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

July 11, 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

Please find enclosed the Discharge Monitoring Report (DMR) of June 2002 for Sequoyah. 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

Enclosure
cc (Enclosure):

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

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

IE25

Printed on recycled paper

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

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

ATTN: Diedre B. Nida

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	29.9	(04)	0	30 / 30	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	42.6	(04)	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	7.3	(12)	0	8 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	6	8	(19)	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	(19)	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1787	(03)	********	********	********	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.008	0.016	(19)	0	39 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	07	11
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 0.053 mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.012 mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.018mg/L--limit 0.100mg/L) 4. H-130M (max. calc. conc. was 0.022mg/L--limit 0.050mg/L)

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

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

ATTN: Diedre B. Nida

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.1	(62)	0	30 / 30	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR			CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	1.9	(04)	0	30 / 30	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0	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 / 30	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L			GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

CCW data for June 2002 is attached.

CCW Data for June 2002

CCW CHANNEL		
DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
June 4, 2002	< 0.5	

CCW TRENCH DISCHARGE		
DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
June 4, 2002	0.6	

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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)*

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	04	01	To	02	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	(23)	0	1 / 91	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MINIMUM	********	********	PERCENT		QUART-ERLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100	********	********	(23)	0	1 / 91	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MIMINUM	********	********	PERCENT		QUART-ERLY	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

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

Toxicity was sampled from 5/5/02 to 5/10/02. The report is attached.

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Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

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

Form Approved.
OMB No. 2040-0004

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		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	8.7	(12)	0	12 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	73	113	(26)	********	8	12	(19)	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<44	<49	(26)	********	<5	<5	(19)	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.035	1.193	(03)	********	********	********	**	0	30 / 30	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		
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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)*

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

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

ATTN: Diedre B. Nida

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

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

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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
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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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)*

No phosphate bearing chemicals were employed. No Discharge this Period

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

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SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

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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	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	COMPOS
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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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)*
No Discharge this Period

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

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Address BOX 2000
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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)*

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	(00)	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

Operations is required once per shift to perform visual inspections.

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

Name TVA - SEQUOYAH NUCLEAR PLANT
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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	(00)	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	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 this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	07	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
Operations is required once per shift to perform visual inspections.

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

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

ATTN: Diedre B. Nida

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

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	06	01	To	02	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	07	11
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

June 26, 2002

Diedre B. Nida, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, MAY, 2002

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report is included for your records. The report provides results of compliance testing using fathead minnows and daphnids.

Outfall 101 samples collected May 5-10, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows to intake samples resulted in no significant differences from controls during this study period, although intake minnow survival was only 68 percent. Daphnid reproduction was significantly different from control based on results from the Homoscedastic t-Test.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of historic problems with WET tests for this effluent.

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

Cynthia L. Russell

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

Attachment
cc (Attachment):
Files, ER&TA, CEB 1B-M
SQN May 2002m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION/EXECUTIVE SUMMARY

1) Facility/Discharger: Sequoyah Nuclear Plant/TVA Report Date: June 26, 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) 1Q10: 2,992.4

8) Outfall Tested: 101 9) Dates Sampled: May 5-10, 2002

10) Average flow on day(s) sampled (MGD): 851, 869, 875

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

12) Test Dates: May 7-14, 2002 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

Pimephales promelas: UV treated Outfall 101: 10.98, 22, 43.9, 72, 100
UV treated Intake: 100

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

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

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

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

20) Consultant/Testing Lab Name: Environmental Testing Solutions, LLC

21) Lab Contact: Jim Sumner 22) Phone #: (828) 862-8193
TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

*Production/operation data will be provided upon request.

22) Notes: Outfall 101 samples collected May 5-10, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows to intake samples resulted in no significant differences from controls during this study period, although intake minnow survival was only 68 percent. Daphnid reproduction was significantly different from control based on result of the Homoscedastic t-Test.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of historic problems with WET tests for this effluent.

METHODS SUMMARY

Samples

1) Sampling Point: Outfall 101, Intake

2) Sample Type: Composite

3) Sample Information:

Sample ID	Date/Time Collected (MM/DD/YY Time)	Date/Time Received (MM/DD/YY Time)	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date/Time Used (MM/DD/YY Time)
101	05/05/02 1450 to 05/06/02 1350	05/07/02 1155	0.3†	<0.10	05/07/02 1458 05/08/02 1450
Intake	05/05/02 1509 to 05/06/02 1409	05/07/02 1155	0.3	<0.10	05/07/02 1458 05/08/02 1450
101	05/07/02 1225 to 05/08/02 1125	05/09/02 1112	0.3†	<0.10	05/09/02 1446 05/10/02 1440
Intake	05/07/02 1241 to 05/08/02 1141	05/09/02 1112	0.3	<0.10	05/09/02 1446 05/10/02 1440
101	05/09/02 1318 to 05/10/02 1218	05/11/02 1145	1.8†	<0.10	05/11/02 1511 05/12/02 1518 05/13/02 1514
Intake	05/09/02 1333 to 05/10/02 1233	05/11/02 1145	1.8	<0.10	05/11/02 1511 05/12/02 1518 05/13/02 1514

*Total residual chlorine.
†Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

4) Sample manipulation:

Non-treated samples (compliance test) from Outfall 101 and Intake were warmed to test temperature (25.0 ±1.0°C) in a warm water bath.

Aliquots of Outfall 101 and intake samples used for the side by side UV treated fathead minnow test were warmed to 24°C in a warm water bath and held in a 40 Watt Rainbow Lifeguard UV Sterilizer for 2 minutes, prior to exposure of test organisms.

Test Organisms

	Pimephales promelas	*Ceriodaphnia dubia*
1) Source:	Aquatic BioSystems, Inc.	In-house culture
2) Age:	23.0-26.5 hours	< 24 hours

Test Method Summary (See Appendix A for additional information)

	Pimephales promelas	*Ceriodaphnia dubia*
1) Test Conditions	Static, renewal	Static, renewal
2) Test Duration	7 days	Until at least 60% of control females have 3 broods
3) Dilution/Control Water	Moderately Hard Synthetic Water	Moderately Hard Synthetic Water
4) Number Replicates	4	10
5) Animals per Replicate	10	1
6) Test Initiation: (Date/Time)		
Outfall 101	05/07/02-1458 EDT	05/07/02-1249 EDT
UV Treated Outfall 101	05/07/02-1600 EDT	
7) Test Termination: (Date/Time)		
Outfall 101	05/14/02-1409 EDT	05/14/02-1300 EDT
UV Treated Outfall 101	05/14/02-1436 EDT	
8) Test Temperature: Outfall 101:	Mean =24.5 °C (24.2-25.1°C)	Mean = 24.7°C (24.2-25.4°C)

Test Temperature: UV-Treated Outfall 101: Mean = 24.5°C (24.2-25.3°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 replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.

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

TOXICITY TEST RESULTS (See Appendix C for Bench Sheets)

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

Conducted 05/07/02 05/14/02 Using Effluent From Outfall 101.
(mm/dd/yy) (mm/dd/yy) (number)

Test Solutions	Percent Surviving (time intervals used - days)						
	1	2	3	4*	5	6	7
Control	100	100	100	100	100	100	98
10.98% Effluent	100	98	95	95	95	95	95
22% Effluent	100	95	95	95	95	95	95
43.9% Effluent	100	100	100	100	100	98	98
72% Effluent	100	100	100	100	100	98	98
100% Effluent	100	98	98	98	98	98	97†
Intake	100	100	100	98	88	75	68

*96-Hour LC_{50} Value: ≥ 100%	Calculated TU Estimates: † < 1.0 TUa
95% Confidence Limits: Upper Limit NA Lower Limit NA	Permit Limit: 1.0 TUa

Test Solutions	IC_{25} Mean Dry Weight (mg) (Replication)				
	1	2	3	4	Mean
Control	0.448	0.476	0.405	0.432	0.440
10.98% Effluent	0.562	0.361	0.557	0.502	0.496
22% Effluent	0.497	0.463	0.353	0.472	0.446
43.9% Effluent	0.583	0.448	0.406	0.552	0.497
72% Effluent	0.421	0.486	0.519	0.507	0.483
100% Effluent	0.546	0.624	0.492	0.536	0.549
Intake	0.478	0.389	0.125	0.463	0.364

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

† One fish was lost during termination. The test concentration was initiated with 39 fish instead of 40 for statistical purposes.

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

TOXICITY TEST RESULTS

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

Conducted 05/07/02 (mm/dd/yy) 05/14/02 (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
6.25% Effluent	100	100	100	100	100	100	100
12.5% Effluent	100	100	100	100	100	100	100
25% Effluent	100	100	100	100	100	100	100
50% 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

*96-Hour LC_{50} Value: ≥ 100% 95% Confidence Limits Upper Limit = NA Lower Limit = NA	Calculated TU Estimates: † ≤ 1.0 TUa Permit Limit: 1.0 TUa

Test Solutions	Reproduction (#young/female/7 days) Data Replicates										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	25	28	31	32	24	26	25	25	29	31	27.6
10.98% Effluent	26	28	28	29	29	31	27	26	32	30	28.6
22% Effluent	26	31	26	32	29	31	30	27	25	28	28.5
43.9% Effluent	25	28	26	31	29	34	28	28	30	31	29.0
72% Effluent	27	26	30	27	31	27	27	30	32	34	29.1
100% Effluent	30	31	28	30	28	29	33	35	33	32	30.9
Intake	30	22	24	21	15	14	23	18	26	27	22.0

IC_{25} Value: ≥ 100% 95% Confidence Limits: Upper Limit = N/A Lower Limit = N/A	Calculated TU Estimates: † ≤ 1.0 TUc Permit Limit: 1.0 TUc

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

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	05/07/02	1538	7-days	KCl	544.6 mg/L (IC_{25})
Ceriodaphnia dubia	05/07/02	1220	7-days	NaCl	1049.2 mg/L (IC_{25})

TOXICITY TEST RESULTS UV-TREATED (See Appendix B for Bench Sheets)

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

Conducted 05/07/02 (mm/dd/yy) 05/14/02 (mm/dd/yy) Using Effluent From Outfall 101, UV treated (number)

Test Solutions	Percent Surviving (time intervals used - days)						
	1	2	3	4*	5	6	7
Control	100	100	100	100	100	98	98
10.98% Effluent	100	100	100	100	100	95	95
22% Effluent	100	100	100	100	100	100	100
43.9% Effluent	100	100	100	100	100	100	100
72% Effluent	100	100	100	100	100	100	100
100% Effluent	100	100	100	100	100	98	98
Intake	100	100	100	100	100	100	100

*96-Hour LC_{50} Value: ≥ 100%	Calculated TU Estimates: † ≤ 1.0 TUa
95% Confidence Limits: Upper Limit NA Lower Limit NA	Permit Limit: 1.0 TUa

Test Solutions	IC_{25} Mean Dry Weight (mg) (Replication)				
	1	2	3	4	Mean
Control	0.494	0.446	0.475	0.479	0.473
10.98% Effluent	0.377	0.477	0.487	0.336	0.419
22% Effluent	0.504	0.484	0.508	0.541	0.509
43.9% Effluent	0.512	0.516	0.493	0.613	0.533
72% Effluent	0.458	0.480	0.440	0.443	0.455
100% Effluent	0.474	0.480	0.420	0.520	0.473
Intake	0.477	0.436	0.447	0.496	0.464

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

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

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas UV- Treated	05/07/02	1538	7-days	KCl	536.7 mg/L (IC_{25})

SUMMARY/CONCLUSIONS

Outfall 101 samples collected May 5-10, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows to intake samples resulted in no significant differences from controls during this study period, although intake minnow survival was only 68 percent. Daphnid reproduction was significantly different from control based on result of the Homoscedastic t-Test.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of historic problems with WET tests for this effluent.

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 400-mL polypropylene beakers, each containing 250-mL of test solution.

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 polypropylene cups, each containing 15-mL of test solution.

DEVIATIONS/MODIFICATIONS TO TEST PROTOCOL

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

DEVIATIONS/MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

PHYSICAL AND CHEMICAL METHODS

1) Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).

2) Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.

3) Temperature was measured using EPA Method 170.1.

4) Dissolved oxygen was measured using EPA Method 360.1.

5) The pH was measured EPA Method 150.1.

6) Conductance was measured EPA 120.1.

7) Alkalinity was measured using EPA 310.1.

8) Hardness was measured EPA Method 130.2.

9) Total residual chlorine was measured using EPA 330.5.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage, glassware preparation, test organism culturing/acquisition and acclimation, test organism handling during test, and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA/600/4-91/002. Any known deviations were noted during the study and are reported herein.

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

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

2) Standard Toxicant: Potassium Chloride (KCl crystalline).

3) Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1) NPDES Permit No. TN0026450.

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

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

Sequoyah Nuclear Plant Biomonitoring
May 7-14, 2002

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. 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-May 10, 2002

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
03/12/1998	0.016	-	-	-	-	-	-
03/13/1998	0.015	-	-	-	-	-	-
03/14/1998	0.013	-	-	-	-	-	-
03/15/1998	0.030	-	-	-	-	-	-
03/16/1998	0.013	-	-	-	-	-	-
03/17/1998	0.020	-	-	-	-	-	-
03/18/1998	0.018	-	-	-	-	-	-
09/08/1998	0.015	-	0.014	0.005	-	-	0.021
09/09/1998	0.003	-	0.031	0.011	-	-	-
09/10/1998	0.014	-	0.060	0.021	-	-	-
09/11/1998	0.013	-	0.055	0.019	-	-	-
09/12/1998	< 0.001	-	0.044	0.015	-	-	-
09/13/1998	< 0.001	-	0.044	0.015	-	-	-
09/14/1998	0.008	-	0.044	0.015	-	-	-
02/22/1999	< 0.001	-	-	-	-	-	-
02/23/1999	0.005	-	-	-	-	-	-
02/24/1999	0.009	-	-	-	-	-	-
02/25/1999	0.012	-	-	-	-	-	-
02/26/1999	0.008	-	-	-	-	-	-
02/27/1999	< 0.001	-	-	-	-	-	-
02/28/1999	< 0.001	-	-	-	-	-	-
08/18/1999	-	0.015	0.069	0.024	0.006	-	-
08/19/1999	-	0.012	0.068	0.024	-	-	-
08/20/1999	-	0.023	0.070	0.024	-	0.120	-
08/21/1999	-	0.022	0.068	0.024	-	-	-
08/22/1999	-	0.022	0.068	0.024	-	-	-
08/23/1999	-	0.025	0.068	0.024	0.006	-	-
08/24/1999	-	0.016	0.067	0.023	0.020	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-May 10, 2002

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling,
March 12, 1998-May 10, 2002

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
1/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
1/03/2002	-	< 0.0042	0.023	0.014	-	-	-
1/04/2002	-	0.0124	0.024	0.014	0.009	-	-
1/05/2002	-	< 0.0042	-	-	-	-	-
1/06/2002	-	< 0.0042	-	-	-	-	-
1/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
2/24/2002	-	< 0.004	-	-	-	-	-
2/25/2002	-	< 0.004	0.023	0.023	-	-	-
2/26/2002	-	0.0143	0.023	0.023	0.007	-	-
2/27/2002	-	< 0.0041	0.023	0.023	-	-	-
2/28/2002	-	< 0.0041	0.024	0.008	-	-	-
3/01/2002	-	<0.0041	0.024	0.008	-	-	-
5/05/2002	-	<0.0070	-	-	-	-	-
5/06/2002	-	<0.0106	0.058	0.02	0.014	-	-
5/07/2002	-	<0.0154	0.058	0.02	0.015	-	-
5/08/2002	-	<0.0150	0.056	0.019	-	-	-
5/09/2002	-	<0.0122	0.057	0.02	0.014	-	-
5/10/2002	-	<1.0189	0.056	0.019	-	-	-

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, May 5-14, 2002

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 mg/L $CaCO_3$	Hardness mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Fathead/ Control	24.5 (24.3-24.6)	24.5 (24.3-24.9)	7.9 (7.8-8.0)	7.1 (6.4-7.7)	8.25 (8.23-8.27)	7.84 (7.54-8.10)	313 (298-321)	64 (63-65)	87 (82-89)	-
Fathead/ 10.98 %	24.5 (24.3-24.8)	24.5 (24.2-24.8)	7.9 (7.8-8.1)	7.1 (6.2-7.6)	8.25 (8.23-8.27)	7.80 (7.44-8.11)	297 (287-305)	-	-	-
Fathead/ 22 %	24.6 (24.2-24.8)	24.5 (24.3-24.9)	8.0 (7.8-8.1)	6.9 (6.3-7.6)	8.23 (8.20-8.26)	7.76 (7.53-8.02)	281 (269-289)	-	-	-
Fathead/ 43.9 %	24.5 (24.2-24.8)	24.5 (24.3-24.9)	8.1 (7.9-8.2)	7.1 (6.5-8.0)	8.19 (8.13-8.24)	7.84 (7.62-8.04)	250 (241-257)	-	-	-
Fathead/ 72 %	24.6 (24.2-25.0)	24.5 (24.3-24.9)	8.1 (7.9-8.2)	7.0 (6.5-7.5)	8.15 (8.06-8.21)	7.79 (7.62-8.04)	211 (203-216)	-	-	-
Fathead/ 100 %	24.6 (24.3-25.1)	24.5 (24.2-24.9)	8.2 (8.0-8.4)	7.2 (6.5-7.6)	8.08 (7.93-8.18)	7.80 (7.65-8.04)	170 (165-175)	58 (57-59)	75 (72-76)	<0.10 (<0.10-<0.10)
Fathead/ Intake	24.6 (24.4-25.1)	24.5 (24.2-24.9)	8.3 (8.1-8.4)	7.1 (6.6-7.7)	8.11 (7.99-8.18)	7.91 (7.67-8.22)	171 (165-173)	60 (58-61)	74 (72-76)	<0.10 (<0.10-<0.10)
Daphnid/ Control	24.4 (24.2-24.7)	24.6 (24.4-24.9)	7.9 (7.8-8.0)	8.1 (7.9-8.4)	8.25 (8.23-8.27)	8.27 (8.18-8.38)	313 (298-321)	64 (63-65)	87 (82-89)	-
Daphnid/ 10.98 %	24.6 (24.3-25.0)	24.6 (24.3-25.1)	7.9 (7.8-8.1)	8.0 (7.9-8.3)	8.25 (8.23-8.27)	8.27 (8.19-8.39)	297 (287-305)	-	-	-
Daphnid/ 22 %	24.7 (24.3-25.1)	24.7 (24.3-25.1)	8.0 (7.8-8.1)	8.0 (7.9-8.3)	8.23 (8.20-8.26)	8.27 (8.18-8.38)	281 (269-289)	-	-	-
Daphnid/ 43.9%	24.7 (24.4-25.1)	24.7 (24.4-25.1)	8.1 (7.9-8.2)	8.1 (7.9-8.4)	8.19 (8.13-8.24)	8.26 (8.18-8.37)	250 (241-257)	-	-	-
Daphnid/ 72%	24.8 (24.4-25.3)	24.7 (24.4-25.0)	8.1 (7.9-8.2)	8.1 (7.9-8.3)	8.15 (8.06-8.21)	8.30 (8.18-8.42)	211 (203-216)	-	-	-
Daphnid/ 100 %	24.8 (24.3-25.4)	24.6 (24.4-25.1)	8.2 (8.0-8.4)	8.2 (8.0-8.4)	8.08 (7.93-8.18)	8.33 (8.18-8.50)	170 (165-175)	58 (57-59)	75 (72-76)	<0.10 (<0.10-<0.10)
Daphnid/ Intake	24.6 (24.3-24.8)	24.6 (24.4-25.1)	8.3 (8.1-8.4)	8.2 (7.8-8.6)	8.11 (7.99-8.18)	8.27 (8.15-8.54)	171 (165-173)	60 (58-61)	74 (72-76)	<0.10 (<0.10-<0.10)

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Test, Sequoyah Nuclear Plant (SQN), UV Treated Outfall 101 and Intake Samples, May 7-14, 2002

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 mg/L $CaCO_3$	Hardness mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Fathead/ Control	24.5 (24.3-24.7)	24.5 (24.3-24.8)	8.0 (7.9-8.2)	7.2 (6.5-7.8)	8.23 (8.18-8.27)	7.87 (7.49-8.12)	307 (296-315)	64 (63-65)	87 (82-89)	-
Fathead/ 10.98 %	24.6 (24.3-24.8)	24.5 (24.2-24.8)	8.0 (7.9-8.2)	7.1 (6.1-7.8)	8.22 (8.17-8.28)	7.87 (7.48-8.12)	292 (287-300)	-	-	-
Fathead/ 22 %	24.6 (24.3-25.0)	24.5 (24.2-24.8)	7.9 (7.7-8.1)	7.2 (6.5-7.8)	8.20 (8.16-8.25)	7.89 (7.45-8.10)	277 (270-283)	-	-	-
Fathead/ 43.9 %	24.6 (24.3-25.1)	24.5 (24.2-24.8)	7.9 (7.7-8.2)	7.2 (6.4-7.7)	8.18 (8.12-8.24)	7.83 (7.43-8.10)	247 (240-253)	-	-	-
Fathead/ 72 %	24.6 (24.3-25.2)	24.5 (24.2-24.8)	8.0 (7.8-8.1)	7.0 (6.0-7.7)	8.14 (8.08-8.20)	7.83 (7.42-8.08)	209 (204-214)	-	-	-
Fathead/ 100 %	24.7 (24.2-25.3)	24.5 (24.3-24.8)	8.0 (7.9-8.1)	7.2 (6.4-7.7)	8.10 (7.99-8.17)	7.82 (7.44-8.08)	168 (164-173)	58 (57-59)	75 (72-76)	<0.10 (<0.10-<0.10)
Fathead/ Intake	24.6 (24.3-25.0)	24.5 (24.2-24.8)	8.0 (7.9-8.1)	7.1 (6.2-7.7)	8.10 (8.02-8.14)	7.84 (7.47-8.10)	168 (165-172)	60 (58-61)	74 (72-76)	<0.10 (<0.10-<0.10)

Sequoyah Nuclear Plant Biomonitoring
May 7-14, 2002

Appendix C

Chain of Custody Records and Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_ _____

General Comments:

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	---	---	Start	End	---	---	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appear-ance
SQN-101-TOX	comp	4	1450 5/5/02	5/6/02 1350	2(2.5g)				✓		321 020507.01	0.3°C	JS	1155	CUSTODY INTACT GOOD
SQN-INT-TOX	comp	4	1509 5/5/02	5/6/02 1409	1 (2.5g)				✓		321 020507.02	0.3°C	JS	1155	CONDITIO ↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	5/6/02 1530	Fedex	05-06-02 / 1530
Fedex	05-07-02 1155	[illegible]	05-07-02 1155

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: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): _____

General Comments:

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	---	---	Start	End	---	---	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1225 5/7/02 1226	5/08/02 1125 1126	2(2.5g)				no		324 020509.02	0.8°C	JL	1112	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	5/7/02 1241	5/08/02 1141	1 (2.5g)				no		324 020509.03	0.3°C	JL	1112	SAMPLES RECEIVED IN GOOD CONDITION
														JL	

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	5/8/02 1500	Fedex	05-08-02 / 1500
Fedex	05-09-02 1112	[illegible]	05-09-02 1112
	JL		

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: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_ _____

General Comments:

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	---	---	Start	End	---	---	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	~~1218~~ 1318 5/9/02	5/10/02 ~~1318~~ 1218	2(2.5g)						324 020511-01	1.8°C	KEK	1145	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	1333 5/9/02	5/10/02 1233	1 (2.5g)						324 020511.02	1.8°C	KEK	1145	SAMPLE RECEIVED IN GOOD CONDITIO
													JL		

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	5/10/02 1500	Fedex	05-10-02 / 1500
Fedex	05-11-02 1145	KEKeenan ETS	05-11-02 1145
		JL	

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 eacl sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
04-25-02	1010	KEKeenan	Fedex	3.1°C	323	020425.01	BE&K TERRANEXT OUTFALL 002	MO	
04-25-02	1010	KEKeenan	Fedex	3.1°C	323	020425.02	BE&K TERRANEXT OUTFALL 003	MO	
04-25-02	1010	KEKeenan	Fedex	3.1°C	323	020425.03	BE&K TERRANEXT UPSTREAM OUTFALL 002	MO	
04-25-02	1010	KEKeenan	Fedex	3.1°C	323	020425.04	BE&K TERRANEXT UPSTREAM OUTFALL 003	MO	
04-25-02	1012	KEKeenan	Fedex	0.2°C	321	020425.05	TVA WATTS BAR NUCLEAR PLANT	TN	
04-27-02	1208	J/umner	Fedex	0.6°C	321	020427.01	TVA WATTS BAR NUCLEAR PLANT	TN	
04-27-02	1211	J/umner	L. Carreiro	0.9°C	322	020427.02	City of Asheville, North Fork WTP	NC	
05-07-02	1155	J/umner	Fedex	0.3°C	324	020507.01	TVA Sequoyah Nuclear Plant - Outfall 101	TN	
05-07-02	1155	J/umner	Fedex	0.3°C	324	020507.02	TVA Sequoyah Nuclear Plant - Intake	TN	
05-08-02	0800	J/umner	D. Trammel	0.3°C	325	020508.01	Test America Silverline Plastics	NC	
05-08-02	0826	KEKeenan	Asheville Courier	0.8°C	326	020508.02	Comm Scope, Inc.	NC	
05-08-02	0827	KEKeenan	Greyhound	0.9°C	327	020508.03	Waynesville WWTP	NC	
05-08-02	1038	J/umner	Fedex	3.7°C	328	020508.04	Duke Energy Corp. Belews Creek Steam Station	NC	
05-08-02	1040	J/umner	Fedex	* 6.4°C	329	020508.05	Georgetown Steel DRI Plant	SC	*Sample exceeded acceptable temperature upon receipt.
05-08-02	1043	J/umner	Fedex	0.3°C	330	020508.06	PCS Phosphate, Outfall 007	NC	
05-08-02	1043	J/umner	Fedex	1.1°C	330	020508.07	PCS Phosphate, Outfall 100	NC	
05-08-02	1046	J/umner	Fedex	2.2°C	331	020508.08	Duke Energy Corp. McGuire Nuclear Station 001	NC	
05-08-02	1049	J/umner	Fedex	0.1°C	332	020508.09	Duke Energy, Corp. McGuire Nuclear Station 002	NC	
05-08-02	1052	J/umner	UPS	0.3°C	333	020508.10	TRITEST, INC. CP&L - Mayo E.G. Plant	NC	
05-08-02	1052	J/umner	UPS	0.3°C	334	020508.11	TRITEST, INC. CP&L - SHNPP	NC	
05-08-02	1330	J/umner	R. Vess	0.2°C	335	020508.12	Baxter Healthcare Corp.	NC	

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
5-09-02	1102	KEKeenan	Fedex	2.6°C	336	020509.01	Alcoa Engineered Products	NC	
5-09-02	1112	Jlumner	Fedex	0.3°C	324	020509.02	TVA Sequoyah Nuclear Plant Outfall 101	TN	
5-09-02	1112	Jlumner	Fedex	0.3°C	324	020509.03	TVA Sequoyah Nuclear Plant Intake	TN	
5-10-02	0836	Jlumner	D. Trammel	1.7°C	337	020510.01	Test America - Earth Env. Marshall WWTP	NC	
5-10-02	0951	KEKeenan	UPS	0.9°C	338	020510.02	Tritest CPIL - Harris E+E Center	NC	
5-14-02	1036 ~~0830~~	Jlumner	R. Vess	1.6°C	335	020510.03	Baxter Healthcare Corp.	NC	
5-11-02	1145	KEKeenan	Fedex	1.8°C	324	020511.01	TVA Sequoyah Nuclear Plant Outfall 101	TN	
5-11-02	1145	KEKeenan	Fedex	1.8°C	324	020511.02	TVA Sequoyah Nuclear Plant Intake	TN	
5-11-02	1148	KEKeenan	Fedex	1.4°C	328	020511.03	Duke Energy Corp. Belews Creek Steam Station	NC	
5-11-02	1148	KEKeenan	Asheville Courier	0.5°C	326	020511.04	Comm Scope, Inc.	NC	
5-11-02	1149	KEKeenan	Greyhound	1.3°C	327	020511.05	Waynesville WWTP	NC	
5-~~09~~ 10-02	1102	KEKeenan	Fedex	* 20.0°C	339	020510.04	Georgetown Steel Scale Pit	SC	* Sample exceeded acceptable temp. upon receipt.
5-15-02	1004	Jlumner	UPS	0.1°C	340	020514.01	Tritest, Inc. Apex WWTP	NC	
5-14-02	1410	Jlumner	R. Pate	3.6°C	341	020514.01	EMS - The Mountain WWTP	NC	
5-15-02	1140	Jlumner	Fedex	1.2°C	342	020515.02	Duke Energy Corp. Marshall Steam Station	NC	

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

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

Dilution preparation information:						*Comments:*
MHS batch:		05-06-02				
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.5	1080	1500	
Diluent volume (mL)	1335.3	1170	841.5	420	0	

Test organism information:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	05-06-02 1030 to 1400 MST 1230 - 1600 EST	Incubator number:	2
Organism source:	ABS BATCH 05-06-02	*Artemia* lot number:	850207P
Transfer bowl information:	pH = 7.98 Temperature = 24.0°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	05-07-02	—	1600	1458	
1	05-08-02	1014	1611	1450	
2	05-09-02	1000	1602	1446	
3	05-10-02	0953	1606	1440	
4	05-11-02	1140	1801	1511	KEK
5	05-12-02	0948	1557	1518	KEK
6	05-13-02	1003	1618	1514	
7	05-14-02	—	—	1409	

Control information:		Acceptance criteria
% Mortality:	2.5%	≤ 20%
Average weight per larvae:	0.4403	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC50	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC25	>100%

Species: *Pimephales promelas*

Client: TVA-SEQUOYAH
NONTREATED

Date: 05-07-02

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	9 2d	10	10	10	10	8 2d	10
3	10	10	10	10	10	8 1d	10	10	10	10	8	10
4	10	10	10	10	10	8	10	10	10	10	8	10
5	10	10	10	10	10	8	10	10	10	10	8	10 ~~9 1d~~
6	10	10	10	10	10	8	10	10	10	10	8	10
7	10	10	10	9 1d	10	8	10	10	10	10	8	10
A = Pan weight (mg) 2 PANS 1 BIK	14.936	14.802	14.880	14.292	15.059	14.904	15.163	14.676	15.034	14.891	15.037	14.684
B = Pan + Larvae weight (mg)	19.42	19.56	18.94	18.61	20.66	18.51	20.72	19.70	20.00	19.46	18.57	19.40
Larvae weight (mg) = A – B	4.484	4.758	4.052	4.318	5.621	3.606	5.567	5.024	4.966	4.629	3.533	4.716

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH
NONTREATED

Date: 05-07-02

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	9[1d]
3	10	10	10	10	10	10	10	10	10	10	10	9
4	10	10	10	10	10	10	10	10	10	10	10	9
5	10	10	10	10	10	10	10	10	10	10	10	9
6	10	9[1d]	10	10	10	10	10	9[1d]	10	10	10	9
7	10	9	10	10	10	10	10	9	1 missing ~~10~~ 9	10	10	9
A = Pan weight (mg)	15.127	14.679	15.090	14.587	15.134	15.436	15.091	14.971	14.700	15.019	14.791	15.091
B = Pan + Larvae weight (mg)	20.96	19.16	19.15	20.11	19.34	20.30	20.28	20.04	19.10 ~~19.604~~	~~19.704~~	~~21.264~~ 19.71	20.45
Larvae weight (mg) = A – B	5.833	4.481	4.060	5.523	4.206	4.864	5.189	5.069	4.912	4.241	4.919	5.359

*SPILLED CUP AT TEST TERMINATION.
Calculations and data reviewed: JA
COULD NOT RECOVER 1 LARVAE

Comments:

Species: ***Pimephales promelas***

Client: TVA-SEQUOYAH NONTREATED

Date: 05-07-02

Survival and Growth Data

Day	100% INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	9 1d
5	10	~~10~~ 9 1d	~~10~~ 8 2d	8 1d
6	10	7 2d	5 3d	8
7	10	7	2 3d	8
A = Pan weight (mg)	14.621	14.8[illegible]	15.007	14.857
B = Pan + Larvae weight (mg)	19.40	14.681 18.57	16.26	19.49
Larvae weight (mg) = A – B	4.779	3.889	1.253	4.633

* Bacteria growth observed on minnows before death.

Calculations and data reviewed: JH

Comments:

Environmental Testing Solutions, LLC

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

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

Client: TVA Sequoyah Nuclear Plant, Nontreated
Test dates: May 7-14, 2002
Project number: 324

Reveiwed by: [illegible]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.936	19.420	4.484	0.4484	97.5 98	0.4403	6.7	Not applicable
	B	10	10	14.802	19.560	4.758	0.4758				
	C	10	10	14.888	18.940	4.052	0.4052				
	D	10	9	14.292	18.610	4.318	0.4318				
10.98%	E	10	10	15.039	20.660	5.621	0.5621	95.0	0.4955	18.9	-12.5
	F	10	8	14.904	18.510	3.606	0.3606				
	G	10	10	15.153	20.720	5.567	0.5567				
	H	10	10	14.676	19.700	5.024	0.5024				
22%	I	10	10	15.034	20.000	4.966	0.4966	95.0	0.4461	14.2	-1.3
	J	10	10	14.831	19.460	4.629	0.4629				
	K	10	8	15.037	18.570	3.533	0.3533				
	L	10	10	14.684	19.400	4.716	0.4716				
43.9%	M	10	10	15.127	20.960	5.833	0.5833	97.5 98	0.4974	16.9	-13.0
	N	10	9	14.679	19.160	4.481	0.4481				
	O	10	10	15.090	19.150	4.060	0.4060				
	P	10	10	14.587	20.110	5.523	0.5523				
72%	Q	10	10	15.134	19.340	4.206	0.4206	97.5 98	0.4832	9.1	-9.7
	R	10	10	15.436	20.300	4.864	0.4864				
	S	10	10	15.091	20.280	5.189	0.5189				
	T	10	9	14.971	20.040	5.069	0.5069				
100%	U	9	9	14.788	19.700	4.912	0.5458	97.5 98	0.5494	10.0	-24.8
	V	10	10	15.019	21.260	6.241	0.6241				
	W	10	10	14.791	19.710	4.919	0.4919				
	X	10	9	15.091	20.450	5.359	0.5359				
100% Intake	Y	10	10	14.621	19.400	4.779	0.4779	67.5 68	0.3639	45.0	17.4
	Z	10	7	14.681	18.570	3.889	0.3889				
	AA	10	2	15.007	16.260	1.253	0.1253				
	BB	10	8	14.857	19.490	4.633	0.4633				

Outfall 101:
Dunnett's MSD value: 0.1116
PMSD: 25.3

Intake:
Dunnett's MSD value: 0.1617
PMSD: 36.7

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.7% from the control (determined
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah - Nontreated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.4484	0.4758	0.4052	0.4318
10.98	0.5621	0.3606	0.5567	0.5024
22	0.4966	0.4629	0.3533	0.4716
43.9	0.5833	0.4481	0.4060	0.5523
72	0.4206	0.4864	0.5189	0.5069
100	0.5458	0.6241	0.4919	0.5359

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4403	1.0000	0.4403	0.4052	0.4758	6.725	4				0.4853	1.0000
10.98	0.4955	1.1253	0.4955	0.3606	0.5621	18.944	4	-1.191	2.410	0.1116	0.4853	1.0000
22	0.4461	1.0132	0.4461	0.3533	0.4966	14.233	4	-0.125	2.410	0.1116	0.4853	1.0000
43.9	0.4974	1.1297	0.4974	0.4060	0.5833	16.891	4	-1.234	2.410	0.1116	0.4853	1.0000
72	0.4832	1.0974	0.4832	0.4206	0.5189	9.072	4	-0.927	2.410	0.1116	0.4853	1.0000
100	0.5494	1.2478	0.5494	0.4919	0.6241	10.014	4	-2.357	2.410	0.1116	0.4853	1.0000

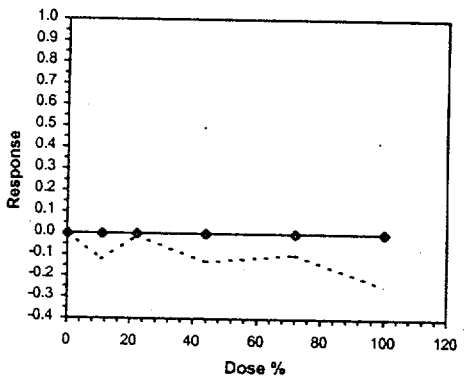
Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9559744	0.884	-0.639853048	-0.188351025
Bartlett's Test indicates equal variances (p = 0.52)	4.198050499	15.08631706		

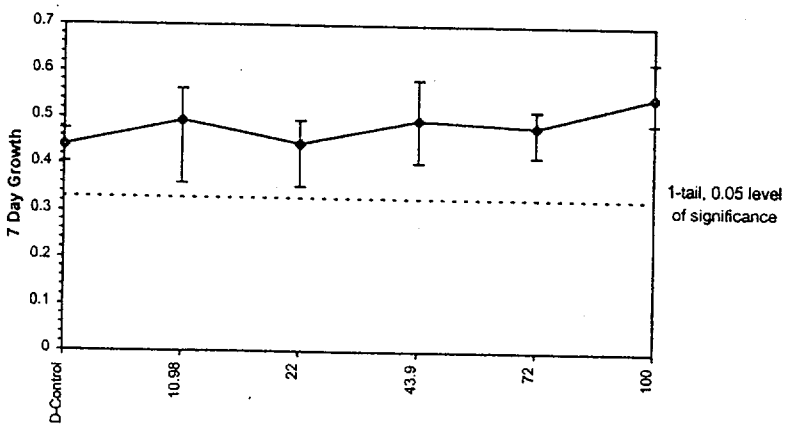
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.111584903	0.253429259	0.006341912	0.004287526	0.245395169	5, 18

Linear Interpolation (80 Resamples)

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



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/7/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah - Nontreated Intake
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	0.9000
100	1.0000	0.7000	0.2000	0.8000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			
100	0.6750	0.6923	0.9935	0.4636	1.4120	39.790	4	1.872	1.943	0.3922

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.880755126	0.749	-0.780447334	2.82895682
F-Test indicates equal variances (p = 0.03)	23.53577423	47.46834564		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah - Nonreated Intake
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.4484	0.4758	0.4052	0.4318
100	0.4779	0.3889	0.1253	0.4633

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.4403	1.0000	0.4403	0.4052	0.4758	6.725	4			
100	0.3639	0.8264	0.3639	0.1253	0.4779	45.002	4	0.919	1.943	0.1617

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.842814147	0.749	-1.634364624	3.644213996
F-Test indicates equal variances (p = 0.02)	30.58085251	47.46834564		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1002.0)
Species: *Ceriodaphnia dubia*

	Date	Time	Analyst
Test start	05-07-02	1249	JH
Test end	05-14-02	1300	JH

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

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.5	1080	1500	
Diluent volume (mL)	1335.3	1170	841.5	420	0	

Test organism information:		*Test information:*	
Organism age:	<24-HOURS OLD	Randomizing template:	PURPLE
Date and times organisms were born between:	05-06-02 1411 TO 1802	Incubator number:	2
Organism source:	04-30-02 AM B	YCT batch: ABS	04-16-02
Transfer bowl information:	pH = 8.23 Temperature = 24.3	*Selenastrum* batch: ABS	04-16-02

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	4	0	0	3	4	4	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	5	4	0	0	0	4	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	10	12	9	8	9	9	8	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	14	0	16	12	14	12	12	15	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	16	0	0	0	0	0	0	0
Total young produced		25	28	31	32	24	26	25	25	29	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Calculations and data reviewed: JH

Test Renewal, Feeding, and Incubator Location Information

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	05-13	05-07	05-08	05-09	05-10	05-11	05-12
Time	1208	1249	1300	1222	1200	1310	1200
Analyst	JH	JH	JH	JH	JH	JH	JH
Shelf Location	B2	B2	B2	B2	B2	B2	B2

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	100%
% Mortality:	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	27.6	≥ 15.0 offspring/female	ChV	>100%
% CV:	10.8%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*

Client: TVA- SEQUOYAH

Date: 05-07-02

CONCENTRATION: 10.98%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	3	4	3	0	4	0	3	4	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	2	0	0	4	0	5	0	0	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	9	11	10	0	10	8	12	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	14	16	0	0	15	14	0	16	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	14	15	11	0	~~12~~ 14	0	0
Total young produced		26	28	28	29	29	31	27	26	32	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.6
% Reduction from Control:	-3.6%

Calculations and data reviewed: JF

CONCENTRATION: 22%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	5	0	3	0	4	0	4	0	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	4	0	5	0	4	1	4	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	8	11	11	0	9	9	10	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	17	4	0	14	14	16	14	12	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	11	16	0	13	0	0	0	0
Total young produced		26	31	26	32	29	31	30	27	25	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.5
% Reduction from Control:	-3.3%

Calculations and data reviewed: JF

Species: *Ceriodaphnia dubia*

Client: TVA - SEQUOYAH

Date: 05-07-02

CONCENTRATION: 43%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	4	4	0	3	4	4	3	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	5	0	0	0	0	1	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	8	9	10	13	9	12	10	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	14	14	0	16	16	5	13	14	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	17	0	1	10	0	0	14
Total young produced		25	28	26	31	29	34	28	28	30	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.0
% Reduction from Control:	-5.1%

Calculations and data reviewed: JJ

CONCENTRATION: 72%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	3	2	0	0	0	0	0	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	3	0	6	4	5	3	4	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	7	12	8	10	8	10	10	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	13	0	0	17	14	14	16	18	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	0	16	13	0	0	0	0	0	0
Total young produced		27	26	30	27	31	27	27	30	32	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.1
% Reduction from Control:	-5.4%

Calculations and data reviewed: JJ

Species: *Ceriodaphnia dubia*

Client: TVA - SEQUOYAH **Date:** 05-07-02

CONCENTRATION: 100%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	0	3	0	3	3	4	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	5	0	4	0	0	0	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	10	9	0	10	8	13	13	11	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	16	16	12	15	18	0	17	18	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	0	0	14	0	0	16	0	0	0
Total young produced		30	31	28	30	28	29	33	35	33	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.9
% Reduction from Control:	-12.0%

Calculations and data reviewed: JH

CONCENTRATION: 100% INTAKE

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	3	0	0	0	0	4	0	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	0	4	5	3	3	0	5	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	8	10	7	0	1	7	10	9	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	2	11	0	10	10	12	0	12	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	8	0	10	0	0	1	4	0	0
Total young produced		30	22	24	21	15	14	23	18	26	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	22.0
% Reduction from Control:	20.3%

Calculations and data reviewed: JH

Environmental Testing Solutions, LLC

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

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

Client: TVA Sequoyah Nuclear Plant, Nontreated

Test dates: May 7-14, 2002

Project number: 324

Reveiwed by:

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	25	28	31	32	24	26	25	25	29	31	100	27.6	10.8	Not applicable
10.98%	26	28	28	29	29	31	27	26	32	30	100	28.6	7.0	-3.6
22%	26	31	26	32	29	31	30	27	25	28	100	28.5	8.6	-3.3
43.9%	25	28	26	31	29	34	28	28	30	31	100	29.0	9.1	-5.1
72%	27	26	30	27	31	27	27	30	32	34	100	29.1	9.2	-5.4
100%	30	31	28	30	28	29	33	35	33	32	100	30.9	7.5	-12.0
100% Intake	30	22	24	21	15	14	23	18	26	27	100	22.0	23.5	20.3

Outfall 101:

Dunnett's MSD value: 2.593

PMSD: 9.4

Intake:

Dunnett's MSD value: 3.272

PMSD: 11.9

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by **12.6%** from the control.

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

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

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

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

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/7/02	Test ID:	CdFRCR	Sample ID:	TVA, Sequoyah - Nontreated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
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	25.000	28.000	31.000	32.000	24.000	26.000716X	25.000	25.000	29.000	31.000
10.98	26.000	28.000	28.000	29.000	29.000	31.000	27.000	26.000	32.000	30.000
22	26.000	31.000	26.000	32.000	29.000	31.000	30.000	27.000	25.000	28.000
43.9	25.000	28.000	26.000	31.000	29.000	34.000	28.000	28.000	30.000	31.000
72	27.000	26.000	30.000	27.000	31.000	27.000	27.000	30.000	32.000	34.000
100	30.000	31.000	28.000	30.000	28.000	29.000	33.000	35.000	33.000	32.000

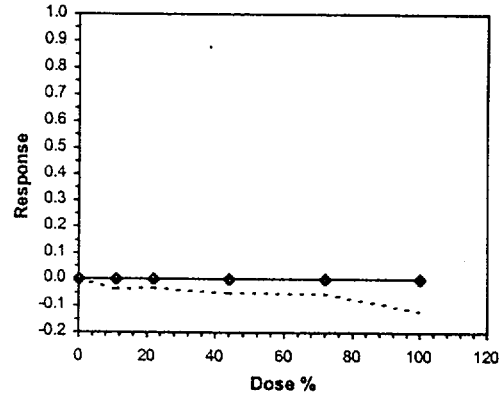
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	27.600	1.0000	27.600	24.000	32.000	10.829	10				28.950	1.0000
10.98	28.600	1.0362	28.600	26.000	32.000	7.032	10	-0.882	2.287	2.593	28.950	1.0000
22	28.500	1.0326	28.500	25.000	32.000	8.634	10	-0.794	2.287	2.593	28.950	1.0000
43.9	29.000	1.0507	29.000	25.000	34.000	9.051	10	-1.235	2.287	2.593	28.950	1.0000
72	29.100	1.0543	29.100	26.000	34.000	9.228	10	-1.323	2.287	2.593	28.950	1.0000
100	30.900	1.1196	30.900	28.000	35.000	7.544	10	-2.911	2.287	2.593	28.950	1.0000

Auxillary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.83713907	1.035	0.298146516	-0.9893687
Bartlett's Test indicates equal variances (p = 0.91)	1.532001376	15.08631706		

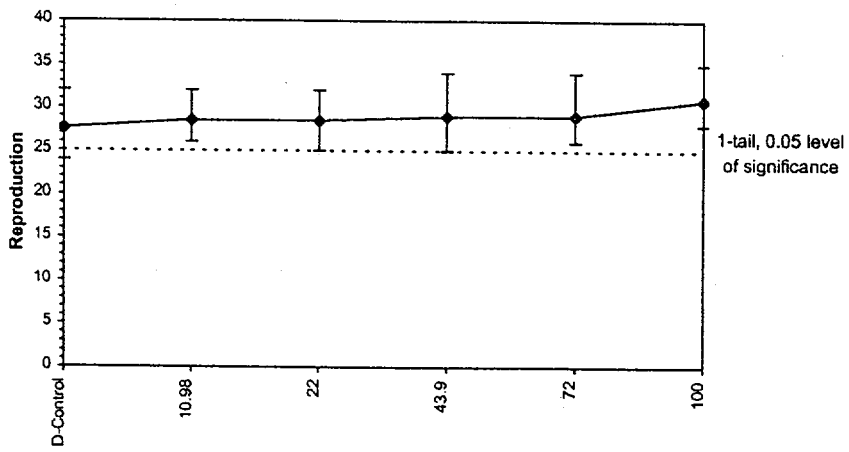
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.592676189	0.093937543	11.95	6.427777778	0.116908096	5, 54

Linear Interpolation (80 Resamples)

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



Dose-Response Plot



sqn_05-07-02data.xls

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/7/02	Test ID:	CdFRCR	Sample ID:	TVA, Sequoyah - Nontreated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Intake

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	25.000	28.000	31.000	32.000	24.000	26.000	25.000	25.000	29.000	31.000
100	30.000	22.000	24.000	21.000	15.000	14.000	23.000	18.000	26.000	27.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	27.600	1.0000	27.600	24.000	32.000	10.829	10			
*100	22.000	0.7971	22.000	14.000	30.000	23.473	10	2.968	1.734	3.272

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.983128428	0.868	-0.124038982	-0.311539277
F-Test indicates equal variances (p = 0.12)	2.98507452	6.54108572		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

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

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN-0026450
UV-TREATED

Dilution preparation information:						*Comments:*
MHS batch:		05-06-02				Each concentration was UV treated for 2 minutes using a 40-watt UV sterilizer.
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.5	1080	1500	
Diluent volume (mL)	1335.3	1170	841.5	420	0	

Test organism information:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	Yellow
Date and times organisms were born between:	05-06-02 1030 TO 1400 MST 1230 to 1600 EST	Incubator number:	2
Organism source:	ABS BATCH 05-06-02	*Artemia* lot number:	050207P
Transfer bowl information:	pH = 7.98 Temperature = 24.0°C	Oven temperature:	60°C
		Drying time:	24 HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	05-07-02	— JS	1600	1458	JS
1	05-08-02	1014	1611	1513	JS
2	05-09-02	1000	1602	1502	JS
3	05-10-02	0953	1606	1422	JS
4	05-11-02	1140	1801	1500	JS KEK
5	05-12-02	0948	1557	1450	JS KEK
6	05-13-02	1003	1618	1452	JS
7	05-14-02	—	JS	1436	JS

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC50	>100%
Average weight per larvae:	0.4734	≥ 0.25 mg/larvae	NOEC	100%
			LOEC	>100%
			ChV	>100%
			IC25	>100%

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH UV - TREATED

Date: 05-07-02

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10 ~~9'd~~
6	10	10	9'd	10	9'd	10	10	9'd	10	10	10	10
7	10	10	9	10	9	10	10	9	10	10	10	10
A = Pan weight (mg) 1PAN 1 RED	14.632	14.634	14.701	14.650	15.020	15.037	14.947	14.870	15.173	15.004	15.030	14.791
B = Pan + Larvae weight (mg)	19.57	19.09	19.45	19.45	18.79	19.81	19.82	18.23	20.21	19.84	20.12	20.20
Larvae weight (mg) = A – B	4.938	4.456	4.749	4.794	3.770	4.773	4.873	3.360	5.037	4.836	5.084	5.409

Calculations and data reviewed: JH

Comments:

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH
UV - TREATED

Date: 05-07-02

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	9 rd	10
7	10	10	10	10	10	10	10	10	10	10	9	10
A = Pan weight (mg)	14.875	15.060	15.145	15.008	15.362	14.972	14.669	14.787	14.645	14.759	14.933	15.186
B = Pan + Larvae weight (mg)	19.99	20.22	20.07	21.14	19.94	19.77	19.07	19.22	19.35	19.56	19.13	20.39
Larvae weight (mg) = A – B	5.115	5.160	4.925	6.132	4.578	4.798	4.401	4.433	4.705	4.801	4.197	5.204

Calculations and data reviewed: JF

Comments:

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH UN-TREATED

Date: 05-07-02

Survival and Growth Data

Day	100% INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	15.015	14.843	14.982	15.047
B = Pan + Larvae weight (mg)	19.78	19.20	19.45	20.03
Larvae weight (mg) = A – B	4.765	4.357	4.468	4.983

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant, UV Treated

Test dates: May 7-14, 2002

Project number: 324

Reveiwed by: [signature]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.632	19.570	4.938	0.4938	97.5 98	0.4734	4.3	Not applicable
	B	10	10	14.634	19.090	4.456	0.4456				
	C	10	9	14.701	19.450	4.749	0.4749				
	D	10	10	14.656	19.450	4.794	0.4794				
10.98%	E	10	9	15.020	18.790	3.770	0.3770	95.0	0.4194	17.8	11.4
	F	10	10	15.037	19.810	4.773	0.4773				
	G	10	10	14.947	19.820	4.873	0.4873				
	H	10	9	14.870	18.230	3.360	0.3360				
22%	I	10	10	15.173	20.210	5.037	0.5037	100.0	0.5092	4.7	-7.5
	J	10	10	15.004	19.840	4.836	0.4836				
	K	10	10	15.036	20.120	5.084	0.5084				
	L	10	10	14.791	20.200	5.409	0.5409				
43.9%	M	10	10	14.875	19.990	5.115	0.5115	100.0	0.5333	10.2	-12.6
	N	10	10	15.060	20.220	5.160	0.5160				
	O	10	10	15.145	20.070	4.925	0.4925				
	P	10	10	15.008	21.140	6.132	0.6132				
72%	Q	10	10	15.362	19.940	4.578	0.4578	100.0	0.4553	4.0	3.8
	R	10	10	14.972	19.770	4.798	0.4798				
	S	10	10	14.669	19.070	4.401	0.4401				
	T	10	10	14.787	19.220	4.433	0.4433				
100%	U	10	10	14.615	19.350	4.735	0.4735	97.5 98	0.4734	8.7	0.0
	V	10	10	14.759	19.560	4.801	0.4801				
	W	10	9	14.933	19.130	4.197	0.4197				
	X	10	10	15.186	20.390	5.204	0.5204				
100% Intake	Y	10	10	15.015	19.780	4.765	0.4765	100.0	0.4638	6.0	2.0
	Z	10	10	14.843	19.200	4.357	0.4357				
	AA	10	10	14.982	19.450	4.468	0.4468				
	BB	10	10	15.067	20.030	4.963	0.4963				

Outfall 101:
Dunnett's MSD value: 0.0747
PMSD: 15.8

Intake:
Dunnett's MSD value: 0.0333
PMSD: 7.0

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.7% from the control (determined through
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah - UV-treated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.4938	0.4456	0.4749	0.4794
10.98	0.3770	0.4773	0.4873	0.3360
22	0.5037	0.4836	0.5084	0.5409
43.9	0.5115	0.5160	0.4925	0.6132
72	0.4578	0.4798	0.4401	0.4433
100	0.4735	0.4801	0.4197	0.5204

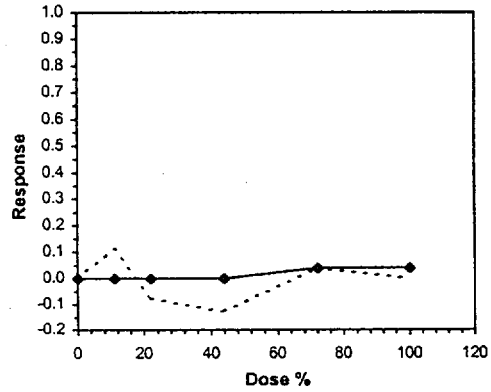
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4734	1.0000	0.4734	0.4456	0.4938	4.272	4				0.4838	1.0000
10.98	0.4194	0.8859	0.4194	0.3360	0.4873	17.798	4	1.743	2.410	0.0747	0.4838	1.0000
22	0.5092	1.0755	0.5092	0.4836	0.5409	4.663	4	-1.153	2.410	0.0747	0.4838	1.0000
43.9	0.5333	1.1265	0.5333	0.4925	0.6132	10.169	4	-1.932	2.410	0.0747	0.4838	1.0000
72	0.4553	0.9616	0.4553	0.4401	0.4798	3.973	4	0.586	2.410	0.0747	0.4643	0.9597
100	0.4734	1.0000	0.4734	0.4197	0.5204	8.741	4	0.000	2.410	0.0747	0.4643	0.9597

Auxillary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.980244517	0.884	0.193884967	0.15776262
Bartlett's Test indicates equal variances (p = 0.14)	8.409856796	15.08631706		

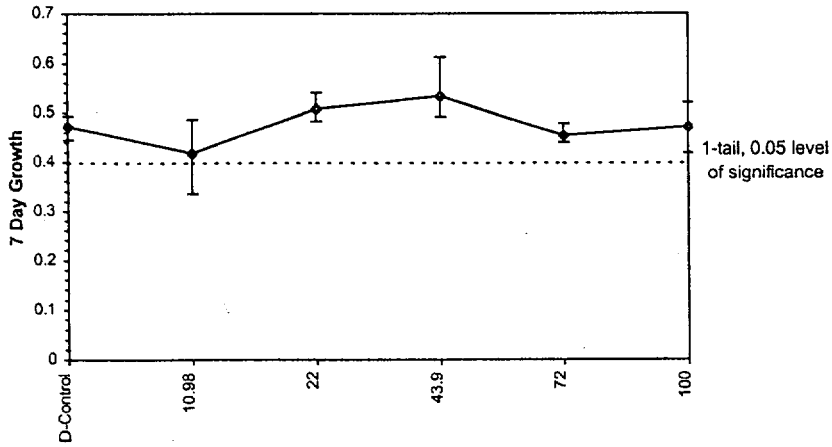
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.074689285	0.157763711	0.00641525	0.001920934	0.026198762	5, 18

Linear Interpolation (80 Resamples)

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



Dose-Response Plot



sqn_05-07-02data.xls

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah - UV-Treated Intake
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.4938	0.4456	0.4749	0.4794
100	0.4765	0.4357	0.4468	0.4963

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.4734	1.0000	0.4734	0.4456	0.4938	4.272	4			
100	0.4638	0.9797	0.4638	0.4357	0.4963	5.965	4	0.560	1.943	0.0333

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93363601	0.749	-0.063500364	-1.35330716
F-Test indicates equal variances (p = 0.62)	1.870973468	47.46834564		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Methods 1000.0 and 1002.0)

Species: *Ceriodaphnia dubia* and *Pimephales promelas*

Summary of Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: May 07-14, 2002

Project number: 324

Reviewed by: [signature]

Concentration	Parameter	Initial				*Pimephales promelas* Final				*Ceriodaphnia dubia* Final			
		Minimum	Maximum	Mean	S	Minimum	Maximum	Mean	S	Minimum	Maximum	Mean	S
Control	pH (SU)	8.23	8.27	8.25	0.02	7.54	8.10	7.84	0.19	8.18	8.38	8.27	0.06
	DO (mg/L)	7.8	8.0	7.9	0.1	6.4	7.7	7.1	0.5	7.9	8.4	8.1	0.2
	Conductivity (µmhos/cm)	298	321	313	8								
	Alkalinity (mg/L $CaCO_3$)	63	65	64	1								
	Hardness (mg/L $CaCO_3$)	82	89	87	4								
	Initial Temperature (°C)					24.3	24.6	24.5	0.1	24.2	24.7	24.4	0.2
	Final Temperature (°C)					24.3	24.9	24.5	0.2	24.4	24.9	24.6	0.2
10.98%	pH (SU)	8.23	8.27	8.25	0.01	7.44	8.11 ~~8.24~~	7.80	0.21	8.19	8.39	8.27	0.07
	DO (mg/L)	7.8	8.1	7.9	0.1	6.2	7.6	7.1	0.5	7.9	8.3	8.0	0.2
	Conductivity (µmhos/cm)	287	305	297	6								
	Initial Temperature (°C)					24.3	24.8	24.5	0.2	24.3	25.0	24.6	0.2
	Final Temperature (°C)					24.2	24.8	24.5	0.2	24.3	25.1	24.6	0.3
22%	pH (SU)	8.20	8.26	8.23	0.02	7.53	8.02	7.76	0.18	8.18	8.38	8.27	0.06
	DO (mg/L)	7.8	8.1	8.0	0.1	6.3	7.6 ~~8.0~~	6.9	0.5	7.9	8.3	8.0	0.2
	Conductivity (µmhos/cm)	269	289	281	8								
	Initial Temperature (°C)					24.2	24.8	24.6	0.2	24.3	25.1	24.7	0.2
	Final Temperature (°C)					24.3	24.9	24.5	0.2	24.3	25.1	24.7	0.3
43.9%	pH (SU)	8.13	8.24	8.19	0.04	7.62	8.04	7.84	0.16	8.18	8.37	8.26	0.07
	DO (mg/L)	7.9	8.2	8.1	0.4	6.5	8.0	7.1	0.6	7.9	8.4	8.1	0.2
	Conductivity (µmhos/cm)	241	257	250	6								
	Initial Temperature (°C)					24.2	24.8	24.5	0.2	24.4	25.1	24.7	0.2
	Final Temperature (°C)					24.3	24.9	24.5	0.2	24.4	25.1	24.7	0.3
72%	pH (SU)	8.06	8.21	8.15	0.06	7.62	8.04	7.79	0.16	8.18	8.42	8.30	0.09
	DO (mg/L)	7.9	8.2	8.1	0.1	6.5	7.5	7.0	0.4	7.9	8.3	8.1	0.2
	Conductivity (µmhos/cm)	203	216	211	5								
	Initial Temperature (°C)					24.2	25.0	24.6	0.3	24.4	25.3	24.8	0.3
	Final Temperature (°C)					24.3	24.9	24.5	0.2	24.4	25.0	24.7	0.3
100%	pH (SU)	7.93	8.18	8.08	0.10	7.65	8.04	7.80	0.14	8.18	8.50	8.33	0.13
	DO (mg/L)	8.0	8.4	8.2	0.2	6.5	7.6	7.2	0.5	8.0	8.4	8.2	0.2
	Conductivity (µmhos/cm)	165	175	170	4								
	Alkalinity (mg/L $CaCO_3$)	57	59	58	1								
	Hardness (mg/L $CaCO_3$)	72	76	75	2								
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0								
	Initial Temperature (°C)					24.3	25.1	24.6	0.3	24.3	25.4	24.8	0.4
	Final Temperature (°C)					24.2	24.9	24.5	0.2	24.4	25.1	24.6	0.3
100% Intake	pH (SU)	7.99	8.18	8.11	0.07	7.67	8.22	7.91	0.19	8.15	8.54	8.27	0.14
	DO (mg/L)	8.1	8.4	8.3	0.1	6.6	7.7	7.1	0.5	7.8	8.6	8.2	0.2
	Conductivity (µmhos/cm)	165	173	171	3								
	Alkalinity (mg/L $CaCO_3$)	58	61	60	2								
	Hardness (mg/L $CaCO_3$)	72	76	74	2								
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0								
	Initial Temperature (°C)					24.4	25.1	24.6	0.2	24.3	24.8	24.6	0.2
	Final Temperature (°C)					24.2	24.9	24.5	0.2	24.4	25.1	24.6	0.3
Overall Temperature (°C) (including all concentrations for initial and final temperatures)						24.2	25.1	24.5	0.2	24.2	25.4	24.7	0.3

Environmental Testing Solutions, LLC

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

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: May 07-14, 2002

Project number: 324

Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.27	8.10	8.23	7.85	8.24	7.99	8.27	7.90	8.27	7.67	8.25	7.86	8.25	7.54
	DO (mg/L)	7.9	7.7	7.8	6.9	7.9	7.6	7.9	7.4	7.8	6.6	8.0	7.2	8.0	6.4
	Conductivity (µmhos/cm)	321		314		319		319		314		298		308	
	Alkalinity (mg/L $CaCO_3$)	63								64				65	
	Hardness (mg/L $CaCO_3$)	89								89				82	
	Temperature (°C)	24.4	24.3	24.6	24.6	24.5	24.5	24.6	24.3	24.6	24.9	24.4	24.5	24.3	24.6
10.98%	pH (SU)	8.26	8.11	8.24	7.66	8.23	7.91	8.27	7.88	8.24	7.75	8.24	7.84	8.24	7.44
	DO (mg/L)	8.1	7.6	7.8	7.0	7.9	7.5	7.9	7.2	7.8	7.1	8.0	7.2	8.0	6.2
	Conductivity (µmhos/cm)	301		299		299		305		290		287		297	
	Temperature (°C)	24.6	24.2	24.6	24.6	24.4	24.6	24.5	24.3	24.8	24.8	24.4	24.5	24.3	24.6
22%	pH (SU)	8.26	8.02	8.24	7.66	8.20	7.90	8.26	7.82	8.21	7.59	8.21	7.82	8.24	7.53
	DO (mg/L)	8.1	7.6	7.8	6.7	8.0	7.4	8.0	7.1	8.1	6.4	8.0	6.9	8.1	6.3
	Conductivity (µmhos/cm)	287		285		285		289		269		273		282	
	Temperature (°C)	24.6	24.3	24.6	24.6	24.6	24.6	24.6	24.3	24.8	24.9	24.5	24.5	24.2	24.4
43.9%	pH (SU)	8.23	8.04	8.22	7.66	8.13	7.87	8.24	7.79	8.16	7.62	8.15	7.93	8.21	7.95
	DO (mg/L)	8.2	7.6	7.9	6.5	8.0	7.4	8.1	7.0	8.1	6.5	8.1	7.0	8.2	8.0
	Conductivity (µmhos/cm)	254		253		252		257		241		244		250	
	Temperature (°C)	24.6	24.3	24.5	24.6	24.6	24.6	24.6	24.3	24.8	24.9	24.5	24.5	24.2	24.4
72%	pH (SU)	8.20	8.04	8.21	7.62	8.06	7.86	8.20	7.80	8.10	7.65	8.08	7.89	8.18	7.64
	DO (mg/L)	8.2	7.5	7.9	6.5	8.0	7.4	8.1	7.0	8.2	6.6	8.2	7.4	8.2	6.9
	Conductivity (µmhos/cm)	212		213		213		216		203		206		211	
	Temperature (°C)	24.8	24.3	24.5	24.5	24.6	24.6	24.6	24.3	25.0	24.9	24.4	24.5	24.2	24.6
100%	pH (SU)	8.15	8.04	8.18	7.65	7.93	7.85	8.15	7.72	8.04	7.68	7.98	7.89	8.13	7.74
	DO (mg/L)	8.2	7.6	8.0	6.6	8.0	7.4	8.0	7.0	8.3	6.5	8.3	7.6	8.4	7.4
	Conductivity (µmhos/cm)	170		172		172		175		165		166		169	
	Alkalinity (mg/L $CaCO_3$)	57				59				59					
	Hardness (mg/L $CaCO_3$)	76				72				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.8	24.2	24.6	24.6	24.6	24.6	24.7	24.3	25.1	24.9	24.4	24.5	24.3	24.5
100% Intake	pH (SU)	8.13	7.99	8.14	7.69	7.99	7.96	8.18	7.87	8.10	7.67	8.05	7.98	8.16	8.22
	DO (mg/L)	8.2	7.7	8.1	6.7	8.4	7.7	8.3	7.0	8.3	6.6	8.4	7.5	8.2	6.8
	Conductivity (µmhos/cm)	170		173		173		173		165		168		172	
	Alkalinity (mg/L $CaCO_3$)	60				58				61					
	Hardness (mg/L $CaCO_3$)	74				72				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.2	24.6	24.6	24.6	24.6	24.6	24.3	24.6	24.9	24.4	24.4	24.4	24.5

Environmental Testing Solutions, LLC

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

Species: *Ceriodaphnia dubia*

Daily Chemical Analyses

:nt: Sequoyah Nuclear Plant Non-Treated

t dates: May 07-14, 2002

ject number: 324

Reviewed by: [signature]

ncentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.27	8.26	8.23	8.38	8.24	8.26	8.27	8.26	8.27	8.18	8.25	8.28	8.25	8.30
	DO (mg/L)	7.9	8.1	7.8	7.9	7.9	8.3	7.9	8.1	7.8	7.9	8.0	8.0	8.0	8.4
	Conductivity (µmhos/cm)	321		314		319		319		314		298		308	
	Alkalinity (mg/L $CaCO_3$)	63								64				65	
	Hardness (mg/L $CaCO_3$)	89								89				82	
	Temperature (°C)	24.3	24.5	24.6	24.9	24.3	24.7	24.7	24.5	24.4	24.8	24.5	24.7	24.2	24.4
10.98%	pH (SU)	8.26	8.20	8.24	8.39	8.23	8.25	8.27	8.24	8.24	8.19	8.24	8.30	8.24	8.30
	DO (mg/L)	8.1	7.9	7.8	7.9	7.9	8.3	7.9	8.0	7.8	7.9	8.0	8.0	8.0	8.2
	Conductivity (µmhos/cm)	301		299		299		305		290		287		297	
	Temperature (°C)	24.6	24.3	24.7	25.0	24.6	24.7	24.7	24.4	25.0	25.1	24.6	24.6	24.3	24.4
22%	pH (SU)	8.26	8.23	8.24	8.38	8.20	8.25	8.26	8.24	8.21	8.18	8.21	8.31	8.24	8.29
	DO (mg/L)	8.1	7.9	7.8	7.9	8.0	8.2	8.0	8.0	8.1	7.9	8.0	8.1	8.1	8.3
	Conductivity (µmhos/cm)	287		285		285		289		269		273		282	
	Temperature (°C)	24.8	24.3	24.7	25.1	24.6	24.7	24.8	24.4	25.1	25.1	24.6	24.6	24.3	24.4
43.9%	pH (SU)	8.23	8.22	8.22	8.34	8.13	8.25	8.24	8.20	8.16	8.18	8.15	8.37	8.21	8.26
	DO (mg/L)	8.2	7.9	7.9	8.0	8.0	8.2	8.1	8.0	8.1	7.9	8.1	8.3	8.2	8.4
	Conductivity (µmhos/cm)	254		253		252		257		241		244		250	
	Temperature (°C)	24.8	24.5	24.6	25.1	24.7	24.7	24.7	24.4	25.1	25.0	24.6	24.6	24.4	24.4
72%	pH (SU)	8.20	8.22	8.21	8.40	8.06	8.25	8.20	8.26	8.10	8.18	8.08	8.42	8.18	8.35
	DO (mg/L)	8.2	7.9	7.9	8.0	8.0	8.3	8.1	8.0	8.2	8.0	8.2	8.3	8.2	8.3
	Conductivity (µmhos/cm)	212		213		213		216		203		206		211	
	Temperature (°C)	25.1	24.5	24.6	25.0	24.7	24.7	24.7	24.4	25.3	25.0	24.6	24.6	24.4	24.4
100%	pH (SU)	8.15	8.22	8.18	8.47	7.93	8.27	8.15	8.24	8.04	8.18	7.98	8.50	8.13	8.42
	DO (mg/L)	8.2	8.0	8.0	8.1	8.0	8.3	8.0	8.1	8.3	8.0	8.3	8.4	8.4	8.4
	Conductivity (µmhos/cm)	170		172		172		175		165		166		169	
	Alkalinity (mg/L $CaCO_3$)	57				59				59					
	Hardness (mg/L $CaCO_3$)	76				72				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.5	24.7	24.8	24.7	24.7	24.9	24.4	25.4	25.1	24.6	24.6	24.3	24.4
100% Intake	pH (SU)	8.13	8.15	8.14	8.35	7.99	8.26	8.18	8.19	8.10	8.15	8.05	8.27	8.16	8.54
	DO (mg/L)	8.2	8.1	8.1	8.1	8.4	8.3	8.3	8.2	8.3	8.1	8.4	7.8	8.2	8.6
	Conductivity (µmhos/cm)	170		173		173		173		165		168		172	
	Alkalinity (mg/L $CaCO_3$)	60 ~~57~~				58 ~~59~~				61 ~~59~~					
	Hardness (mg/L $CaCO_3$)	74 ~~76~~				72				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.7	24.5	24.6	24.8	24.3	24.7	24.6	24.4	24.8	25.1	24.6	24.6	24.5	24.4

Species: *Pimephales promelas*

Client: TVA SEQUOYAH NONTREATED

Date: 05-07-02

Full-strength Chemistry: OUTFALL 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.15 ~~8.27~~	7.93	8.04	8.27	8.27	8.25
DO (mg/L)	8.2 ~~7.9~~	8.0	8.3	7.9	7.8	8.0
Conductivity (µmhos/cm)	170 ~~321~~	172	165	321	314	308
Alkalinity (mg $CaCO_3$/L)	57	59	59	63	64	65
Hardness (mg $CaCO_3$/L)	76	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1350	1126	1218			
Grab or Composite (duration)	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.01	020509.02	020511.01			

Species: *Pimephales promelas*

Client: TVA SEQUOYAH NONTREATED

Date: 05-07-02

Full-strength Chemistry: INTAKE

Parameter	Sample Number:			Control Batch:		
	1	2	3	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.13	7.99	8.10	8.27	8.27	8.25
DO (mg/L)	8.2	8.4	8.3	7.9	7.8	8.0
Conductivity (µmhos/cm)	170	173	165	321	314	308
Alkalinity (mg $CaCO_3$/L)	60	58	61	63	64	65
Hardness (mg $CaCO_3$/L)	~~76~~ 74	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1409	1141	1233			
Grab or Composite (duration)	~~23-HOUR~~ 24 hr COMPOSITE	~~23-HOUR~~ 24 hr COMPOSITE	~~23-HOUR~~ 24 hr COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.02	020509.03	020511.02			

Species: ***Pimephales promelas***

Client: TVA SEQUOYAH NONTREATED **Date:** 05-07-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	8.27	8.10	8.23	7.85	8.24	7.99
	DO (mg/L)	7.9	7.7	7.8	6.9	7.9	7.6
	Conductivity (µmhos/cm)	321		314		319	
	Temperature (°C)	24.4	24.3	24.6	24.6	24.5	24.5
10.98%	pH (S.U.)	8.26	8.11	8.24	7.66	8.23	7.91
	DO (mg/L)	8.1	7.6	7.8	7.0	7.9	7.5
	Conductivity (µmhos/cm)	301		299		299	
	Temperature (°C)	24.6	24.2	24.6	24.6	24.4	24.6
22%	pH (S.U.)	8.26	8.02	8.24	7.66	8.20	7.90
	DO (mg/L)	8.1	7.6	7.8	6.7	8.0	7.4
	Conductivity (µmhos/cm)	287		285		285	
	Temperature (°C)	24.6	24.3	24.6	24.6	24.6	24.6
43.9%	pH (S.U.)	8.23	8.04	8.22	7.66	8.13	7.87
	DO (mg/L)	8.2	7.6	7.9	6.5	8.0	7.4
	Conductivity (µmhos/cm)	254		253		252	
	Temperature (°C)	24.6	24.3	24.5	24.6	24.6	24.6
72%	pH (S.U.)	8.20	8.04	8.21	7.62	8.06	7.86
	DO (mg/L)	8.2	7.5	7.9	6.5	8.0	7.4
	Conductivity (µmhos/cm)	212		213		213	
	Temperature (°C)	24.8	24.3	24.5	24.5	24.6	24.6
100%	pH (S.U.)	8.15	8.04	8.18	7.65	7.93	7.85
	DO (mg/L)	8.2	7.6	8.0	6.6	8.6	7.4
	Conductivity (µmhos/cm)	170		172		172	
	Temperature (°C)	24.8	24.2	24.6	24.6	24.6	24.6
INTAKE 100%	pH (S.U.)	8.13	7.99	8.14	7.69	7.99	7.96
	DO (mg/L)	8.2	7.7	8.1	6.7	8.4	7.7
	Conductivity (µmhos/cm)	170		173		173	
	Temperature (°C)	25.1	24.2	24.6	24.6	24.6	24.6
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Client: TVA SEQUOYAH NONTREATED

Date: 05-07-02

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	8.27	7.90	8.27	7.67	8.25	7.86	8.25	7.54
	DO (mg/L)	7.9	7.4	7.8	6.6	8.0	7.2	8.0	6.4
	Conductivity (µmhos/cm)	319		314		~~310~~ 299		308	
	Temperature (°C)	24.6	24.3	24.6	24.9	24.4	24.5	24.3	24.6
10.98%	pH (S.U.)	8.27	7.88	8.24	7.75	8.24	7.84	8.24	7.44
	DO (mg/L)	7.9	7.2	7.8	7.1	8.0	7.2	8.0	6.2
	Conductivity (µmhos/cm)	305		290		287		297	
	Temperature (°C)	24.5	24.3	24.8	24.8	24.4	24.5	24.3	24.6
22%	pH (S.U.)	8.26	7.82	8.21	7.59	8.21	7.82	8.24	7.53
	DO (mg/L)	8.0	7.1	8.1	6.4	8.0	6.9	8.1	6.3
	Conductivity (µmhos/cm)	289		269		273 ~~244~~		282	
	Temperature (°C)	24.6	24.3	24.8	24.9	24.5	24.5	24.2	24.4
43.9%	pH (S.U.)	8.24	7.79	8.16	7.62	8.15	7.93	8.21	7.95
	DO (mg/L)	8.1	7.0	8.1	6.5	8.1	7.0	8.2	8.0
	Conductivity (µmhos/cm)	257		241		244 ~~200~~		250	
	Temperature (°C)	24.6	24.3	24.8	24.9	24.5	24.5	24.2	24.4
72%	pH (S.U.)	8.20	7.80	8.10	7.65	8.08	7.89	8.18	7.64
	DO (mg/L)	8.1	7.0	8.2	6.6	8.2	7.4	8.2	6.9
	Conductivity (µmhos/cm)	216		203		206		211	
	Temperature (°C)	24.6	24.3	25.0	24.9	24.4	24.5	24.2	24.6
100%	pH (S.U.)	8.15	7.72	8.04	7.68	7.98	7.89	8.13	7.74
	DO (mg/L)	8.0	7.0	8.3	6.5	8.3	7.6	8.4	7.4
	Conductivity (µmhos/cm)	175		165		164		169	
	Temperature (°C)	24.7	24.3	25.1	24.9	24.4	24.5	24.3	24.5
INTAKE 100%	pH (S.U.)	8.18	7.67	8.10	7.67	8.05	7.98	8.16	8.22
	DO (mg/L)	8.3	7.0	8.3	6.6	8.4	7.5	8.2	6.8
	Conductivity (µmhos/cm)	173		165		168		172	
	Temperature (°C)	24.6	24.3	24.6	24.9	24.4	24.4	24.4	24.5

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOYAH **Date:** 05-07-02

Full-strength Chemistry: OUTFALL 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.15	7.93	8.04	8.27	8.27	8.25
DO (mg/L)	8.2	8.0	8.3	7.9	7.8	8.0
Conductivity (µmhos/cm)	170	172	165	321	314	308
Alkalinity (mg $CaCO_3$/L)	57	59	59	63	64	65
Hardness (mg $CaCO_3$/L)	76	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1350	1126	1218			
Grab or Composite (duration)	~~25-HOUR~~ 24 HR COMPOSITE	~~25-HOUR~~ 24 HR COMPOSITE	~~25-HOUR~~ 24 HR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.04	020509.02	020511.01			

Species: *Ceriodaphnia dubia*

Client: TVA-SEQUOYAH

Date: 05-07-02

Full-strength Chemistry: INTAKE

Parameter	Sample Number:			Control Batch:		
	1	2	3	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.13	7.99	8.10	8.27	8.27	8.25
DO (mg/L)	8.2	8.4	8.3	7.9	7.8	8.0
Conductivity (µmhos/cm)	170	173	165	321	314	308
Alkalinity (mg $CaCO_3$/L)	~~57~~ 60	~~59~~ 58	~~59~~ 61	63	64	65
Hardness (mg $CaCO_3$/L)	~~76~~ 74	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1409	1141	1233			
Grab or Composite (duration)	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.02	020509.03	020511.02			

Species: *Ceriodaphnia dubia*

Client: TVA - SEQUOYAH **Date:** 05-07-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	8.27	8.26	8.23	8.38	8.24	8.26
	DO (mg/L)	7.9	8.1	7.8	7.9	7.9	8.3
	Conductivity (µmhos/cm)	321		314		319	
	Temperature (°C)	24.3	24.5	24.6	24.9	24.3	24.7
10.98%	pH (S.U.)	8.26	8.20	8.24	8.39	8.23	8.25
	DO (mg/L)	8.1	7.9	7.8	7.9	7.9	8.3
	Conductivity (µmhos/cm)	301		299		299	
	Temperature (°C)	24.6	24.3	24.7	25.0	24.6	24.7
22%	pH (S.U.)	8.26	8.23	8.24	8.38	8.20	8.25
	DO (mg/L)	8.1	7.9	7.8	7.9	8.0	8.2
	Conductivity (µmhos/cm)	287		285		285	
	Temperature (°C)	24.8	24.3	24.7	25.1	24.6	24.7
43.9%	pH (S.U.)	8.23	8.22	8.22	8.34	8.13	8.25
	DO (mg/L)	8.2	7.9	7.9	8.0	8.0	8.2
	Conductivity (µmhos/cm)	254		253		252	
	Temperature (°C)	24.8	24.5	24.6	25.1	24.7	24.7
72%	pH (S.U.)	8.20	8.22	8.21	8.40	8.06	8.25
	DO (mg/L)	8.2	7.9	7.9	8.0	8.0	8.3
	Conductivity (µmhos/cm)	212		213		213	
	Temperature (°C)	25.1	24.5	24.6	25.0	24.7	24.7
100%	pH (S.U.)	8.15	8.22	8.18	8.47	7.93	8.27
	DO (mg/L)	8.2	8.0	8.0	8.1	8.0	8.3
	Conductivity (µmhos/cm)	170		172		172	
	Temperature (°C)	25.1	24.5	24.7	24.8	24.7	24.7
INTAKE 100%	pH (S.U.)	8.13	8.15	8.14	8.35	7.99	8.26
	DO (mg/L)	8.2	8.1	8.1	8.1	8.4	8.3
	Conductivity (µmhos/cm)	170		173		173	
	Temperature (°C)	24.7	24.5	24.6	24.8	24.3	24.7

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH **Date:** 05-07-02

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	8.27	8.26	8.27	8.18	8.25	8.28	8.25	~~8.32~~ 8.3
	DO (mg/L)	7.9	8.1	7.8	7.9	8.0	8.0	8.0	8.4
	Conductivity (µmhos/cm)	319		314		298		308	
	Temperature (°C)	24.7	24.5	24.4	24.8	24.5	24.7	24.2	24.4
10.98%	pH (S.U.)	8.27	8.24	8.24	8.19	8.24	8.30	8.24	8.30
	DO (mg/L)	7.9	8.0	7.8	7.9	8.0	8.0	8.0	8.2
	Conductivity (µmhos/cm)	305		290		287		297	
	Temperature (°C)	24.7	24.4	25.0	25.1	24.6	24.6	24.3	24.4
22%	pH (S.U.)	8.26	8.24	8.21	8.18	8.21	8.31	8.24	8.29
	DO (mg/L)	8.0	8.0	8.1	7.9	8.0	8.1	8.1	8.3
	Conductivity (µmhos/cm)	289		269		273		282	
	Temperature (°C)	24.8	24.4	25.1	25.1	24.6	24.6	24.3	24.4
43.9%	pH (S.U.)	8.24	8.20	8.16	8.18	8.15	8.37	8.21	8.26
	DO (mg/L)	8.1	8.0	8.1	7.9	8.1	8.3	8.2	8.4
	Conductivity (µmhos/cm)	257		241		244		250	
	Temperature (°C)	24.7	24.4	25.1	25.0	24.6	24.6	24.4	24.4
72%	pH (S.U.)	8.20	8.26	8.10	8.19	8.08	8.42	8.18	8.35
	DO (mg/L)	8.1	8.0	8.2	8.0	8.2	8.3	8.2	8.3
	Conductivity (µmhos/cm)	216		203		206		211	
	Temperature (°C)	24.7	24.4	25.3	25.0	24.6	24.6	24.4	24.4
100%	pH (S.U.)	8.15	8.24	8.04	8.18	7.98	8.50	8.13	8.42
	DO (mg/L)	8.0	8.1	8.3	8.0	8.3	8.4	8.4	8.4
	Conductivity (µmhos/cm)	175		165		166		~~214~~ 169	
	Temperature (°C)	24.9	24.4	25.4	25.1	24.6	24.6	24.3	24.4
INTAKE 100%	pH (S.U.)	8.18	8.19	8.10	8.15	8.05	8.27	8.16	8.54
	DO (mg/L)	8.3	8.2	8.3	8.1	8.4	7.8	8.2	8.6
	Conductivity (µmhos/cm)	173		165		168		172	
	Temperature (°C)	24.6	24.4	24.8	25.1	24.6	24.6	24.5	24.4

Environmental Testing Solutions, LLC

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

Summary of Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated

Test dates: May 07-14, 2002

Project number: 324

Reviewed by: [signature]

Pimephales promelas

Concentration	Parameter	Initial Minimum	Initial Maximum	Initial Mean	Initial S	Final Minimum	Final Maximum	Final Mean	Final S
Control	pH (SU)	8.18	8.27	8.23	0.03	7.49	8.12	7.87	0.21
	DO (mg/L)	7.9	8.2	8.0	0.1	6.5	7.8	7.2	0.5
	Conductivity (µmhos/cm)	296	315	307	7				
	Alkalinity (mg/L $CaCO_3$)	63	65	64	1				
	Hardness (mg/L $CaCO_3$)	82	89	87	4				
	Initial Temperature (°C)					24.3	24.7	24.5	0.2
	Final Temperature (°C)					24.3	24.8	24.5	0.2
10.98%	pH (SU)	8.17	8.28	8.22	0.03	7.48	8.12	7.87	0.21
	DO (mg/L)	7.9	8.2	8.0	0.1	6.1	7.8	7.1	0.6
	Conductivity (µmhos/cm)	287	300	292	5				
	Initial Temperature (°C)					24.3	24.8	24.6	0.2
	Final Temperature (°C)					24.2	24.8	24.5	0.2
22%	pH (SU)	8.16	8.25	8.20	0.03	7.45	8.10	7.89	0.23
	DO (mg/L)	7.7	8.1	7.9	0.1	6.5	7.8	7.2	0.5
	Conductivity (µmhos/cm)	270	283	277	4				
	Initial Temperature (°C)					24.3	25.0	24.6	0.2
	Final Temperature (°C)					24.2	24.8	24.5	0.2
43.9%	pH (SU)	8.12	8.24	8.18	0.04	7.43	8.10	7.83	0.22
	DO (mg/L)	7.7	8.2	7.9	0.2	6.4	7.7	7.2	0.5
	Conductivity (µmhos/cm)	240	253	247	5				
	Initial Temperature (°C)					24.3	25.1	24.6	0.3
	Final Temperature (°C)					24.2	24.8	24.5	0.2
72	pH (SU)	8.08	8.20	8.14	0.04	7.42	8.08	7.83	0.21
	DO (mg/L)	7.8	8.1	8.0	0.1	6.0	7.7	7.0	0.6
	Conductivity (µmhos/cm)	204	214	209	3				
	Initial Temperature (°C)					24.3	25.2	24.6	0.3
	Final Temperature (°C)					24.2	24.8	24.5	0.2
100%	pH (SU)	7.99	8.17	8.10	0.06	7.44	8.08	7.82	0.21
	DO (mg/L)	7.9	8.1	8.0	0.1	6.4	7.7	7.2	0.5
	Conductivity (µmhos/cm)	164	173	168	3				
	Alkalinity (mg/L $CaCO_3$)	57	59	58	1				
	Hardness (mg/L $CaCO_3$)	72	76	75	2				
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0				
	Initial Temperature (°C)					24.2	25.3	24.7	0.4
	Final Temperature (°C)					24.3	24.8	24.5	0.2
100% Intake	pH (SU)	8.02	8.14	8.10	0.05	7.47	8.10	7.84	0.20
	DO (mg/L)	7.9	8.1	8.0	0.1	6.2	7.7	7.1	0.5
	Conductivity (µmhos/cm)	165	172	168	2				
	Alkalinity (mg/L $CaCO_3$)	58	61	60	1				
	Hardness (mg/L $CaCO_3$)	72	76	74	2				
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0				
	Initial Temperature (°C)					24.3	25.0	24.6	0.3
	Final Temperature (°C)					24.2	24.8	24.5	0.2

Overall Temperature (°C) (including all concentrations for initial and final temperatures) 24.2 25.3 24.5 0.2

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)

Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated

Test dates: May 07-14, 2002

Project number: 324

Reviewed by: [illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.27	8.12	8.22	7.72	8.24	8.00	8.25	7.90	8.22	7.85	8.18	8.00	8.23	7.49
	DO (mg/L)	7.9	7.6	8.1	6.8	8.2	7.8	8.1	7.1	7.9	6.9	7.9	7.5	7.9	6.5
	Conductivity (µmhos/cm)	315		304		313		308		296		310		303	
	Alkalinity (mg/L $CaCO_3$)	63								64				65	
	Hardness (mg/L $CaCO_3$)	89								89				82	
	Temperature (°C)	24.5	24.3	24.6	24.5	24.4	24.6	24.7	24.3	24.6	24.8	24.3	24.5	24.3	24.5
10.98%	pH (SU)	8.28	8.12	8.22	7.80	8.23	8.02	8.24	7.94	8.21	7.78	8.17	7.96	8.21	7.48
	DO (mg/L)	7.9	7.7	8.1	7.0	8.2	7.8	8.2	7.0	7.9	6.8	7.9	7.4	7.9	6.1
	Conductivity (µmhos/cm)	300		292		299		289		287		288		289	
	Temperature (°C)	24.6	24.3	24.6	24.5	24.5	24.6	24.7	24.2	24.8	24.8	24.4	24.5	24.3	24.5
22%	pH (SU)	8.25	8.10	8.21	7.76	8.20	7.98	8.23	7.95	8.18	8.10	8.16	7.92	8.20	7.45
	DO (mg/L)	7.9	7.7	8.0	7.0	8.0	7.8	8.1	7.3	7.9	6.8	7.7	7.4	7.8	6.5
	Conductivity (µmhos/cm)	283		279		280		277		270		274		274	
	Temperature (°C)	24.7	24.3	24.5	24.5	24.7	24.6	24.7	24.2	25.0	24.8	24.4	24.5	24.3	24.5
43.9%	pH (SU)	8.24	8.10	8.20	7.70	8.16	7.94	8.20	7.93	8.15	7.77	8.12	7.96	8.17	7.43
	DO (mg/L)	7.9	7.7	8.0	6.9	8.1	7.6	8.2	7.4	7.9	6.9	7.7	7.3	7.8	6.4
	Conductivity (µmhos/cm)	251		248		253		249		240		244		244	
	Temperature (°C)	24.7	24.3	24.5	24.3	24.6	24.6	24.6	24.2	25.1	24.8	24.4	24.5	24.3	24.5
72%	pH (SU)	8.20	8.08	8.18	7.79	8.12	7.94	8.17	7.80	8.12	7.84	8.08	7.96	8.14	7.42
	DO (mg/L)	8.0	7.7	8.0	6.9	8.1	7.5	8.1	7.0	7.9	6.8	7.9	7.3	7.8	6.0
	Conductivity (µmhos/cm)	211		209		214		210		204		207		206	
	Temperature (°C)	24.7	24.3	24.5	24.4	24.7	24.6	24.6	24.2	25.2	24.8	24.4	24.5	24.3	24.5
100%	pH (SU)	8.17	8.08	8.15	7.71	8.06	7.93	8.14	7.90	8.09	7.76	7.99	7.95	8.10	7.44
	DO (mg/L)	7.9	7.7	8.0	7.0	8.0	7.6	8.1	7.4	8.0	6.9	7.9	7.4	7.9	6.4
	Conductivity (µmhos/cm)	169		169		173		170		164		164		165	
	Alkalinity (mg/L $CaCO_3$)	57				59				59					
	Hardness (mg/L $CaCO_3$)	76				72				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.8	24.3	24.5	24.3	24.8	24.6	24.6	24.3	25.3	24.8	24.4	24.5	24.2	24.5
100% Intake	pH (SU)	8.14	8.10	8.13	7.74	8.07	7.94	8.14	7.87	8.08	7.76	8.02	7.97	8.12	7.47
	DO (mg/L)	7.9	7.7	8.0	7.2	8.0	7.6	8.1	7.1	8.0	6.8	8.0	7.4	7.9	6.2
	Conductivity (µmhos/cm)	167		169		172		168		165		168		167	
	Alkalinity (mg/L $CaCO_3$)	60 ~~57~~				58 ~~59~~				61 ~~59~~					
	Hardness (mg/L $CaCO_3$)	74 ~~76~~				72				76					
	Total Residual Chlorine (mg/L)	<0.10 ~~<0.10~~				<0.10				<0.10					
	Temperature (°C)	24.9	24.3	24.5	24.3	24.7	24.6	24.7	24.2	25.0	24.8	24.4	24.5	24.3	24.5

Species: ***Pimephales promelas***

Client: TVA- SEQUOYAH UN-TREATED

Date: 05-07-02

Full-strength Chemistry: OUTFALL 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.17	8.06	8.09	8.27	8.22	8.23
DO (mg/L)	7.9	8.0	8.0	7.9	7.9	7.9
Conductivity (µmhos/cm)	169	173	164	315	296	303
Alkalinity (mg $CaCO_3$/L)	57	59	59	63	64	65
Hardness (mg $CaCO_3$/L)	76	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1350	1126	1218			
Grab or Composite (duration)	~~23~~-HOUR 24 COMPOSITE	~~23~~-HOUR 24 COMPOSITE	~~23~~-HOUR 24 COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.01	020509.02	020511.01			

Species: *Pimephales promelas*

Client: TVA-SEQUOYAH UV-TREATED

Date: 05-07-02

Full-strength Chemistry: INTAKE

Parameter	Sample Number: 1	2	3	Control Batch: 05-06-02	05-09-02	05-11-02
pH (S.U.)	8.14	8.07	8.08	8.27	8.22	8.23
DO (mg/L)	7.9	8.0	8.0	7.9	7.9	7.9
Conductivity (µmhos/cm)	167	172	168	315	296	303
Alkalinity (mg $CaCO_3$/L)	60 ~~57~~	~~59~~ 58	~~59~~ 61	63	64	65
Hardness (mg $CaCO_3$/L)	74 ~~76~~	72	76	89	89	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	05-05-02	05-07-02	05-09-02			
Collection end time	1409	1141	1218			
Grab or Composite (duration)	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.3°C	1.8°C			
Physical characteristics	PALE TAN CLEAR	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	05-07-02 05-08-02	05-09-02 05-10-02	05-11-02 05-12-02 05-13-02			
ETS Project and Sample numbers	324 020507.02	020509.03	020511.01			

Species: *Pimephales promelas*

Client: TVA- SEQUOYAH UV-TREATED

Date: 05-07-02

Daily Chemistry:

Concentration	Parameter	Day 0 Initial	Day 0 Final	Day 1 Initial	Day 1 Final	Day 2 Initial	Day 2 Final
CONTROL	pH (S.U.)	8.27	8.12	8.22	7.72	8.24	8.00
	DO (mg/L)	7.9	7.6	8.1	6.8	8.2	7.8
	Conductivity (µmhos/cm)	315		304		313	
	Temperature (°C)	24.5	24.3	24.6	24.5	24.4	24.6
10.98%	pH (S.U.)	8.28	8.12	8.22	7.80	8.23	8.02
	DO (mg/L)	7.9	7.7	8.1	7.0	8.2	7.8
	Conductivity (µmhos/cm)	300		292		299	
	Temperature (°C)	24.6	24.3	24.6	24.5	24.5	24.6
22%	pH (S.U.)	8.25	8.10	8.21	7.76	8.20	7.98
	DO (mg/L)	7.9	7.7	8.0	7.0	8.0	7.8
	Conductivity (µmhos/cm)	283		279		280	
	Temperature (°C)	24.7	24.3	24.5	24.5	24.7	24.6
43.9%	pH (S.U.)	8.24	8.10	8.20	7.70	8.16	7.94
	DO (mg/L)	7.9	7.7	8.0	6.9	8.1	7.6
	Conductivity (µmhos/cm)	251		248		253	
	Temperature (°C)	24.7	24.3	24.5	24.3	24.6	24.6
72%	pH (S.U.)	8.10	8.08	8.18	7.77	8.12	7.94
	DO (mg/L)	8.0	7.7	8.0	6.9	8.1	7.5
	Conductivity (µmhos/cm)	211		209		214	
	Temperature (°C)	24.7	24.3	24.5	24.4	24.7	24.6
100%	pH (S.U.)	8.17	8.08	8.15	7.71	8.06	7.93
	DO (mg/L)	7.9	7.7	8.0	7.0	8.0	7.6
	Conductivity (µmhos/cm)	169		169		173	
	Temperature (°C)	24.8	24.3	24.5	24.3	24.8	24.6
INTAKE 100%	pH (S.U.)	8.14	8.10	8.13	7.74	8.07	7.94
	DO (mg/L)	7.9	7.7	8.0	7.2	8.0	7.6
	Conductivity (µmhos/cm)	167		169		172	
	Temperature (°C)	24.9	24.3	24.5	24.3	24.7	24.6

Species: *Pimephales promelas*

Client: TVA-SEQUOYAH UV-TREATED **Date:** 05-07-02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.25	7.90	8.22	7.85	8.18	8.00	8.23	7.49
	DO (mg/L)	8.1	7.1	7.9	6.9	7.9	7.5	7.9	6.5
	Conductivity (µmhos/cm)	308		296		310		303	
	Temperature (°C)	24.7	24.3	24.6	24.8	24.3	24.5	24.3	24.5
10.98%	pH (S.U.)	8.24	7.94	8.21	7.78	8.17	7.96	8.21	7.48
	DO (mg/L)	8.2	7.0	7.9	6.8	7.9	7.4	7.9	6.1
	Conductivity (µmhos/cm)	289		287		288		289	
	Temperature (°C)	24.7	24.2	24.8	24.8	24.4	24.5	24.3	24.5
22%	pH (S.U.)	8.23	7.95	8.18	8.10	8.16	7.92	8.20	7.45
	DO (mg/L)	8.1	7.3	7.9	6.8	7.7	7.4	7.8	6.5
	Conductivity (µmhos/cm)	277		270		274		274	
	Temperature (°C)	24.7	24.2	25.0	24.8	24.4	24.5	24.3	24.5
43.9%	pH (S.U.)	8.20	7.93	8.15	7.77	8.12	7.96	8.17	7.43
	DO (mg/L)	8.2	7.4	7.9	6.9	7.7	7.3	7.8	6.4
	Conductivity (µmhos/cm)	249		240		244		244	
	Temperature (°C)	24.6	24.2	25.1	24.8	24.4	24.5	24.3	24.5
72%	pH (S.U.)	8.17	7.80	8.12	7.84	8.08	7.96	8.14	~~7.3~~ 7.42
	DO (mg/L)	8.1	7.0	7.9	6.8	7.9	7.3	7.8	6.0
	Conductivity (µmhos/cm)	210		204		207		206	
	Temperature (°C)	24.6	24.2	25.2	24.8	24.4	24.5	24.3	24.5
100%	pH (S.U.)	8.14	7.90	8.09	7.76	7.99	7.95	8.10	7.44
	DO (mg/L)	8.1	7.4	8.0	6.9	7.9	7.4	7.9	6.4
	Conductivity (µmhos/cm)	170		164		164		165	
	Temperature (°C)	24.6	24.3	25.3	24.8	24.4	24.5	24.2	24.5
INTAKE 100%	pH (S.U.)	8.14	7.87	8.08	7.76	8.02	7.97	8.12	7.47
	DO (mg/L)	8.1	7.1	8.0	6.8	8.0	7.4	7.9	6.2
	Conductivity (µmhos/cm)	168		165		168		167	
	Temperature (°C)	24.7	24.2	25.0	24.8	24.4	24.5	24.3	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KEN
Date analyzed	05-07-02

Iodide reagent:	INR024
Acid reagent:	INR046
Slope:	27.8

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS091	INSS091

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS091	0.50	0.545	109.0%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020507.01	SQN-101	PALE TAN CLEAR	S <0.00440	
↓	Duplicate		D <0.00405	0%

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00709
020507-02	SQN-INT	PALE TAN CLEAR	<0.00210

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS091	0.50	0.512	102.4%

Reviewed by	
Date reviewed	05-20-02

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KEK
Date analyzed	05-09-02

Iodide reagent:	INR024
Acid reagent:	INR046
Slope:	27.5

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5091	INS5091

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5091	0.50	0.457	91.47%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020509.01	ALCOA EP	no color, clear	S <0.00852	
↓	Duplicate		D <0.00817	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00843
020509.02	SQN-101	pale tan, clear	<0.00557
020509.03	SQN-INT	pale tan, clear	<0.00222

KEK

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5091	0.50	0.456	91.7%

Reviewed by	[illegible]
Date reviewed	05-20-02

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model 25 pH/Ion Meter

Analyst	KHK
Date analyzed	05-11-02

Iodide reagent:	INR024
Acid reagent:	INR046
Slope:	28.01

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5091	INS5091

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5091	0.50	0.492	98.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020511.01	SQN-101	PALE TAN, CLEAR	S < 0.00728	
↓	Duplicate		D <0.00624	0%

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00527
020511.02	SQN-INT	PALE TAN, CLEAR	<0.00452

KHK

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5091	0.50	0.479	95.8%

Reviewed by	[illegible]
Date reviewed	05-20-02

Environmental Testing Solutions, LLC

Alkalinity
(EPA Method 310.1)

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

Analyst	KDL
Date analyzed	05-20-02

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
5.58	INR038	INSS078	0.2	13.0	12.8	0.0195	9.8

B/K Correction 0.0 - 0.1 = 0.1 ml

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS099	100	100	13.0	23.0	10.0	9.8	98	98%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-06-02A	MHS H2O	100	23.0	29.4	6.4	9.8	S 63	
05-06-02A	Duplicate	100	29.4	36.0	6.6	↓	D 65	3.1%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS099	50	100	29.4	41.0	11.6	9.8	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
65	45	90%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
04-29-02	MHS H2O	100	41.0	48.0	7.0	9.8	69
05-06-02 B			1.0	7.4	6.4		63
↓ C			7.4	13.8	6.4		63
05-09-02 A			14.0	20.5	6.5		64
↓ B			20.5	26.8	6.3		62
05-10-02			26.8	33.2	6.4		63
05-11-02 A			33.2	39.8	6.6		65
↓ B			39.8	46.5 33.2	6.7		66
↓ C			2.5	9.0	6.5		64

Reviewed by: [signature] Date reviewed: 05-20-02

Alkalinity
(EPA Method 310.1)

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

Analyst	KEL
Date analyzed	05.20.02

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

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

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5099	100	100	9.1	19.1	10.0	9.8	98	98%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-14-02	MHS	100	19.1	25.5	6.4	9.8	S 63	
05-14-02	Duplicate	100	25.5	32.0	6.5	9.8	D 64	1.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5099	50	100	25.5	36.9	11.4	9.8	110

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
64	46	92%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
05-06-02	SSW H2O	~~B~~ 100	36.9	40.1	3.2	9.8	31
05-14-02	↓		0.0	3.6	3.6		35
020507.01	SQN 101 1		3.6	9.4	5.8		57
020509.02	2		9.5	15.5	6.0		59
020511.01	3		15.5	21.5	6.0		59
020507.02	SQN INTAKE 1		21.5	27.6	6.1		60
020509.03	2		27.6	33.5	5.9		58
020511.02	3		~~27~~ 33.6	39.8	6.2		61
	ALCOA EP		39.8	42.8	3.0		29

Reviewed by: [illegible] Date reviewed: 05-20-02

Environmental Testing Solutions, LLC

Total Hardness
(EPA Method 130.2)

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

Analyst	KEN
Date analyzed	05-20-02

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INR050	INSS092	0.1	9.8	9.7	0.0206	20.6

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS008	40	50	9.8	11.7	1.9	20.6	39	97.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
04-29-02	MHS H_2O	50	11.7	16.0	4.3	20.6	S 89	
04-29-02	Duplicate	50	16.0	20.2	4.2	↓	D 86	3.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS008	40	50	16.0	22.2	6.2	20.6	130

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
86	44	110%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV=ND	Blank (should be = 0 mg $CaCO_3$/L)	50	0.1	0.1	0.0	20.6	ND
05.06.02 A	MHS		22.2	26.5	4.3		89
B			26.5	30.8	4.3		89
C			30.8	35.2	4.4		91
05.09.02 A			35.2	39.5	4.3		89
B			39.5	43.8	4.3		89
05-10-02			43.8	47.9	4.1		84
05-11-02 A			0.5	4.5	4.0		82
B			4.5	8.8	4.3		89
C			8.8	13.1	4.3		89

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

Reviewed by: [signature]

Date reviewed 05-20-02

Environmental Testing Solutions, LLC

Total Hardness
(EPA Method 130.2)

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

Analyst	KEN
Date analyzed	05-20-02

Titrant normality and multiplier determination:

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

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5008	40	50	13.1	15.1	2.0	20.6	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-14-02	MHS H2O	50	15.1	19.1	4.0	20.6	S 82	
05-14-02	Duplicate	50	19.1	23.2	4.1	↓	D 84	2.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INS5008	~~5~~ 40	50	19.1	25.2	6.1	20.6	130

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
84	46	115%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						KEN
05-06-02	SSW H2O	50	25.2	27.5	2.3	20.6	47
05-14-02	↓		27.5	29.8	2.3		47
020507.01	SQN 101 1		29.8	33.5	3.7		76
020509.02	2		33.5	37.0	3.5		72
020511.01	3		37.0	40.7	3.7		76
020507.02	SQN INTAKE 1		40.7	44.3	3.6		74
020509.03	2		44.3	47.8	3.5		72
020511.02	3		6.3	10.0	3.7		76
	AICDA EP		10.0	11.7	1.7		34

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

Reviewed by: [signature]

Date reviewed 05-20-02

Sequoyah Nuclear Plant Biomonitoring
May 7-14, 2002

Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, LLC

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

Test number	Test date	7-day IC25 (g KCl/L)	CT (g/L KCl)	S	$S_{A.75}$	$S_{A.90}$	CV
1	06-13-00	0.70					
2	09-19-00	0.66	0.68	0.03	0.26	0.31	0.05
3	10-24-00	0.77	0.71	0.06	0.27	0.32	0.08
4	11-07-00	0.65	0.69	0.05	0.26	0.31	0.08
5	03-13-01	0.69	0.69	0.05	0.26	0.31	0.07
6	06-26-01	0.53	0.67	0.08	0.25	0.30	0.12
7	07-17-01	0.74	0.68	0.08	0.26	0.30	0.11
8	08-21-01	0.62	0.67	0.07	0.25	0.30	0.11
9	09-25-01	0.60	0.66	0.07	0.25	0.30	0.11
10	11-01-01	0.71	0.67	0.07	0.25	0.30	0.11
11	11-06-01	0.66	0.67	0.07	0.25	0.30	0.10
12	11-27-01	0.57	0.66	0.07	0.25	0.30	0.10
13	12-12-01	0.63	0.66	0.07	0.25	0.30	0.10
14	01-04-02	0.49	0.64	0.08	0.24	0.29	0.12
15	02-05-02	0.61	0.64	0.08	0.24	0.29	0.12
16	02-13-02	0.65	0.64	0.07	0.24	0.29	0.11
17	02-26-02	0.56	0.64	0.07	0.24	0.29	0.12
18	03-28-02	0.70	0.64	0.07	0.24	0.29	0.11
19	04-23-02	0.61	0.64	0.07	0.24	0.29	0.11
20	05-07-02	0.54	0.64	0.07	0.24	0.29	0.11

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

CT = Central tendency (mean IC25).

S = Standard deviation of the IC25 values.

$S_{A.75}$ = Standard deviation corresponding to the the 75th percentile CV.
$S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint.

$S_{A.90}$ = Standard deviation corresponding to the the 90th percentile CV.
$S_{A.90}$ = 0.45, as determined by the USEPA for the method and endpoint.

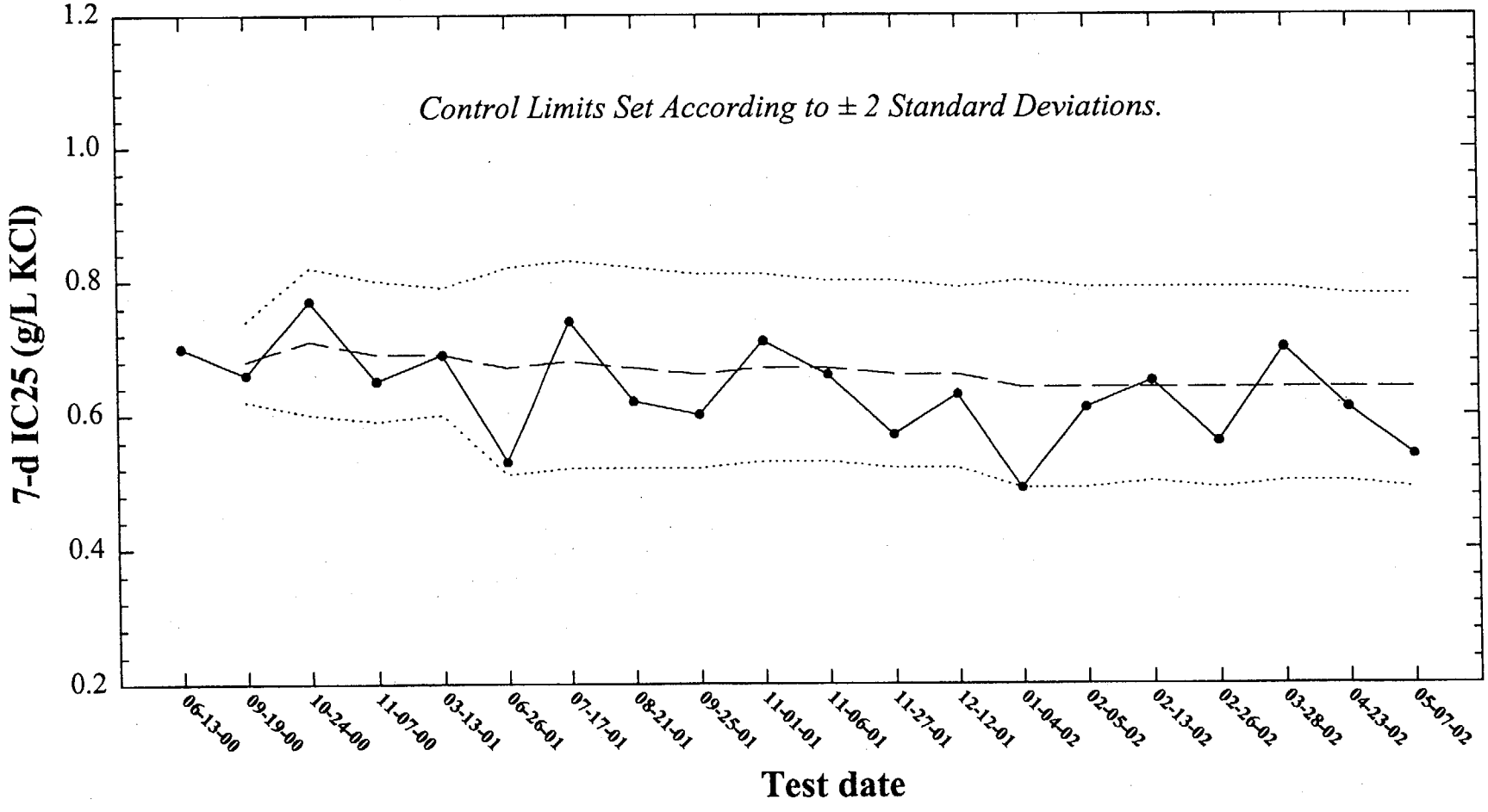
CV = Coefficient of variation of the IC25 values.

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

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, LLC

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



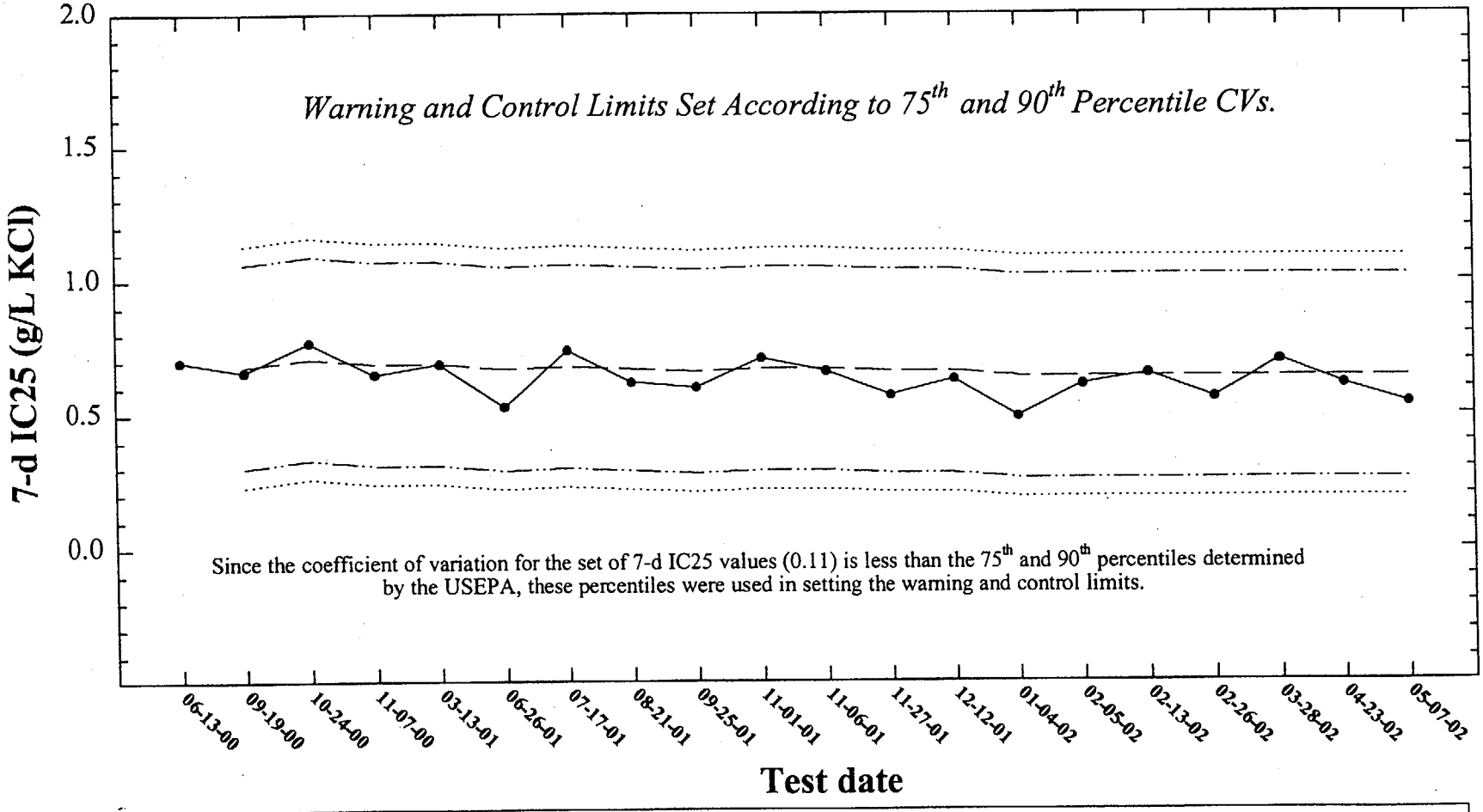
—●— **7-day IC25** = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

— — **Central Tendency** (mean IC25)

····· **Control Limits** (mean IC25 ± 2 Standard Deviations)

Environmental Testing Solutions, LLC

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



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

— – **Central Tendency** (mean IC25)

—·— **Warning Limits** (mean IC25 ± $S_{A.75}$, $S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint)

····· **Control Limits** (mean IC25 ± $S_{A.90}$, $S_{A.90}$ = 0.45, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	06-13-00	100	0.58	13.2		0.12	20.0	
2	09-19-00	100	0.67	5.3	9.2	0.07	11.2	15.6
3	10-24-00	97.5	0.83	13.3	10.6	0.22	26.9	19.4
4	11-07-00	97.5	0.67	10.5	10.6	0.13	19.3	19.3
5	03-13-01	92.5	0.34	6.5	9.8	0.08	22.8	20.0
6	06-26-01	100	0.63	9.8	9.8	0.19	30.6	21.8
7	07-17-01	100	0.52	9.1	9.7	0.07	13.8	20.7
8	08-21-01	100	0.89	8.3	9.5	0.13	15.1	20.0
9	09-25-01	100	0.85	4.9	9.0	0.09	10.4	18.9
10	11-01-01	100	0.54	2.5	8.3	0.10	18.6	18.9
11	11-06-01	100	1.00	7.4	8.3	0.17	16.9	18.7
12	11-27-01	97.5	0.70	22.8	9.5	0.18	26.1	19.3
13	12-12-01	95	0.82	16.6	10.0	0.19	23.5	19.6
14	01-04-02	95	0.80	10.1	10.0	0.18	22.0	19.8
15	02-05-02	97.5	0.95	6.9	9.8	0.21	22.2	20.0
16	02-13-02	100	0.65	8.0	9.7	0.10	15.5	19.7
17	02-26-02	100	0.64	3.3	9.3	0.11	16.5	19.5
18	03-28-02	100	0.63	11.2	9.4	0.13	21.4	19.6
19	04-23-02	100	0.71	12.8	9.6	0.19	26.2	20.0
20	05-07-02	97.5	0.46	12.3	9.7	0.07	15.4	19.7

Note:

CV = Coefficient of variation for control survival.
On average, the CV for control growth is **9.7%** in Environmental Testing Solutions, LLC *Pimephales* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by **19.7%** from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

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

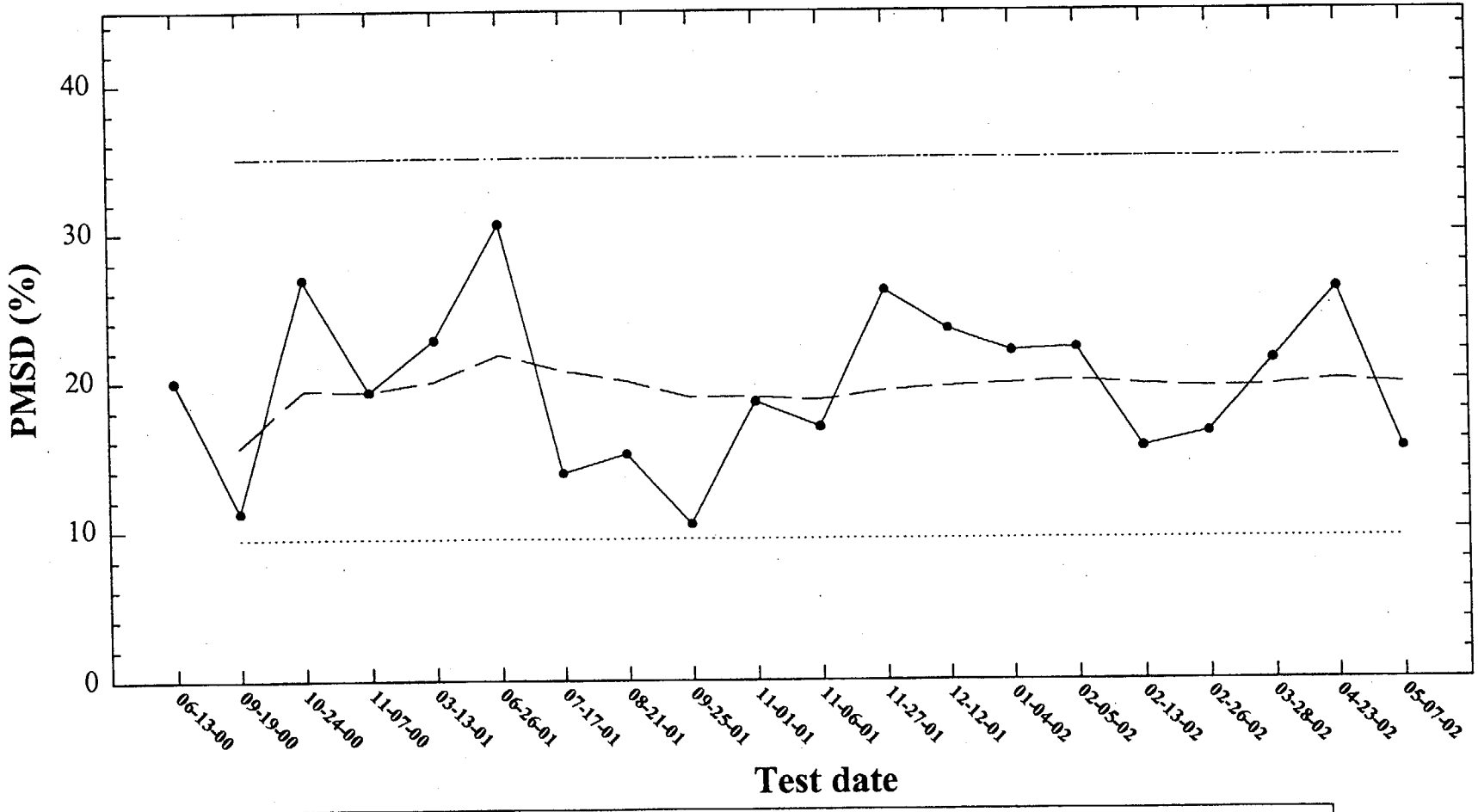
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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



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

— - **Central Tendency** (mean PMSD)

····· **Lower and Upper PMSD Bounds**
Lower PMSD Bound (10th percentile) = 9.4%, Upper PMSD Bound (90th percentile) = 35%
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

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

PpKClCR Test Number: 18
NONTREATED

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM067					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	

Test organism information:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	05-06-02 1030 TO 1400 MST	Incubator number:	2
Organism source:	ABS BATCH 05-06-02	*Artemia* lot number:	060207P
Transfer bowl information:	pH = 7.98 Temperature = 24.0°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	05-07-02	——	1600	1538	JJ
1	05-08-02	1014	1611	1530	JJ
2	05-09-02	1000	1602	1521	JJ
3	05-10-02	0953	1606	1520	JJ
4	05-11-02	1140	1801	1542	JJ/KEK
5	05-12-02	0948	1557	1550	JJ/KEK
6	05-13-02	1003	1618	1600	JJ
7	05-14-02	——	——	1502	JJ

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC50	852.2
Average weight per larvae:	0.4580	≥ 0.25 mg/larvae	NOEC	450
			LOEC	600
			ChV	519.6
			IC25	544.6

PpKClCR Test Number: 19
NONTREATED

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	9 ed	10	10	10	10	9 ed	10	10	10	10	10
4	10	9	10	10	10	10	9	10	10	10	10	10
5	10	9	10	10	10	10	9	10	10	10	10	10 ~~9 ed~~
6	10	9	10	10	10	10	9	10	10	10	10	10
7	10	9	10	10	10	10	9	10	10	10	10	10
A = Pan weight (mg) RED	14.720	14.650	14.464	14.908	15.082	14.862	14.459	14.775	14.874	15.123	14.503	14.693
B = Pan + Larvae weight (mg)	19.16	18.53	19.65	19.81	19.29	19.39	18.77	19.71	18.37	19.30	18.29	18.98
Larvae weight (mg) = A – B	4.440	3.872	5.186	4.822	4.208	4.538	4.311	4.935	3.496	4.177	3.787	4.287

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, LLC

PpKClCR Test Number: 18

NONTREATED

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	8 2d	10	10	10	9 1d	10	10	9 1d	4 6d	4 6d	7 3d	8 2d
2	8	10	10	9 1d	8 1d	10	10	9	4	3 1d	7	7 1d
3	8	10	10	9	8	10	10	8 1d	4	3	6 1d	6 1d
4	8	9 1d	10	9	8	9 1d	10	8	4	3	6	6
5	8	9	10	8 1d	8	9	9 1d	8	3 1d	3	6	5 1d
6	8	8 1d	10	8	8	9	8 1d	8	3	3	4 2d	3 2d
7	8	7 1d	10	8	8	9	8	8	2 1d	3	4	1 2d
A = Pan weight (mg)	15.135	14.960	14.955	15.087	14.531	15.046	15.297	15.264	14.970	14.980	14.784	14.620
B = Pan + Larvae weight (mg)	18.56	17.70	17.88	18.56	17.11	18.32	17.97	18.90	15.60	15.81	15.91	15.01
Larvae weight (mg) = A – B	3.425	2.740	2.925	3.473	2.579	3.274	2.673	3.636	0.630	0.822	1.126	0.390

Calculations and data reviewed: JA

Comments:

Environmental Testing Solutions, LLC

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

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

Test number: PpKClCR # 18

Test dates: May 7-14, 2002

Reveiwed by: [signature]

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.720	19.160	4.440	0.4440	97.5	0.4580	12.3	Not applicable
	B	10	9	14.658	18.530	3.872	0.3872				
	C	10	10	14.464	19.650	5.186	0.5186				
	D	10	10	14.988	19.810	4.822	0.4822				
300	E	10	10	15.082	19.290	4.208	0.4208	97.5	0.4498	7.2	1.8
	F	10	10	14.852	19.390	4.538	0.4538				
	G	10	9	14.459	18.770	4.311	0.4311				
	H	10	10	14.775	19.710	4.935	0.4935				
450	I	10	10	14.874	18.370	3.496	0.3496	100.0	0.3937	9.2	14.0
	J	10	10	15.123	19.300	4.177	0.4177				
	K	10	10	14.503	18.290	3.787	0.3787				
	L	10	10	14.693	18.980	4.287	0.4287				
600	M	10	8	15.135	18.560	3.425	0.3425	82.5	0.3141	11.6	31.4
	N	10	7	14.960	17.700	2.740	0.2740				
	O	10	10	14.955	17.880	2.925	0.2925				
	P	10	8	15.087	18.560	3.473	0.3473				
750	Q	10	8	14.531	17.110	2.579	0.2579	82.5	0.3041	16.5	33.6
	R	10	9	15.046	18.320	3.274	0.3274				
	S	10	8	15.297	17.970	2.673	0.2673				
	T	10	8	15.264	18.900	3.636	0.3636				
900	U	10	2	14.970	15.600	0.630	0.0630	25.0	0.0742	41.9	83.8
	V	10	3	14.988	15.810	0.822	0.0822				
	W	10	4	14.784	15.910	1.126	0.1126				
	X	10	1	14.620	15.010	0.390	0.0390				

Dunnett's MSD value: 0.0707

PMSD: 15.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.7% from the control (determined

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

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

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

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

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/7/02	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

Conc-mg/L	1	2	3	4
D-Control	1.0000	0.9000	1.0000	1.0000
300	1.0000	1.0000	0.9000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.8000	0.7000	1.0000	0.8000
750	0.8000	0.9000	0.8000	0.8000
900	0.2000	0.3000	0.4000	0.1000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
300	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	1	40
450	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
600	0.8250	0.8462	1.1544	0.9912	1.4120	15.615	4	12.50	10.00	7	40
750	0.8250	0.8462	1.1426	1.1071	1.2490	6.209	4	10.50	10.00	7	40
*900	0.2500	0.2564	0.5124	0.3218	0.6847	30.428	4	10.00	10.00	30	40

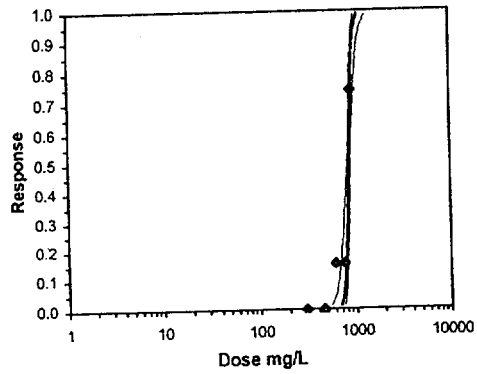
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.948615253	0.884	0.427279336	1.241498999
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	750	900	821.5838363	

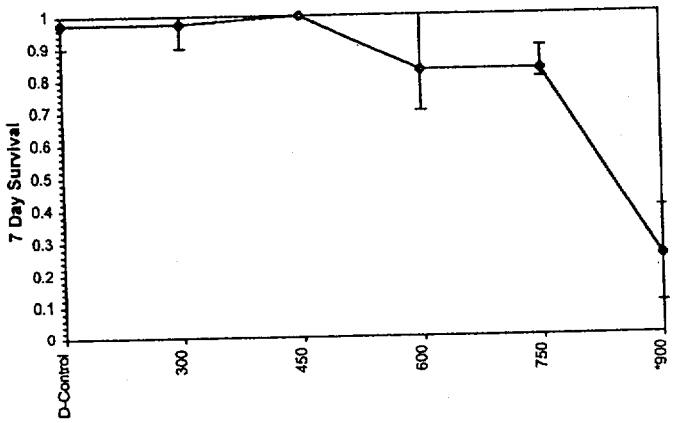
Maximum Likelihood-Probit							
Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
0.025	2.535851211	7.814724922	0.47	2.930516378	0.040272093	22

Parameter	Value	SE	95% Fiducial Limits	
Slope	24.83109115	6.391501454	12.30374806	37.35843424
Intercept	-67.76791931	18.77373555	-104.5644417	-30.97139691
TSCR	0.099690478	0.023695382	0.053247527	0.146133428

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	686.7987265	537.058375	747.6565068
EC05	3.355	731.6016577	608.8859727	781.3018378
EC10	3.718	756.6684322	650.5914712	800.3850597
EC15	3.964	774.064301	680.0050895	813.9142816
EC20	4.158	788.1747746	704.0221999	825.1876413
EC25	4.326	800.4851229	724.9768854	835.3575863
EC40	4.747	832.3645221	778.0726786	864.3273455
EC50	5.000	852.150649	808.6100921	885.7921691
EC60	5.253	872.4071154	836.1833631	912.3091936
EC75	5.674	907.1508087	873.6396115	969.6457235
EC80	5.842	921.319425	886.269403	996.4079068
EC85	6.036	938.1142293	900.0531996	1029.871372
EC90	6.282	959.6815291	916.5147209	1074.967135
EC95	6.645	992.5629769	940.0032492	1147.249305
EC99	7.326	1057.312313	983.3092802	1299.356351



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

Conc-mg/L	1	2	3	4
D-Control	0.4440	0.3872	0.5186	0.4822
300	0.4208	0.4538	0.4311	0.4935
450	0.3496	0.4177	0.3787	0.4287
600	0.3425	0.2740	0.2925	0.3473
750	0.2579	0.3274	0.2673	0.3636
900	0.0630	0.0822	0.1126	0.0390

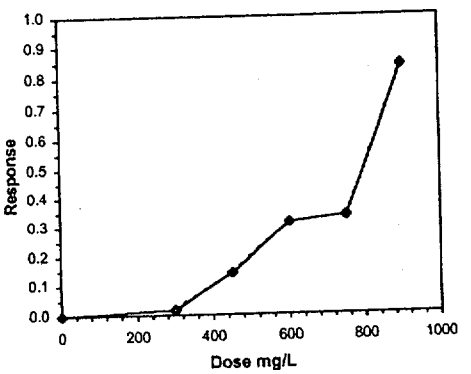
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.4580	1.0000	0.4580	0.3872	0.5186	12.265	4				0.4580	1.0000
300	0.4498	0.9821	0.4498	0.4208	0.4935	7.165	4	0.279	2.410	0.0707	0.4498	0.9821
450	0.3937	0.8596	0.3937	0.3496	0.4287	9.241	4	2.192	2.410	0.0707	0.3937	0.8596
*600	0.3141	0.6858	0.3141	0.2740	0.3473	11.602	4	4.904	2.410	0.0707	0.3141	0.6858
*750	0.3041	0.6639	0.3041	0.2579	0.3636	16.523	4	5.245	2.410	0.0707	0.3041	0.6639
*900	0.0742	0.1620	0.0742	0.0390	0.1126	41.924	4	13.076	2.410	0.0707	0.0742	0.1620

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.956860721	0.884	-0.025996871	-1.050953136
Bartlett's Test indicates equal variances (p = 0.90)	1.646460414	15.08631706		

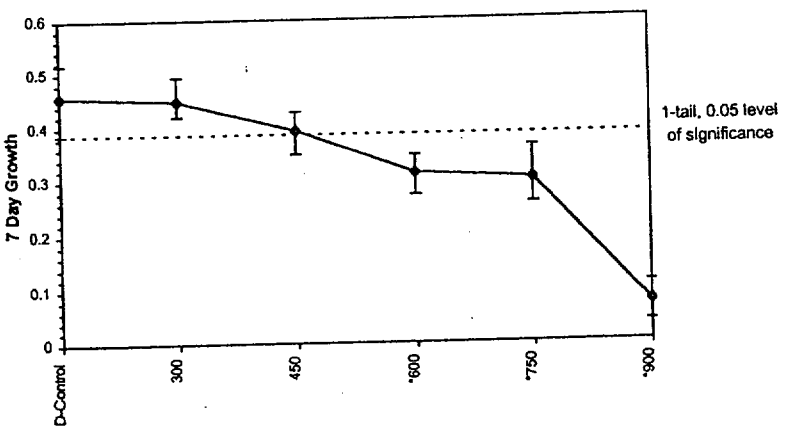
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	600	519.6152423		0.070734455	0.154442041	0.080895563	0.001722891	1.1E-09	5, 18

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	339.29	88.10	0.00	449.63	-0.8574
IC10	400.49	63.04	140.29	517.97	-0.7585
IC15	458.24	47.77	277.89	543.89	-0.8195
IC20	501.40	38.76	363.05	585.41	-0.5792
IC25	544.55	41.44	438.65	635.04	1.2997
IC40	769.09	26.54	635.98	795.77	-2.2081
IC50	798.98	11.39	755.26	824.51	-0.2208



Dose-Response Plot



PpKClCR Test Number: 18
NONTREATED

MHS Control Chemistry:

Parameter	Control Batch:		
	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.27	8.27	8.25
DO (mg/L)	7.9	7.8	8.0
Conductivity (µmhos/cm)	321	314	308
Alkalinity (mg $CaCO_3$/L)	63	64	65
Hardness (mg $CaCO_3$/L)	89	89	82

Acceptance Criteria for Daily Chemistry:

Concentration	Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range)
CONTROL	280 - 360
300 mg KCl/L	840 - 890
450 mg KCl/L	1100 - 1180
600 mg KCl/L	1390 - 1460
750 mg KCl/L	1660 - 1710
900 mg KCl/L	1890 - 1950
KCl Stock (25 g KCl/L)	67000 - 76000

nvironmental Testing Solutions, LLC

PpKClCR Test Number: 18
NONTREATED

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	8.27	8.09	8.23	7.99	8.24	8.07
	DO (mg/L)	7.9	7.6	7.8	7.4	7.9	7.6
	Conductivity (µmhos/cm)	321		314		~~313~~ 318	
	Temperature (°C)	24.5	24.3	24.6	25.0	24.4	24.3
300 mg KCl/L	pH (S.U.)	8.29	7.91	8.24	7.98	8.24	8.06
	DO (mg/L)	8.1	7.5	8.1	7.4	7.8	7.6
	Conductivity (µmhos/cm)	886		863		890	
	Temperature (°C)	24.4	24.3	24.6	25.0	24.3	24.2
450 mg KCl/L	pH (S.U.)	8.29	7.96	8.23	8.00	8.23	7.98
	DO (mg/L)	8.1	7.4	8.0	7.4	7.8	7.6
	Conductivity (µmhos/cm)	~~287~~		1133		1160	
	Temperature (°C)	1163 24.4	24.3	24.6	24.8	24.4	24.2
600 mg KCl/L	pH (S.U.)	8.29	7.92	8.24	8.00	8.24	8.04
	DO (mg/L)	8.2	7.2	8.0	7.4	7.8	7.5
	Conductivity (µmhos/cm)	~~254~~		1399		1439	
	Temperature (°C)	1442 24.5	24.3	24.6	25.1	24.4	24.3
750 mg KCl/L	pH (S.U.)	8.28	7.96	8.24	7.98	8.24	8.04
	DO (mg/L)	8.2	7.4	8.0	7.5	7.8	7.7
	Conductivity (µmhos/cm)	1707		1666		1696	
	Temperature (°C)	24.5	24.3	24.6	24.9	24.4	24.3
900 mg KCl/L	pH (S.U.)	8.27	7.89	8.24	8.07	8.24	8.04
	DO (mg/L)	8.2	7.4	8.0	7.5	7.8	7.8
	Conductivity (µmhos/cm)	1917		1863		1892	
	Temperature (°C)	24.5	24.3	24.6	24.9	24.4	24.3

Stock 69600 68000 68900

PpKClCR Test Number: 18
NONTREATED

ncentration	Parameter	Day 3		Day 4		Day 5		Day 6	
ONTROL	pH (S.U.)	8.27	8.10	8.27	7.85	8.25	7.95	8.25 ~~8.22~~	7.36
	DO (mg/L)	7.9	7.8	7.8	7.4	8.0	7.4	8.0	6.3
	Conductivity (µmhos/cm)	319		314		298		308	
	Temperature (°C)	24.6	24.2	24.7	24.8	24.4	24.5	24.3	24.4
0 mg KCl/L	pH (S.U.)	8.26	7.98	8.22	7.77	8.22	7.98	8.22	7.42
	DO (mg/L)	8.0	7.8	8.1	7.3	8.0	7.3	7.9	6.3
	Conductivity (µmhos/cm)	874		833		850		854	
	Temperature (°C)	24.6	24.2	24.7	24.8	24.4	24.4	24.3	24.4
50 mg KCl/L	pH (S.U.)	8.27	7.94	8.24	7.78	8.21	7.84	8.23	7.38
	DO (mg/L)	8.1	7.7	8.1	7.2	8.2	7.4	7.8	6.1
	Conductivity (µmhos/cm)	1142		1106		1118		1128	
	Temperature (°C)	24.6	24.2	24.7	24.8	24.4	24.4	24.4	24.4
00 mg KCl/L	pH (S.U.)	8.24	7.87	8.24	7.72	8.23	7.94	8.23	7.42
	DO (mg/L)	8.1	7.3	8.1	6.9	8.1	7.3	7.8	6.0
	Conductivity (µmhos/cm)	1402		1358		1393		1392	
	Temperature (°C)	24.6	24.3	24.7	24.8	24.4	24.5	24.3	24.4
750 mg KCl/L	pH (S.U.)	8.26	7.81	8.22	7.78	8.23	7.99	8.22	7.43
	DO (mg/L)	8.2	7.2	8.1	6.9	8.1	7.6	7.9	~~7.~~ 6.4
	Conductivity (µmhos/cm)	1671		1608		1644		1672	
	Temperature (°C)	24.6	24.2	24.7	24.8	24.4	24.5	24.3	24.4
900 mg KCl/L	pH (S.U.)	8.25	7.98	8.22	7.77	8.23	7.97	8.22	7.51
	DO (mg/L)	8.2	7.6	8.2	6.9	8.1	7.7	8.0	6.3
	Conductivity (µmhos/cm)	1858		1808		1850		1860	
	Temperature (°C)	24.6	24.2	24.7	24.8	24.4	24.5	24.2	24.4
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Stock 70200 69500 69300 70300

Environmental Testing Solutions, LLC

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

Test number	Test date	7-d IC25 (g/L NaCl)	CT (g/L NaCl)	S	$S_{A.75}$	$S_{A.90}$	CV
1	12-17-00	0.89					
2	12-19-00	1.01	0.95	0.08	0.43	0.59	0.09
3	12-19-00	0.97	0.96	0.06	0.43	0.59	0.06
4	01-09-01	0.95	0.95	0.05	0.43	0.59	0.05
5	02-06-01	1.11	0.99	0.08	0.44	0.61	0.08
6	03-07-01	1.04	0.99	0.08	0.45	0.62	0.08
7	04-04-01	1.02	1.00	0.07	0.45	0.62	0.07
8	05-09-01	1.10	1.01	0.07	0.46	0.63	0.07
9	06-06-01	1.07	1.02	0.07	0.46	0.63	0.07
10	07-10-01	1.05	1.02	0.07	0.46	0.63	0.07
11	08-08-01	1.02	1.02	0.07	0.46	0.63	0.06
12	09-12-01	1.02	1.02	0.06	0.46	0.63	0.06
13	10-10-01	1.03	1.02	0.06	0.46	0.63	0.06
14	11-01-01	1.00	1.02	0.06	0.46	0.63	0.06
15	12-05-01	1.05	1.02	0.06	0.46	0.63	0.06
16	01-09-02	0.91	1.02	0.06	0.46	0.63	0.06
17	02-05-02	1.07	1.02	0.06	0.46	0.63	0.06
18	03-19-02	1.03	1.02	0.06	0.46	0.63	0.06
19	04-09-02	1.03	1.02	0.06	0.46	0.63	0.06
20	05-07-02	1.05	1.02	0.06	0.46	0.63	0.06

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

CT = Central tendency (mean IC25).

S = Standard deviation of the IC25 values.

$S_{A.75}$ = Standard deviation corresponding to the the 75th percentile CV.
$S_{A.75}$ = 0.45, as determined by USEPA for the method and endpoint.

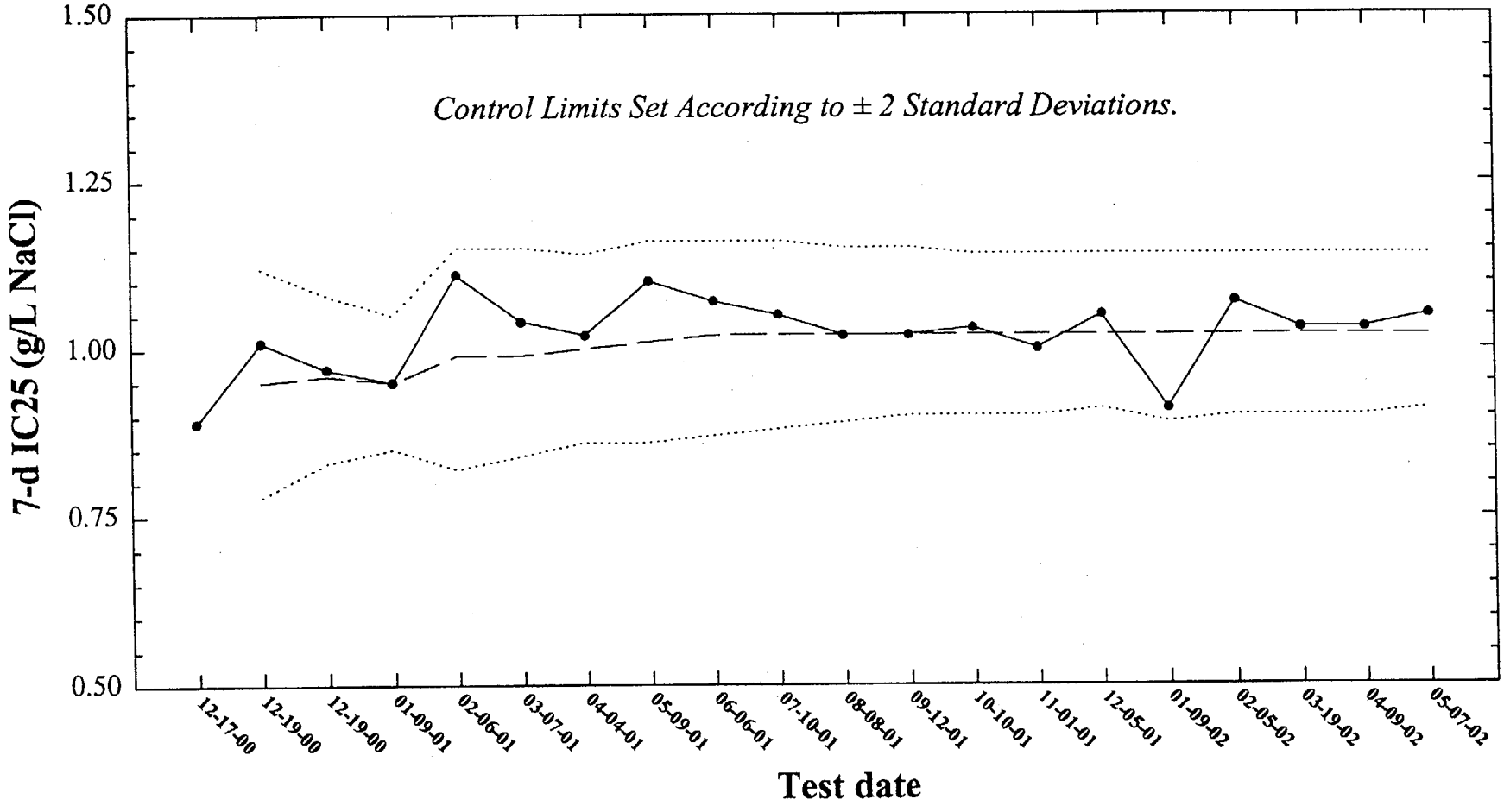
$S_{A.90}$ = Standard deviation corresponding to the the 90th percentile CV.
$S_{A.90}$ = 0.62, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values.

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

Environmental Testing Solutions, LLC

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



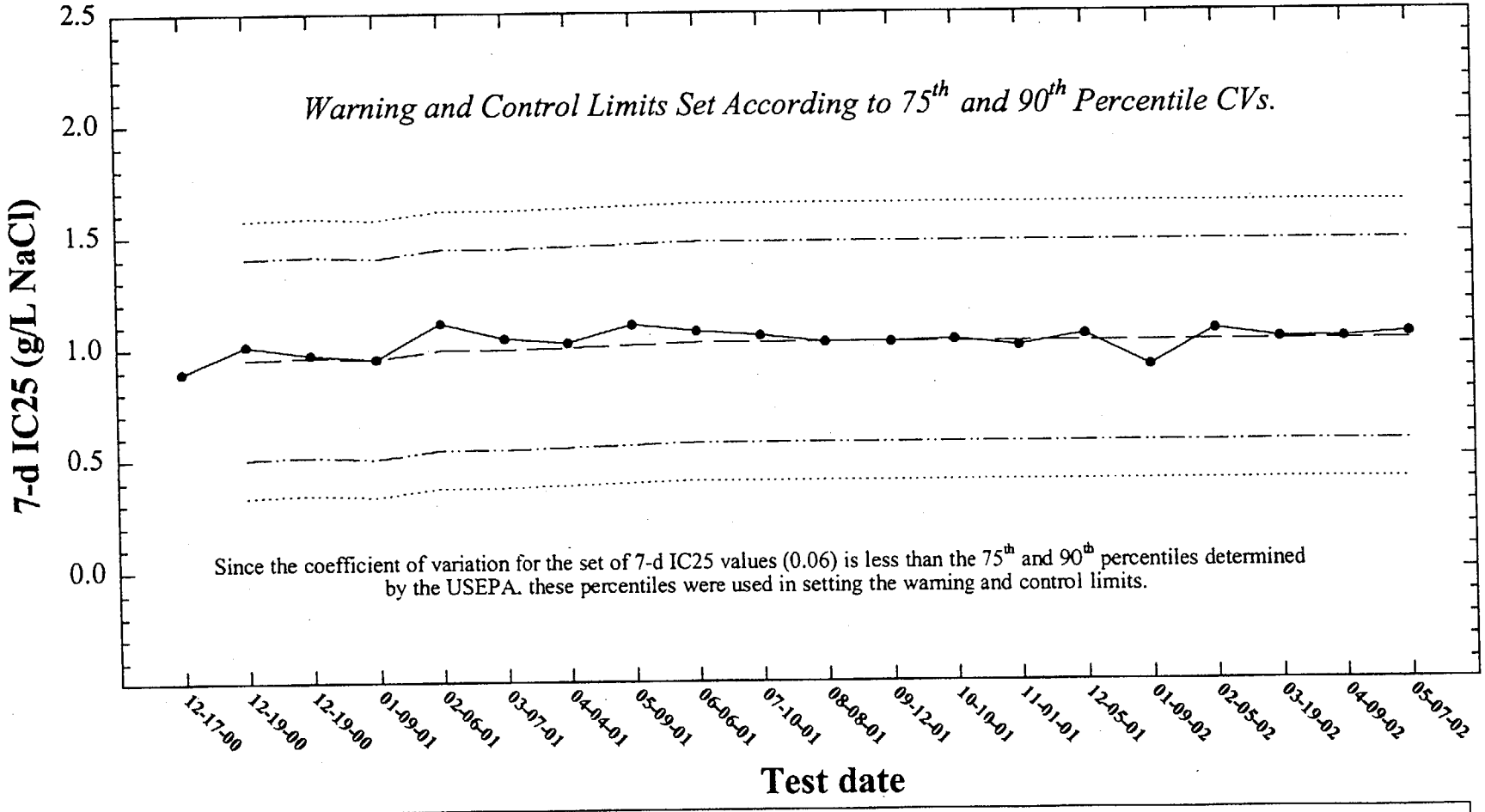
—•— **7-day IC25** = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— – **Central Tendency** (mean IC25)

····· **Control Limits** (mean IC25 ± 2 Standard Deviations)

Environmental Testing Solutions, LLC

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



—•— **7-day IC25** = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— – **Central Tendency** (mean IC25)

—··— **Warning Limits** (mean IC25 ± $S_{A.75}$, $S_{A.75}$ = 0.45, as determined by USEPA for the method and endpoint)

····· **Control Limits** (mean IC25 ± $S_{A.90}$, $S_{A.90}$ = 0.62, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	12-17-00	100	25.6	4.6		3.3	12.9	
2	12-19-00	100	24.8	9.5	7.1	4.6	18.4	15.6
3	12-19-00	100	25.1	19.2	11.1	5.0	19.8	17.0
4	01-09-01	100	28.0	8.4	10.4	3.5	12.4	15.9
5	02-06-01	100	22.1	10.1	10.4	3.1	14.2	15.5
6	03-07-01	100	24.0	8.3	10.0	2.4	10.1	14.6
7	04-04-01	100	25.0	10.0	10.0	2.9	11.8	14.2
8	05-09-01	100	27.9	8.9	9.9	3.1	11.0	13.8
9	06-06-01	100	27.8	5.8	9.4	3.5	12.5	13.7
10	07-10-01	100	25.0	9.4	9.4	2.8	11.2	13.4
11	08-08-01	100	30.9	2.4	8.8	2.7	8.7	13.0
12	09-12-01	100	28.6	6.6	8.6	2.7	9.4	12.7
13	10-10-01	100	24.9	8.8	8.6	2.5	9.9	12.5
14	11-01-01	100	27.0	6.5	8.5	3.1	11.6	12.4
15	12-05-01	100	24.8	9.1	8.5	4.8	19.5	12.9
16	01-09-02	100	27.5	7.5	8.4	4.5	16.3	13.1
17	02-05-02	100	23.1	10.1	8.5	2.6	11.1	13.0
18	03-19-02	100	26.3	8.6	8.5	3.0	11.2	12.9
19	04-09-02	100	26.2	12.3	8.7	2.8	10.7	12.8
20	05-07-02	100	27.3	8.1	8.7	2.3	8.4	12.6

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is **8.7%** in Environmental Testing Solutions, LLC
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by **12.6%** from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

CT = Central Tendancy (mean Control Reproduction CV or mean PMSD)

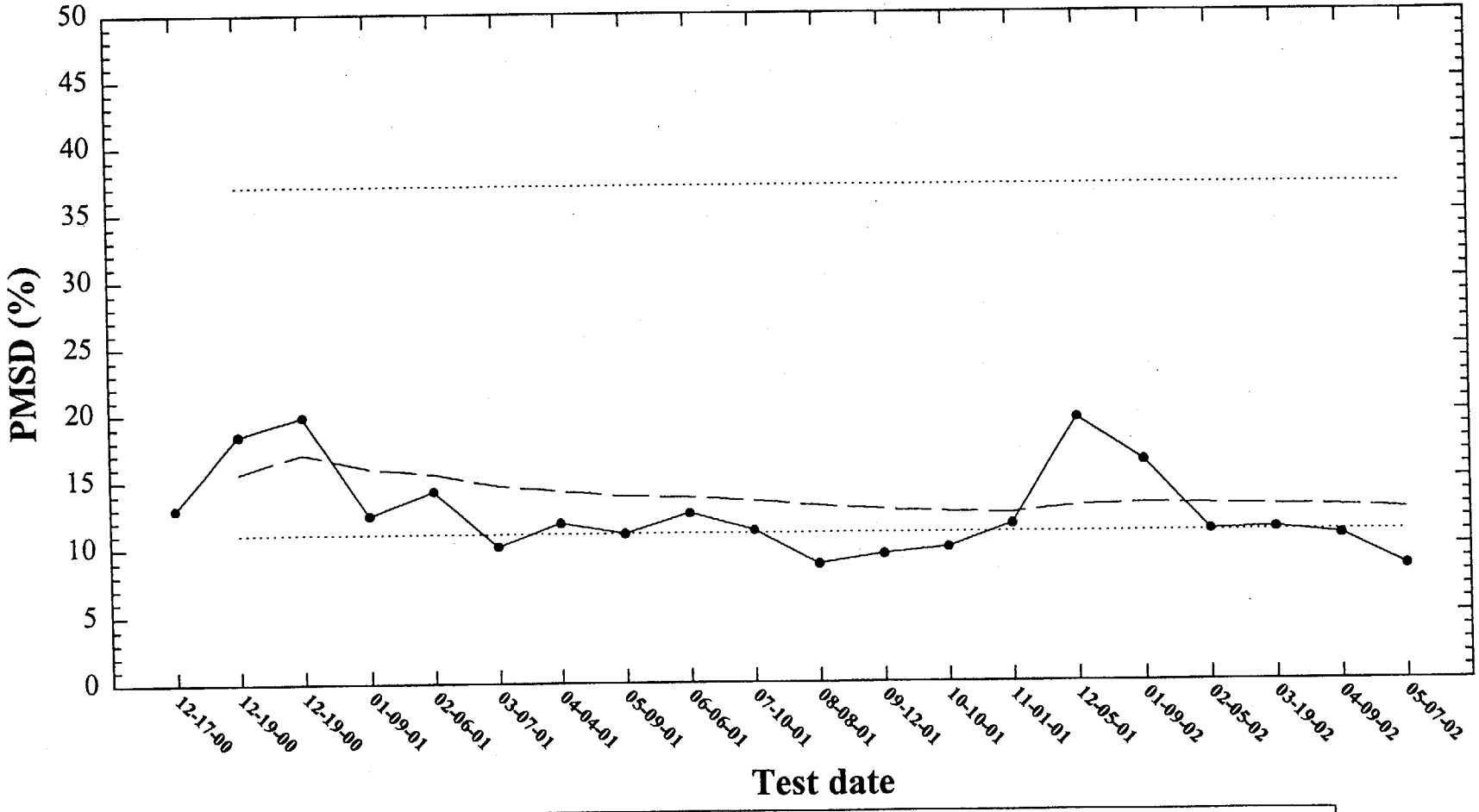
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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



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

— - **Central Tendency** (mean PMSD)

····· **Lower and Upper PMSD Bounds**

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

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

Environmental Testing Solutions, LLC

Sodium Chloride Chronic Reference Toxicant Test
(EPA/600/4-91/002 Method 1002.0)
Species: *Ceriodaphnia dubia*

CdNaClCR Test Number: 22

	Date	Time	Analyst
Test start	05-07-02	1220	[illegible]
Test end	05-14-02	1220	[illegible]

Dilution preparation information:						***Comments:***
NaCl CHM number:	CHM 060					
Stock preparation:	100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water)					
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	

Test organism information:		***Test information:***	
Organism age:	<24-HOURS OLD	Randomizing template:	Yellow
Date and times organisms were born between:	05-06-02 1411 TO 1802	Incubator number:	2
Organism source:	04-30-02 A+B	YCT batch: ABS	04-16-02
Transfer bowl information:	pH = 8.23 Temperature (°C)= 24.3	*Selenastrum* batch: ABS	04-16-02

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	3	0	4	0	5	0	0	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	6	0	4	0	5	5	0	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	8	10	9	10	10	7	8	8	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	16	0	14	14	16	0	0	14	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	14	0	0	0	12	15	0	2
Total young produced		28	27	30	27	28	31	24	28	25	25
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Calculations and data reviewed: [illegible]

Test Renewal, Feeding, and Randomization Record Label

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	05-13	05-07	05-08	05-09	05-10	05-11	05-12
Time	1152	1220	1159	1147	1139	1152	1154
Analyst	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Shelf Location	B1	B1	B1	B1	B1	B1	B1

Control information:		Acceptance criteria	***Summary of test endpoints*** *(mg NaCl/L)*:	
% of Male Adults:	0%	≤ 20%	7-day LC50	>1406
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	27.3	≥ 15.0 offspring/female	ChV	894.4
% CV:	8.1%	< 40.0 %	IC25	1049.2

Environmental Testing Solutions, LLC

CdNaClCR Test Number: 22

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	3	4	0	5	0	0	0	0	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	5	0	5	3	4	5	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	8	8	8	7	10	8	8	8	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	12	14	15	11	12	0	0	14	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	0	16	13	0	14
Total young produced		27	24	27	28	23	25	28	26	26	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	26.1
% Reduction from Control:	4.47%

Calculations and data reviewed: dl

800 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	0	0	0	0	0	0	0	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	5	3	4	5	3	4	4	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	8	10	7	9	9	10	6	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	0	0	0	12	10	12	14	16	1
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	12	14	12	0	0	0	0	0	8
Total young produced		27	27	25	26	24	22	25	28	26	22
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	25.2
% Reduction from Control:	7.7%

Calculations and data reviewed: dl

CdNaClCR Test Number: 22

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	4	0	0	0	4	0	0	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	0	4	4	3	0	3	3	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	7	8	0	7	8	10	8	6	6	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	7	13	3	11	0	14	12	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	12	11	0	11	2	12	0	0	10
Total young produced		24	24	22	24	25	27	23	23	21	23
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	23.6
% Reduction from Control:	13.6%

Calculations and data reviewed: JH

1200 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	2	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	3	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	6	3	5	3	7	7	3	0	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	6	3	0	0	7	10	0	0	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	6	0	5	0	0	0	10	6	0	7
Total young produced		16	11	8	5	10	20	17	9	4	9
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	10.9
% Reduction from Control:	60.1%

Calculations and data reviewed: JH

CdNaClCR Test Number: 22

1400 mg NaCl/L

Survival and Reproduction Data

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

Concentration:	
% Mortality:	10%
Mean Offspring/Female:	5.3
% Reduction from Control:	80.6%

Calculations and data reviewed: dl

Environmental Testing Solutions, LLC

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

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

Test number: CdNaClCR #22

Test dates: May 7-14, 2002

Reveiwed by: [signature]

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	28	27	30	27	28	31	24	28	25	25	100	27.3	8.1	Not applicable
600	27	24	27	28	23	25	28	26	26	27	100	26.1	6.4	4.4
800	27	27	25	26	24	22	25	28	26	22	100	25.2	8.1	7.7
1000	24	24	22	24	25	27	23	23	21	23	100	23.6	7.0	13.6
1200	16	11	8	5	10	20	17	9	4	9	100	10.9	47.9	60.1
1400	2	8	5	8	3	3	8	5	7	4	90	5.3	43.6	80.6

Dunnett's MSD value: 2.866

PMSD: 10.5

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by **12.6%** from the control.

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

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

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

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

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/7/02	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	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	28.000	27.000	30.000	27.000	28.000	31.000	24.000	28.000	25.000	25.000
600	27.000	24.000	27.000	28.000	23.000	25.000	28.000	26.000	26.000	27.000
800	27.000	27.000	25.000	26.000	24.000	22.000	25.000	28.000	26.000	22.000
1000	24.000	24.000	22.000	24.000	25.000	27.000	23.000	23.000	21.000	23.000
1200	16.000	11.000	8.000	5.000	10.000	20.000	17.000	9.000	4.000	9.000
1400	2.000	8.000	5.000	8.000	3.000	3.000	8.000	5.000	7.000	4.000

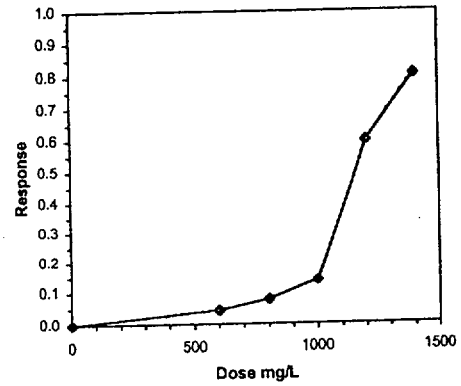
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	27.300	1.0000	27.300	24.000	31.000	8.108	10			27.300	1.0000
600	26.100	0.9560	26.100	23.000	28.000	6.373	10	88.50	75.00	26.100	0.9560
800	25.200	0.9231	25.200	22.000	28.000	8.111	10	80.00	75.00	25.200	0.9231
*1000	23.600	0.8645	23.600	21.000	27.000	6.977	10	62.50	75.00	23.600	0.8645
*1200	10.900	0.3993	10.900	4.000	20.000	47.857	10	55.00	75.00	10.900	0.3993
*1400	5.300	0.1941	5.300	2.000	8.000	43.619	10	55.00	75.00	5.300	0.1941

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.79925704	1.035	0.46940546	1.8849612
Bartlett's Test indicates unequal variances (p = 1.11E-03)	20.2808399	15.0863171		

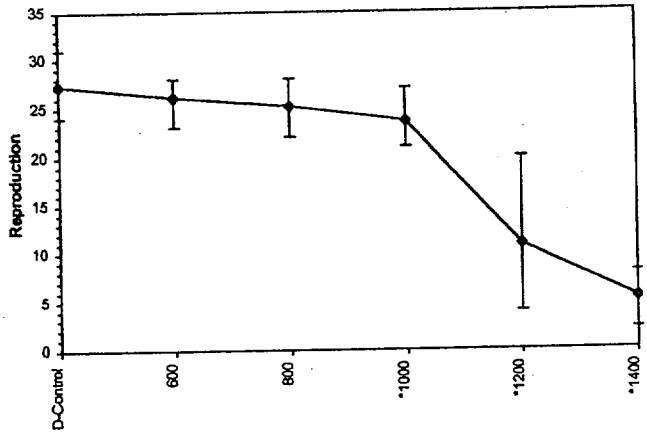
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	800	1000	894.427191	

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	636.666667	155.017213	358.664431	885.833333	-0.2340
IC10	878.75	94.9980011	668.58167	1004.25561	-1.0865
IC15	1006.22047	47.7651403	831.597222	1025.6365	-3.3118
IC20	1027.71654	11.7313368	1004.79496	1050.25581	-0.0532
IC25	1049.2126	12.28073	1025.37009	1076.86047	0.2916
IC40	1113.70079	17.0805645	1095.25067	1153.5577	0.8164
IC50	1156.69291	21.6175266	1131.84389	1207.59528	0.8727



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only.				Ceriodaphnia Survival and Reproduction Test-Reproduction	
Start Date:	5/7/02	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	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	28.000	27.000	30.000	27.000	28.000	31.000	24.000	28.000	25.000	25.000
600	27.000	24.000	27.000	28.000	23.000	25.000	28.000	26.000	26.000	27.000
800	27.000	27.000	25.000	26.000	24.000	22.000	25.000	28.000	26.000	22.000
1000	24.000	24.000	22.000	24.000	25.000	27.000	23.000	23.000	21.000	23.000
1200	16.000	11.000	8.000	5.000	10.000	20.000	17.000	9.000	4.000	9.000
1400	2.000	8.000	5.000	8.000	3.000	3.000	8.000	5.000	7.000	4.000

			Transform: Untransformed						1-Tailed	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	27.300	1.0000	27.300	24.000	31.000	8.108	10			
600	26.100	0.9560	26.100	23.000	28.000	6.373	10	0.958	2.287	2.866
800	25.200	0.9231	25.200	22.000	28.000	8.111	10	1.676	2.287	2.866
*1000	23.600	0.8645	23.600	21.000	27.000	6.977	10	2.953	2.287	2.866
*1200	10.900	0.3993	10.900	4.000	20.000	47.857	10	13.087	2.287	2.866
*1400	5.300	0.1941	5.300	2.000	8.000	43.619	10	17.556	2.287	2.866

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.79925704	1.035	0.469405458	1.884961203
Bartlett's Test indicates unequal variances (p = 1.11E-03)	20.28083992	15.08631706		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.865523013	0.104964213	857.9466667	7.851851852	5.6E-27	5, 54

CdNaClCR Test Number: 22

MHS Control Chemistry:

Parameter	Control Batch:		
	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.27	8.27	8.25
DO (mg/L)	7.9	7.8	8.0
Conductivity (µmhos/cm)	321	314	308
Alkalinity (mg $CaCO_3$/L)	63	64	65
Hardness (mg $CaCO_3$/L)	89	89	82

Acceptance Criteria for Daily Chemistry:

Concentration	Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range)
CONTROL	280 - 360
600 mg NaCl/L	1390 - 1590
800 mg NaCl/L	1780 - 1970
1000 mg NaCl/L	2190 - 2370
1200 mg NaCl/L	2550 - 2740
1400 mg NaCl/L	2910 - 3160
NaCl Stock	110500 - 116300

CdNaClCR Test Number: 22

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2		
CONTROL	pH (S.U.)	8.27	8.28	8.23	8.19	8.24	~~8.24~~	8.26
	DO (mg/L)	7.9	8.0	7.8	7.8	7.9	8.1	
	Conductivity (µmhos/cm)	321		314		319		
	Temperature (°C)	24.4	24.8	24.3	24.6	24.4	24.7	
600 mg NaCl/L	pH (S.U.)	8.28	8.18	8.22	8.06	8.21	~~8.24~~	8.22
	DO (mg/L)	8.1	8.0	7.9	7.8	7.8	8.1	
	Conductivity (µmhos/cm)	1519		1517		1478		
	Temperature (°C)	24.4	24.8	24.3	24.5	24.4	24.6	
800 mg NaCl/L	pH (S.U.)	8.27	8.18	8.22	8.05	8.20	8.20	
	DO (mg/L)	8.1	8.0	7.9	7.7	7.8	8.1	
	Conductivity (µmhos/cm)	1853		1842		1811		
	Temperature (°C)	24.4	24.8	24.4	24.5	24.4	24.6	
1000 mg NaCl/L	pH (S.U.)	8.26	8.19	8.22	8.18	8.19	8.23	
	DO (mg/L)	8.2	8.0	8.0	7.7	7.8	8.1	
	Conductivity (µmhos/cm)	2276		2256		2204		
	Temperature (°C)	24.4	24.8	24.4	24.7	24.4	24.6	
1200 mg NaCl/L	pH (S.U.)	8.25	8.18	8.20	8.06	8.18	8.25	
	DO (mg/L)	8.2	8.1	8.0	7.8	7.8	8.1	
	Conductivity (µmhos/cm)	2647		2637		2575		
	Temperature (°C)	24.4	24.8	24.4	24.6	24.4	24.6	
1400 mg NaCl/L	pH (S.U.)	8.24	8.19	8.21	8.03	8.18	8.23	
	DO (mg/L)	8.2	8.2	8.0	7.7	7.8	8.1	
	Conductivity (µmhos/cm)	3008		2997		2925		
	Temperature (°C)	24.4	24.8	24.4	24.6	24.4	24.6	
		Initial	Final	Initial	Final	Initial	Final	

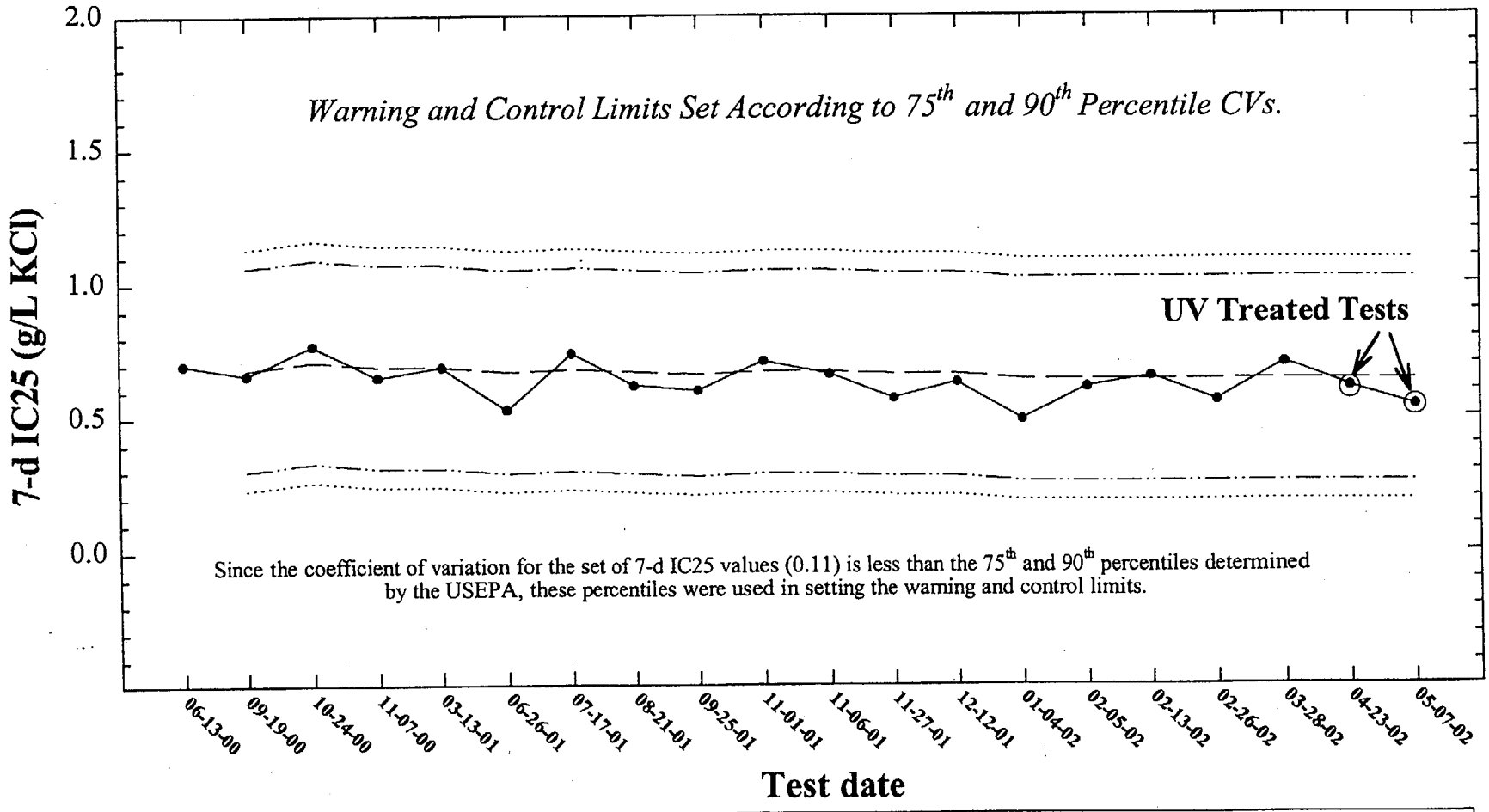
Stock 111100 110500 108900

CdNaClCR Test Number: 22

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.27	8.32	8.27	8.19	8.25	8.27	8.25	8.32
	DO (mg/L)	7.9	8.2	7.8	8.0	8.0	8.1	8.0	8.0
	Conductivity (µmhos/cm)	319		314		298		308	
	Temperature (°C)	24.3	24.8	24.5	24.7	24.3	24.5	24.2	24.6
600 mg NaCl/L	pH (S.U.)	8.26	8.24	8.20	8.12	8.21	8.24	8.22	8.22
	DO (mg/L)	8.0	8.3	8.1	8.0	8.1	8.1	8.1	8.1
	Conductivity (µmhos/cm)	1511		1441		1441		1473	
	Temperature (°C)	24.3	24.8	24.5	24.5	24.2	24.5	24.2	24.7
800 mg NaCl/L	pH (S.U.)	8.26	8.23	8.17	8.11	8.21	8.23	8.22	8.20
	DO (mg/L)	8.1	8.3	8.1	8.0	8.1	8.1	8.1	8.3
	Conductivity (µmhos/cm)	1835		1815		1812		1829	
	Temperature (°C)	24.3	24.8	24.4	24.6	24.2	24.5	24.2	24.8
1000 mg NaCl/L	pH (S.U.)	8.25	8.20	8.18	8.09	8.20	8.26	8.21	8.28
	DO (mg/L)	8.1	8.3	8.1	8.0	8.0	8.1	8.2	8.3
	Conductivity (µmhos/cm)	2254		2213		2203		2244	
	Temperature (°C)	24.4	24.6	24.5	24.6	24.2	24.5	24.2	24.6
1200 mg NaCl/L	pH (S.U.)	8.23	8.18	8.18	8.17	8.19	8.22	8.20	8.33
	DO (mg/L)	8.1	8.3	8.1	8.0	8.1	8.1	8.2	8.4
	Conductivity (µmhos/cm)	2621		2570		2560		2448	
	Temperature (°C)	24.3	24.6	24.5	24.6	24.2	24.5	24.2	24.6
1400 mg NaCl/L	pH (S.U.)	8.22	8.16	8.17	8.11	8.19	8.24	8.20	8.25
	DO (mg/L)	8.1	8.3	8.2	8.2	8.1	8.1	8.1	8.4
	Conductivity (µmhos/cm)	2978		2938		2918		2958	
	Temperature (°C)	24.4	24.6	24.5	24.6	24.2	24.5	24.2	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
Stock		110400		112200		110500		111400	

Environmental Testing Solutions, LLC

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



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

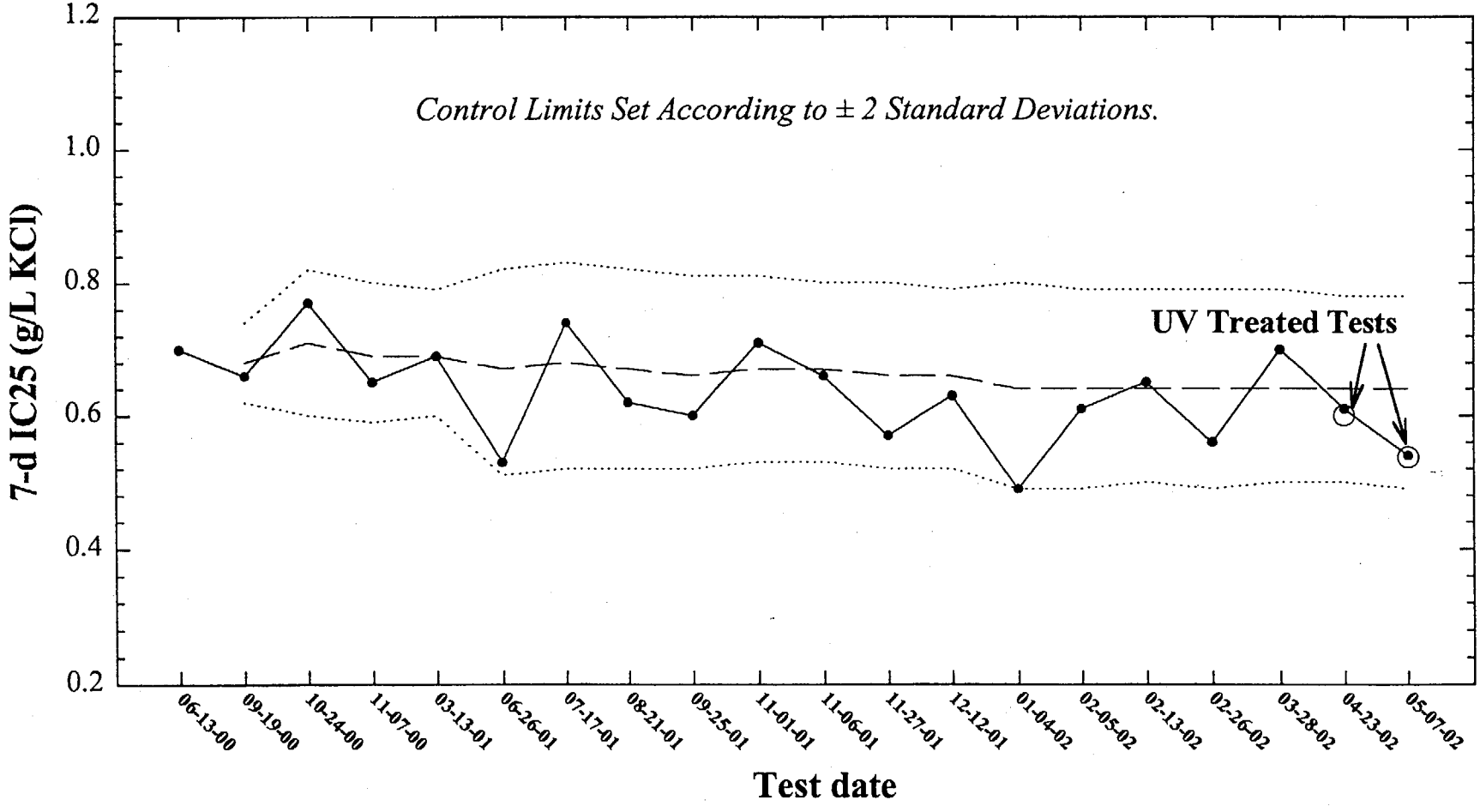
— – **Central Tendency** (mean IC25)

—·— **Warning Limits** (mean IC25 ± $S_{A.75}$, $S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint)

····· **Control Limits** (mean IC25 ± $S_{A.90}$, $S_{A.90}$ = 0.45, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

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



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

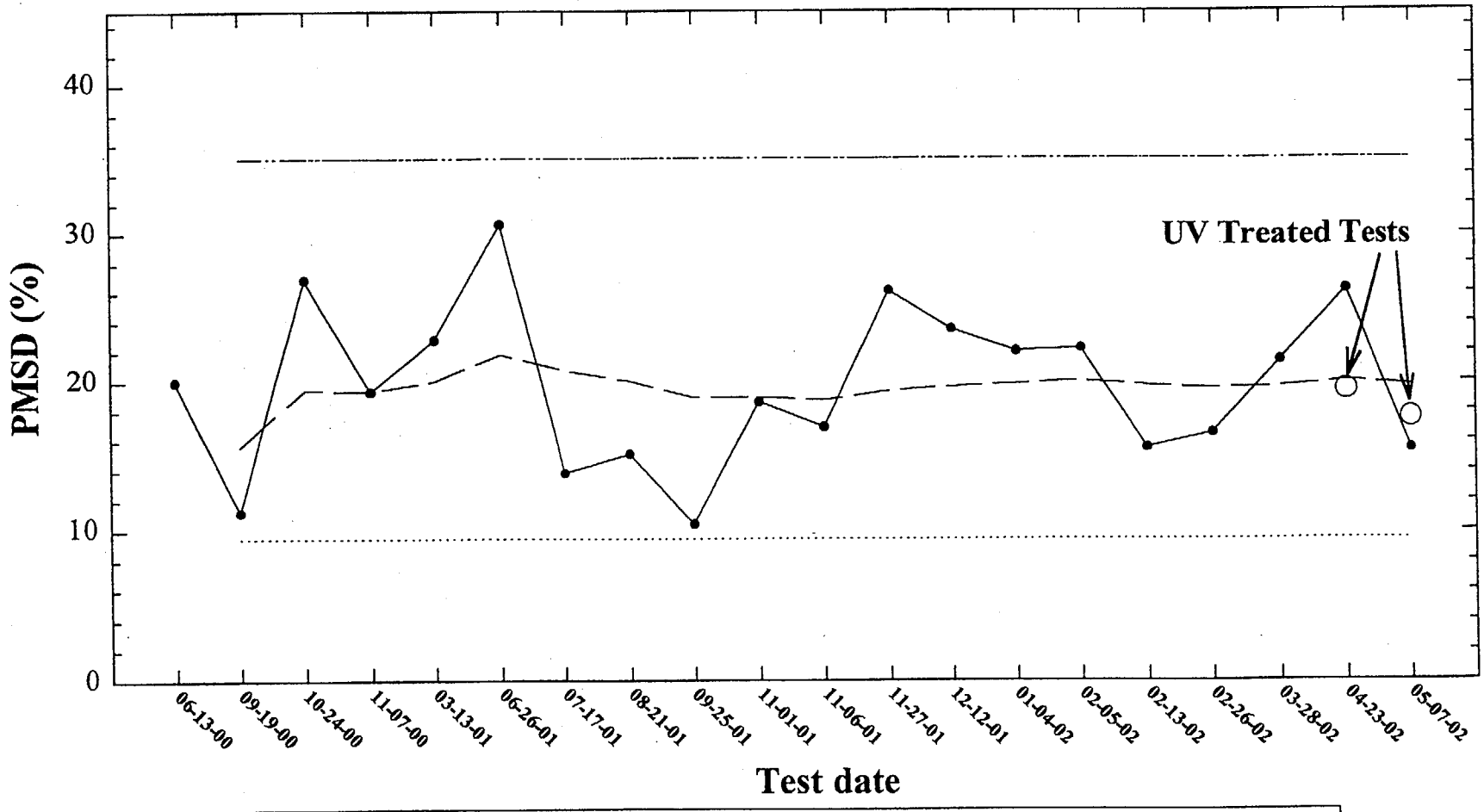
— – **Central Tendency** (mean IC25)

····· **Control Limits** (mean IC25 ± 2 Standard Deviations)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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



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

— - **Central Tendency** (mean PMSD)

····· **Lower and Upper PMSD Bounds**

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

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

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

PpKClCR Test Number: 19
UV-TREATED

Dilution preparation information:						*Comments:*
KCl CHM number:		CHM067				Each concentration was UV treated for 2 minutes using a 40 watt UV-sterilizer.
Stock preparation:		50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water				
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	

Test organism information:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	05-06-02 1030 TO 1400 MST	Incubator number:	2
Organism source:	ABS BATCH 05-06-02	*Artemia* lot number:	860207P
Transfer bowl information:	pH = 7.98 Temperature = 24.0°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	05-06-02	—	1600	1538	JH
1	05-08-02	1014	1611	1547	JH
2	05-09-02	1000	1602	1540	JH
3	05-10-02	0953	1606	1501	JH
4	05-11-02	1140	1801	1529	JH/KEK
5	05-12-02	0948	1557	1543	JH/KEK
6	05-13-02	1003	1618	1541	JH
7	05-14-02	—	—	1530	JH

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC50	797.1
Average weight per larvae:	0.4966	≥ 0.25 mg/larvae	NOEC	450
			LOEC	600
			ChV	519.6
			IC25	536.7

Environmental Testing Solutions, LLC

PpKClCR Test Number: 2819

UV - TREATED

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	9 1d
2	10	10	10	10	10	10	10	10	10	10	10	9
3	10	10	10	10	10	10	10	10	10	10	10	9
4	10	10	10	10	10	10	10	10	10	10	10	9
5	10	10	10	10	10	10	10	10	10	10	10	9
6	9 1d	10	10	10	10	10	10	9 1d	10	10	10	9
7	9	10	10	10	10	10	10	9	10	10	10	9
A = Pan weight (mg) GREEN	14.545	14.633	14.867	14.903	14.720	15.036	14.664	15.059	14.722	14.851	14.791	15.246
B = Pan + Larvae weight (mg)	19.31	20.02	19.84	19.64	19.88	19.50	19.00	18.54	18.69	18.86	18.79	19.77
Larvae weight (mg) = A – B	4.765	5.387	4.973	4.737	5.160	4.464	4.336	3.481	3.968	4.009	3.979	4.524

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, LLC

PpKClCR Test Number: ~~20~~ 19

UV-TREATED

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	9^{1d}	10	10	10	9^{1d}	7^{3d}	8^{2d}	8^{2d}	5^{3d}	6^{4d}	7^{3d}	9^{1d}
2	9	9^{1d}	10	10	8^{1d}	6^{1d}	6^{2d}	7^{1d}	4^{1d}	6	6^{1d}	~~6~~ 8^{1d}
3	9	9	10	10	8	6	4^{2d}	7	4	6	6	8
4	9	9	10	10	8	6	4	7	4	6	6	6^{2d}
5	9	9	10	10	7^{1d}	6	4	6^{1d}	4	4^{2d}	5^{1d}	4^{2d}
6	9	9	10	10	6^{1d}	6	4	6	4	4	4	3^{1d}
7	9	9	10	10	6	6	4	5^{1d}	1^{3d}	4	4	3
A = Pan weight (mg)	14.713	15.022	15.022	14.692	15.005	14.810	14.608	14.609	15.005	14.916	14.817	14.712
B = Pan + Larvae weight (mg)	17.84	18.82	18.53	18.00	18.44	16.99	16.07	16.76	15.63	16.46	16.30	15.98
Larvae weight (mg) = A – B	3.127	3.798	3.508	3.308	3.375	2.180	1.462	2.153	0.545	1.544	1.483	1.268

Calculations and data reviewed: dl

Comments:

Environmental Testing Solutions, LLC

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

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

Test number: PpKClCR # 2, UV Treated

Test dates: May 7-14, 2002

Reviewed by:

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	9	14.545	19.310	4.765	0.4765	97.5	0.4966	6.0	Not applicable
	B	10	10	14.633	20.020	5.387	0.5387				
	C	10	10	14.867	19.840	4.973	0.4973				
	D	10	10	14.903	19.640	4.737	0.4737				
300	E	10	10	14.720	19.880	5.160	0.5160	97.5	0.4360	15.8	12.2
	F	10	10	15.036	19.500	4.464	0.4464				
	G	10	10	14.664	19.000	4.336	0.4336				
	H	10	9	15.059	18.540	3.481	0.3481				
450	I	10	10	14.722	18.690	3.968	0.3968	97.5	0.4120	6.6	17.0
	J	10	10	14.851	18.860	4.009	0.4009				
	K	10	10	14.791	18.770	3.979	0.3979				
	L	10	9	15.246	19.770	4.524	0.4524				
600	M	10	9	14.713	17.840	3.127	0.3127	95.0	0.3435	8.4	30.8
	N	10	9	15.022	18.820	3.798	0.3798				
	O	10	10	15.022	18.530	3.508	0.3508				
	P	10	10	14.692	18.000	3.308	0.3308				
750	Q	10	6	15.065	18.440	3.375	0.3375	52.5	0.2293	34.7	53.8
	R	10	6	14.810	16.990	2.180	0.2180				
	S	10	4	14.608	16.070	1.462	0.1462				
	T	10	5	14.607	16.760	2.153	0.2153				
900	U	10	1	15.085	15.630	0.545	0.0545	30.0	0.1210	37.9	75.6
	V	10	4	14.916	16.460	1.544	0.1544				
	W	10	4	14.817	16.300	1.483	0.1483				
	X	10	3	14.712	15.980	1.268	0.1268				

Dunnett's MSD value: 0.087

PMSD: 17.5

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.7% from the control (determined
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests.

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

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/7/02	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant, UV-treated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

Conc-mg/L	1	2	3	4
D-Control	0.9000	1.0000	1.0000	1.0000
300	1.0000	1.0000	1.0000	0.9000
450	1.0000	1.0000	1.0000	0.9000
600	0.9000	0.9000	1.0000	1.0000
750	0.6000	0.6000	0.4000	0.5000
900	0.1000	0.4000	0.4000	0.3000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
300	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	1	40
450	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00	1	40
600	0.9500	0.9744	1.3305	1.2490	1.4120	7.072	4	16.00	10.00	2	40
*750	0.5250	0.5385	0.8106	0.6847	0.8861	11.892	4	10.00	10.00	19	40
*900	0.3000	0.3077	0.5677	0.3218	0.6847	30.172	4	10.00	10.00	28	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.862006068	0.884	-1.017845934	0.379250916
Bartlett's Test indicates equal variances (p = 0.73)	2.776863813	15.08631706		

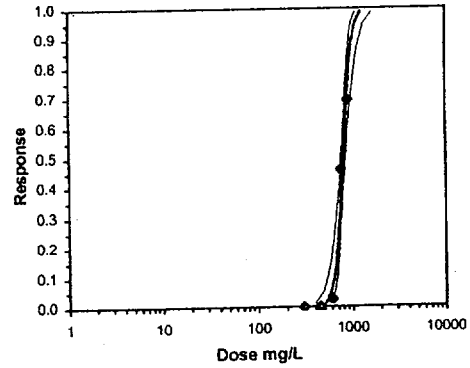
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.8203932	

Maximum Likelihood-Probit

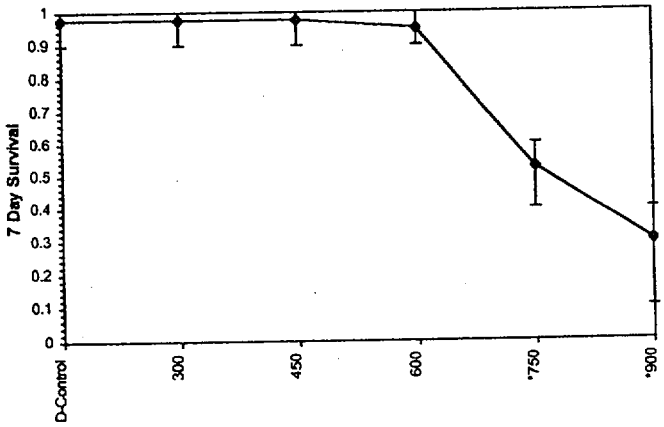
Parameter	Value	SE	95% Fiducial Limits	
Slope	12.10974068	2.331844041	7.539326274	16.68015509
Intercept	-30.13650687	6.745375227	-43.35744257	-16.91557117
TSCR	0.022501998	0.013809721	-0.004565055	0.049569051

Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
0.025	2.424613033	7.814724922	0.49	2.901507785	0.082578151	5

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	512.1560148	391.703859	580.8151195
EC05	3.355	583.0137711	480.703891	640.2751492
EC10	3.718	624.7116821	535.4309698	675.318892
EC15	3.964	654.5171571	575.2343058	700.7688006
EC20	4.158	679.2165533	608.3610921	722.3985151
EC25	4.326	701.1479503	637.6098112	742.2855737
EC40	4.747	759.6033144	712.0742551	801.1398016
EC50	5.000	797.0907819	754.4481002	846.0502775
EC60	5.253	836.428315	793.355763	900.2217852
EC75	5.674	906.1621171	852.5340068	1009.74882
EC80	5.842	935.4214269	875.2090525	1059.256191
EC85	6.036	970.7212707	901.5749537	1121.062246
EC90	6.282	1017.03508	935.0066861	1205.102395
EC95	6.645	1089.774769	985.6862065	1342.975512
EC99	7.326	1240.547284	1086.116912	1648.841103



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/7/02	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant, UV-treated
End Date:	5/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas

Comments:

Conc-mg/L	1	2	3	4
D-Control	0.4765	0.5387	0.4973	0.4737
300	0.5160	0.4464	0.4336	0.3481
450	0.3968	0.4009	0.3979	0.4524
600	0.3127	0.3798	0.3508	0.3308
750	0.3375	0.2180	0.1462	0.2153
900	0.0545	0.1544	0.1483	0.1268

			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	0.4966	1.0000	0.4966	0.4737	0.5387	6.043	4				0.4966	1.0000
300	0.4360	0.8781	0.4360	0.3481	0.5160	15.801	4	1.678	2.410	0.0870	0.4360	0.8781
450	0.4120	0.8297	0.4120	0.3968	0.4524	6.551	4	2.343	2.410	0.0870	0.4120	0.8297
*600	0.3435	0.6918	0.3435	0.3127	0.3798	8.371	4	4.241	2.410	0.0870	0.3435	0.6918
*750	0.2293	0.4617	0.2293	0.1462	0.3375	34.656	4	7.409	2.410	0.0870	0.2293	0.4617
*900	0.1210	0.2437	0.1210	0.0545	0.1544	37.923	4	10.409	2.410	0.0870	0.1210	0.2437

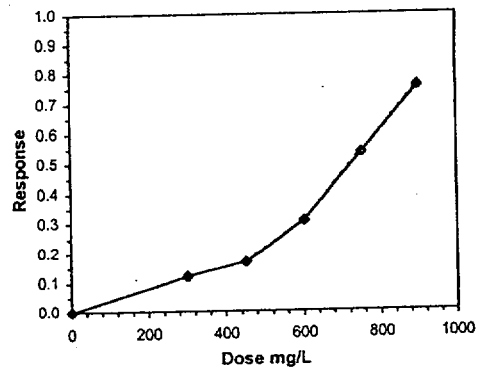
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.952484667	0.884	0.215608854	0.863392203
Bartlett's Test indicates equal variances (p = 0.32)	5.864162445	15.08631706		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	600	519.6152423		0.086950432	0.175109118	0.07932099	0.002603391	3.5E-08	5, 18

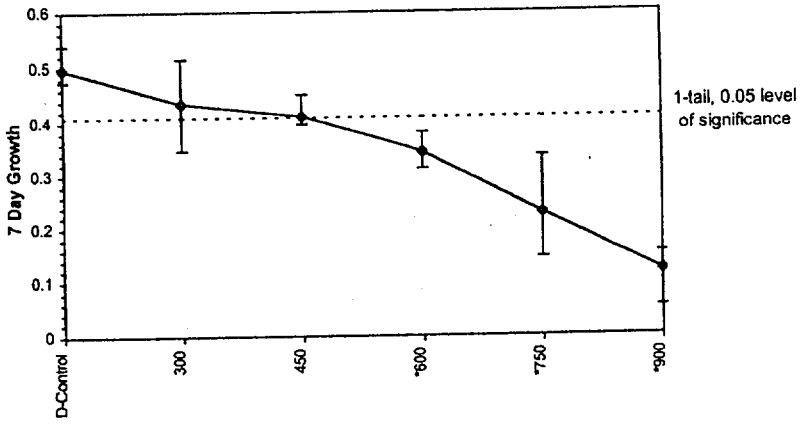
Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	123.06	97.92	32.63	484.41	1.0553
IC10*	246.12	92.86	65.26	520.64	0.4150
IC15	387.14	92.53	87.11	536.37	-0.2871
IC20	482.33	64.69	136.47	577.07	-2.0787
IC25	536.72	29.90	446.28	627.33	0.2279
IC40	659.85	29.85	610.87	812.87	1.4573
IC50	725.03	33.50	648.90	836.91	0.4917

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



PpKClCR Test Number: 19
UV-TREATED

MHS Control Chemistry:

Parameter	Control Batch:		
	05-06-02	05-09-02	05-11-02
pH (S.U.)	8.27	8.22	8.23
DO (mg/L)	7.9	7.9	7.9
Conductivity (µmhos/cm)	315	296	303
Alkalinity (mg $CaCO_3$/L)	63	64	65
Hardness (mg $CaCO_3$/L)	89	89	82

Acceptance Criteria for Daily Chemistry:

Concentration	Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range)
CONTROL	280 - 360
300 mg KCl/L	840 - 890
450 mg KCl/L	1100 - 1180
600 mg KCl/L	1390 - 1460
750 mg KCl/L	1660 - 1710
900 mg KCl/L	1890 - 1950
KCl Stock (25 g KCl/L)	67000 - 76000

Environmental Testing Solutions, LLC

PpKClCR Test Number: 19

UV-TREATED

Daily Chemistry:

Concentration	Parameter	Day 0 Initial	Day 0 Final	Day 1 Initial	Day 1 Final	Day 2 Initial	Day 2 Final
CONTROL	pH (S.U.)	8.27	8.09	8.22	8.01	8.24	8.05
	DO (mg/L)	7.9	7.6	8.1	7.6	8.2	7.7
	Conductivity (µmhos/cm)	315		304		313	
	Temperature (°C)	24.5	24.2	24.7	24.9	24.4	24.5
300 mg KCl/L	pH (S.U.)	8.27	7.96	8.18	7.94	8.22	8.01
	DO (mg/L)	7.9	7.6	8.2	7.4	8.0	7.7
	Conductivity (µmhos/cm)	869		852		856	
	Temperature (°C)	24.5	24.2	24.7	25.0	24.3	24.5
450 mg KCl/L	pH (S.U.)	8.27	7.96	8.17	7.98	8.21	8.04
	DO (mg/L)	8.0	7.5	8.2	7.4	7.9	7.6
	Conductivity (µmhos/cm)	1138		1127		1137	
	Temperature (°C)	24.6	24.2	24.7	25.0	24.5	24.5
600 mg KCl/L	pH (S.U.)	8.28	7.97	8.17	7.94	8.21	8.10
	DO (mg/L)	8.1	7.5	8.2	7.5	7.9	7.7
	Conductivity (µmhos/cm)	1412		1399		1415	
	Temperature (°C)	24.6	24.2	24.8	24.9	24.5	24.5
750 mg KCl/L	pH (S.U.)	8.26	7.88	8.18	8.02	8.20	8.08
	DO (mg/L)	8.1	7.2	8.1	7.5	7.9	7.7
	Conductivity (µmhos/cm)	1679		1663		1678	
	Temperature (°C)	24.6	24.2	24.6	25.0	24.5	24.5
900 mg KCl/L	pH (S.U.)	8.25	7.97	8.18	8.05	8.20	8.05
	DO (mg/L)	8.2	7.6	8.1	7.5	7.8	7.7
	Conductivity (µmhos/cm)	1898		1864		1880	
	Temperature (°C)	24.6	24.2	24.7	25.0	24.5	24.5

Stock 69600 68000 68900

PpKClCR Test Number: 19
UV-TREATED

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	8.25	7.90	8.22	7.87	8.18	7.95	8.23	7.43
	DO (mg/L)	8.1	7.6	7.9	7.2	7.9	7.5	7.9	6.4
	Conductivity (µmhos/cm)	308		296		310		303	
	Temperature (°C)	24.6	24.2	24.6	24.9	24.4	24.6	24.3	24.4
300 mg KCl/L	pH (S.U.)	8.25	7.85	8.18	7.69	8.17	7.89	8.21	7.46
	DO (mg/L)	8.0	7.4	8.0	7.0	8.1	7.4	7.9	6.4
	Conductivity (µmhos/cm)	856		816		829		846	
	Temperature (°C)	24.6	24.2	24.6	25.0	24.3	24.7	24.3	24.4
450 mg KCl/L	pH (S.U.)	8.24	7.88	8.17	7.78	8.16	7.91	8.21	7.46
	DO (mg/L)	8.0	7.5	8.0	6.8	8.1	7.3	7.9	6.3
	Conductivity (µmhos/cm)	1124		1098		1115		1141	
	Temperature (°C)	24.6	24.3	24.8	25.0	24.3	24.6	24.5	24.4
600 mg KCl/L	pH (S.U.)	8.24	7.89	8.17	7.79	8.16	7.93	8.19	7.63
	DO (mg/L)	8.0	7.5	8.0	6.8	8.1	7.4	8.0	6.8
	Conductivity (µmhos/cm)	1398		1359		1388		1395	
	Temperature (°C)	24.6	24.1	24.6	25.0	24.3	24.6	24.4	24.4
750 mg KCl/L	pH (S.U.)	8.23	7.85	8.15	7.78	8.14	7.95	8.20	7.52
	DO (mg/L)	8.1	7.3	8.0	6.8	8.1	7.5	8.1	6.4
	Conductivity (µmhos/cm)	1670		1611		1641		1668	
	Temperature (°C)	24.6	24.2	24.6	25.0	24.3	24.6	24.5	24.4
900 mg KCl/L	pH (S.U.)	8.24	8.06	8.14	7.78	8.15	7.87	8.19	7.52
	DO (mg/L)	8.1	7.4	8.0	6.9	8.0	7.5	8.1	6.4
	Conductivity (µmhos/cm)	1858		1804		1847		1859	
	Temperature (°C)	24.6	24.2	24.8	25.0	24.4	24.6	24.5	24.4

Stock 70200 69500 69800 70300