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

January 9, 2002

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

Attention: Ms. Evelyn Haskin, Enforcement & Compliance

Dear Ms. Haskin:

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

Please find enclosed the Discharge Monitoring Report (DMR) of December 2001 for SQN. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Diedre B. Nida

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

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

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

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

IE25

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

ATTN: Diedre B. Nida

DISCHARGE MONITORING REPORT (DMR)

OMB No. 2040-0004
Approval expires 05-31-98

(2-16)	(17-19)
TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	01	12	01	To	01	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	17.7	(04)	0	31 / 31	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	********	********	**	********	********	30.3	(04)	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.3	********	7.8	(12)	0	8 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	5	8	(19)	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	(19)	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1622	(03)	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.007	0.014	(19)	0	41 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor	423	843-6700	02	01	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following injections occured: 1. PCL-222 (max. calc. conc. was 0.025mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.008mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.02mg/L--limit 0.100mg/L)

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

ATTN: Diedre B. Nida

DISCHARGE MONITORING REPORT (DMR)

(2-16)	(17-19)
TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	01	12	01	To	01	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

OMB No. 2040-0004
Approval expires 05-31-98

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.3	(04)	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG. C.			CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.7	(04)	0	31 / 31	CALCTD
00016 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0	DEG. C.			CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.2	<0.2	<0.2	(19)	0	1 / 31	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L			GRAB
	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)*
CCW data for December 2001 is attached.

CCW Data for December 2001

CCW CHANNEL

DATE	DIESEL RANGE ORGANICS (mg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
12/05/01	< 0.1	< 1	
12/19/01	0.6	<1	Backup samples sent to the lab for DRO.

CCW TRENCH DISCHARGE

DATE	DIESEL RANGE ORGANICS (mg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
12/05/01	0.67	< 1	
12/19/01	0.51	<1	Backup samples sent to the lab for DRO.

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

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
TN0026450	101 T

MONITORING PERIOD

	YEAR (20-21)	MO (22-23)	DAY (24-25)		YEAR (26-27)	MO (28-29)	DAY (30-31)
From	01	10	01	To	01	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

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PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	(23)	0	1 / 92	GRAB
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MINIMUM	********	********	PERCENT		QUART-ERLY	GRAB
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	INVALID	********	********	(23)		1/92	GRAB
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MIMINUM	********	********	PERCENT		QUART-ERLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	02	01	10
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled from 11/25 to 11/30. The test was terminated due to a Fed-Ex delivery error. Toxicity was sampled 12/9 to 12/14. The test results were determined to be invalid. A repeat test was initiated from 1/2 to 1/7. The follow-up test results will be reported within 30 days of test invalidation, according to the permit requirements. A detailed explanation and the report are attached.

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

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
TN0026450	103 G

MONITORING PERIOD

	YEAR (20-21)	MO (22-23)	DAY (24-25)		YEAR (26-27)	MO (28-29)	DAY (30-31)
From	01	12	01	To	01	12	31

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

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PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	(4 Card Only) QUALITY OR CONCENTRATION MINIMUM (38-45)	AVERAGE (46-53)	MAXIMUM (54-61)	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
PH	SAMPLE MEASUREMENT	********	********	**	7.0	********	8.7	(12)	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	98	132	(26)	********	10	13	(19)	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<50	<52	(26)	********	<5	<5	(19)	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.163	1.246	(03)	********	********	********	**	0	31 / 31	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		DAILY	TOTAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	02	01	10
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

Name TVA - SEQUOYAH NUCLEAR PLANT
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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
TN0026450	107 G

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	01	12	01	To	01	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

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PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
PH	SAMPLE MEASUREMENT	********	********	**		********		(12)			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMP-8
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMP-8
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMP-8
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMP-8
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor	423	843-6700	02	01	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No phosphate bearing chemicals were employed. No Discharge this Period

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

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

(2-16) PERMIT NUMBER	(17-19) DISCHARGE NUMBER
TN0026450	110 G

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	01	12	01	To	01	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

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

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

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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	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	GRAB
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 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	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	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor	423	843-6700	02	01	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

ATTN: Diedre B. Nida

DISCHARGE MONITORING REPORT (DMR)

(2-16)	(17-19)
TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	01	12	01	To	01	12	31
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

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

*** NO DISCHARGE XX ***

OMB No. 2040-0004
Approval expires 05-31-98

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE	(54-61) MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM	(46-53) AVERAGE	(54-61) MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
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	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)	Diedre B. Nida Environmental Supervisor	423	843-6700	02	01	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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

January 8, 2002

Diedre B. Nida, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, NOVEMBER AND DECEMBER 2001

Attached are two copies of the subject report for submission to the state of Tennessee with the DMR package. The report provides results of compliance testing using daphnids only due to invalidation of the concurrent fathead minnow test. I have also included a copy of the report for your records.

SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC25) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agrees upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

The first attempt to conduct SQN fourth quarter biomonitoring was initiated on November 27, 2001. These tests were terminated on December 1 (Day 4) due to failure by FedEx to deliver weekend samples. Bench sheets for these tests are presented in Appendix F.

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

Cynthia L. Russell

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

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

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION/EXECUTIVE SUMMARY

1) Facility/Discharger: Sequoyah Nuclear Plant/TVA Report Date: January 8, 2002

2) County/State: Hamilton/Tennessee 3) NPDES Permit #: TN0026450

4) Type of Facility: Nuclear-fueled electric generating plant

5) Design Flow (MGD): 3,266

6) Receiving Stream: Tennessee River (TRM 483.6) 7) 1Q20: 2,992.4

8) Outfall Tested: 101 9) Dates Sampled: December 9-14, 2001

10) Flow on day(s) sampled (MGD): 1600, 1605, 1599, 1598, 1605, 1589

11) Pertinent site conditions: No unusual conditions reported.*

12) Test Dates: December 10-17, 2001 13) Test Type: Short-term Chronic-definitive

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

15) Concentrations Tested (%): Outfall 101 10.98 22 43.9 72 100
Intake 100

16) Permit Limit Endpoint (%): Outfall 101 IC_{25}= 43.9

17) Test Results (%): Outfall 101

Pimephales promelas IC_{25} = Test Invalid (See Appendix E)
Ceriodaphnia dubia IC_{25} >100

18) Facility Contact: Diedre B. Nida 19) Phone #: (423) 843-6700

20) Consultant/Testing Lab Name: S&ME Inc.

21) Lab Contact: Leira S. Douthat Phone #: (865)-970-0003

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

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

23) Notes: SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC25) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agrees upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

The first attempt to conduct SQN fourth quarter biomonitoring was initiated on November 27, 2001. These tests were terminated on December 1 (Day 4) due to failure by FedEx to deliver weekend samples. Bench sheets for these tests are presented in Appendix F.

METHODS SUMMARY

Samples

1) Sampling Point: Outfall 101 and Intake

2) Sample Type: Composite

3) Sample Information:

ID	Date/Time Collected (MM-DD/Time)	Date/Time Received (MM-DD/Time)	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date/Time Used By (MM-DD/Time)
101	12/09-0922 to 12/10-0822	12/10/1232	0.3	0.07	12-10/1430 12-11/1500
Intake	12/09-0940 to 12/10-0840	12/10/1232	0.5	0.15	12-10/1430 12-11/1500
101	12/11-0909 to 12/12-0809	12/12/1210	0.9	0.08	12-12/1445 12-13/1415
Intake	12/11-0926 to 12/12-0826	12/12/1210	1.4	0.06	12-12/1445 12-13/1445
101	12/13-0826 to 12/14-0726	12/14/1235	2.0	0.07	12-14/1330 12-15/1330 12-16/1345
Intake	12/13-0841 to 12/14-0741	12/14/1235	2.0	0.05	12-14/1330 12-15/1330 12-16/1345

*Total residual chlorine upon receipt.

4) Sample manipulation: Daily samples warmed to 25±1°C

Test Organisms

	Pimephales promelas	*Ceriodaphnia dubia*
1) Source:	In-house Culture	In-house Culture
2) Age:	< 24 hours	< 24 hours

Test Method Summary (See Appendix A for additional information)

	Pimephales promelas	*Ceriodaphnia dubia*
1) Test Conditions	N/A	Static, renewal
2) Test Duration	N/A	Until at least 60% of control females have 3 broods
3) Dilution/Control Water	N/A	20% Dilute minerals water and trace minerals
4) Number Replicates	N/A	10
5) Animals per Replicate	N/A	1
6) Test Initiation	N/A (Date/Time)	12-10-01/1430 (Date/Time)
7) Test Termination	N/A (Date/Time)	12-17-01/1500 (Date/Time)
8) Test Temperature	Mean = N/A	Mean = 24.7°C (24.0°C-25.5°C)

9) Physical/Chemical Measurements: Hardness, alkalinity, total residual chlorine, and conductivity were measured at the laboratory in each 100 percent sample. Daily temperatures were measured in one replication per test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.

10) Statistics: Toxcalc software Version 5.0 was used for statistical analyses. Test data were reviewed for dose response, sensitivity, and validity following recent EPA guidance. [2] [3]

2) Results of a *Ceriodaphnia* (Genus) *dubia* (Species) Chronic/ 7 day (3-brood) (Type/Duration) Toxicity Test

Conducted 12/10/01 (mm/dd/yy) - 12/17/01 (mm/dd/yy) Using Effluent From Outfall 101. (number)

Test Solutions	Percent Surviving (time intervals used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%Effluent	100	100	100	100	100	100	100
22.0% Effluent	100	100	100	100	100	100	100
43.9% Effluent	100	100	100	100	100	100	100
72.0% Effluent	100	100	100	100	100	100	100
100% Effluent	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions	Reproduction (# of young/female during test) Data Replicates										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	28	31	22	26	24	26	24	24	28	24	25.7
10.98%Effluent	26	25	26	22	20	24	28	22	24	24	24.1
22.0% Effluent	30	24	30	23	28	28	28	23	29	25	26.8
43.9% Effluent	31	29	25	24	29	28	25	24	24	24	26.3
72.0% Effluent	24	27	29	27	22	23	24	23	23	23	24.5
100% Effluent	27	27	30	23	28	24	25	21	26	22	25.3
Intake	30	32	23	25	26	27	26	22	24	25	26.0

IC_{25} Value: > 100%	Calculated TU Estimates †: <1.0 TUc
95% Confidence Limits Upper Limit NA Lower Limit NA	Permit Limit: 2.3 TUc

†NOTE: TUa = 100/LC_{50}; TUc = 100/ IC_{25}

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (LC_{50}/IC_{25})
Ceriodaphnia dubia	12/10/10	1530	7 days	NaCl	1.117 mg/L NaCl

PHYSICAL/CHEMICAL SUMMARY

1) Analysis of Sequoyah Nuclear Plant Diffuser Discharge Concentrations of Total Residual Chlorine
2) Diffuser Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling
3) Initial and Final Chemistry for Fathead Minnow 7-day and Daphnid 3-brood Chronic Tests.

See Summary Tables in Appendix B

SUMMARY/CONCLUSIONS

SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC25) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agrees upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1) *Pimephales promelas*

Tests were conducted according to EPA/600/4-91/002 (July 1994) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL polystyrene cups, each containing 250 mL of test solution. [4]

2) *Ceriodaphnia dubia*

Tests were conducted according to EPA/600/4-91/002 (July 1994) using ten replicates, each containing one test organism, per treatment. Test vessels consisted of 30-mL polystyrene cups, each containing 15 mL of test solution. [4]

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 S&ME laboratory instruments is recorded in calibration and maintenance log books.

3) Temperature was measured using a VWR Scientific digital NIST-traceable thermometer according to S&ME SOP. [5]

4) Dissolved oxygen was measured using a YSI Dissolved Oxygen meter. The instrument was calibrated and readings were made according to EPA Method 120.1.

5) The pH was measured using a VWR Scientific Symphony pH meter equipped with an Orion combination electrode. The instrument was calibrated and readings were made according to EPA Method 150.1.

6) Conductance was measured using an Orion conductivity meter. The instrument was calibrated and readings were taken according to manufacturers instructions.

7) Alkalinity was measured using Standard Methods Titration Method 2320 B using 0.01 N HCl to an endpoint pH of 4.5.

8) Hardness was measured using Standard Methods EDTA Titrimetric Method 2340 C or EPA Method 130.2.

9) Total residual chlorine was determined using the DPD Ferrous Titrimetric Method with a Hach colorimetric kit.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to. sample collection, handling and storage; glassware preparation; test organism culturing/acquisition and acclimation; test organism handling during test; and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA/600/4-91/002. [4] 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 NaCl or g/L KCl.

2) Standard Toxicant: Sodium Chloride and Potassium Chloride (NaCl and KCl crystalline)

3) Dilution Water Used: Moderately hard water for fathead minnows and 20 percent DMW water for the *Ceriodaphnia dubia*.

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

REFERENCES

1) NPDES Permit No. TN0026450.

2) *Methods Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 CFR Part 130)*. EPA 821-B-00-004 (July 2000).

3) *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge System*. EPA 833-R-00-003 (June 2000)

4) Lewis, P. A., D. J. Klemm, J. M. Lazorchak, T. J. Norberg-King, W. H. Peltier, M. A. Heber. *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002 (July 1994).

5) S&ME Standard Operating Procedures. April, 2000.

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

And

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

Table B-1. Analysis of Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Total Residual Chlorine*, December 10 – December 14, 2001

2001		Sample Type	Total Residual Chlorine
Month	Date		
			(mg/L)
December	10	Comp	0.08
December	12	Comp	0.05
December	14	Comp	0.08

*Towerbrom-960 (Oxidizing Biocide) 7% Sodium Bromide, 89% Sodium Dichloroisocyanurate is utilized in the essential raw cooling water and in the raw cooling water systems at SQN to control the growth of microbiologically induced bacteria and Asiatic Clams. The treatment is necessary for adequate cooling water flow, efficient heat exchange and corrosion prevention. The injected chemical is diluted by the condenser cooling water flow as well as from the flow from other sources.

Table B-2. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-December 14, 2001

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-2 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-December 14, 2001

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/31/2000	-	< 0.002	0.026	0.009	-	-	-
02/01/2000	-	0.011	0.026	0.028	-	-	-
02/02/2000	-	0.028	0.026	0.009	0.006	-	-
02/03/2000	-	0.008	0.027	0.009	-	-	-
02/04/2000	-	0.006	0.027	0.009	0.005	0.109	-
02/05/2000	-	< 0.002	0.027	0.009	-	-	-
02/06/2000	-	< 0.002	0.027	0.009	-	-	-
07/26/2000	-	< 0.0057	0.055	0.019	-	-	0.021
07/27/2000	-	0.019	0.055	0.019	-	-	-
07/28/2000	-	0.0088	0.053	0.018	0.004	0.108	-
07/29/2000	-	< 0.0088	0.055	0.019	-	-	-
07/30/2000	-	< 0.0076	0.055	0.019	-	-	-
07/31/2000	-	< 0.0152	0.055	0.019	0.006	-	-
08/01/2000	-	< 0.0141	0.055	0.019	0.005	-	-
12/11/2000	-	0.0143	0.025	0.020	0.005	-	-
12/12/2000	-	0.0092	0.025	0.020	0.005	-	-
12/13/2000	-	< 0.0120	0.025	0.020	-	-	-
12/14/2000	-	< 0.0087	0.025	0.020	-	-	-
12/15/2000	-	0.0120	0.025	0.020	0.005	-	-
12/16/2000	-	< 0.0036	0.025	0.020	-	-	-
12/17/2000	-	< 0.0036	0.025	0.020	-	-	-
08/26/2001	-	0.017	0.06	0.021	0.006	-	-
08/27/2001	-	<0.0096	0.06	0.021	0.005	-	0.021
08/28/2001	-	<0.0085	0.06	0.021	-	-	-
08/29/2001	-	<0.0094	0.059	0.020	0.005	-	0.021
08/30/2001	-	<0.0123	0.06	0.021	0.005	-	-
08/31/2001	-	<0.005	0.059	0.020	-	-	-
11/25/2001	-	<0.0044	-	-	-	-	-
11/26/2001	-	<0.0119	0.024	0.02	0.005	-	-
11/27/2001	-	0.0137	0.023	0.019	0.007	-	-
11/28/2001	-	<0.0089	0.022	0.019	0.006	-	-
11/29/2001	-	0.0132	0.024	0.02	0.007	-	-
11/30/2001	-	< 0.0043	0.024	0.02	-	-	-
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-3. Water Chemistry Mean Values and Ranges for Daphnid Test, Sequoyah Nuclear Plant (SQN), December 10 - 17, 2001

Test/ Sample ID	Temperature Initial (°C)	Temperature Final (°C)	Dissolved Oxygen Initial (mg/L)	Dissolved Oxygen Final (mg/L)	pH Initial S.U.	pH Final S.U.	Conductance Initial (µmhos)	Alkalinity Initial mg/L $CaCO_3$	Hardness Initial mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Daphnid/ Control	24.7 (24.0-25.2)	24.9 (24.3-25.5)	7.3 (7.1-7.6)	7.0 (6.3-7.8)	8.0 (7.9-8.2)	8.0 (7.9-8.1)	164 (134-181)	63.0 (60-67)	91.7 (90-95)	-
Daphnid/ 10.98	24.7 (24.0-25.4)	25.0 (24.4-25.4)	7.4 (7.1-7.8)	7.0 (6.3-7.7)	8.1 (8.0-8.1)	8.1 (8.0-8.2)	170 (152-183)	-	-	-
Daphnid/ 22.0 %	24.7 (24.0-25.2)	24.9 (24.4-25.4)	7.3 (7.1-7.6)	7.1 (6.6-7.8)	8.1 (8.0-8.1)	8.1 (8.0-8.1)	173 (159-185)	-	-	-
Daphnid/ 44.0 %	24.7 (24.0-25.3)	24.7 (24.0-25.3)	7.3 (7.1-7.5)	7.1 (6.7-7.7)	8.0 (7.9-8.0)	8.1 (8.1-8.2)	179 (168-188)	-	-	-
Daphnid/ 72.0 %	24.7 (24.0-25.3)	24.5 (24.0-25.1)	7.2 (7.0-7.5)	7.2 (6.9-7.7)	7.9 (7.8-7.9)	8.2 (8.1-8.3)	186 (178-194)	-	-	-
Daphnid/ 100.0 %	24.8 (24.0-25.4)	24.5 (24.0-25.0)	7.3 (7.0-7.8)	7.2 (6.9-7.8)	7.8 (7.6-7.9)	8.2 (8.1-8.3)	194 (183-205)	66.3 (63-69)	76.7 (70-80)	0.07 (0.05-0.08)
Daphnid/ Intake	24.8 (24.0-25.3)	24.6 (24.1-25.2)	7.3 (7.0-8.0)	7.2 (6.7-7.8)	7.7 (7.4-7.8)	8.0 (7.3-8.2)	195 (190-205)	68.3 (67-70)	76.0 (72-80)	0.09 (0.05-0.15)

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix C

Chain of Custody Records and
Toxicity Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client
Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End") Start	End	Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate) Yes	If Yes, Inches	No	Trace	Laboratory Use S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
QN-DIS-101-TOX	comp	4°C	12/9/01 0922	12/10/01 0822	(1) 2.5 GAL		✓				01-435	0.3°C	LSP	1235	clear
QN-INT-TOX	comp	4°C	12/9/01 0940	12/10/01 0840	(1) 2.5 GAL		✓				01-436	0.5°C	LSO	1235	clear

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	12/10/01 0930	R. Nunley	12/10/01 0930
R. Nunley	12/10/01 1232	Lena S. Douthat	12/10/01 1232

ructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold
e 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
ing 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.

oc

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client
Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
QN-DIS-101-TOX	comp	4°C	12/11/01 0909	12/12/01 0809	(1) 2.5 GAL				✓		01-433	0.9	SD	1215	[illegible]
QN-INT-TOX	comp	4°C	12/11/01 0926	12/12/01 0826	(1) 2.5 GAL				✓		01-434	1.4	SD	1215	[illegible]

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	12/12/01 1000	[illegible]	12/12/01 1015
[illegible]	12/12/01 1210	[illegible]	12/12/01 1210

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

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BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client
Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	12/13/01 0826	12/14/01 0726	(2) 2.5 GAL		✓				01-431	2°C	DS	1236	
SQN-INT-TOX	comp	4°C	12/13/01 0841	12/14/01 0741	(1) 2.5 GAL		✓				01-432	2°C	DS	1236	

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	12/14/01 1000	[illegible]	12/14/01 1002
[illegible]	12/14/01 1235	[illegible]	12/14/01 1235

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

COC

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: TVA –Sequoyah Nuclear Plant

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations:
1. Control
2. 10.98%
3. 22%
4. 43.9%
5. 72%
6. 100% outfall
7. Intake

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 169

Age of Test Organisms:

Isolated neonates for test on ~~0830~~ 12/10/01 (date) from ~~1400~~ 0830 to 1400 (time) Initials LSO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: [illegible] (Reviewer Initials) on 12/17/01 (Date)

REV.01, January 00 (ceriodaphnia test info sheet)

Ceriodaphnia Daily Test Information Logsheet

Test Name: TVA - Sequoyah Nuclear Plant Test Dates: 12/10/01 - 12/17/01

Daily Test information	Temperature Information (cup -25±1°C)			Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selanastrum Date	Start Time	End Time		
	a.m.	p.m.								Carboy #	Date Prep.
Day 0 LSD 12/10/01	—	25.1	4	1500	7/17/01	1500	11/20/01	1430	1500	1	12/9/01
Day 1 BAO 12/11/01	25.2	25.2	4	✓ 1530	7/17/01	✓ 1530	11/20/01	1500	1505	1	12/10/01
Day 2 VLS 12/12/01	25.1	25.3	4	1515	7/17/01	1515	11/20/01	1445	1515	1	12/10/01
Day 3 VLS 12/13/01	25.1	25.1	4	1445	7/17/01	1445	11/20/01	1415	1445	1	12/10/01
Day 4 VLS 12/14/01	25.1	25.2	4	1400	7/17/01	1400	11/20/01	1330	1400	1	12/13/01
Day 5 BAO 12/15/01	25.3	25.2	4	1400	7/17/01	1400	11/20/01	1330	1400	1	12/13/01
Day 6 AUP 12/16/01	25.2	25.2	4	1415	7/17/01	1415	11/20/01	1345	1414	1	12/13/01
Day 7 VLS 12/17/01	25.2	25.2	4					1500		—	—

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah Analysts: BAO, VCS, ALR
Location: Soddy Daisy, Tennessee Test Start-Date/Time: 12/10/01/1430
Dates Samples Collected: 12/10, 12/12, 12/14 Test Stop-Date/Time: 12/17/01/1500

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
Control DMW 20%	BAO	1	0	→									0	10	10	0
	VCS	2	0	→									0	10	10	0
	VCS	3	0	→									0	10	10	0
	VCS	4	5	5	4	6	1	4	5	0	7	4	41	10	10	4.1
	BAO	5	0	0	4	0	0	0	0	5	0	0	9	10	10	0.9
	ALR	6	10	10	0	8	7	7	8	8	7	10	77	10	10	7.7
	VCS	7	13	16	14	12	16	15	11	11	12	10	130	10	10	13.0
		Total	28	31	22	26	24	26	24	24	28	24	257	10	10	25.7

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
10.98% Outfall	BAO	1	0	→									0	10	10	0
	VCS	2	0	→									0	10	10	0
	VCS	3	0	→									0	10	10	0
	VCS	4	5	4	1	5	3	4	4	6	4	5	41	10	10	4.1
	BAO	5	7	7	5	6	0	0	0	0	0	0	BAO ~~7~~ 25	10	10	2.5
	ALR	6	0	0	6	0	3	7	8	8	7	5	44	10	10	4.4
	VCS	7	14	14	14	11	14	13	16	8	13	14	131	10	10	13.1
		Total	26	25	26	22	20	24	28	22	24	24	241	10	10	24.1

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
22.0% Outfall	BAO	1	0	→									0	10	10	0
	VCS	2	0	→									0	10	10	0
	VCS	3	0	→									0	10	10	0
	VCS	4	7	5	5	7	1	5	4	4	6	4	48	10	10	4.8
	BAO	5	8	0	7	0	4	0	0	0	0	0	19	10	10	1.9
	ALR	6	0	7	0	3	7	6	7	7	7	6	50	10	10	5.0
	VCS	7	15	12	18	13	16	17	17	12	16	15	151	10	10	15.1
		Total	30	24	30	23	28	28	28	23	29	25	268	10	10	26.8

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah Analysts: BAD YCS ALR
Location: Soddy Daisy, Tennessee Test Start-Date/Time: 12/10/01 /1430
Dates Samples Collected: 12/10 12/12, 12/14 Test Stop-Date/Time: 12/17/01 /1500

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	BAD	1	0										0	10	10	0
	YCS	2	0										0	10	10	0
	YCS	3	0										0	10	10	0
43.9% Outfall	YCS	4	6	5	3	4	3	4	3	6	4	5	43	10	10	4.3
	BAD	5	0	0	7	8	0	0	0	0	0	0	15	10	10	1.5
	ALR	6	10	8	0	0	11	8	6	8	8	8	67	10	10	6.7
	YCS	7	15	16	15	12	15	16	16	10	12	11	138	10	10	13.8
		Total	31	29	25	24	29	28	25	24	24	24	263	10	10	26.3

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	BAD	1	0										0	10	10	0
	YCS	2	0										0	10	10	0
	YCS	3	0										0	10	10	0
72% Outfall	YCS	4	5	5	5	5	3	0	3	4	5	4	39	10	10	3.9
	BAD	5	0	0	0	7	8	0	1	0	0	0	16	10	10	1.6
	ALR	6	8	10	9	0	0	10	8	9	7	7	68	10	10	6.8
	YCS	7	11	12	15	15	11	13	12	10	11	12	122	10	10	12.2
		Total	24	27	29	27	22	23	24	23	23	23	245	10	10	24.5

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	BAD	1	0										0	10	10	0
	YCS	2	0										0	10	10	0
	YCS	3	0										0	10	10	0
100% Outfall	YCS	4	5	4	5	4	4	5	4	4	4	3	42	10	10	4.2
	BAD	5	0	0	7	9	7	0	0	0	0	0	23	10	10	2.3
	ALR	6	7	8	0	0	0	8	7	8	8	7	53	10	10	5.3
	YCS	7	15	15	18	10	17	11	14	9	14	12	135	10	10	13.5
		Total	27	27	~~20~~ 30 YW	23	28	24	25	21	26	22	253	10	10	25.3

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah Analysts: BAD, YCS, PLR

Location: Soddy Daisy, Tennessee Test Start-Date/Time: 12/10/01 1430

Dates Samples Collected: 12/10, 12/12, 12/14 Test Stop-Date/Time: 12/17/01 1500

			Replicate										Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9	10				
			--	--	--	--	--	--	--	--	--	--				
	BAD	1	0										0	10	10	0
	YCS	2	0										0	10	10	0
	YCS	3	0										0	10	10	0
100% Intake	YCS	4	4	6	3	5	3	3	6	4	4	5	43	10	10	4.3
	BAD	5	8	9	7	0	0	0	0	0	0	0	24	10	10	2.4
	PLR	6	8	1	0	9	8	9	5	7	9	6	60	10	10	6.0
	YCS	7	16	16	13	11	15	16	12	11	11	12	133	10	10	13.3
		Total	30	32	23	25	26	27	26	22	24	25	260	10	10	26.0

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/10/01 14:30	Test ID: SN1201cr	Sample ID: TN0026450
End Date:	12/17/01 15:00	Lab ID: S&ME INC.	Sample Type: EFF3-Power Plant
Sample Date:		Protocol: EPAF 91-EPA Freshwater	Test Species: CD-Ceriodaphnia dubia
Comments:			

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	31.000	22.000	26.000	24.000	26.000	24.000	24.000	28.000	24.000
10.98	26.000	25.000	26.000	22.000	20.000	24.000	28.000	22.000	24.000	24.000
22	30.000	24.000	30.000	23.000	28.000	28.000	28.000	23.000	29.000	25.000
43.9	31.000	29.000	25.000	24.000	29.000	28.000	25.000	24.000	24.000	24.000
72	24.000	27.000	29.000	27.000	22.000	23.000	24.000	23.000	23.000	23.000
100	27.000	27.000	30.000	23.000	28.000	24.000	25.000	21.000	26.000	22.000

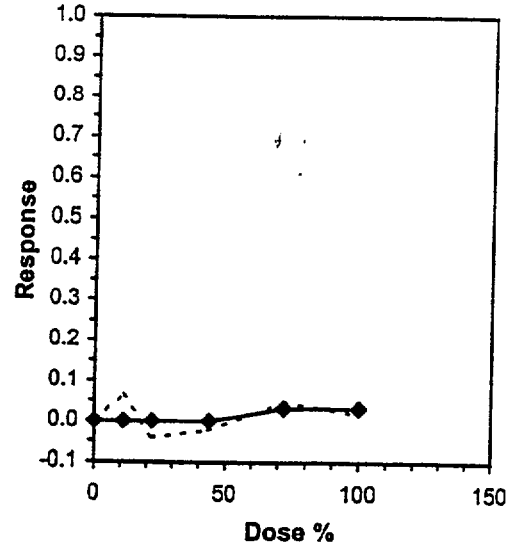
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	25.700	1.0000	25.700	22.000	31.000	10.384	10			25.725	1.0000
10.98	24.100	0.9377	24.100	20.000	28.000	9.672	10	90.00	75.00	25.725	1.0000
22	26.800	1.0428	26.800	23.000	30.000	10.376	10	116.00	75.00	25.725	1.0000
43.9	26.300	1.0233	26.300	24.000	31.000	10.147	10	112.50	75.00	25.725	1.0000
72	24.500	0.9533	24.500	22.000	29.000	9.475	10	88.50	75.00	24.900	0.9679
100	25.300	0.9844	25.300	21.000	30.000	11.187	10	101.50	75.00	24.900	0.9679

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.16764	1.035	0.25398	-0.8876
Bartlett's Test indicates equal variances (p = 0.99)	0.63383	15.0863		

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

Linear Interpolation (80 Resamples)

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



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/10/01 14:30	Test ID:	SN1201Incr	Sample ID:	TN0026450
End Date:	12/17/01 15:00	Lab ID:	S&ME INC.	Sample Type:	EFF3-Power Plant
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	31.000	22.000	26.000	24.000	26.000	24.000	24.000	28.000	24.000
Intake	30.000	32.000	23.000	25.000	26.000	27.000	26.000	22.000	24.000	25.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	25.700	1.0000	25.700	22.000	31.000	10.384	10		-	
Intake	26.000	1.0117	26.000	22.000	32.000	11.750	10	-0.234	1.734	2.224

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93247	0.868	0.76037	-0.0034
F-Test indicates equal variances (p = 0.69)	1.31045	6.54109		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant
Analysts: LSD, VCS, BAD, DSG
Location: Soddy Daisy, Tennessee
Dates/times: 12/10/01 1430 - 12/17/01 1500
Template No.: 1
Age of neonates: <24 hrs

Control: (20% DMW)	0	1	2	3	4	5	6	7	Remarks
	Day								
Temperature-Initial	24.6	24.3	24.4	25.2	25.1	24.0	25.0		
Final		24.3	24.9	25.5	25.4	24.4	25.3	24.8	
D.O. Initial	7.1	7.5	7.6	7.2	7.2	7.6	7.2		
Final		7.0	7.8	7.0	6.3	6.8	6.9	7.5	
pH Initial	8.1	8.1	7.9	7.9	8.0	8.2	8.1		
Final		8.0	8.1	8.0	7.9	8.0	8.0	8.1	
Alkalinity	~~67~~ 67	62	/	/	~~62~~ 59	/	/		alk day 0 - 67
Hardness	90	90	/	/	95	/	/		alk day 4 = 60
Conductivity-Initial	181	179	173	170	134	150	159		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

10.98% Outfall 001	0	1	2	3	4	5	6	7	Remarks
	Day								
Temperature-Initial	24.7	24.3	24.4	25.4	25.2	24.0	25.0		
Final		24.4	24.8	25.4	25.4	25.2	25.0	24.6	d.O. 6 day => 7.2
D.O. Initial	7.1	7.5	7.5	7.2	7.2	7.9	~~7.8~~		
Final		7.0	7.7	6.8	6.3	6.6	6.8	7.7	
pH Initial	8.1	8.0	8.0	8.1	8.1	8.1	8.1		
Final		8.1	8.2	8.1	8.0	8.0	8.0	8.1	
Conductivity-Intitial	183	180	179	176	152	156	161		
Analyst Initials	LSD	BAD	BAD	DSG	DSG	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

22% Outfall 001	0	1	2	3	4	5	6	7	Remarks
	Day								
Temperature-Initial	24.6	24.5	24.5	25.2	25.1	24.0	25.1		
Final		24.4	24.7	25.4	24.7	25.2	25.0	24.6	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.6	7.2		
Final		7.0	7.7	6.3	6.6	6.7	6.8	7.8	
pH Initial	8.0	8.0	8.0	8.1	8.1	8.1	8.1		
Final		8.1	8.2	8.1	8.0	8.1	8.0	8.1	
Conductivity-Intitial	185	183	182	182	160	159	160		
Analyst Initials	LSD	BAD	BAD	DSG	DSG	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Notes:

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant Analysts: VCS, LSD, BAD, DSG

Location: Soddy Daisy, Tennessee Dates/times: 12/10/01/1430 - 12/17/01/1500

Template No.: Age of neonates: <24 hrs

Day									
43.9% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.4	24.4	25.3	25.0	24.0	25.0		
Final		24.0	24.6	25.3	24.3	24.7	25.2	24.5	
D.O. Initial	7.1	7.2	7.5	7.2	7.2	7.5	7.2		
Final		7.1	7.7	6.8	6.7	6.9	6.9	7.6	
pH Initial	8.0	7.9	7.9	8.0	8.0	8.0	8.0		
Final		8.1	8.2	8.1	8.1	8.1	8.1	8.1	
Conductivity-Initial	187	186	187	188	168	~~158~~	164		cond day 5 = 168
Analyst Initials	LSD	BAD	BAD	DSG	DSG	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Day									
72% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.6	24.6	25.3	25.1	24.0	25.0		
Final		24.0	24.5	25.1	24.0	24.6	25.0	24.6	
D.O. Initial	7.1	7.0	7.5	7.2	7.2	7.5	7.2		
Final		7.1	7.7	6.9	7.0	6.9	6.9	7.6	
pH Initial	7.8	7.8	7.8	7.9	7.9	7.9	7.9		
Final		8.1	8.3	8.1	8.1	8.2	8.2	8.2	
Conductivity-Initial	190	189	193	194	179	178	181		
Analyst Initials	LSD	BAD	BAD	DSG	DSG	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Day									
100% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	~~24.8~~	24.9	25.4	25.1	24.0	25.0		24.8 = init. stereo day 2
Final		24.1	24.4	25.0	24.0	24.5	25.0	24.4	
D.O. Initial	7.0	7.2	~~7.4~~	7.2	7.2	7.5	7.2		init D.O. day 2 = 7.8
Final		7.0	7.8	6.9	7.1	7.0	7.1	7.6	
pH Initial	7.7	7.6	7.8	7.9	~~8.0~~	7.8	7.8		ph day 4 => 7.8
Final		8.1	8.3	8.2	8.1	8.2	8.2	8.2	
Alkalinity	63	/	69	/	67	/	/		Conductivity day 4 => 191
Hardness	70	/	80	/	80	/	/		
Conductivity-Initial	193	194	201	205	~~188~~	191	183		
Chlorine	0.07	/	0.08	/	0.07	/	/		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes:

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant Analysts: VCS, LSD, BJD, DSE

Location: Soddy Daisy, Tennessee Dates/times: 12/10/01/1430 - 12/7/01/1500

Template No.: 1 Age of neonates: <24 hrs

	Day								
Intake-100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	25.0	24.8	25.3	25.3	24.0	25.0		
Final		24.2	24.1	24.9	24.9	24.3	25.2	24.6	
D.O. Initial	7.0	7.1	8.0	7.2	7.2	7.6	7.2		
Final		7.0	7.8	7.0	6.7	7.0	7.0	7.7	
pH Initial	7.4	7.13	7.7	7.8	7.8	7.8	7.8		
Final		8.1	8.0	8.1	8.2	8.2	7.3	8.2	
Alkalinity	1.7	/	70	/	68	/	/		
Hardness	72	/	80	/	76	/	/		
Conductivity-Initial	190	198	196	205	193	192	194		
Chlorine	0.15	/	0.06	/	0.05	/	/		
Analyst Initials	LSD	BJD	BJD	VCS	VCS	BJD	DSE	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10/01	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes:

SQN- December 10 - 17, 2001 INITIAL AND FINAL WATER CHEMISTRY (CERIO)

Initial Chemistry

CERIO

Control	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.6	24.3	24.4	25.2	25.1	24.0	25.0	24.0	25.2		24.7
DO	7.1	7.5	7.6	7.2	7.2	7.6	7.2	7.1	7.6		7.3
pH	8.1	8.1	7.9	7.9	8.0	8.2	8.1	7.9	8.2		8.0
Cond	181	179	173	170	134	150	159	134	181		164
Hard	90.0	90.0			95.0			90.0	95.0		91.7
Alk	67.0	62.0			60.0			60.0	67.0		63.0

Concentration 10.98%	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.7	24.3	24.4	25.4	25.2	24.0	25.0	24.0	25.4		24.7
DO	7.1	7.5	7.5	7.2	7.2	7.8	7.2	7.1	7.8		7.4
pH	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.0	8.1		8.1
Cond	183	180	179	176	152	156	161	152	183		170

Concentration 22%	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.6	24.5	24.5	25.2	25.1	24.0	25.1	24.0	25.2		24.7
DO	7.1	7.4	7.5	7.2	7.2	7.6	7.2	7.1	7.6		7.3
pH	8.0	8.0	8.0	8.1	8.1	8.1	8.1	8.0	8.1		8.1
Cond	185	183	182	182	160	159	160	159	185		173

Concentration 43.9%	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.5	24.4	24.4	25.3	25.0	24.0	25.0	24.0	25.3		24.7
DO	7.1	7.2	7.5	7.2	7.2	7.5	7.2	7.1	7.5		7.3
pH	8.0	7.9	7.9	8.0	8.0	8.0	8.0	7.9	8.0		8.0
Cond	187	186	187	188	168	168	169	168	188		179

Concentration 72%	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.6	24.6	24.6	25.3	25.1	24.0	25.0	24.0	25.3		24.7
DO	7.1	7.0	7.5	7.2	7.2	7.5	7.2	7.0	7.5		7.2
pH	7.8	7.8	7.8	7.9	7.9	7.9	7.9	7.8	7.9		7.9
Cond	190	189	193	194	179	178	181	178	194		186

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.6	24.8	24.9	25.4	25.1	24.0	25.0	24.0	25.4		24.8
DO	7.0	7.2	7.8	7.2	7.2	7.5	7.2	7.0	7.8		7.3
pH	7.7	7.6	7.8	7.9	7.8	7.8	7.8	7.6	7.9		7.8
Cond	193	194	201	205	191	191	183	183	205		194
Hard	70.0		80.0		80.0			70	80		76.7
Alk	63.0		69.0		67.0			63	69		66.3
TRC	0.07		0.08		0.07			0.07	0.08		0.07

Cerio Water Chemistry

Intake	0	1	2	3	4	5	6	MIN	MAX		MEAN
Temp	24.3	25.0	24.8	25.3	25.3	24.0	25.0	24.0	25.3		24.8
DO	7.0	7.1	8.0	7.2	7.2	7.6	7.2	7.0	8.0		7.3
pH	7.4	7.6	7.7	7.8	7.8	7.8	7.8	7.4	7.8		7.7
Cond	190	198	196	205	193	192	194	190	205		195
Hard	72.0		80.0		76.0			72	80		76.0
Alk	67.0		70.0		68.0			67	70		68.3
TRC	0.15		0.06		0.05			0.05	0.15		0.09

Final Chemistry

CERIO

Cerio - Medium	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.3	24.9	25.5	25.4	24.4	25.3	24.8	24.3	25.5		24.9
DO	7.0	7.8	7.0	6.3	6.8	6.9	7.5	6.3	7.8		7.0
pH	8.0	8.1	8.0	7.9	8.0	8.0	8.1	7.9	8.1		8.0

Concentration 10.98%	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.4	24.8	25.4	25.4	25.2	25.0	24.6	24.4	25.4		25.0
DO	7.0	7.7	6.8	6.3	6.6	6.8	7.7	6.3	7.7		7.0
pH	8.1	8.2	8.1	8.0	8.0	8.0	8.1	8.0	8.2		8.1

Concentration 22%	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.4	24.7	25.4	24.7	25.2	25.0	24.6	24.4	25.4		24.9
DO	7.0	7.7	6.8	6.6	6.7	6.8	7.8	6.6	7.8		7.1
pH	8.1	8.2	8.1	8.0	8.1	8.0	8.1	8.0	8.2		8.1

Concentration 43.9%	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.0	24.6	25.3	24.3	24.7	25.2	24.5	24.0	25.3		24.7
DO	7.1	7.7	6.8	6.7	6.9	6.9	7.6	6.7	7.7		7.1
pH	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.2		8.1

Concentration 72%	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.0	24.5	25.1	24.0	24.6	25.0	24.6	24.0	25.1		24.5
DO	7.1	7.7	6.9	7.0	6.9	6.9	7.6	6.9	7.7		7.2
pH	8.1	8.3	8.1	8.1	8.2	8.2	8.2	8.1	8.3		8.2

Concentration 100%	1	2	3	4	5	6	7	MIN	MAX		MEAN
Temp	24.1	24.4	25.0	24.0	24.5	25.0	24.4	24.0	25.0		24.5
DO	7.0	7.8	6.9	7.1	7.0	7.1	7.6	6.9	7.8		7.2
pH	8.1	8.3	8.2	8.1	8.2	8.2	8.2	8.1	8.3		8.2

Cerio Water Chemistry

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.2	24.1	24.9	24.9	24.3	25.2	24.6	24.1	25.2	24.6
DO	7.0	7.8	7.0	6.7	7.0	7.0	7.7	6.7	7.8	7.2
pH	8.1	8.0	8.1	8.2	8.2	7.3	8.2	7.3	8.2	8.0

Test temperature	Mean:	24.7
	Min:	24.0
	Max:	25.5

Word Review by: CM

Excel Reviewed by: CM

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

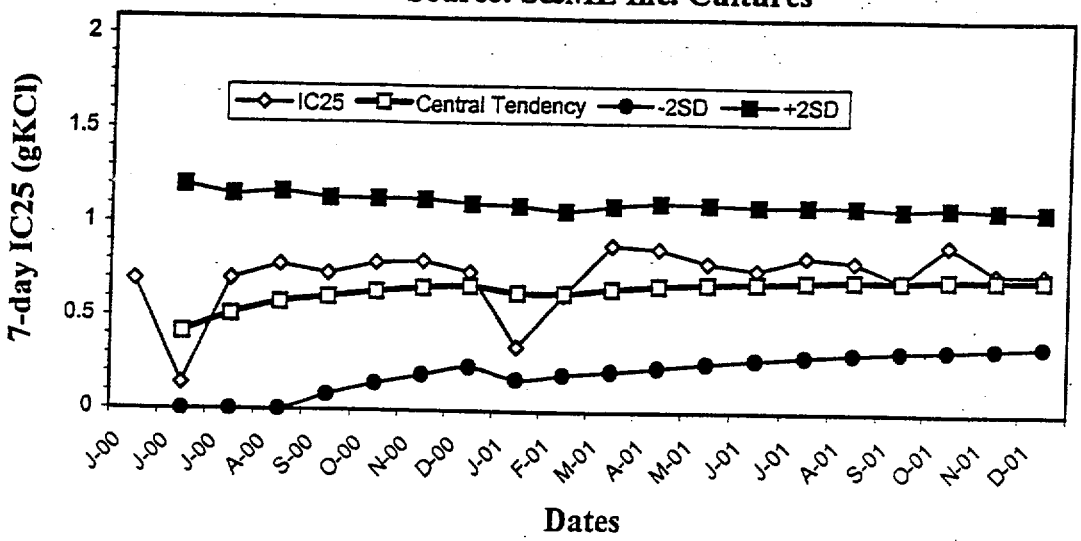
Appendix D

Reference Toxicant Tests and
Control Chart Information

Fathead Minnow Potassium Chloride Chronic Reference Toxicant Control Chart

CV% = 25.0

Source: S&ME Inc. Cultures



Dates	Values	Mean	-2 SD	+2 SD
6/13/00	0.6935			
7/10/00	0.1400	0.4168	0.0000	1.1996
7/26/00	0.7000	0.5112	0.0000	1.1541
8/24/00	0.7760	0.5774	0.0000	1.1653
9/17/00	0.7317	0.6082	0.0807	1.1358
10/17/00	0.7892	0.6384	0.1439	1.1329
11/30/00	0.7997	0.6615	0.1939	1.1290
12/30/00	0.7418	0.6715	0.2349	1.1081
1/29/01	0.3442	0.6351	0.1721	1.0981
2/19/01	0.6250	0.6341	0.1975	1.0707
3/6/01	0.8859	0.6570	0.2159	1.0981
4/9/01	0.8693	0.6747	0.2366	1.1128
5/10/01	0.7948	0.6839	0.2592	1.1086
6/4/01	0.7580	0.6892	0.2793	1.0992
7/18/01	0.8288	0.6985	0.2970	1.1001
8/20/01	0.8040	0.7051	0.3136	1.0966
9/18/01	0.7039	0.7050	0.3260	1.0841
10/30/01	0.8997	0.7159	0.3368	1.0949
11/18/01	0.7502	0.7177	0.3490	1.0864
12/9/01	0.7514	0.7194	0.3602	1.0785

Fathead Minnow Daily Test Information Logsheet

Test Name: Chronic Reference Test Test Dates: 12/9/01 - 12/16/01

Daily Test information	Temperature Information (25±1°C)			Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time		
	a.m.	p.m.						Carboy #	Date Prep.
Day 0 LSO 12/9/01	25.3	25.3	4		am: — ✓ pm: 1600	1135	[illegible]	2	12/7/01
Day 1 VS 12/10/01	25.2	25.1	4		✓ am: 1000 ✓ pm: 1615	1145	1215	2	12/9/01
Day 2 BJO 12/11/01	25.2	25.2	4		✓ am: 0930 ✓ pm: 1600	1115	1145	4	12/9/01
Day 3 VCS 12/12/01	25.1	25.3	4		✓ am: 1000 ✓ pm: 1630	1100	1130	4	12/11/01
Day 4 VCS 12/13/01	25.1	25.1	4		✓ am: 0930 ✓ pm: 1600	1040	1115	2	12/11/01
Day 5 VS 12/14/01	25.1	25.2	4		✓ am: 0830 ✓ pm: 1600	1040	1105	4	12/12/01
Day 6 BJO 12/15/01	25.3	25.2	4		✓ am: 0915 ✓ pm: 1500	1035	1105	2	12/13/01
Day 7 AGC 12/16/01	25.2	25.2	4			1100		—	—

Client: S&ME Chronic Reference

Location: S&ME Laboratory

Analyst: DSG, LSD, VCS

Dates: 12/9/01 – 12/16/01

CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
Control Mod. Hard	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0	0	0**	0
	LSD	6	0	0	0	0
	ALR	7	0	0	0	0
250 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0	0	0	0
	LSD	6	0	0	0	0
	ALR	7	0	0	0	0
500 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0*	0	0	0
	LSD	6	4	0	0	0
	ALR	7	1	0	0	0
750 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	2	0	1
	LSD	4	0	LSD 2	1	LSD 1
	LSD	5	1	3	3	1
	LSD	6	1	3	3	1
	ALR	7	1	3	4	1
1000 mg/L (KCl)	VCS	1	0	0	1	1
	VCS	2	3	0	3	3
	VCS	3	6	6	6	6
	LSD	4	6	6	6	6
	LSD	5	6	4	6	6
	LSD	6	3	2	7	6
	ALR	7	7	8	8	6

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
1500 mg/L (KCl)	VCS	1	7	6	5	5
	VCS	2	9	8	7	9
	VCS	3	10	9	8	9
	LSD	4	10	10	10	10
		5	↓	↓	↓	↓
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

* last 4 fish when cup was spilled 12/14/01 LSD

** Injured during removal 12/4/01 LSD

FATHEAD MINNOW SEVEN DAY TEST
RAW DATA
SURVIVAL AND GROWTH

Client: S&ME Chronic Reference Test
Test Conducted By: DSG, LSD, VCS
Date Weighed 12/17/01
Weights Conducted by: DSG

Test Dates: 12/9/01 - 12/16/01
Oven Temp (°C) 103
Comments:
Drying Time (h) ~~110~~ LSD QA 9 1/2 hrs
End of drying (date/time) 0900 12/17/01
Start of drying (date/time) 1130 12/16/01

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare)(mg)	Mean Dry Weight (mg)
Control	A	10	10	1264.99	1270.02	5.83	0.503
(Mod. Hard)	B	10	10	1253.35	1257.88	4.53	0.453
	C	10	10	1259.65	1264.55	4.90	0.490
	D	10	10	1255.13	1260.40	5.27	0.527
250 mg/L	A	10	10	1264.50	1269.51	5.01	0.501
(KCl)	B	10	10	1263.07	1268.08	5.01	0.501
	C	10	10	1263.71	1267.97	4.26	0.426
	D	10	10	1264.20	1269.19	4.99	0.499
500 mg/L	A	6	~~10~~ 6	1257.10	1259.55	~~2.45~~ 4.00	0.408
(KCl)	B	10	10	1260.41	1264.73	4.32	0.432
	C	10	10	1263.02	1267.94	4.92	0.492
	D	10	10	1262.73	1267.34	4.61	0.461
750 mg/L	A	9	10	1258.84	1262.39	3.55	0.355
(KCl)	B	7	10	1262.35	1266.46	4.11	0.411
	C	6	10	1250.18	1253.27	3.09	0.309
	D	9	10	1250.41	1254.50	4.09	0.409
1000 mg/L	A	3	10	1263.15	1264.86	1.71	0.171
(KCl)	B	2	10	1262.94	1264.28	1.34	0.134
	C	2	10	1259.08	1260.38	1.30	0.130
	D	4	10	1250.47	1253.35	2.88	0.288

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/9/01 11:35	Test ID:	Ref1201fg	Sample ID:	REF-Ref Toxicant
End Date:	12/16/01 11:00	Lab ID:		Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.5030	0.4530	0.4900	0.5270
250	0.5010	0.5010	0.4260	0.4990
500	0.4083	0.4320	0.4920	0.4610
750	0.3550	0.4110	0.3090	0.4090
1000	0.1710	0.1340	0.1300	0.2880

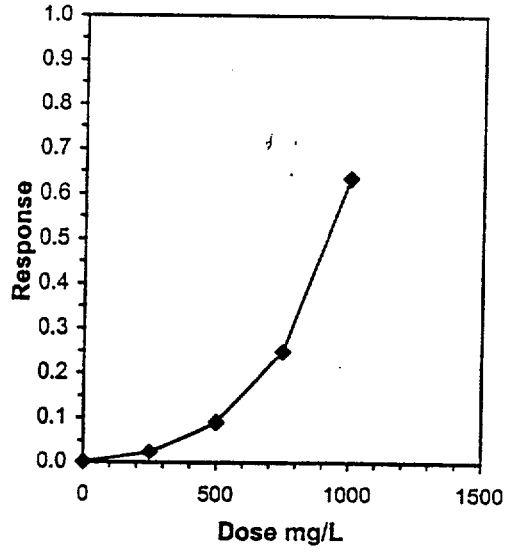
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4933	1.0000	0.4933	0.4530	0.5270	6.265	4				0.4933	1.0000
250	0.4818	0.9767	0.4818	0.4260	0.5010	7.717	4	0.339	2.360	0.0800	0.4818	0.9767
500	0.4483	0.9089	0.4483	0.4083	0.4920	8.077	4	1.326	2.360	0.0800	0.4483	0.9089
*750	0.3710	0.7522	0.3710	0.3090	0.4110	13.153	4	3.608	2.360	0.0800	0.3710	0.7522
*1000	0.1807	0.3664	0.1807	0.1300	0.2880	40.854	4	9.222	2.360	0.0800	0.1807	0.3664

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94546	0.868	0.54046	0.49254
Bartlett's Test indicates equal variances (p = 0.60)	2.76513	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	500	750	612.372		0.07997	0.16213	0.0665	0.0023	6.7E-07	4, 15

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	348.47	119.00	0.00	639.68	-0.2193
IC10	514.25	80.68	65.98	639.22	-1.5899
IC15	593.98	47.43	431.48	741.82	-0.1763
IC20	673.71	51.28	551.96	818.15	0.2887
IC25	751.40	39.48	600.04	821.49	-0.6644
IC40	848.62	26.11	770.29	920.45	-0.1432
IC50	913.44				



Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test
Analysts: LSD, DSG, VCS
Location: S&ME Inc. Laboratory
Dates/times: 12/9/01/1135 - 12/16/01/1100
Template No.: 1
Age of larvae: <24 hrs

Control: (Mod. Hard)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.0	24.4	24.6	25.1	24.3	24.1		
Final		24.8	25.2	25.0	25.3	24.8	24.1	24.5	
D.O. Initial	7.3	7.2	7.1	7.7	7.3	7.3	7.3		
Final		6.3	6.5	7.0	6.9	6.8	7.2	7.1	
pH Initial	8.0	7.8	8.0	7.9	8.0	8.1	8.2		
Final		7.8	7.7	7.5	7.8	7.5	7.8	7.6	
Alkalinity	71	62	67	65	67	67	70		
Hardness	95	98	100	98	92	90	92		
Conductivity	334	326	325	318	321	35	340		
Analyst Initials	DSG	VCS	BAO	BAO	DSG	VCS	BAO	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

250 mg/L (KCl)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.4	24.0	24.0	24.6	25.2	24.2	24.1		
Final		24.8	25.2	25.1	25.3	25.1	24.5	24.4	
D.O. Initial	7.3	7.2	7.1	7.6	7.2	7.2	7.2		
Final		6.3	6.7	7.0	6.9	6.7	7.1	7.1	
pH Initial	8.1	7.9	8.0	8.0	8.0	8.1	8.2		
Final		7.6	7.6	7.5	7.8	7.5	7.9	7.6	
Conductivity	673	754	758	693	718	729	776		
Analyst Initials	DSG	VCS	BAO	BAO	DSG	VCS	BAO	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

500 mg/L (KCl)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.1	24.0	24.4	24.7	25.2	24.3	24.2		
Final		24.8	25.9	25.2	25.3	25.1	25.4	24.7	
D.O. Initial	7.2	7.2	7.1	7.6	7.3	7.2	7.3		
Final		6.3	6.6	7.0	6.9	6.7	6.8	6.9	
pH Initial	8.1	8.0	8.0	8.0	8.0	8.2	8.3		
Final		7.6	7.6	7.6	7.8	7.6	7.9	7.7	
Conductivity	1171	1104	[illegible]	1087	1122	1128	1164		Cond. d. 2 = 1123
Analyst Initials	DSG	VCS	BAO	BAO	DSG	VCS	BAO	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

NOTES:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test
Location: S&ME Inc. Laboratory
Template No.: 1

Analysts: LSD, DSG
Dates/times: 12/9/01/1135 - 12/16/01/1100
Age of larvae: <24 hrs

750 mg/L (KCl)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.3	24.0	24.4	24.8	25.3	24.2	24.2		
Final		25.3	25.0	25.5	25.2	25.9	24.9	25.0	
D.O. Initial	7.2	7.1	7.1	7.6	7.2	~~7.3~~ VCS	7.2		No for day 5 = 7.1
Final		6.2	6.5	7.0	7.0	6.5	6.9	6.9	
pH Initial	8.1	8.1	8.1	8.0	8.1	8.1	8.3		
Final		7.6	7.6	7.4	7.8	7.6	7.9	7.7	
Conductivity	1574	1518	1564	1512	1549	1538	1571		
Analyst Initials	DSG	VCS	BAO	BAO	DSG	VCS	BAO	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

1000 mg/L (KCl)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.6	24.0	24.4	24.8	25.4	24.3	24.2		
Final		25.0	26.0	25.0	25.3	25.1	24.9	25.1	
D.O. Initial	7.2	7.1	7.1	7.6	7.2	7.2	7.2		
Final		6.3	7.0	7.1	6.9	6.7	7.1	6.9	
pH Initial	8.2	8.1	8.1	8.0	8.1	8.2	8.3		
Final		7.6	7.7	7.6	7.8	7.5	7.9	7.7	
Conductivity	1986	1957	1948	1888	1959	1954	1852		
Analyst Initials	~~DSG 1986~~	VCS	BAO	BAO	DSG	VCS	BAO	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

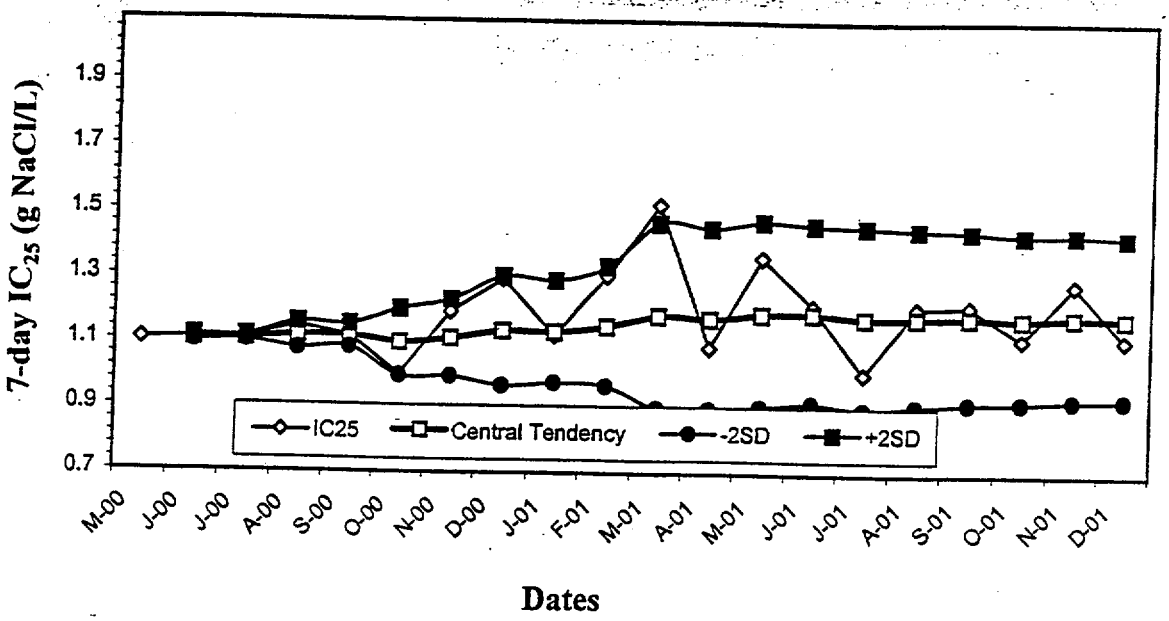
1500 mg/L (KCl)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.6	24.0	24.4	24.8	25.3				
Final		24.9	26.0	24.6	—	/	/	/	
D.O. Initial	7.2	7.6	7.1	7.6	7.3	/	/		
Final		6.4	7.6	7.3	—	/	/	/	
pH Initial	8.1	8.1	8.1	8.0	9.0	/	/		
Final		7.6	7.8	7.5	—	/	/	/	
Conductivity	2810	2730	2450	2720	2721				
Analyst Initials	DSG	VCS	BAO	BAO	DSG				
QA Review Initials	LSD	LSD	LSD	LSD	LSD				
Stock Solution Date	12/9/01	12/9/01	12/9/01	12/11	12/11	12/11/01	12/11/01		

NOTES:

Ceriodaphnia dubia Sodium Chloride Chronic Reference Toxicant Control Chart

CV% = 10.6

Source: S&ME Inc. Cultures



Dates	Values	Mean	-2 SD	+2 SD
5/19/00	1.1038			
6/16/00	1.1100	1.1069	1.0982	1.1156
07/14/00	1.1106	1.1081	1.1007	1.1156
8/11/00	1.1483	1.1182	1.0776	1.1588
09/29/00	1.1180	1.1181	1.0829	1.1533
10/20/00	0.9996	1.0984	0.9966	1.2002
11/27/00	1.1931	1.1119	0.9946	1.2292
12/18/00	1.2921	1.1344	0.9670	1.3019
1/15/01	1.1200	1.1328	0.9759	1.2897
2/23/01	1.3046	1.1500	0.9665	1.3336
3/14/01	1.5233	1.1839	0.8994	1.4685
4/17/01	1.0857	1.1758	0.8985	1.4530
5/20/01	1.3621	1.1901	0.9053	1.4749
6/15/01	1.2154	1.1919	0.9179	1.4659
7/17/01	1.0089	1.1797	0.8993	1.4601
8/14/01	1.2115	1.1817	0.9103	1.4531
9/24/01	1.2183	1.1838	0.9205	1.4472
10/29/01	1.1179	1.1802	0.9228	1.4376
11/27/01	1.2857	1.1857	0.9310	1.4405
12/10/01	1.1171	1.1823	0.9324	1.4322

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: Chronic Reference Test

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations:
1. Control
2. 500 mg/L
3. 750 mg/L
4. 1000 mg/L
5. 1500 mg/L
6. 2000 mg/L

Stock (if applicable): 10,000 mg/L stock prepared 12/10/01

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 169

Age of Test Organisms:

Isolated neonates for test on 12/10/01 (date) from 0830 to 1400 (time) Initials LSO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: [signature] (Reviewer Initials) on 12/19/01 (Date)

REV.01, January 00 (ceriodaphnia test info sheet)

Ceriodaphnia Daily Test Information Logsheet

Test Name: Chronic Reference Test Test Dates: 12/10/01 - 12/17/01

Daily Test information	Temperature Information (cup -25±1°C)			Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selanastrum Date	Start Time	End Time		
	a.m.	p.m.								Carboy #	Date Prep.
Day 0 LSO 12/10/01	—	25.1	4	1600	7/17/01	1600	11/20/01	1530	1600	1	12/9/01
Day 1 BAD 12/11/01	25.2	25.2	4	1615	7/17/01	1615	11/20/01 ~~7/17/01~~ BAD	1545	1615	1	12/10/01
Day 2 VCS 12/12/01	25.1	25.3	4	1620	7/17/01	1620	11/20/01	1545	1620	1	12/10/01
Day 3 VCS 12/13/01	25.1	25.1	4	1540	7/17/01	1540	11/20/01	1570	1540	1	12/10/01
Day 4 VCS 12/14/01	25.1	25.2	4	1530	7/17/01	1530	11/20/01	1500	1530	1	12/13/01
Day 5 BAD 12/15/01	25.3	25.2	4	1500	7/17/01	1500	11/20/01	1430	1500	1	12/13/01
Day 6 AUR 12/16/01	25.2	25.2	4	1450	7/17/01	1450	11/20/01	1430	1450	1	12/13/01
Day 7 VCS 12/17/01	25.2	25.2	4					1530		VCS	—

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Reference Test
Location: S&ME Inc.
Analysts: LSO VCS, BAD, DSG

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
Control	BAD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	4	5	4	6	5	4	4	5	3	0	40	10	10	4.0
	DSG	5	8	7	10	8	7	0	0	8	7	10	65	10	10	6.5
	DSG	6	12	11	0	10	0	9	11	0	12	0	65	10	10	6.5
	DSG	7	0	0	12	0	13	13	12	14	0	14	78	10	10	7.8
		Total	24	23	26	24	25	26	27	27	22	24	248	10	10	24.8

500	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
	BAD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	5	4	4	3	5	4	3	5	6	5	44	10	10	4.4
	DSG	5	9	8	18	8	8	9	7	0	8	0	67	10	10	6.7
	DSG	6	0	7	0	9	9	0	12	13	0	10	~~50~~ 60 LSO	10	10	~~5.0~~ 6.0 LSO
	DSG	7	11	10	12	0	0	14	0	8	12	11	78	10	10	7.8
		Total	25	29	26	20	22	27	22	26	26	26	249	10	10	24.9

750	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
	BAD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	4	4	3	2	4	5	5	4	4	5	40	10	10	4.0
	DSG	5	8	10	0	9	0	8	7	9	0	0	51	10	10	5.1
	DSG	6	10	0	11	11	12	0	0	11	10	9	74	10	10	7.4
	DSG	7	0	13	10	0	11	14	14	0	11	11	84	10	10	8.4
		Total	22	27	24	22	27	27	26	24	25	25	249	10	10	24.9

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Reference Test
Location: S&ME Inc.
Analysts: LSD, VCS, BAO DSC

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
	Init.	Day	1	2	3	4	5	6	7	8	9	10				
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
	BAO	1	0									→	0	10	10	0
	LSD	2	0									→	0	10	10	0
	LSD	3	0									→	0	10	10	0
1000	VCS	4	4	3	0	5	4	5	3	2	4	3	33	10	10	3.3
	DSC	5	5	6	4	4	0	0	4	7	6	5	41	10	10	4.1
	DSC	6	5	0	6	7	6	10	9	0	10	6	59	10	10	5.9
	DSC	7	9	10	9	1	1	8	4	12	0	8	72	10	10	7.2
		Total	23	19	19	17	21	23	20	21	20	22	205	10	10	20.5

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
	Init.	Day	1	2	3	4	5	6	7	8	9	10				
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
	BAO	1	0									→	0	10	10	0
	LSD	2	0									→	0	10	10	0
	LSD	3	0									→	0	10	10	0
1500	VCS	4	3	4	3	2	4	3	0	4	3	3	29	10	10	2.9
	DSC	5	0	0	1	2	0	4	3	4	0	0	14	10	10	1.4
	DSC	6	6	7	7	0	5	0	4	0	9	7	45	10	10	4.5
	DSC	7	7	5	1	8	9	7	6	9	4	7	63	10	10	6.3
		Total	16	16	12	12	18	14	13	17	16	17	151	10	10	15.1

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
	Init.	Day	1	2	3	4	5	6	7	8	9	10				
			--	--	--	--	--	--	--	--	--	--	---	---	---	---
	BAO	1	0									→	0	10	10	0
	LSD	2	X	X	X	X	X	X	X	X	X	X	0	0	10	0
		3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0	0	10	0
2000		4											0	0	10	0
		5											0	0	10	0
		6											0	0	10	0
		7											0	0	10	0
		Total	0	0	0	0	0	0	0	0	0	0	0	0	10	0

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	12/10/01 15:30	Test ID:	Ref1201cr	Sample ID:	REF-Ref Toxicant
End Date:	12/17/01 15:30	Lab ID:	S&ME INC.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	24.000	23.000	26.000	24.000	25.000	26.000	27.000	27.000	22.000	24.000
500	25.000	29.000	26.000	20.000	22.000	27.000	22.000	26.000	26.000	26.000
750	22.000	27.000	24.000	22.000	27.000	27.000	26.000	24.000	25.000	25.000
1000	23.000	19.000	19.000	17.000	21.000	23.000	20.000	21.000	20.000	22.000
1500	16.000	16.000	12.000	12.000	18.000	14.000	13.000	17.000	16.000	17.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

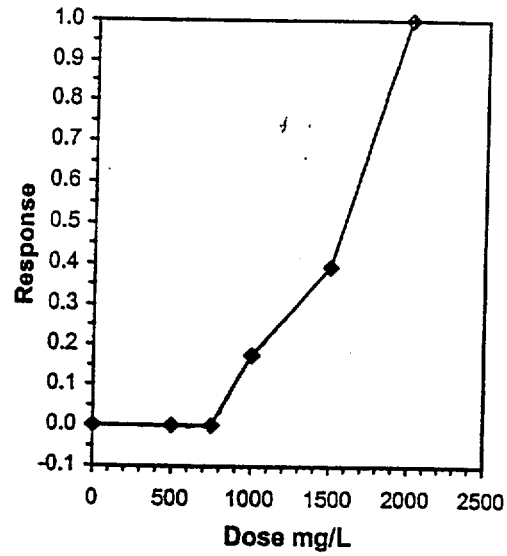
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	24.800	1.0000	24.800	22.000	27.000	6.801	10				24.867	1.0000
500	24.900	1.0040	24.900	20.000	29.000	10.949	10	-0.106	2.223	2.100	24.867	1.0000
750	24.900	1.0040	24.900	22.000	27.000	7.679	10	-0.106	2.223	2.100	24.867	1.0000
*1000	20.500	0.8266	20.500	17.000	23.000	9.270	10	4.552	2.223	2.100	20.500	0.8244
*1500	15.100	0.6089	15.100	12.000	18.000	14.459	10	10.268	2.223	2.100	15.100	0.6072
2000	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95611	0.93	-0.3933	-0.5821
Bartlett's Test indicates equal variances (p = 0.65)	2.45569	13.2767		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	750	1000	866.025		2.10037	0.08469	186.28	4.46222	1.3E-14	4, 45

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	821.183	69.9968	681.554	830.39	-4.7078
IC10	892.366	30.9724	820.33	926.357	0.8830
IC15	963.55	35.013	891.735	1022.56	1.1642
IC20	1056.17	46.035	960.829	1116.43	0.4145
IC25	1171.3	46.0524	1060.11	1237.08	-0.1350
IC40	1505.96	39.2483	1396.43	1541.33	-1.1204
IC50	1588.3	19.4053	1547.28	1617.78	-0.4628



Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference Test
Location: S&ME Inc.
Template No.: 1

Analysts: LSD YCS, BAD, DSG
Dates/times: 12/10/01 1430 - 12/17/01 1500
Age of Neonates: <24 hrs

Control: (20% DMW)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.2	24.6	25.1	25.0	25.0	25.0		
Final		24.6	24.8	25.1	25.1	24.5	24.4	24.7	
D.O. Initial	7.1	7.4	7.5	7.1	7.2	7.4	7.1		
Final		7.0	7.4	7.1	7.1	7.5	7.0	7.0	
pH Initial	8.1	8.1	8.0	7.8	8.0	8.1	8.1		
Final		8.0	8.1	8.0	7.9	8.0	8.1	8.0	
Alkalinity	67	/	/	/	67	/	/		
Hardness	90	/	/	/	95	/	/		
Conductivity	180	180	176	171	138	148	151		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

500 mg/L	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.3	24.6	25.2	25.1	24.9	25.1		
Final		24.5	25.1	25.3	25.0	24.4	24.3	24.8	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.3	7.1		
Final		7.1	7.4	7.0	7.0	7.5	6.9	7.1	
pH Initial	8.1	8.1	8.0	~~7.3~~ DSG	8.1	8.1	8.1		pH day 3 - 7.9
Final		8.0	8.1	8.0	7.8	7.9	8.0	8.0	
Conductivity	1160	1152	1142	1096	1131	1157	8.0		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	LSD	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

750 mg/L	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.3	24.6	25.2	25.0	24.8	24.8		
Final		24.7	25.0	25.3	24.6	24.3	24.5	24.7	
D.O. Initial	7.1	7.4	7.4	7.3	7.2	7.4	7.2		
Final		7.1	7.5	7.0	7.0	7.4	6.9	7.2	
pH Initial	8.1	8.1	8.0	8.0	8.0	8.1	8.1		
Final		8.0	8.1	8.0	7.9	7.9	8.0	8.0	
Conductivity	1605	1589	1609	1576	1611	1581	8.0		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference Test
Location: S&ME Inc.
Template No.: 1

Analysts: LSD, VCS, BDD, DSG
Dates/times: 12/10/01 ~~1430~~ - 12/17/01 1530
Age of Neonates: <24hrs 1590

1000 mg/L	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.3	24.3	25.1	25.1	24.8	24.8		
Final		24.7	25.0	25.1	24.7	24.6	24.6	24.6	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.4	7.2		
Final		7.1	7.5	7.1	7.0	7.3	6.8	7.3	
pH Initial	8.1	8.1	8.0	8.1	8.0	8.1	8.0		
Final		8.0	8.0	8.1	7.9	8.0	8.0	8.1	
Conductivity	1990	2000	2030	2020	2010	2020	2020		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

1500 mg/L	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.4	24.3	25.1	25.0	24.9	24.6		
Final		24.6	24.9	25.0	24.6	24.7	24.7	25.0	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.4	7.1		
Final		7.0	7.4	7.0	7.0	7.5	6.8	7.2	
pH Initial	8.0	8.1	8.0	8.0	8.0	8.1	8.0		
Final		8.0	8.0	8.1	7.9	8.0	8.0	8.1	
Conductivity	2920	2390	2930	2860	2910	2880	2910		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

2000 mg/L	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.4	24.4	/						
Final		24.4	25.1						
D.O. Initial	7.1	7.4	/						
Final		7.0	7.5						
pH Initial	8.0	8.1	/						
Final		8.0	8.0						
Conductivity	3960	3680	/						
Analyst Initials	LSD	LSD	LSD						
QA Review Initials	LSD	LSD	LSD						
Stock Solution Date	12/10/01	12/10/01	12/10/01	→					

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix E

Invalid Fathead Minnow Toxicity Test
Bench Sheets

TOXICITY TEST RESULTS (See Appendix E for Bench Sheets)

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

Conducted 12/10/21 (mm/dd/yy) - 12/17/01 (mm/dd/yy) Using Effluent From Outfall 101. (number)

Test Solutions	Percent Surviving (time intervals used – days)						
	1	2	3	4	5	6	7
Control	97	95	95	95	95	92	92
10.98%Effluent	100	100	100	100	100	95	90
22.0% Effluent	100	100	100	98	93	85	80
43.9% Effluent	100	100	98	90	80	73	68
72.0% Effluent	100	100	100	88	88	85	83
100% Effluent	100	100	100	95	75	70	70
Intake	100	100	88	60	48	43	40

Test Solutions	IC_{25} Mean Dry Weight (mg) (Replication)				
	1	2	3	4	Mean
Control	0.691	0.719	0.675	0.749	0.709
10.98%Effluen	0.894	0.633	0.528	0.865	0.730
22% Effluent	0.677	0.466	0.909	0.516	0.642
43.9% Effluent	0.622	0.150	0.539	0.651	0.491
72% Effluent	0.378	0.819	0.612	0.607	0.604
100% Effluent	0.631	0.757	0.131	0.461	0.484
Intake	0.043	0.333	0.142	0.591	0.277

IC_{25} Value: 75%	Calculated TU Estimates †: 1.3 TUc
95% Confidence Limits Upper Limit = NA Lower Limit = NA	Permit Limit: 2.3 TUc

†NOTE: TUa = 100/LC_{50}; TUc = 100/ IC_{25}

REFERENCE TOXICANT TEST RESULTS

Species	Date	Time	Duration	Toxicant	Results (LC_{50}/IC_{25})
Pimephales promelas	12/09/01	1135	7 days	KCl	0.751 mg/L KCl

Water Chemistry Mean Values and Ranges for Fathead Minnow Test, Sequoyah Nuclear Plant (SQN), December 10 - 17, 2001

Test/ Sample ID	Temperature Initial (°C)	Temperature Final (°C)	Dissolved Oxygen Initial (mg/L)	Dissolved Oxygen Final (mg/L)	pH Initial S.U.	pH Final S.U.	Conductance Initial (µmhos)	Alkalinity Initial mg/L $CaCO_3$	Hardness Initial mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Fathead/ Control	24.6 (24.1-25.3)	24.7 (24.0-25.3)	7.3 (7.2-7.7)	7.0 (6.5-7.9)	8.0 (7.9-8.2)	7.6 (7.5-7.8)	325 (319-338)	66.4 (62-70)	94.6 (90-100)	-
Fathead/ 10.98%	24.7 (24.1-25.2)	24.8 (24.0-25.3)	7.3 (7.2-7.6)	7.1 (6.6-7.7)	8.1 (7.9-8.2)	7.5 (7.4-7.8)	317 (311-325)	-	-	-
Fathead/ 22.0 %	24.7 (24.1-25.3)	25.1 (24.9-25.3)	7.3 (7.2-7.6)	7.0 (6.6-7.6)	8.1 (7.9-8.2)	7.5 (7.4-7.7)	304 (298-311)	-	-	-
Fathead/ 43.9%	24.8 (24.0-25.4)	24.9 (24.0-25.7)	7.3 (7.2-7.7)	6.7 (6.4-7.6)	8.0 (7.9-8.1)	7.5 (7.3-7.6)	273 (269-277)	-	-	-
Fathead/ 72.0 %	24.9 (24.0-25.2)	24.9 (24.0-25.6)	7.4 (7.2-7.9)	6.8 (6.5-7.6)	7.9 (7.7-8.0)	7.7 (7.4-8.0)	234 (225-242)	-	-	-
Fathead/ 100.0 %	24.7 (24.0-25.2)	24.7 (24.0-25.2)	7.4 (7.2-8.0)	6.9 (6.5-7.9)	7.7 (7.6-7.8)	7.5 (7.4-7.9)	197 (191-205)	66.3 (63-69)	76.7 (70-80)	0.07 (0.05-0.08)
Fathead/ Intake	24.8 (24.1-25.1)	24.9 (24.5-25.2)	7.4 (7.0-8.2)	7.1 (6.7-7.7)	7.7 (7.5-7.8)	7.6 (7.3-8.2)	196 (190-206)	68.3 (67-70)	76.0 (72-80)	0.09 (0.05-0.12)

FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations: 1. Control 2. 10.98% 3. 22% 4. 43.9% 5. 72% 6. 100% 7. Intake

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

Source of Test Larvae (✓):

S&ME Lot# 01-227 ☐

Other (describe): _____ ☐

Date Larvae Hatched: 12/9/01 - 12/10/01 Hatch Time: 1600 - 0800 Initials: LJD

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: [signature] (Reviewer Initials) on 12/13/01 (Date)

REV.01, JANUARY00 (fathead minnow test info)

Fathead Minnow Daily Test Information Logsheet

Test Name: TVA-Sequoyah Nuclear Plant Test Dates: 12/10/01 - 12/17/01

Daily Test information	Temperature Information (25±1°C)			Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C) a.m.	Incubator Temp. (°C) p.m.	Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time	Carboy #	Date Prep.
Day 0 LSO 12/10/01	—	25.1	4		am: — ✓pm: 1615	1400	1430	2	12/9/01
Day 1 BHO 12/11/01	25.2	25.2	4	✓	am: 0930 ✓pm: 1600	1425	1450	4	12/9/01
Day 2 VCS 12/12/01	25.1	25.3	4	✓	am: 1000 ✓pm: 1630	1440	1505	4	12/11/01
Day 3 VCS 12/13/01	25.1	25.1	4	✓	am: 0930 ✓pm: 1600	1335	1500	2	12/11/01
Day 4 VCS 12/14/01	25.1	25.2	4	✓	am: 0830 pm: 1600	1325	1401	4	12/12/01
Day 5 BW 12/15/01	25.3	25.2	4	✓	am: 0915 ✓pm: 1500	1400	1435	LSO ~~4~~ 2	12/13/01
Day 6 ALR 12/16/01	25.2	25.2	4	✓	am: 930 pm: 1600	1300	1335	4	12/14/01
Day 7 DSS 12/17/01	25.2	25.2	4			1435		~~2~~ ~~4~~ DSS ~~12/11~~	DSS ~~12/14/01~~

Client: TVA/Sequoyah Nuclear Plant **Analysts:** DSG, VCS, BAD, LSD

Location: Soddy Daisy, Tennessee **Dates:** 12/10/01 – 12/17/01

CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
Mod. Hard	BAD	1	1	0	0	1*
	BAD	2	1	0	1	1*
	DSG	3	1	0	1	1*
	DSG	4	1	0	1	1*
	LSD	5	1	0	1	1*
	ALR	6	1	1	1	1*
	DSG	7	1	1	1	1*
10.98% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	0	0	0
	LSD	5	0	0	0	0
	ALR	6	0	1	0	1
	DSG	7	0	1	2	1
22.0% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	1	0	0
	LSD	5	1	1	0	1
	ALR	6	2	1	0	3
	DSG	7	2	3	0	3
43.9% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	1	0	0
	DSG	4	0	4	0	0
	LSD	5	1	7	0	0
	ALR	6	1	7	2	1
	DSG	7	2	8	2	1
72% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	5	0	0	0
	LSD	5	5	0	0	0
	ALR	6	5	0	1	0
	DSG	7	5	0	1	1

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
100% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	0	2	0
	LSD	5	0	0	7	3
	ALR	6	1	1	7	3
	DSG	7	1	1	7	3
100% Intake	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	5	0
	DSG	4	5	4	7	0
	LSD	5	8	4	7	0
	ALR	6	9	6	8	0
	DSG	7	9	6	8	1
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

*injured removed from replicate

Day 5 and Day 6 - used new cups since fungus was adhering to the sides of cups. Brine shrimp was also adhering to the fungus LSD

FATHEAD MINNOW SEVEN DAY TEST
RAW DATA
SURVIVAL AND GROWTH

Client: TVA - Sequoyah Nuclear Plant
Test Conducted By: VCS, LSD, BAD, DSG, ALR
Date Weighed 12/17/01 + 12/18/01
Weights Conducted by: ALR, LSD

Test Dates: 12/10/01 – 12/17/01 Oven Temp (°C) 101
Comments:
Began drying (date/time) 12/17/01 / 1510
End of drying (date/time) 12/18/01 / 0645

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
Control	A	9	10	1256.13	1263.04	6.91	0.691
(Moderately Hard)	B	9	10	1253.19	1260.38	7.19	0.719
	C	9	10	1244.24	1250.99	6.75	0.675
	D	9	9	1253.35	1260.09	6.74	0.749
10.98%	A	10	10	1260.57	1269.51	8.94	0.894
Outfall 101	B	9	10	1251.97	1258.30	6.33	0.633
	C	8	10	1257.54	1262.82	5.28	0.528
	D	9	10	1254.22	1262.87	8.65	0.865
22.0%	A	8	10	1257.75	1264.52	6.77	0.677
Outfall 101	B	7	10	1263.12	1267.78	4.66	0.466
	C	10	10	1264.74	1273.83	9.09	0.909
	D	7	10	1247.60	1252.76	5.16	0.516
43.9%	A	8	10	1243.98	1250.20	6.22	0.622
Outfall 101	B	2	10	1244.92	1246.42	1.50	0.150
	C	8	10	1255.20	1260.59	5.39	0.539
	D	9	10	1252.46	1258.97	6.51	0.651
72%	A	5	10	1252.68	1256.46	3.78	0.378
Outfall 101	B	10	10	1257.38	1265.57	8.19	0.819
	C	9	10	1268.50	1274.62	6.12	0.612
	D	9	10	1258.25	1264.32	6.07	0.607
100%	A	9	10	1270.20	1276.51	6.31	0.631
Outfall 101	B	9	10	1251.27	1258.84	7.57	0.757
	C	3	10	1260.64	1261.95	1.31	0.131
	D	7	10	1260.22	1264.38	4.16	0.416

FATHEAD MINNOW SEVEN DAY TEST
RAW DATA
SURVIVAL AND GROWTH

Client: TVA - Sequoyah Nuclear Plant
Test Conducted By: VCS LSD, BAD DSG, ALR
Date Weighed 12/17/01 - 12/18/01
Weights Conducted by: ALR / LSD

Test Dates: 12/10/01 - 12/17/01
Oven Temp (°C) 101
Comments:
Began drying (date/time) 12/17/01 / 1610
End of drying (date/time) 12/18/01 / 0645

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
	A	1	10	1258.54	1258.97	0.43	0.043
Intake	B	4	10	1266.77	1270.10	3.33	0.333
100%	C	2	10	1258.07	1259.49	1.42	0.142
	D	9	10	1267.03	1272.94	5.91	0.591
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/10/01 14:00	Test ID:	SQN1201fg	Sample ID:	TN0026450-NPDES Permit #
End Date:	12/17/01 14:35	Lab ID:	S&ME Inc.	Sample Type:	EFF3-Power Plant
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6910	0.7190	0.6750	0.7489
10.98	0.8940	0.6330	0.5280	0.8650
22	0.6770	0.4660	0.9090	0.5160
43.9	0.6220	0.1500	0.5390	0.6510
72	0.3780	0.8190	0.6120	0.6070
100	0.6310	0.7570	0.1310	0.4160

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7085	1.0000	0.7085	0.6750	0.7489	4.588	4				0.7192	1.0000
10.98	0.7300	1.0304	0.7300	0.5280	0.8940	24.420	4	-0.154	2.410	0.3365	0.7192	1.0000
22	0.6420	0.9062	0.6420	0.4660	0.9090	31.070	4	0.476	2.410	0.3365	0.6420	0.8926
43.9	0.4905	0.6923	0.4905	0.1500	0.6510	47.280	4	1.561	2.410	0.3365	0.5472	0.7609
72	0.6040	0.8525	0.6040	0.3780	0.8190	29.828	4	0.748	2.410	0.3365	0.5472	0.7609
100	0.4837	0.6828	0.4837	0.1310	0.7570	56.659	4	1.609	2.410	0.3365	0.4837	0.6726

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96236	0.884	-0.4075	-0.4154
Bartlett's Test indicates equal variances (p = 0.16)	7.96597	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.33653	0.47501	0.0443	0.039	0.37737	5, 18

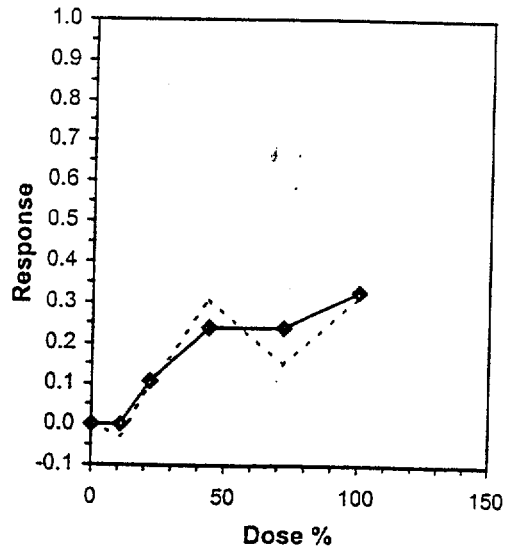
Linear Interpolation (80 Resamples)

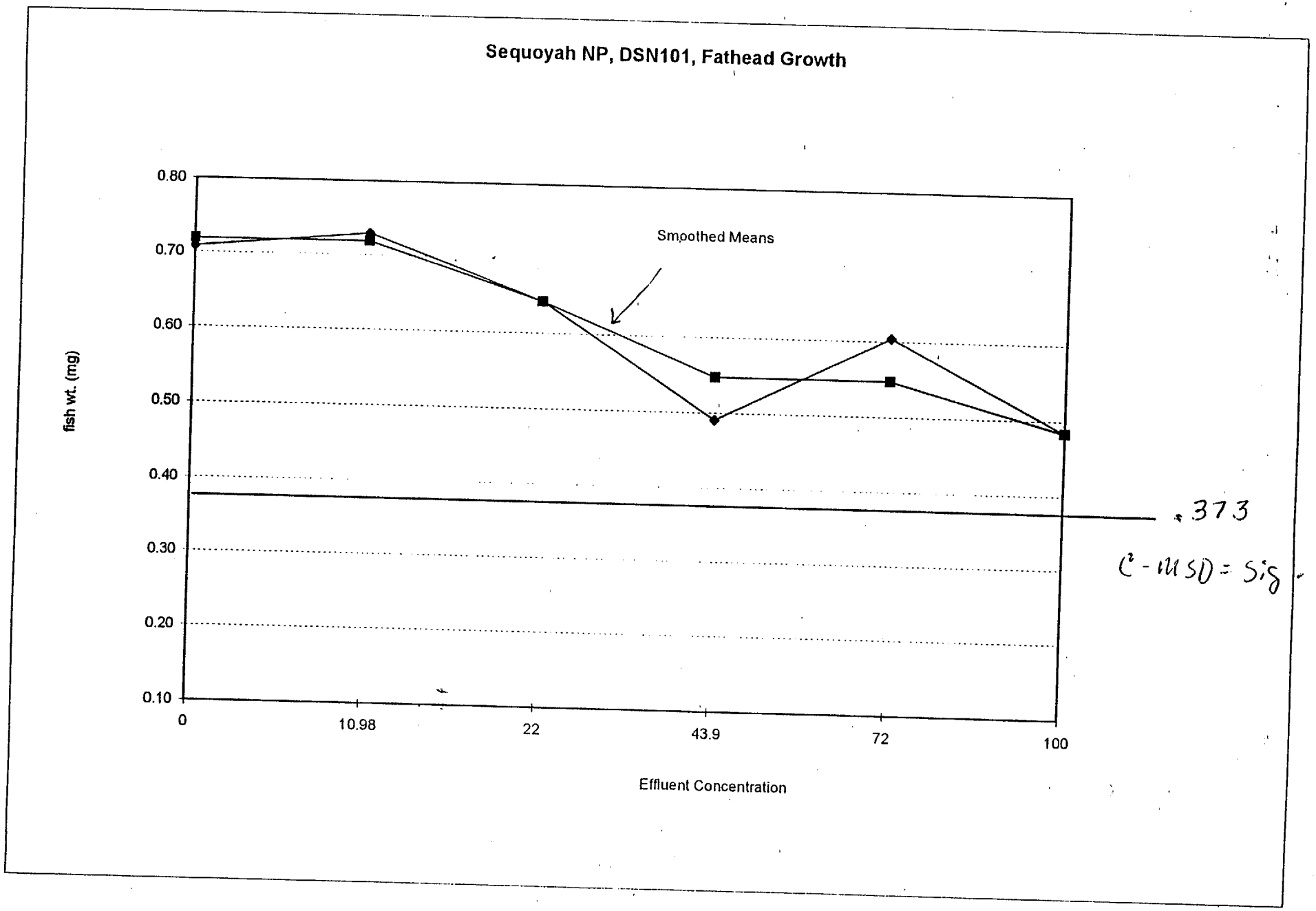
Point	%	SD	95% CL(Exp)		Skew
IC05	16.111	7.134	0.000	34.339	0.5410
IC10	21.242				
IC15	29.084				
IC20	37.396				
IC25	75.449				
IC40	>100				
IC50	>100				

PMSD range 9.4% - 35%

MSD = 0.3365

$PMSD = \frac{MSD}{\text{Control } \bar{x}} \times 100$ = 46.8%




Sequoyah NP, DSN101, Fathead Growth
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
fish wt. (mg)
Smoothed Means
.373
C - MSD = Sig
0
10.98
22
43.9
72
100
Effluent Concentration

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	12/10/01 14:00	Test ID:	SQN1201fs	Sample ID:	TN0026450
End Date:	12/17/01 14:35	Lab ID:	S&ME INC.	Sample Type:	EFF3-Power Plant
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.9000	0.9000	0.9000	1.0000
10.98	1.0000	0.9000	0.8000	0.9000
22	0.8000	0.7000	1.0000	0.7000
43.9	0.8000	0.2000	0.8000	0.9000
72	0.5000	1.0000	0.9000	0.9000
100	0.9000	0.9000	0.3000	0.7000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9250	1.0000	1.2876	1.2490	1.4033	5.992	4			
10.98	0.9000	0.9730	1.2543	1.1071	1.4120	9.935	4	0.193	2.410	0.4160
22	0.8000	0.8649	1.1254	0.9912	1.4120	17.662	4	0.940	2.410	0.4160
43.9	0.6750	0.7297	0.9817	0.4636	1.2490	35.836	4	1.772	2.410	0.4160
72	0.8250	0.8919	1.1739	0.7854	1.4120	23.013	4	0.659	2.410	0.4160
100	0.7000	0.7568	1.0172	0.5796	1.2490	31.069	4	1.566	2.410	0.4160

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91089	0.884	-0.9339	-0.58272
Bartlett's Test indicates equal variances (p = 0.23)	6.93356	15.0863		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.33618	0.36464	0.06107	0.0596	0.43258	5, 18

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	12/10/01 14:00	Test ID:	SQN1201lfs	Sample ID:	TN0026450-NPDES Permit #
End Date:	12/17/01 14:35	Lab ID:	S&ME Inc.	Sample Type:	EFF3-Power Plant
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.9000	0.9000	0.9000	1.0000
Intake	0.1000	0.4000	0.2000	0.9000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9250	1.0000	1.2876	1.2490	1.4033	5.992	4			
*Intake	0.4000	0.4324	0.6798	0.3218	1.2490	59.994	4	2.929	1.943	0.4033

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.87838	0.749	1.23279	2.88667
F-Test indicates equal variances (p = 0.02)	27.9435	47.4683		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	12/10/01 14:00	Test ID:	SQN1201Inf
End Date:	12/17/01 14:35	Lab ID:	S&ME Inc.
Sample Date:		Protocol:	EPAF 91-EPA Freshwater
Comments:			
Sample ID:	TN0026450-NPDES Permit #		
Sample Type:	EFF3-Power Plant		
Test Species:	PP-Pimephales promelas		

Conc-%	1	2	3	4
D-Control	0.6910	0.7190	0.6750	0.7489
Intake	0.0430	0.3330	0.1420	0.5910

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.7085	1.0000	0.7085	0.6750	0.7489	4.588	4			
*Intake	0.2773	0.3913	0.2773	0.0430	0.5910	87.042	4	3.542	2.353	0.2865

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92908	0.749	0.7408	2.0285
F-Test indicates unequal variances (p = 8.03E-03)	55.1143	47.4683		

Hypothesis Test (1-tail, 0.05)

Heteroscedastic t Test indicates significant differences

SQN- December 10 - 17, 2001 INITIAL AND FINAL WATER CHEMISTRY (FATHEAD)

Initial Chemistry

Fish - Control	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.1	24.3	25.1	25.3	24.1	25.0	24.1	25.3	24.6
DO	7.2	7.4	7.7	7.2	7.2	7.3	7.2	7.2	7.7	7.3
pH	8.0	8.0	7.9	7.9	8.1	8.2	8.1	7.9	8.2	8.0
Cond	325	325	320	321	319	338	327	319	338	325
Hard	98	100	98	92	90	92	92	90	100	94.6
Alk	62	67	65	67	67	70	67	62	70	66.4

Concentration 10.98%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.3	24.9	25.2	25.1	24.1	25.0	24.1	25.2	24.7
DO	7.2	7.3	7.6	7.2	7.2	7.2	7.2	7.2	7.6	7.3
pH	8.0	8.0	7.9	8.1	8.2	8.2	8.1	7.9	8.2	8.1
Cond	314	315	311	313	317	324	325	311	325	317

Concentration 22%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.5	24.9	25.1	25.3	24.1	25.0	24.1	25.3	24.7
DO	7.2	7.3	7.6	7.2	7.2	7.3	7.2	7.2	7.6	7.3
pH	8.0	8.0	7.9	8.0	8.2	8.2	8.1	7.9	8.2	8.1
Cond	301	304	298	300	305	308	311	298	311	304

Concentration 43.9%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.5	24.5	25.1	25.4	25.0	24.0	25.0	24.0	25.4	24.8
DO	7.2	7.2	7.7	7.2	7.2	7.5	7.2	7.2	7.7	7.3
pH	7.9	7.9	7.9	8.0	8.1	8.1	8.1	7.9	8.1	8.0
Cond	273	277	270	274	274	269	271	269	277	273

Concentration 72%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.7	25.0	25.2	25.1	25.0	24.0	25.1	24.0	25.2	24.9
DO	7.2	7.3	7.9	7.2	7.2	7.5	7.2	7.2	7.9	7.4
pH	7.8	7.9	7.8	7.7	8.0	7.9	8.0	7.7	8.0	7.9
Cond	235	225	242	229	238	235	237	225	242	234

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.8	25.2	24.0	25.0	24.1	25.1	24.0	25.2	24.7
DO	7.2	7.2	8.0	7.2	7.2	7.7	7.2	7.2	8.0	7.4
pH	7.6	7.6	7.7	7.8	7.8	7.8	7.8	7.6	7.8	7.7
Cond	197	195	204	205	196	192	191	191	205	197
Hard	70		80		80			70	80	76.7
Alk	63		69		67			63	69	66.3
TRC	0.07		0.08		0.07			0.05	0.08	0.07

Fish Water Chemistry

Intake	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.2	25.0	25.1	25.1	25.1	24.1	25.0	24.1	25.1	24.8
DO	7.0	7.1	8.2	7.2	7.2	7.7	7.2	7.0	8.2	7.4
pH	7.5	7.6	7.7	7.7	7.8	7.8	7.8	7.5	7.8	7.7
Cond	190	199	197	206	196	193	194	190	206	196
Hard	72		80		76			72	80	76.0
Alk	67		70		68			67	70	68.3
TRC	0.15		0.06		0.05			0.05	0.12	0.09

Final Chemistry

FISH

Fish - Medium	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.4	24.7	25.3	24.8	24.4	25.2	24.0	24.0	25.3	24.7
DO	6.5	7.1	6.8	7.1	7.0	6.6	7.9	6.5	7.9	7.0
pH	7.6	7.7	7.6	7.8	7.5	7.6	7.5	7.5	7.8	7.6

Concentration 10.98%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.1	24.8	25.3	24.8	24.6	25.3	24.0	24.0	25.3	24.8
DO	6.6	7.4	7.1	7.0	6.8	6.8	7.7	6.6	7.7	7.1
pH	7.8	7.5	7.6	7.5	7.4	7.5	7.5	7.4	7.8	7.5

Concentration 22%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.0	25.0	25.3	25.1	24.9	25.3	24.0	24.9	25.3	25.1
DO	6.6	7.4	6.9	6.8	6.8	6.7	7.6	6.6	7.6	7.0
pH	7.7	7.4	7.5	7.5	7.4	7.5	7.6	7.4	7.7	7.5

Concentration 43.9%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	25.2	24.9	25.7	24.4	25.2	24.0	24.0	25.7	24.9
DO	6.5	7.0	6.7	6.5	6.4	6.5	7.6	6.4	7.6	6.7
pH	7.6	7.5	7.5	7.6	7.3	7.4	7.6	7.3	7.6	7.5

Concentration 72%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	25.0	25.0	25.6	24.5	25.3	24.0	24.0	25.6	24.9
DO	6.5	7.2	6.6	6.6	6.7	6.5	7.6	6.5	7.6	6.8
pH	7.6	7.4	7.5	7.6	7.9	7.8	8.0	7.4	8.0	7.7

Concentration 100%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	24.5	24.8	25.1	24.5	25.2	24.0	24.0	25.2	24.7
DO	6.7	7.3	6.7	6.7	6.8	6.5	7.9	6.5	7.9	6.9
pH	7.4	7.4	7.5	7.7	7.4	7.4	7.9	7.4	7.9	7.5

Fish Water Chemistry

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	24.5	25.0	25.1	24.7	25.2	24.6	24.5	25.2	24.9
DO	6.7	7.4	6.7	7.1	7.1	7.0	7.7	6.7	7.7	7.1
pH	7.6	7.5	7.6	7.7	7.3	7.3	8.2	7.3	8.2	7.6

Test Temperature	Mean	24.9
	Minimum	24.0
	Maximum	25.7

Word Review by: Cur

Excel Reviewed by: Cur

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant
Analysts: VCS, LSD, BAD, DSG
Location: Soddy Daisy, Tennessee
Dates/times: 12/10/01/1400 - 12/17/01/1435
Template No.: 1
Age of larvae: <24 hrs

Control: (Mod. Hard)	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.1	24.3	25.1	25.3	24.1	25.0		
Final		24.4	24.7	25.3	24.8	24.4	25.2	24.0	
D.O. Initial	7.2	7.4	7.7	7.2	7.2	7.3	7.2		
Final		6.5	7.1	6.8	7.1	7.0	6.6	7.9	
pH Initial	8.0	8.0	7.9	7.9	8.1	8.2	8.1		
Final		7.6	7.7	7.6	7.8	7.5	7.6	7.5	
Alkalinity	62	67	65	67	67	70	67		
Hardness	98	100	98	92	90	92	92		
Conductivity-Initial	325	325	320	321	319	338	327		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

10.98% Outfall 001	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.3	24.9	25.2	25.1	24.1	25.0		
Final		25.1	24.8	25.3	24.8	24.6	25.3	24.0	
D.O. Initial	7.2	7.3	7.6	7.2	7.2	7.2	7.2		
Final		6.6	7.4	7.1	7.0	6.8	6.9	7.7	
pH Initial	8.0	8.0	7.9	8.1	8.2	8.2	8.1		
Final		7.8	7.5	7.6	7.5	7.4	7.5	7.5	
Conductivity-Intitial	314	315	311	313	317	324	325		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

22.0% Outfall 001	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.5	24.9	25.1	25.3	24.1	25.0		
Final		25.0	25.0	25.3	25.1	24.9	25.3	24.0	
D.O. Initial	7.2	7.3	7.6	7.2	7.2	7.3	7.2		
Final		6.6	7.4	6.9	6.8	6.8	6.7	7.6	
pH Initial	8.0	8.0	7.9	8.0	8.2	8.2	8.1		
Final		7.7	7.4	7.5	7.5	7.4	7.5	7.6	
Conductivity-Intitial	301	304	298	300	305	308	311		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Notes:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant Analysts: VCS, LSD, BAD, DSG

Location: Soddy Daisy, Tennessee Dates/times: 12/10/01 1400 - 12/17/01 1435

Template No.: 1 Age of larvae: <24 hrs

43.9% Outfall 001	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.5	25.1	25.4	25.0	24.0	25.0		
Final		24.9	25.2	24.9	25.7	24.4	25.2	24.0	
D.O. Initial	7.2	7.2	7.7	7.2	7.2	7.5	7.2		
Final		6.5	7.0	6.7	6.5	~~7.0~~	6.5	7.6	final D.O. day 5 = 6.4
pH Initial	~~8.7~~ 7.9	7.9	7.9	8.0	8.1	8.1	8.1		
Final		7.6	7.5	7.5	7.6	7.3	7.4	7.6	
Conductivity-Initial	273	277	270	274	274	269	271		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

72% Outfall 001	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.7	25.0	25.2	25.1	25.0	~~24.4~~	25.1		initial temp day 5 = 24.0
Final		24.9	25.0	25.0	25.6	24.5	25.3	24.0	
D.O. Initial	7.2	7.3	7.9	7.2	7.2	7.5	7.2		
Final		6.5	7.2	6.6	6.6	~~7.0~~	6.5	7.6	final D.O. day 5 = 6.7
pH Initial	7.8	7.9	7.8	7.7	8.0	7.9	8.0		
Final		7.6	7.4	7.5	7.6	7.9	7.8	8.0	
Conductivity-Initial	235	225	242	229	238	235	237		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

100% Outfall 001	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.8	25.2	24.0	25.0	24.1	25.1		
Final		24.9	24.5	24.8	25.1	24.5	25.2	24.0	D.O. day 3 = 7.2
D.O. Initial	7.2	7.2	8.0	~~7.9~~	7.2	7.7	7.2		
Final		6.7	7.3	6.7	6.7	6.8	6.5	7.9	
pH Initial	7.6	7.6	7.7	7.8	7.8	7.8	7.8		
Final		7.4	7.4	7.5	7.7	7.4	7.4	7.9	
Alkalinity	63	/	69	/	67	/	/		
Hardness	70	/	80	/	80	/	/		
Conductivity-Initial	197	195	204	205	196	192	191		
Chlorine	0.07	/	0.08	/	0.07	/	/		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10/01	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, Tennessee
Template No.: 1

Analysts: VCS, LSD, BAD, DSG
Dates/times: 12/10/01 1400 - 12/17/01 1435
Age of larvae: <24 hrs

	Day								
Intake-100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.2	25.0	25.1	25.1	25.1	24.1	25.0		
Final		24.9	24.5	25.0	25.1	24.7	25.2	24.6	
D.O. Initial	7.0	7.1	8.2	7.2	7.2	7.7	7.2		
Final		6.7	7.4	6.7	7.1	7.1	7.0	7.7	
pH Initial	7.5	7.6	7.7	7.7	7.8	7.8	7.9		
Final		7.6	7.5	7.6	7.7	7.3	7.3	8.2	
Alkalinity	67	/	70	/	68	/	/		
Hardness	72	/	80	/	76	/	/		
Conductivity-Initial	190	199	197	206	196	193	194		
Chlorine	0.15	/	0.06	/	0.05	/	/		
Analyst Initials	LSD	BAD	BAD	DSG	VCS	BAD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes

Sequoyah Nuclear Plant Biomonitoring
November 27- December 1, 2001

Appendix F

Void Tests
Chain of Custody Records and
Toxicity Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client
Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	11/25/01 0922	11/26/01 0822	(1) 2.5 GAL				✓		01-381	1.0°	VCS	0900	[illegible]
SQN-INT-TOX	comp	4°C	11/25/01 0949	11/26/01 0849	(1) 2.5 GAL				✓		01-382	1.0°	VCS	0900	[illegible]

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	11/26/01 1200	[illegible]	11/27/01 9:00

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client

Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	11/27/01 0830	11/28/01 0730	(1) 2.5 GAL		✓				01-388	1°C	DJG	0930	good
SQN-INT-TOX	comp	4°C	11/27/01 0843	11/28/01 0743	(1) 2.5 GAL		✓				01-389	1°C	DJG	0930	good

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	11/28/01 1500	[illegible] 11/29/01 0930	11/29/01 0930

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

A COC

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.
1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003
Fax: 865-970-0004

FedEx UPS Bus Client
Other (specify):

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End	wka 11/18/01		Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	A-0938 11/29/01 B-0951	A 0838 11/30/01 B0851	(2) (1) 2.5 GAL		✓				01-344	2°C	DG	1400	Good
SQN-INT-TOX	comp	4°C	11/29/01 1006	11/30/01 0906	(1) 2.5 GAL		✓				01-345	2°C	DG	1400	Good
			Samples did not arrive within the 36 hour												
			holding time for first use. Fed Ex shipped												
			samples wrong.												

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	11/30/01 1500	[illegible]	12/3/01 1400

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

FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

Test Conducted From: 11/27/01 (Day 0) To 12/04/01 (Day 7)

Sites/Concentrations:
1. control
2. 10.98%
3. 22%
4. 43.9%
5. 72%
6. 100% 001

Intake 100%.

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

Source of Test Larvae (✓):

S&ME Lot # 01-221 ☐

Other (describe): _____ ☐

Date Larvae Hatched: 11/26/01 11/27/01 Hatch Time: 1130 1500 Initials: VCS

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: _____ (Reviewer Initials) on _____ (Date)

REV.01, JANUARY00 (fathead minnow test info)

Fathead Minnow Daily Test Information Logsheet

Test Name: TVA-Sequoyah Nuclear Plant Test Dates: 11/27/01-12/04/01

Daily Test information	Temperature Information (25±1°C)			Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time		
	a.m.	p.m.						Carboy #	Date Prep.
Day 0 VCS 11/27/01	25.2	25.1	4	✓	am: — pm:	1130	1200	2	11/22/01
Day 1 DSS 11/28/01	25.1	25.1	4	✓	am: 0800 pm: 1600	1050	1123	2	11/22/01
Day 2 DSS 11/29/01	25.0	25.0	4	✓	am: 0800 pm: 1600	1115	1143	2	11/22/01
Day 3 DSS 11/30/01	25.1	25.1	4	✓	am: 0800 pm: 1600	1040	1112	2	11/22/01
Day 4 BSO 12/1/01	25.2	25.1	4	✓	am: 1600 pm:			2	11/29/01
Day 5					am: pm:				
Day 6					am: pm:				
Day 7									

Client: TVA/Sequoyah Nuclear Plant

Location: Soddy Daisy, Tennessee

Analysts: VCS, BAD, DSG

Dates: 11/27/01 - 12/04/01

CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
Mod. Hard	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	0	0
		5				
		6				
		7				
10.98% Outfall	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	1	0
		5				
		6				
		7				
22.0% Outfall	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	1	0	0
	BAD	4	0	1	0	0
		5				
		6				
		7				
43.9% Outfall	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	0	0
		5				
		6				
		7				
72% Outfall	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	1	0	1
	BAD	4	0	1	0	1
		5				
		6				
		7				

CONC.	Initials	DAY NO.	REPLICATE A	B	C	D
100% Outfall	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	1
	BAD	4	0	0	0	1
		5				
		6				
		7				
100% Intake	VSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	1	0	0	0
	BAD	4	1	0	0	0
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, TN
Test Type: Fathead Minnow 7-day Chronic

Analysts: VCS, DSG, BAD
Dates/times: 11/27/01/1130 - 12/04/01/
Age of Larvae: <24 hrs

Control: Mod. Hard	Day * 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.2	24.7	25.6	24.0	24.1				
Final		24.6	24.0	25.6	24.7				
D.O. Initial	7.2	7.2	7.1	7.1	7.3				
Final		6.7	6.6	6.6	6.8				
pH Initial	8.1	8.1	8.1	8.1	8.0				
Final		7.9	7.9	7.4	7.3				
Alkalinity	66	—	66	—	64				
Hardness	86	—	86	—	80				
Conductivity	320	315	321	323	321				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 10.98%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.6	24.0					
Final		24.7	25.0	25.0	24.7				
D.O. Initial	7.0	7.1	7.2	7.1					
Final		6.7	6.6	6.5	6.6				
pH Initial	8.1	8.1	8.1	8.1					
Final		7.8	7.9	7.4	7.2				
Conductivity	311	297	304	302					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 22%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	25.0	24.0					
Final		24.6	24.6	25.0	24.9				
D.O. Initial	6.6	7.2	7.2	7.2					
Final		6.7	6.6	6.6	6.5				
pH Initial	8.1	8.1	8.1	8.1					
Final		7.7	7.8	7.4	7.2				
Conductivity	296	291	291	297					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

* change D.O. membrane * DSG

* terminated due to lack of sample day 4
BAD

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, TN
Test Type: Fathead Minnow 7-day Chronic

Analysts: JCS, BAD, DSG
Dates/times: 11/27/01 / 1130 - 12/04/01 /

Outfall 101 - 43.9%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.2	24.6	24.0					
Final		24.6	24.2	25.0	25.6				
D.O. Initial	5.7	7.1	7.2	7.2					
Final		6.8	6.7	6.4	6.2				
pH Initial	8.0	8.0	8.0	8.0					
Final		7.6	7.6	7.3	7.3				
Conductivity	266	262	266	260					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 72%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.6	25.0					
Final		24.6	25.0	25.0	25.1				Day 0 conductivity ⇒ 229
D.O. Initial	5.7	7.2	7.2	7.2					
Final		6.7	6.5	6.4	6.3				
pH Initial	7.7	7.8	7.9	8.0					
Final		7.6	7.7	7.3	7.3				
Conductivity	~~533~~	217	230	225					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 100%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.7	24.0	24.0	24.0					
Final		25.0	25.0	25.0	24.9				
D.O. Initial	5.4	7.1	7.2	7.2					
Final		6.8	6.7	6.4	6.5				
pH Initial	7.8	7.9	7.9	7.9					
Final		7.6	7.7	7.4	7.3				
Alkalinity	62	/	60	/					
Hardness	70	/	80	/					
Conductivity	190	184	196	182					
Chlorine	0.04	/	0.05	/					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD 11/29	LSD 11/29	LSD 12/1				
Sample Date:	11/27	11/27							

DSG changed D.O. membrane day #7

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, Tennessee
Test Type: Fathead Minnow 7-day Chronic

Analysts: VCS, BAD, DSG
Dates/times: 11/27/01 1130 - 12/04/01

Day									
Intake - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	24.6	24.0					
Final		24.6	25.0	25.0	24.7				
D.O. Initial	5.0	7.1	7.0	7.1					
Final		6.5	6.4	6.3	6.7				
pH Initial	7.8	7.8	7.8	7.7					
Final		7.7	7.7	7.4	7.4				
Alkalinity	63								11/29 alk = 64
Hardness	88								hard = 78
Conductivity	191	191	189	189					
Chlorine	0.05		0.02						
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				
Sample Date:	11/27	11/27	11/29	11/29	12/1				

DSG changed D.O. meters on day 1

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: TVA –Sequoyah Nuclear Plant

Test Conducted From: 11/27/01 (Day 0) To 12/04/01 (Day 7)

Sites/Concentrations: 1. control 2. 10.98% 3. 22% 4. 43.9% 5. 72% 6. 100% Intake 100%

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 168

Age of Test Organisms:

Isolated neonates for test on 11/27/01 (date) from 0800 to 1300 (time) Initials VCS

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: _____ (Reviewer Initials) on _____ (Date)

REV.01, January 00 (ceriodaphnia test info sheet)

Ceriodaphnia Daily Test Information Logsheet

Test Name: TVA-Sequoyah Nuclear Plant Test Dates: 11/27/01-12/04/01

Daily Test information	Temperature Information (cup -25±1°C)			Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selanastrum Date	Start Time	End Time	Carboy #	Date Prep.
	a.m.	p.m.									
Day 0 VCS 11/27/01	25.2	25.1	4	✓	7/17/01	✓	11/20/01	13:00	1341	#1	11/22/01
Day 1 DSG 11/28/01	25.1	25.1	4	0800 1500	7/17/01	✓	0800 1500	12:00	1233	#1	11/22/01
Day 2 DSG 11/29/01	25.0	25.0	4	0800 1500	7/17/01	✓	0800 1500	1300	1331	#1	11/22/01
Day 3 11/30/01	25.0	25.0	4	0400 1500	7/17/01	✓	0800 1500	13:20	1401	#1	11/22/01
Day 4 1500 12/1/01	25.2	25.1	4	✓	7/17/01	✓	11/20/01			#1	11/31/01
Day 5											
Day 6											
Day 7											

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah
Location: Soddy Daisy, Tennessee
Dates Samples Collected: 11/26, 11/28

Analysts: VCS, BAD, DSG
Test Start-Date/Time: 11/27/01/1300
Test Stop-Date/Time: 12/04/01/

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0										0	10	10	0
	DSG	2	0										0	10	10	0
Control	DSG	3	0					4					4	10	10	0.4
DMW	BAD	4	4	5	5	6	0	0	3	0	X	5		9	10	
25%		5														
		6														
		7														
	Total										0					

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0		*								0	BAD 9	10	0
	DSG	2	0										0	BAD 9	10	0
	DSG	3	0					4					4	BAD 9	10	0.4
10.98%	BAD	4	4	4		4	3	0	3	0	4	0		9	10	
Outfall		5														
		6														
		7														
	Total				0											

* lost animal

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0										0	10	10	0
	DSG	2	0										0	10	10	0
	DSG	3	0										0	10	10	0
22.0%	BAD	4	3	5	5	5	4	0	4	5	0	0				
Outfall		5														
		6														
		7														
	Total															

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah Analysts: VCS, BAD, DSG
Location: Soddy Daisy, Tennessee Test Start-Date/Time: 11/27/01 / 1300
Dates Samples Collected: 11/26, 11/28 Test Stop-Date/Time: 12/04/01 /

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0										0	10	10	0
	DSG	2	0					*					0	9	10	0
	DSG	3	0										0	9	10	0
43.9% Outfall	BAD	4	4	5	4	3	3		5	4	0	3		9	10	
		5														
		6														
		7														
		Total						0								

* dropped animal.

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0										0	10	10	0
	DSG	2	0										0	10	10	0
	DSG	3	0										0	10	10	0
72% Outfall	BAD	4	4	3	5	4	6	0	5	4	4	3				
		5														
		6														
		7														
		Total														

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
	DSG	1	0										0	10	10	0
	DSG	2	0										0	10	10	0
	DSG	3	0					4					4	10	10	0.4
100% Outfall	BAD	4	4	5	4	5	0	0	4	5	4	3		10	10	
		5														
		6														
		7														
		Total														

Ceriodaphnia 3-Brood Survival and Reproduction
Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah Analysts: VCS, BAD, DSG

Location: Soddy Daisy, Tennessee Test Start-Date/Time: 11/27/01 /1300

Dates Samples Collected: 11/26, 11/28 Test Stop-Date/Time: 12/04/01/

Conc.	Init.	Day	Replicate 1	2	3	4	5	6	7	8	9	10	Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			--	--	--	--	--	--	--	--	--	--				
DSG	D	1	0													
	DSG	2	0										0	10	10	0
	DSG	3	0					1					0	10	10	0
100% Intake	BAD	4	5	5	6	4	4	0	5	5	3	6	1	10	10	0.1
		5												10	10	
		6														
		7														
		Total														

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, TN
Template No.: 1
Test Type: Ceriodaphnia 7-day Chronic

Analysts: VCS, BAD, DSG
Dates/times: 11/27/01 / 1300 - 12/04/01
Age of Neonates <24 hrs

Control: 20% DMW	Day * 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.0	24.0	24.0	25.1				conducting day
Final		24.0	25.3	24.0	25.0				1 ⇒ 179
D.O. Initial	7.2	7.2	7.2	7.1	7.3				conducting day 2
Final		7.1	6.9	6.9	7.4				⇒ 177
pH Initial	8.1	8.1	8.1	8.1	8.1				
Final		8.1	8.4	8.2	8.2				
Alkalinity	68	/	/	/	68				
Hardness	88	/	/	/	88				
Conductivity	177	~~174~~ 177	177	175	180				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 10.98%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.2	24.0	/				conducting day
Final		24.6	25.0	25.0	25.1				1 ⇒ ~~176~~ 184
D.O. Initial	7.3	7.2	7.1	7.1	/				conducting day 2
Final		7.0	6.9	6.9	7.3				⇒ 170
pH Initial	8.2	8.2	8.2	8.1	/				
Final		8.1	8.4	8.2	8.2				
Conductivity	182	~~184~~	170	175	/				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 22%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	25.1	24.0	/				cond
Final		24.2	24.0	25.0	25.1				
D.O. Initial	7.3	7.2	7.1	7.1	/				
Final		7.0	6.9	6.9	7.2				
pH Initial	8.1	8.1	8.1	8.1	/				
Final		8.1	8.4	8.3	8.3				
Conductivity	182	181	178	178	/				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

* terminated test early due to lack of sample.
BAD

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, TN
Template No.: 1
Test Type: Ceriodaphnia 7-day Chronic

Analysts: VCS, DSG, BAD
Dates/times: 11/27/01 /1300 - 12/04/01
Age of Neonates < 24 hrs

Outfall 101 - 43.9%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.6	24.8	24.5					
Final		24.6	25.0	24.0	25.3				
D.O. Initial	7.2	7.2	7.1	7.1					
Final		7.1	6.9	6.8	7.0				
pH Initial	8.1	8.1	8.1	8.1					
Final		8.0	8.5	8.3	8.4				
Conductivity	184	185	182	182					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 72%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	25.6	25.0					
Final		24.6	26.0	24.6	25.1				
D.O. Initial	7.2	7.2	7.1	7.1					
Final		7.1	6.9	6.8	6.9				
pH Initial	8.0	8.1	8.1	8.1					
Final		8.0	8.4	8.4	8.4				
Conductivity	185	187	170	181					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

Outfall 101 - 100%	Day 0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.0	25.0	24.0	25.0					
Final		25.0	25.0	24.0	25.3				
D.O. Initial	7.2	7.2	7.1	7.1					
Final		7.1	6.9	6.9	7.0				
pH Initial	7.9	7.4	8.2	7.9					
Final		7.8	8.6	8.4	8.5				
Alkalinity	62		66						
Hardness	70		80						
Conductivity	191	190	178	192					
Chlorine	0.04		0.05						
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				
Sample Date:	11/27	11/27	11/29	11/29					

Client: TVA - Sequoyah Nuclear Plant
Location: Soddy Daisy, Tennessee
Template No.: 1
Test Type: Ceriodaphnia 7-day Chronic

Analysts: VCS, DSG, BAD
Dates/times: 11/27/01 /1300 - 12/4/01/
Age of Neonates < 24 hrs

	Day								
Intake - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	24.0	24.0					
Final		24.6	25.0	25.0	25.3				
D.O. Initial	7.3	7.2	7.2	7.1					
Final		2.0	6.9	6.8	6.9				
pH Initial	7.8	7.8	7.9	7.7					
Final		7.7	8.5	8.3	8.2				
Alkalinity	63		64						
Hardness	88		78						
Conductivity	185	180	188	184					
Chlorine	0.05		0.02						
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials									
Sample Date:	11/27	11/27	11/29	11/29	12/1				