 600 | 0.4465 | 0.5586 | 0.4465 | 0.2539 | 0.5903 | 31.413 | 4 | | | | 0.4465 | 0.5586 |
| 750 | 0.1775 | 0.2221 | 0.1775 | 0.0000 | 0.4731 | 115.639 | 4 | | | | 0.1775 | 0.2221 |
| 900 | 0.0280 | 0.0350 | 0.0280 | 0.0000 | 0.0564 | 115.478 | 4 | | | | 0.0280 | 0.0350 |

| Auxiliary Tests | | | | | Statistic | Critical | Skew | Kurt |
|--|--|--|--|--|-------------|-------------|--------------|--------------|
| Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$) | | | | | 0.918748081 | 0.805 | -0.488905102 | -1.138415106 |
| Levene's Test indicates equal variances ($p = 0.72$) | | | | | 0.649693608 | 9.21035099 | | |
| Hypothesis Test (1-tail, 0.05) | | | | | NOEC | LOEC | ChV | TU |
| Mann-Whitney's Test | | | | | 450 | 450 | | |
| | | | | | 0.176029231 | 0.220243017 | 0.029730506 | 0.013040269 |
| | | | | | | | 0.158107191 | 2.9 |

| Conc | mg/L | SD | Linear Interpolation (80 Resamples) | | |
|------|--------|--------|-------------------------------------|--------|---------|
| | | | 95% CL(Exp) | Skew | |
| 15* | 80.87 | 91.08 | 29.19 | 518.68 | 2.1810 |
| 30* | 161.74 | 118.92 | 58.39 | 647.06 | 1.0958 |
| 45* | 242.61 | 122.21 | 87.58 | 637.39 | 0.3472 |
| 60 | 458.51 | 113.20 | 35.76 | 569.35 | -0.3797 |
| 75 | 487.82 | 92.49 | 95.89 | 607.45 | -1.2155 |
| 90 | 575.74 | 37.16 | 482.77 | 681.85 | -0.0123 |
| 100 | 626.12 | 40.22 | 525.00 | 778.65 | 0.8685 |

* indicates IC estimate less than the lowest concentration





Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKCICR # 10

Test dates: January 4-11, 2001

Received by: _____

| Concentration (mg/L KCl) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|--------------------------|-----------|--------------------------|------------------------|---------------------|------------------------------|----------------------------|--|-------------------|------------------|------------------------------|------------------------------------|
| Control | A | 10 | 10 | 14.972 | 23.100 | 8.128 | 0.8128 | 95.0 | 0.7993 | 10.1 | Not applicable |
| | B | 10 | 9 | 14.996 | 21.810 | 6.814 | 0.6814 | | | | |
| | C | 10 | 9 | 14.941 | 23.400 | 8.459 | 0.8459 | | | | |
| | D | 10 | 10 | 14.851 | 23.420 | 8.569 | 0.8569 | | | | |
| 300 | E | 10 | 7 | 15.041 | 20.240 | 5.199 | 0.5199 | 87.5 | 0.6407 | 19.5 | 19.8 |
| | F | 10 | 8 | 15.011 | 20.500 | 5.489 | 0.5489 | | | | |
| | G | 10 | 10 | 14.828 | 22.070 | 7.242 | 0.7242 | | | | |
| | H | 10 | 10 | 14.983 | 22.680 | 7.697 | 0.7697 | | | | |
| 450 | I | 10 | 8 | 14.858 | 22.130 | 7.272 | 0.7272 | 85.0 | 0.6613 | 19.7 | 17.3 |
| | J | 10 | 10 | 14.825 | 22.640 | 7.815 | 0.7815 | | | | |
| | K | 10 | 7 | 15.055 | 19.870 | 4.815 | 0.4815 | | | | |
| | L | 10 | 9 | 14.979 | 21.530 | 6.551 | 0.6551 | | | | |
| 600 | M | 10 | 5 | 14.931 | 17.470 | 2.539 | 0.2539 | 60.0 | 0.4465 | 31.4 | 44.1 |
| | N | 10 | 7 | 14.877 | 20.780 | 5.903 | 0.5903 | | | | |
| | O | 10 | 6 | 15.052 | 19.710 | 4.658 | 0.4658 | | | | |
| | P | 10 | 6 | 14.901 | 19.660 | 4.759 | 0.4759 | | | | |
| 750 | Q | 10 | 3 | 14.832 | 15.860 | 1.028 | 0.1028 | 35.0 | 0.1775 | 115.6 | 77.8 |
| | R | 10 | 9 | 14.869 | 19.600 | 4.731 | 0.4731 | | | | |
| | S | 10 | 0 | 0.000 | 0.000 | 0.000 | 0.0000 | | | | |
| | T | 10 | 2 | 14.870 | 16.210 | 1.340 | 0.1340 | | | | |
| 900 | U | 10 | 0 | 0.000 | 0.000 | 0.000 | 0.0000 | 5.0 | 0.0280 | 115.5 | 96.5 |
| | V | 10 | 0 | 0.000 | 0.000 | 0.000 | 0.0000 | | | | |
| | W | 10 | 1 | 14.996 | 15.560 | 0.564 | 0.0564 | | | | |
| | X | 10 | 1 | 14.985 | 15.540 | 0.555 | 0.0555 | | | | |

Dunnett's MSD value: 0.176
 PMSD: 22.0

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, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 19.1% from the control (determined through Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
 Upper PMSD bound determined by USEPA (90th percentile) = 35%.
 The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

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) | CV (%) | CT for Control Growth CV (%) | MSD | PMSD (%) | CT for PMSD (%) |
|-------------|-----------|----------------------|---------------------------------|--------|------------------------------|------|----------|-----------------|
| 1 | 03-07-00 | 100 | 0.67 | 4.9 | | 0.05 | 7.6 | |
| 2 | 03-17-00 | 97.5 | 0.40 | 7.5 | 6.2 | 0.06 | 15.7 | 11.7 |
| 3 | 05-23-00 | 100 | 0.31 | 3.6 | 5.3 | 0.07 | 21.2 | 14.8 |
| 4 | 06-13-00 | 100 | 0.45 | 10.1 | 6.5 | 0.10 | 22.2 | 16.7 |
| 5 | 06-13-00 | 100 | 0.58 | 13.2 | 7.9 | 0.12 | 20.0 | 17.3 |
| 6 | 09-19-00 | 100 | 0.67 | 5.3 | 7.4 | 0.07 | 11.2 | 16.3 |
| 7 | 10-24-00 | 97.5 | 0.83 | 13.3 | 8.3 | 0.22 | 26.9 | 17.8 |
| 8 | 11-07-00 | 97.5 | 0.67 | 10.5 | 8.6 | 0.13 | 19.3 | 18.0 |
| 9 | 03-13-01 | 92.5 | 0.34 | 6.5 | 8.3 | 0.08 | 22.8 | 18.5 |
| 10 | 06-26-01 | 100 | 0.63 | 9.8 | 8.5 | 0.19 | 30.6 | 19.7 |
| 11 | 07-17-01 | 100 | 0.52 | 9.1 | 8.5 | 0.07 | 13.8 | 19.2 |
| 12 | 08-21-01 | 100 | 0.89 | 8.3 | 8.5 | 0.13 | 15.1 | 18.9 |
| 13 | 09-25-01 | 100 | 0.85 | 4.9 | 8.2 | 0.09 | 10.4 | 18.2 |
| 14 | 11-01-01 | 100 | 0.54 | 2.5 | 7.8 | 0.10 | 18.6 | 18.2 |
| 15 | 11-06-01 | 100 | 1.00 | 7.4 | 7.8 | 0.17 | 16.9 | 18.2 |
| 16 | 11-27-01 | 97.5 | 0.70 | 22.8 | 8.7 | 0.18 | 26.1 | 18.7 |
| 17 | 12-12-01 | 95 | 0.82 | 16.6 | 9.2 | 0.19 | 23.5 | 18.9 |
| 18 | 01-04-02 | 95 | 0.80 | 10.1 | 9.2 | 0.18 | 22.0 | 19.1 |

Note:

CV = Coefficient of variation for control survival.

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

Lower CV bound determined by USEPA (10th percentile) = 3.5%.

Upper CV bound determined by USEPA (90th percentile) = 20%.

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 19.1% from the control.

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

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

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

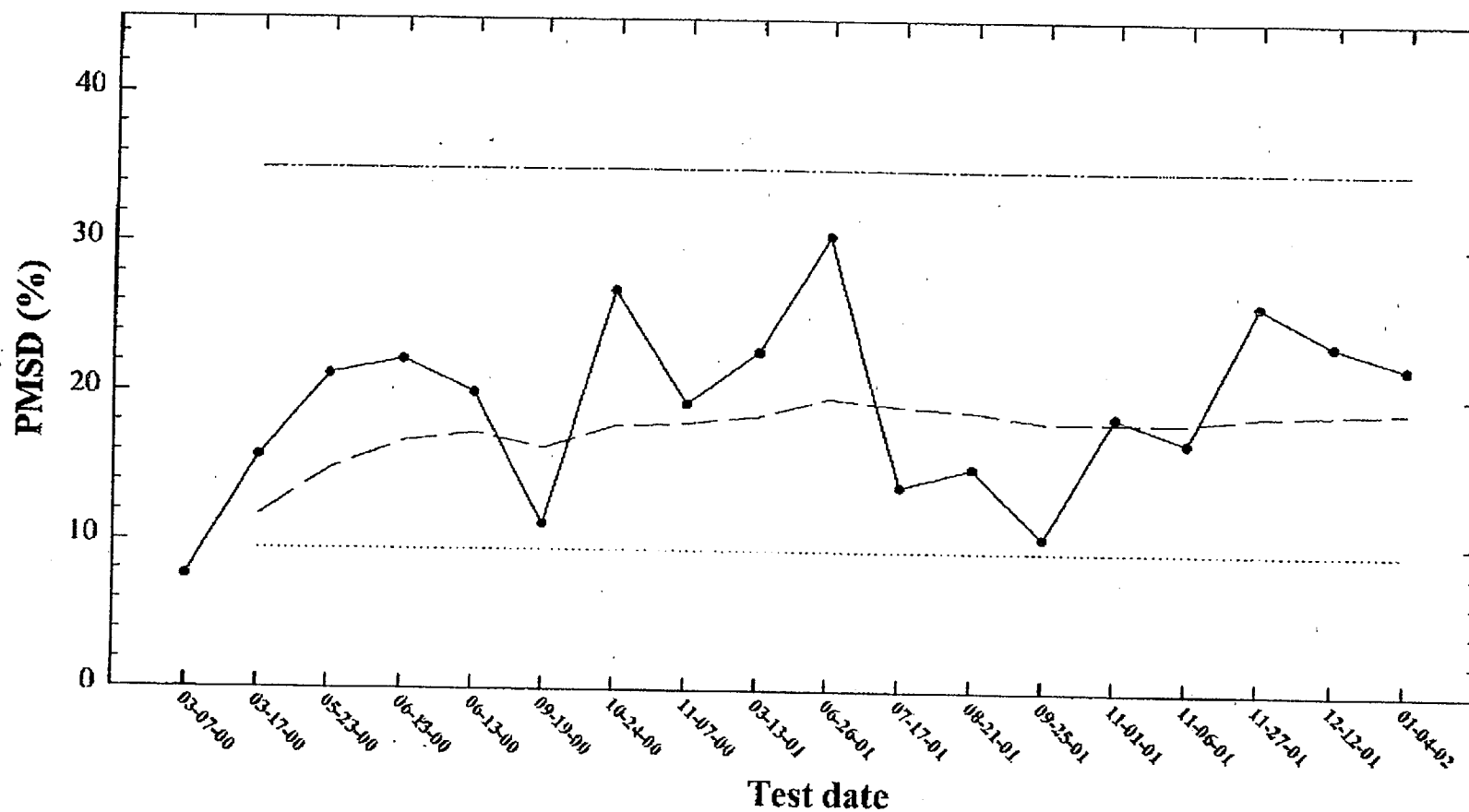
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

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.)

PpKCICR Test Number: 10*KCl Stock and Dilution water chemistry:*

| | Batch or preparation date | Alkalinity (mg CaCO ₃ /L) | Hardness (mg CaCO ₃ /L) |
|----------------------------|---------------------------|--------------------------------------|------------------------------------|
| Control/Dilution Water MHS | 01-03-02 | | |

01-06-02

Conductivity measurements (µmhos/cm):

| Concentration | Day | | | | | | | Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range) |
|------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |
| CONTROL | 320 | 304 | 305 | 302 | 314 | 314 | 300 | 280 - 360 |
| 300 mg KCl/L | 857 | 852 | 860 | 873 | 845 | 864 | 859 | 840 - 890 |
| 450 mg KCl/L | 1178 | 1111 | 1128 | 1143 | 1125 | 1141 | 1130 | 1100 - 1180 |
| 600 mg KCl/L | 1452 | 1390 | 1392 | 1402 | 1390 | 1399 | 1409 | 1390 - 1460 |
| 750 mg KCl/L | 1706 | 1665 | 1664 | 1669 | 1660 | 1681 | 1664 | 1660 - 1710 |
| 900 mg KCl/L | 1937 | 1893 | 1892 | 1896 | 1890 | 1933 | 1902 | 1890 - 1950 |
| KCl Stock (25 g KCl/L) | 71700 | 69500 | 67800 | 68500 | 71600 | 69900 | 69400 | 67000 - 76000 |

PpKCICR Test Number: 10

Daily chemistry:

| Concentration | Parameter | Day | | | | | |
|------------------|-----------|---------|-------|---------|-------|---------|-------|
| | | 0 | | 1 | | 2 | |
| CONTROL | pH (S.U.) | 8.04 | 7.76 | 8.01 | 7.71 | 8.02 | 7.58 |
| | DO (mg/L) | 8.1 | 7.9 | 8.0 | 7.6 | 8.0 | 7.0 |
| 300 mg KCl/L | pH (S.U.) | 8.10 | 7.84 | 8.08 | 7.85 | 8.10 | 7.69 |
| | DO (mg/L) | 8.0 | 7.9 | 8.1 | 7.6 | 8.1 | 7.0 |
| 450 mg KCl/L | pH (S.U.) | 8.10 | 7.85 | 8.11 | 7.85 | 8.12 | 7.67 |
| | DO (mg/L) | 8.0 | 7.9 | 8.1 | 7.5 | 8.1 | 7.0 |
| 600 mg KCl/L | pH (S.U.) | 8.13 | 7.88 | 8.13 | 7.83 | 8.13 | 7.64 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.6 | 8.1 | 7.1 |
| 750 mg KCl/L | pH (S.U.) | 8.13 | 7.86 | 8.14 | 7.87 | 8.13 | 7.71 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.6 | 8.1 | 7.1 |
| 900 mg KCl/L | pH (S.U.) | 8.14 | 7.86 | 8.16 | 7.93 | 8.13 | 7.83 |
| | DO (mg/L) | 8.1 | 7.9 | 8.2 | 7.6 | 8.1 | 7.0 |
| Temperature (°C) | | 24.6 | 24.0 | 24.4 | 24.5 | 24.9 | 24.3 |
| | | Initial | Final | Initial | Final | Initial | Final |

| Concentration | Parameter | Day | | | | | | | |
|------------------|-----------|---------|-------|---------|-------|---------|-------|---------|-------|
| | | 3 | | 4 | | 5 | | 6 | |
| CONTROL | pH (S.U.) | 8.06 | 7.74 | 8.10 | 7.67 | 8.08 | 7.72 | 8.09 | 7.60 |
| | DO (mg/L) | 8.0 | 7.7 | 8.0 | 7.3 | 8.0 | 7.5 | 8.0 | 7.5 |
| 300 mg KCl/L | pH (S.U.) | 8.07 | 7.71 | 8.09 | 7.70 | 8.12 | 7.78 | 8.13 | 7.75 |
| | DO (mg/L) | 8.0 | 7.6 | 8.1 | 7.3 | 8.1 | 7.5 | 8.0 | 7.4 |
| 450 mg KCl/L | pH (S.U.) | 8.11 | 7.76 | 8.14 | 7.70 | 8.15 | 7.81 | 8.14 | 7.74 |
| | DO (mg/L) | 8.0 | 7.4 | 8.2 | 7.1 | 8.3 | 7.5 | 8.0 | 7.5 |
| 600 mg KCl/L | pH (S.U.) | 8.12 | 7.74 | 8.14 | 7.73 | 8.16 | 7.81 | 8.16 | 7.76 |
| | DO (mg/L) | 8.0 | 7.4 | 8.3 | 7.0 | 8.3 | 7.5 | 8.1 | 7.5 |
| 750 mg KCl/L | pH (S.U.) | 8.13 | 7.80 | 8.15 | 7.71 | 8.18 | 7.86 | 8.17 | 7.80 |
| | DO (mg/L) | 8.0 | 7.3 | 8.3 | 7.1 | 8.3 | 7.6 | 8.1 | 7.5 |
| 900 mg KCl/L | pH (S.U.) | 8.14 | 7.86 | 8.14 | 7.73 | 8.18 | 7.85 | 8.17 | 7.90 |
| | DO (mg/L) | 8.1 | 7.5 | 8.3 | 7.1 | 8.3 | 7.7 | 8.1 | 7.5 |
| Temperature (°C) | | 24.4 | 24.7 | 25.4 | 24.3 | 24.9 | 24.4 | 24.6 | 24.2 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |