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

July 13, 2007

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

Dear Mr. Hannah:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR JUNE 2007

Enclosed is the June 2007 Discharge Monitoring Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Stephanie A. Howard

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

Enclosure
cc (Enclosure):

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

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

IE25

NRR

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	29.7	04	0	30 / 30	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	41.6	04	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.6	04	0	30 / 30	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.1	********	7.5	12	0	4 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	10	10	19	0	1 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		MONTHLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	1 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		MONTHLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1619	03	********	********	********	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President TYPED OR PRINTED	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423 AREA CODE	843-6700 NUMBER	07 YEAR	07 MO	13 DAY

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

No closed mode operation. The following information is included in an attachment: 1. thermal compliance information 2. CCW data 3. veliger monitoring data

NPDES Permit No. TN0026450
Sequoyah Nuclear Plant
Notification of Adjustment to Numerical Model

This notification is provided in accordance to Part III.G of the NPDES permit, which requires TVA to inform the Division when adjustments are made to the numerical model used to determine compliance with the requirements for water temperature for Outfall 101. The model was removed from service at the beginning of the reporting period for May 2006, and was returned to service at the beginning of the reporting period for June 2007. Provided herein is a brief description of the model, the problem that forced the model out of service, and the adjustments that were made to return the model to service.

In the preferred method of compliance for Outfall 101, the water temperature at the downstream end of the assigned mixing zone is determined every 15 minutes by a mathematical model based on: (1) the measured flow, temperature, and depth of ambient water in the river; and (2) the measured flow and temperature of water entering the river from SQN. Measurements for the model are made by ambient river temperature and stage monitors located at the intake skimmer wall (Station 13), by flow and temperature monitors located at the plant discharge diffusers (Station 12), and by flow monitors located at Watts Bar Dam and Chickamauga Dam. The use of a mathematical model is necessary because it is not possible to locate instream water temperature stations in the river navigation channel, where mixing of the plant thermal effluent occurs. A backup monitor (Station 8) is provided near the shore of the river at the downstream end of the mixing zone, but this location is not situated in the middle of the diffuser plume and can misrepresent the impact of the plant effluent on the river for certain flow conditions.

In May 2006, TVA discovered that the numerical model was consistently underestimating the river temperature compared to measurements at the backup monitor. The discovery was related to changes in the behavior of the diffuser effluent resulting from a sustained period of low flow in the Tennessee River earlier in March and April. In this event, heat from the diffusers was migrating upstream in the river further than that anticipated from previous studies. At that time, the flow in the river was the lowest since 1981, and lower than other historically extreme low flow years, such as 1988. The temperature differences were not observed in the earlier years because in 1981 SQN was operating with only one unit in service, and in the first part of 1988 there were no units in service. TVA has learned that conditions creating such events have occurred even in years with higher river flow. However, based on previous understanding of the behavior of the plant thermal effluent, such events never attracted attention. Recent studies have now led to an improved understanding of the mixing and transport of the plant diffuser effluent at low river flow.

There are two fundamental reasons why the model was removed from service in May 2006. First, to ensure that the ambient temperature measurement is not biased by heat migrating upstream from the plant, a new ambient temperature monitor, Station 14, was installed in the river about 5.7 miles upstream of Station 13. The numerical model did not account for an ambient temperature measurement at Station 14. Second, the model did not adequately account for the local buildup of heat that occurs in the river at sustained low river flow. The model assumed that the heat from the SQN diffusers was all transported downstream when, at sustained low river flow, a portion of the thermal effluent lingers in the river and migrates upstream.

To correct for these factors, the numerical model was adjusted to incorporate the proper ambient temperature and to estimate the local buildup of heat in the river that occurs at sustained low river flow. The former was accomplished simply by importing and assigning the ambient temperature from Station 14 rather than from Station 13. To estimate the local buildup of heat, the model formulation was expanded to include the impact of sustained low river flow as reflected by a dimensionless parameter known as the densimetric Froude number. In the SQN situation, the densimetric Froude number represents the ratio of the river momentum force to the thermal plume buoyancy force. The river momentum force is a measure of the ability of the flow to flush the thermal effluent downstream, whereas the plume buoyancy force is a measure of the ability of the thermal effluent to linger and move upstream in the surface layer of the river. When the river momentum is large compared to plume buoyancy, the thermal effluent tends to be transported downstream, and when the river momentum is small compared to plume buoyancy, a portion of the thermal effluent tends to migrate upstream and become re-entrained into the thermal plume.

Mathematically, at a given point "p" in the upstream temperature profile input into the model, the densimetric Froude number is computed by

$$F_p = \frac{V_r}{\sqrt{g\left(\frac{\rho_p - \rho_o}{\rho_p}\right)\left(Z_p - Z_b\right)}},$$

where V_r is the river velocity, Z_p-Z_b is the elevation of p above the bottom of the river, ρ_p is the water density at p, ρ_o is the density of the effluent plume at the 5-foot compliance depth, and g is the acceleration of gravity. If F_r is greater than 1.0 (momentum greater than buoyancy), the model assumes the thermal effluent is transported downstream, and if F_r is less than 1.0 (buoyancy greater than momentum), the model assumes that part of the plume migrates upstream and is re-entrained into the thermal effluent, thereby mimicking the local buildup of heat that occurs at low river flow.

An example of the performance of the original vs. adjusted model is given in Figure 1, which compares computed 24-hour average downstream temperatures with those measured at Station 8. The comparison is shown for the period in late March and early April, 2006, when the impacts of sustained low river flow first began to emerge. As noted, during this period, the original model yielded temperatures consistently below the actual measurements, whereas the temperatures given by the adjusted model follow the actual measurement much more closely.

Additional details about the model adjustments will be given in a calibration report provided with the next NPDES permit application. The calibration study is required once per permit cycle, as outlined in Part III.G of the permit. The last study was issued by TVA in June 2003 for the current permit cycle.

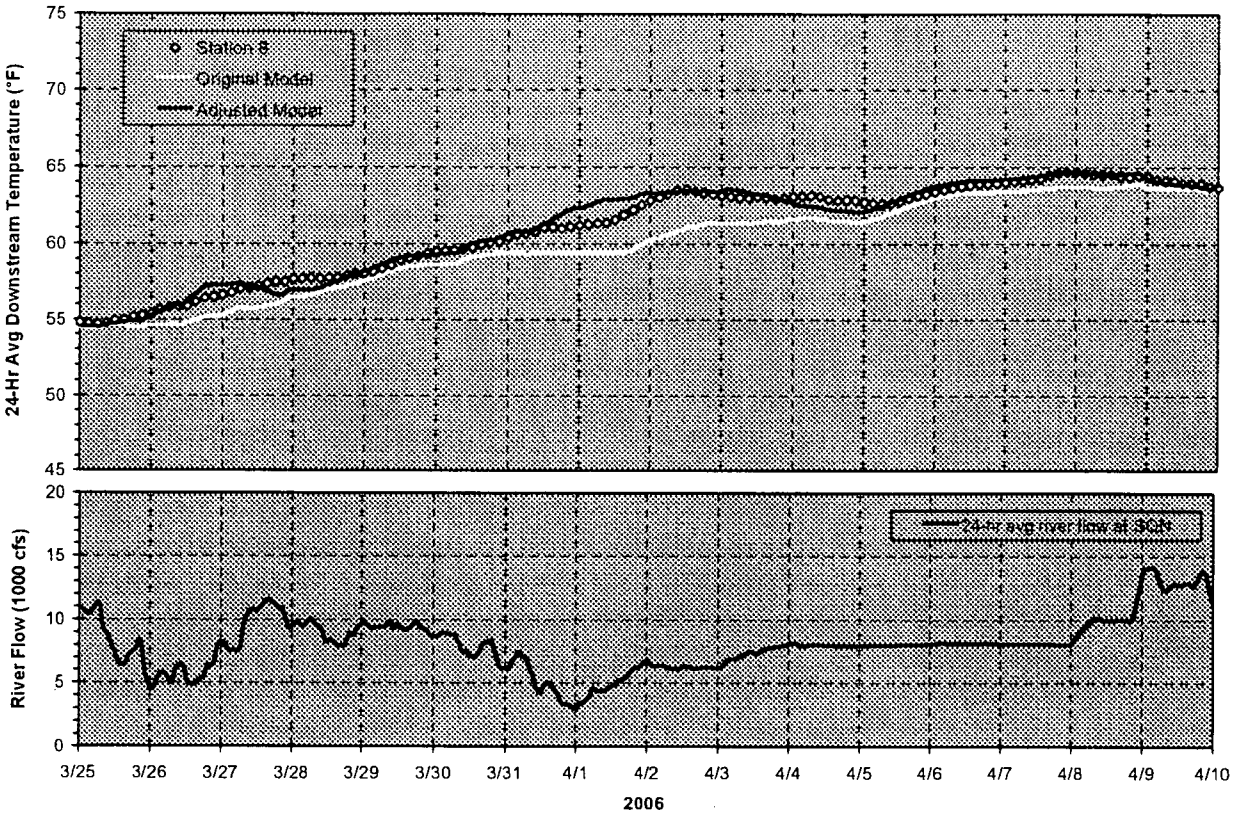

Figure 1. 24-Hr Avg Downstream Temperature with Original and Modified Numerical Models.

June 2007 DMR Attachment

June 2007 CCW Data

CCW TRENCH				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
06/06/2007 @ 0845	0.22 mg/L	06/09/2007 @ 0817	TSF	EPA 8015
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
06/06/2007 @ 0840	<0.10 mg/L	06/09/2007 @ 0849	TSF	EPA 8015

May/June 2007 Veliger Monitoring Information

Sample Date	Mean # of ZM/m^3	% Settlers	Water Temp. (˚C)	Sample Date	Mean# of Asiatic Clams/m^3	Water Temp. (˚C)	LOCATION	SUB LOCATION	NOTES: % Gravid Asiatic Clam	COLLECTED BY
05/02/2007	0	0	17	05/02/2007	71	17	Inplant	RCW		Dick Adcock
05/11/2007	0	0	17	05/11/2007	86	17	Inplant	RCW		Dick Adcock
05/17/2007	0	0	17	05/11/2007	202	17	Inplant	RCW		Dick Adcock

No veliger samples were taken in the month of June.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.019	0.041	19	0	26 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	0	62	********	********		**	0	30 / 30	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2 DAILY MX	DEG C/HR	********	********	********	****		CONTINUOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A Howard Principal Environmental Engineer	423	843-6700	07	07	13
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

The following injections occured: 1. PCL-222 Copolymer (max. calc. conc. was 0.018mg/L--limit 0.2mg/L) 2. PCL-222 Phosphate (max. calc. conc. was 0.052mg/L--limit 0.2mg/L) 3. Biodetergent 73551 (max. calc. conc. was 0.018mg/L--limit 2.0mg/L) 4. MSW-101 (max. calc. conc. was 0.09mg/L--limit 0.2mg/L)

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Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	101 Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	04	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**		<0.20		19	0	1 / 91	
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	*******	REPORT	*******	MG/L		QTRLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	07	07	13
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

Boron was sampled on 04/04/2007 @ 1045.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	07	07	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled 5/28/07 - 6/2/07. Report is attached.

July 5, 2007

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, OUTFALL 101, MAY, 2007

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101 samples collected May 28-June 2, 2007, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Fathead minnows and daphnids were not significantly different from control.

In addition to the routine compliance test, fathead minnows were also tested in Outfall 101 and intake samples which were treated using UV exposure for pathogen removal prior to introduction of test organisms.

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
CTR 2L-M

Attachment
cc (Attachment):
Sherrard, R. M.- PSC 1X-C
Files, RSO&E-EDMS-Muscle Shoals

SQN May 2007M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: July 5, 2007

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA

2. County / State: Hamilton / Tennessee

3. NPDES Permit #: TN0026450

4. Type of Facility: Nuclear-Fueled Electric Generating Plant

5. Design Flow (MGD): 1579

6. Receiving Stream: Tennessee River (TRM 483.6)

7. 1Q10: 3491

8. Outfall Tested: 101

9. Dates Sampled: May 28-June 2, 2007

10. Average Flow for the 24-h Sampling Periods (MGD): 1574, 1579, 1578

11. Pertinent Site Conditions: H-150M non-oxidizing biocide was injected from May 29 – June 1, 2007. The dates and times for the H-150M injection are in the following table. See Appendix B for complete additional chemical application information during the sample collection period.

Injection Location	Date/Start Time (ET)	Date/Ending Time (ET)
Raw Cooling Water	05/29/2007 @ 0950 05/31/2007 @ 1155	05/31/2007 @ 1035 06/01/2007 @ 1152

12. Test Dates: May 30-June 6, 2007

13. Test Type: Short-term Chronic Definitive

14. Test Species: Fathead Minnows (*Pimephales promelas*)
Daphnids (*Ceriodaphnia dubia*)

15. Concentrations Tested (%): Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
Intake: 100.0

Pimephales promelas: UV treated Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
UV treated Intake: 100.0

16. Permit Limit Endpoint (%): Outfall 101: $IC_{25} = 45.2\%$

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

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

18. Facility Contact: Stephanie Howard Phone #: (423) 843-6713

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

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

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

22. Notes: Outfall 101 samples collected May 28–June 2, 2007, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant differences from the control during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (ET) Collected	Date (MM/DD/YY)/ Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (ET) Last Use
101	05/28/07 0800 to 05/29/07 0700	05/29/07 1717	3.8/1.6†	<0.10	05/30/07 1302 05/31/07 1250
Intake	05/28/07 0822 to 05/29/07 0722	05/29/07 1717	1.0	<0.10	05/30/07 1302 05/31/07 1250
101	05/30/07 0751 to 05/31/07 0651	05/31/07 1412	2.7/3.6†	<0.10	06/01/07 1247 06/02/07 1205
Intake	05/30/07 0811 to 05/31/07 0711	05/31/07 1412	2.2	<0.10	06/01/07 1247 06/02/07 1205
101	06/01/07 0758 to 06/02/07 0658	06/02/07 1339	5.6/5.8†	<0.10	06/03/07 1207 06/04/07 1206 06/05/07 1300
Intake	06/01/07 0814 to 06/02/07 0714	06/02/07 1339	2.2	<0.10	06/03/07 1207 06/04/07 1206 06/05/07 1300

*TRC = Total Residual Chlorine

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

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

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

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatox, Inc.	In-house Cultures
2. Age:	21 hours old	<24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	05/30/07 1302 ET	05/30/07 1100 ET
UV Treated Outfall 101	05/30/07 1243 ET	
7. Test Termination: (Date/Time)		
Outfall 101	06/06/07 1309 ET	06/06/07 1140 ET
UV Treated Outfall 101	06/06/07 1252 ET	
8. Test Temperature: Outfall 101:	Mean = 24.6°C (24.1 - 25.1°C)	Mean = 24.8°C (24.5 - 25.1°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.6°C (24.1 - 25.1°C)	

9. Physical / Chemical Measurements: Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.

10. Statistics: Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted May 30 – June 6, 2007 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	98	98	95	95
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	98	98
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.673	0.792	0.702	0.657	0.706
11.3%	0.822	0.776	0.601	0.726	0.731
22.6%	0.773	0.686	0.807	0.674	0.735
45.2%	0.708	0.770	0.663	0.810	0.738
72.6%	0.673	0.696	0.871	0.728	0.742
100.0%	0.668	0.657	0.673	0.592	0.648
Intake	0.655	0.729	0.663	0.578	0.656

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted May 30 – June 6, 2007 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	27	31	30	28	30	31	30	30	32	30	29.9
11.3%	28	31	30	34	32	30	32	34	32	33	31.6
22.6%	34	36	35	33	31	32	37	32	31	30	33.1
45.2%	33	38	38	33	34	33	34	34	35	31	34.3
72.6%	35	38	33	36	36	37	33	35	34	35	35.2
100.0%	40	36	37	38	36	32	41	37	38	35	37.0

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)

Conducted May 30 – June 6, 2007 using water from Intake

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

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	30	31	31	27	30	30	31	30	30	30.0
Intake	32	31	31	36	33	30	31	33	32	31	32.0

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

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

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

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

Conducted May 30 – June 6, 2007 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	98	98
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.676	0.614	0.686	0.682	0.665
11.3%	0.648	0.676	0.674	0.787	0.696
22.6%	0.762	0.593	0.720	0.710	0.696
45.2%	0.641	0.608	0.788	0.737	0.694
72.6%	0.621	0.734	0.542	0.616	0.628
100.0%	0.629	0.603	0.630	0.604	0.617
Intake	0.499	0.696	0.627	0.670	0.623

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

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

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	May 30 – June 6, 2007	1326	7-days	KCl	0.62 g/L
Ceriodaphnia dubia	May 08 – 15, 2007	1207	7-days	NaCl	1.10 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101 and Intake, May 30 - June 6, 2007.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.8 24.6 - 25.0	24.3 24.1 - 24.5	7.7 7.6 - 8.2	7.3 6.7 - 7.8	7.76 7.66 - 7.91	7.51 7.34 - 7.70	313 302 - 326	60 59 - 61	91 89 - 93	- - -
	11.3%	24.8 24.6 - 25.0	24.3 24.1 - 24.5	8.0 7.6 - 8.3	7.4 6.8 - 7.8	7.74 7.63 - 7.83	7.47 7.33 - 7.70	297 290 - 310	- - -	- - -	- - -
	22.6%	24.8 24.7 - 25.0	24.5 24.2 - 24.6	8.0 7.6 - 8.3	7.3 6.7 - 7.8	7.71 7.64 - 7.81	7.46 7.32 - 7.68	283 273 - 295	- - -	- - -	- - -
	45.2%	24.8 24.7 - 25.1	24.4 24.3 - 24.6	8.0 7.8 - 8.3	7.3 6.7 - 7.8	7.66 7.54 - 7.78	7.45 7.31 - 7.67	252 245 - 260	- - -	- - -	- - -
	72.6%	24.8 24.7 - 25.1	24.4 24.2 - 24.7	8.1 7.8 - 8.3	7.4 6.7 - 7.9	7.61 7.45 - 7.76	7.42 7.27 - 7.64	213 208 - 221	- - -	- - -	- - -
	100.0%	24.9 24.7 - 25.1	24.4 24.2 - 24.6	8.2 7.9 - 8.4	7.3 6.4 - 8.0	7.54 7.35 - 7.73	7.40 7.26 - 7.60	175 170 - 182	62 62 - 62	72 71 - 73	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.7 - 25.0	24.3 24.2 - 24.5	8.2 7.8 - 8.4	7.4 6.7 - 8.0	7.47 7.23 - 7.72	7.42 7.27 - 7.60	175 168 - 181	60 59 - 60	74 71 - 75	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.8 24.6 - 24.9	24.8 24.6 - 25.1	7.7 7.6 - 8.2	8.0 7.8 - 8.2	7.76 7.66 - 7.91	7.75 7.65 - 7.82	313 302 - 326	60 59 - 61	91 89 - 93	- - -
	11.3%	24.8 24.7 - 25.0	24.8 24.6 - 25.0	8.0 7.6 - 8.3	8.0 7.8 - 8.2	7.74 7.63 - 7.83	7.75 7.65 - 7.80	297 290 - 310	- - -	- - -	- - -
	22.6%	24.8 24.6 - 25.0	24.8 24.5 - 24.9	8.0 7.6 - 8.3	8.0 7.9 - 8.2	7.71 7.64 - 7.81	7.74 7.65 - 7.79	283 273 - 295	- - -	- - -	- - -
	45.2%	24.8 24.6 - 25.0	24.7 24.5 - 25.0	8.0 7.8 - 8.3	8.1 8.0 - 8.2	7.66 7.54 - 7.78	7.73 7.64 - 7.78	252 245 - 260	- - -	- - -	- - -
	72.6%	24.8 24.7 - 25.0	24.8 24.7 - 24.9	8.1 7.8 - 8.3	8.1 8.0 - 8.2	7.61 7.45 - 7.76	7.71 7.62 - 7.77	213 208 - 221	- - -	- - -	- - -
	100.0%	24.9 24.6 - 25.1	24.7 24.5 - 25.0	8.2 7.9 - 8.4	8.0 8.0 - 8.2	7.54 7.35 - 7.73	7.70 7.61 - 7.76	175 170 - 182	62 62 - 62	72 71 - 73	< 0.10 < 0.10 - < 0.10
	Intake	24.8 24.7 - 25.0	24.8 24.5 - 25.0	8.2 7.8 - 8.4	8.0 7.7 - 8.2	7.47 7.23 - 7.72	7.71 7.61 - 7.78	175 168 - 181	60 59 - 60	74 71 - 75	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.6	24.1	25.1
Ceriodaphnia dubia	24.8	24.5	25.1

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV-treated Outfall 101, May 30 - June 6, 2007.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)
		Initial	Final	Initial	Final	Initial	Final	
Pimephales promelas	**Control**	24.8 24.7 - 25.0	24.4 24.2 - 24.6	7.9 7.6 - 8.2	7.2 6.7 - 7.9	7.82 7.76 - 7.90	7.48 7.34 - 7.64	305 295 - 318
	11.3%	24.9 24.8 - 25.0	24.4 24.1 - 24.5	8.0 7.6 - 8.2	7.2 6.8 - 7.7	7.82 7.76 - 7.87	7.49 7.32 - 7.64	296 286 - 308
	22.6%	24.9 24.8 - 25.0	24.3 24.1 - 24.4	8.1 7.8 - 8.2	7.2 6.4 - 7.9	7.81 7.74 - 7.87	7.48 7.31 - 7.65	282 273 - 295
	45.2%	24.9 24.7 - 25.1	24.3 24.2 - 24.6	8.1 7.8 - 8.3	7.2 6.4 - 8.0	7.78 7.69 - 7.84	7.45 7.28 - 7.65	253 245 - 263
	72.6%	24.9 24.7 - 25.1	24.4 24.2 - 24.5	8.2 8.0 - 8.3	7.2 6.5 - 7.9	7.74 7.61 - 7.83	7.44 7.29 - 7.59	225 211 - 280
	100.0%	24.9 24.8 - 25.1	24.4 24.3 - 24.5	8.2 8.0 - 8.3	7.4 6.6 - 7.9	7.69 7.54 - 7.82	7.43 7.28 - 7.58	178 173 - 188
	Intake	24.9 24.7 - 25.1	24.3 24.2 - 24.5	8.2 8.0 - 8.4	7.3 6.5 - 7.9	7.65 7.36 - 7.81	7.41 7.24 - 7.64	175 169 - 188

Overall temperature (°C)	**Average**	**Minimum**	**Maximum**
Pimephales promelas	24.6	24.1	25.1

SUMMARY / CONCLUSIONS

Outfall 101 samples collected May 28-June 2, 2007, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant differences from the control during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL plastic disposable cups, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

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

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

1. 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 by SM 2550 B.

4. Dissolved oxygen was measured by SM 4500 O G.

5. The pH was measured by SM 4500 H+ B.

6. Conductance was measured by SM 2510 B.

7. Alkalinity was measured by SM 2320 B.

8. Total hardness was measured by SM 2340 C.

9. Total residual chlorine was measured by ORION Electrode Method 97-70.

QUALITY ASSURANCE

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

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

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1. NPDES Permit No. TN0026450.

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

3. Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998.

4. Quality Assurance Program: Standard Operating Procedures, Environmental Testing Solutions, Inc (most current version).

Sequoyah Nuclear Plant Biomonitoring
May 30 – June 6, 2007

Appendix B

Diffuser Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

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 Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
06/15/2003	-	< 0.0045	-	-	-	-	-
06/16/2003	-	< 0.0037	0.057	0.020	-	-	0.022
06/17/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/18/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/19/2003	-	< 0.0085	0.058	0.020	-	-	0.025
06/20/2003	-	< 0.0048	0.058	0.020	-	-	0.025
08/03/2003	-	<0.0050	-	-	-	-	-
08/04/2003	-	<0.0050	0.058	0.020	-	-	-
08/05/2003	-	<0.0051	0.057	0.020	-	-	0.025
08/06/2003	-	<0.0084	0.057	0.020	-	-	0.025
08/07/2003	-	0.0129	0.057	0.020	-	-	0.024
08/08/2003	-	0.0153	0.057	0.020	0.009	-	-
10/05/2003	-	<0.0043	0.057	0.020	-	-	-
10/06/2003	-	<0.0043	0.057	0.020	-	-	0.025
10/07/2003	-	<0.0090	0.057	0.020	-	-	0.025
10/08/2003	-	<0.0106	0.057	0.020	-	-	0.025
10/09/2003	-	0.0181	0.026	0.022	-	-	0.025
10/10/2003	-	0.0183	0.026	0.024	0.009	-	-
02/01/2004	-	0.0093	0.027	0.009	-	-	-
02/02/2004	-	<0.0034	0.026	0.009	-	-	-
02/03/2004	-	<0.0034	0.026	0.009	-	-	-
02/04/2004	-	0.0124	0.026	0.009	0.009	-	-
02/05/2004	-	<0.0034	0.026	0.009	-	-	-
02/06/2004	-	0.0105	0.026	0.009	0.010	-	-
05/04/2004	-	<0.0123	0.026	0.019	-	-	0.025
05/05/2004	-	<0.0144	0.026	0.014	0.009	-	0.025
05/06/2004	-	<0.0146	0.037	0.013	-	-	0.025
05/07/2004	-	0.0227	0.058	0.020	0.009	-	0.025
05/08/2004	-	0.016	0.060	0.021	-	-	-
05/09/2004	-	<0.0104	0.058	0.020	-	-	-
07/04/2004	-	0.0217	0.057	0.019	-	-	-
07/05/2004	-	<0.0085	0.057	0.020	0.009	-	-
07/06/2004	-	<0.0077	0.058	0.020	-	-	0.031
07/07/2004	-	0.0252	0.056	0.019	-	-	0.031
07/08/2004	-	0.0223	0.057	0.019	0.009	-	-
07/09/2004	-	0.0182	0.057	0.020	0.009	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

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	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat
11/07/2004	-	<0.0187	0.000	0.014	-	-	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042	-	-
02/06/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/07/2005	-	<0.0116	0.028	0.010	-	-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-	-	-	-
02/09/2005	-	0.0199	0.028	0.010	-	-	-	-	-
02/10/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/11/2005	-	0.0155	0.028	0.010	-	-	-	0.007	-
06/05/2005	-	0.0063	-	-	-	-	-	-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	-	-	-	-	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	-	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	-	-	-	-	-	-
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	-	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	-
07/22/2005	-	0.0238	0.054	0.018	-	-	-	0.014	-
10/30/2005	-	0.0068	-	-	-	-	-	-	-
10/31/2005	-	0.0112	-	-	-	-	-	-	-
11/01/2005	-	0.0104	-	-	-	-	-	-	0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	-	-	-	0.036
11/04/2005	-	0.0165	-	-	-	-	-	-	0.035
11/14/2005	-	0.0274	-	-	-	-	-	-	-
11/15/2005	-	0.0256	-	-	-	-	-	-	-
11/16/2005	-	0.0234	-	-	-	-	-	-	-
11/17/2005	-	0.0231	-	-	-	-	-	-	-
11/18/2005	-	0.0200	-	-	-	-	-	-	-
11/19/2005	-	0.0116	-	-	-	-	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks, During Toxicity Test Sampling

March 12, 1998 – June 2, 2007

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	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat	MSW 101 mg/L Phosphate
11/12/2006	-	0.0055	-	-	-	-	-	-	-	-
11/13/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/14/2006	-	0.0143	-	-	-	-	-	-	0.037	-
11/15/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/16/2006	-	0.0267	-	-	-	-	-	-	0.037	-
11/17/2006	-	0.0222	-	-	-	-	-	-	-	-
11/26/2006	-	0.0188	-	-	-	-	-	-	-	-
11/27/2006	-	0.0138	-	-	-	-	-	-	-	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	-	-	-	-	-	-	-	-
11/30/2006	-	0.0376	-	-	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-	-	-	-	-	-
05/28/2007	-	-	-	-	-	-	-	-	-	0.015
05/29/2007	-	-	-	-	-	-	-	-	0.036	0.015
05/30/2007	-	0.0084	-	-	-	-	-	0.017	0.036	0.015
05/31/2007	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/2007	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/2007	-	0.0305	-	-	-	-	-	-	-	0.015

Sequoyah Nuclear Plant Biomonitoring
May 30 – June 6, 2007

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn, Steve Williams

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

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Laboratory Use (project # 3240)				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	05/28/07-05/29/07	0800-0700	2 (2.5gal)	NA			X		070529.01	3.8 | 1.6C	JH	1717	*
SQN-INT-TOX	Comp	05/28/07-05/29/07	0822-0722	1 (2.5 gal)	NA			X		070529.02	1.0°C	JH	1717	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. J/umner

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams Chevy Williams	05/29/07 11:53	Sonic Delivery DUANE BULLOCK	05/29/07 11:54
Sonic Delivery DUANE BULLOCK	05/29/07 1717	ETS Jm/umner ETS	05/29/07 1717

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn, Steve Williams

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

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project# 3240 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	05/30/07-05/31/07	0751-0651	2 (2.5gal)	NA			X		070531.02	2.7/3.6°C	JL	1412	*
SQN-INT-TOX	Comp	05/30/07-05/31/07	0811-0711	1 (2.5 gal)	NA			X		070531 03	2.2°C	JL	1412	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition Jim Lumner

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	05/31/07 1000	Sonic Delivery CTX #105518 [signature]	05/31/07 10:00 AM
Sonic Delivery [signature]	05/31/07 1412	ETS Jim Lumner ETS	05/31/07 1412

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn, Steve Williams

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

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project # 3240 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	06/01/07-06/02/07	0758-0658	2 (2.5gal)	NA					070002.01	5.6/5.8C	KEK	1339	*
SQN-INT-TOX	Comp	06/01/07-06/02/07	0814-0714	1 (2.5 gal)	NA					070002.02	3.2.6	KEK	1339	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. J Turner

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	~~06/01/07~~ 06-02-07 0949	Sonic Delivery [signature]	~~06/01/07~~ 06-02-07 0949
Sonic Delivery [signature] AL TE 307	~~06/01/07~~ 06-02-07 1339	ETS KEKeenan ETS	~~06/01/07~~ 06-02-07 1339

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

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 3240

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	~~339~~ 565	1130	1815	2500	
Diluent volume (mL)	2217.5	~~2161~~ 1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	21-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	05-29-07 1600	Incubator number:	3C
Organism source:	ATOX BATCH Pp 05-29-07	*Artemia* lot number:	B60204U
Transfer bowl information:	pH = 7.86 Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 06-06-07	1330
Average transfer volume:	8.6 ml	Date / Time out: 06-07-07	1330
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	05-30-07	~~—~~	1600	1302	05-28-07A	070529.01 & 02	JH
1	05-31-07	0800	1400	1250	05-28-07A	070529.01 & 02	JH
2	06-01-07	0800	1404	1247	05-28-07B	070531.02 & 03	JH
3	06-02-07	0900	1500	1205	05-28-07B	070531.02 & 03	JH
4	06-03-07	0900	1500	1207	05-31-07A	070602.01 & 02	JH
5	06-04-07	0830	1430	1206	05-31-07A	070602.01 & 02	JH
6	06-05-07	0800	1428	1300	05-31-07A	070602.01 & 02	JH
7	06-06-07			1309			JH

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae: 0.706	~~0.665~~		NOEC	100%
Average weight per surviving larvae:	~~0.665~~ 0.706	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 05-30-07

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	CONTROL				11.3%				22.6%			
	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	9 1d	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	9 1d	10	10	9	10	10	10	10
7	10	10 1fg	10	10	9 2fg	10 1fg	10	9 2fg	10	10	10 1fg	10
A = Pan weight (mg) Color identification: light Blue Analyst: JK	15.05	14.06	13.80	13.98	14.20	14.54	14.49	15.73	~~14.70~~ 14.87	13.68	13.99	14.28
B = Pan + Larvae weight (mg) Analyst: LAB	* ~~21.78~~ 21.78	21.98	20.82	* ~~20.55~~ 20.55	22.42	22.30	20.50	22.99	22.60	20.54	22.06	21.02
Larvae weight (mg) = A – B	* ~~6.76~~ 6.73	~~6.14~~ 7.92	~~6.86~~ 7.02	~~6.82~~ 6.57	~~6.48~~ 8.22	~~6.76~~ 7.76	~~6.14~~ 6.01	~~7.87~~ 7.26	~~7.62~~ 7.73	~~5.93~~ 6.86	~~7.20~~ 8.07	~~7.108~~ 6.74
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.673	0.792	0.702	0.657	0.822	0.776	0.601	0.726	0.773	0.686	0.807	0.674
Average weight per initial number of larvae (mg)	0.706				0.731				0.735			
Percent reduction from control (%)					-3.6%				-4.1%			

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

Calculations and data reviewed: JL

Comments: * CALCULATIONS FROM SQN UV-TREATED. CORRECTED JL
- CALCULATIONS COPIED FROM WRONG EXCEL SHEET.

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

Survival and Growth Data

Day	45.2%				72.6%				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	9 d ~~10 d~~	10	10	10	10	10	10	10	10	10	10	10
7	1 lg 9	10	10	1 lg 10	10	10	2 lg 10	10	10	10	10	1 sm 10
A = Pan weight (mg) Color identification: light blue Analyst: SK	14.09	16.05	13.14	14.49	14.70	13.90	14.96	15.74	15.81	15.06	13.94	14.05
B = Pan + Larvae weight (mg) Analyst: LAB	21.17	23.75	19.77	22.59	21.43	20.86	23.67	23.02	22.49	21.63	20.67	19.97
Larvae weight (mg) = A – B	7.08	7.70	6.63	8.10	6.73	6.96	8.71	7.28	6.68	6.57	6.73	5.92
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.708	0.770	0.663	0.810	0.673	0.696	0.871	0.728	0.668	0.657	0.673	0.592
Average weight per initial number of larvae (mg)	0.738				0.742				0.648			
Percent reduction from control (%)			-4.5%				-5.1%				8.3%	

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

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10 15M
A = Pan weight (mg) Color identification: light blue Analyst:	13.87	14.01	15.32	13.13
B = Pan + Larvae weight (mg) Analyst: LAB	20.42	21.30	21.95	18.91
Larvae weight (mg) = A – B	6.55	7.29	6.63	5.78
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.655	0.729	0.663	0.578
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.656		7.0%	

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

Calculations and data reviewed: dl

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007

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

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

Project number: 3240

Reveiwed by: [signature]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	15.05	21.78	6.73	0.673	0.706	8.5	0.673	100.0	0.706	8.5	Not applicable
	B	10	10	14.06	21.98	7.92	0.792			0.792				
	C	10	10	13.80	20.82	7.02	0.702			0.702				
	D	10	10	13.98	20.55	6.57	0.657			0.657				
11.3%	E	10	9	14.20	22.42	8.22	0.913	0.774	16.7	0.822	95.0	0.731	13.0	-3.6
	F	10	10	14.54	22.30	7.76	0.776			0.776				
	G	10	10	14.49	20.50	6.01	0.601			0.601				
	H	10	9	15.73	22.99	7.26	0.807			0.726				
22.6%	I	10	10	14.87	22.60	7.73	0.773	0.735	8.9	0.773	100.0	0.735	8.9	-4.1
	J	10	10	13.68	20.54	6.86	0.686			0.686				
	K	10	10	13.99	22.06	8.07	0.807			0.807				
	L	10	10	14.28	21.02	6.74	0.674			0.674				
45.2%	M	10	9	14.09	21.17	7.08	0.787	0.757	8.6	0.708	97.5	0.738	8.8	-4.5
	N	10	10	16.05	23.75	7.70	0.770			0.770				
	O	10	10	13.14	19.77	6.63	0.663			0.663				
	P	10	10	14.49	22.59	8.10	0.810			0.810				
72.6%	Q	10	10	14.70	21.43	6.73	0.673	0.742	12.0	0.673	100.0	0.742	12.0	-5.1
	R	10	10	13.90	20.86	6.96	0.696			0.696				
	S	10	10	14.96	23.67	8.71	0.871			0.871				
	T	10	10	15.74	23.02	7.28	0.728			0.728				
100%	U	10	10	15.81	22.49	6.68	0.668	0.648	5.8	0.668	100.0	0.648	5.8	8.3
	V	10	10	15.06	21.63	6.57	0.657			0.657				
	W	10	10	13.94	20.67	6.73	0.673			0.673				
	X	10	10	14.05	19.97	5.92	0.592			0.592				
100% Intake	Y	10	10	13.87	20.42	6.55	0.655	0.656	9.4	0.655	100.0	0.656	9.4	7.0
	Z	10	10	14.01	21.30	7.29	0.729			0.729				
	AA	10	10	15.32	21.95	6.63	0.663			0.663				
	BB	10	10	13.13	18.91	5.78	0.578			0.578				

Outfall 101:
Dunnett's MSD value: 0.1215
PMSD: 17.2

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Intake:
Dunnett's MSD value: 0.0839
PMSD: 11.9

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.
Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/30/2007	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.6730	0.7920	0.7020	0.6570
11.3	0.8220	0.7760	0.6010	0.7260
22.6	0.7730	0.6860	0.8070	0.6740
45.2	0.7080	0.7700	0.6630	0.8100
72.6	0.6730	0.6960	0.8710	0.7280
100	0.6680	0.6570	0.6730	0.5920

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7060	1.0000	0.7060	0.6570	0.7920	8.539	4				0.7304	1.0000
11.3	0.7313	1.0358	0.7313	0.6010	0.8220	13.029	4	-0.501	2.410	0.1215	0.7304	1.0000
22.6	0.7350	1.0411	0.7350	0.6740	0.8070	8.870	4	-0.575	2.410	0.1215	0.7304	1.0000
45.2	0.7378	1.0450	0.7378	0.6630	0.8100	8.831	4	-0.630	2.410	0.1215	0.7304	1.0000
72.6	0.7420	1.0510	0.7420	0.6730	0.8710	11.982	4	-0.714	2.410	0.1215	0.7304	1.0000
100	0.6475	0.9171	0.6475	0.5920	0.6730	5.807	4	1.160	2.410	0.1215	0.6475	0.8865

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98098224	0.884	0.13838349	-0.4270667
Bartlett's Test indicates equal variances (p = 0.77)	2.5448122	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.12154682	0.17216263	0.00522627	0.00508725	0.43117049	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	84.671			
IC10	96.741			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

sqn_05-30-07data

TVA / Sequoyah Nuclear Plant, Intake
Non-treated
May 30 - June 06, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/30/2007	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.6730	0.7920	0.7020	0.6570
100	0.6550	0.7290	0.6630	0.5780

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7060	1.0000	0.7060	0.6570	0.7920	8.539	4				0.7060	1.0000
100	0.6563	0.9295	0.6563	0.5780	0.7290	9.419	4	1.152	1.943	0.0839	0.6563	0.9295

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94020569	0.749	0.40988519	-0.6290803
F-Test indicates equal variances (p = 0.97)	1.05143547	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.0838889	0.11882281	0.00495012	0.00372746	0.29299587	1, 6
Treatments vs D-Control						

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	70.955			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration

sqn_05-30-07data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007
Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Project number: 3240

Reviewed by: [illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.91	7.61	7.66	7.59	7.75	7.36	7.71	7.50	7.74	7.34	7.79	7.48	7.75	7.70
	DO (mg/L)	7.8	7.8	7.7	7.6	8.2	6.7	7.7	7.2	7.6	6.8	7.6	7.4	7.6	7.7
	Conductivity (µmhos/cm)	326		316		309		315		302		305		315	
	Alkalinity (mg/L $CaCO_3$)	60				61				59					
	Hardness (mg/L $CaCO_3$)	91				93				89					
	Temperature (°C)	24.9	24.3	24.6	24.1	24.7	24.3	24.8	24.3	24.7	24.4	24.6	24.2	25.0	24.5
11.3%	pH (SU)	7.83	7.51	7.76	7.50	7.82	7.36	7.68	7.44	7.64	7.33	7.63	7.47	7.79	7.70
	DO (mg/L)	8.0	7.7	8.3	7.4	8.0	7.0	8.0	7.4	7.6	6.8	7.8	7.5	8.0	7.8
	Conductivity (µmhos/cm)	306		291		292		290		294		310		298	
	Temperature (°C)	25.0	24.4	24.6	24.4	24.7	24.1	24.8	24.1	24.7	24.5	24.7	24.3	24.9	24.5
22.6%	pH (SU)	7.81	7.50	7.73	7.48	7.75	7.35	7.67	7.42	7.64	7.32	7.64	7.44	7.76	7.68
	DO (mg/L)	8.0	7.6	8.3	7.4	8.1	7.0	8.0	7.3	7.6	6.7	7.9	7.6	8.0	7.8
	Conductivity (µmhos/cm)	290		280		280		278		273		295		284	
	Temperature (°C)	25.0	24.4	24.7	24.6	24.7	24.2	24.8	24.6	24.7	24.5	24.7	24.5	24.9	24.5
45.2%	pH (SU)	7.78	7.48	7.71	7.48	7.67	7.35	7.63	7.42	7.54	7.31	7.61	7.44	7.67	7.67
	DO (mg/L)	8.0	7.6	8.3	7.4	8.2	7.1	8.0	7.1	7.8	6.7	7.9	7.5	8.1	7.8
	Conductivity (µmhos/cm)	260		250		254		250		245		253		253	
	Temperature (°C)	25.1	24.4	24.7	24.3	24.8	24.5	24.8	24.3	24.7	24.5	24.7	24.6	24.9	24.4
72.6%	pH (SU)	7.76	7.44	7.67	7.46	7.58	7.34	7.59	7.40	7.45	7.27	7.58	7.42	7.61	7.64
	DO (mg/L)	8.2	7.7	8.3	7.4	8.2	7.1	8.0	7.2	7.8	6.7	8.0	7.6	8.2	7.9
	Conductivity (µmhos/cm)	221		214		211		208		208		214		213	
	Temperature (°C)	25.1	24.7	24.7	24.5	24.7	24.3	24.9	24.2	24.7	24.3	24.8	24.4	24.9	24.5
100%	pH (SU)	7.73	7.41	7.63	7.46	7.48	7.31	7.55	7.36	7.35	7.26	7.50	7.39	7.55	7.60
	DO (mg/L)	8.2	7.8	8.4	7.3	8.3	7.1	8.2	7.3	7.9	6.4	7.9	7.3	8.3	8.0
	Conductivity (µmhos/cm)	182		177		176		172		170		173		174	
	Alkalinity (mg/L $CaCO_3$)	62				62				62					
	Hardness (mg/L $CaCO_3$)	73				73				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.6	24.7	24.2	24.7	24.2	25.1	24.4	24.8	24.4	24.8	24.6	25.0	24.2
100% Intake	pH (SU)	7.72	7.46	7.62	7.51	7.35	7.35	7.49	7.36	7.23	7.27	7.40	7.42	7.49	7.60
	DO (mg/L)	8.2	7.8	8.4	7.3	8.2	7.4	8.3	7.1	7.8	6.7	7.9	7.3	8.3	8.0
	Conductivity (µmhos/cm)	181		172		174		168		179		178		172	
	Alkalinity (mg/L $CaCO_3$)	59				60				60					
	Hardness (mg/L $CaCO_3$)	71				75				75					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.3	24.7	24.4	24.8	24.2	25.0	24.2	24.7	24.3	24.8	24.5	25.0	24.5

Species: *Pimephales promelas* Date: 05-30-07

Client: TVA / Sequoyah Nuclear Plant – Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KEK	KEK	KEK	KEK	KEK	KEK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.91	7.61	7.66	7.59	7.75	7.36
	DO (mg/L)	7.8	7.8	7.7	7.6	8.2	6.7
	Conductivity (µmhos/cm)	326		316		309	
	Alkalinity (mg $CaCO_3$/L)	60				61	
	Hardness (mg $CaCO_3$/L)	91				93	
	Temperature (°C)	24.9	24.3	24.6	24.1	24.7	24.3
11.3%	pH (S.U.)	7.83	7.51	7.76	7.50	7.82	7.36
	DO (mg/L)	8.0	7.7	8.3	7.4	8.0	7.0
	Conductivity (µmhos/cm)	306		291		292	
	Temperature (°C)	25.0	24.4	24.6	24.4	24.7	24.1
22.6%	pH (S.U.)	7.81	7.50	7.73	7.48	7.79	7.35
	DO (mg/L)	8.0	7.6	8.3	7.4	8.1	7.0
	Conductivity (µmhos/cm)	290		280		280	
	Temperature (°C)	25.0	24.4	24.7	24.6	24.7	24.2
45.2%	pH (S.U.)	7.78	7.48	7.71	7.48	7.67	7.35
	DO (mg/L)	8.0	7.6	8.3	7.4	8.2	7.1
	Conductivity (µmhos/cm)	260		250		254	
	Temperature (°C)	25.1	24.4	24.7	24.3	24.8	24.5
72.6%	pH (S.U.)	7.76	7.44	7.67	7.46	7.58	7.34
	DO (mg/L)	8.2	7.7	8.3	7.4	8.2	7.1
	Conductivity (µmhos/cm)	221		214		211	
	Temperature (°C)	25.1	24.7	24.7	24.5	24.7	24.3
100%	pH (S.U.)	7.73	7.41	7.63	7.46	7.48	7.31
	DO (mg/L)	8.2	7.8	8.4	7.3	8.3	7.1
	Conductivity (µmhos/cm)	182		177		176	
	Alkalinity (mg $CaCO_3$/L)	62				62	
	Hardness (mg $CaCO_3$/L)	73				73	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.6	24.7	24.2	24.7	24.2
100% Intake	pH (S.U.)	7.72	7.46	7.62	7.51	7.35	7.35
	DO (mg/L)	8.2	7.8	8.4	7.3	8.2	7.4
	Conductivity (µmhos/cm)	181		172		174	
	Alkalinity (mg $CaCO_3$/L)	59				60	
	Hardness (mg $CaCO_3$/L)	71				75	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.3	24.7	24.4	24.8	24.2
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 05-30-07
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	KEA	KEA	KEA	KEA	KEA	KEA	KEA	KEA
Concen-tration	Parameter								
CONTROL	pH (S.U.)	7.71	7.50	7.74	7.34	7.79	7.48	7.75	7.70
	DO (mg/L)	7.7	7.7	7.6	6.8	7.6	7.4	7.6	7.7
	Conductivity (µmhos/cm)	315		302		305		315	
	Alkalinity (mg $CaCO_3$/L)			59					
	Hardness (mg $CaCO_3$/L)			89					
	Temperature (°C)	24.8	24.3	24.7	24.4	24.6	24.2	25.0	24.5
11.3%	pH (S.U.)	7.68	7.44	7.64	7.33	7.63	7.47	7.79	7.70
	DO (mg/L)	8.0	7.4	7.6	6.8	7.8	7.5	8.0	7.8
	Conductivity (µmhos/cm)	290		294		310		298	
	Temperature (°C)	24.8	24.1	24.7	24.5	24.7	24.3	24.9	24.5
22.6%	pH (S.U.)	7.67	7.42	7.64	7.32	7.64	7.44	7.70	7.68
	DO (mg/L)	8.0	7.3	7.6	6.7	7.9	7.6	8.0	7.8
	Conductivity (µmhos/cm)	278		273		295		284	
	Temperature (°C)	24.8	24.6	24.7	24.5	24.7	24.5	24.9	24.5
45.2%	pH (S.U.)	7.63	7.42	7.04	7.31	7.61	7.44	7.67	7.67
	DO (mg/L)	8.0	7.1	7.8	6.7	7.9	7.5	8.1	7.8
	Conductivity (µmhos/cm)	250		245		253		253	
	Temperature (°C)	24.8	24.3	24.7	24.5	24.7	24.6	24.9	24.4
72.6%	pH (S.U.)	7.59	7.40	7.45	7.27	7.58	7.42	7.61	7.64
	DO (mg/L)	8.0	7.2	7.8	6.7	8.0	7.6	8.2	7.9
	Conductivity (µmhos/cm)	208		208		214		213	
	Temperature (°C)	24.9	24.2	24.7	24.3	24.8	24.4	24.9	24.5
100%	pH (S.U.)	7.55	7.36	7.35	7.26	7.50	7.39	7.55	7.60
	DO (mg/L)	8.2	7.3	7.9	6.4	7.9	7.3	8.3	8.0
	Conductivity (µmhos/cm)	172		170		173		174	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			71					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.4	24.8	24.4	24.8	24.6	25.0	24.2
100% Intake	pH (S.U.)	7.49	7.36	7.23	7.27	7.40	7.42	7.49	7.60
	DO (mg/L)	8.3	7.1	7.8	6.7	7.9	7.3	8.3	8.0
	Conductivity (µmhos/cm)	168		179		178		172	
	Alkalinity (mg $CaCO_3$/L)			60					
	Hardness (mg $CaCO_3$/L)			75					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.2	24.7	24.3	24.8	24.5	25.0	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

Client: TVA
Facility: Sequovah Nuclear Plant
NPDES #: TN 0026450
Project #: 3240

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	~~339~~ 565	1130	1815	2500	
Diluent volume (mL)	2217.5	~~2161~~ 1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	< 24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	05-30-07 0740 TO 1046	Incubator number and shelf location:	2B
Organism Source Culture board: 05-22-07A	Cups: 2, 5, 6, 7, 10, 14, 16, 17, 18, 32	YCT batch:	04-08-07
Transfer bowl information:	pH = 7.94 Temperature = 24.5	*Selenastrum* batch:	05-01-07 *05-31-07

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	05-30-07	1100	05-28-07A	070529.01&02	dl
1	05-31-07	1003	05-28-07A	070529.01&02	dl
2	06-01-07	1005	05-28-07 B	070531.02&03	dl
3	06-02-07	1011	05-28-07 B	070531.02&03	dl
4	06-03-07	1013	05-31-07 A	070602.01&02	dl
5	06-04-07	1015	05-31-07 A	070602.01&02	dl
6	06-05-07	1020	05-31-07 A	070602.01&02	dl
7	06-06-07	1140			dl

Control information:	1	2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	29.9	30.0	≥ 15.0 offspring/female	ChV	>100%
% CV:	4.8%	3.8%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequovah Nuclear Plant - Non-treated Date: 05-30-07

CONTROL - 1 *Survival and Reproduction Data*

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

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.9

CONC: 11.3% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	5	5	4	5	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	11	10	11	10	11	13	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	17	15	19	16	16	16	17	16	18
Total young produced		28	31	30	34	32	30	32	34	32	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.6
% Reduction from Control:	-5.7%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

CONC: 22.6% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	6	4	4	6	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	13	12	10	10	14	12	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	18	18	15	17	18	17	16	15	16
Total young produced		34	36	35	33	31	32	37	32	31	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.1
% Reduction from Control:	-10.7%

CONC: 45.2% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	6	6	4	5	4	5	5	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	13	13	10	13	12	12	10	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	19	19	19	16	17	17	19	18	16
Total young produced		33	38	38	33	34	33	34	34	35	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.3
% Reduction from Control:	-14.7%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

CONC: 72.6% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	7	6	4	5	6	4	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	12	12	12	11	12	10	11	12	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	20	17	19	19	21	18	19	18	18
Total young produced		35	38	33	36	36	37	33	35	34	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.2
% Reduction from Control:	-17.7%

CONC: 100% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	6	5	5	5	5	4	5	6	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	13	12	14	10	11	14	13	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	21	18	20	19	21	17	22	18	19	19
Total young produced		40	36	37	38	36	32	41	37	38	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	37.0
% Reduction from Control:	-23.7%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

CONTROL - 2 *Survival and Reproduction Data*

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

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.0

CONC: 100% Intake *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	5	5	4	6	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	13	10	13	12	10	10	12	12	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	14	17	18	16	16	15	17	15	15
Total young produced		32	31	31	36	33	30	31	33	32	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0
% Reduction from Control:	-6.7%

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007

Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	4	3	4	4	4	5	4	42
5	10	11	11	10	12	10	10	10	10	11	105
6	0	0	0	0	0	0	0	0	0	0	0
7	13	15	14	14	15	17	16	16	17	15	152
Total	27	31	30	28	30	31	30	30	32	30	299

11.3%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	5	5	4	5	4	5	5	45
5	10	10	11	10	11	10	11	13	11	10	107
6	0	0	0	0	0	0	0	0	0	0	0
7	14	17	15	19	16	16	16	17	16	18	164
Total	28	31	30	34	32	30	32	34	32	33	316

22.6%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	6	4	4	6	4	5	4	47
5	12	13	13	12	10	10	14	12	11	10	117
6	0	0	0	0	0	0	0	0	0	0	0
7	17	18	18	15	17	18	17	16	15	16	167
Total	34	36	35	33	31	32	37	32	31	30	331

45.2%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	6	6	4	5	4	5	5	6	4	49
5	11	13	13	10	13	12	12	10	11	11	116
6	0	0	0	0	0	0	0	0	0	0	0
7	18	19	19	19	16	17	17	19	18	16	178
Total	33	38	38	33	34	33	34	34	35	31	343

72.6%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	7	6	4	5	6	4	5	5	4	5	51
5	11	12	12	12	11	12	10	11	12	12	115
6	0	0	0	0	0	0	0	0	0	0	0
7	17	20	17	19	19	21	18	19	18	18	186
Total	35	38	33	36	36	37	33	35	34	35	352

100%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	5	5	5	5	4	5	6	6	4	51
5	13	13	12	14	10	11	14	13	13	12	125
6	0	0	0	0	0	0	0	0	0	0	0
7	21	18	20	19	21	17	22	18	19	19	194
Total	40	36	37	38	36	32	41	37	38	35	370

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	5	4	4	4	5	4	4	44
5	12	10	11	11	10	10	10	12	11	10	107
6	0	0	0	0	0	0	0	0	0	0	0
7	14	15	15	15	13	16	16	14	15	16	149
Total	30	30	31	31	27	30	30	31	30	30	300

100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	5	5	4	6	4	5	5	46
5	10	13	10	13	12	10	10	12	12	11	113
6	0	0	0	0	0	0	0	0	0	0	0
7	18	14	17	18	16	16	15	17	15	15	161
Total	32	31	31	36	33	30	31	33	32	31	320

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007

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

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

Project number: 3240

Reveiwed by:

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	27	31	30	28	30	31	30	30	32	30	100	29.9	4.8	Not applicable
11.3%	28	31	30	34	32	30	32	34	32	33	100	31.6	6.0	-5.7
22.6%	34	36	35	33	31	32	37	32	31	30	100	33.1	7.0	-10.7
45.2%	33	38	38	33	34	33	34	34	35	31	100	34.3	6.5	-14.7
72.6%	35	38	33	36	36	37	33	35	34	35	100	35.2	4.6	-17.7
100%	40	36	37	38	36	32	41	37	38	35	100	37.0	6.9	-23.7
Control - 2	30	30	31	31	27	30	30	31	30	30	100	30.0	3.8	Not applicable
100% Intake	32	31	31	36	33	30	31	33	32	31	100	32.0	5.3	-6.7

Outfall 101:
Dunnett's MSD value: 2.092
PMSD: 7.0

Intake:
Dunnett's MSD value: 1.127
PMSD: 3.8

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.
Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/30/2007	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	27.000	31.000	30.000	28.000	30.000	31.000	30.000	30.000	32.000	30.000
11.3	28.000	31.000	30.000	34.000	32.000	30.000	32.000	34.000	32.000	33.000
22.6	34.000	36.000	35.000	33.000	31.000	32.000	37.000	32.000	31.000	30.000
45.2	33.000	38.000	38.000	33.000	34.000	33.000	34.000	34.000	35.000	31.000
72.6	35.000	38.000	33.000	36.000	36.000	37.000	33.000	35.000	34.000	35.000
100	40.000	36.000	37.000	38.000	36.000	32.000	41.000	37.000	38.000	35.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.900	1.0000	29.900	27.000	32.000	4.847	10				33.517	1.0000
11.3	31.600	1.0569	31.600	28.000	34.000	6.004	10	-1.859	2.287	2.092	33.517	1.0000
22.6	33.100	1.1070	33.100	30.000	37.000	7.042	10	-3.498	2.287	2.092	33.517	1.0000
45.2	34.300	1.1472	34.300	31.000	38.000	6.454	10	-4.810	2.287	2.092	33.517	1.0000
72.6	35.200	1.1773	35.200	33.000	38.000	4.600	10	-5.794	2.287	2.092	33.517	1.0000
100	37.000	1.2375	37.000	32.000	41.000	6.861	10	-7.762	2.287	2.092	33.517	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.6246798	1.035	0.04521495	-0.0695896
Bartlett's Test indicates equal variances (p = 0.56)	3.92323184	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.09160219	0.06995325	65.0166667	4.18333333	1.9E-09	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Intake
Non-treated
May 30 - June 06, 2007
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/30/2007	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	30.000	31.000	31.000	27.000	30.000	30.000	31.000	30.000	30.000
100	32.000	31.000	31.000	36.000	33.000	30.000	31.000	33.000	32.000	31.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	30.000	1.0000	30.000	27.000	31.000	3.849	10				31.000	1.0000
100	32.000	1.0667	32.000	30.000	36.000	5.311	10	-3.078	1.734	1.127	31.000	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88865483	0.868	0.62026911	2.99845201
F-Test indicates equal variances (p = 0.26)	2.16666675	6.54108953		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	1.12677077	0.03755903	20	2.11111111	0.00648469	1, 18
Treatments vs D-Control						

Linear Interpolation (200 Resamples)

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

sqn_05-30-07data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 30 - June 06, 2007

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

Daily Chemical Analyses

Project number: 3240

Reviewed by: [illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.91	7.76	7.66	7.80	7.75	7.78	7.71	7.73	7.74	7.65	7.79	7.71	7.75	7.82
	DO (mg/L)	7.8	8.0	7.7	8.1	8.2	8.2	7.7	7.8	7.6	7.8	7.6	8.0	7.6	8.0
	Conductivity (µmhos/cm)	326		316		309		315		302		305		315	
	Alkalinity (mg/L $CaCO_3$)	60				61				59					
	Hardness (mg/L $CaCO_3$)	91				93				89					
	Temperature (°C)	24.9	24.6	24.6	24.9	24.7	24.8	24.8	25.1	24.6	24.8	24.8	24.6	24.9	24.7
11.3%	pH (SU)	7.83	7.77	7.76	7.80	7.82	7.78	7.68	7.74	7.64	7.65	7.63	7.71	7.79	7.78
	DO (mg/L)	8.0	8.0	8.3	8.1	8.0	8.2	8.0	7.8	7.6	7.9	7.8	8.0	8.0	8.0
	Conductivity (µmhos/cm)	306		291		292		290		294		310		298	
	Temperature (°C)	25.0	24.8	24.7	24.6	24.7	24.8	24.8	25.0	24.7	24.8	24.8	24.9	25.0	24.9
22.6%	pH (SU)	7.81	7.77	7.73	7.79	7.75	7.77	7.67	7.74	7.64	7.65	7.64	7.70	7.76	7.77
	DO (mg/L)	8.0	8.0	8.3	8.2	8.1	8.2	8.0	7.9	7.6	7.9	7.9	8.0	8.0	7.9
	Conductivity (µmhos/cm)	290		280		280		278		273		295		284	
	Temperature (°C)	25.0	24.5	24.6	24.7	24.7	24.7	24.8	24.8	24.7	24.8	24.8	24.9	25.0	24.9
45.2%	pH (SU)	7.78	7.75	7.71	7.78	7.67	7.76	7.63	7.74	7.54	7.64	7.61	7.70	7.67	7.76
	DO (mg/L)	8.0	8.0	8.3	8.2	8.2	8.2	8.0	8.0	7.8	8.0	7.9	8.1	8.1	8.0
	Conductivity (µmhos/cm)	260		250		254		250		245		253		253	
	Temperature (°C)	25.0	24.5	24.6	24.9	24.7	24.6	24.8	24.7	24.7	24.7	24.8	25.0	25.0	24.8
72.6%	pH (SU)	7.76	7.72	7.67	7.77	7.58	7.76	7.59	7.72	7.45	7.62	7.58	7.68	7.61	7.72
	DO (mg/L)	8.2	8.0	8.3	8.1	8.2	8.2	8.0	8.0	7.8	8.0	8.0	8.1	8.2	8.0
	Conductivity (µmhos/cm)	221		214		211		208		208		214		213	
	Temperature (°C)	25.0	24.7	24.7	24.9	24.7	24.9	24.9	24.9	24.7	24.9	24.8	24.8	25.0	24.8
100%	pH (SU)	7.73	7.72	7.63	7.76	7.48	7.74	7.55	7.71	7.35	7.61	7.50	7.67	7.55	7.69
	DO (mg/L)	8.2	8.0	8.4	8.0	8.3	8.2	8.2	8.0	7.9	8.0	7.9	8.1	8.3	8.0
	Conductivity (µmhos/cm)	182		177		176		172		170		173		174	
	Alkalinity (mg/L $CaCO_3$)	62				62				62					
	Hardness (mg/L $CaCO_3$)	73				73				71					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.5	24.7	24.6	24.6	24.6	25.1	24.8	24.8	24.7	24.8	24.9	25.0	25.0
100% Intake	pH (SU)	7.72	7.73	7.62	7.78	7.35	7.75	7.49	7.71	7.23	7.61	7.40	7.67	7.49	7.69
	DO (mg/L)	8.2	8.1	8.4	8.0	8.2	8.2	8.3	7.8	7.8	7.8	7.9	8.1	8.3	7.7
	Conductivity (µmhos/cm)	181		172		174		168		179		178		172	
	Alkalinity (mg/L $CaCO_3$)	59				60				60					
	Hardness (mg/L $CaCO_3$)	71				75				75					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.5	24.7	24.8	24.8	24.8	24.9	25.0	24.7	24.9	24.8	24.7	25.0	24.8

Species: *Ceriodaphnia dubia* Date: 05-30-07

Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KEK	KEK	KEK	KEK	KEK	KEK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.91	7.70	7.66	7.80	7.75	7.78
	DO (mg/L)	7.8	8.0	7.7	8.1	8.2	8.2
	Conductivity (µmhos/cm)	326		316		309	
	Alkalinity (mg $CaCO_3$/L)	60				61	
	Hardness (mg $CaCO_3$/L)	91				93	
	Temperature (°C)	24.9	24.6	24.6	24.9	24.7	24.8
11.3%	pH (S.U.)	7.83 ~~7.90~~	7.77	7.76	7.80	7.82	7.78
	DO (mg/L)	8.0	8.0	8.3	8.1	8.0	8.2
	Conductivity (µmhos/cm)	306		291		292	
	Temperature (°C)	25.0	24.8	24.7	24.6	24.7	24.8
22.6%	pH (S.U.)	7.81 ~~7.90~~	~~7.77~~	7.73	7.79	7.75	7.77
	DO (mg/L)	8.0	8.0	8.3	8.2	8.1	8.2
	Conductivity (µmhos/cm)	290		280		280	
	Temperature (°C)	25.0	24.5	24.6	24.7	24.7	24.7
45.2%	pH (S.U.)	~~8.0~~ 7.78	7.75	7.71	7.78	7.67	7.76
	DO (mg/L)	8.0	8.0	8.3	8.2	8.2	8.2
	Conductivity (µmhos/cm)	260		250		254	
	Temperature (°C)	25.0	24.5	24.6	24.9	24.7	24.6
72.6%	pH (S.U.)	7.76	7.72	7.67	7.77	7.58	7.76
	DO (mg/L)	8.2	8.0	8.3	8.1	8.2	8.2
	Conductivity (µmhos/cm)	221		214		211	
	Temperature (°C)	25.0	24.7	24.7	24.9	24.7	24.9
100%	pH (S.U.)	7.73	7.72	7.63	7.76	7.48	7.74
	DO (mg/L)	8.2	8.0	8.4	8.0	8.3	8.2
	Conductivity (µmhos/cm)	182		177		176	
	Alkalinity (mg $CaCO_3$/L)	62				62	
	Hardness (mg $CaCO_3$/L)	73				73	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.5	24.7	24.6	24.6	24.6
100% Intake	pH (S.U.)	7.72	7.73	7.62	7.78	7.35	7.75
	DO (mg/L)	8.2	8.1	8.4	8.0	8.2	8.2
	Conductivity (µmhos/cm)	181		172		174	
	Alkalinity (mg $CaCO_3$/L)	59				60	
	Hardness (mg $CaCO_3$/L)	71				75	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.5	24.7	24.8	24.8	24.8
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 05-30-07

		Day							
		3		4		5		6	
	Analyst	KEN	KEN	KEN	KEN	KEN	KEN	KEN	KEN
Concen-tration	Parameter								
CONTROL	pH (S.U.)	7.71	7.73	7.74	7.65	7.79	7.71	7.79	7.82
	DO (mg/L)	7.7	7.8	7.6	7.8	7.6	8.0	7.6	8.0
	Conductivity (µmhos/cm)	315		302		305		315	
	Alkalinity (mg $CaCO_3$/L)			59					
	Hardness (mg $CaCO_3$/L)			89					
	Temperature (°C)	24.8	25.1	24.6	24.8	24.8	24.6	24.9	24.7
11.3%	pH (S.U.)	7.68	7.74	7.64	7.65	7.63	7.71	7.79	7.78
	DO (mg/L)	8.0	7.8	7.6	7.9	7.8	8.0	8.0	8.0
	Conductivity (µmhos/cm)	290		294		310		298	
	Temperature (°C)	24.8	25.0	24.7	24.8	24.8	24.9	25.0	24.9
22.6%	pH (S.U.)	7.67	7.74	7.64	7.65	7.64	7.70	7.76	7.77
	DO (mg/L)	8.0	7.9	7.6	7.9	7.9	8.0	8.0	7.9
	Conductivity (µmhos/cm)	278		273		295		284	
	Temperature (°C)	24.8	24.8	24.7	24.8	24.8	24.9	25.0	24.9
45.2%	pH (S.U.)	7.63	7.74	7.54	7.64	7.61	7.70	7.67	7.76
	DO (mg/L)	8.0	8.0	7.8	8.0	7.9	8.1	8.1	8.0
	Conductivity (µmhos/cm)	250		245		253		253	
	Temperature (°C)	24.8	24.7	24.7	24.7	24.8	25.0	25.0	24.8
72.6%	pH (S.U.)	7.59	7.72	7.45	7.62	7.58	7.68	7.61	7.72
	DO (mg/L)	8.0	8.0	7.8	8.0	8.0	8.1	8.2	8.0
	Conductivity (µmhos/cm)	208		208		214		213	
	Temperature (°C)	24.9	24.9	24.7	24.9	24.8	24.8	25.0	24.8
100%	pH (S.U.)	7.55	7.71	7.35	7.61	7.50	7.67	7.55	7.69
	DO (mg/L)	8.2	8.0	7.9	8.0	7.9	8.1	8.3	8.0
	Conductivity (µmhos/cm)	172		170		173		174	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			71					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.8	24.8	24.7	24.8	24.9	25.0	25.0
100% Intake	pH (S.U.)	7.49	7.71	7.33	7.61	7.40	7.67	7.49	7.69
	DO (mg/L)	8.3	7.8	7.8	7.8	7.9	8.1	8.3	7.7
	Conductivity (µmhos/cm)	168		179		178		172	
	Alkalinity (mg $CaCO_3$/L)			60					
	Hardness (mg $CaCO_3$/L)			75					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	25.0	24.7	24.9	24.8	24.7	25.0	24.8
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 3240

County: Hamilton
Treatment: UV-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	Each concentration was treated
Effluent volume (mL)	282.5	~~339~~ 565	1130	1815	2500	for 2 minutes with a UV sterilizer
Diluent volume (mL)	2217.5	~~2161~~ 1935	1370	685	0	to remove pathogenic
Total volume (mL)	2500	2500	2500	2500	2500	interferences.

Test organism information:		*Test information:*	
Organism age:	20.75 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	05-29-07 1600	Incubator number:	3B
Organism source:	ATOX BATCH Pp 05-29-07	*Artemia* lot number:	B602040
Transfer bowl information:	pH = 7.86 Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 06-06-07	1330
Average transfer volume:	8.6 ml	Date / Time out: 06-07-07	1330
		Oven temperature:	60° C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Sample numbers used	Analyst
0	05-30-07	—	1600	1243	05-28-07 A	070529.01 & 02	JL
1	05-31-07	0800	1400	1309	05-28-07 A	070529.01 & 02	JL
2	06-01-07	0800	1404	1302	05-28-07 B	070531.02 & 03	JL
3	06-02-07	0900	1500	1245	05-28-07 B	070531.02 & 03	JL
4	06-03-07	0900	1500	1228	05-31-07 A	070602.01 & 02	JL
5	06-04-07	0830	1430	1222	05-31-07 A	070602.01 & 02	JL
6	06-05-07	0800	1428	1316	05-31-07 A	070602.01 & 02	JL
7	06-06-07			1252			JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.665		NOEC	100%
Average weight per surviving larvae:	0.665	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 05-30-07

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	CONTROL				11.3%				22.6%			
	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	9 1d	10	10	10	10
7	10	10	10	10	10	10	10	9 2G	10 1G	10 1SM	10	10
A = Pan weight (mg) Color identification: Magenta Analyst: LK	15.35	14.19	14.73	14.34	15.75	13.03	14.81	14.55	14.25	14.84	14.38	14.66
B = Pan + Larvae weight (mg) Analyst: LAB	22.11	20.33	21.59	21.16	22.23	19.79	21.55	22.42	21.87	20.77	21.58	21.76
Larvae weight (mg) = A – B	6.76	6.14	6.86	6.82	6.48	6.76	6.74	7.87	7.62	5.93	7.20	7.10
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.676	0.614	0.686	0.682	0.648	0.676	0.674	0.787	0.762	0.593	0.720	0.710
Average weight per initial number of larvae (mg)	0.665				0.696				0.696			
Percent reduction from control (%)							-4.8%				-4.8%	

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

Calculations and data reviewed: JH

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 05-30-07

Survival and Growth Data

Day	45.2%				72.6%				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	~~9~~ sk 10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10 lg	10 lg	10	10	10 sm	10	10	10	10	10
A = Pan weight (mg) Color identification: Magenta Analyst: JK	13.29	14.42	14.24	15.64	14.75	14.36	13.75	14.40	14.14	15.08	13.53	13.95
B = Pan + Larvae weight (mg) Analyst: LAB	19.70	20.50	22.12	23.01	20.96	21.70	19.17	20.56	20.43	21.11	19.83	19.99
Larvae weight (mg) = A – B	6.41	6.08	7.88	7.37	6.21	7.34	5.42	6.16	6.29	6.03	6.30	6.04
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.641	0.608	0.788	0.737	0.621	0.734	0.542	0.616	0.629	0.603	0.630	0.604
Average weight per initial number of larvae (mg)	0.694				0.628				0.617			
Percent reduction from control (%)			-4.4%				5.5%				7.2%	

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

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 05-30-07

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	2SH 10	10	10	10
A = Pan weight (mg) Color identification: Magenta Analyst: ~~MB~~ JK	14.13	14.06	12.62	15.71
B = Pan + Larvae weight (mg) Analyst: LAB	19.12	21.02	18.89	22.41
Larvae weight (mg) = A – B	4.99	6.96	6.27	6.70
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.499	0.696	0.627	0.670
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.623		6.2%	

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

Calculations and data reviewed: JS

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
May 30 - June 06, 2007

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

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

Project number: 3240

Reveiwed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	15.35	22.11	6.76	0.676	0.665	5.1	0.676	100.0	0.665	5.1	Not applicable
	B	10	10	14.19	20.33	6.14	0.614			0.614				
	C	10	10	14.73	21.59	6.86	0.686			0.686				
	D	10	10	14.34	21.16	6.82	0.682			0.682				
11.3%	E	10	10	15.75	22.23	6.48	0.648	0.718	14.6	0.648	97.5	0.696	8.9	-4.8
	F	10	10	13.03	19.79	6.76	0.676			0.676				
	G	10	10	14.81	21.55	6.74	0.674			0.674				
	H	10	9	14.55	22.42	7.87	0.874			0.787				
22.6%	I	10	10	14.25	21.87	7.62	0.762	0.696	10.4	0.762	100.0	0.696	10.4	-4.8
	J	10	10	14.84	20.77	5.93	0.593			0.593				
	K	10	10	14.38	21.58	7.20	0.720			0.720				
	L	10	10	14.66	21.76	7.10	0.710			0.710				
45.2%	M	10	10	13.29	19.70	6.41	0.641	0.694	12.0	0.641	100.0	0.694	12.0	-4.4
	N	10	10	14.42	20.50	6.08	0.608			0.608				
	O	10	10	14.24	22.12	7.88	0.788			0.788				
	P	10	10	15.64	23.01	7.37	0.737			0.737				
72.6%	Q	10	10	14.75	20.96	6.21	0.621	0.628	12.6	0.621	100.0	0.628	12.6	5.5
	R	10	10	14.36	21.70	7.34	0.734			0.734				
	S	10	10	13.75	19.17	5.42	0.542			0.542				
	T	10	10	14.40	20.56	6.16	0.616			0.616				
100%	U	10	10	14.14	20.43	6.29	0.629	0.617	2.4	0.629	100.0	0.617	2.4	7.2
	V	10	10	15.08	21.11	6.03	0.603			0.603				
	W	10	10	13.53	19.83	6.30	0.630			0.630				
	X	10	10	13.95	19.99	6.04	0.604			0.604				
100% Intake	Y	10	10	14.13	19.12	4.99	0.499	0.623	14.0	0.499	100.0	0.623	14.0	6.2
	Z	10	10	14.06	21.02	6.96	0.696			0.696				
	AA	10	10	12.62	18.89	6.27	0.627			0.627				
	BB	10	10	15.71	22.41	6.70	0.670			0.670				

Outfall 101:
Dunnett's MSD value: 0.1071
PMSD: 16.1

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Intake:
Dunnett's MSD value: 0.0911
PMSD: 13.7

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
May 30 - June 06, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/30/2007	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.6760	0.6140	0.6860	0.6820
11.3	0.6480	0.6760	0.6740	0.7870
22.6	0.7620	0.5930	0.7200	0.7100
45.2	0.6410	0.6080	0.7880	0.7370
72.6	0.6210	0.7340	0.5420	0.6160
100	0.6290	0.6030	0.6300	0.6040

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6645	1.0000	0.6645	0.6140	0.6860	5.104	4				0.6876	1.0000
11.3	0.6963	1.0478	0.6963	0.6480	0.7870	8.880	4	-0.715	2.410	0.1071	0.6876	1.0000
22.6	0.6963	1.0478	0.6963	0.5930	0.7620	10.402	4	-0.715	2.410	0.1071	0.6876	1.0000
45.2	0.6935	1.0436	0.6935	0.6080	0.7880	12.032	4	-0.653	2.410	0.1071	0.6876	1.0000
72.6	0.6283	0.9454	0.6283	0.5420	0.7340	12.609	4	0.816	2.410	0.1071	0.6283	0.9137
100	0.6165	0.9278	0.6165	0.6030	0.6300	2.437	4	1.080	2.410	0.1071	0.6165	0.8966

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96499479	0.884	0.11010883	-0.2509188
Bartlett's Test indicates equal variances (p = 0.19)	7.4650507	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.10706301	0.16111815	0.00517108	0.00394707	0.30368891	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05	61.066	14.544	0.000	99.872	-0.2097
IC10	94.491				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				

TVA / Sequoyah Nuclear Plant, Intake
UV-treated
May 30 - June 06, 2007
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/30/2007	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.6760	0.6140	0.6860	0.6820
100	0.4990	0.6960	0.6270	0.6700

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6645	1.0000	0.6645	0.6140	0.6860	5.104	4				0.6645	1.0000
100	0.6230	0.9375	0.6230	0.4990	0.6960	14.033	4	0.885	1.943	0.0911	0.6230	0.9375

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.89268976		0.749		-1.2560788	1.77523149
F-Test indicates equal variances (p = 0.15)	6.64445066		47.4672279			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences	0.09111043	0.13711126	0.0034445	0.00439683	0.41016689	1, 6
Treatments vs D-Control						

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	80.060			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
May 30 - June 06, 2007

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

Daily Chemical Analyses

Project number: 3240

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.87	7.55	7.83	7.52	7.90	7.41	7.83	7.42	7.81	7.34	7.76	7.50	7.76	7.64
	DO (mg/L)	8.0	7.7	7.9	7.2	7.6	7.2	8.2	6.7	7.9	6.7	7.9	7.3	8.1	7.9
	Conductivity (µmhos/cm)	318		306		301		305		295		302		305	
	Temperature (°C)	25.0	24.4	24.7	24.2	24.7	24.3	24.9	24.6	24.7	24.4	24.9	24.6	25.0	24.5
11.3%	pH (SU)	7.87	7.62	7.83	7.52	7.87	7.40	7.84	7.40	7.80	7.32	7.76	7.50	7.76	7.64
	DO (mg/L)	8.1	7.7	8.2	7.1	7.6	6.9	8.2	6.8	7.9	6.8	7.9	7.2	8.1	7.7
	Conductivity (µmhos/cm)	308		300		291		295		286		292		299	
	Temperature (°C)	25.0	24.4	24.8	24.1	24.8	24.3	24.9	24.4	24.8	24.5	24.9	24.4	25.0	24.5
22.6%	pH (SU)	7.87	7.62	7.84	7.51	7.82	7.40	7.84	7.40	7.74	7.31	7.77	7.47	7.77	7.65
	DO (mg/L)	8.2	7.8	8.2	7.0	7.8	6.9	8.2	6.9	8.0	6.4	8.0	7.2	8.1	7.9
	Conductivity (µmhos/cm)	295		283		278		279		273		278		288	
	Temperature (°C)	25.0	24.2	24.8	24.3	24.8	24.1	24.9	24.2	24.8	24.4	24.9	24.4	25.0	24.3
45.2%	pH (SU)	7.84	7.56	7.83	7.48	7.78	7.39	7.83	7.34	7.69	7.28	7.76	7.44	7.75	7.65
	DO (mg/L)	8.3	7.9	8.2	7.1	7.8	7.0	8.3	6.9	8.1	6.4	8.0	7.1	8.1	8.0
	Conductivity (µmhos/cm)	263		256		250		253		245		249		256	
	Temperature (°C)	25.1	24.2	24.7	24.3	24.8	24.2	24.9	24.2	24.8	24.6	24.9	24.5	25.1	24.3
72.6%	pH (SU)	7.83	7.55	7.83	7.47	7.71	7.38	7.79	7.34	7.61	7.29	7.72	7.44	7.71	7.59
	DO (mg/L)	8.3	7.8	8.2	7.1	8.0	7.0	8.3	6.8	8.2	6.5	8.1	7.1	8.2	7.9
	Conductivity (µmhos/cm)	227		216		215		212		211		214		280	
	Temperature (°C)	25.1	24.3	24.7	24.5	24.8	24.4	25.0	24.4	24.8	24.3	24.9	24.5	25.1	24.2
100%	pH (SU)	7.82	7.52	7.79	7.47	7.63	7.36	7.76	7.33	7.54	7.28	7.66	7.44	7.66	7.58
	DO (mg/L)	8.3	7.8	8.2	7.3	8.0	7.1	8.3	7.7	8.3	6.6	8.2	7.1	8.2	7.9
	Conductivity (µmhos/cm)	188		176		178		174		173		176		181	
	Temperature (°C)	25.1	24.5	24.8	24.3	24.8	24.4	25.1	24.3	24.8	24.4	24.8	24.5	25.1	24.3
100% Intake	pH (SU)	7.81	7.44	7.78	7.45	7.54	7.32	7.74	7.33	7.36	7.24	7.66	7.44	7.66	7.64
	DO (mg/L)	8.4	7.9	8.3	7.4	8.1	7.0	8.4	6.9	8.3	6.5	8.1	7.4	8.0	7.9
	Conductivity (µmhos/cm)	188		174		177		172		169		171		176	
	Temperature (°C)	25.1	24.5	24.8	24.4	24.8	24.2	25.0	24.3	24.7	24.5	24.8	24.3	25.0	24.2

Species: *Pimephales promelas* Date: 05-30-07
Client: TVA / Sequoyah Nuclear Plant – UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KKK	KKK	KKK	KKK	KKK	KKK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.87	7.55	7.83	7.52	7.90	7.41
	DO (mg/L)	8.0	7.7	7.9	7.2	7.6	~~8.2~~ 7.2
	Conductivity (µmhos/cm)	318		306		301	
	Temperature (°C)	25.0	24.4	24.7	24.2	24.7	24.3
11.3%	pH (S.U.)	7.87	7.62	7.83	7.52	7.87	7.40
	DO (mg/L)	8.1	7.7	8.2	7.1	7.6	6.9
	Conductivity (µmhos/cm)	308		300		291	
	Temperature (°C)	25.0	24.4	24.8	24.1	24.8	24.3
22.6%	pH (S.U.)	7.87	7.62	7.84	7.51	7.82	7.40
	DO (mg/L)	8.2	7.8	8.2	7.0	7.8	6.9
	Conductivity (µmhos/cm)	295		283		278	
	Temperature (°C)	25.0	24.2	24.8	24.3	24.8	24.1
45.2%	pH (S.U.)	7.84	7.56	7.83	7.48	7.78	7.39
	DO (mg/L)	8.3	7.9	8.2	7.1	7.8	7.0
	Conductivity (µmhos/cm)	263		256		250	
	Temperature (°C)	25.1	24.2	24.7	24.3	24.8	24.2
72.6%	pH (S.U.)	7.83	7.55	7.83	7.47	7.71	7.38
	DO (mg/L)	8.3	7.8	8.2	7.1	8.0	7.0
	Conductivity (µmhos/cm)	227		216		215	
	Temperature (°C)	25.1	24.3	24.7	24.5	24.8	24.4
100%	pH (S.U.)	7.82	7.52	7.79	7.47	7.63	7.36
	DO (mg/L)	8.3	7.8	8.2	7.3	8.0	7.1
	Conductivity (µmhos/cm)	188		176		178	
	Temperature (°C)	25.1	24.5	24.8	24.3	24.8	24.4
100% Intake	pH (S.U.)	7.81	7.44	7.78	7.45	7.54	7.32
	DO (mg/L)	8.4	7.9	8.3	7.4	8.1	7.0
	Conductivity (µmhos/cm)	188		174		177	
	Temperature (°C)	25.1	24.5	24.8	24.4	24.8	24.2
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 05-30-07
Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		3		4		5		6	
	Analyst	KLR	KLR	KLR	KLR	KLR	KLR	KLR	KLR
Concen-tration	Parameter								
CONTROL	pH (S.U.)	7.83	7.42	7.81	7.34	7.76	7.50	7.76	7.64
	DO (mg/L)	8.2	6.7	7.9	6.7	7.9	7.3	8.1	7.9
	Conductivity (µmhos/cm)	305		295		302		305	
	Temperature (°C)	24.9	24.6	24.7	24.4	24.9	24.6	25.0	24.5
11.3%	pH (S.U.)	7.84	7.40	7.80	7.32	7.76	7.50	7.76	7.64
	DO (mg/L)	8.2	6.8	7.9	6.8	7.9	7.2	8.1	7.7
	Conductivity (µmhos/cm)	295		286		292		299	
	Temperature (°C)	24.9	24.4	24.8	24.5	24.9	24.4	25.0	24.5
22.6%	pH (S.U.)	7.84	7.40	7.74	7.31	7.77	7.47	7.77	7.65
	DO (mg/L)	8.2	6.9	8.0	6.4	8.0	7.2	8.1	7.9
	Conductivity (µmhos/cm)	279		273		278		288	
	Temperature (°C)	24.9	24.2	24.8	24.4	24.9	24.4	25.0	24.3
45.2%	pH (S.U.)	7.83	7.34	7.69	7.28	7.76	7.44	7.75	7.65
	DO (mg/L)	8.3	6.9	8.1	6.4	8.0	7.1	8.1	8.0
	Conductivity (µmhos/cm)	253		245		249		256	
	Temperature (°C)	24.9	24.2	24.8	24.6	24.9	24.5	25.1	24.3
72.6%	pH (S.U.)	7.79	7.34	7.61	7.29	7.72	7.44	7.71	7.59
	DO (mg/L)	8.3	6.8	8.2	6.5	8.1	7.1	8.2	7.9
	Conductivity (µmhos/cm)	212		211		214		280	
	Temperature (°C)	25.0	24.4	24.8	24.3	24.9	24.5	25.1	24.2
100%	pH (S.U.)	7.76	7.33	7.54	7.28	7.66	7.44	7.66	7.58
	DO (mg/L)	8.3	7.7	8.3	6.6	8.2	7.1	8.2	7.9
	Conductivity (µmhos/cm)	174		173		176		181	
	Temperature (°C)	25.1	24.3	24.8	24.4	24.8	24.5	25.1	24.3
100% Intake	pH (S.U.)	7.74	7.33	7.36	7.24	7.66	7.44	7.66	7.64
	DO (mg/L)	8.4	6.9	8.3	6.5	8.1	7.4	8.0	7.9
	Conductivity (µmhos/cm)	192		169		171		176	
	Temperature (°C)	25.0	24.3	24.7	24.5	24.8	24.3	25.0	24.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst	JI	Iodide reagent:	CHM254
Date analyzed	05-30-07	Acid reagent:	CHM258

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS482	INSS482

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%)
INSS482	0.50	0.464	92.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
070530.02	WASHINGTON	CLEAR, NO COLOR	S < 0.0000218	
↓	Duplicate		D < 0.0000154	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		< 0.000452
070529.01	SQN 101	LIGHT TAN, CLEAR, PARTICLES	< 0.00199
070529.02	SQN INTAKE	LIGHT TAN, CLEAR, PARTICLES	< 0.00386
070530.01	HANTEO	LIGHT GREEN CLEAR	< 0.0000266
	~~WASHINGTON~~ JI		
			JI

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%)
INSS482	0.50	0.471	94.2%

Reviewed by	JI
Date reviewed	05-31-07

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

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

Analyst	LAB	Iodide reagent:	CHN254
Date analyzed	05-31-07	Acid reagent:	INR258

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5482	INS5482

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%)
INS5482	0.50	0.519	103.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
070531.02	TVA-SQN-101	clear, no color	S <0.0127	
↓	Duplicate		D <0.0119	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0100
070531.03	TVA-SQN-Int.	slightly cloudy w/ part., no color	<0.0106
070531.02	~~Edlub~~ Exide	clear, no color	<0.00213
			UB

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%)
INS5482	0.50	0.500	100%

Reviewed by	[illegible]
Date reviewed	05-31-07

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

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

Analyst	LAB	Iodide reagent:	CHN254
Date analyzed	06-02-07	Acid reagent:	INR258

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS482	INSS482

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%)
INSS482	0.50	0.481	96.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
070602.02-	TVA-SQN-Int	clear, no color	S <0.0398	
)	Duplicate		D <0.0385	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00740
070602.01	TVA-SQN-101	clear, no color	<0.0460
			UB

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%)
INSS482	0.50	0.474	94.8%

Reviewed by	[illegible]
Date reviewed	06-02-07

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst	BEK
Date analyzed	06-03-07

Titrate samples to pH = 4.50 S.U.

Time initiated	1130
Time completed	1210

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
5.6	INR941	INS5472	0.0	12.3	12.3	0.0203	10.2

B/L correction 0.0 - 0.0 = 0.0 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%)
INS5407	100	100	12.3	21.5	9.2	10.2	94	94.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-31-07A	MHS H2O	100	21.5	27.3	5.8	10.2	S 59	
↓	Duplicate (B)	↓	27.3	33.1	5.8	↓	D 59	—

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)
INS5407	50	100	27.3	37.9	10.6	10.2	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
59	51	102.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
05-31-07 B	MHS H2O	100	37.9	43.7	5.8	10.2	59
05-21-07	↓	↓	0.0	6.0	6.0	↓	61
05-28-07 A			6.0	11.9	5.9		60
05-28-07 B			11.9	17.9	6.0		61
070531.01	Exide		17.9	24.4	6.5		66
39511	EES# 050744		24.4	26.4	2.0		20
39512	↓ 050745		26.5	28.5	2.0		20
39513	↓ 050746		28.5	30.0	1.5		15
05-28-07 A	MHS UV 1	↓	30.0	36.0	6.0	↓	~~60~~ 61

Reviewed by: [signature] Date reviewed: 06-18-07

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst: KJ
Date analyzed: 06-03-07

Titrate samples to pH = 4.50 S.U.

Time initiated:
Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS54 07	100	100	36.0	45.2	9.2	10.2	94	94.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-28-07B	MITS VV 2	100	0.0	5.8	5.8	10.2	S 59	
↓	Duplicate (B)	↓	5.8	11.5	5.7	↓	D 58	1.7%

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)
INS54 07	50	100	5.8	16.4	10.6	10.2	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
58	52	104.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
05-31-07A	MITS VV 3	100	16.4	22.0	5.6	10.2	57
070529.01	TVA SQN 1	↓	22.0	28.1	6.1	↓	62
070531.02	↓ 2	↓	28.3	34.4	6.1	↓	62
070602.01	↓ 3	↓	34.4	40.5	6.1	↓	62
070529.02	TVA SQN INT 1	↓	40.5	46.3	5.8	↓	59
070531.03	↓ 2	↓	0.0	5.9	5.9	↓	60
070602.02	↓ 3	↓	5.9	11.8	5.9	↓	60
070529.01	TVA SQN UV 1	↓	11.8	17.8	6.0	↓	61
070531.02	↓ 2	↓	17.8	23.9	6.1	↓	62

Reviewed by: [signature]
Date reviewed: 06-18-07

Alkalinity
(EPA Method 310.1)

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

Analyst: KCL

Date analyzed: 06-05-07

Time initiated:

Time completed:

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5407	100	100	23.9	33.8	9.9	10.2	101	101.0%

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%)
070602.01	TVA-SQNUV3 ~~TVA-SQNINT~~	100	33.9	40.0	6.1	10.2	S 62	
↓	Duplicate (B)	↓	40.0	46.0	6.0	↓	D 61	1.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5407	50	100	16.3	21.0	4.7	10.2	48

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%)
61	48	96.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
070529.02 ~~03~~	TVA-SONINT-V31	100	21.0	27.0	6.0	10.2	61
070531.03	2	↓	27.0	33.1	6.1	↓	62
070602.02	3	↓	33.1	39.1	6.0	↓	61

Reviewed by: JL

Date reviewed: 06-18-07

Environmental Testing Solutions, Inc.

Total Hardness
(EPA Method 130.2)

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

Analyst	[illegible]	Time initiated	1047
Date analyzed	06-08-07	Time completed	1119

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
INR255	INS5474	0.0	9.9	9.9	0.020	20.2

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5436	40	50	9.9	12.0	2.1	20.2	42	105.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-31-07A	MITS H2O	50	12.0	16.4	4.4	20.2	S 89	
↓	Duplicate (B)	↓	16.4	21.0	4.6	↓	D 93	4.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INS5436	40	50	16.4	23.9	6.5	20.2	130

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%)
93	37	92.5%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TVENP	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20.2	ND
05-31-07 B	MITS H2O		23.9	27.4	4.5		91
05-21-07			27.4	31.9	4.5		91
05-28-07 A			31.9	36.4	4.5		91
05-28-07 B	↓		36.4	41.0	4.6		93
070531.01	Exide		41.0	41.3	0.3		6.1
05-28-07A	MITS UU 1		41.3	45.6	4.3		87
05-28-07B	2		0.0	4.4	4.4		89
05-31-07A	↓ 3		4.4	8.6	4.2		85
070529.01	TVASGN 1	↓	8.6	12.2	3.6	↓	73

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 06-18-07

Total Hardness
(EPA Method 130.2)

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

Analyst	KEN	Time initiated	
Date analyzed	06-03-07	Time completed	

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%)
INS5436	40	50	12.2	14.2	2.0	20.2	40	100.0%

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%)
070531.02	TVA SQN 2	50	14.2	17.8	3.6	20.2	S 73	
↓	Duplicate (B)	↓	17.8	21.5	3.7	↓	D 75	2.7%

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)
INS5436	40	50	17.8	23.5	5.7	20.2	120

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
75	45	112.5%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank ~~(should be = 0 mg $CaCO_3$/L)~~						
070602.01	TVA SQN 3	50	23.5	27.0	3.5	20.2	71
070529.02	TVA SQN INT 1		27.0	30.5	3.5		71
070531.03	2		30.5	34.2	3.7		75
070602.02	3		34.2	37.9	3.7		75
070529.01	TVA SQN UV 1		37.9	41.5	3.6		73
070531.02	2		41.5	45.0	3.5		71
070602.01	3		45.0	48.6	3.6		73
070529.02	TVA SQN INT UV 1		31.1	34.6	3.5		71
070531.03	2		34.6	38.3	3.7		75
070602.02	3		38.3	~~34.0~~ 41.7	3.4		69

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: dl Date reviewed 06-18-07

Sequoyah Nuclear Plant Biomonitoring
May 30 – June 6, 2007

Appendix D

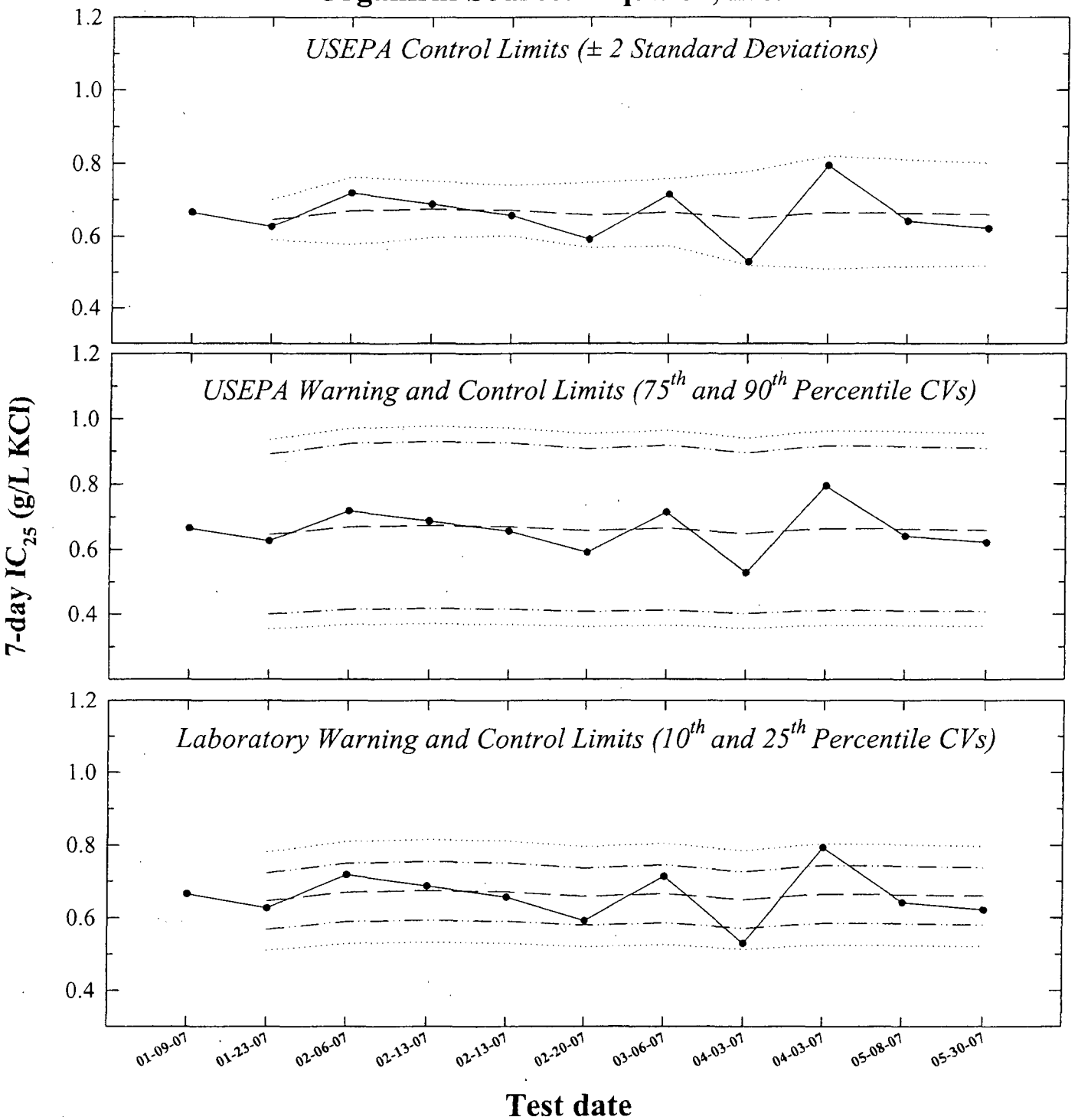
Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, Inc.

Pimephales promelas

Potassium Chloride Chronic Reference Toxicant Control Chart using Moderately Hard Synthetic Water

Organism Source: Aquatox, Inc.



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

Central Tendency (mean IC_{25})

Warning Limits (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

Control Limits (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

Pimephales promelas
Potassium Chloride Chronic Reference Toxicant Control Chart
using Moderately Hard Synthetic Water
Organism Source: Aquatox, Inc.

Test number	Test date	7-day IC_{25} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	01-09-07	0.67																	
2	01-23-07	0.63	0.65	0.03	0.59	0.70	0.08	0.57	0.72	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.04
3	02-06-07	0.72	0.67	0.05	0.58	0.76	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.42	0.92	0.30	0.37	0.97	0.07
4	02-13-07	0.69	0.67	0.04	0.60	0.75	0.08	0.59	0.76	0.14	0.53	0.82	0.26	0.42	0.93	0.30	0.37	0.98	0.06
5	02-13-07	0.66	0.67	0.03	0.60	0.74	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.42	0.93	0.30	0.37	0.97	0.05
6	02-20-07	0.59	0.66	0.04	0.57	0.75	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.95	0.07
7	03-06-07	0.71	0.67	0.05	0.57	0.76	0.08	0.59	0.75	0.14	0.53	0.81	0.25	0.41	0.92	0.30	0.37	0.97	0.07
8	04-03-07	0.53	0.65	0.06	0.52	0.78	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.90	0.29	0.36	0.94	0.10
9	04-03-07	0.79	0.66	0.08	0.51	0.82	0.08	0.59	0.74	0.14	0.53	0.80	0.25	0.41	0.92	0.30	0.37	0.96	0.12
10	05-08-07	0.64	0.66	0.07	0.52	0.81	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.11
11	05-30-07	0.62	0.66	0.07	0.52	0.80	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.11

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

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

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

Laboratory Control and Warning Limits

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

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

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

USEPA Control and Warning Limits

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

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

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

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

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Pimephales promelas
Potassium Chloride Chronic Reference Toxicant Data using Moderately Hard Synthetic Water
Organism Source: Aquatox, Inc.

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	01-09-07	100	0.724		9.1		0.10	13.4	
2	01-23-07	100	0.665	0.695	2.9	6.0	0.10	15.3	14.4
3	02-06-07	100	0.673	0.687	12.3	8.1	0.10	15.0	14.6
4	02-13-07	100	0.567	0.657	4.3	7.1	0.06	10.4	13.5
5	02-13-07	100	0.598	0.645	10.6	7.8	0.08	12.6	13.4
6	02-20-07	100	0.531	0.626	6.3	7.6	0.12	22.8	14.9
7	03-06-07	100	0.734	0.642	15.6	8.7	0.12	15.8	15.0
8	04-03-07	100	0.724	0.652	14.8	9.5	0.11	15.8	15.1
9	04-03-07	100	0.763	0.664	3.7	8.8	0.12	15.9	15.2
10	05-08-07	100	0.883	0.686	6.1	8.6	0.09	10.5	14.8
11	05-30-07	100	0.790	0.695	12.2	8.9	0.11	13.6	14.7

Note:

CV = Coefficient of variation for control growth.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

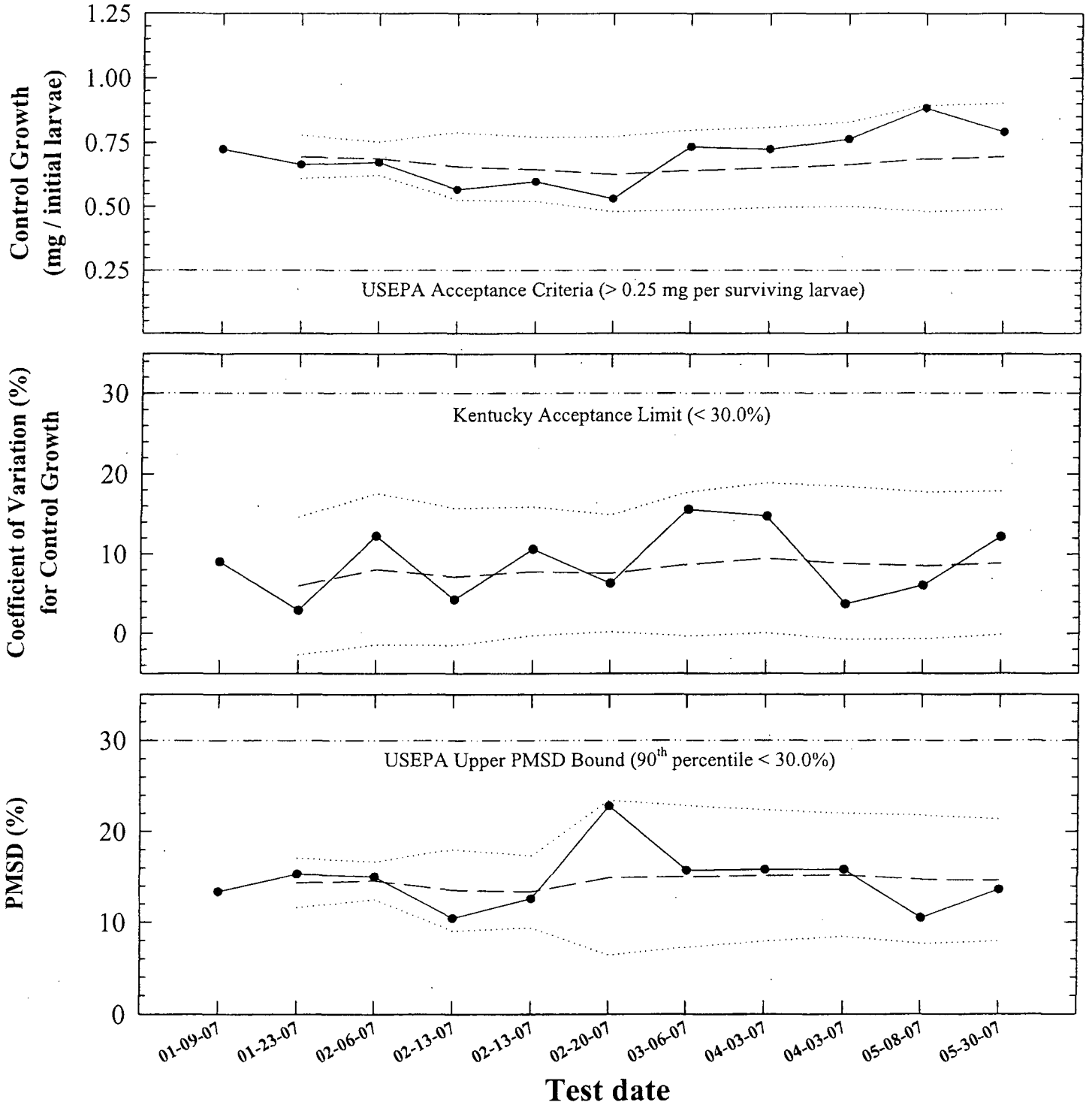
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

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

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.
USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2 Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Pimephales promelas Control Growth, Coefficient of Variation, and PMSD in Potassium Chloride Chronic Reference Toxicant Tests
Organism Source: Aquatox, Inc.



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)** PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— — **Central Tendency** (mean Control Growth, CV, or PMSD)

..... **Control Limits** (mean Control Growth, CV, or PMSD ± 2 Standard Deviations)

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

PpKClCR Test Number: 124

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 306					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	450	600	750	900	1050	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	991	988	985	982	979	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age:	21.5 HOURS OLD	Randomizing template:	~~Yellow~~ PURPLE
Date and times organisms were born between:	05-29-07 1600	Incubator number and shelf location:	3C 3D
Organism source:	ATOX BATCH Pp 05-29-07	*Artemia* lot number:	B602041U
Transfer bowl information:	pH = 7.86 SU Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 06-06-07	1330
Average transfer volume:	8.6 mL	Date / Time out: 06-07-07	1330
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Analyst
0	05-30-07	—	1600	1326	05-28-07 A	dl
1	05-31-07	0800	1400	1324	05-28-07 A	dl
2	06-01-07	0800	1404	1320	05-28-07 B	dl
3	06-02-07	0900	1500	1230	05-28-07 B	dl
4	06-03-07	0900	1500	1243	05-31-07 A	dl
5	06-04-07	0830	1430	1250	05-31-07 A	dl
6	06-05-07	0800	1428	1330	05-31-07 A	dl
7	06-06-07			1323		dl

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	835.3
Average weight per initial larvae:	0.790		NOEC	<450
Average weight per surviving larvae:	0.790	≥ 0.25 mg/larvae	LOEC	450
			ChV	<450
			IC_{25}	621.0

Species: *Pimephales promelas* PpKClCR Test Number: 124

Survival and Growth Data

Day	Control				450 mg KCl/L				600 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	9 d
2	10	10	10	10	10	10	10	10	10	10	10	9
3	10	10	10	10	10	10	10	10	10	10	10	9
4	10	10	10	10	10	10	10	10	10	10	10	9
5	10	10	10	10	10	10	10	10	10	10	10	9
6	10	10	10	10	10	10	10	10	9 d	10	10	9
7	10	10	10	10 ISM	10	10	10 ISM	10 ISM	9	10	10	9
A = Pan weight (mg) Tray color code:: green Analyst: YK	14.72	15.05	14.73	13.60	13.91	14.40	14.11	14.79	14.17	14.47	13.92	14.63
B = Pan + Larvae weight (mg) Analyst: LAB	22.95	23.93	22.62	20.19	20.46	21.03	19.52	20.38	20.11	21.25	20.23	21.25
C = Larvae weight (mg) = A – B	8.23	8.88	7.89	6.59	6.55	6.63	5.41	5.59	5.94	6.78	6.31	6.62
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.823	0.888	0.789	0.659	0.655	0.663	0.541	0.559	0.594	0.678	0.631	0.662
Average weight per initial number of larvae (mg)	0.790				0.605				0.641			
Percent reduction from control (%)							23.5%				18.8%	

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

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas* PpKClCR Test Number: 124

Survival and Growth Data

Day	750 mg KCl/L				900 mg KCl/L				1050 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	8 2d	7 3d	8 2d	8 2d	9 1d	7 3d	7 3d	7 3d	4 6d	4 6d	6 4d	5 5d
2	8	7	8	8	9	7	7	7	4	4	5 1d	4 1d
3	8	6 1d	8	7 1d	8 1d	7	7	7	4	4	5	4
4	8	6	8	6 1d	7 1d	6 1d	6 1d	4 3d	2 3d	2 2d	4 1d	2 2d
5	7 1d	6	8	5 1d	5 2d	5 1d	4 2d	4	2	2	3 1d	1 1d
6	7	6	7 1d	5	5	4 1d	4	2 2d	1 1d	2	3	1
7	7	6	7	5 1SM	5	4	4	2 SM	1 LG	2 SM	3 SM	1 SM
A = Pan weight (mg) Tray color code:: green Analyst: JL	13.85	14.55	13.13	14.78	14.32	13.88	14.23	13.81	13.84	13.29	14.51	14.42
B = Pan + Larvae weight (mg) Analyst: LAB	18.42	18.54	17.82	17.70	17.68	16.34	17.14	14.87	14.58	13.96	15.98	14.86
C = Larvae weight (mg) = A – B	4.57	3.99	4.69	2.92	3.36	2.46	2.91	1.06	0.74	0.67	1.47	0.44
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.457	0.399	0.469	0.292	0.336	0.246	0.291	0.106	0.074	0.067	0.147	0.044
Average weight per initial number of larvae (mg)	0.404				0.245				0.083			
Percent reduction from control (%)			46.8%				69.0%				89.5%	

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

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, Inc.

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

Species: *Pimephales promelas*

Organism Source: Aquatox, Inc.

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKClCR # 124

Test dates: May 30 - June 06, 2007

Reveiwed 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 / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.72	22.95	8.23	0.823	0.790	12.2	0.823	100.0	0.790	12.2	Not applicable
	B	10	10	15.05	23.93	8.88	0.888			0.888				
	C	10	10	14.73	22.62	7.89	0.789			0.789				
	D	10	10	13.60	20.19	6.59	0.659			0.659				
450	E	10	10	13.91	20.46	6.55	0.655	0.605	10.5	0.655	100.0	0.605	10.5	23.5
	F	10	10	14.40	21.03	6.63	0.663			0.663				
	G	10	10	14.11	19.52	5.41	0.541			0.541				
	H	10	10	14.79	20.38	5.59	0.559			0.559				
600	I	10	9	14.17	20.11	5.94	0.660	0.676	6.5	0.594	95.0	0.641	5.8	18.8
	J	10	10	14.47	21.25	6.78	0.678			0.678				
	K	10	10	13.92	20.23	6.31	0.631			0.631				
	L	10	9	14.63	21.25	6.62	0.736			0.662				
750	M	10	7	13.85	18.42	4.57	0.653	0.643	6.2	0.457	62.5	0.404	20.0	48.8
	N	10	6	14.55	18.54	3.99	0.665			0.399				
	O	10	7	13.13	17.82	4.69	0.670			0.469				
	P	10	5	14.78	17.70	2.92	0.584			0.292				
900	Q	10	5	14.32	17.68	3.36	0.672	0.636	13.3	0.336	37.5	0.245	40.7	69.0
	R	10	4	13.88	16.34	2.46	0.615			0.246				
	S	10	4	14.23	17.14	2.91	0.728			0.291				
	T	10	2	13.81	14.87	1.06	0.530			0.106				
1050	U	10	1	13.84	14.58	0.74	0.740	0.501	34.3	0.074	17.5	0.083	53.7	89.5
	V	10	2	13.29	13.96	0.67	0.335			0.067				
	W	10	3	14.51	15.98	1.47	0.490			0.147				
	X	10	1	14.42	14.86	0.44	0.440			0.044				

Dunnett's MSD value: 0.1078 MSD = Minimum Significant Difference

PMSD: 13.6 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.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/30/2007	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.9000	1.0000	1.0000	0.9000
750	0.7000	0.6000	0.7000	0.5000
900	0.5000	0.4000	0.4000	0.2000
1050	0.1000	0.2000	0.3000	0.1000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
450	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
600	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
*750	0.6250	0.6250	0.9134	0.7854	0.9912	10.805	4	10.00	10.00	15	40
*900	0.3750	0.3750	0.6546	0.4636	0.7854	20.756	4	10.00	10.00	25	40
*1050	0.1750	0.1750	0.4217	0.3218	0.5796	29.582	4	10.00	10.00	33	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95849895	0.884	-0.3201935	0.12279251
Equality of variance cannot be confirmed				

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

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	10.2420223	1.34262248	7.61048221	12.8735624	0	1.15610913	7.81472778	0.76	2.92182665	0.09763697	3
Intercept	-24.925414	3.91623483	-32.601234	-17.249593							
TSCR											

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	495.095634	411.397448	554.477589
EC05	3.355	577.06951	503.787688	628.611518
EC10	3.718	626.180937	560.512776	672.980097
EC15	3.964	661.656281	601.771683	705.349552
EC20	4.158	691.278908	636.167841	732.816148
EC25	4.326	717.747214	666.658351	757.890818
EC40	4.747	789.024716	745.944742	829.572331
EC50	5.000	835.269552	793.774299	880.709652
EC60	5.253	884.224814	840.795763	939.308298
EC75	5.674	972.034731	917.880584	1053.81268
EC80	5.842	1009.25288	948.678054	1105.02979
EC85	6.036	1054.43757	985.084894	1168.82582
EC90	6.282	1114.17509	1031.98408	1255.44824
EC95	6.645	1208.99682	1104.35347	1397.40266
EC99	7.326	1409.17275	1251.51604	1711.89702

Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/30/2007	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	6/6/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.8230	0.8880	0.7890	0.6590
450	0.6550	0.6630	0.5410	0.5590
600	0.5940	0.6780	0.6310	0.6620
750	0.4570	0.3990	0.4690	0.2920
900	0.3360	0.2460	0.2910	0.1060
1050	0.0740	0.0670	0.1470	0.0440

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7898	1.0000	0.7898	0.6590	0.8880	12.201	4				0.7898	1.0000
*450	0.6045	0.7654	0.6045	0.5410	0.6630	10.495	4	3.745	2.180	0.1078	0.6229	0.7887
*600	0.6413	0.8120	0.6413	0.5940	0.6780	5.778	4	3.002	2.180	0.1078	0.6229	0.7887
750	0.4043	0.5119	0.4043	0.2920	0.4690	19.996	4				0.4043	0.5119
900	0.2448	0.3099	0.2448	0.1060	0.3360	40.666	4				0.2448	0.3099
1050	0.0830	0.1051	0.0830	0.0440	0.1470	53.674	4				0.0830	0.1051

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96893233	0.805	-0.5679795	0.21604887
Bartlett's Test indicates equal variances (p = 0.34)	2.15916371	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<450	450			0.10784147	0.13655141	0.03848025	0.00489428	0.01059279	2, 9
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	106.48	33.37	67.60	277.86	1.8913
IC10*	212.97	73.76	135.19	555.71	2.5016
IC15*	319.45	103.29	202.79	794.72	1.4895
IC20*	425.93	117.18	270.38	776.58	0.2465
IC25	620.97	78.19	284.85	705.59	-1.5867
IC40	702.25	23.97	647.25	787.49	0.3507
IC50	758.82	29.27	689.40	846.43	0.0840

* indicates IC estimate less than the lowest concentration

Species: *Pimephales promelas* PpKClCR Test Number: 124

Daily Chemistry:

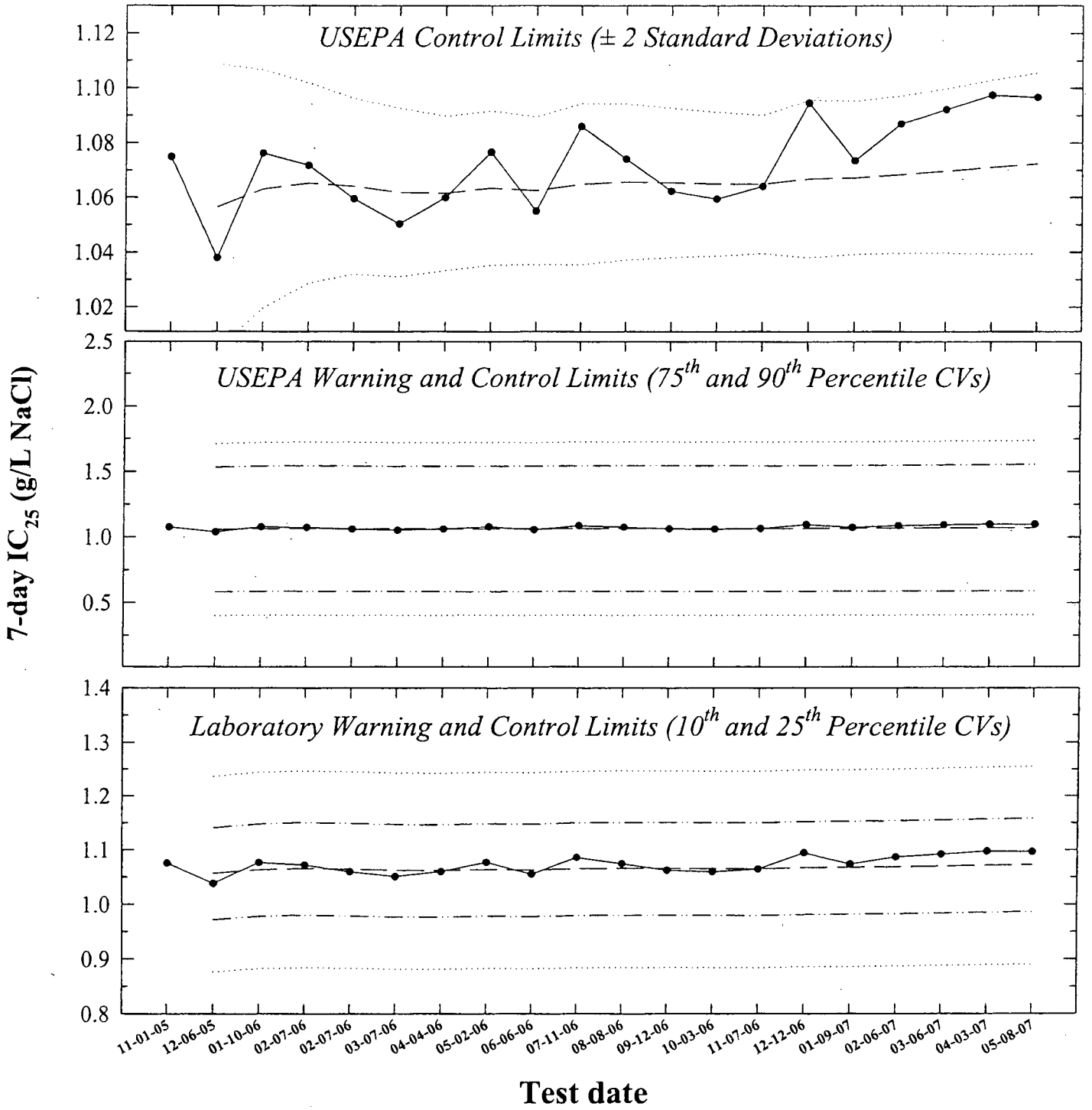
		Day					
		0		1		2	
	Analyst	KEK	KEK	KEK	KEK	MK	MK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.91	7.48	7.66	7.45	7.75	7.25
	DO (mg/L)	7.8	7.4	7.7	7.4	8.2	7.3
	Conductivity (µmhos/cm)	326		316		309	
	Alkalinity (mg $CaCO_3$/L)	60				61	
	Hardness (mg $CaCO_3$/L)	91				93	
	Temperature (°C)	24.9	24.2	24.6	24.5	24.7	24.2
450 mg KCl/L	pH (S.U.)	8.02	7.57	7.84	7.50	7.90	7.37
	DO (mg/L)	7.8	7.4	7.6	7.3	8.0	7.3
	Conductivity (µmhos/cm)	1120		1110		1080	
	Temperature (°C)	25.1	24.5	24.6	24.5	24.7	24.2
600 mg KCl/L	pH (S.U.)	8.03	7.57	7.85	7.54	7.91	7.37
	DO (mg/L)	7.9	7.2	7.6	7.3	8.2	7.3
	Conductivity (µmhos/cm)	1390		1360		1340	
	Temperature (°C)	25.0	24.5	24.5	24.3	24.8	24.3
750 mg KCl/L	pH (S.U.)	8.03	7.58	7.88	7.54	7.92	7.37
	DO (mg/L)	7.9	7.2	7.6	7.3	8.1	7.1
	Conductivity (µmhos/cm)	1640		1600		1580	
	Temperature (°C)	25.0	24.6	24.5	24.1	24.8	24.1
900 mg KCl/L	pH (S.U.)	8.02	7.58	7.88	7.54	7.93	7.37
	DO (mg/L)	8.0	7.3	7.7	7.2	8.2	7.0
	Conductivity (µmhos/cm)	1910		1870		1840	
	Temperature (°C)	25.0	24.3	24.5	24.6	24.7	24.3
1050 mg KCl/L	pH (S.U.)	8.03	7.65	7.89	7.59	7.94	7.43
	DO (mg/L)	8.0	7.4	7.8	7.3	8.1	7.0
	Conductivity (µmhos/cm)	2180		2160		2110	
	Temperature (°C)	25.0	24.5	24.5	24.4	24.8	24.3
STOCK	Conductivity (µmhos/cm)	68600		—		—	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* PpKClCR Test Number: 124

		Day							
		3		4		5		6	
	Analyst	KEN	KEN	KEN	KEN	KEN	KEN	KEN	KEN
Concentration	Parameter								
CONTROL	pH (S.U.)	7.71	7.34	7.74	7.41	7.79	7.44	7.75	7.67
	DO (mg/L)	7.7	7.0	7.6	7.1	7.6	7.6	7.6	7.8
	Conductivity (µmhos/cm)	315		302		305		315	
	Alkalinity (mg $CaCO_3$/L)			59					
	Hardness (mg $CaCO_3$/L)			89					
	Temperature (°C)	24.8	24.2	24.7	24.3	24.8	24.6	24.9	24.5
450 mg KCl/L	pH (S.U.)	7.03	7.39	7.82	7.42	7.88	7.46	7.84	7.74
	DO (mg/L)	7.7	7.0	7.6	7.1	7.6	7.6	7.7	7.8
	Conductivity (µmhos/cm)	1080		1060		1070		1080	
	Temperature (°C)	25.0	24.5	24.9	24.5	24.7	24.6	24.9	24.4
600 mg KCl/L	pH (S.U.)	7.05	7.39	7.82	7.44	7.87	7.45	7.87	7.74
	DO (mg/L)	7.7	7.1	7.6	7.0	7.6	7.3	7.6	7.8
	Conductivity (µmhos/cm)	1340		1320		1340		1340	
	Temperature (°C)	24.9	24.1	24.8	24.5	24.8	24.4	24.9	24.4
750 mg KCl/L	pH (S.U.)	7.09	6.97	7.82	7.44	7.88	7.45	7.87	7.74
	DO (mg/L)	7.8	7.0	7.6	6.9	7.7	7.3	7.6	7.8
	Conductivity (µmhos/cm)	1590		1570		1600		1600	
	Temperature (°C)	24.9	24.3	24.8	24.2	24.7	24.4	25.0	24.4
900 mg KCl/L	pH (S.U.)	7.09	7.37	7.82	7.42	7.90	7.47	7.86	7.75
	DO (mg/L)	7.8	6.8	7.7	6.4	7.7	7.3	7.8	
	Conductivity (µmhos/cm)	1840		1820		1840		1840	
	Temperature (°C)	24.7	24.3	24.8	24.6	24.9	24.5	25.0	24.3
1050 mg KCl/L	pH (S.U.)	7.09	7.37	7.82	7.49	7.90	7.56	7.86	7.77
	DO (mg/L)	7.8	6.9	7.6	6.7	7.7	7.4	7.8	7.6
	Conductivity (µmhos/cm)	2050		2060		2090		2080	
	Temperature (°C)	24.9	24.5	24.9	24.6	24.9	24.5	24.9	24.4
STOCK	Conductivity (µmhos/cm)	—		67700		—		—	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

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



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

— — **Central Tendency** (mean IC_{25})

—·—·- **Warning Limits** (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

..... **Control Limits** (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	11-01-05	1.08																	
2	12-06-05	1.04	1.06	0.03	1.00	1.11	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
3	01-10-06	1.08	1.06	0.02	1.02	1.11	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.02
4	02-07-06	1.07	1.07	0.02	1.03	1.10	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.02
5	02-07-06	1.06	1.06	0.02	1.03	1.10	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.72	0.02
6	03-07-06	1.05	1.06	0.02	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
7	04-04-06	1.06	1.06	0.01	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
8	05-02-06	1.08	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
9	06-06-06	1.06	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
10	07-11-06	1.09	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
11	08-08-06	1.07	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.55	0.66	0.40	1.73	0.01
12	09-12-06	1.06	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
13	10-03-06	1.06	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
14	11-07-06	1.06	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
15	12-12-06	1.09	1.07	0.01	1.04	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
16	01-09-07	1.07	1.07	0.01	1.04	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
17	02-06-07	1.09	1.07	0.01	1.04	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
18	03-06-07	1.09	1.07	0.02	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
19	04-03-07	1.10	1.07	0.02	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
20	05-08-07	1.10	1.07	0.02	1.04	1.11	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.56	0.66	0.41	1.74	0.02

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

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

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

Laboratory Control and Warning Limits

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

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

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

USEPA Control and Warning Limits

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

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

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

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

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CT for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	11-01-05	100	28.4		10.3		3.8	13.2	
2	12-06-05	100	32.6	30.5	6.3	8.3	2.3	7.1	10.2
3	01-10-06	100	29.2	30.1	4.8	7.1	2.3	7.8	9.4
4	02-07-06	100	30.7	30.2	6.0	6.8	2.4	7.9	9.0
5	02-07-06	100	29.9	30.2	6.8	6.8	2.2	7.5	8.7
6	03-07-06	100	28.8	29.9	5.9	6.7	2.6	8.9	8.7
7	04-04-06	100	27.0	29.5	5.2	6.5	2.1	7.6	8.6
8	05-02-06	100	28.6	29.4	8.6	6.7	2.7	9.3	8.7
9	06-06-06	100	30.3	29.5	5.2	6.6	3.0	9.8	8.8
10	07-11-06	100	29.0	29.5	5.4	6.4	2.5	8.6	8.8
11	08-08-06	100	28.6	29.4	8.9	6.7	3.7	12.8	9.1
12	09-12-06	100	30.9	29.5	5.4	6.6	3.3	10.6	9.3
13	10-03-06	100	32.3	29.7	4.6	6.4	3.1	9.5	9.3
14	11-07-06	100	31.0	29.8	6.3	6.4	2.4	7.8	9.2
15	12-12-06	100	28.0	29.7	6.7	6.4	2.2	8.0	9.1
16	01-09-07	100	27.6	29.6	4.9	6.3	2.4	8.6	9.1
17	02-06-07	100	29.9	29.6	7.6	6.4	2.9	9.8	9.1
18	03-06-07	100	30.1	29.6	6.0	6.4	2.6	8.7	9.1
19	04-03-07	100	33.1	29.8	4.4	6.3	2.2	6.6	9.0
20	05-08-07	100	32.0	29.9	8.5	6.4	2.7	8.4	8.9

Note: **CV** = Coefficient of variation for control reproduction.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.

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

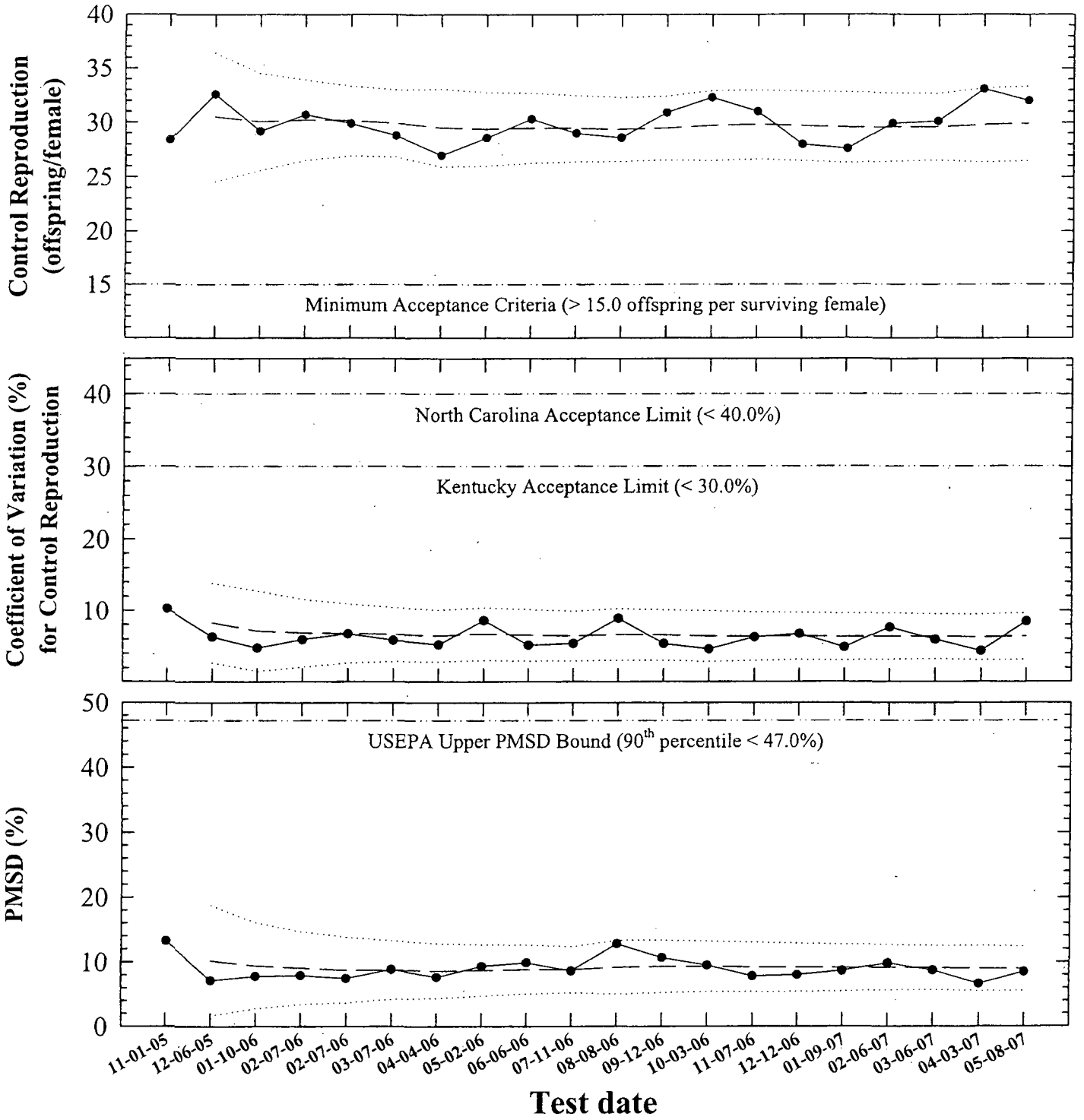
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

05-08-07

Environmental Testing Solutions, Inc.

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



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)** PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

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

..... **Control Limits** (mean Control Reproduction, CV, or PMSD ± 2 Standard Deviations)

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

CdNaCLCR #: 61

Dilution preparation information:						*Comments:*
NaCl CHM number:	CHM 120					
Stock preparation:	100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water)					
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	< 24-hours old	Randomizing template:	ORANGE
Date and times organisms were born between:	05-08-07 0709 TO 1050	Incubator number and shelf location:	2B1
Organism source: 05-01-07A	CWPS: 6,7,8,9,11,12,15,16,19,20	YCT batch:	04-08-07
Transfer bowl information:	pH = 7.78 SU Temperature = 24.6°C	*Selenastrum* batch:	05-01-07

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	MHS water batch used	Analyst
0	05-08-07	1207	05-01-07 B	dl
1	05-09-07	1110	05-01-07 B	dl
2	05-10-07	1113	05-06-07 B	dl
3	05-11-07	1115	05-06-07 B	dl
4	05-12-07	1108	05-09-07 A	dl
5	05-13-07	1110	05-09-07 B	dl
6	05-14-07	1109	05-09-07 B	dl
7	05-15-07	1113		dl

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	1000
% Mortality:	0%	≤ 20%	LOEC	1200
Mean Offspring/Female:	32.0	≥ 15.0 offspring/female	ChV	1095.4
% CV:	8.5%	< 40.0 %	IC25	1096.6

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 61

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	4	5	5	5	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	11	11	13	10	14	12	11	11	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	14	16	18	15	17	18	15	14	14
Total young produced		34	29	31	35	30	36	35	30	29	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	5	6	6	4	4	5	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	14	13	11	13	13	11	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	15	17	16	14	15	15	15	14	15
Total young produced		31	31	36	35	31	32	32	31	32	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0
% Reduction from Control:	0.0%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 61

800 mg NaCl/L

Survival and Reproduction Data

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

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.9
% Reduction from Control:	0.3%

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	4	4	6	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	12	10	11	13	9	12	11	11	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	11	13	10	13	14	11	16	15	14	12
Total young produced		24	30	25	28	31	26	32	31	30	26
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.3
% Reduction from Control:	11.6%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 61

1200 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	5	6	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	10	8	6	9	7	6	10	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	7	13	7	6	7	4	8	6	3	5
Total young produced		22	28	21	19	19	17	19	16	18	15
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	19.4
% Reduction from Control:	39.4%

1400 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	5	0	4	4	3	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	1	3	3	4	1	5	3	2	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	5	5	4	7	3	5	0	3	2	3
Total young produced		13	10	10	15	7	10	9	9	7	9
Final Adult Mortality		L	L	L	L	L	L	D	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	10%
Mean Offspring/Female:	9.9
% Reduction from Control:	69.1%

Environmental Testing Solutions, Inc.

Verification of *Ceriodaphnia* Reproduction Totals

Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	5	5	5	4	4	5	44
5	13	11	11	13	10	14	12	11	11	12	118
6	0	0	0	0	0	0	0	0	0	0	0
7	17	14	16	18	15	17	18	15	14	14	158
Total	**34**	**29**	**31**	**35**	**30**	**36**	**35**	**30**	**29**	**31**	**320**

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	5	4	4	6	4	5	5	5	47
5	9	12	10	11	13	9	12	11	11	9	107
6	0	0	0	0	0	0	0	0	0	0	0
7	11	13	10	13	14	11	16	15	14	12	129
Total	**24**	**30**	**25**	**28**	**31**	**26**	**32**	**31**	**30**	**26**	**283**

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	6	6	4	4	5	5	4	47
5	13	12	14	13	11	13	13	11	13	10	123
6	0	0	0	0	0	0	0	0	0	0	0
7	14	15	17	16	14	15	15	15	14	15	150
Total	**31**	**31**	**36**	**35**	**31**	**32**	**32**	**31**	**32**	**29**	**320**

1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	5	6	4	4	4	5	4	45
5	10	11	10	8	6	9	7	6	10	6	83
6	0	0	0	0	0	0	0	0	0	0	0
7	7	13	7	6	7	4	8	6	3	5	66
Total	**22**	**28**	**21**	**19**	**19**	**17**	**19**	**16**	**18**	**15**	**194**

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	4	5	4	5	4	5	5	46
5	13	13	12	14	11	11	13	13	14	12	126
6	0	0	0	0	0	0	0	0	0	0	0
7	16	15	17	14	15	15	13	13	15	14	147
Total	**34**	**33**	**33**	**32**	**31**	**30**	**31**	**30**	**34**	**31**	**319**

1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	5	0	4	4	3	3	4	34
5	4	1	3	3	4	1	5	3	2	2	28
6	0	0	0	0	0	0	0	0	0	0	0
7	5	5	4	7	3	5	0	3	2	3	37
Total	**13**	**10**	**10**	**15**	**7**	**10**	**9**	**9**	**7**	**9**	**99**

Environmental Testing Solutions, Inc.

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

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

Test number: CdNaClCR #61

Test dates: May 08-15, 2007

Reveiwed by: [signature]

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	34	29	31	35	30	36	35	30	29	31	100	32.0	8.5	Not applicable
600	31	31	36	35	31	32	32	31	32	29	100	32.0	6.4	0.0
800	34	33	33	32	31	30	31	30	34	31	100	31.9	4.8	0.3
1000	24	30	25	28	31	26	32	31	30	26	100	28.3	10.1	11.6
1200	22	28	21	19	19	17	19	16	18	15	100	19.4	19.0	39.4
1400	13	10	10	15	7	10	9	9	7	9	90	9.9	24.9	69.1

Dunnett's MSD value: 2.700

PMSD: 8.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.

Upper PMSD bound determined by USEPA (90th percentile) = 47%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/8/2007	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/15/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	34.000	29.000	31.000	35.000	30.000	36.000	35.000	30.000	29.000	31.000
600	31.000	31.000	36.000	35.000	31.000	32.000	32.000	31.000	32.000	29.000
800	34.000	33.000	33.000	32.000	31.000	30.000	31.000	30.000	34.000	31.000
1000	24.000	30.000	25.000	28.000	31.000	26.000	32.000	31.000	30.000	26.000
1200	22.000	28.000	21.000	19.000	19.000	17.000	19.000	16.000	18.000	15.000
1400	13.000	10.000	10.000	15.000	7.000	10.000	9.000	9.000	7.000	9.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	32.000	1.0000	32.000	29.000	36.000	8.463	10			32.000	1.0000
600	32.000	1.0000	32.000	29.000	36.000	6.421	10	111.50	75.00	32.000	1.0000
800	31.900	0.9969	31.900	30.000	34.000	4.777	10	107.00	75.00	31.900	0.9969
1000	28.300	0.8844	28.300	24.000	32.000	10.139	10	77.00	75.00	28.300	0.8844
*1200	19.400	0.6063	19.400	15.000	28.000	19.009	10	55.00	75.00	19.400	0.6063
*1400	9.900	0.3094	9.900	7.000	15.000	24.948	10	55.00	75.00	9.900	0.3094

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.18371189	1.035	0.76990885	0.95988629
Bartlett's Test indicates equal variances (p = 0.20)	7.30337286	15.0862722		

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

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	883.333333	53.7513901	791.75	948.262024	-2.9183
IC10	972.222222	40.9453323	888.886179	1023.68366	-0.1955
IC15	1024.7191	25.2451288	961.294823	1057.21924	-0.7793
IC20	1060.67416	20.0289083	1018.00206	1091.96511	-0.2681
IC25	1096.62921	19.2521422	1057.92603	1133.3477	0.0839
IC40	1204.21053	20.7343439	1157.77604	1242.49678	-0.0697
IC50	1271.57895	17.2179574	1225.66712	1299.12946	-0.4636

Environmental Testing Solutions, Inc.

Statistical Analyses

Used for PMSD calculation only.			Ceriodaphnia Survival and Reproduction Test-Reproduction		
Start Date:	5/8/2007	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/15/2007	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	34.000	29.000	31.000	35.000	30.000	36.000	35.000	30.000	29.000	31.000
600	31.000	31.000	36.000	35.000	31.000	32.000	32.000	31.000	32.000	29.000
800	34.000	33.000	33.000	32.000	31.000	30.000	31.000	30.000	34.000	31.000
1000	24.000	30.000	25.000	28.000	31.000	26.000	32.000	31.000	30.000	26.000
1200	22.000	28.000	21.000	19.000	19.000	17.000	19.000	16.000	18.000	15.000
1400	13.000	10.000	10.000	15.000	7.000	10.000	9.000	9.000	7.000	9.000

			Transform: Untransformed						1-Tailed	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	32.000	1.0000	32.000	29.000	36.000	8.463	10			
600	32.000	1.0000	32.000	29.000	36.000	6.421	10	0.000	2.287	2.700
800	31.900	0.9969	31.900	30.000	34.000	4.777	10	0.085	2.287	2.700
*1000	28.300	0.8844	28.300	24.000	32.000	10.139	10	3.134	2.287	2.700
*1200	19.400	0.6063	19.400	15.000	28.000	19.009	10	10.673	2.287	2.700
*1400	9.900	0.3094	9.900	7.000	15.000	24.948	10	18.720	2.287	2.700

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.18371189	1.035	0.76990885	0.95988629
Bartlett's Test indicates equal variances (p = 0.20)	7.30337286	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.69952952	0.0843603	827.656667	6.96851852	7.3E-28	5, 54
Treatments vs D-Control										

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 61

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KEN	KEN	KEN	KEN	KEN	KEN
Concentration	Parameter						
CONTROL	pH (S.U.) 7.72	7.80	7.86	7.73	7.78	7.60	7.77
	DO (mg/L)	7.6	7.8	7.8	8.0	7.8	7.9
	Conductivity (µmhos/cm)	320		309		318	
	Alkalinity (mg $CaCO_3$/L)	62				58	
	Hardness (mg $CaCO_3$/L)	90				92	
	Temperature (°C)	24.8	24.6	24.9	24.9	24.8	24.5
600 mg NaCl/L	pH (S.U.)	7.83	7.91	7.90	7.78	7.78	7.81
	DO (mg/L)	7.8	7.8	7.9	8.0	7.8	7.9
	Conductivity (µmhos/cm)	1600		1550		1600	
	Temperature (°C)	24.6	24.6	24.8	24.8	25.0	24.6
800 mg NaCl/L	pH (S.U.)	7.82	7.91	7.90	7.78	7.79	7.81
	DO (mg/L)	7.8	7.8	7.9	7.9	7.8	7.9
	Conductivity (µmhos/cm)	1770		1760		1820	
	Temperature (°C)	24.6	24.5	25.0	24.8	24.9	24.8
1000 mg NaCl/L	pH (S.U.)	7.82	7.91	7.89	7.77	7.78	7.82
	DO (mg/L)	7.9	7.9	7.9	7.9	7.9	8.0
	Conductivity (µmhos/cm)	2160		2150		2180	
	Temperature (°C)	24.6	24.7	24.7	24.7	25.0	24.7
1200 mg NaCl/L	pH (S.U.)	7.82	7.92	7.89	7.78	7.79	7.82
	DO (mg/L)	7.9	7.9	7.9	7.9	7.9	8.0
	Conductivity (µmhos/cm)	2540		2500		2540	
	Temperature (°C)	24.7	24.7	24.8	24.9	25.0	24.6
1400 mg NaCl/L	pH (S.U.)	7.82	7.92	7.89	7.76	7.79	7.81
	DO (mg/L)	7.9	7.9	7.9	7.9	7.9	8.0
	Conductivity (µmhos/cm)	2850		2800		2860	
	Temperature (°C)	24.6	24.5	24.8	24.9	25.0	24.8
STOCK	Conductivity (µmhos/cm)	114000		—		—	
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 61

		Day							
		3		4		5		6	
	Analyst	KEK	KEK	KEK	KEK	KEK	KEK	KEK	KEK
Concentration	Parameter								
CONTROL	pH (S.U.)	7.71	7.86	7.66	7.82	7.69	7.78	7.78	8.08
	DO (mg/L)	7.9	8.1	7.8	7.9	7.8	8.0	8.0	8.0
	Conductivity (µmhos/cm)	315		305		304		318	
	Alkalinity (mg $CaCO_3$/L)			59		60			
	Hardness (mg $CaCO_3$/L)			92		90			
	Temperature (°C)	24.7	24.8	24.8	24.9	24.7	24.5	24.7	24.7
600 mg NaCl/L	pH (S.U.)	7.78	7.86	7.80	7.84	7.76	7.81	7.80	8.02
	DO (mg/L)	8.0	8.2	7.9	8.0	7.9	8.0	8.1	8.0
	Conductivity (µmhos/cm)	1590		1570		1580		1570	
	Temperature (°C)	24.7	24.6	24.7	25.1	24.7	24.5	24.7	24.7
800 mg NaCl/L	pH (S.U.)	7.81	7.87	7.81	7.84	7.83	7.82	7.85	8.01
	DO (mg/L)	8.0	8.2	7.9	8.0	7.9	8.0	8.1	8.0
	Conductivity (µmhos/cm)	1780		1740		1760		1830	
	Temperature (°C)	24.7	24.6	24.9	25.0	24.7	24.7	24.7	24.8
1000 mg NaCl/L	pH (S.U.)	7.81	7.86	7.84	7.83	7.83	7.81	7.84	7.99
	DO (mg/L)	8.0	8.2	8.0	8.0	8.0	8.0	8.1	8.0
	Conductivity (µmhos/cm)	2150		2130		2130		2190	
	Temperature (°C)	24.7	24.7	24.9	25.1	24.8	24.7	24.6	24.7
1200 mg NaCl/L	pH (S.U.)	7.82	7.86	7.84	7.84	7.84	7.82	7.85	7.99
	DO (mg/L)	7.9	8.2	8.0	8.0	8.0	8.1	8.2	8.0
	Conductivity (µmhos/cm)	2500		2530		2540		2520	
	Temperature (°C)	24.8	24.7	24.9	25.1	24.8	24.6	24.6	24.5
1400 mg NaCl/L	pH (S.U.)	7.82	7.86	7.85	7.83	7.85	7.83	7.86	7.97
	DO (mg/L)	7.9	8.2	8.0	7.9	8.0	8.1	8.2	8.0
	Conductivity (µmhos/cm)	2820		2830		2810		2870	
	Temperature (°C)	24.7	24.7	24.8	25.2	24.8	24.7	24.8	24.8
STOCK	Conductivity (µmhos/cm)	— K		— K		— K		— K	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

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

ATTN: Stephanie A. Howard

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	7.0	********	8.9	12	0	13 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	72	129	26	********	12	18	19	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<33	<44	26	********	<6	<6	19	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.676	0.913	03	********	********	********	**	0	30 / 30	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		SEE PERMIT	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	07	07	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

103 flow recorder was inoperable from 6/22/07 @ 1838 - 6/27/07 @ 1703. Problem Evaluation Report 126632 was written to address and fix the problem.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	07	07	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	04	********	********		04			
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	DEG C	********	********	38.3 DAILY MX	DEG C		DAILY	GRAB-4
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	********		19			
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.10 DAILY MX	MG/L		WEEKLY	GRAB-4
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	07	07	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	07	06	01	To	07	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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