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

February 11, 2003

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

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR SEQUOYAH NUCLEAR PLANT

Please find enclosed the Discharge Monitoring Report (DMR) of January 2003 for Sequoyah. Please contact me at (423) 843-7324 if you have any questions or comments.

Sincerely,

M. B

Michael G. Beavers
Acting Environmental Supervisor
Signatory Authority for
Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant

Enclosure
cc (Enclosure):

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

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

IE25

Printed on recycled paper

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

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

ATTN. Michael G. Beavers

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	03	01	01	To	03	01	31

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, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	9.2	04	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	23.2	04	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.6	********	8.0	12	0	10 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	4	5	19	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1614	03	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.005	0.016	19	0	38 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that 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	M. Bu Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	03	02	13
TYPED OR PRINTED			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 026mg/L--limit 0 100mg/L) 2. CL-363 (max. calc. conc. was 0 009mg/L--limit 0 100mg/L) 3. PCL-222/PCL-401 (max. calc conc. was 0 020mg/L--limit 0.100mg/L)

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

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

ATTN. Michael G. Beavers

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	03	01	01	To	03	01	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.2	62	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR		CONTIN UOUS	CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.4	04	0	31 / 31	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0	DEG. C.		CONTIN UOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.2	<0.2	<0.2	19	0	1 / 31	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L		ONCE/ MONTH	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

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

CCW data for Jan 2003 is attached

CCW Data forJanuary 2003

CCW CHANNEL		
DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
January 23, 2003	< 0.5	

CCW TRENCH DISCHARGE		
DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
January 23, 2003	2.3	

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN. Michael G Beavers

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	03	01	01	To	03	01	31

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

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE. Read instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	23	0	1 / 90	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 / 90	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		
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	M. Beaver Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	03	02	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled from Jan 12, 2003 to Jan 17, 2003. The report is attached.

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN Michael G. Beavers

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

PERMIT NUMBER	DISCHARGE NUMBER
TN0026450	103 G

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	01	01	To	03	01	31

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

*** NO DISCHARGE ☐ ***

Form Approved
OMB No 2040-0004

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PH	SAMPLE MEASUREMENT	********	********	**	7.6	********	8.9	12	0	14 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	127	193	26	********	13	20	19	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<48	<51	26	********	<5	<5	19	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.140	1.430	03	********	********	********	**	0	31 / 31	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		DAILY	TOTAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

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

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

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

ATTN Michael G. Beavers

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	03	01	01	To	03	01	31

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

*** NO DISCHARGE XX ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form

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

ATTN Michael G. Beavers

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	03	01	01	To	03	01	31

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

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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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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN Michael G. Beavers

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	03	01	01	To	03	01	31

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	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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Address P O BOX 2000
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Location HAMILTON COUNTY

ATTN· Michael G. Beavers

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	03	01	01	To	03	01	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE· Read instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell 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	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	03	02	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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

ATTN: Michael G. Beavers

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	03	01	01	To	03	01	31

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

*** NO DISCHARGE XX ***

Form Approved
OMB No 2040-0004

NOTE Read instructions before completing this form

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell 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	M. Bar Environmental Supervisor	423	843-6700	03	02	13
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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

February 7, 2003

Richard D. Nunley, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, JANUARY, 2003

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101, samples collected January 12-17, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

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

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

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

SQN January 2003m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: February 7, 2003

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN 0026450
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: January 12 - 17, 2003
10. Average Flow on Days Sampled (MGD): 1605, 1578, 1601
11. Pertinent Site Conditions: No unusual conditions reported. (Production / operation data will be provided upon request.)
12. Test Dates: January 14 - 21, 2003
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: Richard D. Nunley
Phone #: (423) 843-7748

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

20. Lab Contact: Jim Sumner
Phone #: (828) 862-8193

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

22. Notes: Outfall 101, samples collected January 12-17, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (EST) Collected	Date (MM/DD/YY)/ Time (EST) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (EST) Used
101	01/12/03 1350 to 01/13/03 1250	01/14/03 0941	0.7†	<0.10	01/14/03 1517 01/15/03 1500
Intake	01/12/03 1329 to 01/13/03 1229	01/14/03 0941	0.7	<0.10	01/14/03 1517 01/15/03 1500
101	01/14/03 1254 to 01/15/03 1154	01/16/03 0956	0.6†	<0.10	01/16/03 1426 01/17/03 1431
Intake	01/14/03 1248 to 01/15/03 1148	01/16/03 0956	0.3	<0.10	01/16/03 1426 01/17/03 1431
101	01/16/03 1301 to 01/17/03 1201	01/18/03 1000	0.7†	<0.10	01/18/03 1430 01/19/03 1502 01/20/03 1436
Intake	01/16/03 1254 to 01/17/03 1154	01/18/03 1000	0.2	<0.10	01/18/03 1430 01/19/03 1502 01/20/03 1436

*TRC = Total Residual Chlorine
†Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival

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

Aliquots of Outfall 101 and Intake samples were UV-treated through a 40-watt Rainbow Lifeguard® UV Sterilizer for 2 minutes.

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatic BioSystems, Inc.	In-house Cultures
2. Age:	24.0-27.0 hours old	< 24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6) Test Initiation: (Date/Time)		
Outfall 101	01/14/03-1450 EST	01/14/03-1517 EST
UV Treated Outfall 101	01/14/03-1420 EST	
7) Test Termination: (Date/Time)		
Outfall 101	01/21/03-1440 EST	01/21/03-1504 EST
UV Treated Outfall 101	01/21/03-1423 EST	
8) Test Temperature: Outfall 101:	Mean =24.8 °C (24.4-25.4°C)	Mean = 24.8°C (24.3-25.6°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.7°C (24.3-25.3°C)	

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

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted January 14 -21, 2003 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22%	100	98	98	98	98	98	95
43.9%	100	100	100	100	100	100	98
72%	100	100	100	100	100	100	100
100%	100	100	98	90	85	85	83
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.688†	0.580	0.620	0.676	0.641
10.98%	0.626	0.625	0.591	0.671	0.628
22%	0.624	0.703	0.707	0.633	0.667
43.9%	0.560	0.568	0.606	0.648	0.596
72%	0.627	0.561	0.652	0.677	0.629
100%	0.181	0.693	0.665	0.560	0.525
Intake	0.508	0.580	0.718	0.681	0.622

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

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

†One animal missing. Replicate was initiated with 9 animals for statistical analysis.

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* (Genus species) Chronic 7-day Toxicity Test. (Type / Duration)
Conducted January 14 - 21, 2003 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	29	35	32	36	34	36	38	35	32	34	34.1
10.98%	36	36	33	37	35	34	42	34	39	37	36.3
22%	33	40	40	39	38	36	39	39	35	32	37.1
43.9%	41	37	34	41	40	40	38	39	33	36	37.9
72%	40	38	44	39	36	37	40	42	45	40	40.1
100%	42	42	40	38	40	38	39	37	43	39	39.8
Intake	37	34	40	40	40	34	34	37	37	39	37.2

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

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

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

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

Conducted January 14 - 21, 2003 using effluent from UV Treated Outfall 101.

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

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.532	0.686	0.720	0.603	0.635
10.98%	0.759	0.626	0.689	0.644	0.680
22%	0.664	0.650	0.653	0.645	0.653
43.9%	0.702	0.576	0.556	0.634	0.617
72%	0.741	0.608	0.661	0.660	0.668
100%	0.624	0.706	0.686	0.619	0.659
Intake	0.699	0.632	0.652	0.669	0.663

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

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

Reference Toxicant Test Results (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	January 14, 2003	1400	7-days	KCl	607.9 mg/L
Ceriodaphnia dubia	January 7, 2003	1200	7-days	NaCl	962.4 mg/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, January 14-21, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.5 24.4 - 24.7	24.9 24.6 - 25.3	7.8 7.6 - 8.0	7.4 6.4 - 8.1	8.13 8.06 - 8.19	7.84 7.62 - 8.11	295 278 - 308	62 60 - 64	85 84 - 86	- - -
	10.98%	24.6 24.4 - 24.8	24.9 24.6 - 25.3	7.9 7.5 - 8.5	7.2 6.2 - 8.0	8.15 8.05 - 8.22	7.81 7.58 - 8.03	289 278 - 298	- - -	- - -	- - -
	22%	24.6 24.4 - 24.8	24.9 24.6 - 25.4	8.0 7.5 - 8.5	7.2 6.3 - 8.1	8.15 8.07 - 8.20	7.81 7.61 - 8.08	279 266 - 288	- - -	- - -	- - -
	43.9%	24.6 24.4 - 24.8	24.9 24.6 - 25.4	8.1 7.5 - 8.6	7.4 6.3 - 8.2	8.14 8.07 - 8.19	7.84 7.64 - 8.09	259 246 - 266	- - -	- - -	- - -
	72%	24.7 24.4 - 25.0	24.9 24.6 - 25.4	8.2 7.9 - 8.6	7.4 6.5 - 8.1	8.14 8.08 - 8.19	7.86 7.67 - 8.16	231 220 - 240	- - -	- - -	- - -
	100%	24.7 24.4 - 25.2	24.9 24.6 - 25.4	8.3 7.8 - 8.6	7.5 6.8 - 8.0	8.14 8.07 - 8.18	7.93 7.75 - 8.22	203 196 - 213	71 68 - 73	88 86 - 89	<0.10 <0.10 - <0.10
	Intake	24.6 24.4 - 24.9	24.9 24.6 - 25.4	8.5 8.2 - 8.8	7.6 6.9 - 8.3	8.12 8.01 - 8.19	7.91 7.72 - 8.18	203 193 - 214	72 70 - 74	81 80 - 82	<0.10 <0.10 - <0.10
Ceriodaphnia dubia	Control	24.5 24.3 - 24.7	25.0 24.8 - 25.3	7.8 7.6 - 8.0	8.1 7.8 - 8.3	8.13 8.06 - 8.19	8.18 8.14 - 8.23	295 278 - 308	62 60 - 64	85 84 - 86	- - -
	10.98%	24.6 24.5 - 24.6	25.0 24.8 - 25.3	7.9 7.5 - 8.5	8.1 7.9 - 8.3	8.15 8.05 - 8.22	8.19 8.16 - 8.23	289 278 - 298	- - -	- - -	- - -
	22%	24.6 24.5 - 24.7	25.0 24.8 - 25.3	8.0 7.5 - 8.5	8.2 8.0 - 8.3	8.15 8.07 - 8.20	8.21 8.16 - 8.26	279 266 - 288	- - -	- - -	- - -
	43.9%	24.7 24.5 - 24.9	25.0 24.8 - 25.4	8.1 7.5 - 8.6	8.2 8.0 - 8.3	8.14 8.07 - 8.19	8.21 8.16 - 8.24	258 246 - 266	- - -	- - -	- - -
	72%	24.8 24.5 - 25.1	25.0 24.8 - 25.3	8.2 7.9 - 8.6	8.2 8.0 - 8.3	8.14 8.08 - 8.19	8.26 8.21 - 8.31	231 220 - 240	- - -	- - -	- - -
	100%	24.9 24.4 - 25.6	25.0 24.8 - 25.3	8.3 7.8 - 8.6	8.2 7.8 - 8.4	8.14 8.07 - 8.18	8.28 8.22 - 8.30	203 196 - 213	71 68 - 73	88 86 - 89	<0.10 <0.10 - <0.10
	Intake	24.7 24.4 - 24.9	25.0 24.8 - 25.3	8.5 8.2 - 8.8	8.1 8.0 - 8.3	8.12 8.01 - 8.19	8.26 8.22 - 8.30	203 193 - 214	72 70 - 74	81 80 - 82	<0.10 <0.10 - <0.10

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, January 14-21, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24 5 24 3 - 24 8	24.8 24 5 - 25 1	8.3 8 1 - 8 6	7.7 6 9 - 8 4	8.11 8.03 - 8 17	7 87 7 66 - 8 08	299 286 - 309	62 60 - 64	85 84 - 86	
	10.98%	24 6 24 4 - 24 8	24 8 24 5 - 25 1	8.3 8 1 - 8 6	7 4 6 5 - 8 2	8.11 8 02 - 8 18	7 85 7 63 - 8 07	293 283 - 300			
	22%	24 6 24 3 - 24 8	24 8 24 4 - 25.1	8 2 7.9 - 8 6	7 5 6 8 - 8 2	8.10 8 04 - 8 18	7.86 7 66 - 8 07	281 273 - 286			
	43.9%	24 6 24 4 - 24 9	24.8 24 4 - 25 1	8 2 7 8 - 8 5	7 6 6 9 - 8.3	8.10 8 04 - 8 18	7.87 7 66 - 8 07	260 254 - 264			
	72%	24 7 24.5 - 25.1	24 8 24 4 - 25 1	8.2 7 8 - 8 5	7 6 6 9 - 8 3	8.11 8 05 - 8.18	7 87 7.67 - 8 09	231 226 - 235			
	100%	24.7 24 5 - 25 3	24 8 24 4 - 25 1	8 1 7 8 - 8 5	7 6 6 9 - 8.4	8 11 8 04 - 8 18	7.90 7 70 - 8 13	203 198 - 209	71 68 - 73	88 86 - 89	< 0.10 < 0 10 - < 0 10
	Intake	24 6 24 4 - 24 9	24 8 24 4 - 25.1	8 2 7 8 - 8 6	7.7 6 9 - 8 6	8.10 8 03 - 8 18	7.91 7 71 - 8 10	202 197 - 207	72 70 - 74	81 80 - 82	< 0.10 < 0 10 - < 0.10

SUMMARY / CONCLUSIONS

Outfall 101, samples collected January 12-17, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL polypropylene beakers, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

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

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

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

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

3. Temperature was measured using EPA Method 170.1.

4. Dissolved oxygen was measured using EPA Method 360.1.

5. The pH was measured EPA Method 150.1.

6. Conductance was measured EPA Method 120.1.

7. Alkalinity was measured using EPA Method 310.1.

8. Total Hardness was measured EPA Method 130.2.

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

QUALITY ASSURANCE

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

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

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1. NPDES Permit No. TN 0026450

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

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

Sequoyah Nuclear Plant Biomonitoring
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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-January 17, 2003

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
03/12/1998	0.016	-	-	-	-	-	-
03/13/1998	0.015	-	-	-	-	-	-
03/14/1998	0.013	-	-	-	-	-	-
03/15/1998	0.030	-	-	-	-	-	-
03/16/1998	0.013	-	-	-	-	-	-
03/17/1998	0.020	-	-	-	-	-	-
03/18/1998	0.018	-	-	-	-	-	-
09/08/1998	0.015	-	0.014	0.005	-	-	0.021
09/09/1998	0.003	-	0.031	0.011	-	-	-
09/10/1998	0.014	-	0.060	0.021	-	-	-
09/11/1998	0.013	-	0.055	0.019	-	-	-
09/12/1998	< 0.001	-	0.044	0.015	-	-	-
09/13/1998	< 0.001	-	0.044	0.015	-	-	-
09/14/1998	0.008	-	0.044	0.015	-	-	-
02/22/1999	< 0.001	-	-	-	-	-	-
02/23/1999	0.005	-	-	-	-	-	-
02/24/1999	0.009	-	-	-	-	-	-
02/25/1999	0.012	-	-	-	-	-	-
02/26/1999	0.008	-	-	-	-	-	-
02/27/1999	< 0.001	-	-	-	-	-	-
02/28/1999	< 0.001	-	-	-	-	-	-
08/18/1999	-	0.015	0.069	0.024	0.006	-	-
08/19/1999	-	0.012	0.068	0.024	-	-	-
08/20/1999	-	0 023	0.070	0.024	-	0.120	-
08/21/1999	-	0.022	0.068	0.024	-	-	-
08/22/1999	-	0.022	0.068	0.024	-	-	-
08/23/1999	-	0.025	0.068	0.024	0.006	-	-
08/24/1999	-	0.016	0.067	0.023	0.020	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-January 17, 2003

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-January 17, 2003

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
01/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
01/03/2002	-	< 0.0042	0.023	0.014	-	-	-
01/04/2002	-	0.0124	0.024	0.014	0.009	-	-
01/05/2002	-	< 0.0042	-	-	-	-	-
01/06/2002	-	< 0.0042	-	-	-	-	-
01/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
02/24/2002	-	< 0.004	-	-	-	-	-
02/25/2002	-	< 0.004	0.023	0.023	-	-	-
02/26/2002	-	0.0143	0.023	0.023	0.007	-	-
02/27/2002	-	< 0.0041	0.023	0.023	-	-	-
02/28/2002	-	< 0.0041	0.024	0.008	-	-	-
03/01/2002	-	<0.0041	0.024	0.008	-	-	-
05/05/2002	-		-	-	-	-	-
05/06/2002	-		0.058	0.02	0.014	-	-
05/07/2002	-		0.058	0.02	0.015	-	-
05/08/2002	-		0.056	0.019	-	-	-
05/09/2002	-		0.057	0.02	0.014	-	-
05/10/2002	-		0.056	0.019	-	-	-
08/04/2002		<0.0058					
08/05/2002		<0.0058	0.053	0.018			0.025
08/06/2002		0.0092	0.053	0.018			
08/07/2002		<0.0107	0.055	0.019	0.007		
08/08/2002		<0.0061	0.055	0.019			
08/09/2002		0.0152	0.054	0.018	0.008		
10/06/2002	-	<0.00497	-	-	-	-	-
10/07/2002	-	0.0153	0.054	0.018	0.009	-	
10/08/2002	-	<0.0092	0.054	0.018	0.007	-	-
10/09/2002	-	0.0124	0.053	0.018	0.009	-	-
10/10/2002	-	0.0134	0.054	0 018	0.009	-	-
10/11/2002	-	<0.0042	0.054	0 018	-	-	-
01/12/2003	-	<0.0035	-	-	-	-	-
01/13/2003	-	<0.006	0.025	0.019	0.009	-	
01/14/2003	-	<0.0118	0.026	0.020		-	-
01/15/2003	-	<0.0063	0.026	0.020	0.009	-	-
01/16/2003	-	<0.0034	0.026	0 020		-	-
01/17/2003	-	<0.0034	0.026	0.009	-	-	-

Sequoyah Nuclear Plant Biomonitoring
January 14 - 21, 2003

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

351 DEPOT STREET
ASHEVILLE. NC 28801

Phone: 828-350-9364

Fax: 256-386-2963

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_ _____

General Comments:

* Custody seals intact. Samples received in good condition
JL

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 Project # 571				
			Start	End			Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appear-ance
SQN-101-TOX	comp	4	1350 1/12/03	1/13/03 1250	2(2.5g)				✓		030114.01	0.7°C	KEK	0941 *	see comments
SQN-INT-TOX	comp	4	1329 1/12/03	1/13/03 1229	1 (2 5g)				✓		030114.02	0.7°C	KEK	0941	↓
															JL

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	1/13/03 1500	Fedex	01-13-03 1500
Fedex	01-14-03 0941	KEKeenan	01-14-03 0941
		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

351 DEPOT STREET
ASHEVILLE. NC 28801

Phone: 828-350-9364

Fax: 256-386-2963

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_____

General Comments:

*Samples received in good condition
Custody seals intact.
JHumber

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 PROJECT 571				
			Start	End			Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appear-ance
SQN-101-TOX	comp	4	1254 1/14/03	1/15/03 1154	2(2.5g)				✓		030116.01	0.6°C	JH	0956	*See COMMENTS
SQN-INT-TOX	comp	4	1248 1/14/03	1/15/03 1148	1 (2.5g)				✓		030116.02	0.3°C	JH	0956	↓
															JH

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	1/15/03 1600	Fedex	01-15-03 1600 ~~01-16-03 0956~~ JH
JS Fedex	01-16-03 0956	JHumber	01-16-03 0956
		JH	

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

351 DEPOT STREET
ASHEVILLE, NC 28801

Phone: 828-350-9364

Fax: 256-386-2963

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_____

General Comments:

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

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	~~1257~~ 1134 1/16/03	1/17/03 ~~1135~~ 1201	2(2 5g)				✓		030118.01	0.7°C	JL	1000	*See COMMENTS
SQN-INT-TOX	comp	4	1254 1/16/03	1/17/03 1154	1 (2 5g)				✓		030118.02	0.2°C	JL	1000	↓
															JL

Project #571

Sample Custody – Fill In From Top Down

Relinquished By (Signature).	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	1/17/03 1600	Fedex	01-17-03 1600
Fedex	01-18-03 1000	J/Lumner ETS	01-18-03 1000
		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

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
01-09-03	1045	Jumper	Fedex	0.1°C	570	030109.12	TVA WCF Acutes Phase III Test #9 FAP		
01-09-03	1045	Jumper	Fedex	0.1°C	570	030109.13	Test # 10 FGD		
01-09-03	1045	Jumper	Fedex	0.1°C	570	030109.14	Test # 11 FAP		
01-09-03	1048	Jumper	Fedex	0.5°C	560	030109.15	Anderson County Sewer Authority	SC	
01-10-03	1056	Jumper	K. Deaver	1.4°C	563	030110.01	RFS Ecusta, Inc	NC	
01-10-03	1130	Jumper	L. Carreiro	3.3°C	562	030110.02	City of Asheville North Fork WTP	NC	
01-10-03	1613	Jumper	M. Ladd	3.0°C	564	030110.03	Test America - Earth Env. Haggie Valley WWTP	NC	
01-10-03	1539	Jumper	D. Ellerbe	1.9°C	565	030110.04	CP&L Asheville Ash Pond	NC	
01-11-03	1002	Jumper	Fedex	0.4°C	560	030111.01	Anderson County Sewer Auth.	SC	
01-11-03	1002	Jumper	Fedex	0.6°C	567	030111.02	Duke Energy Corp. Riverbend SS.	NC	
01-11-03	1002	Jumper	Fedex	0.2°C	568	030111.03	Aquasource, Inc. Briarwood Subdivision	NC	
01-11-03	1936	Jumper	Fedex	0.3°C	558	030111.04	Tritest Inc. Franklin Co. W&S	NC	
01-14-03	0941	KEKeenan	Fedex	0.7°C	571	030114.01	TVA - Sequoyah Nuclear Plant Outfall 101	TN	
01-14-03	0941	KEKeenan	Fedex	0.7°C	571	030114.02	TVA - Sequoyah Nuclear Plant Intake	TN	
01-14-03	0943	KEKeenan	Fedex	1.2°C	572	030114.03	Georgetown Steel Co. LLC Scale Pit Grab	SC	
01-14-03	0943	KEKeenan	Fedex	1.2°C	~~572~~ 573	030114.04	Scale Pit Composite	SC	
01-15-03	1003	KEKeenan	Fedex	1.0°C	574	030115.01	Duke Energy Corp. McGuire Nuclear Station	NC	
01-15-03	1003	KEKeenan	Greyhound	0.4°C	575	030115.02	Three R's MHP	NC	
01-15-03	1004	KEKeenan	Fedex	0.5°C	576	030115.03	Duke Energy Corp. Allen Steam Station	NC	
01-15-03	1026	KEKeenan	D. Wike	0.4°C	577	030115.04	Env. Inc. Bryson City WWTP	NC	
01-16-03	0956	Jumper	Fedex	0.6°C	571	030116.01	TVA - Sequoyah Nuclear Plant Outfall 101	TN	

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
01-16-03	0956	Jlumner	Fedex	0.3°C	571	030116.02	TVA- SEQUOYAH NUCLEAR PLANT INTAKE	TN	
01-18-03	1000	Jlumner	Fedex	0.7°C	571	030118.01	TVA- SEQUOYAH NUCLEAR PLANT OUTFALL 101	TN	
01-18-03	1000	Jlumner	Fedex	0.2°C	571	030118.02	TVA- SEQUOYAH NUCLEAR PLANT INTAKE	TN	
01-18-03	1000	KEKeenan	Fedex	3.2°C	574	030118.03	DUKE ENERGY CORP. McGUIRE NUCLEAR STATION	NC	
01-18-03	1000	KEKeenan	Fedex	0.1°C	576	030118.04	DUKE ENERGY CORP. ALLEN STEAM STATION	NC	
01-18-03	1001	KEKeenan	Greyhound	2.4°C	575	030118.05	THREE R'S HHP	NC	
01-18-03	1023	KEKeenan	A. Wike	2.4°C	577	030118.06	ENV. INC. BAYSON CITY WWTP	NC	
01-20-03	1000	Jlumner	UPS	NA	578	030120.01	COGNIS TEXTILE Co. ADASIL J&S	NC	PRODUCT TEST
01-20-03	1000	Jlumner	UPS	NA	578	030120.02	ADASIL ESF	NC	
01-20-03	1000	Jlumner	UPS	NA	578	030120.03	SYNTERGENT APW	NC	
01-22-03	0953	KEKeenan	Fedex	0.8°C	579	030122.01	PRISM LABS. SOUTH CENTRAL OIL Co.	NC	
01-~~23~~ 24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.01	TVA- WCF ACUTES PHASE III TEST 1 - FGD		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.02	TEST 1 ~~2~~ - FAP		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.03	TEST 4		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.04	TEST 5 #1		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.05	TEST 5 #2		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.06	TEST 5 #3		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.07	TEST 6		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.08	TEST 7		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.09	TEST 3 - #1 w/o N		
01-24-03	1136	KEKeenan	Fedex	0.9°C	580	030124.10	TEST 3 - #2 w/N		

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

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN 0026450
Project #: 571

NONTREATED

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.2	1080	1500	
Diluent volume (mL)	1335.3	1170	841.5	420	0	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	24 HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	01-13-03 1230 TO 1530 MDT	Incubator number:	2
Organism source:	ABS BATCH 01-13-03	*Artemia* lot number:	BG 18096
Transfer bowl information:	pH = 7.96 Temperature = 24.2 °C	Total drying time:	17.25 HOURS
		Date / Time in:	01-21-03 1450
Average transfer volume.	10.4 mL	Date / Time out:	01-22-03 0800
		Oven temperature:	101°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used 101	INTAKE	Analyst
0	01-14-03	—	1530	1450	MHS 01-12-03	030114.01	030114.02	JJ
1	01-15-03	0914	1520	1430	MHS 01-12-03	030114.01	030114.02	JJ
2	01-16-03	0841	1450	1400	MHS 01-12-03	030116.01	030116.02	JJ
3	01-17-03	0908	1510	1356	MHS 01-15-03	030116.01	030116.02	JJ
4	01-18-03	0910	1517	1400	MHS 01-15-03	030118.01	030118.02	JJ
5	01-19-03	0918	1520	1402	MHS 01-18-03	030118.01	030118.02	JJ
6	01-20-03	0837	1500	1400	MHS 01-18-03	030118.01	030118.02	JJ
7	01-21-03			1440	—	—		JJ

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.6411	
Average weight per surviving larvae:	0.6411	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC_{25}	>100%

Species: *Pimephales promelas*

Client: SEQUOYAH- NONTREATED **Date:** 01-14-03

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	9 id
3	10	10	10	10	10	10	10	10	10	10	10	9
4	10	10	10	10	10	10	10	10	10	10	10	9
5	10	10	10	10	10	10	10	10	10	10	10	9
6	10	10	10	10	10	10	10	10	10	10	10	9
7	9 MISSING	10	10	10	10	10	10	1 SMALL 10	9 id	10	10	9
A = Pan weight (mg) Black	14.777	14.647	15.049	14.832	14.908	15.076	15.097	14.990	14.854	14.881	14.855	15.089
B = Pan + Larvae weight (mg)	20.97	20.45	21.25	21.59	20.97	21.33	21.01	21.70	21.07	21.72	21.92	21.37
Larvae weight (mg) = A – B	6.193	5.803	6.201	6.758	6.262	6.254	5.913	6.710	6.236	7.029	7.065	6.331

Calculations and data reviewed dl

Comments:

Species: *Pimephales promelas*

Client: SEQUOYAH - NONTREATED

Date: 01-14-03

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	9 1d	10	10	10
4	10	10	10	10	10	10	10	10	6 3d	10	10	10
5	10	10	10	10	10	10	10	10	4 2d	10	10	10
6	10	10	10	10	10	10	10	10	4	10	10	10
7	9 1d	10	1 SMALL 10	10	10	10	10	10	3 1d	10	10	1 SMALL 10
A = Pan weight (mg)	15.150	14.690	14.970	14.849	14.819	15.148	14.992	14.714	15.013	14.909	15.340	14.660
B = Pan + Larvae weight (mg)	20.75	20.37	21.04	21.35	21.09	20.76	21.51	21.48	16.82	*21.92	21.99	20.27
Larvae weight (mg) = A – B	5.600	5.680	6.064	6.481	6.271	5.612	6.518	6.766	1.807	6.931	6.650	5.604

Calculations and data reviewed JH

Comments: * Pathogenic growth observed. Dead minnows were heavily fungused.

Species: *Pimephales promelas*

Client: SEQUOYAH - NONTREATED

Date: 01-14-03

Survival and Growth Data

Day	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	1 SMALL 10	10	10	10
A = Pan weight (mg)	15.017	14.685	15.129	14.716
B = Pan + Larvae weight (mg)	20.10	20.48	22.31	21.53
Larvae weight (mg) = A – B	5.083	5.795	7.181	6.814

Calculations and data reviewed: JH

Comments:

Environmental Testing Solutions, LLC

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

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

Client: TVA Sequoyah Nuclear Plant, Nontreated

Test dates: January 14 - 21, 2003

Project number: 571

Reveiwed by: J Turner

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	9	9	14 777	20 970	6 193	0,6881	100 0	0 6411	7 8	Not applicable
	B	10	10	14 647	20 450	5 803	0 5803				
	C	10	10	15 049	21 250	6 201	0 6201				
	D	10	10	14 832	21 590	6 758	0 6758				
10 98%	E	10	10	14 708	20 970	6 262	0 6262	100 0	0 6285	5 2	2 0
	F	10	10	15 076	21 330	6 254	0 6254				
	G	10	10	15 097	21 010	5 913	0 5913				
	H	10	10	14 990	21.700	6 710	0 6710				
22%	I	10	9	14 834	21 070	6 236	0 6236	95 0	0 6665	6 6	-4 0
	J	10	10	14 691	21 720	7 029	0 7029				
	K	10	10	14 855	21 920	7 065	0 7065				
	L	10	9	15 039	21 370	6 331	0 6331				
43 9%	M	10	9	15 150	20 750	5 600	0 5600	97 5	0 5956	6 8	7.1
	N	10	10	14 690	20 370	5 680	0 5680				
	O	10	10	14 976	21 040	6 064	0 6064				
	P	10	10	14 869	21 350	6 481	0 6481				
72%	Q	10	10	14 819	21 090	6 271	0 6271	100 0	0 6292	7 9	1 9
	R	10	10	15 148	20 760	5 612	0 5612				
	S	10	10	14 992	21 510	6 518	0 6518				
	T	10	10	14 714	21 480	6 766	0 6766				
100%	U	10	3	15 013	16 820	1 807	0 1807	82 5	0.5248	45 0	18 1
	V	10	10	14 989	21 920	6 931	0 6931				
	W	10	10	15 340	21 990	6 650	0 6650				
	X	10	10	14 666	20 270	5 604	0 5604				
100% Intake	Y	10	10	15 017	20 100	5 083	0 5083	100 0	0 6218	15 4	3 0
	Z	10	10	14 685	20 480	5 795	0 5795				
	AA	10	10	15 129	22 310	7 181	0 7181				
	BB	10	10	14 716	21 530	6 814	0 6814				

Outfall 101:
Dunnett's MSD value: 0.1781
PMSD 27.8

Intake:
Dunnett's MSD value: 0 105
PMSD 16 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 17 9% from the control (determined through reference toxicant testing)
Lower PMSD bound determined by USEPA (10th percentile) = 9 4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date	1/14/03	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date	1/21/03	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 6881	0 5803	0 6201	0 6758
10 98	0 6262	0 6254	0.5913	0 6710
22	0 6236	0 7029	0 7065	0 6331
43.9	0 5600	0.5680	0 6064	0.6481
72	0 6271	0.5612	0 6518	0 6766
100	0 1807	0.6931	0 6650	0.5604

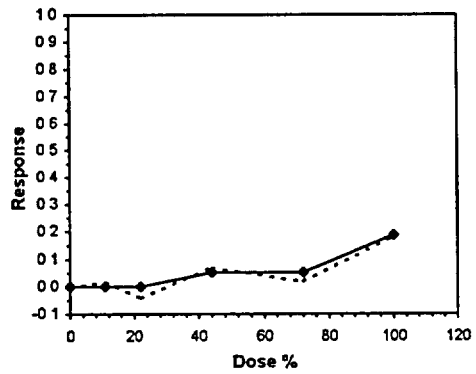
			Transform Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0 6411	1 0000	0 6411	0 5803	0 6881	7.826	4			0 6454	1 0000
10 98	0 6285	0 9803	0 6285	0.5913	0 6710	5 201	4	17 00	10 00	0 6454	1 0000
22	0 6665	1 0397	0.6665	0 6236	0 7065	6 643	4	22.00	10 00	0 6454	1 0000
43.9	0 5956	0 9291	0.5956	0.5600	0 6481	6 787	4	13 00	10 00	0 6124	0 9489
72	0 6292	0 9814	0 6292	0.5612	0 6766	7 886	4	17 00	10 00	0 6124	0 9489
100	0 5248	0 8186	0.5248	0 1807	0 6931	45 045	4	16 00	10 00	0.5248	0 8132

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0 01)	0 785154283	0 884	-2 002403144	8.376526546
Bartlett's Test indicates unequal variances (p = 1 69E-03)	19 2979126	15 08631706		

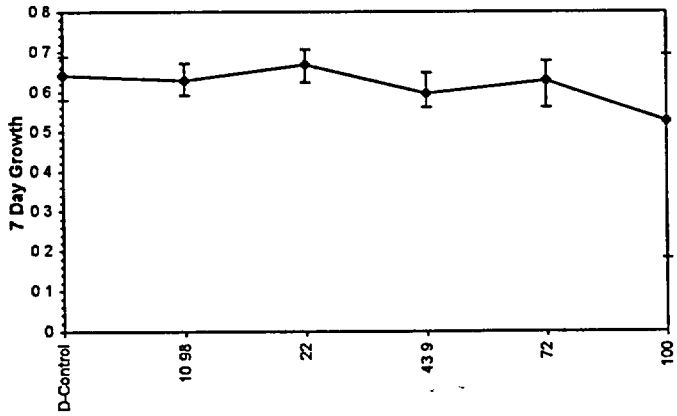
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	43 441			
IC10	82 093			
IC15	92 407			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



sqn_01-14-03data.xls

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date	1/14/03	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date:	1/21/03	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	1 0000
10.98	1 0000	1 0000	1 0000	1 0000
22	0 9000	1 0000	1 0000	0 9000
43 9	0.9000	1 0000	1 0000	1 0000
72	1 0000	1 0000	1 0000	1 0000
100	0.3000	1 0000	1 0000	1 0000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1 0000	1 0000	1 4098	1 4033	1 4120	0.307	4		
10 98	1 0000	1 0000	1 4120	1 4120	1 4120	0 000	4	20 00	10 00
22	0 9500	0 9500	1.3305	1 2490	1 4120	7 072	4	15 00	10 00
43 9	0 9750	0 9750	1.3713	1 2490	1 4120	5 942	4	17.50	10 00
72	1 0000	1 0000	1 4120	1 4120	1 4120	0 000	4	20 00	10 00
100	0 8250	0 8250	1 2039	0 5796	1 4120	34 569	4	17.50	10 00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0 01)	0 671914518	0 884	-2 675882645	11.2806056
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only				Larval Fish Growth and Survival Test-7 Day Growth		
Start Date	1/14/03	Test ID	PpFRCR		Sample ID	TVA, Sequoyah Nuclear Plant
End Date	1/21/03	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 6881	0.5803	0 6201	0 6758
10 98	0 6262	0 6254	0.5913	0 6710
22	0 6236	0 7029	0 7065	0 6331
43 9	0 5600	0 5680	0 6064	0 6481
72	0 6271	0 5612	0 6518	0 6766
100	0 1807	0 6931	0 6650	0 5604

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0 6411	1 0000	0 6411	0 5803	0 6881	7 826	4			
10 98	0 6285	0 9803	0 6285	0 5913	0 6710	5.201	4	0 171	2 410	0 1781
22	0 6665	1 0397	0 6665	0 6236	0 7065	6 643	4	-0 344	2 410	0 1781
43 9	0 5956	0 9291	0 5956	0 5600	0 6481	6 787	4	0 615	2 410	0 1781
72	0 6292	0 9814	0 6292	0 5612	0 6766	7 886	4	0 161	2 410	0 1781
100	0.5248	0 8186	0 5248	0 1807	0 6931	45 045	4	1.574	2 410	0 1781

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0 01)	0 785154283	0 884	-2.002403144	8.376526546
Bartlett's Test indicates unequal variances (p = 1 69E-03)	19 2979126	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 178087756	0 277794306	0 00978056	0 01092104	0.504879713	5, 18

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date	1/14/03	Test ID	PpFRCR	Sample ID	TVA, Sequoyah Nuclear Plant, Intake
End Date	1/21/03	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 6881	0 5803	0 6201	0 6758
100	0.5083	0 5795	0 7181	0 6814

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0 6411	1 0000	0 6411	0 5803	0 6881	7 826	4			
100	0 6218	0 9700	0 6218	0 5083	0 7181	15.396	4	0.356	1 943	0 1050

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 963339746	0 749	-0 281148021	-0 961324515
F-Test indicates equal variances (p = 0 32)	3 641183138	47 46834564		

Hypothesis Test (1-tail, 0 05)

Homoscedastic t Test indicates no significant differences

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

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN 0026450
Project #: 571

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	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	<24-HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	01-14-03 0816 TO 1209	Incubator number and shelf location:	3 C
Organism source:	01-07-03 A-D	YCT batch: ABS	12-24-02
Transfer bowl information:	pH = 8.21 Temperature = 25.1°C	*Selenastrum* batch: ABS	12-24-02

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used 101	INTAKE	Analyst
0	01-14-03	1517	MHS 01-12-03	030114.01	030114.02	JJ
1	01-15-03	1500	MHS 01-12-03	030114.01	030114.02	JJ
2	01-16-03	1426	MHS 01-12-03	030116.01	030116.02	JJ
3	01-17-03	1431	MHS 01-15-03	030116.01	030116.02	JJ
4	01-18-03	1430	MHS 01-15-03	030118.01	030118.02	JJ
5	01-19-03	1502	MHS 01-18-03	030118.01	030118.02	JJ
6	01-20-03	1436	MHS 01-18-03	030118.01	030118.02	JJ
7	01-21-03	1504	—	—	JJ	JJ

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:	~~34.35~~ 34.1	≥ 15.0 offspring/female	ChV	>100%
% CV:	~~7.1%~~ 7.5%	< 40.0 %	IC25	> 100%

Corrected 01-28-03 JJ

Species: *Ceriodaphnia dubia*

Client: SEQUOYAH - NONTREATED

Date: 01-14-03

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	5	5	4	6	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	12	9	13	10	13	12	13	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	0	0	16	0	19	0	0	0	1*
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	18	18	2*	19	0	20	17	16	18
Total young produced		29	35	32	36	34	36	38	35	~~34~~ 32	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

* Carry over

* Carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	~~34.3~~ 34.1

Corrected 01-28-03 JS

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	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	5	5	6	4	6	5	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	10	11	10	12	15	12	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	18	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	18	18	21	19	0	21	17	22	19
Total young produced		36	36	33	37	35	34	42	34	39	37
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	36.3
% Reduction from Control:	5.8%

Species: *Ceriodaphnia dubia*

Client: SEQUOYAH - NONTREATED **Date:** 01-14-03

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	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	6	6	4	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	13	15	14	13	10	14	14	13	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	18	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	22	20	19	19	22	20	20	0	16
Total young produced		33	40	40	39	38	36	39	39	35	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	37.1
% Reduction from Control:	-8.2%

CONCENTRATION: 43.9%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	6	5	5	4	5	5	6	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	11	12	14	13	15	11	13	13	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	19	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	23	20	17	22	23	1*	22	20	16	19
Total young produced		41	37	34	41	40	40	38	39	33	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carryover

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	37.9
% Reduction from Control:	-10.5%

Species: *Ceriodaphnia dubia*

Client: SEQUOYAH - NONTREATED **Date:** 01-14-03

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	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	6	5	5	5	7	6	5	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	16	13	11	14	15	13	16	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	18	18	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	22	19	22	21	20	0	0	23	24	20
Total young produced		40	38	44	39	36	37	40	42	45	40
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	40.1
% Reduction from Control:	-16.9%

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	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	5	4	6	5	6	6	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	13	14	16	11	13	14	12	16	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	20	19	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	22	24	21	18	23	0	0	19	22	20
Total young produced		42	42	40	38	40	38	39	37	43	39
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	39.8
% Reduction from Control:	-16.0%

Species: *Ceriodaphnia dubia*

Client: SEQUOYAH - NONTREATED **Date:** 01-14-03

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	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	5	5	6	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	16	15	16	13	13	11	15	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	1*	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	20	15	19	20	18	17	17	21	17	22
Total young produced		37	34	40	40	40	34	34	37	37	39
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* CARRY OVER

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	37.2
% Reduction from Control:	-8.5%

Environmental Testing Solutions, LLC

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

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

Client: TVA Sequoyah Nuclear Plant, Nontreated
Test dates: January 14 - 21, 2003
Project number: 571

Reveiwed by: [illegible]

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	29	35	32	36	34	36	38	35	32	34	100	34.1	7.5	Not applicable
10.98%	36	36	33	37	35	34	42	34	39	37	100	36.3	7.4	-6.5
22%	33	40	40	39	38	36	39	39	35	32	100	37.1	7.9	-8.8
43.9%	41	37	34	41	40	40	38	39	33	36	100	37.9	7.5	-11.1
72%	40	38	44	39	36	37	40	42	45	40	100	40.1	7.2	-17.6
100%	42	42	40	38	40	38	39	37	43	39	100	39.8	5.0	-16.7
100% Intake	37	34	40	40	40	34	34	37	37	39	100	37.2	6.8	-9.1

Outfall 101:
Dunnett's MSD value: 2.725
PMSD: 8.0

Intake:
Dunnett's MSD value: 1.932
PMSD: 5.7

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 Ceriodaphnia reproduction by 10.8% 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	1/14/03	Test ID:	CdFRCR	Sample ID	TVA Sequoyah Nuclear Plant
End Date:	1/21/03	Lab ID:	ETS-Env Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date		Protocol:	EPAF 91-EPA Freshwater	Test Species	CD-Cenodaphnia dubia
Comments					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	29 000	35 000	32.000	36.000	34 000	36 000	38 000	35 000	32.000	34 000
10 98	36 000	36 000	33 000	37 000	35 000	34 000	42 000	34 000	39 000	37 000
22	33 000	40 000	40 000	39 000	38 000	36 000	39 000	39 000	35 000	32 000
43 9	41 000	37 000	34 000	41 000	40 000	40 000	38 000	39 000	33 000	36 000
72	40 000	38 000	44 000	39 000	36 000	37 000	40 000	42 000	45 000	40 000
100	42 000	42 000	40 000	38 000	40 000	38 000	39 000	37 000	43 000	39 000

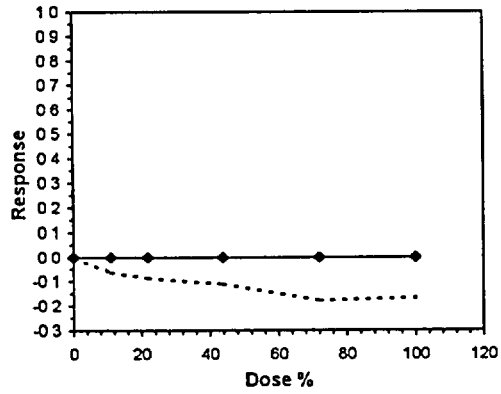
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	34 100	1 0000	34 100	29 000	38 000	7.502	10				37 550	1 0000
10 98	36 300	1 0645	36.300	33 000	42 000	7 352	10	-1 846	2.287	2 725	37 550	1 0000
22	37 100	1 0880	37 100	32 000	40 000	7 879	10	-2 518	2.287	2 725	37 550	1 0000
43 9	37 900	1 1114	37 900	33 000	41 000	7 509	10	-3 189	2 287	2 725	37 550	1 0000
72	40 100	1 1760	40 100	36 000	45 000	7 194	10	-5 036	2 287	2 725	37.550	1 0000
100	39 800	1 1672	39 800	37 000	43 000	4 997	10	-4 784	2 287	2 725	37.550	1 0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0 01)	0 826381624	1 035	-0 091994285	-0.52674914
Bartlett's Test indicates equal variances (p = 0 90)	1 604416966	15 08631706		

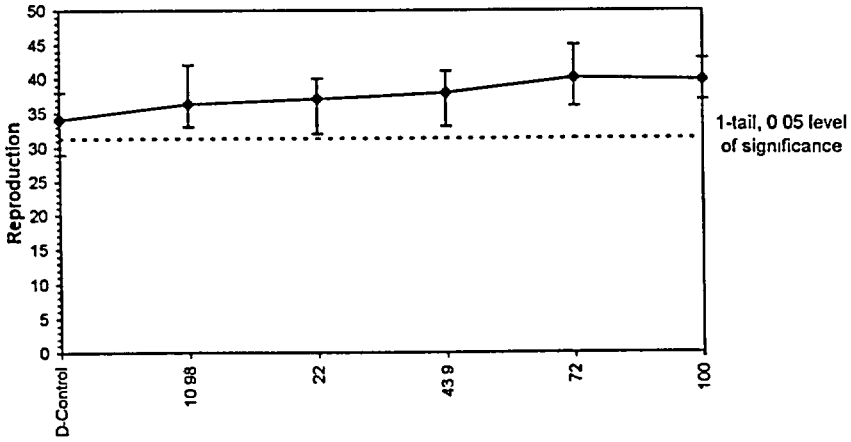
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test -	100	>100		1	2 724522394	0 079898017	50 71	7 098148148	3 4E-05	5, 54

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



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Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date	1/14/03	Test ID	CdFRCR	Sample ID	TVA, Sequoyah Nuclear Plant, Intake
End Date	1/21/03	Lab ID	ETS-Env Testing Solutions	Sample Type	DMR-Discharge Monitoring Report
Sample Date		Protocol	EPAF 91-EPA Freshwater	Test Species	CD-Cenodaphnia dubia
Comments					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	29 000	35 000	32 000	36 000	34 000	36 000	38 000	35 000	34 000	34 000
100	37 000	34 000	40 000	40 000	40 000	34 000	34 000	37 000	37 000	39 000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	34 300	1 0000	34 300	29 000	38 000	7 148	10			
100	37 200	1 0845	37.200	34 000	40 000	6 801	10	-2.603	1 734	1 932

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 940015912	0 868	-0 519383606	-0.338943619
F-Test indicates equal variances (p = 0 93)	1 064695001	6 54108572		

Hypothesis Test (1-tail, 0 05)

Homoscedastic t Test indicates no significant differences

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

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN 0026450
Project #: 571
UV-TREATED

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	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	PURPLE
Date and times organisms were born between:	01-13-03 1230 TO 1530 HDT	Incubator number.	2
Organism source:	ABS BATCH 01-13-03	*Artemia* lot number:	B61809Q
Transfer bowl information:	pH = 7.96 Temperature = 24.2 °C	Total drying time:	17.25-HOURS
		Date / Time in:	01-21-03 1450
Average transfer volume:	10.4 ml	Date / Time out:	01-22-03 0800
		Oven temperature:	101°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used 101	INTAKE	Analyst
0	01-14-03	—	1530	1420	MHS 01-12-03	030114.01	030114.02	JH
1	01-15-03	0914	1520	1404	MHS 01-12-03	030114.01	030114.02	JH
2	01-16-03	0841	1450	1341	MHS 01-12-03	030116.01	030116.02	JH
3	01-17-03	0908	1510	1332	MHS 01-15-03	030116.01	030116.02	JH
4	01-18-03	0910	1517	1330	MHS 01-15-03	030118.01	030118.02	JH
5	01-19-03	0918	1520	1343	MHS 01-18-03	030118.01	030118.02	JH
6	01-20-03	0837	1500	1328	MHS 01-18-03	030118.01	030118.02	JH
7	01-21-03			1423	—	—	JH	JH

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.6354	
Average weight per surviving larvae:	0.6354	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC_{25}	>100%

Species: *Pimephales promelas*

Client: SEQUOYAH - UV TREATED

Date: 01-14-03

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Porpe	14.696	15.096	14.874	15.059	16.264	14.686	14.980	14.911	14.847	14.904	14.906	15.302
B = Pan + Larvae weight (mg)	20.02	21.96	22.07	21.09	23.79	20.95	21.87	21.35	21.49	21.40	21.44	21.75
Larvae weight (mg) = A – B	5.324	6.864	7.196	6.031	7.586	6.264	6.890	6.439	6.643	6.496	6.534	6.448

Calculations and data reviewed

Comments:

Species: *Pimephales promelas*

Client: SEQUOYAH - UV TREATED **Date:** 01-14-03

Survival and Growth Data

Day	43%				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	9'd	10	10	10
7	1 SMALL 10	10	10	1 SMALL 10	10	10	10	1 SMALL 10	9	10	10	1 SMALL 10
A = Pan weight (mg)	14.984	14.982	14.743	14.643	14.900	14.668	14.689	14.824	15.112	15.159	15.137	14.725
B = Pan + Larvae weight (mg)	22.00	20.74	20.30	20.98	22.31	20.75	21.30	21.42	21.35	22.22	22.00	20.91
Larvae weight (mg) = A – B	7.016	5.758	5.557	6.337	7.410	6.082	6.611	6.596	6.238	7.061	6.863	6.185

Calculations and data reviewed

Comments:

Species: *Pimephales promelas*

Client: SEQUOYAH - UV TREATED **Date:** 01-14-03

Survival and Growth Data

Day	INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	14.811	15.185	14.822	14.977
B = Pan + Larvae weight (mg)	21.80	21.50	21.34	21.67
Larvae weight (mg) = A – B	6.989	6.315	6.518	6.693

Calculations and data reviewed: JH

Comments:

Environmental Testing Solutions, LLC

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

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

Client: TVA Sequoyah Nuclear Plant, UV Treated

Test dates: January 14 -21, 2003

Project number: 571

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	14 696	20 020	5 324	0 5324	100 0	0 6354	13.3	Not applicable
	B	10	10	15 096	21 960	6 864	0 6864				
	C	10	10	14 874	22 070	7.196	0 7196				
	D	10	10	15.059	21 090	6 031	0 6031				
10 98%	E	10	10	16 204	23.790	7 586	0.7586	100 0	0 6795	8.7	-6.9
	F	10	10	14 686	20 950	6 264	0 6264				
	G	10	10	14 980	21 870	6.890	0 6890				
	H	10	10	14 911	21.350	6 439	0 6439				
22%	I	10	10	14 847	21.490	6 643	0 6643	100 0	0 6530	1.3	-2.8
	J	10	10	14 904	21.400	6 496	0 6496				
	K	10	10	14 906	21 440	6 534	0 6534				
	L	10	10	15 302	21.750	6 448	0.6448				
43.9%	M	10	10	14 984	22 000	7 016	0 7016	100 0	0 6167	10 6	2.9
	N	10	10	14 982	20 740	5.758	0 5758				
	O	10	10	14.743	20 300	5.557	0 5557				
	P	10	10	14 643	20 980	6 337	0 6337				
72%	Q	10	10	14 900	22 310	7 410	0.7410	100 0	0 6675	8.2	-5.1
	R	10	10	14 668	20 750	6 082	0 6082				
	S	10	10	14 689	21.300	6 611	0 6611				
	T	10	10	14.824	21 420	6 596	0 6596				
100%	U	10	9	15.112	21 350	6.238	0 6238	97.5	0 6587	6.7	-3.7
	V	10	10	15.159	22 220	7.061	0 7061				
	W	10	10	15.137	22 000	6.863	0 6863				
	X	10	10	14.725	20 910	6.185	0 6185				
100% Intake	Y	10	10	14 811	21 800	6.989	0 6989	100 0	0 6629	4 3	-4.3
	Z	10	10	15 185	21 500	6 315	0 6315				
	AA	10	10	14 822	21.340	6 518	0 6518				
	BB	10	10	14 977	21.670	6 693	0 6693				

Outfall 101:
Dunnett's MSD value: 0 0982
PMSD: 15 5

Intake:
Dunnett's MSD value. 0 0865
PMSD: 13 6

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 17.9% from the control (determined through Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests.

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date	1/14/03	Test ID:	PpFRCR	Sample ID	TVA, Sequoyah Nuclear Plant, UV-Treated
End Date	1/21/03	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	0.5324	0 6864	0 7196	0 6031
10 98	0 7586	0 6264	0 6890	0 6439
22	0 6643	0 6496	0 6534	0 6448
43 9	0 7016	0 5758	0.5557	0 6337
72	0 7410	0 6082	0 6611	0 6596
100	0 6238	0 7061	0 6863	0 6185

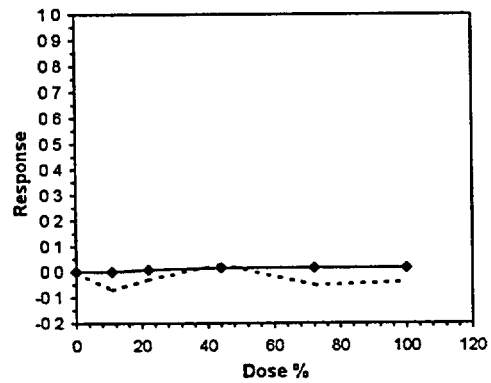
			Transform Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0 6354	1 0000	0 6354	0 5324	0 7196	13.275	4				0 6574	1 0000
10 98	0 6795	1 0694	0 6795	0 6264	0 7586	8 679	4	-1 083	2.410	0 0982	0 6574	1 0000
22	0 6530	1 0278	0 6530	0 6448	0 6643	1 271	4	-0 433	2 410	0 0982	0 6530	0.9933
43 9	0 6167	0 9706	0 6167	0.5557	0 7016	10 629	4	0 458	2 410	0 0982	0 6476	0 9851
72	0 6675	1 0505	0 6675	0 6082	0 7410	8 216	4	-0 788	2 410	0 0982	0 6476	0 9851
100	0 6587	1 0367	0 6587	0 6185	0 7061	6 700	4	-0 572	2 410	0 0982	0 6476	0 9851

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 959238648	0 884	0 156850123	-0 594541763
Bartlett's Test indicates equal variances (p = 0 10)	9 132943153	15 08631706		

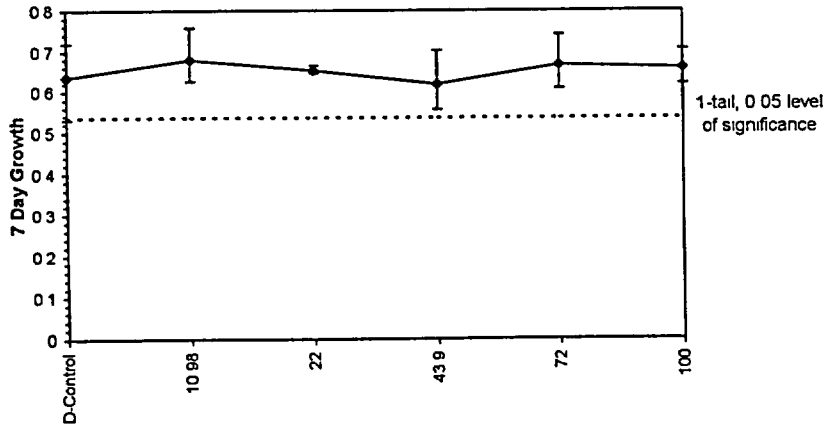
Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0 098173695	0 154512996	0 002049734	0 003318839	0 68807584	5, 18

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 Growth					
Start Date	1/14/03	Test ID	PpFRCR	Sample ID	TVA, Sequoyah Nuclear Plant, Intake UV-Treated
End Date	1/21/03	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 5324	0 6864	0 7196	0 6031
100	0 6989	0 6315	0 6518	0 6693

			Transform Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0 6354	1 0000	0 6354	0.5324	0 7196	13.275	4			
100	0 6629	1 0433	0 6629	0 6315	0 6989	4.308	4	-0 618	1 943	0 0865

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 976053894	0 749	-0.365780657	0 244562207
F-Test indicates equal variances (p = 0 11)	8 725190163	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-821-R-02-013, Method 1000.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated
Test dates: January 14 - 21, 2003
Project number: 571

Mean Temp: 24.8
Min: 24.4
Max: 25.4

Reviewed by: Cw

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)	8.06	8 07	8 19	8.11	8 15	7.74	8 18	7 66	8 09	7 62	8.16	7.68	8.11	8 00
	DO (mg/L)	7.9	8.1	7.7	8 0	7.9	6 9	8 0	6 6	7 8	6 4	7.7	7 6	7.6	7.9
	Conductivity (µmhos/cm)	308		301		303		278		286		284		303	
	Alkalinity (mg/L $CaCO_3$)	64						60				62			
	Hardness (mg/L $CaCO_3$)	84						86				86			
	Temperature (°C)	24 4	25.1	24 4	25.1	24 5	24 7	24 4	24 9	24 4	25.3	24 6	24.6	24.7	24 8
10.98%	pH (SU)	8 05	8 02	8 21	8 03	8.17	7.72	8 22	7.61	8 10	7 58	8 17	7 70	8 12	8 03
	DO (mg/L)	8 5	8 0	8 1	8 0	7.9	6.9	8 0	6 3	7 6	6 2	7.5	7 5	7 8	7.8
	Conductivity (µmhos/cm)	294		298		288		278		286		279		297	
	Temperature (°C)	24 4	25.0	24.5	25.1	24 6	24.7	24 5	24 9	24 5	25.3	24 6	24 6	24.8	24.8
22%	pH (SU)	8 07	8 03	8 20	8 04	8.16	7.66	8 20	7 61	8 10	7 63	8 17	7 65	8 13	8 08
	DO (mg/L)	8 5	8 0	8 1	8.1	8.1	6.5	8 0	6 3	7.7	6 7	7.5	7.3	7.8	7.8
	Conductivity (µmhos/cm)	288		286		278		266		278		272		286	
	Temperature (°C)	24 4	25.0	24.5	25.1	24 6	24 7	24 5	24 9	24 5	25 4	24 6	24.6	24 8	24 8
43.9%	pH (SU)	8 07	8 03	8 19	8 02	8.17	7.72	8.18	7 65	8 09	7 64	8 15	7 72	8 14	8 09
	DO (mg/L)	8 6	8 0	8 1	8.1	8 1	6 9	8.3	6 3	7 8	6 7	7 5	7.3	8 0	8 2
	Conductivity (µmhos/cm)	266		263		257		246		259		254		266	
	Temperature (°C)	24.4	25.0	24 5	25 1	24 7	24.7	24 5	24.9	24.8	25.4	24 6	24 6	24 8	24 8
72%	pH (SU)	8.08	8 03	8 19	8 01	8.16	7.74	8 16	7.69	8 11	7 67	8 13	7.72	8.14	8.16
	DO (mg/L)	8.6	8 0	8 1	8 1	8 1	6 8	8.6	6 6	7.9	6 5	8 0	7.5	8 1	8.1
	Conductivity (µmhos/cm)	235		231		228		220		235		227		240	
	Temperature (°C)	24.4	25 0	24.5	25.1	24 8	24 7	24 5	24 9	25 0	25.4	24.6	24 6	24 8	24 8
100%	pH (SU)	8.07	8.06	8 18	7 99	8 18	7.79	8.14	7.80	8 12	7.75	8 15	7.88	8.15	8.22
	DO (mg/L)	8 5	8.0	8.3	8 0	8 3	7.1	8 6	7.1	8.2	6.8	7.8	7 8	8 2	8 0
	Conductivity (µmhos/cm)	202		201		200		196		208		204		213	
	Alkalinity (mg/L $CaCO_3$)	68				73				71					
	Hardness (mg/L $CaCO_3$)	86				89				89					
	Total Residual Chlorine (mg/L)	<0.10				<0 10				<0 10					
	Temperature (°C)	24 4	25.1	24.5	25.1	24 8	24 7	24 5	24.9	25 2	25.4	24 6	24 6	24 8	24 8
100% Intake	pH (SU)	8 08	8 06	8 19	8 04	8 17	7.79	8 11	7.72	8 11	7.72	8 01	7 86	8 14	8.18
	DO (mg/L)	8.6	7.9	8 2	8 1	8 2	7 0	8.8	6.9	8.5	6 9	8 6	8 0	8 4	8.3
	Conductivity (µmhos/cm)	204		200		200		193		209		202		214	
	Alkalinity (mg/L $CaCO_3$)	70				72				74					
	Hardness (mg/L $CaCO_3$)	80				82				82					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24 6	25.1	24.5	25.1	24 5	24 7	24 4	24.9	24.8	25.4	24 9	24 6	24 8	24 8

Species: *Pimephales promelas*
Client: SEQUOIAH - NONTREATED

Date: 01-14-03

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S U.)	8.06	8.07	8.19	8.11	8.15	7.74
	DO (mg/L)	7.9	8.1	7.7	8.0	7.9	6.9
	Conductivity (µmhos/cm)	308		301		303	
	Alkalinity (mg $CaCO_3$/L)	64					
	Hardness (mg $CaCO_3$/L)	84					
	Temperature (°C)	24.4	25.1	24.4	25.1	24.5	24.7
10.98%	pH (S.U.)	8.05	8.02	8.21	8.03	8.17	7.72
	DO (mg/L)	8.5	8.0	8.1	8.0	7.9	6.9
	Conductivity (µmhos/cm)	294		298		280	
	Temperature (°C)	24.4	25.0	24.5	25.1	24.6	24.7
22%	pH (S.U.)	8.07	8.03	8.20	8.04	8.16	7.66
	DO (mg/L)	8.5	8.0	8.1	8.1	8.1	6.5
	Conductivity (µmhos/cm)	288		286		278	
	Temperature (°C)	24.4	25.0	24.5	25.1	24.6	24.7
43.97%	pH (S.U.)	8.07	8.03	8.19	8.02	8.17	7.72
	DO (mg/L)	8.6	8.0	8.1	8.1	8.1	6.9
	Conductivity (µmhos/cm)	266		263		257	
	Temperature (°C)	24.4	25.0	24.5	25.1	24.7	24.7
72%	pH (S.U.)	8.08	8.03	8.19	8.01	8.16	7.74
	DO (mg/L)	8.6	8.0	8.1	8.1	8.1	6.8
	Conductivity (µmhos/cm)	235		231		228	
	Temperature (°C)	24.4	25.0	24.5	25.1	24.8	24.7
100%	pH (S U.)	8.07	8.06	8.18	7.99	8.18	7.79
	DO (mg/L)	8.5	8.0	8.3	8.0	8.3	7.1
	Conductivity (µmhos/cm)	202		201		200	
	Alkalinity (mg $CaCO_3$/L)	68				73	
	Hardness (mg $CaCO_3$/L)	86				89	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.4	25.1	24.5	25.1	24.8	24.7
100% INTAKE	pH (S U.)	8.08	8.06	8.19	8.04	8.17	7.79
	DO (mg/L)	8.6	7.9	8.2	8.1	8.2	7.0
	Conductivity (µmhos/cm)	204		200		200	
	Alkalinity (mg $CaCO_3$/L)	70				72	
	Hardness (mg $CaCO_3$/L)	80				82	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.6	25.1	24.5	25.1	24.5	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*
Client: SEQUOYAH - NONTREATED

Date: 01-14-03

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S U.)	8.18	7.66	8.09	7.62	8.16	7.68	8.11	8.00
	DO (mg/L)	8.0	6.6	7.8	6.4	7.7	7.6	7.6	7.9
	Conductivity (µmhos/cm)	278		286		284		303	
	Alkalinity (mg $CaCO_3$/L)	60				62			
	Hardness (mg $CaCO_3$/L)	86				86			
	Temperature (°C)	24.4	24.9	24.4	25.3	24.6	24.6	24.7	24.8
10.98%	pH (S.U.)	8.22	7.61	8.10	7.58	8.17	7.70	8.12	8.03
	DO (mg/L)	8.0	6.3	7.6	6.2	7.5	7.5	7.8	7.8
	Conductivity (µmhos/cm)	278		286		279		297	
	Temperature (°C)	24.5	24.9	24.5	25.3	24.6	24.6	24.8	24.8
22%	pH (S U.)	8.20	7.61	8.10	7.63	8.17	7.65	8.13	8.08
	DO (mg/L)	8.0	6.3	7.7	6.7	7.5	7.3	7.8	7.9
	Conductivity (µmhos/cm)	266		278		272		286	
	Temperature (°C)	24.5	24.9	24.5	25.4	24.6	24.6	24.8	24.8
43.99%	pH (S.U.)	8.18	7.65	8.09	7.64	8.15	7.72	8.14	8.09
	DO (mg/L)	8.3	6.3	7.8	6.7	7.5	7.3	8.0	8.2
	Conductivity (µmhos/cm)	246		259		254		266	
	Temperature (°C)	24.5	24.9	24.8	25.4	24.6	24.6	24.8	24.8
72%	pH (S U.)	8.16	7.69	8.11	7.67	8.13	7.72	8.14	8.16
	DO (mg/L)	8.6	6.6	7.9	6.5	8.0	7.5	8.1	8.1
	Conductivity (µmhos/cm)	220		235		227		240	
	Temperature (°C)	24.5	24.9	25.0	25.4	24.6	24.6	24.8	24.8
100%	pH (S.U.)	8.14	7.80	8.12	7.75	8.15	7.88	8.15	8.22
	DO (mg/L)	8.6	7.1	8.2	6.8	7.8	7.8	8.2	8.0
	Conductivity (µmhos/cm)	196		208		204		213	
	Alkalinity (mg $CaCO_3$/L)			71					
	Hardness (mg $CaCO_3$/L)			89					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.5	24.9	25.2	25.4	24.6	24.6	24.8	24.8
100% INTAKE	pH (S.U.)	8.11	7.72	8.11	7.72	8.01	7.86	8.14	8.18
	DO (mg/L)	8.8	6.9	8.5	6.9	8.6	8.0	8.4	8.3
	Conductivity (µmhos/cm)	193		209		202		214	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			82					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.4	24.9	24.8	25.4	24.9	24.6	24.8	24.8
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

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

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated
Test dates: January 14 - 21, 2003
Project number: 571

Mean Temp: 24.8
Min: 24.3
Max: 25.6

Reviewed by: Cur

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 06	8 23	8.19	8 19	8 15	8.21	8 18	8.18	8 09	8.16	8.16	8 14	8.11	8 16
	DO (mg/L)	7 9	8.1	7 7	8.3	7 9	8 2	8 0	8 0	7.8	8.1	7.7	8 2	7 6	7.8
	Conductivity (µmhos/cm)	308		301		303		278		286		284		303	
	Alkalinity (mg/L $CaCO_3$)	64						60				62			
	Hardness (mg/L $CaCO_3$)	84						86				86			
	Temperature (°C)	24 6	24 8	24 3	25 2	24 6	24 9	24.3	24 9	24 5	25 3	24 6	24.8	24 7	25.1
10.98%	pH (SU)	8 05	8 23	8 21	8 20	8.17	8.22	8 22	8.19	8 10	8 17	8.17	8.16	8.12	8.19
	DO (mg/L)	8 5	8 2	8 1	8.3	7 9	8.2	8 0	8 0	7 6	8 1	7 5	8 2	7 8	7.9
	Conductivity (µmhos/cm)	294		298		288		278		286		279		297	
	Temperature (°C)	24 6	24.8	24 5	25.2	24 6	24 9	24 5	24 9	24 6	25 3	24.6	24 8	24 6	25 0
22%	pH (SU)	8 07	8 24	8 20	8 20	8 16	8 26	8.20	8 22	8 10	8 20	8 17	8.16	8 13	8 20
	DO (mg/L)	8 5	8 2	8.1	8 3	8.1	8 2	8 0	8 0	7.7	8 2	7 5	8 2	7 8	8 0
	Conductivity (µmhos/cm)	288		286		278		266		278		272		286	
	Temperature (°C)	24 6	24 8	24.5	25 2	24 6	24 9	24 5	24 9	24 6	25 3	24 7	24 8	24 6	25 0
43.9%	pH (SU)	8 07	8 24	8 19	8.19	8 17	8 24	8 18	8.21	8 09	8.20	8 15	8.16	8.14	8 21
	DO (mg/L)	8 6	8 3	8.1	8 2	8 1	8.2	8 3	8.1	7 8	8.3	7.5	8.1	8 0	8 0
	Conductivity (µmhos/cm)	266		263		257		246		259		254		264	
	Temperature (°C)	24 6	24 8	24 5	25.2	24 6	24 9	24 7	24 9	24 8	25 4	24.9	24 8	24 6	25 0
72%	pH (SU)	8 08	8 28	8.19	8 21	8.16	8 31	8.16	8 27	8 11	8 26	8 13	8 21	8 14	8 27
	DO (mg/L)	8 6	8 3	8 1	8 2	8 1	8 1	8 6	8.2	7.9	8.3	8 0	8.1	8 1	8.0
	Conductivity (µmhos/cm)	235		231		228		220		235		227		240	
	Temperature (°C)	24 6	24 8	24.7	25 2	24.6	24 9	25.0	24 9	24.9	25 3	25.1	24 8	24.5	25 0
100%	pH (SU)	8 07	8.30	8 18	8.22	8 18	8.30	8 14	8 30	8 12	8.28	8 15	8.25	8 15	8.30
	DO (mg/L)	8 5	8 4	8 3	8.3	8 3	8.3	8 6	8 2	8 2	8 3	7 8	8.2	8 2	7.8
	Conductivity (µmhos/cm)	202		201		200		196		208		204		213	
	Alkalinity (mg/L $CaCO_3$)	68				73				71					
	Hardness (mg/L $CaCO_3$)	86				89				89					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24 6	24 8	24 8	25 2	24.6	24.9	25.1	25 0	24.9	25 3	25 6	24 8	24.4	25 0
100% Intake	pH (SU)	8 08	8 29	8 19	8 22	8 17	8 27	8.11	8 27	8 11	8 23	8 01	8 25	8.14	8.30
	DO (mg/L)	8 6	8.1	8 2	8 0	8 2	8.1	8 8	8.2	8 5	8 2	8 6	8 3	8 4	8.1
	Conductivity (µmhos/cm)	204		200		200		193		209		202		214	
	Alkalinity (mg/L $CaCO_3$)	70				72				74					
	Hardness (mg/L $CaCO_3$)	80				82				82					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0 10					
	Temperature (°C)	24 6	24.8	24 4	25.2	24 6	24.9	24.8	25 0	24 8	25 3	24 9	24.8	24 5	25 0

Species: *Ceriodaphnia dubia*
Client: SEQUOYAH- NONTREATED

Date: 01-14-03

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.)	8.06	8.23	8.19	8.19	8.15	8.21
	DO (mg/L)	7.9	8.1	7.7	8.3	7.9	8.2
	Conductivity (µmhos/cm)	308		301		303	
	Alkalinity (mg $CaCO_3$/L)	64					
	Hardness (mg $CaCO_3$/L)	84					
	Temperature (°C)	24.6	24.8	24.3	25.2	24.6	24.9
10.98%	pH (S U.)	8.05	8.23	8.21	8.20	8.17	8.22
	DO (mg/L)	8.5	8.2	8.1	8.3	7.9	8.2
	Conductivity (µmhos/cm)	294		298		288	
	Temperature (°C)	24.6	24.8	24.5	25.2	24.6	24.9
22%	pH (S U.)	8.07	8.24	8.20	8.20	8.16	8.26
	DO (mg/L)	8.5	8.2	8.1	8.3	8.1	8.2
	Conductivity (µmhos/cm)	288		286		278	
	Temperature (°C)	24.6	24.8	24.5	25.2	24.6	24.9
43.9%	pH (S U.)	8.07	8.24	8.19	8.19	8.17	8.24
	DO (mg/L)	8.6	8.3	8.1	8.2	8.1	8.2
	Conductivity (µmhos/cm)	266		263		257	
	Temperature (°C)	24.6	24.8	24.5	25.2	24.6	24.9
72%	pH (S U.)	8.08	8.28	8.19	8.21	8.16	8.31
	DO (mg/L)	8.6	8.3	8.1	8.2	8.1	8.1
	Conductivity (µmhos/cm)	235		231		228	
	Temperature (°C)	24.6	24.8	24.7	25.2	24.6	24.9
100%	pH (S U.)	8.07	8.30	8.18	8.22	8.18	8.30
	DO (mg/L)	8.5	8.4	8.3	8.3	8.3	8.3
	Conductivity (µmhos/cm)	202		201		200	
	Alkalinity (mg $CaCO_3$/L)	68				73	
	Hardness (mg $CaCO_3$/L)	86				89	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.6	24.8	24.8	25.2	24.6	24.9
100% INTAKE	pH (S U.)	8.08	8.29	8.19	8.22	8.17	8.27
	DO (mg/L)	8.6	8.1	8.2	8.0	8.2	8.1
	Conductivity (µmhos/cm)	204		200		200	
	Alkalinity (mg $CaCO_3$/L)	70				72	
	Hardness (mg $CaCO_3$/L)	80				82	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.6	24.8	24.4	25.2	24.6	24.9

Species: *Ceriodaphnia dubia*
Client: SEQUOYAH NONTREATED Date: 01-14-03

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S U.)	8.18	8.18	8.09	8.16	8.16	8.14	8.11	8.16
	DO (mg/L)	9.0	8.0	7.8	8.1	7.7	8.2	7.6	7.8
	Conductivity (µmhos/cm)	278		286		284		303	
	Alkalinity (mg $CaCO_3$/L)	60				62			
	Hardness (mg $CaCO_3$/L)	86				86			
	Temperature (°C)	24.3	24.9	24.5	25.3	24.6	24.8	24.7	25.1
10.98%	pH (S.U.)	8.22	8.19	8.10	8.17	8.17	8.16	8.12	8.19
	DO (mg/L)	8.0	8.0	7.6	8.1	7.5	8.2	7.8	7.9
	Conductivity (µmhos/cm)	278		286		279		297	
	Temperature (°C)	24.5	24.9	24.6	25.3	24.6	24.8	24.6	25.0
22%	pH (S U.)	8.20	8.22	8.10	8.20	8.17	8.16	8.13	8.20
	DO (mg/L)	8.0	8.0	7.7	8.2	7.5	8.2	7.8	8.0
	Conductivity (µmhos/cm)	266		278		272		286	
	Temperature (°C)	24.5	24.9	24.6	25.3	24.7	24.8	24.6	25.0
43.9%	pH (S U.)	8.18	8.21	8.09	8.20	8.15	8.16	8.14	8.21
	DO (mg/L)	8.3	8.1	7.8	8.3	7.5	8.1	8.0	8.0
	Conductivity (µmhos/cm)	246		259		254		264 ~~286~~	
	Temperature (°C)	24.7	24.9	24.8	25.4	24.9	24.8	24.6	25.0
72%	pH (S U.)	8.16	8.27	8.11	8.26	8.13	8.21	8.14	8.27
	DO (mg/L)	8.6	8.2	7.9	8.3	8.0	8.1	8.1	8.0
	Conductivity (µmhos/cm)	220		235		227		240 ~~266~~	
	Temperature (°C)	25.0	24.9	24.9	25.3	25.1	24.8	24.5	25.0
100%	pH (S.U.)	8.14	8.30	8.12	8.28	8.15	8.25	8.15	8.30
	DO (mg/L)	8.6	8.2	8.2	8.3	7.8	8.2	8.2	7.8
	Conductivity (µmhos/cm)	196		208		204		213	
	Alkalinity (mg $CaCO_3$/L)			71					
	Hardness (mg $CaCO_3$/L)			89					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	25.0	24.9	25.3	25.6	24.8	24.4	25.0
100% INTAKE	pH (S U.)	8.11	8.27	8.11	8.23	8.01	8.25	8.14	8.30
	DO (mg/L)	8.8	8.2	8.5	8.2	8.6	8.3	8.4	8.1
	Conductivity (µmhos/cm)	193		209		202		214	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			82					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	25.0	24.8	25.3	24.9	24.8	24.5	25.0
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

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

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated
Test dates: January 14 - 21, 2003
Project number: 571

Mean Temp: 24.7
Min: 24.3
Max: 25.3

Reviewed by: Cen

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 03	8 08	8 17	8 06	8.14	7.72	8 14	7 76	8.11	7 66	8 09	7.77	8 10	8 01
	DO (mg/L)	8.1	8.2	8 6	8 4	8.3	6 9	8 2	7 4	8.1	6 9	8 5	7 8	8 4	8.0
	Conductivity (µmhos/cm)	306		309		299		286		299		292		302	
	Alkalinity (mg/L $CaCO_3$)	64						60				62			
	Hardness (mg/L $CaCO_3$)	84						86				86			
	Temperature (°C)	24 4	24.5	24.3	24 9	24 6	24 7	24.5	25 0	24 6	25.1	24 6	24 6	24.8	24 8
10.98%	pH (SU)	8 02	8 07	8.18	8 02	8.14	7.75	8 12	7.69	8 10	7 63	8 07	7 78	8 11	7 98
	DO (mg/L)	8 2	8 2	8 4	8.2	8 2	6 9	8 2	6 9	8.1	6 5	8 6	7 6	8 3	7.7
	Conductivity (µmhos/cm)	300		296		291		283		295		290		295	
	Temperature (°C)	24 5	24 5	24 4	24.9	24 6	24 7	24 5	25 0	24.7	25.1	24 6	24 6	24 8	24 8
22%	pH (SU)	8 04	8 07	8 18	8 04	8.13	7.71	8 11	7.71	8.10	7 66	8 07	7 85	8.10	8 01
	DO (mg/L)	8 0	8 2	8 5	8 2	8 2	7 0	8 2	6 9	7.9	6.8	8 6	7 6	8.3	7.7
	Conductivity (µmhos/cm)	286		283		278		273		282		282		280	
	Temperature (°C)	24 5	24 4	24 3	24 9	24 6	24.7	24 5	25 0	24 7	25.1	24 6	24 6	24 8	24 8
43.9%	pH (SU)	8 04	8 07	8 18	8 04	8 14	7.74	8 09	7 71	8.11	7.66	8.07	7 83	8 09	8 01
	DO (mg/L)	7 9	8 2	8 4	8.3	8.3	6 9	8 0	7 0	7 8	6.9	8.5	7 9	8 2	8 0
	Conductivity (µmhos/cm)	264		260		256		254		261		261		261	
	Temperature (°C)	24.5	24.4	24.4	24 9	24 6	24 8	24 5	25.0	24.9	25 1	24 6	24 6	24 8	24 8
72%	pH (SU)	8.05	8 09	8 18	8 06	8 15	7.75	8.08	7.70	8 11	7 67	8 08	7 82	8 10	8 01
	DO (mg/L)	7.9	8 2	8 4	8 3	8 3	6 9	8 0	6 9	7 8	6 9	8 5	7 8	8.2	8 0
	Conductivity (µmhos/cm)	230		231		228		226		235		234		233	
	Temperature (°C)	24.5	24 4	24 6	24 9	24 6	24 8	24 5	25 0	25.1	25.1	24 6	24 6	24 8	24 8
100%	pH (SU)	8 04	8.13	8 18	8 06	8 16	7.76	8 06	7.75	8 10	7 70	8 07	7 86	8 13	8 05
	DO (mg/L)	7.9	8 2	8 5	8 4	8 3	7.0	7.9	6 9	7 8	6 9	8 5	7.7	8.1	8.0
	Conductivity (µmhos/cm)	201		201		199		198		208		209		207	
	Alkalinity (mg/L $CaCO_3$)	68				73				71					
	Hardness (mg/L $CaCO_3$)	86				89				89					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0 10					
	Temperature (°C)	24.5	24 4	24 6	24 9	24 7	24 8	24 5	25 0	25 3	25 1	24 6	24 6	24 8	24 8
100% Intake	pH (SU)	8 03	8 10	8 16	8 09	8 18	7 82	8 04	7.76	8.12	7.71	8 03	7 83	8 13	8 05
	DO (mg/L)	8 0	8 2	8 4	8 6	8 6	7 1	7 9	7.1	7 8	6 9	8 4	7.7	8 3	8.1
	Conductivity (µmhos/cm)	199		198		201		197		207		207		207	
	Alkalinity (mg/L $CaCO_3$)	70				72				74					
	Hardness (mg/L $CaCO_3$)	80				82				82					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0 10					
	Temperature (°C)	24 6	24 4	24 4	24.9	24.5	24 8	24 5	25 0	24 9	25 1	24 6	24 6	24 8	24 8

Species: *Pimephales promelas*

Client: SEQUOYAH UV-TREATED

Date: 01-14-03

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	8.03	8.08	8.17	8.06	8.14	7.72
	DO (mg/L)	8.1	8.2	8.6	8.4	8.3	6.9
	Conductivity (µmhos/cm)	306		309		299	
	Alkalinity (mg $CaCO_3$/L)	64					
	Hardness (mg $CaCO_3$/L)	84					
	Temperature (°C)	24.4	24.5	24.3	24.9	24.6	24.7
10.98%	pH (S.U.)	8.02	8.07	8.18	8.02	8.14	7.75
	DO (mg/L)	8.2	8.2	8.4	8.2	8.2	6.9
	Conductivity (µmhos/cm)	300		296		291	
	Temperature (°C)	24.5	24.5	24.4	24.9	24.6	24.7
22%	pH (S.U.)	8.04	8.07	8.18	8.04	8.13	7.71
	DO (mg/L)	8.0	8.2	8.5	8.2	8.2	7.0
	Conductivity (µmhos/cm)	286		283		278	
	Temperature (°C)	24.5	24.4	24.3	24.9	24.6	24.7
43.9%	pH (S.U.)	8.04	8.07	8.18	8.04	8.14	7.74
	DO (mg/L)	7.9	8.2	8.4	8.3	8.3	6.9
	Conductivity (µmhos/cm)	264		260		256	
	Temperature (°C)	24.5	24.4	24.4	24.9	24.6	24.8
72%	pH (S.U.)	8.05	8.09	8.18	8.06	8.15	7.75
	DO (mg/L)	7.9	8.2	8.4	8.3	8.3	6.9
	Conductivity (µmhos/cm)	230		231		228	
	Temperature (°C)	24.5	24.4	24.6	24.9	24.6	24.8
100%	pH (S.U.)	8.04	8.13	8.18	8.06	8.16	7.76
	DO (mg/L)	7.9	8.2	8.5	8.4	8.3	7.0
	Conductivity (µmhos/cm)	201		201		199	
	Alkalinity (mg $CaCO_3$/L)	68				73	
	Hardness (mg $CaCO_3$/L)	86				89	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.5	24.4	24.6	24.9	24.7	24.8
100% INTAKE	pH (S.U.)	8.03	8.10	8.16	8.09	8.18	7.82
	DO (mg/L)	8.0	8.2	8.4	8.6	8.6	7.1
	Conductivity (µmhos/cm)	199		198		201	
	Alkalinity (mg $CaCO_3$/L)	70				72	
	Hardness (mg $CaCO_3$/L)	~~84~~ 80				~~89~~ 82	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.6	24.4	24.4	24.9	24.5	24.8
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*
Client: SEQUOYAH UV TREATED Date: 01-14-03

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.)	8.14	7.76	8.11	7.66	8.09	7.77	8.10	8.01
	DO (mg/L)	8.2	7.4	8.1	6.9	8.5	7.8	8.4	8.0
	Conductivity (µmhos/cm)	286		299		292		302	
	Alkalinity (mg $CaCO_3$/L)	60				62			
	Hardness (mg $CaCO_3$/L)	86				86			
	Temperature (°C)	24.5	25.0	24.6	25.1	24.6	24.6	24.8	24.8
10.98%	pH (S.U.)	8.12	7.69	8.10	7.63	8.07	7.78	8.11	7.98
	DO (mg/L)	8.2	6.9	8.1	6.5	8.6	7.6	8.3	7.7
	Conductivity (µmhos/cm)	283		295		290		295	
	Temperature (°C)	24.5	25.0	24.7	25.1	24.6	24.6	24.8	24.8
22%	pH (S.U.)	8.11	7.71	8.10	7.66	8.07	7.85	8.10	8.01
	DO (mg/L)	8.2	6.9	7.9	6.8	8.6	7.6	8.3	7.7
	Conductivity (µmhos/cm)	273		282		282		280	
	Temperature (°C)	24.5	25.0	24.7	25.1	24.6	24.6	24.8	24.8
43.9%	pH (S.U.)	8.09	7.71	8.11	7.66	8.07	7.83	8.09	8.01
	DO (mg/L)	8.0	7.0	7.8	6.9	8.5	7.9	8.2	8.0
	Conductivity (µmhos/cm)	254		261		261		261	
	Temperature (°C)	24.5	25.0	24.9	25.1	24.6	24.6	24.8	24.8
72%	pH (S.U.)	8.08	7.70	8.11	7.67	8.08	7.82	8.10	8.01
	DO (mg/L)	8.0	6.9	7.8	6.9	8.5	7.8	8.2	8.0
	Conductivity (µmhos/cm)	226		235		234		233	
	Temperature (°C)	24.5	25.0	25.1	25.1	24.6	24.6	24.8	24.8
100%	pH (S.U.)	8.06	7.75	8.10	7.70	8.07	7.86	8.13	8.05
	DO (mg/L)	7.9	6.9	7.8	6.9	8.5	7.7	8.1	8.0
	Conductivity (µmhos/cm)	198		208		209		207	
	Alkalinity (mg $CaCO_3$/L)			71					
	Hardness (mg $CaCO_3$/L)			89					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.5	25.0	25.3	25.1	24.6	24.6	24.8	24.8
100% INTAKE	pH (S.U.)	8.04	7.76 7.1	8.12	7.71	8.03	7.83	8.13	8.05
	DO (mg/L)	7.9	~~8.1~~	7.8	6.9	8.4	7.7	8.3	8.1
	Conductivity (µmhos/cm)	197		207		207		207	
	Alkalinity (mg $CaCO_3$/L)			74					
	Hardness (mg $CaCO_3$/L)			82					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.5	25.0	24.9	25.1	24.6	24.6	24.8	24.8

Total Hardness
(EPA Method 130.2)

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

Analyst	KLW
Date analyzed	01-27-03

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%)
INSS101	40	50	19.6	21.6	2.0	20.6	41.2	103%

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%)
030114.02	SQN INT 1	50	21.6	25.5	3.9	20.6	S 80	
↓	Duplicate	50	25.5	29.5	4.0	20.6	D 82	2.5%

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)
INSS101	40	~~25.5~~ 50	25.5	31.5	6.0	20.6	120

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
82	38	95%

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)						
030116.02	SQN INT 2	50	31.5	35.5	4.0	20.6	82
030118.02	↓ 3	50	35.5	39.5	4.0		82
030124.02	FAP	5	25.4	28.5	3.1	(10)	640
030124.01	FGD	2	39.5	45.1	5.6	(25)	2900
030125.09	FGD 1 FAP	2	28.5	30.2	1.7	(25)	890

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KLW Date reviewed 01-28-03

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	JKK
Date analyzed	01.14.03

Iodide reagent:	INR060
Acid reagent:	INR059
Slope:	-47.3%

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	0.511	102.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030114.01	SQN 101	CLEAR, NO COLOR	S < 0.000213	
↓	Duplicate		D < 0.000208	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0 10 mg/L)		< 0.000318
030114.02	SQN INTAKE	CLEAR, NO COLOR	< 0.000152
030114.04	G.Town DRY Scale	NO COLOR, BLACK PARTICLES	< 0.000621
030114.03	G.Town Scale Auto	NO COLOR, BLACK PARTICLES	< 0.000345

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 091	0.50	0.486	97.2%

Reviewed by	JP
Date reviewed	01-28-03

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KEW
Date analyzed	01.16.03

Iodide reagent:	INR060
Acid reagent:	INR059
Slope:	50.87.

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	0.508	101.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030116.01	SQN 101	no color, clear	S <0.00114	
↓	Duplicate		D <0.00853	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00497
030116.02	SQN INT	no color, floating particles	<0.00743

KEW

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	0.502	100.4%

Reviewed by	[illegible]
Date reviewed	01-28-03

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KW
Date analyzed	01.10.03

Iodide reagent:	INR060
Acid reagent:	INR059
Slope:	48.0%

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	0.537	107.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030118.01	SQN 101	no color, clear	S <0.0113	
↓	Duplicate		D <0.00793	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0446
030118.02	SQN INT	no color, clear	<0.00753

KK

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	0.533	106.6%

Reviewed by	JJ
Date reviewed	01-28-03

Alkalinity
(EPA Method 310.1)

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

Analyst: KEL
Date analyzed: 01-27-03

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
5.2	INR055 ~~HSR038~~	INOS110	0.1	12.5	12.4	0.0202	10.1

blk 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%)
INR065	100	100	12.4	22.5	10.1	10.1	102	102%

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%)
01-18-03A	MHS H_2O	100	22.5	28.6	6.1	10.1	S 62	
01-18-03A	Duplicate	100	28.6	35.0	6.4	10.1	D 65	4.7

not enough to recheck - initial value within limits

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)
INR065	50	100	28.6	40.1	11.5	10.1	120

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	55	110%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
01-15-03	MHS H_2O	100	40.7	46.6	5.9	10.1	60
01-18-038	↓	↓	0.5	6.5	6.0	↓	61
01-22-03	↓	↓	6.5	12.8	6.3	↓	64
01-23-03	↓	↓	12.8	19.1	6.3	↓	64
01-18-03	SSW H_2O	↓	19.1	22.4	3.3	↓	33
030114.03	G.Town Scale A	↓	22.4	25.4	3.0	↓	30
030114.01	SQN 101 1	↓	25.4	32.1	6.7	↓	68
030116.01	↓ 2	↓	32.1	39.3	7.2	↓	73
030118.01	↓ 3	↓	39.4	46.4	7.0	↓	71

Reviewed by: KH Date reviewed: 01-28-03

Alkalinity
(EPA Method 310.1)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst: KLW
Date analyzed: 01.27.03

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%)
INSS101	100	100	0.1	10.0	9.9	10.1	100	100 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030116.02	SQN INT 2	100	10.0	17.1	~~17~~ 7.1	10.1	S 72	
↓	Duplicate	100	17.2	24.3	7.1	10.1	D 72	–

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)
INSS101	50	100	17.2	29.3	12.1	10.1	120

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%)
72	48	96 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
030114.02	SQN INT 1	100	29.3 ~~24.3~~	36.2 ~~29.3~~	6.9	10.1	70
030118.02	↓ 3	↓	36.6	43.9	7.3	↓	74
030124.02	FAP		6.9	15.9	9.0		91
030124.01	FGD		15.9	21.1	5.2		52
030125.09	FAP | FGD		21.1	29.7	8.6		87
01.06.03	Salt H_2O	↓	30.0	47.0	17.0	↓	170

Reviewed by: KLW Date reviewed: 01.28.03

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

Analyst	KBL
Date analyzed	01.27.03

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	INS092	1.0	~~10.7~~ 10.7	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%)
INS101	40	50	10.7	12.7	2.0	20.6	41.2	103%

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%)
01.15.03	MHS H20	50	12.7	16.9	4.2	20.6	S 86	
01.15D3	Duplicate	50	16.9	21.1	4.2	20.6	D 86	—

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)
INS901	40	50	16.9	23.0	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%)
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	1.0	1.0	0.0	20.6	ND
01.18.03A	MHS H2O		23.0	27.2	4.2		86
01.18.03B	↓		27.2	31.1	3.9		80
01.22.03			31.1	35.4	4.3		89
01.25.03	↓		35.4	39.3	3.9		80
01.18.03	SSW H2O		39.3	41.5	2.2		45
030114.03	G.Town Scale A		41.5	43.6	2.1		43
030114.01	SAN 101 1		6.8	11.0	4.2		86
030116.01	↓ 2		11.0	15.3	4.3		89
030118.01	↓ 3		15.3	19.6	4.3		89

Note If >15ml of titrant is used, sample must be diluted. Reviewed by: KBL Date reviewed 01.28.03

Sequoyah Nuclear Plant Biomonitoring
January 14 - 21, 2003

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 IC_{25} (g KCl/L)	CT (g/L KCl)	S	Control Limits CT - 2S	Control Limits CT + 2S	$S_{A.10}$	Warning Limits CT - $S_{A.10}$	Warning Limits CT + $S_{A.10}$	$S_{A.25}$	Control Limits CT - $S_{A.25}$	Control Limits CT + $S_{A.25}$	CV
1	05-07-02	0 61											
2	05-23-02	0.76	0 69	0.11	0 47	0 90	0 08	0.57	0 81	0.14	0 48	0.90	0.15
3	05-24-02	0 66	0 68	0 08	0.52	0 83	0 08	0 56	0.80	0.14	0 47	0 89	0.11
4	06-04-02	0 67	0 68	0 06	0.55	0 80	0 08	0 56	0 80	0.14	0.47	0 89	0 09
5	06-11-02	0 70	0 68	0 06	0.57	0.79	0 08	0.56	0 80	0.14	0.47	0.89	0.08
6	08-06-02	0.55	0.66	0 07	0 52	0 80	0 08	0.54	0.78	0 14	0 45	0 87	0.11
7	08-13-02	0 58	0 65	0 07	0.50	0 79	0 08	0 53	0.77	0.14	0.44	0 86	0.11
8	08-20-02	0 63	0 65	0 07	0.51	0.78	0 08	0 53	0.77	0 14	0.44	0.86	0.10
9	09-10-02	0 61	0 64	0 06	0.51	0.77	0 08	0 52	0 76	0 13	0.43	0 85	0.10
10	09-17-02	0 64	0 64	0 06	0 52	0.76	0 08	0 52	0.76	0.13	0 43	0 85	0 09
11	10-01-02	0.60	0 64	0 06	0 52	0.75	0 08	0.52	0.76	0.13	0 43	0 85	0 09
12	10-01-02	0 47	0 62	0 07	0 48	0.77	0 07	0.50	0.74	0.13	0.41	0 83	0.12
13	10-08-02	0 53	0 62	0 08	0 47	0.77	0 07	0 50	0.74	0.13	0.41	0.83	0 12
14	10-15-02	0 66	0 62	0.07	0.47	0.77	0 07	0 50	0.74	0.13	0.41	0 83	0 12
15	10-22-02	0 64	0 62	0 07	0 48	0.76	0 07	0.50	0.74	0.13	0.41	0 83	0.11
16	11-05-02	0 59	0 62	0 07	0 48	0.76	0 07	0 50	0.74	0 13	0.41	0.83	0 11
17	12-03-02	0 61	0 62	0 07	0.48	0 75	0 07	0 50	0 74	0 13	0 41	0.83	0.11
18	12-03-02	0.52	0 61	0 07	0 47	0.75	0 07	0 49	0.73	0 13	0.40	0 82	0.11
19	01-07-03	0 64	0 61	0 07	0 48	0.75	0 07	0.49	0.73	0.13	0 40	0 82	0.11
20	01-14-03	0.61	0 61	0 07	0 48	0 74	0 07	0 49	0.73	0.13	0.40	0 82	0.11

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

CT = Central tendency (mean IC_{25})

S = Standard deviation of the IC_{25} values

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. $S_{A.10}$ = 0.12, as determined by USEPA for the method and endpoint.

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. $S_{A.25}$ = 0 21, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values

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

USEPA Recommended Control and Warning Limits,

Warning Limit = Standard deviation corresponding to the 75th percentile CV. $S_{A.75}$ = 0 38.

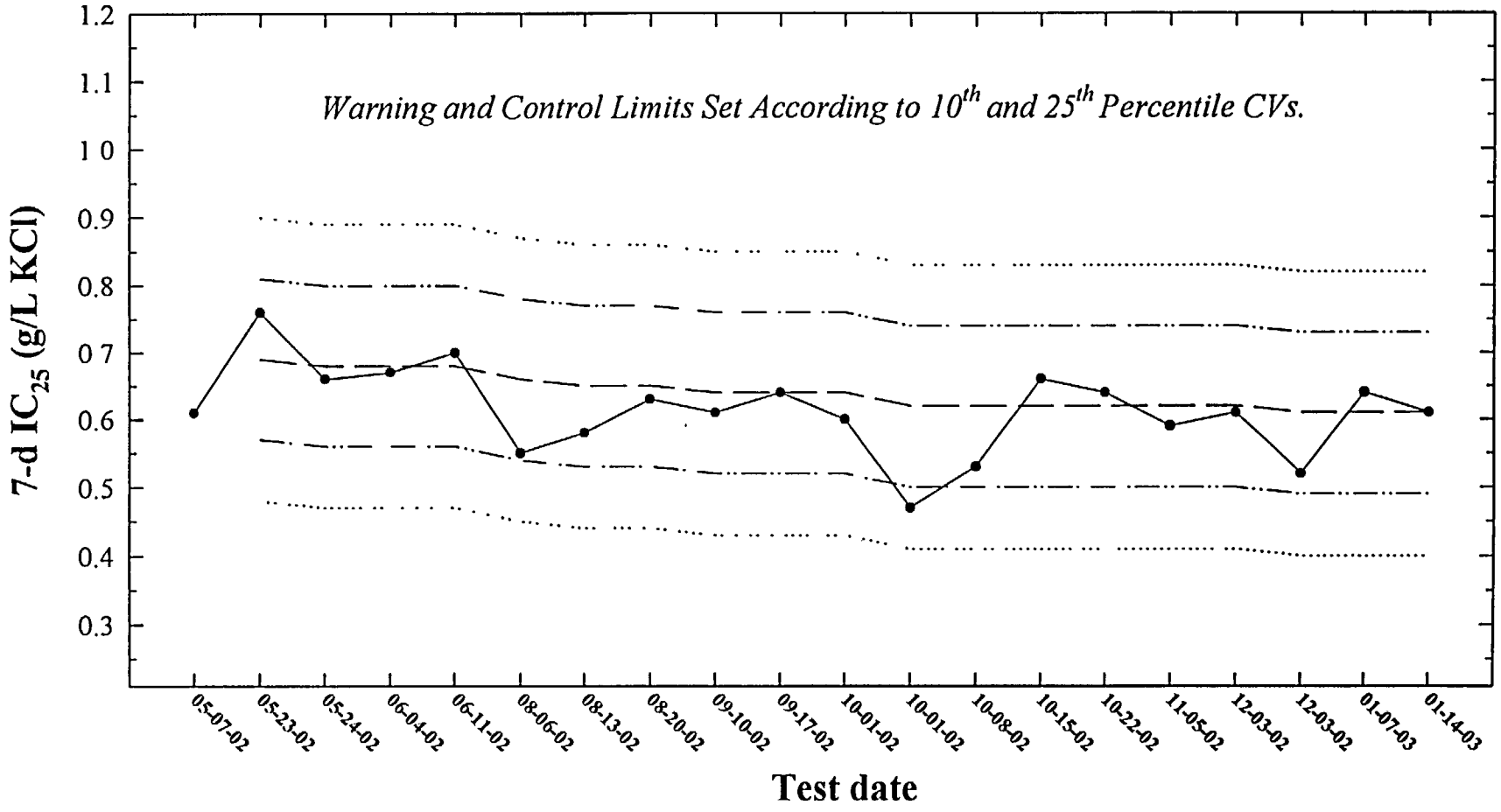
Control Limit = Standard deviation corresponding to the 90th percentile CV. $S_{A.90}$ = 0 45.

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

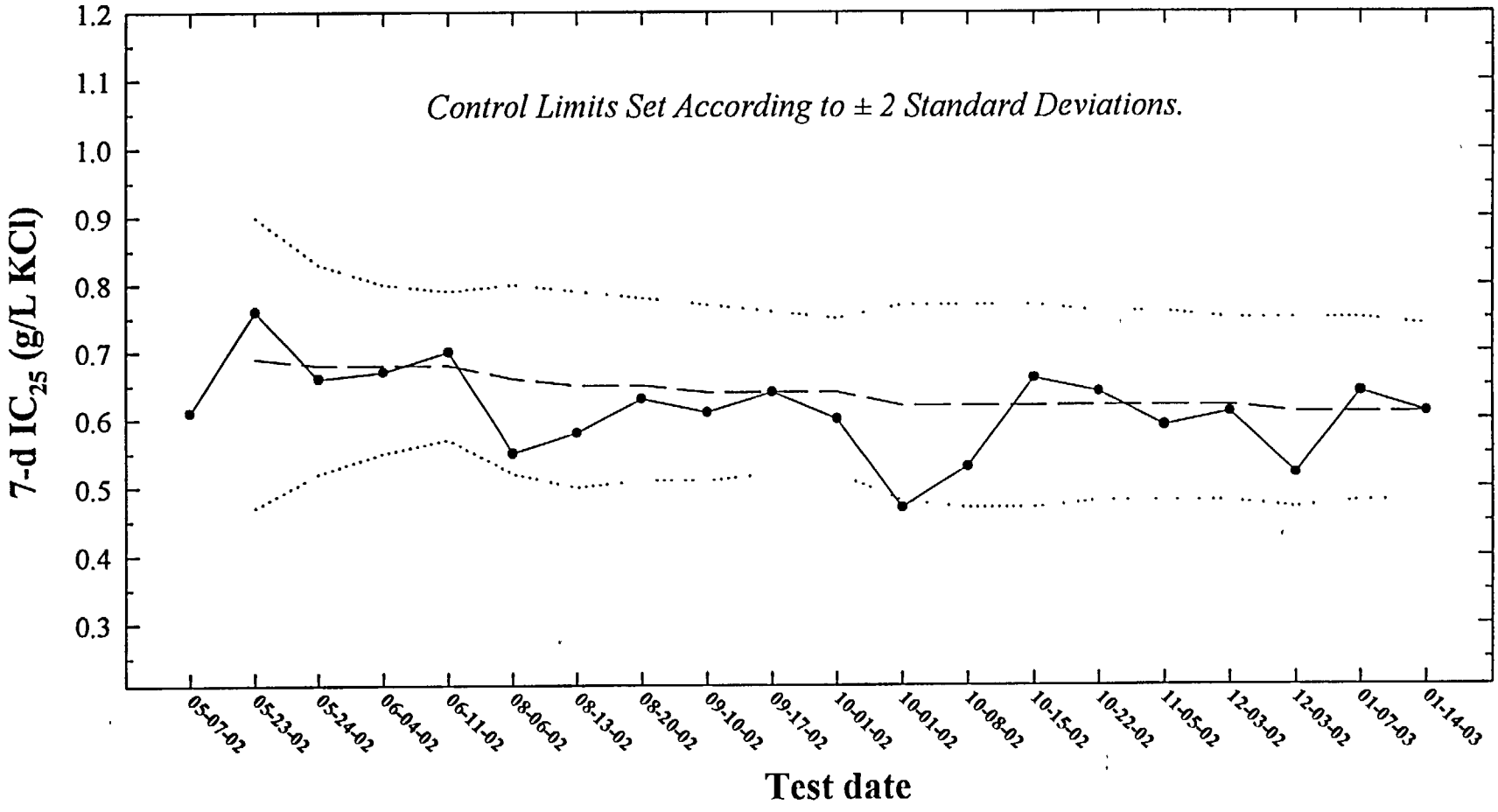
— – **Central Tendency** (mean IC_{25})

— · — **Warning Limits** (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.12$, as determined by USEPA for the method and endpoint)

····· **Control Limits** (mean $IC_{25} \pm S_{A\,25}$, $S_{A\,25} = 0.21$, 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 IC_{25}** = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

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

. . .. **Control Limits** (mean IC_{25} ± 2 Standard Deviations)

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	05-07-02	97.5	0.458	12.3		0 07	15.4	
2	05-23-02	100	0 378	9.9	11.1	0 09	22.5	19.0
3	05-24-02	97.5	0.444	21.3	14.5	0.11	25.0	21.0
4	06-04-02	100	0.682	14 0	14.4	0.15	22.1	21.3
5	06-11-02	100	0 650	3.7	12.2	0.11	16.6	20 3
6	08-06-02	97.5	0 694	22.2	13.9	0.16	23.5	20 9
7	08-13-02	100	0 659	13.6	13.8	0 12	17.5	20 4
8	08-20-02	100	0 765	8.5	13.2	0 12	16.3	19 9
9	09-10-02	100	0 854	1.2	11.8	0 11	12.5	19.1
10	09-17-02	100	0.824	13.4	12.0	0.12	14 6	18 6
11	10-01-02	97.5	0.750	18.4	12.6	0 19	25 4	19.2
12	10-01-02	100	0.975	12 7	12.6	0 13	12.8	18 7
13	10-08-02	97.5	0 929	8.0	12.2	0 18	19.5	18 8
14	10-15-02	100	1.037	16 9	12.6	0 23	21.9	19 0
15	10-22-02	100	0 822	10 6	12.4	0.13	15 6	18 7
16	11-05-02	100	0 874	2 8	11.8	0.12	13.8	18 4
17	12-03-02	100	0 852	9.1	11.7	0.12	13.7	18 2
18	12-03-02	100	0 668	10 4	11.6	0.15	22 4	18 4
19	01-07-03	100	0 886	4 1	11.2	0.14	15.7	18 3
20	01-14-03	100	0 677	3 0	10 8	0.07	11 0	17 9

Note· Average control growth (mg/larvae) = **0.744**

CV = Coefficient of variation for control survival
On average, the CV for control growth is **10.8%** 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 **17.9%** 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)

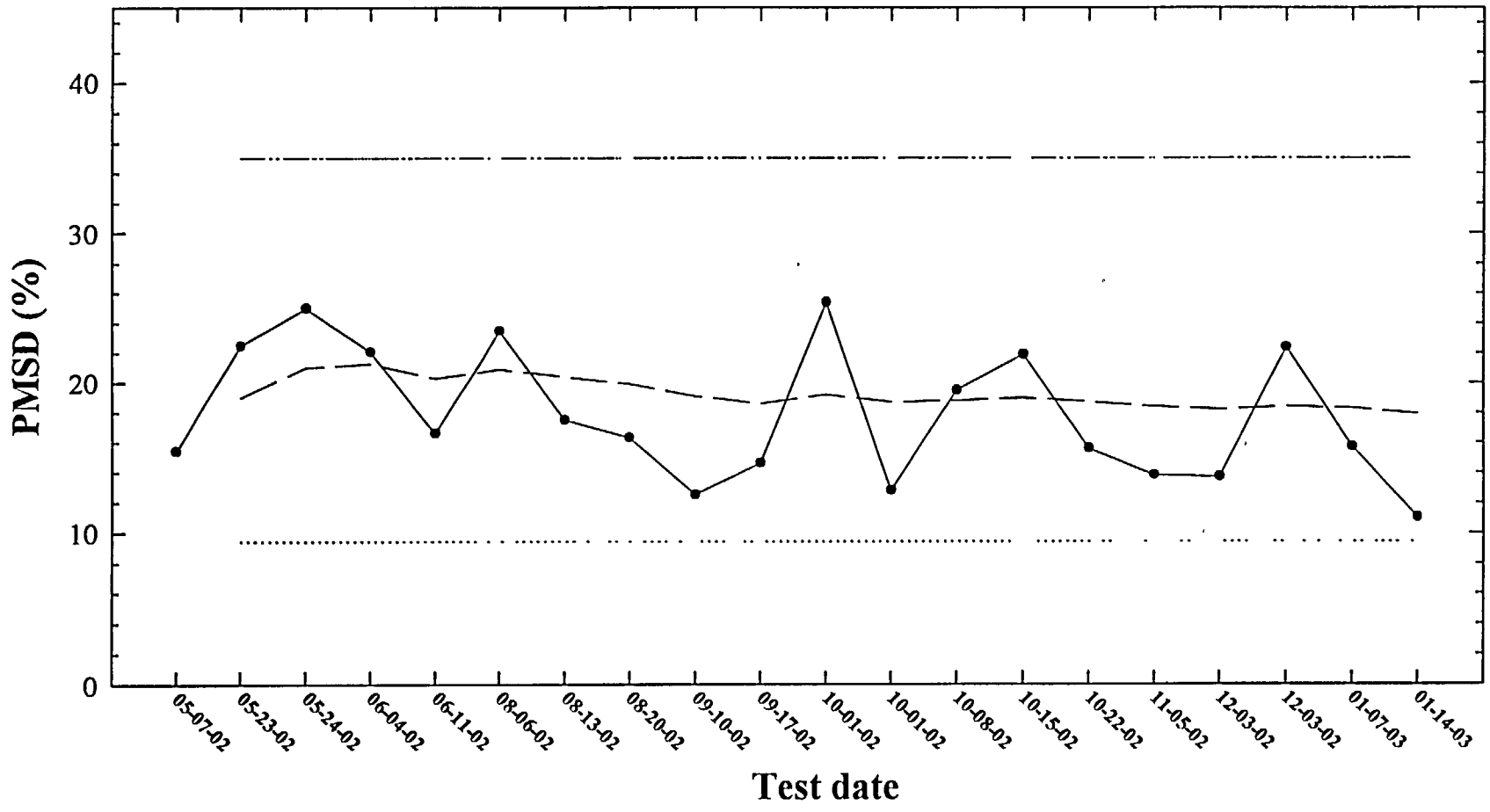
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests

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-821-R-02-013 Method 1000.0)
Species: *Pimephales promelas*

PpKCICR Test Number: 3

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	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age.	24-HOURS OLD	Randomizing template.	RED
Date and times organisms were born between:	01-13-03 1230 TO 1530 HST	Incubator number:	2
Organism source:	ABS BATCH 01-13-03	*Artemia* lot number:	BG1809Q
Transfer bowl information·	pH = 7.96 Temperature = 24.3 °C	Total drying time·	11.25-HOURS
Average transfer volume:	10.4 mL	Date / Time in·	01-21-03 1450
		Date / Time out:	01-22-03 0800
		Oven temperature:	101°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Analyst
0	01-14-03	——	1530	1400	MHS 01-12-03	JJ
1	01-15-03	0914	1520	1342	MHS 01-12-03	JJ
2	01-16-03	0841	1450	1311	MHS 01-12-03	JJ
3	01-17-03	0908	1510	1317	MHS 01-15-03	JJ
4	01-18-03	0910	1517	1308	MHS 01-15-03	JJ
5	01-19-03	0918	1520	1320	MHS 01-18-03	JJ
6	01-20-03	0837	1500	1309	MHS 01-18-03	JJ
7	01-21-03			1352	——	JJ

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.6772	
Average weight per surviving larvae:	0.6772	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	766.2
NOEC	~~600~~ 450
LOEC	~~750~~ 600
ChV	~~670.8~~ 519.6
IC_{25}	607.9

PpKClCR Test Number: 3

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	9 d	10	9 d
3	10	10	10	10	10	10	10	10	9 d	9	10	9
4	10	10	10	10	10	10	10	10	9	9	10	9
5	10	10	10	10	10	10	10	10	9	9	10	9
6	10	10	10	10	10	10	10	10	9	9	10	9
7	10	10	1 SMALL 10	10	10	10	10	10	9	9	10	9
A = Pan weight (mg) Red	15.051	15.100	14.935	14.983	14.592	15.040	14.658	14.733	15.001	15.006	15.000	14.946
B = Pan + Larvae weight (mg)	21.72	21.99	21.92	21.53	21.14	21.44	20.69	20.90	20.21	21.73	21.51	20.75
Larvae weight (mg) = A – B	6.669	6.890	6.985	6.545	6.548	6.400	6.032	6.167	5.209	6.724	6.510	6.104

Calculations and data reviewed: JL

Comments:

PpKClCR Test Number. 3

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	9 1d	8 2d	9 1d	10	10	8 2d	6 4d	4 6d	7 3d
2	9 1d	10	10	9	6 2d	9	7 3d	9 1d	3 5d	4 2d	3 1d	5 2d
3	9	10	10	8 1d	6	9	4 3d	7 2d	3	4	3	5
4	9	10	10	8	6	8 1d	4	7	3	3 1d	2 1d	5
5	8 1d	10	9 1d	8	6	7 1d	4	7	3	3	2	5
6	8	10	9	8	6	7	4	7	2 1d	2 1d	2	5
7	8	10	9	8	6	7	3 1d	7	2	2	1 1d	4 1d
A = Pan weight (mg)	14.763	15.114	15.184	15.219	15.087	15.125	14.685	14.704	14.979	15.172	14.996	15.120
B = Pan + Larvae weight (mg)	19.72	20.34	21.15	19.89	18.24	18.32	16.35	17.92	15.88	16.00	15.43	17.40
Larvae weight (mg) = A – B	4.957	5.226	5.966	4.671	3.153	3.195	1.665	3.211	0.901	0.828	0.434	2.280

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

Test number: PpKClCR # 43

Test dates: January 14 - 21, 2003

Reveiwed by:

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15 051	21 720	6 669	0 6669	100 0	0 6772	3 0	Not applicable
	B	10	10	15 100	21 990	6 890	0 6890				
	C	10	10	14 935	21 920	6 985	0 6985				
	D	10	10	14 985	21 530	6 545	0 6545				
300	E	10	10	14 592	21 140	6 548	0 6548	100 0	0 6287	3.7	7.2
	F	10	10	15 060	21 460	6 400	0 6400				
	G	10	10	14 658	20 690	6 032	0 6032				
	H	10	10	14 733	20 900	6 167	0 6167				
450	I	10	9	15 001	20 210	5 209	0 5209	92 5	0 6137	10 9	9 4
	J	10	9	15 006	21 730	6 724	0 6724				
	K	10	10	15 000	21 510	6 510	0 6510				
	L	10	9	14 646	20 750	6 104	0 6104				
600	M	10	8	14 763	19 720	4 957	0 4957	87 5	0 5205	10.7	23.1
	N	10	10	15 114	20 340	5 226	0 5226				
	O	10	9	15 184	21 150	5 966	0 5966				
	P	10	8	15 219	19 890	4 671	0 4671				
750	Q	10	6	15 087	18 240	3 153	0 3153	57 5	0 2806	27.1	58 6
	R	10	7	15 125	18 320	3 195	0 3195				
	S	10	3	14 685	16 350	1 665	0 1665				
	T	10	7	14 709	17 920	3 211	0 3211				
900	U	10	2	14 979	15 880	0 901	0 0901	22 5	0.1111	72 6	83 6
	V	10	2	15 172	16 000	0 828	0 0828				
	W	10	1	14 996	15 430	0 434	0 0434				
	X	10	4	15 120	17 400	2 280	0 2280				

Dunnett's MSD value. 0 0747

PMSD 11.0

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 17 9% from the control (determined through reference toxicant testing)

Lower PMSD bound determined by USEPA (10th percentile) = 9 4%.

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

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

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

Organisms obtained from Aquatic BioSystems, Inc

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date	1/14/03	Test ID:	PpKClCR	Sample ID	REF-Ref Toxicant
End Date	1/21/03	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 6669	0 6890	0 6985	0 6545
300	0.6548	0 6400	0 6034	0 6167
450	0.5209	0 6724	0 6510	0 6104
600	0.4957	0.5226	0 5966	0 4671
750	0 3153	0.3195	0 1665	0 3211
900	0 0901	0 0828	0 0434	0 2280

			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 6772	1 0000	0 6772	0 6545	0 6985	2.971	4				0 6772	1 0000
300	0 6287	0 9284	0 6287	0 6034	0 6548	3 664	4	1 487	2 290	0 0747	0 6287	0 9284
450	0 6137	0 9062	0 6137	0 5209	0 6724	10 915	4	1 949	2 290	0 0747	0 6137	0 9062
*600	0 5205	0 7686	0 5205	0 4671	0 5966	10 675	4	4 805	2 290	0 0747	0 5205	0 7686
750	0 2806	0 4143	0 2806	0 1665	0 3211	27 123	4				0 2806	0 4143
900	0 1111	0 1640	0 1111	0 0434	0 2280	72 567	4				0 1111	0 1640

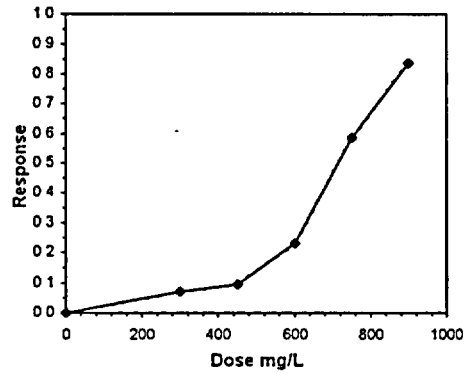
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 978783071	0 844	-0 294340189	0 81047745
Bartlett's Test indicates equal variances (p = 0 17)	5 08170414	11 34488201		

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 074686143	0 110282614	0 017191687	0 002127351	0 003268048	3, 12

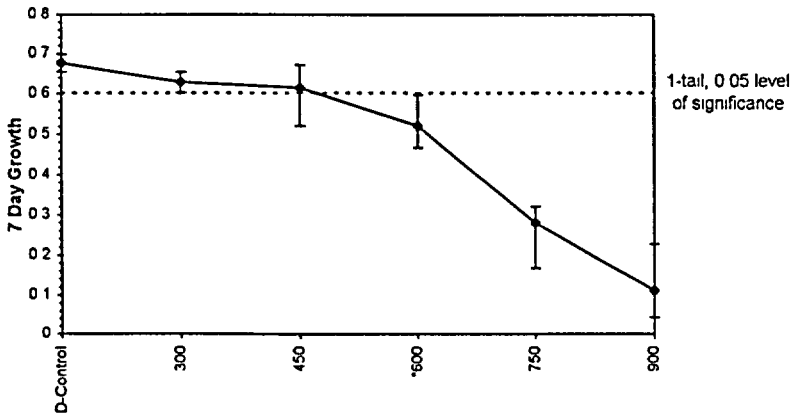
Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	209 47	99 35	100 51	615 49	0 9262
IC10	456 72	68 67	178 35	533 06	-0 8708
IC15	511 23	36 88	385 26	646 37	-0 0122
IC20	565 74	28.33	483 20	644 00	0 2266
IC25	607 87	18 18	538 08	644 29	-0 3037
IC40	671.38	12.57	634 30	707 60	0 2316
IC50	713 73	16 39	666 92	757 68	0 1007

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc

01-14-03 xls

Environmental Testing Solutions, LLC
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date	1/14/03	Test ID	PpKCICR	Sample ID	REF-Ref Toxicant
End Date	1/21/03	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	1 0000	1 0000	1 0000
300	1 0000	1 0000	1 0000	1 0000
450	0 9000	0 9000	1 0000	0 9000
600	0.8000	1 0000	0 9000	0 8000
750	0 6000	0 7000	0 3000	0 7000
900	0 2000	0 2000	0 1000	0 4000

			Transform· Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1 0000	1 0000	1 4120	1 4120	1 4120	0 000	4			0	40
300	1 0000	1 0000	1 4120	1 4120	1 4120	0 000	4	18 00	10 00	0	40
450	0 9250	0 9250	1 2898	1 2490	1 4120	6.318	4	12 00	10 00	3	40
600	0 8750	0 8750	1 2188	1 1071	1 4120	11.906	4	12 00	10 00	5	40
*750	0 5750	0 5750	0 8620	0 5796	0 9912	22.581	4	10 00	10 00	17	40
*900	0 2250	0 2250	0 4834	0.3218	0 6847	31 014	4	10 00	10 00	31	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 91671133	0 884	-0 316165842	1.346744523
Equality of variance cannot be confirmed				

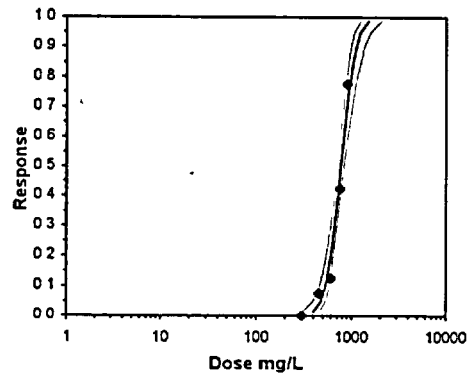
Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670 8203932	

Maximum Likelihood-Probit

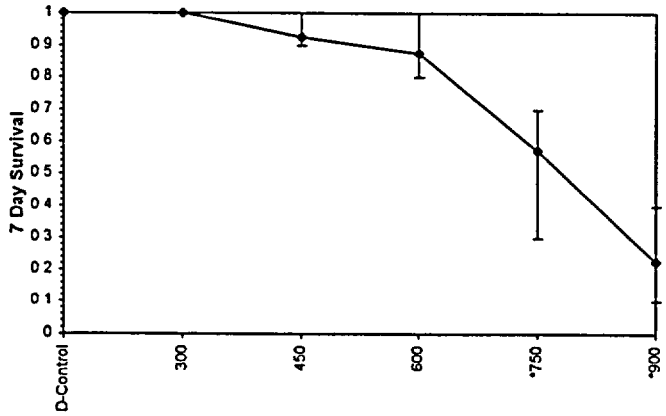
Parameter	Value	SE	95% Fiducial Limits	
Slope	7 973053748	1 226780987	5 568562967	10 37754453
Intercept	-17 99699151	3 501004343	-24 85896016	-11 13502287
TSCR				

Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
0	4 775674923	7 814724922	0 19	2 884339205	0 125422458	3

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2 674	391.3478345	298 8202155	454 7289305
EC05	3 355	476 4722581	394 0635725	531 6781157
EC10	3 718	529 180533	455 680513	579 1682188
EC15	3 964	567 9984976	501 707135	614 6857919
EC20	4 158	600 8706682	540 6378554	645 5854668
EC25	4.326	630 5841393	575 3650197	674 5827642
EC40	4 747	712 1373932	664 9097825	762 8281132
EC50	5 000	766 1948124	717 5883266	830 2770165
EC60	5 253	824 3556709	768 9792198	910 1076376
EC75	5 674	930 969317	854 5525702	1070 235307
EC80	5 842	977 0064101	889 455908	1143 436754
EC85	6 036	1033 549401	931 2294474	1236 051701
EC90	6 282	1109 365193	985 7885374	1364 419056
EC95	6 645	1232 085304	1071 437863	1581.301415
EC99	7 326	1500 083795	1250 293331	2089 403779



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc

PpKClCR Test Number: 3

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	8.06	8.03	8.19	8.11	8.15	7.67
	DO (mg/L)	7.9	7.7	7.7	8.4	7.9	6.6
	Conductivity (µmhos/cm)	308		301		303	
	Alkalinity (mg $CaCO_3$/L)	64					
	Hardness (mg $CaCO_3$/L)	84					
	Temperature (°C)	24.5	24.8	24.3	24.4	24.2	24.7
300 mg KCl/L	pH (S.U.)	8.05	7.96	8.17	8.05	8.14	7.63
	DO (mg/L)	7.8	7.6	7.8	8.2	8.6	6.8
	Conductivity (µmhos/cm)	858		839		857	
	Temperature (°C)	24.5	24.8	24.3	24.4	24.3	24.7
450 mg KCl/L	pH (S.U.)	8.05	7.95	8.16	8.10	8.15	7.65
	DO (mg/L)	8.0	7.7	7.9	8.4	8.6	6.8
	Conductivity (µmhos/cm)	1126		1113		1124	
	Temperature (°C)	24.5	24.8	24.3	24.4	24.3	24.7
600 mg KCl/L	pH (S U.)	8.04	7.90	8.15	8.06	8.13	7.63
	DO (mg/L)	8.0	7.7	7.9	8.4	8.6	6.8
	Conductivity (µmhos/cm)	1402		1376		1385	
	Temperature (°C)	24.5	24.8	24.3	24.4	24.2	24.7
750 mg KCl/L	pH (S U.)	8.03	7.93	8.14	8.04	8.10	7.63
	DO (mg/L)	8.2	7.7	7.8	8.4	8.6	6.9
	Conductivity (µmhos/cm)	1664		1627		1641	
	Temperature (°C)	24.5	24.8	24.3	24.4	24.2	24.7
900 mg KCl/L	pH (S.U.)	8.02	7.91	8.14	8.05	8.14	7.68
	DO (mg/L)	8.1	7.7	7.9	8.4	8.6	7.3
	Conductivity (µmhos/cm)	1894		1873		1873	
	Temperature (°C)	24.5	24.8	24.3	24.4	24.2	24.7

PpKClCR Test Number: 3

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.)	8.18	7.81	8.09	7.82	8.16	7.72	8.11	7.90
	DO (mg/L)	8.0	7.4	7.8	7.6	7.7	7.4	7.6	7.9
	Conductivity (µmhos/cm)	278		296		284		303	
	Alkalinity (mg $CaCO_3$/L)	60				62			
	Hardness (mg $CaCO_3$/L)	86				86			
	Temperature (°C)	24.4	25.1	24.3	24.6	24.5	24.6	24.3	24.5
300 mg KCl/L	pH (S.U.)	8.17	7.81	8.16	7.71	8.15	7.68	8.15	7.89
	DO (mg/L)	8.3	7.4	8.4	7.2	8.6	7.4	8.4	7.7
	Conductivity (µmhos/cm)	787		859		834		873	
	Temperature (°C)	24.4	25.0	24.4	24.6	24.5	24.6	24.4	24.7
450 mg KCl/L	pH (S.U.)	8.14	7.81	8.15	7.71	8.15	7.70	8.16	7.90
	DO (mg/L)	8.5	7.4	8.6	7.2	8.6	7.4	8.4	7.6
	Conductivity (µmhos/cm)	1046		1137		1104		1154	
	Temperature (°C)	24.4	25.0	24.4	24.6	24.5	24.6	24.4	24.7
600 mg KCl/L	pH (S.U.)	8.13	7.77	8.14	7.78	8.15	7.65	8.15	7.86
	DO (mg/L)	8.3	7.4	8.6	7.6	8.6	7.4	8.2	7.6
	Conductivity (µmhos/cm)	1291		1404		1374		1435	
	Temperature (°C)	24.4	25.0	24.4	24.6	24.5	24.6	24.4	24.5
750 mg KCl/L	pH (S.U.)	8.10	7.83	8.12	7.77	8.14	7.64	8.13	7.85
	DO (mg/L)	8.3	7.4	8.5	7.6	8.5	7.3	8.4	7.5
	Conductivity (µmhos/cm)	1534		1652		1628		1698	
	Temperature (°C)	24.4	25.0	24.4	24.6	24.5	24.6	24.4	24.5
900 mg KCl/L	pH (S.U.)	8.10	7.80	8.13	7.86	8.13	7.76	8.13	7.93
	DO (mg/L)	8.2	7.5	8.5	7.9	8.4	7.3	8.4	7.4
	Conductivity (µmhos/cm)	1758		1860		1857		1924	
	Temperature (°C)	24.4	25.0	24.4	24.6	24.5	24.6	24.4	24.5

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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 IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	Control Limits CT - 2S	Control Limits CT + 2S	$S_{A.10}$	Warning Limits CT - $S_{A.10}$	Warning Limits CT + $S_{A.10}$	$S_{A.25}$	Control Limits CT - $S_{A.25}$	Control Limits CT + $S_{A.25}$	CV
1	11-01-01	1.00											
2	12-05-01	1.05	1.03	0 04	0 96	1 10	0 08	0 95	1 11	0.17	0 86	1 20	0 04
3	01-09-02	0.91	0.99	0 07	0 84	1 13	0 08	0 91	1 07	0.17	0 82	1.16	0 07
4	02-05-02	1.07	1.01	0 07	0 86	1.16	0 08	0 93	1 09	0 17	0 84	1.18	0 07
5	03-19-02	1.03	1.01	0 06	0 89	1.14	0 08	0.93	1 09	0.17	0 84	1.18	0 06
6	04-09-02	1.03	1.02	0.06	0.90	1.13	0 08	0.94	1.10	0 17	0 85	1.19	0 06
7	05-07-02	1 05	1.02	0 05	0.91	1.13	0 08	0.94	1.10	0 17	0 85	1.19	0 05
8	06-04-02	1 06	1 03	0 05	0 92	1.13	0 08	0 95	1.11	0.17	0 86	1.20	0 05
9	07-09-02	1.03	1.03	0 05	0 93	1.12	0.08	0 95	1.11	0 17	0 86	1 20	0 05
10	08-06-02	1 05	1.03	0.05	0 94	1.12	0 08	0 95	1.11	0.18	0 86	1.20	0 05
11	09-04-02	1 05	1.03	0 04	0.94	1.12	0 08	0 95	1.11	0.18	0 86	1.20	0 04
12	10-08-02	1.03	1 03	0 04	0 95	1.12	0 08	0 95	1.11	0.18	0 86	1 20	0 04
13	11-05-02	1.03	1.03	0 04	0 95	1.11	0.08	0 95	1.11	0 18	0 86	1.20	0 04
14	12-03-02	1 02	1.03	0 04	0 95	1.11	0 08	0.95	1.11	0 18	0 86	1.20	0 04
15	12-03-02	1 03	1.03	0 04	0.95	1.11	0 08	0 95	1.11	0.18	0 86	1 20	0.04
16	12-04-02	1 02	1.03	0 04	0.96	1.10	0 08	0 95	1.11	0.18	0.86	1 20	0 04
17	12-06-02	1.03	1.03	0 04	0 96	1.10	0 08	0 95	1.11	0 18	0 86	1.20	0 03
18	12-11-02	1.04	1.03	0 03	0 96	1.10	0 08	0.95	1.11	0.18	0 86	1.20	0 03
19	12-18-02	1 04	1.03	0.03	0.96	1.10	0 08	0 95	1.11	0.18	0 86	1 20	0.03
20	01-07-03	0 96	1 03	0.04	0.95	1.10	0 08	0 95	1.11	0.17	0.86	1.20	0 04

Note:

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

CT = Central tendency (mean IC_{25})

S = Standard deviation of the IC_{25} values

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. $S_{A.10}$ = 0 08, as determined by USEPA for the method and endpoint.

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. $S_{A.25}$ = 0.17, as determined by the USEPA for the method and endpoint

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

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

USEPA Recommended Control and Warning Limits.

Warning Limit = Standard deviation corresponding to the 75th percentile CV $S_{A.75}$ = 0 45

Control Limit = Standard deviation corresponding to the 90th percentile CV $S_{A.90}$ = 0 62

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

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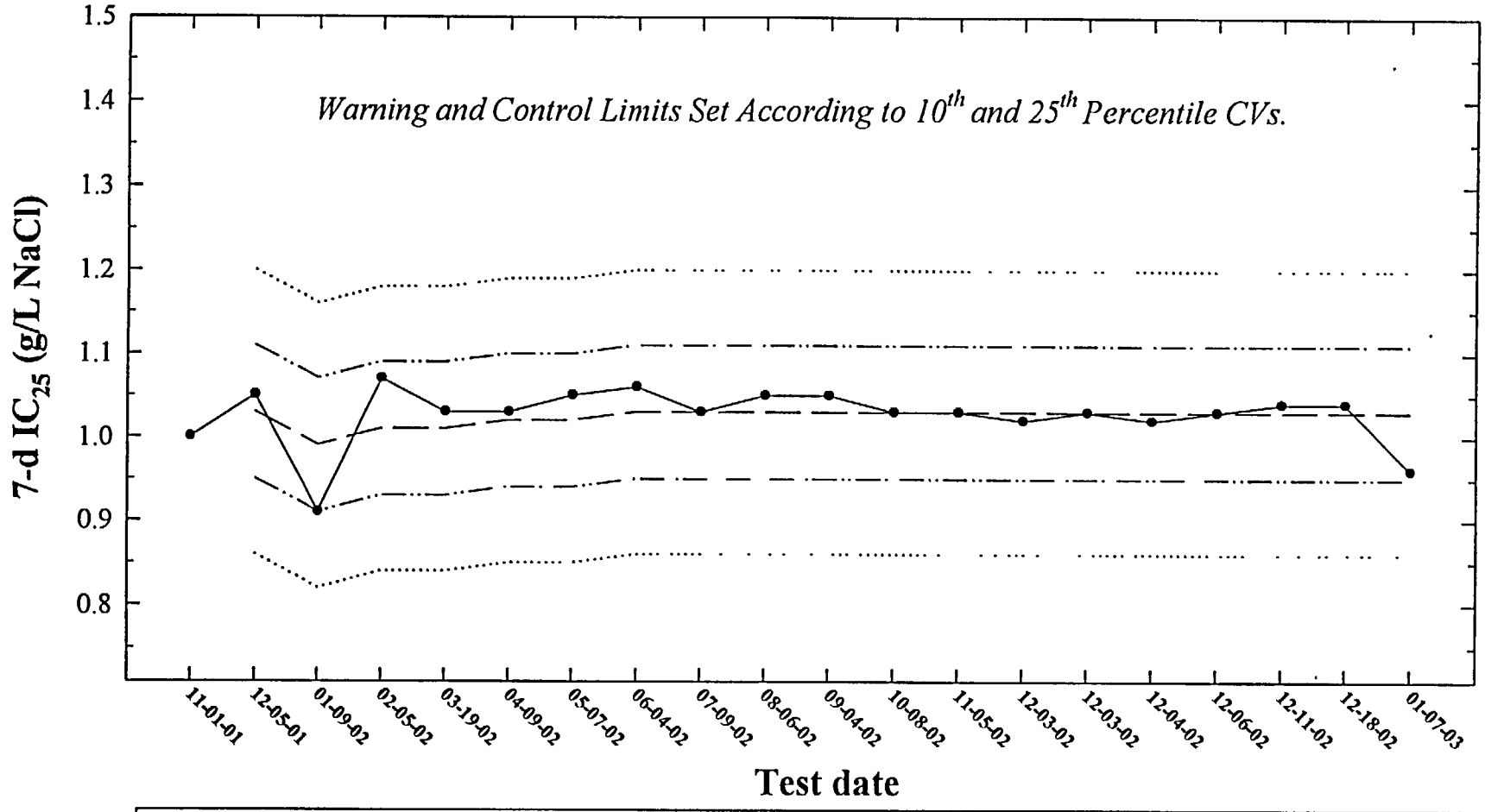
Environmental Testing Solutions, LLC

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



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

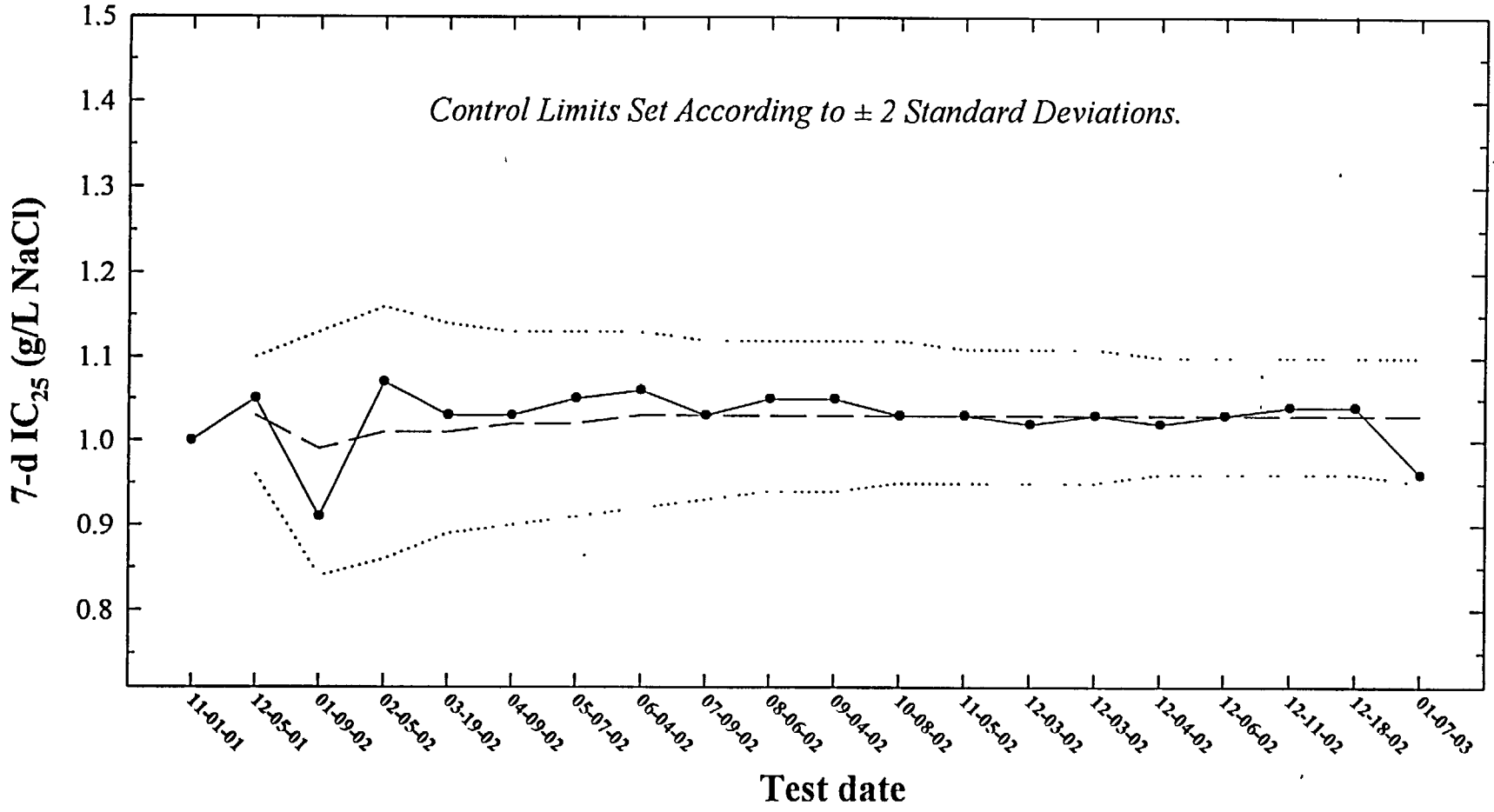
— – **Central Tendency** (mean IC_{25})

—··— **Warning Limits** (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.08$, as determined by USEPA for the method and endpoint)

····· **Control Limits** (mean $IC_{25} \pm S_{A\,25}$, $S_{A\,25} = 0.17$, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

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



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

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

. . .... **Control Limits** (mean IC_{25} ± 2 Standard Deviations)

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	11-01-01	100	27.0	6.5		3.1	11 6	
2	12-05-01	100	24 8	9.1	7.8	4.8	19.5	15.5
3	01-09-02	100	27.5	7.5	7.7	4.5	16.3	15.8
4	02-05-02	100	23 1	10.1	8 3	2.6	11.1	14 6
5	03-19-02	100	26 3	8 6	8 4	3.0	11.2	14 0
6	04-09-02	100	26 2	12 3	9 0	2.8	10.7	13 4
7	05-07-02	100	27.3	8 1	8 9	2.3	8.4	12.7
8	06-04-02	100	26 0	9.9	9.0	3.8	14.7	12 9
9	07-09-02	100	29 5	8 0	8.9	3.5	11.7	12.8
10	08-06-02	100	28 4	10 4	9 1	2.7	9.5	12 5
11	09-04-02	100	31 4	6 7	8 8	3.0	9.5	12.2
12	10-08-02	100	31.1	9.2	8.9	2.9	9.4	12 0
13	11-05-02	100	29.5	8 0	8 8	2.5	8.4	11.7
14	12-03-02	90	34.0	6 2	8 6	2.7	8.0	11.4
15	12-03-02	100	33.2	6.0	8 4	3.3	9.9	11.3
16	12-04-02	100	32.5	11.0	8 6	3.2	9.8	11.2
17	12-06-02	100	29 7	13.7	8 9	3.0	10 0	11 2
18	12-11-02	100	33 8	7.4	8.8	2.9	8 5	11 0
19	12-18-02	100	30 5	7.0	8.7	2.9	9.4	10 9
20	01-07-03	100	33 2	8 1	8.7	2.9	8 6	10.8

Note· Average control reproduction (offspring per female) = 29.3

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 **10.8%** 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)

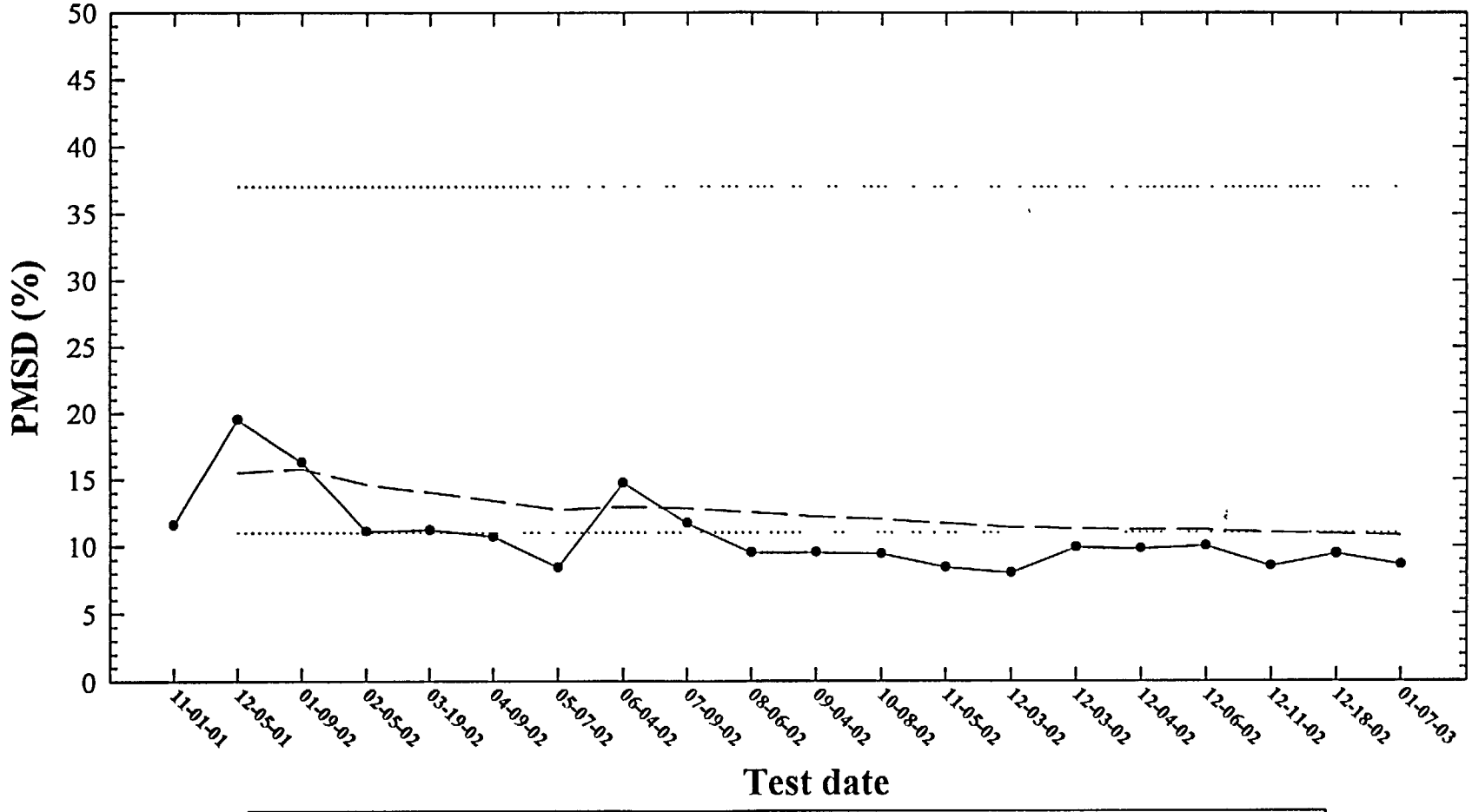
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for Ceriodaphnia reproduction in chronic reference toxicant tests

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.)

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

CdNaClCR Test Number: 6

	Date	Time	Analyst
Test start	01-07-03	1200	dl
Test end	01-14-03	1156	dl

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	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	< 24 HOURS OLD	Randomizing template:	ORANGE
Date and times organisms were born between:	01-07-03 0811 TO 1014	Incubator number:	2
Organism source:	12-31-02 A+B	YCT batch: ABS	12-24-02
Transfer bowl information:	pH = 8.00 Temperature (°C)= 25.2	*Selenastrum* batch: ABS	12-24-02

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	0	0	0	0	4	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	5	0	5	5	3	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	12	14	10	10	15	11	13	11	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	15	0	0	0	0	18
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	18	18	15	0	16	19	15	19	0
Total young produced		31	34	36	30	29	36	35	31	36	34
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

Test Renewal, Feeding, and Randomization Record Label

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	01-13	01-07	01-08	01-09	01-10	01-11	01-12
Time	1206	1200	1157	1207	1155	1200	1146
Analyst	dl	dl	dl	dl	dl	dl	dl
Shelf Location	B1	B1	B1	B1	B1	B1	B1

Control information:		Acceptance criteria	*Summary of test endpoints (mg NaCl/L):*	
% of Mal- Adults:	0%	≤ 20%	7-day LC50	>1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	33.2	≥ 15 0 offspring/female	ChV	894.4
% CV:	8.1%	< 40.0 %	IC25	962.4

CdNaClCR Test Number: 6

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	4	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	6	5	0	3	5	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	10	12	12	14	11	11	15	12	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	0	0	17	17	0	14	0	15	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	19	15	0	0	18	0	14	0	18
Total young produced		34	34	33	34	35	32	30	34	31	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.2
% Reduction from Control:	0%

800 mg NaCl/L

Survival and Reproduction Data

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

* CARRY OVER

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.8
% Reduction from Control:	4.2%

CdNaClCR Test Number: 6

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	4	4	3	5	5	4	4	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	6	5	10	12	6	8	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	14	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	10	13	9	11	0	12	8	13	16	14
Total young produced		21	27	19	19	29	29	18	25	24	22
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	23.3
% Reduction from Control:	29.8%

1200 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	3	0	0	0	3	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	3	3	2	4	5	0	0	4	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	5	0	0	0	6	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	5	0	4	7	0	0	0	0	0	3
Total young produced		5	3	7	12	9	5	0	3	10	5
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female.	5.9
% Reduction from Control:	82.2%

CdNaClCR Test Number: 6

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	0	0	0	2	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	1	0	0	0	4	0	0	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	2	0	3	0	0	0	0	0	0	0
Total young produced		2	1	3	0	0	6	0	0	4	0
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female	1.6
% Reduction from Control.	95.2%

Environmental Testing Solutions, LLC

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

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

Test number: CdNaClCR #35

Test dates: January 7 - 14, 2003

Reviewed by: J Lemon

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	31	34	36	30	29	36	35	31	36	34	100	33.2	8 1	Not applicable
600	34	34	33	34	35	32	30	34	31	35	100	33.2	5 1	0 0
800	31	32	32	32	32	31	31	32	35	30	100	31 8	4.1	4 2
1000	21	27	19	19	29	29	18	25	24	22	100	23 3	17 8	29 8
1200	5	3	7	12	9	5	0	3	10	5	100	5 9	61 6	82.2
1400	2	1	3	0	0	6	0	0	4	0	100	1 6	132 4	95 2

Dunnett's MSD value: 2 853

PMSD: 8 6

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 10 8% 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	01-07-03	Test ID	CdNaClCR	Sample ID	REF-Ref Toxicant
End Date	01-14-03	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	31 000	34 000	36 000	30 000	29 000	36 000	35 000	31 000	36 000	34 000
600	34 000	34 000	33 000	34 000	35 000	32.000	30 000	34 000	31 000	35 000
800	31 000	32 000	32 000	32 000	32 000	31.000	31 000	32 000	35 000	30 000
1000	21 000	27 000	19 000	19 000	29 000	29 000	18 000	25 000	24 000	22 000
1200	5 000	3 000	7 000	12 000	9 000	5 000	0 000	3 000	10 000	5 000
1400	2 000	1 000	3 000	0 000	0 000	6 000	0 000	0 000	4 000	0 000

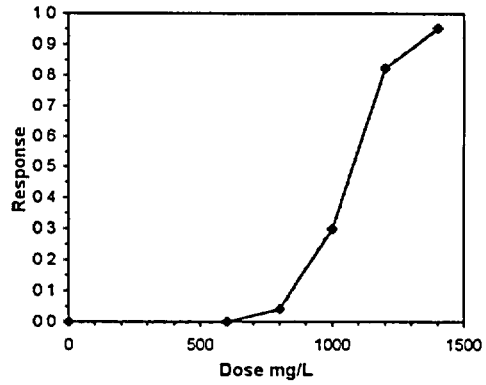
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	33 200	1 0000	33 200	29 000	36 000	8.132	10			33 200	1 0000
600	33 200	1 0000	33 200	30 000	35 000	5 080	10	100 50	75 00	33 200	1 0000
800	31.800	0 9578	31.800	30 000	35 000	4 140	10	92 00	75 00	31 800	0 9578
*1000	23.300	0 7018	23 300	18 000	29 000	17.759	10	56 00	75 00	23.300	0 7018
*1200	5 900	0 1777	5 900	0 000	12 000	61 605	10	55 00	75 00	5 900	0 1777
*1400	1 600	0 0482	1 600	0 000	6 000	132 419	10	55 00	75 00	1 600	0 0482

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0 01)	0 644731641	1 035	0 179333511	-0 088421936
Bartlett's Test indicates unequal variances (p = 8 16E-03)	15 57795048	15 08631706		

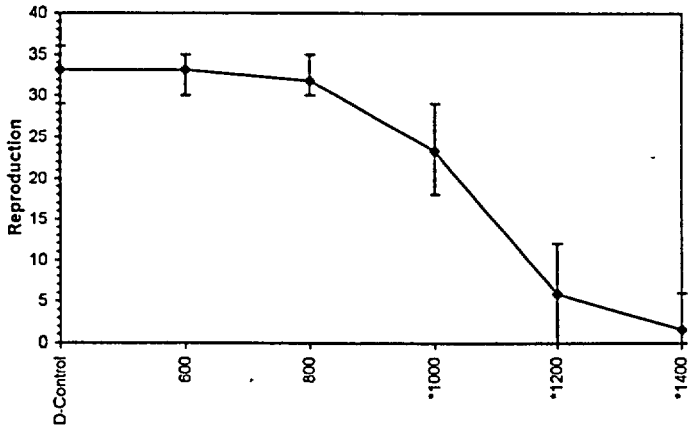
Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	800	1000	894 427191	

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	806 1176471	62 23646999	621 4058824	831 0523374	-2 1157
IC10	845 1764706	16 10286245	814 5108696	870 8034163	0 2593
IC15	884 2352941	17 9163057	850 0187974	918 8172779	0 6136
IC20	923 2941176	21 52170053	886 7947958	967 7859037	0 6574
IC25	962 3529412	23 5811894	921 1981225	1005 440864	0 1587
IC40	1038 850575	11 70688582	1014 698685	1060 114799	-0 2641
IC50	1077 011494	9 250837919	1059 673238	1093 762391	0 1241



Dose-Response Plot



CdNaClCR Test Number: 6

Daily Chemistry: HHS BATCH : 01-06-03

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.98	8.25	8.10	8.27	8.18	8.14
	DO (mg/L)	~~7.4~~ 7.3	7.6	7.4	8.1	7.9	8.0
	Conductivity (µmhos/cm)	297		297		318	
	Alkalinity (mg $CaCO_3$/L)	62					
	Hardness (mg $CaCO_3$/L)	84					
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
600 mg NaCl/L	pH (S U.)	8.01	8.16	8.15	8.22	8.18	8.11
	DO (mg/L)	7.3	7.6	7.4	8.1	8.0	8.1
	Conductivity (µmhos/cm)	1412		1393		1415	
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
800 mg NaCl/L	pH (S.U.)	7.99	8.17	8.15	8.26	8.19	8.12
	DO (mg/L)	7.3	7.8	7.6	8.1	8.0	8.1
	Conductivity (µmhos/cm)	1733		1740		1734	
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
1000 mg NaCl/L	pH (S.U.)	7.97	8.16	8.15	8.24	8.16	8.12
	DO (mg/L)	7.4	7.8	7.6	8.1	8.1	8.0
	Conductivity (µmhos/cm)	2026		~~17~~ 2040		2131	
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
1200 mg NaCl/L	pH (S.U.)	7.98	8.14	8.14	8.20	8.17	8.10
	DO (mg/L)	7.3	7.7	7.6	8.1	8.2	8.2
	Conductivity (µmhos/cm)	2448		2472		2444	
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
1400 mg NaCl/L	pH (S.U.)	7.96	8.13	8.14	8.21	8.16	8.10
	DO (mg/L)	7.3	7.8	7.6	8.1	8.2	8.1
	Conductivity (µmhos/cm)	2795 ~~29~~		2812		2798	
	Temperature (°C)	25.1	24.9	24.3	25.1	24.6	25.0
		Initial	Final	Initial	Final	Initial	Final

10000

CdNaClCR Test Number: 6

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.20	8.24	8.17	8.19	8.20	8.19	8.15	8.08
	DO (mg/L)	8.2	8.3	8.0	8.2	7.7	8.0	7.6	7.9
	Conductivity (µmhos/cm)	297		307		303		294	
	Alkalinity (mg $CaCO_3$/L)								
	Hardness (mg $CaCO_3$/L)								
	Temperature (°C)	24.5	24.8	24.7	25.1	24.2	24.4	24.2	24.7
600 mg NaCl/L	pH (S U.)	8.15	8.20	8.13	8.11	8.16	8.12	8.15	8.05
	DO (mg/L)	7.9	8.3	8.2	8.2	8.1	7.9	7.8	8.0
	Conductivity (µmhos/cm)	1426		1435		1395		1447	
	Temperature (°C)	24.4	24.8	24.7	25.1	24.2	24.4	24.2	24.7
800 mg NaCl/L	pH (S U.)	8.14	8.22	8.12	8.16	8.17	8.12	8.16	8.09
	DO (mg/L)	8.0	8.3	8.2	8.2	8.2	8.0	8.0	8.0
	Conductivity (µmhos/cm)	1759		1774		1741		1771	
	Temperature (°C)	24.4	24.8	24.7	25.1	24.2	24.4	24.2	24.7
1000 mg NaCl/L	pH (S.U.)	8.13	8.23	8.11	8.15	8.16	8.14	8.14	8.11
	DO (mg/L)	8.1	8.3	8.2	8.2	8.1	7.9	8.0	8.0
	Conductivity (µmhos/cm)	2059		2062		2037		2063	
	Temperature (°C)	24.4	24.8	24.7	25.1	24.2	24.4	24.2	24.7
1200 mg NaCl/L	pH (S.U.)	8.12	8.23	8.10	8.15	8.13	8.12	8.13	8.11
	DO (mg/L)	8.2	8.3	8.2	8.2	8.2	7.8	8.0	8.4
	Conductivity (µmhos/cm)	2475		2499		2468		2517	
	Temperature (°C)	24.4	24.8	24.7	25.1	24.2	24.4	24.2	24.7
1400 mg NaCl/L	pH (S.U.)	8.12	8.22	8.10	8.10	8.12	8.11	8.12	8.08
	DO (mg/L)	8.3	8.5	8.4	8.4	8.2	7.8	8.0	8.3
	Conductivity (µmhos/cm)	2829		2793		2762		2818	
	Temperature (°C)	24.4	24.8	24.7	25.1	24.2	24.4	24.2	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final