

NOTICE OF NONCOMPLIANCE WITH EFFLUENT LIMITATION
NPDES PERMIT TN0020168
WATTS BAR NUCLEAR PLANT

April 18, 2003

Outfall Serial Number (OSN) 112: Runoff Holding Pond

Description of the Noncompliance:

Semi-annual toxicity testing of OSN 112 demonstrated chronic toxicity for larval fathead minnows (*Pimephales promelas*). Sampling was conducted from April 13-18, 2003. The IC_{25} value resulted in 82.5%, which did not meet the permit limit of $\geq 100\%$. There were no toxic effects seen in Daphnids (*Ceriodaphnia dubia*).

Cause and Period of the Noncompliance:

The noncompliance is known to have begun April 13, 2003, when the initial test sampling began. Preliminary results from repeat sampling conducted from April 28-May 2 indicates the period of noncompliance likely ended May 2. Final reviews and Engineering confirmation of the repeat test will be completed in late May. The cause of the Noncompliance was due to naturally occurring pathogens.

Steps Taken To Reduce, Eliminate, and Prevent Recurrence of the Noncompliance:

Corrective actions include the retest. UV pretreatment controls tested in parallel for this outfall indicated no chronic toxicity for larval fathead minnows. This is similar to the Notice of Noncompliance that was submitted for the same outfall on April 21, 2001. A study was performed in 2001 at WBN and indicated that the failure of Whole Effluent Toxicity testing for fathead minnows was due to naturally occurring pathogens in this outfall. The same pattern of failure is seen here. A copy of this study has been provided to TDEC. Additional copies are available upon request. No further actions are believed necessary at this time.

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

Name **TVA - WATTS BAR NUCLEAR PLANT**
 Address **P.O. BOX 2000**
INTEROFFICE MOBID
SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

DIFFUSER DISCHARGE

EFFLUENT

Form Approved.
 OMB No. 2040-0004

TN0020168 101 G
 PERMIT NUMBER DISCHARGE NUMBER

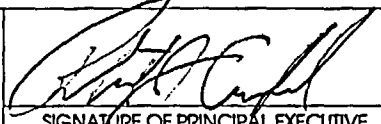
MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 03 04 01 03 04 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION			NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	25	0	30 / 30	RCORDR
00010 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	35 DAILY MX		CONTIN- OUS	RCORDR
EFFLUENT GROSS VALUE										
PH	SAMPLE MEASUREMENT	*****	*****	**	8.2	*****	8.4	0	5 / 30	GRAB
00400 1 0 0	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM		WEEKLY	GRAB
EFFLUENT GROSS VALUE										
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	6	6	0	5 / 30	GRAB
00530 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	100 DAILY MX		WEEKLY	GRAB
EFFLUENT GROSS VALUE										
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	<5	<5	0	5 / 30	GRAB
00556 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	15 MO AVG	20 DAILY MX		WEEKLY	GRAB
EFFLUENT GROSS VALUE										
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	24.214	46.686	(03)	*****	*****	*****	0	30 / 30	RCORDR
50050 1 0 0	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****		CONTIN- OUS	RCORDR
EFFLUENT GROSS VALUE										
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.06	0	19 / 30	GRAB
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	0.10 DAILY MX		WEEK- DAYS	GRAB
EFFLUENT GROSS VALUE										
DISCHARGE EVENT OBSERVATION	SAMPLE MEASUREMENT	*****	YES	(94)	*****	*****	*****	0	1 / 30	OPRCRD
84165 1 0 0	PERMIT REQUIREMENT	***** CERT.	REPORT YES/NO	Y=1;N=0	*****	*****	*****		ONCE/ MONTH	OPRCRD
Instream Flo > 3500 CFS										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
W. R. Lagergren			423	365-8767	03	05	15
SITE VICE PRESIDENT			AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED							

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

Instream flow of > 3500 cfs present as required by permit.

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

Name TVA - WATTS BAR NUCLEAR PLANT
 Address P.O. BOX 2000
(INTEROFFICE MOB.)
SPRING CITY, TN 37381
 Facility TVA - WATTS BAR NUCLEAR PLANT
 Location RHEA COUNTY

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

MAJOR

SUBR 01

F - FINAL

BIOMONITORING FOR OUTFALL 101

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 101 T
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 03 04 01 03 04 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	*****	*****	**	>13.2	*****	*****	(23)	0	1/180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	3.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	>13.2	*****	*****	(23)	0	1/180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	3.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

Instream flow of >3500 cfs present as required by the permit.

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

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 Address **P.O. BOX 2000**
(INTEROFFICE MOBILE)
SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

YD HLDING POND EMERG OVERFLW WEIR

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 102 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR 03 MO 04 DAY 01 To YEAR 03 MO 04 DAY 30

*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(04)			
00010 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	40	DEG. C.		DAILY	GRAB
EFFLUENT GROSS VALUE							DAILY MX				
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		(12)			
00400 1 0 0	PERMIT REQUIREMENT	*****	*****	****	6.0	*****	9.0	SU		WEEKLY	GRAB
EFFLUENT GROSS VALUE					MINIMUM		MAXIMUM				
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****			(19)			
00530 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	30	100	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****			(19)			
00556 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	15	20	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	*****	*****	*****	**			
50050 1 0 0	PERMIT REQUIREMENT	REPORT	REPORT	MGD	*****	*****	*****	****		DAILY	INSTAN
EFFLUENT GROSS VALUE		MO AVG	DAILY MX								
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	0.10	MG/L		WEEK-DAYS	GRAB
EFFLUENT GROSS VALUE							DAILY MX				
DISCHARGE EVENT OBSERVATION	SAMPLE MEASUREMENT	*****		(94)	*****	*****	*****	**			
84165 1 0 0	PERMIT REQUIREMENT	*****	REPORT	Y=1;N=0	*****	*****	*****	****		ONCE/MONTH	OPRCRD
Instm Flo > 3500 CFS		CERT.	YES/NO								

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

No Discharge this Period

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

Name TVA - WATTS BAR NUCLEAR PLANT
 Address P.O. BOX 2000
INTEROFFICE MOBILITY
SPRING CITY, TN 37381
 Facility TVA - WATTS BAR NUCLEAR PLANT
 Location RHEA COUNTY

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

MAJOR

SUBR 01

Form Approved.

OMB No. 2040-0004

TN0020168	102 T
PERMIT NUMBER	DISCHARGE NUMBER

F - FINAL

BIOMONITORING FOR OUTFALL 102

EFFLUENT


*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 03	04	01	To 03	04	30

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	*****	*****	**		*****	*****	(23)			
TRP3B 1 0 0	PERMIT REQUIREMENT	*****	*****	***	3.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**		*****	*****	(23)			
TRP6C 1 0 0	PERMIT REQUIREMENT	*****	*****	***	3.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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W. R. Lagergren			423	365-8767	03	05	15
SITE VICE PRESIDENT			AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED							

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

No Discharge this Period

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

Name **TVA - WATTS BAR NUCLEAR PLANT**
 Address **P.O. BOX 2000**
(INTEROFFICE MOBILE)
SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

LOW VOL. WASTE TREATMENT POND

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 103 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR 03 MO 04 DAY 01 To YEAR 03 MO 04 DAY 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.4	*****	7.8	(12)	0	4 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	22	37	(26)	*****	6	12	(19)	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	250 MO AVG	834 DAILY MX	LBS/DAY	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<21	<32	(26)	*****	<5	<5	(19)	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	125 MO AVG	167 DAILY MX	LBS/DAY	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.626	0.862	(03)	*****	*****	*****	**	0	14 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	****		CONTIN- OUS	RCORDR
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

Discharged Low Volume Waste Treatment Pond 14 days in April.

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

Name **TVA - WATTS BAR NUCLEAR PLANT**
 Address **P.O. BOX 2000**
INTEROFFICE MOBILE
SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

METAL CLEANING WASTE POND

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 107 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR 03 MO 04 DAY 01 To YEAR 03 MO 04 DAY 30

*** NO DISCHARGE ☐ ***

NOTE: Read Instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	8.7	*****	8.7	(12)	0	1 / 30	GRAB
00400 1 0 0	PERMIT REQUIREMENT	*****	*****	***	6.0	*****	9.0	SU		DAILY	GRAB
EFFLUENT GROSS VALUE					MINIMUM		MAXIMUM				
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	3.8	(26)	*****	*****	4	(19)	0	1 / 30	COMPOS
00530 1 0 0	PERMIT REQUIREMENT	*****	250.2	LBS/DAY	*****	*****	30	MG/L		DAILY	COMPOS
EFFLUENT GROSS VALUE			DAILY MX				DAILY MX				
OIL AND GREASE	SAMPLE MEASUREMENT	*****	<5.0	(26)	*****	*****	<5	(19)	0	1 / 30	GRAB
00556 1 0 0	PERMIT REQUIREMENT	*****	125.1	LBS/DAY	*****	*****	15	MG/L		DAILY	GRAB
EFFLUENT GROSS VALUE			DAILY MX				DAILY MX				
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	*****	*****	**	*****	Monitoring Not Required	Monitoring Not Required	(19)			
00665 1 0 0	PERMIT REQUIREMENT	*****	*****	**	*****	1.0	1.0	MG/L		DAILY	COMPOS
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	0.13	0.13	(26)	*****	0.0	0.0	(19)	0	1 / 30	COMPOS
01042 1 0 0	PERMIT REQUIREMENT	8.34	8.34	LBS/DAY	*****	1.0	1.0	MG/L		DAILY	COMPOS
EFFLUENT GROSS VALUE		MO AVG	DAILY MX			MO AVG	DAILY MX				
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	4.64	4.64	(26)	*****	0.2	0.2	(19)	0	1 / 30	COMPOS
01045 1 0 0	PERMIT REQUIREMENT	8.34	8.34	LBS/DAY	*****	1.0	1.0	MG/L		DAILY	COMPOS
EFFLUENT GROSS VALUE		MO AVG	DAILY MX			MO AVG	DAILY MX				
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	2.525	2.525	(03)	*****	*****	*****	**	0	1 / 30	CALCTD
50050 1 0 0	PERMIT REQUIREMENT	REPORT	REPORT	MGD	*****	*****	*****	***		DAILY	CALCTD
EFFLUENT GROSS VALUE		MO AVG	DAILY MX								

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W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT					

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

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

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 Address **P.O. BOX 2000**
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 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

Form Approved.

OMB No. 2040-0004

TN0020168	111 G
PERMIT NUMBER	DISCHARGE NUMBER

F - FINAL

COMBINED SEWAGE TREATMENT PLANTS

EFFLUENT

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 03	04	01	To 03	04	30

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
BOD, 5-DAY (20 DEG. C)	SAMPLE MEASUREMENT	*****	*****	**	*****	<2	<2	(19)	0	5 / 30	GRAB
00310 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	45 DAILY MX	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	4	12	(19)	0	5 / 30	GRAB
00530 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	45 DAILY MX	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	<0.1	(25)	0	22 / 30	GRAB
00545 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	ML/L		TWICE/ WEEK	GRAB
EFFLUENT GROSS VALUE											
COLIFORM, FECAL MF, M-FC BROTH, 44.5C	SAMPLE MEASUREMENT	*****	*****	**	*****	<3	7	(13)	0	5 / 30	GRAB
31616 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	200 MO AVG	1000 DAILY MX	#/100 ML		WEEKLY	GRAB
EFFLUENT GROSS VALUE											
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.046	0.124	(03)	*****	*****	*****	..	0	30 / 30	RCORDR
50050 1 0 0	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	****		CONTIN- OUS	RCORDR
EFFLUENT GROSS VALUE											
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	Not Chlorinating	(19)			
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	2.0 DAILY MX	MG/L		WEEK- DAYS	GRAB
EFFLUENT GROSS VALUE											
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

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

Name TVA - WATTS BAR NUCLEAR PLANT
 Address P.O. BOX 2000
(INTEROFFICE MOBILE)
SPRING CITY, TN 37381
 Facility TVA - WATTS BAR NUCLEAR PLANT
 Location RHEA COUNTY

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

MAJOR

SUBR 01

F - FINAL

RUNOFF HOLDING POND

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168	112 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
03	04	01	03	04	30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	*****	*****	**	10.4	*****	*****	(19)	0	5 / 30	GRAB
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	5.0 DAILY MN	*****	*****	MG/L		WEEKLY	GRAB
PH	SAMPLE MEASUREMENT	*****	*****	**	7.3	*****	9.1	(12)	0	5 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.5 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	11	16	(19)	0	5 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
NITROGEN, AMMONIA TOTAL (AS N)	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.06	0.15	(19)	0	5 / 30	GRAB
00610 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	1.46 MO AVG	2.42 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.371	0.654	(03)	*****	*****	*****	**	0	5 / 30	INSTAN
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	****		WEEKLY	INSTAN
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.02	<0.02	(19)	0	5 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	.011 MO AVG	.019 DAILY MX	MG/L		WEEKLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

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

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SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

BIOMONITORING FOR OUTFALL 112

EFFLUENT

Form Approved.
 OMB No. 2040-0004

TN0020168 112 T
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 03 04 01 03 04 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

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	1/180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	100 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	82	*****	*****	(23)	1	1/180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	100 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

See attached Notice of Noncompliance. Repeat toxicity testing on Pimephales was performed April 27-May 2, 2003. The report has not been reviewed. The retest test report will be sent with the next DMR along with a correction for this DMR.

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

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INTEROFFICE MOBILE
SPRING CITY, TN 37381
 Facility **TVA - WATTS BAR NUCLEAR PLANT**
 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

SCCW DISCHARGE

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 113 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 03 04 01 03 04 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER	<div></div>	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE 00010 P 0 0 Temp, Receiving Stream Btm	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	18.5	(04)	0	30 / 30	RCORDR
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	33.5 DAILY MX	DEG. C.		HOURLY	RCORDR
TEMPERATURE, WATER DEG. CENTIGRADE 00010 Z 0 0 Instream Edge of Mixing Zone	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	18.1	(04)	0	30 / 30	RCORDR
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30.5 DAILY MX	DEG. C.		HOURLY	RCORDR
TEMPERATURE, WATER DEG. CENTIGRADE 00010 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	30	(04)	0	30 / 30	RCORDR
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT DAILY MX	DEG. C.		CONTIN- UOUS	RCORDR
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C 00016 Z 0 0 Temp, Rise UpStrm to DnStrm	SAMPLE MEASUREMENT	*****	*****	(04)	*****	*****	1	(04)	0	30 / 30	CALCTD
	PERMIT REQUIREMENT	*****	*****	DEG. C.	*****	*****	3 DAILY MX	DEG. C.		HOURLY	CALCTD
OXYGEN, DISSOLVED (DO) 00300 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	8.8	*****	*****	(19)	0	1 / 30	GRAB
	PERMIT REQUIREMENT	*****	*****	****	REPORT DAILY MN	*****	*****	MG/L		ONCE / MONTH	GRAB
PH 00400 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	8.3	*****	8.3	(12)	0	1 / 30	GRAB
	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		ONCE / MONTH	GRAB
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	5	5	(19)	0	1 / 30	GRAB
	PERMIT REQUIREMENT	*****	*****	****	*****	REPORT MO AVG	REPORT DAILY MX	MG/L		ONCE / MONTH	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
W. R. Lagergren SITE VICE PRESIDENT		423	365-8767	03	05	15
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

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

Instream flow of > 3500 cfs present as required by the permit. 00010Z = Instream temp. at edge of the Mixing Zone. 00010P = Instream temp. at Receiving Stream bottom. Stream Flow direction indicates maximum daily percentage of time flow was upstream.

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 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

F - FINAL

SCCW DISCHARGE

EFFLUENT

Form Approved.

OMB No. 2040-0004

TN0020168 113 G
 PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD
 From YEAR MO DAY To YEAR MO DAY
 03 04 01 03 04 30

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Attn: Robert J. Crawford, Environmental Supervisor

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	168.148	188.499	(03)	*****	*****	*****	..	0	30 / 30	RCORDR
50050 1 0 0	PERMIT REQUIREMENT	REPORT	REPORT	MGD	*****	*****	*****	****		CONTIN- OUS	RCORDR
EFFLUENT GROSS VALUE		MO AVG	DAILY MX								
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.020	<0.020	(19)	0	1 / 30	GRAB
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	0.092	0.158	MG/L		ONCE/ MONTH	GRAB
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	1	(04)	0	30 / 30	CALCTD
82234 Z 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	2	DEG. C.		HOURLY	CALCTD
Temp, Rate of Chng DnStrm							DAILY MX				
DISCHARGE EVENT OBSERVATION	SAMPLE MEASUREMENT	*****	YES	(94)	*****	*****	*****	..	0	1 / 30	OPRCRD
84165 1 0 0	PERMIT REQUIREMENT	*****	REPORT	Y=1;N=0	*****	*****	*****	****		MONTHLY	OPRCRD
EFFLUENT GROSS VALUE		CERT.	YES/NO								
STREAM FLOW DIRECTION RECORDING	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	33		0	30 / 30	RCORDR
50052 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	Flo Upstrm	% TIME		DAILY	RCORDR
EFFLUENT GROSS VALUE							DAILY MX				
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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W. R. Lagergren		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
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COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

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

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 Location **RHEA COUNTY**

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

MAJOR

SUBR 01

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BIOMONITORING FOR OUTFALL 113

EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
 OMB No. 2040-0004

TN0020168 **113 T**
PERMIT NUMBER **DISCHARGE NUMBER**

MONITORING PERIOD
 From **03 04 01** To **03 04 30**

Attn: Robert J. Crawford, Environmental Supervisor

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	*****	*****	**	>41.2	*****	*****	(23)	0	1/180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	10.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	>41.2	*****	*****	(23)	0	1/180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	10.3 MINIMUM	*****	*****	PERCENT		SEMI-ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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W. R. Lagergen		423	365-8767	03	05	15
SITE VICE PRESIDENT		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

Instream flow of >3500 cfs present as required by the permit. 00010Z = Instream temp. at edge of the Mixing Zone. 0010P = Instream temp. at Receiving Stream bottom. Stream flow direction indicates maximum daily percentage of time flow was upstream.

**TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT TOXICITY TESTING,
OUTFALLS 101, 112, AND 113**

EXECUTIVE SUMMARY

Toxicity testing was conducted on Outfalls 101, 112, and 113 during April 2003, to meet the requirements of the Watts Bar Nuclear Plant (WBN) NPDES permit (TN0020168).

Composite samples collected from Outfalls 101, 112, and 113 were analyzed for toxicity using definitive, short-term chronic toxicity tests with fathead minnows, *Pimephales promelas*, and daphnids, *Ceriodaphnia dubia*. Acute (96-hour LC₅₀) and chronic (IC₂₅) endpoints were calculated for each effluent. Toxicity tests were conducted according to U.S. EPA (EPA/821/R/02/013) Method 1000.0 for *Pimephales* and Method 1002.0 for *Ceriodaphnia*.

Toxicity test results follow:

Outfall 101

Composite samples of Outfall 101 and grab samples of raw water intake were collected April 13-18, 2003. The toxicity tests for fathead minnows and daphnid were conducted April 14-21, using the specified test dilution series of 0.83, 1.7, 3.3, 6.6, and 13.2 percent concentrations of Outfall 101. The resulting IC₂₅ values for fathead minnow and daphnids were > 13.2 percent, which meets the permit limit of 3.3 percent.

Intake samples were tested at 100 percent only, for both tests. Fathead minnows exposed to intake samples were significantly different from control for survival and growth based on Homoscedastic t-Test. There was no significant difference between control and intake samples for daphnid survival or reproduction based on Homoscedastic t-Test.

Outfall 112

Composite samples of Outfall 112 were collected April 13-18, 2003. Toxicity tests were conducted April 15-22, using the specified dilution series of 6.25, 12.5, 25.0, 50.0, and 100 percent concentrations of Outfall 112. The resulting IC₂₅ value for daphnid test was > 100 percent, which meets the permit limit of 100 percent. Testing of fathead minnows, however, resulted in an IC₂₅ of 82.5 percent effluent (1.2 TUc) due to significant and highly variable mortality observed throughout the Outfall 112 serial dilution series. This pattern of mortality has been observed previously in WBN Outfall 112 samples and it may be related to ambient conditions upstream of the construction runoff holding pond, possibly due to the presence of pathogens or other biological organisms. Bacterial growth was observed on the gills of minnows exposed to non-treated effluent from Outfall 112. This pathogenic growth was likely the cause of mortality in the effluent.

A repeat test with fathead minnows was conducted April 29-May 6, due to test results in April which exceeded the permit limit for Outfall 112. Surface stream samples collected upstream of the sewage treatment pond (NOSTP) discharge (Outfall 111) was also tested as part of this study to evaluate the influence of individual inflows on the quality of Outfall 112.

Fathead minnows were also exposed to UV treated Outfall 112 samples since fish pathogens present in upstream water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Watts Bar Nuclear Plant. Survival was 100% in all effluent concentrations with two-minute exposure to UV light prior to introduction of test organisms. These results suggest that fish pathogen interference is a likely cause of minnow mortality in the effluent. The resulting IC_{25} value for UV-treated effluent was > 100 percent for fathead minnows.

Outfall 113

Composite samples of Outfall 113 and grab samples of raw water intake were collected April 13-18, 2003. Toxicity tests were conducted April 15-22, using the specified dilution series of 2.58, 5.20, 10.3, 20.6, and 41.2 percent concentrations of Outfall 113. The resulting IC_{25} values for fathead minnows and daphnids were > 41.2 percent, which meets the permit limit of 10.3 percent.

Intake samples were tested at 100 percent only, for both tests. Analyses using the Homoscedastic t-Test showed no toxicity to fathead minnows or daphnids exposed to intake samples.

INTRODUCTION/EXECUTIVE SUMMARY

- 22) Phone #: (865) 970-0003
Phone #: (256) 386-2755

23) Notes: Exposure of test organisms to samples from Outfall 101 resulted in no toxicity to *Pimephales promelas* or *Ceriodaphnia dubia*. Fathead minnows exposed to intake samples were significantly different from control for survival and growth based on Homoscedastic t-Test. There was no significant difference between control and intake samples for daphnid survival or reproduction based on Homoscedastic t-Test.

METHODS SUMMARY

Samples

- 1) Sampling Point: Outfall 101 - Diffuser Discharge; Intake
- 2) Sample Type: Outfall 101-Composite; Intake-Grab
- 3) Sample Information:

ID	Date/Time Collected (MM-DD/Time)	Date/Time Received (MM-DD/Time)	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date/Time Used By (MM-DD/Time)
101 Intake	04-13/0805 to 04-14/0705	04-14/1250	1.0	0.05	04-14/1400 04-15/1445
	04-14/0845	04-14/1250	1.5	0.04	04-14/1400 04-15/1445
101 Intake	04-15/0850 to 04-16/0750	04-16/1158	1.2	0.07	04-16/1400 04-17/1420
	04-16/0735	04-16/1158	0.9	0.07	04-16/1400 04-17/1420
101 Intake	04-17/0845 to 04-18/0745	04-18/1228	1.9	0.05	04-18/1445 04-19/1310 04-20/1305
	04-18/0830	04-18/1228	2.0	0.06	04-18/1445 04-19/1310 04-20/1305

*Total residual chlorine. Interference likely since chlorine would not be expected in ambient (intake) water.

NOTE: All times listed are Eastern Daylight Savings Time.

- 4) Sample manipulation: Samples were warmed to test temperature (25°C) in a warm water bath

Test Organisms

- | | | |
|------------|-----------------------------------|----------------------------------|
| | <u><i>Pimephales promelas</i></u> | <u><i>Ceriodaphnia dubia</i></u> |
| 1) Source: | <u>In-house culture</u> | <u>In-house culture</u> |
| 2) Age: | <u>< 24 hours</u> | <u>< 24 hours</u> |

Test Method Summary (See Appendix A for additional information)

	<u><i>Pimephales promelas</i></u>	<u><i>Ceriodaphnia dubia</i></u>
1) Test Conditions	<u>Static, renewal</u>	<u>Static, renewal</u>
2) Test Duration	<u>7 days</u>	<u>Until 60% of control females have 3 broods</u>
3) Dilution/Control Water	<u>Moderately Hard Reconstituted Water</u>	<u>20% Dilute Mineral Water with trace minerals</u>
4) Number Replicates	<u>4</u>	<u>10</u>
5) Animals per Replicate	<u>10</u>	<u>1</u>
6) Test Initiation (101)	<u>4-14-03/1330 EDT</u>	<u>4-14-03/1400 EDT</u>
7) Test Termination (101)	<u>4-21-03/1400 EDT</u>	<u>4-21-03/1350 EDT</u>
8) Test Temperature (101)	Mean = 25.1°C <u>(24.0°C-25.9°C)</u>	Mean = 25.1°C <u>(24.0°C-25.8°C)</u>
9) Physical/Chemical Measurements:	Hardness, alkalinity, total residual chlorine, and conductivity were measured at the laboratory in each 100 percent sample or the highest concentration tested. Daily temperatures were measured in one replicate in 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).	

1) Results of a Pimephales promelas Larval Survival and Growth/7-days Toxicity Test
 (Genus) (Species) (Type/Duration)

Conducted 04/14/03 - 04/21/03
 (mm/dd/yy) (mm/dd/yy)

Using Effluent From: Outfall 101
 (number)

Test Solutions	Percent Surviving (time intervals used – days)						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4*</u>	<u>5</u>	<u>6</u>	<u>7</u>
Control	<u>100</u>	<u>100</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>98</u>
0.83% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>98</u>	<u>98</u>
1.7% Effluent	<u>100</u>	<u>100</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>98</u>
3.3% Effluent	<u>100</u>	<u>100</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>98</u>	<u>95</u>
6.6% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>98</u>	<u>95</u>	<u>95</u>	<u>93</u>
13.2% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>98</u>	<u>93</u>	<u>90</u>
Intake	<u>100</u>	<u>98</u>	<u>90</u>	<u>88</u>	<u>80</u>	<u>58</u>	<u>53</u>
*96-Hour LC ₅₀ Value: <u>> 13.2%</u>		Calculated TU Estimate: <u><7.58 TUa</u> Permit Limit: <u>N/A</u>					

Test Solutions	IC ₂₅ Mean Dry Weight (mg) (Replicate)				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Mean</u>
Control	<u>0.439</u>	<u>0.512</u>	<u>0.470</u>	<u>0.603</u>	<u>0.506</u>
0.83% Effluent	<u>0.298</u>	<u>0.480</u>	<u>0.467</u>	<u>0.521</u>	<u>0.442</u>
1.7% Effluent	<u>0.459</u>	<u>0.453</u>	<u>0.501</u>	<u>0.510</u>	<u>0.481</u>
3.3% Effluent	<u>0.415</u>	<u>0.319</u>	<u>0.455</u>	<u>0.375</u>	<u>0.391</u>
6.6% Effluent	<u>0.371</u>	<u>0.447</u>	<u>0.425</u>	<u>0.544</u>	<u>0.447</u>
13.2% Effluent	<u>0.359</u>	<u>0.448</u>	<u>0.501</u>	<u>0.378</u>	<u>0.422</u>
Intake	<u>0.155</u>	<u>0.070</u>	<u>0.286</u>	<u>0.516</u>	<u>0.257</u>
IC ₂₅ Value: <u>> 13.2%</u> Permit Limit= <u>3.3%</u>		Calculated TU Estimates [†] : <u><7.58 TUc</u> Permit Limit: <u>30.30 TUc</u>			

NOTE: TUa = 100/LC₅₀; TUc = 100/ IC₂₅

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

Conducted 4/14/03 - 4/21/03
(mm/dd/yy) (mm/dd/yy)

Using Effluent From: Outfall 101.
(number)

Test Solutions	Percent Surviving (time intervals used – days)						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4*</u>	<u>5</u>	<u>6</u>	<u>7</u>
Control	<u>100</u>	<u>100</u>	<u>100</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>
0.83% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>90</u>	<u>90</u>	<u>90</u>
1.7% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
3.3% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
6.6% Effluent	<u>100</u>	<u>100</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>
13.2% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Intake	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
*96-Hour LC ₅₀ Value: <u>> 13.2%</u>			Calculated TU Estimate: <u><7.58 TU_a</u> Permit Limit: <u>N/A</u>				

Test Solutions	Reproduction (#young/female/6 days) Data Replicates										Mean
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	
Control	<u>31</u>	<u>31</u>	<u>25</u>	<u>23</u>	<u>29</u>	<u>29</u>	<u>0</u>	<u>27</u>	<u>27</u>	<u>29</u>	<u>25.1</u>
0.83% Effluent	<u>27</u>	<u>4</u>	<u>23</u>	<u>22</u>	<u>32</u>	<u>26</u>	<u>28</u>	<u>27</u>	<u>28</u>	<u>21</u>	<u>23.8</u>
1.7% Effluent	<u>27</u>	<u>31</u>	<u>32</u>	<u>31</u>	<u>24</u>	<u>24</u>	<u>27</u>	<u>24</u>	<u>20</u>	<u>24</u>	<u>26.4</u>
3.3% Effluent	<u>23</u>	<u>33</u>	<u>27</u>	<u>28</u>	<u>24</u>	<u>23</u>	<u>27</u>	<u>25</u>	<u>30</u>	<u>23</u>	<u>26.3</u>
6.6% Effluent	<u>0</u>	<u>32</u>	<u>24</u>	<u>26</u>	<u>27</u>	<u>21</u>	<u>22</u>	<u>26</u>	<u>24</u>	<u>23</u>	<u>22.5</u>
13.2% Effluent	<u>29</u>	<u>30</u>	<u>22</u>	<u>29</u>	<u>23</u>	<u>22</u>	<u>23</u>	<u>21</u>	<u>28</u>	<u>25</u>	<u>25.2</u>
Intake	<u>35</u>	<u>25</u>	<u>23</u>	<u>25</u>	<u>25</u>	<u>31</u>	<u>22</u>	<u>28</u>	<u>31</u>	<u>35</u>	<u>28.0</u>
IC ₂₅ Value: <u>≥ 13.2%</u> Permit Limit= <u>3.3%</u>			Calculated TU Estimates [†] : <u><7.58 TU_c</u> Permit Limit: <u>30.30 TU_c</u>								

[†]NOTE: TU_a = 100/LC₅₀; TU_c = 100/ IC₂₅

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (LC ₅₀ /IC ₂₅)
<i>Pimephales promelas</i>	04/08/03	1300	7 days	KCl	801.69 mg/L (IC ₂₅)
<i>Ceriodaphnia dubia</i>	04/08/03	1345	7 days	NaCl	1106.64 mg/L (IC ₂₅)

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for Fathead Minnow Test, Watts Bar Nuclear Plant, WBN, Outfall 101, April 14-21, 2003

Test/ Sample ID	Temperature		Dissolved Oxygen		pH		Conductance	Alkalinity	Hardness	Total Residual
	Initial	Final	Initial	Final	Initial	Final	Initial			Chlorine
	(°C)	(°C)	(mg/L)	(mg/L)	S.U.	S.U.	(µmhos)	mg/L CaCO ₃	mg/L CaCO ₃	(mg/L)
Fathead/ Control	25.2 (24.2-25.8)	25.1 (24.8-25.6)	6.7 (6.2-7.2)	5.8 (5.2-6.3)	8.0 (7.9-8.1)	7.6 (7.3-7.9)	390 (377-401)	62.5 (60-64)	94.3 (80-100)	-
Fathead/ 0.83%	25.3 (24.3-25.8)	24.9 (24.5-25.3)	6.7 (6.2-7.1)	5.8 (5.3-6.5)	8.0 (7.9-8.1)	7.6 (7.2-7.9)	387 (375-399)	-	-	-
Fathead/ 1.7%	25.3 (24.3-25.8)	25.0 (24.6-25.2)	6.6 (6.3-7.0)	5.6 (4.9-6.5)	8.0 (7.9-8.2)	7.6 (7.3-7.8)	385 (373-397)	-	-	-
Fathead/ 3.3%	25.4 (24.3-25.8)	25.1 (24.7-25.9)	6.6 (6.2-7.1)	5.5 (4.9-6.2)	8.1 (7.9-8.2)	7.6 (7.3-7.7)	381 (369-393)	-	-	-
Fathead/ 6.6%	25.4 (24.3-25.9)	24.9 (24.3-25.6)	6.6 (6.3-7.0)	5.6 (4.9-6.4)	8.1 (8.0-8.2)	7.6 (7.3-7.8)	375 (363-387)	-	-	-
Fathead/ 13.2%	25.3 (24.3-25.8)	24.8 (24.1-25.6)	6.7 (6.3-7.1)	5.5 (4.9-6.5)	8.1 (8.0-8.2)	7.6 (7.3-7.7)	366 (350-374)	-	-	-
Fathead/ 100%	25.1 (24.2-25.9)	-	7.4 (6.7-7.9)	-	8.0 (7.9-8.1)	-	183 (164-203)	61.7 (60-65)	78 (70-84)	0.06 (0.05-0.07)
Fathead/ Intake	25.1 (24.0-25.7)	25.0 (24.6-25.3)	8.1 (7.4-8.9)	5.9 (5.3-6.7)	7.9 (7.8-8.1)	7.7 (7.5-8.0)	159 (154-165)	57 (54-59)	73.3 (68-76)	0.06 (0.04-0.07)

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for Daphnid Test, Watts Bar Nuclear Plant, WBN, Outfall 101, April 14-21, 2003

Test/ Sample ID	<u>Temperature</u>		<u>Dissolved Oxygen</u>		<u>pH</u>		<u>Conductance</u>	<u>Alkalinity</u>	<u>Hardness</u>	<u>Total Residual</u>
	Initial	Final	Initial	Final	Initial	Final	Initial			Chlorine
	(°C)	(°C)	(mg/L)	(mg/L)	S.U.	S.U.	(µmhos)	mg/L CaCO ₃	mg/L CaCO ₃	(mg/L)
Daphnid/ Control	25.3 (24.2-25.8)	24.9 (24.0-25.8)	6.7 (6.5-7.0)	6.2 (5.5-6.6)	8.0 (8.0-8.1)	7.9 (7.6-8.3)	168 (163-175)	59.7 (58-62)	80.7 (80-82)	-
Daphnid/ 0.83%	25.3 (24.2-25.8)	24.9 (24.1-25.6)	6.7 (6.3-6.9)	6.2 (5.5-6.5)	8.1 (8.0-8.1)	8.0 (7.7-8.2)	167 (164-169)	-	-	-
Daphnid/ 1.7%	25.3 (24.3-25.8)	24.9 (24.1-25.5)	6.7 (6.2-7.0)	6.2 (5.5-6.5)	8.1 (8.0-8.2)	8.1 (7.7-8.3)	167 (165-169)	-	-	-
Daphnid/ 3.3%	25.3 (24.3-25.7)	24.9 (24.2-25.5)	6.7 (6.2-7.0)	6.2 (5.5-6.5)	8.1 (8.0-8.1)	8.1 (7.7-8.2)	168 (165-170)	-	-	-
Daphnid/ 6.6%	25.3 (24.5-25.6)	24.9 (24.2-25.5)	6.7 (6.3-7.0)	6.2 (5.5-6.6)	8.1 (8.0-8.1)	8.1 (7.7-8.2)	169 (166-171)	-	-	-
Daphnid/ 13.2%	25.2 (24.5-25.6)	25.0 (24.3-25.5)	6.7 (6.3-7.1)	6.2 (5.5-6.8)	8.1 (8.0-8.1)	8.1 (7.7-8.2)	170 (167-174)	-	-	-
Daphnid/ 100%	25.2 (24.6-25.8)	-	7.5 (6.8-8.1)	-	8.0 (7.9-8.1)	-	180 (161-203)	61.7 (60-65)	78 (70-84)	0.06 (0.05-0.07)
Daphnid/ Intake	25.1 (24.1-25.7)	24.8 (24.2-25.2)	8.1 (7.2-8.8)	6.3 (5.8-6.6)	8.0 (7.8-8.5)	8.2 (7.7-8.3)	159 (149-165)	57 (54-59)	73.3 (68-76)	0.06 (0.04-0.07)

SUMMARY/CONCLUSIONS

Exposure of test organisms to samples from Outfall 101 resulted in no toxicity to *Pimephales promelas* or *Ceriodaphnia dubia*. Fathead minnows exposed to intake samples were significantly different from control for survive and growth based on Homoscedastic t-Test. There was no significant difference between control and intake samples for daphnid survival or reproduction based on Homoscedastic t-Test.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

Fathead minnow tests were conducted according to EPA/821/R/02/013 using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL polystyrene tumblers, each containing 250 mL of test solution. [2]

C. dubia tests were conducted according to EPA/821/R/02/013 using ten replicates, each containing one test organism. Test vessels consisted of 30-mL polystyrene containers, each containing 15 mL of test solution.

DEVIATIONS/MODIFICATIONS TO TEST PROTOCOL

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

DEVIATIONS/MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

PHYSICAL AND CHEMICAL METHODS

- 1) Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).
- 2) Instruments: All identification, service, and calibration information pertaining to S&ME laboratory instruments is recorded in calibration and maintenance log books.
- 3) Temperature was measured using a VWR Scientific digital NIST-traceable thermometer according to S&ME SOP. [3]
- 4) Dissolved oxygen was measured using a VWR Scientific Dissolved oxygen meter. The instrument was calibrated and readings were made according to EPA Method 120.1.
- 5) The pH was measured using a VWR Scientific Symphony pH meter equipped with an Orion combination electrode. The instrument was calibrated and readings were made according to EPA Method 150.1.
- 6) Conductance was measured using an Orion conductivity meter. The instrument was calibrated and readings were taken according to manufacturers instructions.
- 7) Alkalinity was measured using Standard Methods Titration Method 2320 B using 0.01 N HCl to an endpoint pH of 4.5.
- 8) Hardness was measured using Standard Methods EDTA Titrimetric Method 2340 C or EPA Method 130.2.
- 9) Total residual chlorine was determined using the DPD Ferrous Titrimetric Method with a Hach Colorimetric kit.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage; glassware preparation; test organism culturing/acquisition and acclimation; test organism handling during test; and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA/821/R/02/013. [2] Any known deviations were noted during the study and are reported herein.

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

- 1) Test Type: 7-day chronic tests with results expressed as IC₂₅ values in mg NaCl/L for *Ceriodaphnia dubia* or KCL/L for *Pimephales promelas*.
- 2) Standard Toxicant: Sodium Chloride (NaCl crystalline) and Potassium Chloride (KCl crystalline)
- 3) Dilution Water Used: 20% Dilute Mineral Water with trace metals for *Ceriodaphnia dubia* and Moderately Hard Water for *Pimephales promelas*.
- 4) Statistics: IC₂₅ – calculated by ToxCalc version 5.0 statistical software using EPA-recommended methods.

REFERENCES

- 1) NPDES Permit No. TN0020168.
- 2) U.S. Environmental Protection Agency, Office of Water. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/821/R/02/013 (October 2002).
- 3) S&ME Standard Operating Procedures. May 2002.

Watts Bar Nuclear Plant Biomonitoring
April 14 - 21, 2003

Appendix B
Pertinent Site Data

Calculated Dilution Based Watts Bar Nuclear Plant (WBN) and Watts Bar (WB) Hydro Plant Releases,
April 14-21, 2003.

<u>Date</u>	<u>Zero Release (Hours)</u>	<u>WB Hydro Hourly Average Flow (MGD)</u>	<u>WBN DSN101 Daily Flow (MGD)</u>	<u>Dilution (WB Hydro/WBN)</u>	<u>TRO (mg/L) Measured at the time of samples collection</u>
13-Apr	0	10923	22.25	491	<0.02
14-Apr	0	10923	20.22	540	
15-Apr	0	10923	19.05	574	<0.02
16-Apr	0	10923	19.20	569	
17-Apr	0	10923	18.92	577	0.02
18-Apr	0	10923	10.03	1089	

Watts Bar Nuclear Plant Biomonitoring
April 14 - 21, 2003

Appendix C

Chain of Custody Records
Toxicity Test Bench Sheets
Statistical Analyses

Page 1 of 1

Collected By: Del Clark
Loring Brown

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

Fax: 865-970-0004

Samples arrived packed in ice.

[illegible]

Sample Custody - Fill In From Top Down

DueTime

Al Clark

4/14/03 @ 1015

Calvin Nichols — ~~PerEx~~ mte 4/14/03

4/14/03 e 1015

Calvin Nichols ~~Federal~~

4/14/03 1250

Brooke Davis

4/14/03 1252

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.

25.2203 11:24 AM

SGM:

NO. 593

पु.

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: TVA	S & ME, Inc. 1413 Topside Road Louisville, TN 37777 Phone: 865-970-0003 Fax: 865-970-0004	Delivered By (Circle One): FedEx UPS Bus Client
Project Name: WBNP BIOTOXICITY		Other (specify): _____
P.O. Number: N/A		General Comments: Contact WBNP personnel at (423) 365-3575 if any problems are encountered. Pager number 1-800-323-4853 then number to be dialed.
Facility Sampled: Watts Bar Nuclear Plant		Samples arrived on ice.
NPDES Number: TN0020163		
Collected By: Lanny Brown Calvin Nichols		

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				
			Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
WBN Intake 101-2	Grab		4/16/03	07:35	101- .1gal				X		03-093	0.9°C	AO	1200	clear
WBN Intake 113	Grab				113- .1gal										
WBN OSN 101-2	Comp	Start	4/15/03	07:35	101- .2.5 gal				X		03-014	1.2°C	AO	1200	clear
WBN OSN 113	Comp			08:50	113- .2.5 gal										
				mid 4/16/03											
		end	4/16/03	07:50											
TRC = 40.02 ppm for composite.															

Sample Custody - Fill In From Top Down

Relinquished By (Signature)	Date/Time	Received By (Signature)	Date/Time
		FedEx mjb 4/16/03	
Calvin N. Nichols mjb 4/16/03	4/16/03 1158	Monke Duro	4/16/03 1158

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.

APR. 25. 2003 11:24AM

S&ME

NO. 593

P. 10

Page 1 of 1

Collected By: Martha Ervin
Del Clark

28801

Fax: 828-350-9368

WTE 4/17/03

Other (specify):

General Comments: Contact WBNO personnel

at (423) 363-3575 if any problems
are encountered. Pager number
1-800-323-4553 then number
to be dialed, - samples arrived on ice

[illegible]

Sample Custody – Fill In From Top Down

Date/Time

Paul Clark

4/18/03 C1228

~~Felix~~ MIE 4/18/03

Mark Min 4/18/03 1228

~~Podex~~ mIE
4/18/03

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

FATHEAD MINNOW TEST INFORMATION

Test Name: TVA - Watts Bar Nuclear Plant (Outfall 101)

Test Conducted From: 4/14/03 (Day 0) To 4/21/03 (Day 7)

Sites/Concentrations: 1. control 4. 3.3% 7. Intake 100%
2. 0.83% 5. 0.6%
3. 1.7% 6. 13.2%

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Larvae (✓):

S&ME Lot # 03 - 023 ☒

Other (describe): _____ ☐

Date Larvae Hatched: 4/13 - 4/14/03 Hatch Time: (4/13) (4/14) 1600-1845 Initials: PO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: Jim S. Daulton (Reviewer Initials) on 4/22/03 (Date)

Fathead Minnow Daily Test Information Logsheet

Test Name: TVA - Watts Bar (Outfall 101)

Test Dates: 4/14 - 4/22/03

Daily Test information	Temperature Information (25±1°C)		Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments		
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time	Carboy #	Date Prep.
	a.m.	p.m.							
Day 0 PO 4/14/03	25.1	25.0	1	SB ✓	am: — pm: 1600	1330	1400	5	4/13/03
Day 1 MO 4/15/03	25.0	25.2	1	MO ✓ SB ✓	am: 0900 pm: 1545	1415	1435	5	4/13/03
Day 2 PO 4/16/03	25.0	25.1	1	MO ✓ MO ✓	am: 0900 pm: 1530	1400	1425	2	4/14/03
Day 3 MO 4/17/03	25.0	25.1	1	SB ✓ MO ✓	am: 0900 pm: 1530	1345	1405	5	4/15/03
Day 4 PO 4/18/03	25.0	25.2	1	SB ✓ JM ✓	am: 0900 pm: 1545	1400	1420	2	4/17/03 4/19/03
Day 5 PO 4/19/03	25.2	25.1	1	JM ✓ PO ✓	am: 0930 pm: 1500	1310	1330	5	4/18/03
Day 6 PO 4/20/03	25.1	25.0	1	JM ✓ JM ✓	am: 1000 pm: 1530	1300	1320	2	4/19/03
Day 7 PO 4/21/03	25.0	24.9	1			1400		—	—

Client: TVA Watts Bar - Outfall 101
Location: Rhea County, Tennessee

Analysts: SAS, JM, BD
Dates: 4/14-4/21/03

CUMULATIVE SURVIVAL OF P. PROMELAS IN CHRONIC TEST

REPLICATE							REPLICATE						
CONC.	Initials	DAY NO.	A	B	C	D	CONC.	Initials	DAY NO.	A	B	C	D
Control Mod. Hard	SAS/JM	1	10	10	10	10	13.2% Outfall 101	SAS/JM	1	10	10	10	10
	PO	2	10	10	10	10		PO	2	10	10	10	10
	PO/SAS	3	10	10	9	10		PO/SAS	3	10	10	10	10
	PO/SAS	4	10	10	9	10		PO/SAS	4	10	10	10	10
	PO/JM	5	10	10	9	10		PO/JM	5	9	10	10	10
	SAS/JM	6	10	10	9	10		SAS/JM	6	8	9	10	10
	PO/SAS	7	10	10	9	10		PO/SAS	7	8	9	10	9
0.83% Outfall 101	SAS/JM	1	10	10	10	10	Intake	SAS/JM	1	10	10	10	10
	PO	2	10	10	10	10		PO	2	9*	10	10	10
	PO/SAS	3	10	10	10	10		PO/SAS	3	7*	9	10	10
	PO/SAS	4	10	10	10	10		PO/SAS	4	7	9	9	10
	PO/JM	5	10	10	10	10		PO/JM	5	7	8*	7*	10
	JM/SAS	6	9	10	10	10		SAS/JM	6	3*	4*	6	10
	PO/SAS	7	9	10	10	10		PO/SAS	7	3	2*	6	10
1.7% Outfall 101	SAS/JM	1	10	10	10	10			1				
	PO	2	10	10	10	10			2				
	PO/SAS	3	10	10	9	10			3				
	PO/SAS	4	10	10	9	10			4				
	PO/JM	5	10	10	9	10			5				
	JM/SAS	6	10	10	9	10			6				
	PO/SAS	7	10	10	9	10			7				
3.3% Outfall 101	SAS/JM	1	10	10	10	10			1				
	PO	2	10	10	10	10			2				
	PO/SAS	3	10	9	10	10			3				
	PO/SAS	4	10	9	10	10			4				
	PO/JM	5	10	9	10	10			5				
	SAS/JM	6	10	9	10	10			6				
	PO/SAS	7	10	9	10	9			7				
6.6% Outfall 101	SAS/JM	1	10	10	10	10			1				
	PO	2	10	10	10	10			2				
	PO/SAS	3	10	10	10	10			3				
	PO/SAS	4	10	10	9	10			4				
	PO/JM	5	10	10	8	10			5				
	JM/SAS	6	10	10	8	10			6				
	PO/SAS	7	10	9*	8	10			7				

* 4/16/03 - PO - Day 2 - fuzzy dead fish Intake D, A
* 4/17/03 - PO - Day 3 - two fish dead, one was fuzzy.
* 4/19/03 - PO - Day 5 - fuzzy dead fish Intake B + C
* 4/20/03 - SAS - Day 6 - fuzzy dead fish Intake A+B
* 4/21/03 - PO - Day 7 - fuzzy dead fish 6.6% B, 2 fuzzy dead fish Intake B

FATHEAD MINNOW SEVEN DAY TEST

RAW DATA

SURVIVAL AND GROWTH

Client: TVA Watts Bar - Outfall 101

Test Conducted By: SAS, BJD, JM

Date Weighed 4/21/03 + 4/22/03

Weights Conducted by: SAS, BJD

Test Dates: 4/11 - 4/21/03

Comments: _____

Began drying (date/time) 4/21/03 1430

End of drying (date/time) 4/22/03 1103

Oven Temp

(°C) 121.8°C

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Groups Dry Weight		
					Dry Weight Pan + Fish (mg)	(Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
Control	A	10	10	1286.63	1291.02	4.39	0.439
	B	10	10	1283.01	1288.13	5.12	0.512
	C	9	10	1284.41	1289.11	4.70	0.470
	D	10	10	1285.21	1291.24	6.03	0.603
0.83% Outfall 101	A	9	10	1287.90	1290.88	2.98*	0.298
	B	10	10	1301.14	1305.94	4.80	0.480
	C	10	10	1284.72	1289.39	4.67	0.467
	D	10	10	1287.83	1293.04	5.21	0.521
1.7% Outfall 101	A	10	10	1280.84	1285.43	4.59	0.459
	B	10	10	1290.60	1295.13	4.53	0.453
	C	9	10	1291.82	1296.83	5.01	0.501
	D	10	10	1292.83	1297.93	5.10	0.510
3.3% Outfall 101	A	10	10	1290.65	1294.80	4.15	0.415
	B	9	10	1286.65	1289.84	3.19	0.319
	C	10	10	1298.06	1302.61	4.55	0.455
	D	9	10	1301.55	1305.30	3.75	0.375
6.6% Outfall 101	A	10	10	1289.80	1293.51	3.71 ^{LY}	0.371
	B	9	10	1299.18	1303.65	4.47	0.447
	C	8	10	1296.30	1294.55	4.25	0.425
	D	10	10	1297.68	1302.52	5.44	0.544
13.2% Outfall 101	A	8	10	1287.31	1290.90	3.59	0.359
	B	9	10	1286.36	1290.84	4.48	0.448
	C	10	10	1293.16	1298.17	5.01	0.501
	D	9	10	1286.50	1290.28	3.78	0.378

no * reweighed 0.83% A to double check - weights looked much smaller - the weights came to same. - The fish in the pans looked smaller - more runt.

FATHEAD MINNOW SEVEN DAY TEST RAW DATA SURVIVAL AND GROWTH

Client: TVA Watts Bar - Outfall 101

Test Conducted By: SAS, BD, JM

Date Weighed 4/21/03 + 4/22/03

Weights Conducted by: SAS, BD

Test Dates: 4/14 - 4/21/03

Oven Temp

(°C) 101.8°C

Comments:

Began drying (date/time) 4/21/03 1430

End of drying (date/time) 4/22/03 1103

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
	A	3	10	1290.75	1292.30	1.55	6.155
Intake	B	2	10	1291.10	1291.80	.70	0.070
100%	C	6	10	1288.32	1291.18	2.86	0.286
	D	10	10	1286.78	1291.94	5.16	0.516
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 4/14/03 13:30 Test ID: 101wb0403f Sample ID: TN0020168
 End Date: 4/22/03 14:00 Lab ID: S&ME Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4
D-Control	0.4390	0.5120	0.4700	0.6030
0.83	0.2980	0.4800	0.4670	0.5210
1.7	0.4590	0.4530	0.5010	0.5100
3.3	0.4150	0.3190	0.4550	0.3750
6.6	0.3710	0.4470	0.4250	0.5440
13.2	0.3590	0.4480	0.5010	0.3780

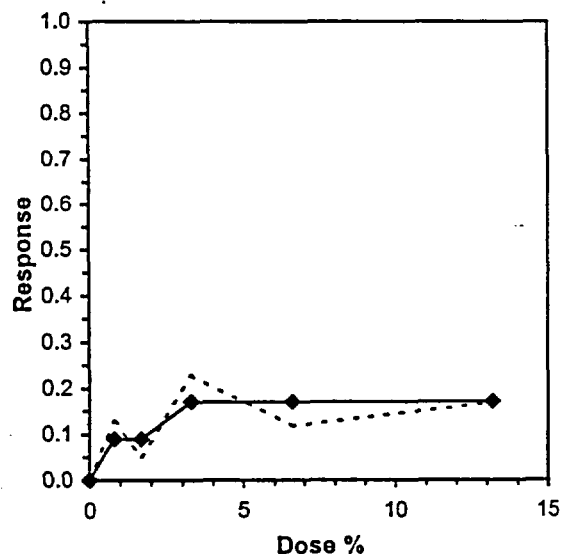
Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	0.5060	1.0000	0.5060	0.4390	0.6030	14.081	4				0.5060	1.0000
0.83	0.4415	0.8725	0.4415	0.2980	0.5210	22.287	4	1.324	2.410	0.1174	0.4611	0.9113
1.7	0.4808	0.9501	0.4808	0.4530	0.5100	6.015	4	0.518	2.410	0.1174	0.4611	0.9113
3.3	0.3910	0.7727	0.3910	0.3190	0.4550	14.848	4	2.361	2.410	0.1174	0.4198	0.8295
6.6	0.4468	0.8829	0.4468	0.3710	0.5440	16.177	4	1.217	2.410	0.1174	0.4198	0.8295
13.2	0.4215	0.8330	0.4215	0.3590	0.5010	15.510	4	1.735	2.410	0.1174	0.4198	0.8295

Auxiliary Tests					Statistic		Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.97069		0.884	-0.2608	-0.1386		
Bartlett's Test indicates equal variances (p = 0.63)					3.46342		15.0863				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		13.2	>13.2		7.57576	0.11737	0.23196	0.00675	0.00474	0.26378	5, 18

Linear Interpolation (80 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05*	0.4679			
IC10	1.9214			
IC15	2.8998			
IC20	>13.2			
IC25	>13.2			
IC40	>13.2			
IC50	>13.2			

* indicates IC estimate less than the lowest concentration

$pm_{50} = 23.22$



Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 4/14/03 13:30	Test ID: 101wb0403i	Sample ID: TN0020168-NPDES Permit #
End Date: 4/22/03 14:00	Lab ID: S&ME	Sample Type: EFF3-Power Plant
Sample Date:	Protocol: EPAF 91-EPA Freshwater	Test Species: PP-Pimephales promelas

Comments:

Conc-%	1	2	3	4
D-Control	0.4390	0.5120	0.4700	0.6030
100	0.1550	0.0700	0.2860	0.5160

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	0.5060	1.0000	0.5060	0.4390	0.6030	14.081	4				0.5060	1.0000
*100	0.2568	0.5074	0.2568	0.0700	0.5160	75.689	4	2.408	1.943	0.2011	0.2568	0.5074

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9637	0.749	0.79994	1.15323
F-Test indicates equal variances (p = 0.13)	7.43892	47.4683		

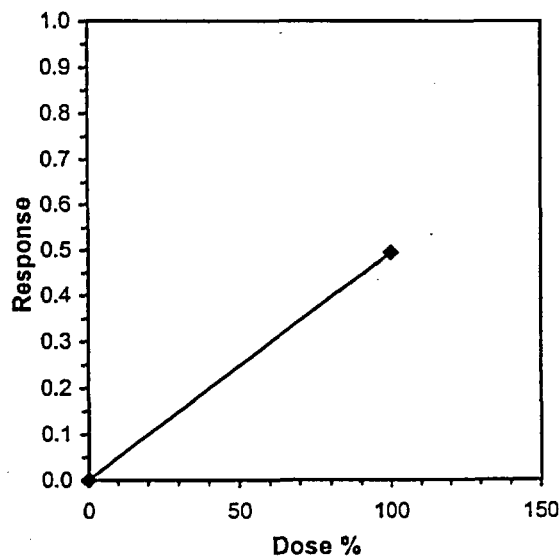
Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Linear Interpolation (80 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05*	10.150			
IC10*	20.301			
IC15*	30.451			
IC20*	40.602			
IC25*	50.752			
IC40*	81.204			
IC50	>100			

* indicates IC estimate less than the lowest concentration

$$pmsd = 39.7\%$$



Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 4/14/03 13:30 Test ID: 101wb0403i Sample ID: TN0020168
 End Date: 4/22/03 14:00 Lab ID: S&ME Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
100	0.3000	0.2000	0.6000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			
*100	0.5250	0.5250	0.8353	0.4636	1.4120	50.726	4	2.722	2.353	0.4986

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.83562	0.749	1.10492	2.85603
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)				
Heteroscedastic t Test indicates significant differences				



CERIODAPHNIA TEST INFORMATION SHEET

Test Name: TVA - Watts Bar Nuclear Plant (Outfall 101)

Test Conducted From: 4/14/03 (Day 0) To 4/21/03 (Day 7)

Sites/Concentrations: 1. control 4. 3.3% 7. 100% Intake
2. 0.83% 5. 1.6%
3. 1.7% 6. 13.2%

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals



Other (describe): _____



Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals



Other (describe): _____



Source of Test Organisms: S&ME brood board nos. 242

Age of Test Organisms:

Isolated neonates for test on 4/14/03 (date) from 0845 to 1255 (time) Initials BO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: J. S. Donnell (Reviewer Initials) on 4/23/03 (Date)

Ceriodaphnia Daily Test Information Logsheet

Test Name: TVA - Watts Bar (Outfall 101)

Test Dates: 4/14 - 4/21/03

Daily Test information	Temperature Information (cup -25±1°C)		Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments		
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selenastrum Date	Start Time	End Time	Carboy # Date Prep.	
	a.m.	p.m.									
Day 0 <i>Po</i> 4/14/03	25.1	25.0	1	1420 2/5/03	2/5/03	1420	3/24/03	1400	1420	3	4/13/03
Day 1 <i>848</i> 4/15/03	25.0	25.2	1	1500	2/5/03	1500	3/24/03	1445	1500	3	4/13/03
Day 2 <i>Po</i> 4/16/03	25.0	25.1	1	1355	2/5/03	1355	3/24/03	1340	1355	3	4/15/03
Day 3 <i>Po</i> 4/17/03	25.0	25.0	1	1445	2/5/03	1445	3/24/03	1420	1445	3	4/15/03
Day 4 <i>Po</i> 4/18/03	25.0	25.2	1	1520	2/5/03	1520	3/24/03	1445	1520	3	4/15/03
Day 5 <i>Po</i> 4/19/03	25.2	25.1	1	1325	2/5/03	1325	3/24/03	1300	1325	3	4/18/03
Day 6 <i>848</i> 4/20/03	25.1	25.0	1	1330	2/5/03	1330	3/24/03	1305	1330	3	4/18/03
Day 7 <i>Po</i> 4/21/03	25.0	24.9	1					1350		—	—

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: TVA Watts Bar - Outfall 101

Location: Rhea County, Tennessee

Analysts: BMD, SAS, Jm

Test Dates: 4/14 - 4/21/03

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
Control 20% DMW	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	SAS	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	0										0	10	10	0
	Jm	4	4	6	5	3	5	5	x	5	6	5	44	9	10	4.4
	PO	5	10 ⁺	9	8	10	12	10		11	9	11	90	9	10	9.0
	Jm	6	2 ⁺	0	0	0	0	0		0	0	0	2	9	10	0.2
	SAS	7	15	16	12	10	12	14		11	12	13	115	9	10	11.5
	SAS	Total	31	31	25	23	29	29	0	27	27	29	251	9	10	25.1

+ split brood

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
0.83% Outfall 101	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	SAS	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	0										0	10	10	0
	Jm	4	3	4	2	5	6	4	2	3	5	4	38	10	10	3.8
	PO	5	10	x ₀	9	11	14	12	13	10	12	12	103	9	10	10.3
	Jm	6	4 ⁺		0	6	1 ⁺	0	0	0	0	3 ⁺	14	9	10	1.4
	SAS	7	10 ⁺		12	6	11 ⁺	10	13	14	11	2 ⁺	83	9	10	8.3
	SAS	Total	27	4	23	22	32	26	28	27	28	21	238	9	10	23.8

+ split brood

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
1.7% Outfall 101	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	SAS	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	0										0	10	10	0
	Jm	4	0	3	6	7	2	4	2	2	1 ⁺	6	33	10	10	3.3
	PO	5	14	13	12	13	12	10	9	9	4	9	105	10	10	10.5
	SAS	6	0	2 ⁺	0	1 ⁺	0	0	4 ⁺	0	1 ⁺	9	17	10	10	1.7
	SAS	7	13	13 ⁺	14	10 ⁺	10	10	12 ⁺	13	14 ⁺	0	109	10	10	10.9
	SAS	Total	27	31	32	31	24	24	27	24	20	24	264	10	10	26.4

+ split brood

Ceriodaphnia 3-Brood Survival and Reproduction

Raw Data Sheet

Client: TVA Watts Bar - Outfall 101

Location: Rhea County, Tennessee

Analysts: Eric S. Jm

Test Dates: 4/14 - 4/21/03

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
3.3% Outfall 101	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	SAB	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	0										0	10	10	0
	SAB	4	1+	6	6	6	5	3	4	7	6	5	49	10	10	4.9
	JM	5	7+	6+	6	7+	9	10	0	7	7	6	65	10	10	6.5
	SAB	6	0	2+	0	3+	10	0	11	0	0	0	26	10	10	2.6
	SAB	7	15	19	15	12	0	10	12	11	17	12	123	10	10	12.3
	SAB	Total	23	33	27	28	24	23	27	25	30	23	263	10	10	26.3

+ split brand

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
6.6% Outfall 101	Init.	Day	--	--	--	--	--	--	--	--	--	--				
	SAB	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	X _{6.6}										0	9	10	0
	SAB	4	1	6	5	6	6	5	6	3	5	5	47	9	10	4.7
	JM	5	1	10	6	7	9	6	7	8	6	7	66	9	10	6.6
	SAB	6	0										0	9	10	0.0
	SAB	7	1	16	13	13	12	10	9	15	13	11	112	9	10	11.2
	SAB	Total	0	32	24	26	27	21	22	26	24	23	225	9	10	22.5

* Day3 - Cerro had fuzzy film surrounding it.

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
13.2% Outfall 101	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	SAB	1	0										0	10	10	0
	PO	2	0										0	10	10	0
	PO	3	0										0	10	10	0
	SAB	4	4	7	2	6	5	5	4	3	6	5	47	10	10	4.7
	JM	5	10	11	0	9	4	5	5	3	5	5	57	10	10	5.7
	SAB	6	0	0	10	0	14	0					24	10	10	2.4
	SAB	7	15	12	10	14	0	12	14	15	17	15	124	10	10	12.4
	SAB	Total	29	30	22	29	23	22	23	21	28	25	252	10	10	25.2

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: TVA Watts Bar - Outfall 101

Location: Rhea County, Tennessee

Analysts: B. J. O., S. J. M.

Test Dates: 4/14 - 4/21/03

			Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
Intake	Init.	Day	--	--	--	--	--	--	--	--	--	--	---	---	---	---
	S/S	1	0										0	10	10	0
	M	2	0										0	10	10	0
	M	3	0										0	10	10	0
	S/S	4	7	6	4	4	6	5	5	4	5	8	54	10	10	5.4
	M	5	14	8	10	9	9	7+	5	11	10	5+	87	10	10	8.7
	S/S	6	14	11	9	12	11	6	2+	0	4+	9+	78	10	10	7.8
	S/S	7	0	0	0	0	0	13	10+	13	12+	13	61	10	10	6.1
	S/S	Total	35	25	23	25	25	31	22	28	31	35	280	10	10	28.0

+ split brood

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 4/14/2003 14:00 Test ID: WB101cr Sample ID: TN0020168-NPDES Permit #
 End Date: 4/21/2003 13:50 Lab ID: S&ME Inc. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

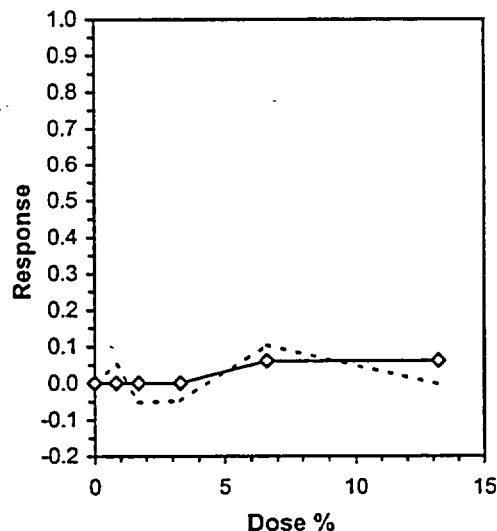
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	25.000	23.000	29.000	29.000	0.000	27.000	27.000	29.000
0.83	27.000	4.000	23.000	22.000	32.000	26.000	28.000	27.000	28.000	21.000
1.7	27.000	31.000	32.000	31.000	24.000	24.000	27.000	24.000	20.000	24.000
3.3	23.000	33.000	27.000	28.000	24.000	23.000	27.000	25.000	30.000	23.000
6.6	0.000	32.000	24.000	26.000	27.000	21.000	22.000	26.000	24.000	23.000
13.2	29.000	30.000	22.000	29.000	23.000	22.000	23.000	21.000	28.000	25.000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
D-Control	25.100	1.0000	25.100	0.000	31.000	36.536	10			25.400	1.0000
0.83	23.800	0.9482	23.800	4.000	32.000	32.292	10	90.50	75.00	25.400	1.0000
1.7	26.400	1.0518	26.400	20.000	32.000	14.854	10	100.00	75.00	25.400	1.0000
3.3	26.300	1.0478	26.300	23.000	33.000	12.807	10	95.00	75.00	25.400	1.0000
6.6	22.500	0.8964	22.500	0.000	32.000	37.727	10	83.00	75.00	23.850	0.9390
13.2	25.200	1.0040	25.200	21.000	30.000	13.721	10	89.50	75.00	23.850	0.9390

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution ($p \leq 0.01$)	1.68395	1.035	-2.3437	7.25168
Bartlett's Test indicates unequal variances ($p = 3.49E-03$)	17.6006	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	13.2	>13.2		7.57576

Linear Interpolation (80 Resamples)				
Point	%	SD	95% CL	Skew

IC05	6.0039			
IC10	>13.2			
IC15	>13.2			
IC20	>13.2			
IC25	>13.2			
IC40	>13.2			
IC50	>13.2			



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 4/14/2003 14:00 Test ID: WB101Incr Sample ID: TN0020168-NPDES Permit #
 End Date: 4/21/2003 13:50 Lab ID: S&ME Inc. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc.-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	25.000	23.000	29.000	29.000	0.000	27.000	27.000	29.000
Intake	35.000	25.000	23.000	25.000	25.000	31.000	22.000	28.000	31.000	35.000

Conc.-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
D-Control	25.100	1.0000	25.100	0.000	31.000	36.536	10		
Intake	28.000	1.1155	28.000	22.000	35.000	17.003	10	108.00	82.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.76207	0.868	-2.4231	7.96181
F-Test indicates equal variances ($p = 0.06$)	3.71029	6.54109		
Hypothesis Test (1-tail, 0.05)				
Wilcoxon Two-Sample Test indicates no significant differences				

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 4/14/2003 14:00 Test ID: WB101cr Sample ID: TN0020168
 End Date: 4/21/2003 13:50 Lab ID: S&ME INC. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

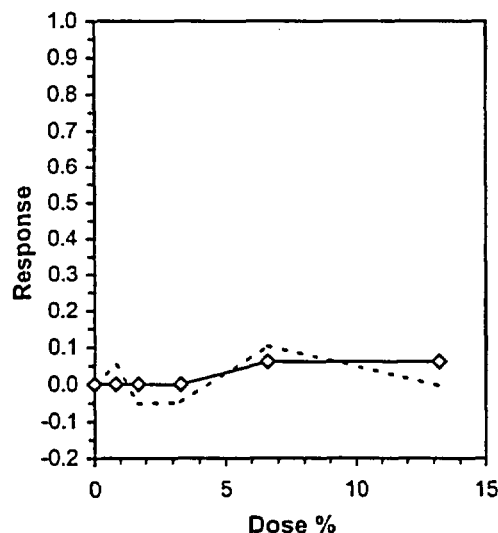
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	25.000	23.000	29.000	29.000	0.000	27.000	27.000	29.000
0.83	27.000	4.000	23.000	22.000	32.000	26.000	28.000	27.000	28.000	21.000
1.7	27.000	31.000	32.000	31.000	24.000	24.000	27.000	24.000	20.000	24.000
3.3	23.000	33.000	27.000	28.000	24.000	23.000	27.000	25.000	30.000	23.000
6.6	0.000	32.000	24.000	26.000	27.000	21.000	22.000	26.000	24.000	23.000
13.2	29.000	30.000	22.000	29.000	23.000	22.000	23.000	21.000	28.000	25.000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed		Isotonic	
			Mean	Min	Max	CV%	Critical			MSD	Mean	N-Mean	
D-Control	25.100	1.0000	25.100	0.000	31.000	36.536	10					25.400	1.0000
0.83	23.800	0.9482	23.800	4.000	32.000	32.292	10	0.447	2.287	6.652		25.400	1.0000
1.7	26.400	1.0518	26.400	20.000	32.000	14.854	10	-0.447	2.287	6.652		25.400	1.0000
3.3	26.300	1.0478	26.300	23.000	33.000	12.807	10	-0.412	2.287	6.652		25.400	1.0000
6.6	22.500	0.8964	22.500	0.000	32.000	37.727	10	0.894	2.287	6.652		23.850	0.9390
13.2	25.200	1.0040	25.200	21.000	30.000	13.721	10	-0.034	2.287	6.652		23.850	0.9390

Auxiliary Tests					Statistic	Critical	Skew	Kurt						
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)					1.68395	1.035	-2.3437	7.25168						
Bartlett's Test indicates unequal variances (p = 3.49E-03)					17.6006	15.0863								
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test					13.2	>13.2		7.57576	6.65233	0.26503	22.6167	42.3167	0.74922	5, 54

Linear Interpolation (80 Resamples)				
Point	%	SD	95% CL	Skew
IC05	6.0039			
IC10	>13.2			
IC15	>13.2			
IC20	>13.2			
IC25	>13.2			
IC40	>13.2			
IC50	>13.2			

$p_{MSD} = 26.5\%$



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 4/14/2003 14:00	Test ID: WB101Incr	Sample ID: TN0020168
End Date: 4/21/2003 13:50	Lab ID: S&ME INC.	Sample Type: EFF3-Power Plant
Sample Date:	Protocol: EPAF 91-EPA Freshwater	Test Species: CD-Ceriodaphnia dubia
Comments:		

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	25.000	23.000	29.000	29.000	0.000	27.000	27.000	29.000
Intake	35.000	25.000	23.000	25.000	25.000	31.000	22.000	28.000	31.000	35.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	25.100	1.0000	25.100	0.000	31.000	36.536	10			
Intake	28.000	1.1155	28.000	22.000	35.000	17.003	10	-0.888	1.734	5.666

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)	0.76207	0.868	-2.4231	7.96181
F-Test indicates equal variances ($p = 0.06$)	3.71029	6.54109		
Hypothesis Test (1-tail, 0.05)				
Homoscedastic t Test indicates no significant differences				

$pmsd = 22.6\%$

Fish Water Chemistry

WB101- April 14-21, 2003 INITIAL AND FINAL WATER CHEMISTRY (FATHEAD)

Initial Chemistry

Fish - Control	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.6	25.4	25.4	24.2	25.3	25.8	25.0	24.2	25.8	25.2
DO	7.2	6.7	7.0	6.7	6.6	6.6	6.2	6.2	7.2	6.7
pH	8.0	7.9	8.1	8.0	7.9	8.1	8.1	7.9	8.1	8.0
Cond	400	377	383	387	388	392	401	377	401	390
Hard	100.0		98.0	96.0	96.0	96.0	80.0	80	100	94.3
Alk	61.0		63.0	60.0	63.0	64.0	64.0	60	64	62.5

Concentration 0.83%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.7	25.4	25.6	24.3	25.4	25.8	25.1	24.3	25.8	25.3
DO	7.1	6.6	7.0	6.7	6.6	6.4	6.2	6.2	7.1	6.7
pH	8.0	7.9	8.1	8.0	8.0	8.1	8.1	7.9	8.1	8.0
Cond	380	375	386	386	389	391	399	375	399	387

Concentration 1.7%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.6	25.4	25.5	24.3	25.4	25.8	25.2	24.3	25.8	25.3
DO	7.0	6.6	7.0	6.6	6.6	6.4	6.3	6.3	7.0	6.6
pH	8.0	7.9	8.1	8.0	8.0	8.2	8.1	7.9	8.2	8.0
Cond	376	373	384	384	386	392	397	373	397	385

Concentration 3.3%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.8	25.4	25.3	24.3	25.6	25.8	25.3	24.3	25.8	25.4
DO	7.1	6.6	7.0	6.7	6.5	6.2	6.2	6.2	7.1	6.6
pH	8.0	7.9	8.1	8.0	8.0	8.2	8.2	7.9	8.2	8.1
Cond	372	369	381	380	383	388	393	369	393	381

Concentration 6.6%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.6	25.5	25.3	24.3	25.6	25.9	25.3	24.3	25.9	25.4
DO	7.0	6.6	7.0	6.7	6.5	6.4	6.3	6.3	7.0	6.6
pH	8.0	8.0	8.1	8.0	8.0	8.2	8.2	8.0	8.2	8.1
Cond	367	363	373	373	378	382	387	363	387	375

Concentration 13.2%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.4	25.3	25.4	24.3	25.7	25.8	25.3	24.3	25.8	25.3
DO	7.1	6.6	7.1	6.8	6.5	6.3	6.3	6.3	7.1	6.7
pH	8.0	8.0	8.1	8.0	8.0	8.2	8.2	8.0	8.2	8.1
Cond	369	350	368	361	366	374	374	350	374	366

Fish Water Chemistry

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.4	25.1	25.2	24.2	24.8	25.9	25.4	24.2	25.9	25.1
DO	7.8	7.9	7.6	7.7	7.0	6.8	6.7	6.7	7.9	7.4
pH	8.1	7.9	8.1	8.0	8.0	8.0	8.0	7.9	8.1	8.0
Cond	181	178	164	171	197	203	190	164	203	183
Hard	84.0		70.0		80.0			70	84	78
Alk	65.0		60.0		60.0			60	65	61.7
TRC	0.05		0.07		0.05			0.05	0.07	0.06

Intake	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.7	25.2	25.3	24.0	24.9	25.4	25.4	24.0	25.7	25.1
DO	7.8	8.4	8.9	8.6	7.7	7.8	7.4	7.4	8.9	8.1
pH	8.0	7.9	8.1	7.8	7.8	7.8	7.8	7.8	8.1	7.9
Cond	165	162	163	154	158	159	154	154	165	159
Hard	76.0		68.0		76.0			68	76	73.3
Alk	59.0		54.0		58.0			54	59	57.0
TRC	0.04		0.07		0.06			0.04	0.07	0.06

Final Chemistry

FISH

Fish - Medium	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	25.3	24.8	25.6	25.0	24.8	24.8	24.8	25.6	25.1
DO	6.3	6.0	5.2	5.6	5.7	5.5	6.3	5.2	6.3	5.8
pH	7.9	7.9	7.6	7.3	7.4	7.6	7.7	7.3	7.9	7.6

Concentration 0.83%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.1	25.3	24.8	24.5	25.0	24.9	24.5	24.5	25.3	24.9
DO	6.5	5.7	5.3	5.3	5.8	5.4	6.3	5.3	6.5	5.8
pH	7.9	7.7	7.6	7.2	7.6	7.7	7.6	7.2	7.9	7.6

Concentration 1.7%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.1	25.2	24.9	24.6	25.0	25.1	24.8	24.6	25.2	25.0
DO	6.5	5.6	4.9	5.0	5.5	5.4	6.3	4.9	6.5	5.6
pH	7.8	7.7	7.5	7.3	7.5	7.6	7.7	7.3	7.8	7.6

Concentration 3.3%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	25.9	24.9	24.7	25.3	24.9	24.8	24.7	25.9	25.1
DO	6.1	5.6	5.0	4.9	5.5	5.3	6.2	4.9	6.2	5.5
pH	7.7	7.7	7.5	7.3	7.6	7.7	7.7	7.3	7.7	7.6

Fish Water Chemistry

Concentration 6.6%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.0	25.6	24.7	24.6	25.2	24.7	24.3	24.3	25.6	24.9
DO	6.2	5.8	5.0	4.9	5.5	5.4	6.4	4.9	6.4	5.6
pH	7.8	7.7	7.5	7.3	7.6	7.5	7.8	7.3	7.8	7.6

Concentration 13.2%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.8	25.6	24.7	24.6	25.3	24.8	24.1	24.1	25.6	24.8
DO	6.4	5.4	5.0	4.9	5.1	5.2	6.5	4.9	6.5	5.5
pH	7.7	7.7	7.5	7.3	7.5	7.6	7.7	7.3	7.7	7.6

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.8	25.0	24.6	25.1	25.1	24.9	25.3	24.6	25.3	25.0
DO	6.3	6.4	5.3	5.4	5.8	5.3	6.7	5.3	6.7	5.9
pH	7.7	7.7	7.5	7.5	7.7	7.7	8.0	7.5	8.0	7.7

Test Temperature Mean 25.1

 Minimum 24.0

 Maximum 25.9

Word Review by: CH 05-02-2003

Excel Reviewed by: CH 05-02-2003

Client: TVA Watts Bar - Outfall 101
 Location: Rhea County, Tennessee
 Template No.: 1
 Test Type: Fathead Minnow 7-day Chronic

Analysts: RD, SAS, TJ
 Dates/times: 4/11/03 1430 4/12/03 1400
 Age of Larvae: ~24 hrs

Day								
Control: Mod. Hard	0	1	2	3	4	5	6	7
Temperature-Initial	25.6	25.4	25.4	24.2	25.3	25.8	25.0	
Final		25.5	25.3	24.8	25.6	25.0	24.8	24.8
D.O. Initial	7.2	6.7	7.0	6.7	6.6	6.6	6.2	
Final		6.3	6.0	5.2	5.6	5.7	5.5	6.3
pH Initial	8.0	7.9	8.1	8.0	7.9	8.1	8.1	
Final		7.9	7.9	7.6	7.3	7.4	7.6	7.7
Alkalinity	101		63	60	63	64	64	
Hardness	100		98	96	98	96	90	
Conductivity	400	377	383	387	388	392	401	
Analyst Initials	RD	SAS	RD	SAS	RD	SAS	RD	SAS
QA Review Initials	SAS	RD	SAS	RD	SAS	RD	SAS	RD
Day								
0.83% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.7	25.4	25.6	24.3	25.4	25.8	25.1	
Final		25.1	25.3	24.8	24.5	25.0	24.9	24.5
D.O. Initial	7.1	6.6	7.0	6.7	6.6	6.4	6.2	
Final		6.5	5.7	5.3	5.3	5.8	5.4	6.3
pH Initial	8.0	7.9	8.1	8.0	8.0	8.1	8.1	
Final		7.9	7.7	7.6	7.2	7.6	7.7	7.6
Conductivity	380*	375	386	386	389	391	399	
Analyst Initials	RD	SAS	RD	SAS	RD	SAS	RD	SAS
QA Review Initials	SAS	RD	SAS	RD	SAS	RD	SAS	RD
Day								
1.7% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.6	25.4	25.5	24.3	25.4	25.8	25.2	
Final		25.1	25.2	24.9	24.6	25.0	25.1	24.8
D.O. Initial	7.0	6.6	7.0	6.6	6.6	6.4	6.3	
Final		6.5	5.6	4.9	5.0	5.5	5.4	6.3
pH Initial	8.0	7.9	8.1	8.0	8.0	8.2	8.1	
Final		7.8	7.7	7.5	7.3	7.5	7.6	7.7
Conductivity	376	373	384	384	386	392	397	
Analyst Initials	RD	SAS	RD	SAS	RD	SAS	RD	SAS
QA Review Initials	SAS	RD	SAS	RD	SAS	RD	SAS	RD

* Day 0 - 4/11/03 - As the temperature of lab was 26.1°C - opened all doors to cool down - 15 minutes later checked the temp. of room - the temp reduced to 25.4°C. Left the doors ajar.

- checked the temperature of the control H₂O's - #2 M. Hard = 25.8°C
 #5 M. Hard = 25.6°C
 #3 G₂O = 25.8°C

- the control water temp. did not fluctuate very much with the room temp.

* day 0 - checked conductivity
 two times - because
 a lot lower than controls - only 2

25.4

Client: TVA Watts Bar - Outfall 101Location: Rhea County, TennesseeTemplate No.: 1Test Type: Fathead Minnow 7-day ChronicAnalysts: BD, SJJ, TMDates/times: 4/14/13 4/21/13/1400Age of Larvae: 4-5 days

Day								
3.3% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.8	25.4	25.3	24.3	25.6	25.8	25.3	
Final		25.5	25.9	24.9	24.7	25.3	24.9	24.8
D.O. Initial	7.1	6.6	7.0	6.7	6.5	6.2	6.2	
Final		6.1	5.6	5.0	4.9	5.5	5.3	6.2
pH Initial	8.0	7.9	8.1	8.0	8.0	8.2	8.2	
Final		7.7	7.7	7.5	7.3	7.6	7.7	7.7
Conductivity	372	369	381	380	383	388	393	
Analyst Initials	mo	SJJ	mo	mo	mo	J	SJJ	mo
QA Review Initials	SJJ	mo	SJJ	mo	SJJ	mo	mo	SJJ
Day								
6.6% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.1	25.5	25.3	24.3	25.6	25.9	25.3	
Final		25.0	25.6	24.7	24.6	25.2	24.7	24.3
D.O. Initial	7.0	6.6	7.0	6.7	6.5	6.4	6.3	
Final		6.2	5.8	5.0	4.9	5.5	5.4	6.4
pH Initial	8.0	8.0	8.1	8.0	8.0	8.2	8.2	
Final		7.8	7.7	7.5	7.3	7.6	7.5	7.8
Conductivity	367	363	373	373	378	382	387	
Analyst Initials	mo	SJJ	mo	SJJ	mo	J	SJJ	mo
QA Review Initials	SJJ	mo	SJJ	mo	SJJ	mo	mo	SJJ
Day								
13.2% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.4	25.3	25.4	24.3	25.7	25.8	25.3	
Final		24.8	25.6	24.7	24.6	25.3	24.8	24.1
D.O. Initial	7.1	6.6	7.1	6.8	6.5	6.3	6.3	
Final		6.4	5.4	5.0	4.9	5.1	5.2	6.5
pH Initial	8.0	8.0	8.1	8.0	8.0	8.2	8.2	
Final		7.7	7.7	7.5	7.3	7.5	7.6	7.7
Conductivity	369	350	368	361	366	374	374	
Analyst Initials	mo	SJJ	mo	SJJ	mo	J	SJJ	mo
QA Review Initials	SJJ	mo	SJJ	mo	SJJ	mo	mo	SJJ

Client: TVA Watts Bar - Outfall 101
 Location: Rhea County, Tennessee
 Template No.: 1
 Test Type: Fathead Minnow 7-day Chronic

Analysts: MS 813 JM
 Dates/times: 4/11/13 4/12/13 4/00
 Age of Larvae: 24 hrs.

Day									
100% Outfall 101	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.4	25.1	25.2	24.2	24.8	25.9	25.4		
Final									
D.O. Initial	7.8	7.9	7.6	7.7	7.0	6.8	6.7		7.8 = initial D.O. day 0
Final									
pH Initial	8.1	7.9	8.1	8.0	8.0	8.0	8.0		
Final									
Alkalinity	65		54		60				alk day 2 = 60
Hardness	84		70		80				hard day 2 = 70
Conductivity	181	178	164	171	197	203	190		
Residual Chlorine	0.05		0.07		0.05				
Sample Date	4/11	4/11	4/11	4/11	4/12	4/12	4/12		
Analyst Initials	MS	MS	MS	MS	MS	MS	MS		
QA Review Initials	MS	MS	MS	MS	MS	MS	MS		
Day									
Intake	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.7	25.2	25.3	24.0	24.9	25.4	25.4		
Final		24.8	25.0	24.6	25.1	25.1	24.9	25.3	Day 0 = aerated
D.O. Initial	9.8	9.3	8.9	8.6	7.7	7.8	7.4		sample for 10 minutes
Final		6.3	6.4	5.3	5.4	5.8	5.3	6.7	to reduce D.O.
pH Initial	8.0	7.9	8.1	7.8	7.8	7.8	7.8		Day 1 = aerated for
Final		7.7	7.7	7.5	7.5	7.7	7.7	8.0	10 minutes to
Alkalinity	59		54		58				reduce D.O.
Hardness	76		68		76				
Conductivity	165	162	163	154	158	159	154		
Residual Chlorine	0.04		0.01		0.06				
Sample Date	4/11	4/11	4/11	4/11	4/12	4/12	4/12		
Analyst Initials	MS	MS	MS	MS	MS	MS	MS	MS	
QA Review Initials	MS	MS	MS	MS	MS	MS	MS	MS	

* Day 0 - MS - aerated sample for 10 minutes - final D.O. = 7.8

* Day 1 - MS - aerated sample for 10 minutes - final D.O. = 8.4

Cerio Water Chemistry

WB101 April 14-21, 2002 INITIAL AND FINAL WATER CHEMISTRY (CERIO)

Initial Chemistry

CERIO

Control	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.5	25.4	25.4	24.2	25.8	25.8	25.1	24.2	25.8	25.3
DO	6.9	6.7	7.0	6.7	6.7	6.5	6.5	6.5	7.0	6.7
pH	8.0	8.0	8.1	8.0	8.0	8.0	8.1	8.0	8.1	8.0
Cond	166	169	167	167	166	175	163	163	175	168
Hard	80.0		82.0			80.0		80.0	82.0	80.7
Alk	58.0		59.0			62.0		58.0	62.0	59.7

Concentration 0.83%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.5	25.3	25.4	24.2	25.8	25.7	25.1	24.2	25.8	25.3
DO	6.9	6.6	6.8	6.7	6.7	6.7	6.3	6.3	6.9	6.7
pH	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.1
Cond	167	164	169	168	168	167	164	164	169	167

Concentration 1.7%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.5	25.4	25.5	24.3	25.7	25.8	25.2	24.3	25.8	25.3
DO	7.0	6.6	6.9	6.7	6.7	6.8	6.2	6.2	7.0	6.7
pH	8.0	8.0	8.2	8.0	8.1	8.1	8.2	8.0	8.2	8.1
Cond	167	165	169	168	169	169	165	165	169	167

Concentration 3.3%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.4	25.4	25.5	24.3	25.7	25.4	25.2	24.3	25.7	25.3
DO	7.0	6.7	6.9	6.7	6.7	6.8	6.2	6.2	7.0	6.7
pH	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.1
Cond	167	169	168	168	169	170	165	165	170	168

Concentration 6.6%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.4	25.3	25.5	24.5	25.6	25.6	25.2	24.5	25.6	25.3
DO	7.0	6.6	6.9	6.7	6.7	6.7	6.3	6.3	7.0	6.7
pH	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.1
Cond	168	169	168	169	170	171	166	166	171	169

Concentration 13.2%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.4	25.3	25.0	24.5	25.6	25.6	25.3	24.5	25.6	25.2
DO	7.0	6.6	7.1	6.7	6.6	6.6	6.3	6.3	7.1	6.7
pH	8.0	8.0	8.1	8.0	8.1	8.1	8.1	8.0	8.1	8.1
Cond	168	170	167	169	172	174	167	167	174	170

Cerio Water Chemistry

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.5	25.4	25.1	24.6	24.8	25.8	25.2	24.6	25.8	25.2
DO	7.9	7.9	7.8	8.1	7.0	6.8	6.9	6.8	8.1	7.5
pH	8.1	7.9	8.1	7.9	8.0	8.0	8.1	7.9	8.1	8.0
Cond	181	178	161	171	197	203	172	161	203	180
Hard	84.0		70.0		80.0			70	84	78.0
Alk	65.0		60.0		60.0			60	65	61.7
TRC	0.05		0.07		0.05			0.05	0.07	0.06

Intake	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	25.3	25.2	25.0	24.1	24.9	25.7	25.6	24.1	25.7	25.1
DO	7.8	8.4	8.8	8.7	7.7	7.8	7.2	7.2	8.8	8.1
pH	8.0	7.9	8.1	7.8	7.8	7.8	8.5	7.8	8.5	8.0
Cond	165	164	163	155	158	159	149	149	165	159
Hard	76.0		68.0		76.0			68	76	73.3
Alk	59.0		54.0		58.0			54	59	57.0
TRC	0.04		0.07		0.06			0.04	0.07	0.06

Final Chemistry

CERIO

Cerio - Medium	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.8	25.0	24.8	24.5	25.5	24.8	24.0	24.0	25.8	24.9
DO	6.3	6.0	6.4	6.6	6.3	5.5	6.4	5.5	6.6	6.2
pH	7.9	7.6	8.1	7.9	8.0	8.3	7.8	7.6	8.3	7.9

Concentration 0.83%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.6	24.9	24.7	24.5	25.5	24.9	24.1	24.1	25.6	24.9
DO	6.3	6.0	6.3	6.5	6.2	5.5	6.4	5.5	6.5	6.2
pH	8.1	7.7	8.2	8.0	8.0	8.2	8.0	7.7	8.2	8.0

Concentration 1.7%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	24.9	24.7	24.4	25.5	25.0	24.1	24.1	25.5	24.9
DO	6.4	5.8	6.3	6.5	6.2	5.5	6.4	5.5	6.5	6.2
pH	8.0	7.7	8.2	8.1	8.1	8.3	8.0	7.7	8.3	8.1

Concentration 3.3%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	25.2	24.8	24.4	25.4	25.0	24.2	24.2	25.5	24.9
DO	6.5	5.8	6.3	6.5	6.0	5.5	6.5	5.5	6.5	6.2
pH	8.2	7.7	8.2	8.2	8.2	8.2	8.0	7.7	8.2	8.1

Cerio Water Chemistry

Concentration 6.6%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	25.1	24.8	24.3	25.4	25.0	24.2	24.2	25.5	24.9
DO	6.6	5.8	6.4	6.6	6.0	5.5	6.5	5.5	6.6	6.2
pH	8.1	7.7	8.1	8.2	8.2	8.2	8.2	7.7	8.2	8.1

Concentration 13.2%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.5	25.3	24.8	24.3	25.5	25.0	24.3	24.3	25.5	25.0
DO	6.8	5.8	6.3	6.6	6.0	5.5	6.5	5.5	6.8	6.2
pH	8.1	7.7	8.1	8.1	8.1	8.2	8.1	7.7	8.2	8.1

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.1	25.2	24.9	24.2	24.9	24.9	24.3	24.2	25.2	24.8
DO	6.6	6.0	6.3	6.3	6.4	5.8	6.5	5.8	6.6	6.3
pH	8.2	7.7	8.2	8.3	8.1	8.3	8.3	7.7	8.3	8.2

Test ter Mean: 25.1

Min: 24.0

Max: 25.8

Word Review by: 05-02-2003 Cur

Excel Reviewed by: Cur 05-02-2003

Client: TVA Watts Bar - Outfall 101Analysts: B.D. S43, JHLocation: Rhea County, TennesseeDates/times: 4/14/03 11:40 AM 4/21/03 1:35 PMTemplate No.: 1Age of Neonates: ~8hrsTest Type: Ceriodaphnia dubia 7-day Chronic

Day								
Control: 20% DMW	0	1	2	3	4	5	6	7
Temperature-Initial	25.5	25.4	25.4	24.2	25.8	25.8	25.1	
Final		25.8	25.0	24.8	24.5	25.5	24.8	24.0
D.O. Initial	6.9	6.7	7.0	6.7	6.7	6.5	6.5	
Final		6.3	6.0	6.4	6.6	6.3	5.5	6.4
pH Initial	8.0	8.0	8.1	8.0	8.0	8.0	8.1	
Final		7.9	7.6	8.1	7.9	8.0	8.3	7.8
Alkalinity	59		59			62		
Hardness	80		82			80		
Conductivity	166	169	167	167	166	175	163	
Analyst Initials	PO	S43	PO	S43	S43	PO	S43	PO
QA Review Initials	S43	PO	S43	PO	PO	S43	PO	S43
Day								
0.83% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.5	25.3	25.4	24.2	25.8	25.7	25.1	
Final		25.6	24.9	24.7	24.5	25.5	24.9	24.1
D.O. Initial	6.9	6.6	6.8	6.7	6.7	6.7	6.3	
Final		6.3	6.0	6.3	6.5	6.2	5.5	6.4
pH Initial	8.0	8.0	8.1	8.0	8.1	8.1	8.1	
Final		8.1	7.7	8.2	8.0	8.0	8.2	8.0
Conductivity	167	164	169	168	169	167	166	
Analyst Initials	PO	S43	PO	S43	S43	PO	S43	PO
QA Review Initials	S43	PO	S43	PO	PO	S43	PO	S43
Day								
1.7% Outfall 101	0	1	2	3	4	5	6	7
Temperature-Initial	25.5	25.4	25.5	24.3	25.7	25.8	25.2	
Final		25.5	24.9	24.7	24.4	25.5	25.0	24.1
D.O. Initial	7.0	6.4	6.9	6.7	6.7	6.8	6.2	
Final		6.4	5.8	6.3	6.5	6.2	5.5	6.4
pH Initial	8.0	8.0	8.2	8.0	8.1	8.1	8.2	
Final		8.0	7.7	8.2	8.1	8.1	8.3	8.0
Conductivity	167	165	169	168	169	169	165	
Analyst Initials	PO	S43	PO	S43	S43	PO	S43	PO
QA Review Initials	S43	PO	S43	PO	PO	PO	PO	S43

164

Client: TVA Watts Bar - Outfall 101 Analysts: BD S43 TM
 Location: Rhea County, Tennessee Dates/times: 4/10/14⁰⁰ 4/21/14 1135⁰
 Template No.: 1 Age of Neonates: +8w3
 Test Type: Ceriodaphnia dubia 7-day Chronic

Day									
3.3% Outfall 101	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.4	25.4	25.5	24.3	25.7	25.4	25.2		
Final		25.5	25.2	24.8	24.4	25.4	25.0	24.2	
D.O. Initial	7.0	6.7	6.9	6.7	6.7	6.8	6.2		
Final		6.5	5.8	6.3	6.5	6.0	5.5	6.5	
pH Initial	8.0	8.0	8.1	8.0	8.1	8.1	8.1		
Final		8.2	7.7	8.2	8.2	8.2	8.2	8.0	
Conductivity	167	169	168	168	169	170	165		
Analyst Initials	mo	SB	mo	SB	SB	mo	SB	mo	
QA Review Initials	SB	mo	SB	mo	mo	SB	mo	SB	
Day									
6.6% Outfall 101	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.4	25.3	25.5	24.5	25.6	25.6	25.2		
Final		25.5	25.1	24.8	24.3	25.4	25.0	24.2	
D.O. Initial	7.0	6.6	6.9	6.7	6.7	6.7	6.3		
Final		6.6	5.8	6.4	6.6	6.0	5.5	6.5	5.8 = final D.O. day 2
pH Initial	8.0	8.0	8.1	8.0	8.1	8.1	8.1		
Final		8.1	7.7	8.1	8.2	8.2	8.2	8.2	
Conductivity	168	169	168	169	170	171	166		
Analyst Initials	mo	SB	mo	SB	SB	mo	SB	mo	
QA Review Initials	SB	mo	SB	mo	mo	SB	mo	SB	
Day									
13.2% Outfall 101	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.4	25.3	25.0	24.5	25.6	25.6	25.3		
Final		25.5	25.3	24.8	24.3	25.5	25.0	24.3	
D.O. Initial	7.0	6.6	7.1	6.7	6.6	6.6	6.3		
Final		6.6	5.8	6.3	6.6	6.0	5.5	6.5	5.8 = final D.O. day 2
pH Initial	8.0	8.0	8.1	8.0	8.1	8.1	8.1		4.3 = final D.O. day 3
Final		8.1	7.7	8.1	8.1	8.1	8.2	8.1	
Conductivity	168	170	167	169	172	174	167		
Analyst Initials	mo	SB	mo	SB	SB	mo	SB	mo	
QA Review Initials	SB	mo	SB	mo	mo	SB	mo	SB	

Client: TVA Watts Bar - Outfall 101Analysts: BD, SJS, JYLocation: Rhea County, TennesseeDates/times: 4/14/03 4/21/03 1/950Template No.: 1Age of Neonates: ~8hrsTest Type: Ceriodaphnia dubia 7-day Chronic

Day									
100% Outfall 101	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.5	25.4	25.1	24.6	24.8	25.8	25.2		
Final									
D.O. Initial	7.9	7.9	8.1	8.1	7.0	6.8	6.9		
Final									
pH Initial	8.1	7.9	8.1	7.9	8.0	8.0	8.1		
Final									
Alkalinity	65		60		10 ³ 60				
Hardness	84		70		86				
Conductivity	181	178	161	155	197	203	172		cond. day 3 = 171
Residual Chlorine	0.05		0.07		0.05				
Sample Date	4/14	4/14	4/16	4/16	4/18	4/18	4/18		
Analyst Initials	BD	SJS	BD	SJS	SJS	BD	BD		
QA Review Initials	SJS	BD	SJS	BD	SJS	SJS	SJS		
Day									
Intake	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.3	25.2	25.0	24.1	24.9	24.8	25.6		int temp day 5 = 25.7
Final		25.1	25.2	24.9	24.2	24.9	24.9	24.3	
D.O. Initial	7.8*	8.4*	8.8	8.7	7.7	7.8	7.2		
Final		6.6	6.0	6.3	6.3	6.4	5.8	6.5	
pH Initial	8.0	7.9	8.1	7.8	7.8	7.8	8.5		
Final		8.2	7.7	8.2	8.3	8.1	8.3	8.3	
Alkalinity	59		54		58				
Hardness	76		68		76				
Conductivity	165	164	163	155	152	159	149		
Residual Chlorine	0.04		0.07		0.06				
Sample Date	4/14	4/14	4/16	4/16	4/18	4/18	4/18		
Analyst Initials	BD	SJS	BD	SJS	SJS	BD	BD	BD	
QA Review Initials	SJS	BD	SJS	BD	BD	SJS	SJS	SJS	

* Day 0 = the initial D.O. is ~~BD~~ after aeration

* Day 1 = initial D.O. is after aeration

Watts Bar Nuclear Plant Biomonitoring
April 14 - 21, 2003

Appendix D

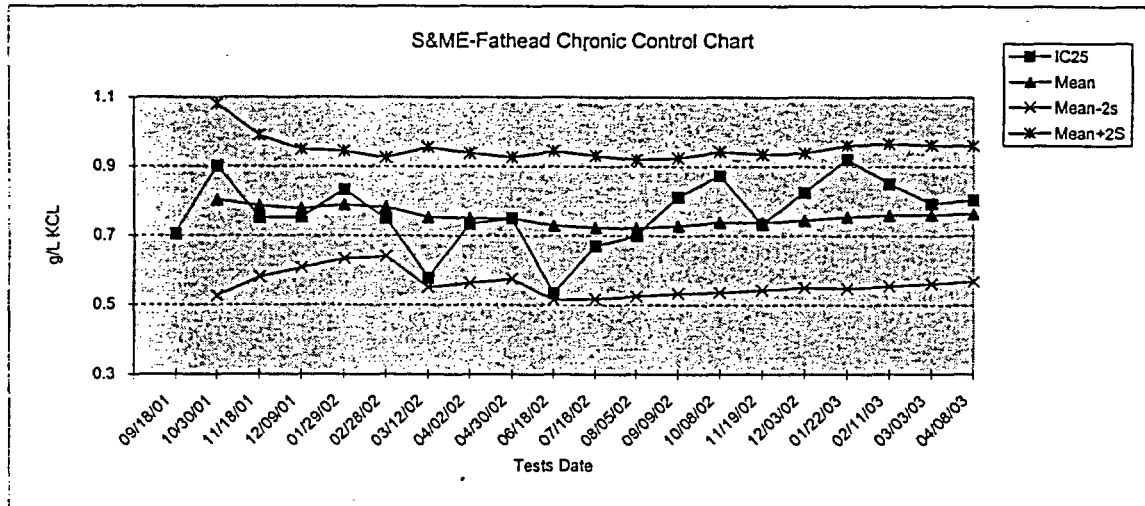
Reference Toxicant Tests and
Control Chart Information

SE - Fathead Chronic Control Chart

Updated April 21, 2003

Control Growth KCL Toxicity Test
Control Chart (PP)

Source	Date	IC25	Mean	S	2S	Mean-2s	Mean+2S	CV%
S&ME	09/18/01	0.7039						
S&ME	10/30/01	0.8997	0.8018	0.1385	0.2769	0.5249	1.0787	17.3
S&ME	11/18/01	0.7502	0.7846	0.1023	0.2047	0.5799	0.9893	13.0
S&ME	12/09/01	0.7514	0.7763	0.0852	0.1704	0.6059	0.9467	11.0
S&ME	01/29/02	0.8314	0.7873	0.0778	0.1556	0.6318	0.9429	9.9
S&ME	02/28/02	0.7485	0.7808	0.0714	0.1427	0.6381	0.9236	9.1
S&ME	03/12/02	0.5773	0.7518	0.1008	0.2016	0.5502	0.9534	13.4
S&ME	04/02/02	0.7327	0.7494	0.0936	0.1871	0.5623	0.9365	12.5
S&ME	04/30/02	0.7482	0.7493	0.0875	0.1750	0.5742	0.9243	11.7
S&ME	06/18/02	0.5319	0.7275	0.1074	0.2148	0.5127	0.9423	14.8
S&ME	07/16/02	0.6690	0.7222	0.1034	0.2068	0.5154	0.9290	14.3
S&ME	08/05/02	0.6990	0.7203	0.0988	0.1976	0.5226	0.9179	13.7
S&ME	09/09/02	0.8100	0.7272	0.0978	0.1956	0.5315	0.9228	13.5
S&ME	10/08/02	0.8720	0.7375	0.1016	0.2033	0.5342	0.9408	13.8
S&ME	11/19/02	0.7320	0.7371	0.0980	0.1959	0.5412	0.9331	13.3
S&ME	12/03/02	0.8230	0.7425	0.0970	0.1941	0.5484	0.9366	13.1
S&ME	01/22/03	0.9200	0.7530	0.1033	0.2067	0.5463	0.9597	13.7
S&ME	02/11/03	0.8480	0.7582	0.1027	0.2055	0.5528	0.9637	13.5
S&ME	03/03/03	0.7914	0.7600	0.1001	0.2003	0.5597	0.9602	13.2
S&ME	04/08/03	0.8020	0.7621	0.0979	0.1958	0.5663	0.9579	12.8



**Potassium Chloride Chronic Reference Toxicant Control Chart
for Fathead Minnow**

Test Number	Test date	7-d IC ₂₅ (g/L KCl)	CT (g/L KCl)	S	Control Limits		S _{A.75}	Warning Limits		S _{A.90}	Control Limits		CV
					CT - 2S	CT + 2S		CT - S _{A.75}	CT + S _{A.75}		CT - S _{A.90}	CT + S _{A.90}	
1	09/18/01	0.7039											
2	10/30/01	0.8997	0.80	0.14	0.52	1.08	0.36	0.44	1.16	0.50	0.30	1.30	0.17
3	11/18/01	0.7502	0.78	0.10	0.58	0.99	0.35	0.43	1.14	0.49	0.30	1.27	0.13
4	12/09/01	0.7514	0.78	0.09	0.61	0.95	0.35	0.43	1.13	0.48	0.29	1.26	0.11
5	01/29/02	0.8314	0.79	0.08	0.63	0.94	0.35	0.43	1.14	0.49	0.30	1.28	0.10
6	02/28/02	0.7485	0.78	0.07	0.64	0.92	0.35	0.43	1.13	0.48	0.30	1.26	0.09
7	03/12/02	0.5773	0.75	0.10	0.55	0.95	0.34	0.41	1.09	0.47	0.29	1.22	0.13
8	04/02/02	0.7327	0.75	0.09	0.56	0.94	0.34	0.41	1.09	0.46	0.28	1.21	0.12
9	04/30/02	0.7482	0.75	0.09	0.57	0.92	0.34	0.41	1.09	0.46	0.28	1.21	0.12
10	06/18/02	0.5319	0.73	0.11	0.51	0.94	0.33	0.40	1.05	0.45	0.28	1.18	0.15
11	07/16/02	0.6690	0.72	0.10	0.52	0.93	0.32	0.40	1.05	0.45	0.27	1.17	0.14
12	08/05/02	0.6990	0.72	0.10	0.52	0.92	0.32	0.40	1.04	0.45	0.27	1.17	0.14
13	09/09/02	0.8100	0.73	0.10	0.53	0.92	0.33	0.40	1.05	0.45	0.28	1.18	0.13
14	10/08/02	0.8720	0.74	0.10	0.53	0.94	0.33	0.41	1.07	0.46	0.28	1.19	0.14
15	11/19/02	0.7320	0.74	0.10	0.54	0.93	0.33	0.41	1.07	0.46	0.28	1.19	0.13
16	12/03/02	0.8230	0.74	0.10	0.55	0.94	0.33	0.41	1.08	0.46	0.28	1.20	0.13
17	01/22/03	0.9200	0.75	0.10	0.55	0.96	0.34	0.41	1.09	0.47	0.29	1.22	0.14
18	02/11/03	0.8480	0.76	0.10	0.55	0.96	0.34	0.42	1.10	0.47	0.29	1.23	0.14
19	03/03/03	0.7914	0.76	0.10	0.56	0.96	0.34	0.42	1.10	0.47	0.29	1.23	0.13
20	04/08/03	0.8020	0.76	0.10	0.57	0.96	0.34	0.42	1.11	0.47	0.29	1.23	0.13

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

CT = Central tendency (mean IC₂₅).

S = Standard deviation of the IC₂₅ values.

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

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

CV = Coefficient of variation of the IC₂₅ values.

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

Precision of Endpoint Measurements
Sodium Chloride Chronic Reference Toxicant Data
for Fathead Minnows
using Moderately Hard Synthetic Water

Test number	Test date	Control Survival (%)	Control Mean Growth (dry weight/larvae) (mg)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	09/18/01	95	0.839	7.5		0.1769	21.1	
2	10/30/01	97.5	0.705	10.1	8.8	0.147	20.9	21.0
3	11/18/01	100	0.850	8.6	8.7	0.1188	14.0	18.6
4	12/09/01	100	0.493	12.3	9.6	0.08	16.2	18.0
5	01/29/02	100	0.669	8.1	9.3	0.1115	16.7	17.8
6	02/28/02	97.5	0.723	9.9	9.4	0.2536	35.1	20.6
7	03/12/02	92.5	0.662	8.0	9.2	0.1316	19.9	20.5
8	04/02/02	95	0.813	10.4	9.4	0.1757	21.6	20.7
9	04/30/02	100	0.460	6.7	9.1	0.0789	17.1	20.3
10	06/18/02	97.5	0.696	9.2	9.1	0.1965	28.2	21.1
11	07/16/02	100	0.338	8.0	9.0	0.1407	41.6	22.9
12	08/05/02	90	0.538	6.2	8.8	0.1531	28.5	23.4
13	09/09/02	100	0.508	6.0	8.5	0.1542	30.4	23.9
14	10/08/02	97.5	0.715	11.0	8.7	0.1988	27.8	24.2
15	11/19/02	92.5	0.674	13.7	9.0	0.087	12.9	23.5
16	12/03/02	95	0.504	7.4	8.9	0.153	30.4	23.9
17	01/22/03	97.5	0.403	7.0	8.8	0.1422	35.3	24.6
18	02/11/03	92.5	0.555	8.1	8.8	0.1567	28.2	24.8
19	03/03/03	97.5	0.509	5.1	8.6	0.0673	13.2	24.2
20	04-08-03	90	0.434	10.9	8.7	0.1357	31.3	24.5

FATHEAD MINNOW TEST INFORMATION

Test Name: S&ME Chronic Reference Test

Test Conducted From: 4/18/03 (Day 0) To 4/15/03 (Day 7)

Sites/Concentrations: 1. Control 4. 750mg/L
2. 250mg/L 5. 1000mg/L
3. 500mg/L 6. 1500mg/L

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals



Other (describe): _____



Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals



Other (describe): _____



Source of Test Larvae (✓):

S&ME Lot # 03-020



Other (describe): _____



Date Larvae Hatched: 4/7-4/8/03 Hatch Time: (4/7 - 4/8) 1500 - 0310 Initials: Bo

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: [Signature] (Reviewer Initials) on 4/16/03 (Date)

REV.01, JANUARY00 (fathead minnow test info)

Fathead Minnow Daily Test Information Logsheet

Test Name: Chronic Reference Test

Test Dates: 4/8 - 4/15/03

Daily Test information		Temperature Information (25±1°C)		Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time		
	a.m.	p.m.						Carboy #	Date Prep.
Day 0 <i>PO</i> 4/8/03	25.0	25.0	1		am: — ✓ pm: 1515	1300	1330	2	4/4/03
Day 1 <i>PO</i> 4/9/03	25.1	25.0	1		✓ am: 1315 ✓ pm: 1530	1400	1425	5	4/8/03
Day 2 <i>PO</i> 4/10/03	25.1	25.0	1		✓ am: 0915 ✓ pm: 1615	1400	1415	2	4/8/03
Day 3 <i>SAS</i> 4/11/03	25.1	25.2	1		✓ am: 0915 ✓ pm: 1600	1305	1325	5	4/9/03
Day 4 <i>ju</i> 4/12/03	25.0	25.0	1		✓ am: 1115 ✓ pm: 1645	1300	1330	5	4/11/03
Day 5 <i>ju</i> 4/13/03	25.0	25.0	1		✓ am: 1130 ✓ pm: 1700	1300	1325	5	4/11/03
Day 6 <i>SAS</i> 4/14/03	25.1	25.0	1		✓ am: 1000 ✓ pm: 1615	1300	1320	2	4/11/03
Day 7 <i>SAS</i> 4/15/03	25.0	25.0	1			1300		—	—

Client: S&ME Chronic Reference

Location: S&ME Laboratory

Analyst: RD, S&S, JM

Dates: 4/8 - 4/15/03

CUMULATIVE SURVIVAL OF P. PROMELAS IN CHRONIC TEST

REPLICATE						
CONC.	Initials	DAY NO.	A	B	C	D
Control Mod. Hard	RD/S&S	1	10	10	10	10
	RD/S&S	2	10	10	10	10
	S&S	3	10	10	10	10
	JM	4	10	10	10	10
	JM	5	10	10	9	9
	RD/S&S	6	10	10	9	9
	S&S	7	9	10	9	8
250 mg/L (KCl)	RD/S&S	1	10	10	10	10
	RD/S&S	2	9	10	10	10
	S&S	3	9	10	10	10
	JM	4	9	10	10	10
	JM	5	9	10	10	10
	RD/S&S	6	8	9	10	9
	S&S	7	8	8	9	9
500 mg/L (KCl)	RD/S&S	1	10	10	10	10
	RD/S&S	2	10	10	10	10
	S&S	3	10	10	10	10
	JM	4	10	10	10	10
	JM	5	9	10	10	10
	RD/S&S	6	8	10	9	9
	S&S	7	7	10	8	7
750 mg/L (KCl)	RD/S&S	1	10	10	10	10
	RD/S&S	2	9	10	10	10
	S&S	3	8	10	9	9
	JM	4	8	10	8	9
	JM	5	8	9	8	8
	RD/S&S	6	8	9	7	7
	S&S	7	8	9	6	7
1000 mg/L (KCl)	RD/S&S	1	9	10	10	9
	RD/S&S	2	9	10	10	5
	S&S	3	9	10	10	5
	JM	4	9	10	10	5
	JM	5	8	7	7	3
	RD/S&S	6	8	7	7	2
	S&S	7	6	7	7	1

REPLICATE						
CONC.	Initials	DAY NO.	A	B	C	D
1500 mg/L (KCl)	RD/S&S	1	5	5	10	6
	RD/S&S	2	1	0	4	0
	S&S	3	0	0	0	0
	JM	4	0	0	0	0
	JM	5	0	0	0	0
	S&S	6	0	0	0	0
	S&S	7	0	0	0	0
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

FATHEAD MINNOW SEVEN DAY TEST RAW DATA SURVIVAL AND GROWTH

Client: S&ME Reference Test

Test Conducted By: Ms. S. J. M.

Date Weighed 4/16/03

Test Dates: 4/8-4/15/03

Oven Temp

(°C) 107.5°C

Comments:

Began drying (date/time) 4/15/03 1400

End drying (date/time) 4/16/03 1000

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
Control	A	9	10	1294.30	1298.05	3.75	0.375
	B	10	10	1291.22	1295.60	4.38	0.438
	C	9	10	1297.39	1302.30	4.91	0.491
	D	8	10	1297.00	1301.32	4.32	0.432
250 mg/L	A	8	10	1288.79	1293.31	4.52	0.452
	B	8	10	1290.03	1293.30	3.27	0.327
	C	9	10	1291.58	1294.68	3.10	0.310
	D	9	10	1286.42 1288.79	1288.79	2.37	0.237
500 mg/L	A	7	10	1286.18	1289.21	3.03	0.303
	B	10	10	1295.35	1300.07	4.72	0.472
	C	8	10	1288.58	1292.17	3.59 3.59	0.359
	D	7	10	1293.80	1296.28	2.48	0.248
750 mg/L	A	8	10	1294.10	1298.83	4.73	0.473
	B	9	10	1286.88	1289.36	2.48	0.248
	C	6	10	1291.29	1294.86	3.57	0.357
	D	7	10	1279.76	1283.04	3.28	0.328
1000 mg/L	A	6	10	1290.94	1294.35	3.41	0.341
	B	7	10	1292.41	1295.63	3.22	0.322
	C	7	10	1298.36	1301.87	3.51	0.351
	D	1	10	1293.36	1293.58	0.22	0.022

Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 4/8/03 13:00 Test ID: ref0403fs Sample ID: REF-Ref Toxicant
 End Date: 4/15/03 13:00 Lab ID: S&ME Sample Type: KCL-Potassium chloride
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-mg/L	1	2	3	4
D-Control	0.9000	1.0000	0.9000	0.8000
250	0.8000	0.8000	0.9000	0.9000
500	0.7000	1.0000	0.8000	0.7000
750	0.8000	0.9000	0.6000	0.7000
1000	0.6000	0.7000	0.7000	0.1000
1500	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	0.9000	1.0000	1.2543	1.1071	1.4120	9.935	4			
250	0.8500	0.9444	1.1781	1.1071	1.2490	6.954	4	0.554	2.360	0.3246
500	0.8000	0.8889	1.1254	0.9912	1.4120	17.662	4	0.938	2.360	0.3246
750	0.7500	0.8333	1.0584	0.8861	1.2490	14.733	4	1.425	2.360	0.3246
*1000	0.5250	0.5833	0.7975	0.3218	0.9912	40.253	4	3.321	2.360	0.3246
1500	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	4			

Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.94207		0.868		-0.8093	1.72125	
Bartlett's Test indicates equal variances (p = 0.25)					5.33512		13.2767				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		750	1000	866.025		0.26077	0.28874	0.12228	0.03782	0.04222	4, 15

Larval Fish Growth and Survival Test-7 Day Growth

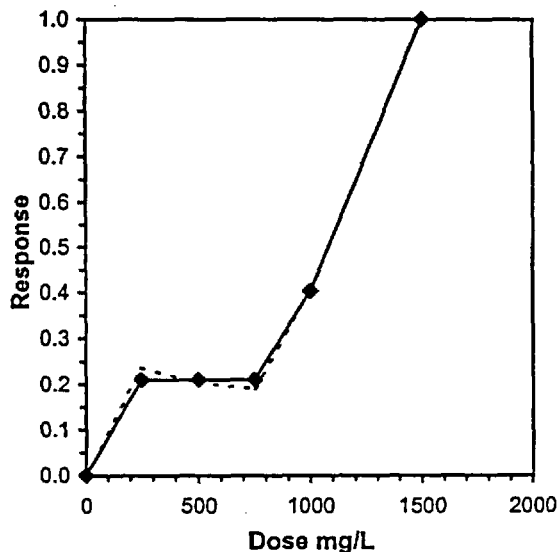
Start Date: 4/8/03 13:00 Test ID: ref0403fg Sample ID: REF-Ref Toxicant
 End Date: 4/15/03 13:00 Lab ID: S&ME Sample Type: KCL-Potassium chloride
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-mg/L	1	2	3	4
D-Control	0.3750	0.4380	0.4910	0.4320
250	0.4520	0.3270	0.3100	0.2370
500	0.3030	0.4720	0.3590	0.2480
750	0.4730	0.2480	0.3570	0.3280
1000	0.3410	0.3220	0.3510	0.0220
1500	0.0000	0.0000	0.0000	0.0000

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)	Skew
IC05*	59.5064	108.319	23.9033	806.72
IC10*	119.013	181.187	47.8067	1137.14
IC15*	178.519	245.365	71.71	1172.32
IC20*	238.026	293.221	95.6134	1479.06
IC25	801.69	301.38	0	1189.49
IC40	995.825	122.377	540.058	1218.91
IC50	1081.08	92.9263	770.357	1265.02

* indicates IC estimate less than the lowest concentration



Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 4/8/03 13:00 Test ID: ref0403fg Sample ID: REF-Ref Toxicant
 End Date: 4/15/03 13:00 Lab ID: S&ME 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	0.3750	0.4380	0.4910	0.4320
250	0.4520	0.3270	0.3100	0.2370
500	0.3030	0.4720	0.3590	0.2480
750	0.4730	0.2480	0.3570	0.3280

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%				
D-Control	0.4340	1.0000	0.4340	0.3750	0.4910	10.930	4			
250	0.3315	0.7638	0.3315	0.2370	0.4520	26.944	4	1.730	2.290	0.1357
500	0.3455	0.7961	0.3455	0.2480	0.4720	27.710	4	1.494	2.290	0.1357
750	0.3515	0.8099	0.3515	0.2480	0.4730	26.514	4	1.393	2.290	0.1357

Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.9149		0.844		0.46543	-0.5616	
Bartlett's Test indicates equal variances (p = 0.71)					1.39661		11.3449				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		750	>750			0.13567	0.3126	0.00859	0.00702	0.34353	3, 12

$p_{msd} = 31.3$

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test

Analysts: MD S&B JN

Location: S&ME Inc. Laboratory

Dates/times: 4/31/03 4/15/03/1300

Template No.: 1

Age of larvae: 24hrs 42hrs

Day								
Control: (Mod. Hard)	0	1	2	3	4	5	6	7
Temperature-Initial	25.8	24.3	25.9	24.4	25.4	25.8	25.8	
Final		24.3	24.6	24.3	25.0	25.2	25.8	25.2
D.O. Initial	6.9	6.8	6.9	6.8	7.1	7.0	6.6	
Final		6.0	6.8	6.2	6.0	6.5	5.6	5.4
pH Initial	7.9	7.9	7.9	8.0	8.1	8.1	8.0	
Final		7.6	7.5	7.4	7.6	7.9	7.6	7.5
Alkalinity	62	62	59	57	62		63	
Hardness	98	96	96	98	98		100	
Conductivity	393	369	374	399	386	387	399	
Analyst Initials	BD	MD	MD	S&B	JN	JN	S&B	BD
QA Review Initials	S&B	S&B	S&B	MD	MD	MD	MD	S&B
Day								
250 mg/L (KCl)	0	1	2	3	4	5	6	7
Temperature-Initial	25.9	24.3	25.8	24.4	25.5	25.8	25.6	
Final		24.1	24.2	24.3	25.0	25.3	25.4	25.2
D.O. Initial	6.5	6.6	6.9	6.8	7.0	6.5	6.6	
Final		5.9	6.0	6.0	5.8	6.0	5.5	5.3
pH Initial	8.0	7.9	8.0	8.1	8.1	8.2	8.0	
Final		7.6	7.7	7.5	7.6	7.8	7.6	7.5
Conductivity	811	813	806	855	831	831	850	
Analyst Initials	BD	MD	MD	S&B	JN	JN	S&B	BD
QA Review Initials	S&B	S&B	S&B	MD	MD	MD	MD	S&B
Day								
500 mg/L (KCl)	0	1	2	3	4	5	6	7
Temperature-Initial	25.9	24.3	25.8	24.5	25.5	25.7	25.6	
Final		24.1	24.5	24.5	25.2	25.2	25.4	25.2
D.O. Initial	6.4	6.4	6.8	6.7	6.8	6.3	6.6	
Final		5.9	6.4	6.0	5.4	5.8	5.6	5.5
pH Initial	8.0	8.0	8.0	8.0	8.1	8.2	8.0	
Final		7.7	7.7	7.4	7.6	7.8	7.6	7.6
Conductivity	1258	1266	1257	1243	1246	1256	1260	
Analyst Initials	BD	MD	MD	S&B	JN	JN	S&B	BD
QA Review Initials	S&B	S&B	S&B	MD	MD	MD	MD	S&B

NOTES:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test

Analysts: S&B, BD

Location: S&ME Inc. Laboratory

Dates/times: 4/8/03 11300 - 4/15/03 1300

Template No.: 1

Age of larvae: <24 hrs

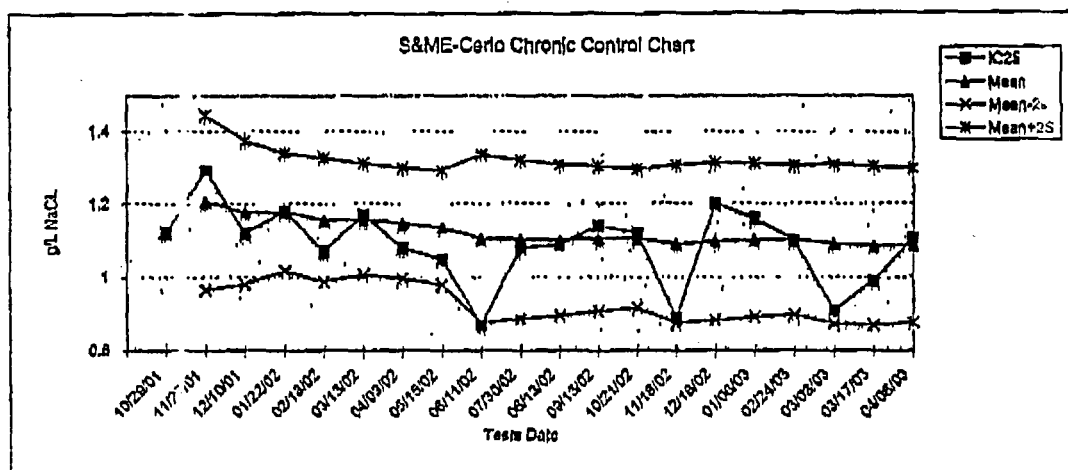
Day									
750 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.8	24.3	25.8	24.6	25.6	25.8	25.6		
Final		24.4	24.4	24.6	25.1	25.3	25.3	25.2	
D.O. Initial	6.5	6.6	6.7	6.6	6.8	6.1	6.3		
Final		5.8	6.2	5.9	5.8	5.6	5.5	5.6	
pH Initial	8.0	8.0	8.0	8.0	8.1	8.2	8.0		
Final		7.8	7.7	7.5	7.7	7.7	7.6	7.5	
Conductivity	1591	1563	1549	1652	1667	1648	1684		
Analyst Initials	S&B	BD	BD	S&B	J	J	S&B	BD	
QA Review Initials	BD	S&B	S&B	BD	BD	BD	BD	S&B	
Day									
1000 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.8	24.3	25.8	24.6	25.6	25.8	25.6		
Final		24.5	24.5	24.6	25.0	25.3	25.3	24.9	
D.O. Initial	6.5	6.5	6.7	6.6	6.9	5.9	6.3		
Final		6.0	6.1	5.7	6.0	5.7	5.4	5.4	
pH Initial	8.0	8.0	8.0	8.0	8.1	8.2	8.0		
Final		7.8	7.7	7.4	7.7	7.8	7.6	7.5	
Conductivity	1975	1987	1925	2050	2050	2030	2020		
Analyst Initials	BD	BD	BD	S&B	J	J	S&B	BD	
QA Review Initials	S&B	S&B	S&B	BD	BD	BD	BD	S&B	
Day									
1500 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.9	24.4	25.8	24.7					
Final		24.4	24.6	24.8					
D.O. Initial	6.5	6.5	6.5	6.6					
Final		6.0	6.2	5.7					
pH Initial	8.0	8.0	8.0	8.0					
Final		7.8	7.6	7.6					
Conductivity	2710	2780	2760	2940					
Analyst Initials	BD	BD	BD	S&B	J				
QA Review Initials	S&B	S&B	S&B	BD					
Stock Solution Date	4/8	4/8	4/8	4/8	4/8	4/13			

NOTES:

S&ME-CD Chronic Control Chart

Updated April 11, 2003
 IC25 NaCl Toxicity Test
 Control Chart (CD)

Source	Date	IC25	Mean	S	2S	Mean-2s	Mean+2S	CV%
S&MB	10/29/01	1.1200						
S&MB	11/27/01	1.2900	1.2050	0.1202	0.2404	0.9646	1.4454	10.0
S&MB	12/10/01	1.1200	1.1767	0.0981	0.1963	0.9804	1.3730	8.3
S&MB	01/22/02	1.1800	1.1775	0.0802	0.1603	1.0172	1.3378	6.8
S&MB	02/18/02	1.0700	1.1560	0.0844	0.1689	0.9871	1.3249	7.3
S&MB	03/13/02	1.1700	1.1583	0.0737	0.1515	1.0069	1.3098	6.5
S&MB	04/03/02	1.0800	1.1471	0.0752	0.1504	0.9967	1.2976	6.6
S&MB	05/15/02	1.0500	1.1350	0.0776	0.1553	0.9797	1.2903	6.8
S&MB	06/11/02	0.8700	1.1056	0.1144	0.2287	0.8768	1.3343	10.3
S&MB	07/30/02	1.0800	1.1030	0.1081	0.2162	0.8868	1.3192	9.8
S&MB	08/13/02	1.0900	1.1018	0.1026	0.2053	0.8965	1.3071	9.3
S&MB	09/13/02	1.1400	1.1050	0.0983	0.1970	0.9080	1.3020	8.9
S&MB	10/21/02	1.1200	1.1062	0.0944	0.1888	0.9174	1.2949	8.5
S&MB	11/18/02	0.8900	1.0907	0.1075	0.2150	0.8757	1.3058	9.9
S&MB	12/16/02	1.2000	1.0980	0.1074	0.2148	0.8832	1.3128	9.8
S&MB	01/09/03	1.1600	1.1019	0.1049	0.2098	0.8921	1.3117	9.5
S&MB	02/24/03	1.1000	1.1018	0.1016	0.2031	0.8986	1.3049	9.2
S&MB	03/03/03	0.9100	1.0911	0.1084	0.2168	0.8743	1.3079	9.9
S&MB	03/17/03	0.9900	1.0858	0.1079	0.2157	0.8700	1.3015	9.9
S&MB	04/08/03	1.1066	1.0868	0.1051	0.2102	0.8766	1.2970	9.7



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

Test number	Test date	Control Mean Reproduction	CV	CT	MSD	PMSD	CT
		(offspring/female)	(%)	for Control Reproduction CV (%)		(%)	for PMSD (%)
1	10-29-01	27.7	10.1		3.0	10.8	
2	11-27-01	23.2	8.6	8.6	4.3	18.5	18.5
3	12-10-01	24.8	12.3	10.5	2.1	8.5	13.5
4	01-22-02	23.5	8.1	9.7	4.3	18.3	15.1
5	02-18-02	17.3	9.9	9.7	6.1	35.3	20.1
6	03-13-02	23.3	8.0	9.4	4.7	20.2	20.1
7	04-03-02	24.6	10.4	9.6	3.2	13.0	19.0
8	05-15-02	28.6	6.7	9.2	6.2	21.7	19.3
9	06-11-02	28.7	9.2	9.2	6.1	21.3	19.6
10	07-30-02	20.6	8.0	9.0	5.0	24.3	20.1
11	08-13-02	29.7	6.2	8.7	6.2	20.9	20.2
12	09-13-02	28.8	6.0	8.5	5.0	17.4	19.9
13	10-21-02	25.4	11.0	8.7	5.5	21.7	20.1
14	11-18-02	29.3	13.7	9.1	9.6	32.8	21.0
15	12-16-02	24.9	7.4	9.0	3.6	14.5	20.6
16	01-08-03	20.8	7.0	8.8	4.0	19.2	20.5
17	02-24-03	26.8	8.1	8.8	4.0	14.9	20.1
18	03-03-03	31.4	5.1	8.6	6.2	19.7	20.1
19	03-17-03	29.0	6.2	8.4	5.6	19.3	20.1
20	04-08-03	24.9	21.5	9.1	4.5	18.1	20.0

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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		S _{A.75}	Warning Limits		S _{A.90}	Control Limits		CV
					CT - 2S	CT + 2S		CT - S _{A.75}	CT + S _{A.75}		CT - S _{A.90}	CT + S _{A.90}	
1	10-29-01	1.120											
2	11-27-01	1.290	1.205	0.12	0.96	1.45	0.54	0.66	1.75	0.75	0.46	1.95	0.10
3	12-10-01	1.120	1.177	0.10	0.98	1.37	0.53	0.65	1.71	0.73	0.45	1.91	0.08
4	01-22-02	1.180	1.178	0.08	1.02	1.34	0.53	0.65	1.71	0.73	0.45	1.91	0.07
5	02-18-02	1.070	1.156	0.08	0.99	1.32	0.52	0.64	1.68	0.72	0.44	1.87	0.07
6	03-13-02	1.170	1.158	0.08	1.01	1.31	0.52	0.64	1.68	0.72	0.44	1.88	0.07
7	04-03-02	1.080	1.147	0.08	1.00	1.30	0.52	0.63	1.66	0.71	0.44	1.86	0.07
8	05-15-02	1.050	1.135	0.08	0.98	1.29	0.51	0.62	1.65	0.70	0.43	1.84	0.07
9	06-11-02	0.870	1.106	0.11	0.88	1.33	0.50	0.61	1.60	0.69	0.42	1.79	0.10
10	07-30-02	1.080	1.103	0.11	0.89	1.32	0.50	0.61	1.60	0.68	0.42	1.79	0.10
11	08-13-02	1.090	1.102	0.10	0.90	1.31	0.50	0.61	1.60	0.68	0.42	1.78	0.09
12	09-13-02	1.140	1.105	0.10	0.91	1.30	0.50	0.61	1.60	0.69	0.42	1.79	0.09
13	10-21-02	1.120	1.106	0.09	0.92	1.29	0.50	0.61	1.60	0.69	0.42	1.79	0.09
14	11-18-02	0.890	1.091	0.11	0.88	1.31	0.49	0.60	1.58	0.68	0.41	1.77	0.10
15	12-16-02	1.200	1.098	0.11	0.88	1.31	0.49	0.60	1.59	0.68	0.42	1.78	0.10
16	01-08-03	1.160	1.102	0.10	0.89	1.31	0.50	0.61	1.60	0.68	0.42	1.79	0.10
17	02-24-03	1.100	1.102	0.10	0.90	1.30	0.50	0.61	1.60	0.68	0.42	1.78	0.09
18	03-03-03	0.910	1.091	0.11	0.87	1.31	0.49	0.60	1.58	0.68	0.41	1.77	0.10
19	03-17-03	0.990	1.086	0.11	0.87	1.30	0.49	0.60	1.57	0.67	0.41	1.76	0.10
20	04-08-03	1.107	1.087	0.11	0.88	1.30	0.49	0.60	1.58	0.67	0.41	1.76	0.10

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

CT = Central tendency (mean IC₂₅).

S = Standard deviation of the IC₂₅ values.

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

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

CV = Coefficient of variation of the IC₂₅ values.

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

P.003

NO.036

P.3

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: Chronic Reference Test

Test Conducted From: 4/8/03 (Day 0) To 4/15/03 (Day 7)

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

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 241

Age of Test Organisms:

Isolated neonates for test on 4/8/03 (date) from 0815 to 1255 (time) Initials BS

Record of Minor Test Non-Conformity:

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets (A) Reviewed By: Jean S. Dendak (Reviewer Initials) on 4/15/03 (Date)

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

MY-13-2003 07:26

865 970 2312

P.006

Ceriodaphnia Daily Test Information Logsheet

Test Name: S&ME Chronic Reference Test

Test Dates: 4/8 - 4/15/03

Daily Test Information	Temperature Information (cup -25±1°C)		Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selenastrum Date	Start Time	End Time	Carboy # Date Prep.	
	a.m.	p.m.								
Day 0 ^{PM} 4/8/03	25.0	25.0	1405	2/5/03	1405	3/24/03	1345	1405	3	4/4/03
Day 1 ^{PM} 4/9/03	25.1	25.0	1420	2/5/03	1420	3/24/03	1410	1420	3	4/4/03
Day 2 ^{PM} 4/10/03	25.1	25.0	1445	2/5/03	1445	3/24/03	1430	1445	3	4/9/03
Day 3 ^{PM} 4/11/03	25.1	25.2	1350	2/5/03	1350	3/24/03	1330	1350	3	4/9/03
Day 4 ^{AM} 4/12/03	25.0	25.0	1355	2/5/03	1355	3/24/03	1330	1355	3	4/9/03
Day 5 ^{AM} 4/13/03	25.0	25.0	1405	2/5/03	1405	3/24/03	1335	1405	3	4/9/03
Day 6 ^{PM} 4/14/03	25.1	25.0	1340	2/5/03	1340	3/24/03	1315	1340	3	4/13/03
Day 7 ^{PM} 4/15/03	25.0	25.0					1330		—	—

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: Chronic Reference TestLocation: S&ME Inc.Analysts: PD, SAS, CMTest Dates: 4/8 - 4/15/03

Conc.	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
Control	10	1	0										0	10	10	0
	10	2	0										0	10	10	0
	SAS	3	0										0	10	10	0
	JM	4	6	2	5	5	5	2	4	4	4	4	43	10	10	4.3
	JM	5	11	9	10	9	10	9	8	7	9	6	88	10	10	8.8
	SAS	6	0	0	0	0	11	0	0	0	9	8	28	10	10	2.8
	JM	7	20	12	10	12	0	13	16	18	0	0	90	10	10	9.0
	Total		37	23	25	26	26	24	28	18	24	18	249	10	10	24.9

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
500 mg/L NaCl	10	1	0										0	10	10	0
	10	2	0										0	10	10	0
	SAS	3	0										0	10	10	0
	JM	4	2	5	4	5	5	4	5	3	5	4	43	10	10	4.3
	JM	5	11	11	7	8	9	8	8	7	12	10	91	10	10	9.1
	SAS	6	14	0	0	10	0	0	12	14	9		89	10	10	8.9
	JM	7	52	12	10	0	14	14	7	0	0	0	57	10	10	5.7
	Total		28	28	21	23	28	26	20	22	31	23	250	10	10	25.0

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
750 mg/L NaCl	10	1	0										0	10	10	0
	10	2	0										0	10	10	0
	SAS	3	0										0	10	10	0
	JM	4	5	6	5	6	6	5	4	5	5	3	50	10	10	5.0
	JM	5	10	9	11	10	10	9	10	10	8	9	94	10	10	9.4
	SAS	6	12	15	10	12	12	12	0	12	14		88	10	10	8.8
	JM	7	0	3*	0	0	0	0	17	19	3*	0	42	10	10	4.2
	Total		27	33	26	28	28	26	31	34	28	26	287	10	10	28.7

* split brood on

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: Chronic Reference TestLocation: S&ME Inc.Analysts: RD, SLO, JMTest Dates: 4/8 - 4/15/03

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
1000 mg/L NaCl			--	--	--	--	--	--	--	--	--	--	--	--	--	--
	8/8	1	0										0	10	10	0
	8/8	2	0										0	10	10	0
	8/8	3	0										0	10	10	0
	JM	4	4	1+	2	6	4	2	4	4	3	3	30	10	10	3.0
	JM	5	8	8	10	9	7	5	8	7	4	5	71	10	10	7.1
	JM	6	10	9	13	15	12	14	15	13	13	9	123	10	10	12.3
	JM	7	0	0	0	0	0	0	0	0	0	0	3	10	10	0.3
Total			22	18	25	30	23	21	27	24	20	17	227	10	10	22.7

+ spir blood JM

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
1500 mg/L NaCl			--	--	--	--	--	--	--	--	--	--	--	--	--	--
	8/8	1	0										0	10	10	0
	8/8	2	0										0	10	10	0
	8/8	3	0										0	10	10	0
	JM	4	4	1	0	1	8	20	20	20	0	3	30	10	10	3.0
	JM	5	2	1	1	3	1	0	0	1	X	1	8	7	10	0.8
	JM	6	3	7	7	4	3	6	10	1	1	0	33	7	10	3.3
	JM	7	0	0	0	0	9	8	7			8	33	7	10	5.3
Total			7	8	0	8	13	14	17	2	0	12	87	7	10	12.4

+ not count since all brood

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
2000 mg/L NaCl			--	--	--	--	--	--	--	--	--	--	--	--	--	--
	8/8	1	0										0	10	10	0
	8/8	2	X	X	X	X	0	0	X	X	X	0	0	3	10	0
	8/8	3					0	0				0	0	0	10	0
		4														
		5														
		6														
		7														
Total			0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

Start Date: 4/8/2003 13:45 Test ID: Ref403cr Sample ID: REF-Ref Toxicant
 End Date: 4/15/2003 13:30 Lab ID: S&ME INC. Sample Type: NACL-Sodium chloride
 Sample Date: Protocol: EPAF 81-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
750	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1500	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000
2000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-mg/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	1.0000	1.0000	0	10	10	10		
500	1.0000	1.0000	0	10	10	10	1.0000	0.0500
750	1.0000	1.0000	0	10	10	10	1.0000	0.0500
1000	1.0000	1.0000	0	10	10	10	1.0000	0.0500
1500	0.7000	0.7000	3	7	10	10	0.1053	0.0500
2000	0.0000	0.0000	10	0	10	10		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	Chv	TU
Fisher's Exact Test	1500	2000	1732.05	

Ceriodaphnia Survival and Reproduction Test-Reproduction

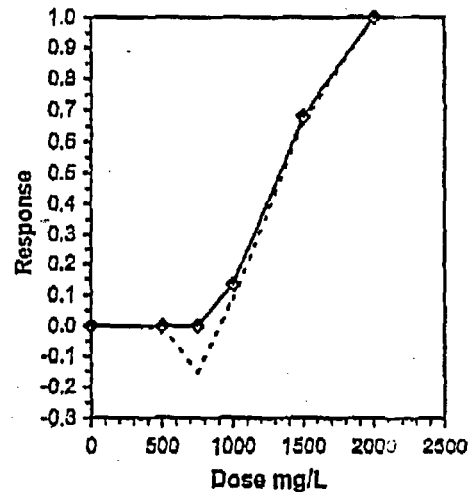
Start Date: 4/8/2003 13:45 Test ID: Ref403cr Sample ID: REF-Ref Toxicant
 End Date: 4/15/2003 13:30 Lab ID: S&ME INC. Sample Type: NACL-Sodium chloride
 Sample Date: Protocol: EPAF 81-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	37.000	23.000	25.000	26.000	26.000	24.000	28.000	18.000	24.000	18.000
500	28.000	28.000	21.000	23.000	28.000	28.000	20.000	22.000	31.000	23.000
750	27.000	33.000	28.000	28.000	28.000	28.000	31.000	34.000	28.000	26.000
1000	22.000	18.000	25.000	30.000	23.000	21.000	27.000	24.000	20.000	17.000
1500	9.000	9.000	0.000	8.000	13.000	14.000	17.000	2.000	0.000	12.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	24.900	1.0300	24.900	18.000	37.000	21.540	10				26.200	1.0000
500	25.000	1.0340	25.000	20.000	31.000	14.727	10	-0.049	2.223	4.509	26.200	1.0000
750	28.700	1.1328	28.700	26.000	34.000	10.284	10	-1.874	2.223	4.509	26.200	1.0000
1000	22.700	0.9118	22.700	17.000	30.000	17.627	10	1.085	2.223	4.509	22.700	0.8664
*1500	8.400	0.3373	8.400	0.000	17.000	71.252	10	8.136	2.223	4.509	8.400	0.3206
2000	0.000	0.0300	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests					Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test Indicates normal distribution ($p > 0.01$)					0.98276	0.93	0.27392	0.28416
Bartlett's Test: indicates equal variances ($p = 0.24$)					5.51255	13.2767		
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU
Dunnett's Test:					1000	1500	1224.74	
					MSDu	MSDp	MSB	MSE
					4.50922	0.18109	819.33	20.5667
					F-Prob	df		
					3.3E-12	4, 45		

Linear Interpolation (80 Resamples)					
Point	mg/L	SD	95% CL	Skew	
IC05	843.571	82.6739	775.866	1010.87	-2.5223
IC10	937.143	64.3879	837.834	1048.29	0.2867
IC15	1015.03	55.1818	899.347	1085.65	-0.1838
IC20	1080.84	48.5488	949.14	1126.69	-0.2786
IC25	1106.64	45.1469	999.048	1173.16	-0.2564
IC40	1244.06	39.1017	1166.64	1320.39	0.1802
IC50	1335.66	42.3373	1253.65	1431.73	0.2024



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 4/8/2003 13:45 Test ID: Ref403or Sample ID: REF-Ref Toxicant
 End Date: 4/15/2003 13:30 Lab ID: S&ME INC. Sample Type: NACL-Sodium chloride
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	37.000	23.000	25.000	26.000	26.000	24.000	28.000	18.000	24.000	18.000
500	28.000	28.000	21.000	23.000	28.000	26.000	20.000	22.000	31.000	23.000
750	27.000	33.000	26.000	28.000	28.000	26.000	31.000	34.000	28.000	26.000
1000	22.000	18.000	25.000	30.000	23.000	21.000	27.000	24.000	20.000	17.000
1500	9.000	9.000	0.000	8.000	13.000	14.000	17.000	2.000	0.000	12.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%			Critical	MSD
D-Control	24.900	1.0000	24.900	18.000	37.000	21.540	10			
500	25.000	1.0140	25.000	20.000	31.000	14.727	10	-0.048	2.223	4.509
750	28.700	1.1326	28.700	26.000	34.000	10.264	10	-1.874	2.223	4.509
1000	22.700	0.9118	22.700	17.000	30.000	17.827	10	1.085	2.223	4.509
*1500	8.400	0.3373	8.400	0.000	17.000	71.252	10	8.136	2.223	4.509

Auxiliary Tests					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.98276	0.93	0.27392	0.26416		
Bartlett's Test indicates equal variances (p = 0.24)					5.51255	13.2767				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test:	1000	1500	1224.74		4.50922	0.18109	619.33	20.6667	3.3E-12	4, 45

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference TestAnalysts: Po, S&ME, SMLocation: S&ME Inc.Dates/times: 4/8/03 11:15/11:30Template No.: 1Age of Neonates: <8 hnd

Day									Remarks
Control: (20% DM.W)	0	1	2	3	4	5	6	7	
Temperature-Initial	25.8	24.4	25.1	24.1	25.7	25.8	25.6		
Final		24.5	24.5	24.1	24.8	24.7	25.8	25.9	
D.O. Initial	6.4	6.8	6.8	6.6	7.1	6.6	6.4		
Final		6.3	6.5	6.3	6.9	6.4	5.6	6.1	
pH Initial	8.0	7.9	8.2	7.9	8.0	8.1	8.0		
Final		8.2	8.2	8.1	8.2	8.2	7.9	8.0	
Alkalinity	59		59				58		
Hardness	90		82				80		
Conductivity	174	173	170	168	167	168	174		✓checked against ucl & LCL 100 CF
Analyst Initials	BD	Po	Po	S&S	SM	SM	S&S	S&S	
QA Review Initials	S&S	S&S	S&S	Po	Po	Po	Po	LSD	
Day									Remarks
500 mg/L	0	1	2	3	4	5	6	7	
Temperature-Initial	25.8	24.2	25.1	24.1	25.9	25.8	25.6		
Final		24.7	24.3	24.1	25.0	24.7	25.9	25.9	
D.O. Initial	6.5	6.6	6.8	6.6	6.8	6.5	6.3		
Final		6.2	6.4	6.3	6.8	6.5	5.6	6.1	
pH Initial	8.0	8.0	8.0	7.9	8.1	8.1	7.9		
Final		8.1	8.2	8.0	8.1	8.1	7.9	8.0	
Conductivity	1068	1154	1127	1121	1089	1089	1135		✓checked against ucl & LCL 100 CF
Analyst Initials	BD	Po	Po	S&S	SM	SM	S&S	S&S	
QA Review Initials	S&S	S&S	S&S	Po	Po	Po	Po	LSD	
Day									Remarks
750 mg/L	0	1	2	3	4	5	6	7	
Temperature-Initial	25.8	24.2	25.2	24.2	25.9	25.7	25.6		
Final		24.7	24.3	24.2	25.0	24.8	25.9	25.9	
D.O. Initial	6.4	6.5	6.5	6.5	6.6	6.5	6.4		
Final		6.2	6.5	6.3	6.8	6.4	5.9	6.2	
pH Initial	8.0	8.0	8.0	7.9	8.0	8.1	7.9		
Final		8.1	8.1	8.1	8.2	8.2	7.9	8.0	
Conductivity	1357	1351	1351	1471	1566	1519	1395		✓checked against ucl & LCL 100 CF
Analyst Initials	BD	Po	Po	S&S	SM	SM	S&S	S&S	
QA Review Initials	S&S	S&S	S&S	Po	Po	Po	Po	LSD	

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference TestAnalysts: PO, S&S, JHLocation: S&ME Inc.Dates/times: 4/8^{PM} 4/15/03/12:00Template No.: 1Age of Neonates: < 8 hrs

Day									Remarks
1000 mg/L	0	1	2	3	4	5	6	7	
Temperature-Initial	25.8	24.2	25.3	24.3	24.2	25.8	25.6		day 4 ini temp 25.2
Final		24.2	24.1	24.1	25.0	24.8	25.3	25.8	
D.O. Initial	6.5	6.6	6.5	6.6	6.4	6.3	6.4		
Final		6.2	6.6	6.2	6.7	6.5	5.8	6.3	
pH Initial	8.0	8.0	8.1	8.0	8.0	8.1	7.9		
Final		8.1	8.2	8.1	8.4	8.2	8.0	8.0	
Conductivity	1878	1896	2000	2190	2070	1986	1945		checked against ucl + 100
Analyst Initials	BD	PO	PO	S&S	JH	JH	S&S	S&S	
QA Review Initials	S&S	S&S	S&S	PO	PO	PO	PO	PO	
Day									Remarks
1500 mg/L	0	1	2	3	4	5	6	7	
Temperature-Initial	25.9	24.2	25.4	24.4	25.7	25.9	25.8		
Final		24.1	24.0	24.0	24.9	24.8	25.5	25.7	
D.O. Initial	6.4	6.5	6.5	6.5	6.5	6.3	6.5		
Final		6.2	6.5	6.3	6.7	6.4	5.9	6.3	
pH Initial	8.0	8.0	8.0	8.0	8.0	8.1	7.9		
Final		8.1	8.2	8.1	8.4	8.3	8.0	7.9	
Conductivity	2670	2730	2720	2750	2880	2810	2740		checked against ucl + 100
Analyst Initials	BD	PO	PO	S&S	JH	JH	S&S	S&S	
QA Review Initials	S&S	S&S	S&S	PO	PO	PO	PO	PO	
Day									Remarks
2000 mg/L	0	1	2	3	4	5	6	7	
Temperature-Initial	25.9	24.3	25.3	24.4					
Final		24.1	24.1	24.0					
D.O. Initial	6.4	6.5	6.5	6.5					
Final		6.3	6.5	6.0					
pH Initial	8.0	8.0	8.0	8.0					
Final		8.0	8.2	8.1					
Conductivity	3340	2510	2580	3726					checked against ucl + 100
Analyst Initials	BD	PO	PO	S&S	JH				
QA Review Initials	S&S	PO	S&S	BD					
Stock Solution Date	3/4/8	4/8	4/8	4/8	4/8	4/8			