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

September 13, 2002

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

Attention: Ms. Evelyn Haskin

Dear Ms. Haskin:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR SEQUOYAH NUCLEAR PLANT

Please find enclosed the Discharge Monitoring Report (DMR) of August 2002 for Sequoyah. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

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

Enclosure
cc (Enclosure):

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

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

I E25

Printed on recycled paper

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

| TN0026450 | 101 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved
OMB No 2040-0004

NOTE: Read Instructions before completing this form

| PARAMETER | | QUANTITY OR LOADING AVERAGE | QUANTITY OR LOADING MAXIMUM | UNITS | QUALITY OR CONCENTRATION MINIMUM | QUALITY OR CONCENTRATION AVERAGE | QUALITY OR CONCENTRATION MAXIMUM | UNITS | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 30.5 | (04) | 0 | 31 / 31 | MODELD |
| 00010 Z 0 0 INSTREAM MONITORING | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 30.5 DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 43.7 | (04) | 0 | 31 / 31 | RCORDR |
| 00010 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | REPORT DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.4 | ******** | 8.0 | (12) | 0 | 8 / 31 | GRAB |
| 00400 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 6.0 MINIMUM | ******** | 9.0 MAXIMUM | SU | | WEEKLY | GRAB |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | 5 | 5 | (19) | 0 | 4 / 31 | GRAB |
| 00530 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 30 MO AVG | 100 DAILY MX | MG/L | | WEEKLY | GRAB |
| OIL AND GREASE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | <5 | <5 | (19) | 0 | 4 / 31 | GRAB |
| 00556 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 15 MO AVG | 20 DAILY MX | MG/L | | WEEKLY | GRAB |
| FLOW, IN CONDUIT OR THRU TREATMENT PLANT | SAMPLE MEASUREMENT | ******** | 1709 | (03) | ******** | ******** | ******** | ** | 0 | 31 / 31 | RCORDR |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | REPORT DAILY MX | MGD | ******** | ******** | ******** | **** | | CONTIN UOUS | RCORDR |
| CHLORINE, TOTAL RESIDUAL | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | <0.010 | 0.020 | (19) | 0 | 36 / 31 | GRAB |
| 50060 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 0.036 | 0.058 INST MAX | MG/L | | WEEK-DAYS | CALCTD |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nida<br>Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

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

No closed mode operation. The following injections occured: 1. PCL-222 (max. calc. conc. was 0.055mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0 009mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0 019mg/L--limit 0.100mg/L) 4. H-130M (max. calc. conc was 0.025mg/L--limit 0 050mg/L)

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

| TN0026450 | 101 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

MONITORING PERIOD

| | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form

| PARAMETER | | QUANTITY OR LOADING AVERAGE | QUANTITY OR LOADING MAXIMUM | UNITS | QUALITY OR CONCENTRATION MINIMUM | QUALITY OR CONCENTRATION AVERAGE | QUALITY OR CONCENTRATION MAXIMUM | UNITS | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEMPERATURE - C, RATE OF CHANGE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0.4 | (62) | 0 | 31 / 31 | CALCTD |
| 82234 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 2.0 | DEG C /HR | | CONTIN UOUS | CALCTD |
| TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 2.1 | (04) | 0 | 31 / 31 | CALCTD |
| 00016 1 S 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 3.0 | DEG. C. | | CONTIN UOUS | CALCTD |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| BORON, TOTAL | SAMPLE MEASUREMENT | ******** | ******** | ** | <0.2 | <0.2 | <0.2 | (19) | 0 | 1 / 31 | GRAB |
| 01022 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | REPORT | REPORT | REPORT | MG/L | | ONCE/ MONTH | GRAB |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nide<br>Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
CCW data for August 2002 is attached

CCW Data for August 2002

CCW CHANNEL

| DATE | EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L) | COMMENTS |
|---|---|---|
| August 19, 2002 | < 0 5 | |

CCW TRENCH DISCHARGE

| DATE | EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L) | COMMENTS |
|---|---|---|
| August 19, 2002 | 1.2 | |

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

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B Nida

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

| TN0026450 | 101 T |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

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

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| IC25 STATRE 7DAY CHR CERIODAPHNIA | SAMPLE MEASUREMENT | ******** | ******** | ** | >100 | ******** | ******** | (23) | 0 | 1 / 90 | COMPOS |
| TRP3B 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 43.9 MINIMUM | ******** | ******** | PERCENT | | QUART-ERLY | COMPOS |
| IC25 STATRE 7DAY CHR PIMEPHALES | SAMPLE MEASUREMENT | ******** | ******** | ** | >100 | ******** | ******** | (23) | 0 | 1 / 90 | COMPOS |
| TRP6C 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 43.9 MIMINUM | ******** | ******** | PERCENT | | QUART-ERLY | COMPOS |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B Nida<br>Environmental Supervisor | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

Toxicity was sampled from August 4,2002 through August 9,2002. Report is attached.

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

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

ATTN: Diedre B. Nida

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

| TN0026450 | 101 Y |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 01 | 09 | 01 | To | 02 | 08 | 31 |

MAJOR
(SUBR 01)
F - FINAL
ANNUAL MONITORING (PCBS)
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

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| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| POLYCHLORINATED BIPHENYLS | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0.0 | (19) | 0 | 1 / 365 | GRAB |
| 39521 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 0.0 | MG/L | | ANNUAL | GRAB |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nida<br>Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

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

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

| TN0026450 | 103 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

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

Form Approved
OMB No. 2040-0004

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| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.2 | ******** | 8.9 | (12) | 0 | 13 / 31 | GRAB |
| 00400 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | ** | 6.0 MINIMUM | ******** | 9.0 MAXIMUM | SU | | THREE/ WEEK | GRAB |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | 121 | 164 | (26) | ******** | 12 | 15 | (19) | 0 | 4 / 31 | GRAB |
| 00530 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | 380 MO AVG | 1250 DAILY MX | LBS/DY | ******** | 30 MO AVG | 100 DAILY MX | MG/L | | WEEKLY | GRAB |
| OIL AND GREASE | SAMPLE MEASUREMENT | <52 | <55 | (26) | ******** | <5 | <5 | (19) | 0 | 4 / 31 | GRAB |
| 00556 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | 190 MO AVG | 250 DAILY MX | LBS/DY | ******** | 15 MO AVG | 20 DAILY MX | MG/L | | WEEKLY | GRAB |
| FLOW, IN CONDUIT OR THRU TREATMENT PLANT | SAMPLE MEASUREMENT | 1.212 | 1.360 | (03) | ******** | ******** | ******** | ** | 0 | 31 / 31 | TOTAL |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | REPORT MO AVG | REPORT DAILY MX | MGD | ******** | ******** | ******** | ** | | DAILY | TOTAL |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nida<br>Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

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

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

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

ATTN: Diedre B Nida

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

| TN0026450 | 107 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

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

*** NO DISCHARGE XX ***

Form Approved
OMB No. 2040-0004

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | | ******** | | (12) | | | |
| 00400 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 6.0 MINIMUM | ******** | 9.0 MAXIMUM | SU | | DAILY | GRAB |
| PHOSPHORUS, TOTAL (AS P) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 00665 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 1.0 DAILY MX | MG/L | | DAILY | COMPOS |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 00530 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 30 DAILY MX | MG/L | | DAILY | COMPOS |
| OIL AND GREASE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 00556 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 15 DAILY MX | MG/L | | DAILY | GRAB |
| COPPER, TOTAL (AS CU) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 01042 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 1.0 DAILY MX | MG/L | | DAILY | COMPOS |
| IRON, TOTAL (AS FE) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 01045 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 1.0 DAILY MX | MG/L | | DAILY | COMPOS |
| FLOW, IN CONDUIT OR THRU TREATMENT PLANT | SAMPLE MEASUREMENT | | | (03) | ******** | ******** | ******** | ** | | | |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | REPORT MO AVG | REPORT DAILY MX | MGD | ******** | ******** | ******** | **** | | DAILY | CALCTD |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

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

No phosphate bearing chemicals were employed. No Discharge this Period

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

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

ATTN. Diedre B. Nida

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

| TN0026450 | 110 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

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

*** NO DISCHARGE XX ***

Form Approved
OMB No 2040-0004

NOTE Read instructions before completing this form.

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

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nida<br>Environmental Supervisor<br>SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | | AREA CODE | NUMBER | YEAR | MO | DAY |

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
No Discharge this Period

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

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

ATTN: Diedre B Nida

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

| TN0026450 | 116 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

MONITORING PERIOD

| | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved
OMB No 2040-0004

NOTE Read instructions before completing this form

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| DEBRIS, FLOATING (SEVERITY) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0 | (00) | 0 | 1 / 31 | VISUAL |
| 01345 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | REPORT MO TOTAL | PASS=0 FAIL=1 | | SEE PERMIT | VISUAL |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
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| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T. Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B Nida<br>Environmental Supervisor | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

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

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

ATTN: Diedre B. Nida

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

| TN0026450 | 117 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

MONITORING PERIOD

| | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved
OMB No 2040-0004

NOTE Read instructions before completing this form.

| PARAMETER | | QUANTITY OR LOADING | | | QUALITY OR CONCENTRATION | | | | NO. EX | FREQUENCY OF ANALYSIS | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE | MAXIMUM | UNITS | MINIMUM | AVERAGE | MAXIMUM | UNITS | | | |
| DEBRIS, FLOATING (SEVERITY) | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 0 | (00) | 0 | 1 / 31 | VISUAL |
| 01345 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | REPORT MO TOTAL | PASS=0 FAIL=1 | | SEE PERMIT | VISUAL |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| Richard T Purcell<br>Site Vice President | I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations | Diedre B. Nida<br>Environmental Supervisor | 423 | 843-6700 | 02 | 09 | 13 |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

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

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

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

ATTN: Diedre B. Nida

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

| TN0026450 | 118 G |
|---|---|
| PERMIT NUMBER | DISCHARGE NUMBER |

| MONITORING PERIOD | YEAR | MO | DAY | | YEAR | MO | DAY |
|---|---|---|---|---|---|---|---|
| From | 02 | 08 | 01 | To | 02 | 08 | 31 |

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

Form Approved
OMB No. 2040-0004

*** NO DISCHARGE XX ***

NOTE Read instructions before completing this form

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

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

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

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

September 9, 2002

Diedre B. Nida, SB 2A-SQN

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

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

Outfall 101 samples collected August 4-9, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting $IC_{25}$ values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

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

Cynthia L Russell

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

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

# TENNESSEE VALLEY AUTHORITY
# TOXICITY TEST REPORT

## INTRODUCTION / EXECUTIVE SUMMARY

Report Date: September 9, 2002

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN 0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: August 4-9, 2002
10. Average Flow on Days Sampled (MGD): 1692, 1687, 1662
11. Pertinent Site Conditions: No unusual conditions reported. (Production / operation data will be provided upon request).
12. Test Dates: August 6-13, 2002
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 10.98, 22, 43.9, 72, 100
    Intake: 100
    *Pimephales promelas*: UV treated Outfall 101: 10.98, 22, 43.9, 72, 100
    UV treated Intake: 100
16. Permit Limit Endpoint(%): Outfall 101: $IC_{25} = 43.9\%$
17. Test Results: Outfall 101: *Pimephales promelas:* $IC_{25} > 100$
    *Ceriodaphnia dubia:* $IC_{25} > 100$
    UV treated Outfall 101: *Pimephales promelas:* $IC_{25} > 100$

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

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

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

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

22) Notes: Outfall 101 samples collected August 4-9, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting $IC_{25}$ values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

## METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

| Sample ID | Date (MM/DD/YY)/ Time (EST) Collected | Date (MM/DD/YY)/ Time (EST) Received | Arrival Temp. (°C) | Initial TRC* (mg/L) | Date (MM/DD/YY)/ Time (EST) Used |
|---|---|---|---|---|---|
| 101 | 08/04/02 1244 to 08/05/02 1147 | 08/06/02 1040 | 0.7† | <0.10 | 08/06/02 1502<br>08/07/02 1446 |
| Intake | 08/04/02 1256 to 08/05/02 1156 | 08/06/02 1040 | 0.5 | <0.10 | 08/06/02 1502<br>08/07/02 1446 |
| 101 | 08/06/02 1257 to 08/07/02 1157 | 08/08/02 1125 | 1.2† | <0.10 | 08/08/02 1500<br>08/09/02 1509 |
| Intake | 08/06/02 1245 to 08/07/02 1145 | 08/08/02 1125 | 0.5 | <0.10 | 08/08/02 1500<br>08/09/02 1509 |
| 101 | 08/08/02 1332 to 08/09/02 1232 | 08/10/02 1051 | 1.7† | <0.10 | 08/10/02 1456<br>08/11/02 1443<br>08/12/02 1442 |
| Intake | 08/08/02 1303 to 08/09/02 1203 | 08/10/02 1051 | 1.5 | <0.10 | 08/10/02 1456<br>08/11/02 1443<br>08/12/02 1442 |

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

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

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

| Test Organisms: | *Pimephales promelas* | *Ceriodaphnia dubia* |
|---|---|---|
| 1. Source: | Aquatic BioSystems, Inc. | In-house Cultures |
| 2. Age: | 23.5-26.5 hours old | < 24-hours old |
| **Test Method Summary:** | | |
| 1. Test Conditions: | Static, Renewal | Static, Renewal |
| 2. Test Duration: | 7 days | Until at least 60% of control females have 3 broods |
| 3. Control / Dilution Water: | Moderately Hard Synthetic | Moderately Hard Synthetic |
| 4. Number of Replicates: | 4 | 10 |
| 5. Organisms per Replicate: | 10 | 1 |
| 6) Test Initiation: (Date/Time) | | |
| Outfall 101 | 08/06/02-1502 EST | 08/06/02-1214 EST |
| UV Treated Outfall 101 | 08/06/02-1529 EST | |
| 7) Test Termination: (Date/Time) | | |
| Outfall 101 | 08/13/02-1422 EST | 08/13/02-1146 EST |
| UV Treated Outfall 101 | 08/13/02-1446 EST | |
| 8) Test Temperature: Outfall 101: | Mean =24.8 °C (24.3-25.6°C) | Mean = 24.8°C (24.2-25.6°C) |
| Test Temperature: UV-Treated Outfall 101: | Mean = 24.9°C (24.3-25.5°C) | |

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

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

**TOXICITY TEST RESULTS** (see Appendix B for Bench Sheets)

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

Conducted August 6-13, 2002 using effluent from Outfall 101.

| Test Solutions (% Effluent) | Percent Surviving (time interval used – days) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Control | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 10.98% | 100 | 100 | 100 | 100 | 100 | 98 | 98 |
| 22% | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 43.9% | 100 | 100 | 100 | 100 | 100 | 95 | 93 |
| 72% | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 100% | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Intake | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

| | |
|---|---|
| 96-hour $LC_{50}$ Value: ≥ 100% | Calculated TU Estimates: < 1.0 TUa* |
| 95% Confidence Limits: NA<br>Upper Limit: NA<br>Lower Limit: NA | Permit Limit: 1.0 TUa |

| Test Solutions (% Effluent) | Mean Dry Weight (mg) (replicate number) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Mean |
| Control | 0.745 | 0.780 | 0.873 | 0.964 | 0.841 |
| 10.98% | 0.533 | 0.609 | 0.667 | 0.766 | 0.644 |
| 22% | 0.754 | 0.714 | 0.846 | 0.631 | 0.736 |
| 43.9% | 0.683 | 0.618 | 0.697 | 0.577 | 0.644 |
| 72% | 0.937 | 0.719 | 0.823 | 0.681 | 0.790 |
| 100% | 0.753 | 0.729 | 0.720 | 0.652 | 0.714 |
| Intake | 0.819 | 0.787 | 0.793 | 0.769 | 0.792 |

| | |
|---|---|
| $IC_{50}$ Value: ≥ 100% | Calculated TU Estimates: < 1.0 TUc* |
| 95% Confidence Limits: NA<br>Upper Limit: NA<br>Lower Limit: NA | Permit Limit: 1.0 TUc |

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

TOXICITY TEST RESULTS (see Appendix B for Bench Sheets)

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

Conducted August 6-13, 2002 using effluent from Outfall 101.

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

96-hour $LC_{50}$ Value: ≥ 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUa*

Permit Limit: 1.0 TUa

| Test Solutions (% Effluent) | Reproduction (#young/female/7 days) Data (replicate number) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Mean |
| Control | 27 | 25 | 28 | 32 | 28 | 24 | 30 | 32 | 28 | 30 | 28.4 |
| 10.98% | 27 | 36 | 34 | 32 | 33 | 31 | 31 | 29 | 31 | 31 | 31.5 |
| 22% | 30 | 29 | 30 | 31 | 31 | 28 | 28 | 32 | 27 | 31 | 29.7 |
| 43.9% | 34 | 26 | 31 | 30 | 33 | 33 | 33 | 32 | 32 | 30 | 31.4 |
| 72% | 31 | 32 | 33 | 37 | 31 | 31 | 36 | 34 | 31 | 32 | 32.8 |
| 100% | 32 | 31 | 34 | 35 | 31 | 37 | 38 | 35 | 36 | 33 | 34.2 |
| Intake | 28 | 28 | 25 | 30 | 25 | 27 | 26 | 26 | 30 | 31 | 27.6 |

$IC_{50}$ Value: ≥ 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUc*

Permit Limit: 1.0 TUc

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

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

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

Conducted August 6-13, 2002 using effluent from UV Treated Outfall 101.

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

96-hour $LC_{50}$ Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUa*

Permit Limit: 1.0 TUa

| Test Solutions (% Effluent) | Mean Dry Weight (mg) (replicate number) | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Mean |
| Control | 0.869 | 0.846 | 0.676 | 0.766 | 0.789 |
| 10.98% | 0.897 | 0.704 | 0.649 | 0.853 | 0.776 |
| 22% | 0.8850 | 0.684 | 0.899 | 0.795 | 0.816 |
| 43.9% | 0.679 | 0.822 | 0.878 | 0.899 | 0.820 |
| 72% | 0.581 | 0.730 | 0.740 | 0.690 | 0.685 |
| 100% | 0.607 | 0.935 | 0.859 | 0.617 | 0.755 |
| Intake | 0.815 | 0.665 | 0.747 | 0.786 | 0.753 |

$IC_{50}$ Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUc*

Permit Limit: 1.0 TUc

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

## REFERENCE TOXICANT TEST RESULTS (see Appendix A and C)

| Species | Date | Time | Duration | Toxicant | Results ($IC_{25}$) |
|---|---|---|---|---|---|
| *Ceriodaphnia dubia* | August 6-13, 2002 | 1159 | 7-days | NaCl | 1055 mg/L |
| *Pimephales promelas* | August 6-13, 2002 | 1627 | 7-days | KCl | 553 mg/L |

## SUMMARY / CONCLUSIONS

Outfall 101 samples collected August 4-9, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting $IC_{25}$ values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

## Appendix A

## ADDITIONAL TOXICITY TEST INFORMATION

### SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA/600/4-91/002 (July 1994) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL polypropylene beakers, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

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

### DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

### DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

## PHYSICAL AND CHEMICAL METHODS

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

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

3. Temperature was measured using EPA Method 170.1.

4. Dissolved oxygen was measured using EPA Method 360.1.

5. The pH was measured EPA Method 150.1.

6. Conductance was measured EPA Method 120.1.

7. Alkalinity was measured using EPA Method 310.1.

8. Hardness was measured EPA Method 130.2.

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

## QUALITY ASSURANCE

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

## REFERENCE TOXICANT TESTS (See Appendix C for control chart information)

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

## REFERENCES


1. NPDES Permit No. TN0026450.

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

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

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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

And

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-August 9, 2002

| Date | Sodium hypochlorite mg/L TRC | Towerbrom mg/L TRC | PCL-222 mg/L Phosphate | PCL-401 mg/L Copolymer | CL-363 mg/L DMAD | Cuprostat-PF mg/L Azole | H-130M mg/L Quat |
|---|---|---|---|---|---|---|---|
| 03/12/1998 | 0.016 | - | - | - | - | - | - |
| 03/13/1998 | 0.015 | - | - | - | - | - | - |
| 03/14/1998 | 0.013 | - | - | - | - | - | - |
| 03/15/1998 | 0.030 | - | - | - | - | - | - |
| 03/16/1998 | 0.013 | - | - | - | - | - | - |
| 03/17/1998 | 0.020 | - | - | - | - | - | - |
| 03/18/1998 | 0.018 | - | - | - | - | - | - |
| 09/08/1998 | 0.015 | - | 0.014 | 0.005 | - | - | 0.021 |
| 09/09/1998 | 0.003 | - | 0.031 | 0.011 | - | - | - |
| 09/10/1998 | 0.014 | - | 0.060 | 0.021 | - | - | - |
| 09/11/1998 | 0.013 | - | 0.055 | 0.019 | - | - | - |
| 09/12/1998 | <0.001 | - | 0.044 | 0.015 | - | - | - |
| 09/13/1998 | <0.001 | - | 0.044 | 0.015 | - | - | - |
| 09/14/1998 | 0.008 | - | 0.044 | 0.015 | - | - | - |
| 02/22/1999 | <0.001 | - | - | - | - | - | - |
| 02/23/1999 | 0.005 | - | - | - | - | - | - |
| 02/24/1999 | 0.009 | - | - | - | - | - | - |
| 02/25/1999 | 0.012 | - | - | - | - | - | - |
| 02/26/1999 | 0.008 | - | - | - | - | - | - |
| 02/27/1999 | <0.001 | - | - | - | - | - | - |
| 02/28/1999 | <0.001 | - | - | - | - | - | - |
| 08/18/1999 | - | 0.015 | 0.069 | 0.024 | 0.006 | - | - |
| 08/19/1999 | - | 0.012 | 0.068 | 0.024 | - | - | - |
| 08/20/1999 | - | 0.023 | 0.070 | 0.024 | - | 0.120 | - |
| 08/21/1999 | - | 0.022 | 0.068 | 0.024 | - | - | - |
| 08/22/1999 | - | 0.022 | 0.068 | 0.024 | - | - | - |
| 08/23/1999 | - | 0.025 | 0.068 | 0 024 | 0.006 | - | - |
| 08/24/1999 | - | 0.016 | 0.067 | 0.023 | 0.020 | - | - |

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-August 9, 2002

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-August 9, 2002

| Date | Sodium hypochlorite | Towerbrom | PCL-222 | PCL-401 | CL-363 | Cuprostat-PF | H-130M |
|---|---|---|---|---|---|---|---|
| | mg/L TRC | mg/L TRC | mg/L Phosphate | mg/L Copolymer | mg/L DMAD | mg/L Azole | mg/L Quat |
| 01/02/2002 | - | < 0.0079 | 0.023 | 0.02 | 0.006 | - | - |
| 01/03/2002 | - | < 0.0042 | 0.023 | 0.014 | - | - | - |
| 01/04/2002 | - | 0.0124 | 0.024 | 0.014 | 0.009 | - | - |
| 01/05/2002 | - | < 0.0042 | - | - | - | - | - |
| 01/06/2002 | - | < 0.0042 | - | - | - | - | - |
| 01/07/2002 | - | < 0.0089 | 0.024 | 0.014 | 0.006 | - | - |
| 02/24/2002 | - | < 0.004 | - | - | - | - | - |
| 02/25/2002 | - | < 0.004 | 0.023 | 0.023 | - | - | - |
| 02/26/2002 | - | 0.0143 | 0.023 | 0.023 | 0.007 | - | - |
| 02/27/2002 | - | < 0.0041 | 0.023 | 0.023 | - | - | - |
| 02/28/2002 | - | < 0.0041 | 0.024 | 0.008 | - | - | - |
| 03/01/2002 | - | <0.0041 | 0.024 | 0.008 | - | - | - |
| 05/05/2002 | - | - | - | - | - | - | - |
| 05/06/2002 | - | - | 0.058 | 0.02 | 0.014 | - | - |
| 05/07/2002 | - | - | 0.058 | 0.02 | 0.015 | - | - |
| 05/08/2002 | - | - | 0.056 | 0.019 | - | - | - |
| 05/09/2002 | - | - | 0.057 | 0.02 | 0.014 | - | - |
| 05/10/2002 | - | - | 0.056 | 0.019 | - | - | - |
| 08/04/2002 | - | <0.0058 | - | - | - | - | - |
| 08/05/2002 | - | <0.0058 | 0.053 | 0.018 | - | - | 0.025 |
| 08/06/2002 | - | 0.0092 | 0.053 | 0.018 | - | - | - |
| 08/07/2002 | - | <0.0107 | 0.055 | 0.019 | 0.007 | - | - |
| 08/08/2002 | - | <0.0061 | 0.055 | 0.019 | - | - | - |
| 08/09/2002 | - | 0.0152 | 0.054 | 0.018 | 0.008 | - | - |

## PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, August 6-13, 2002.

| Test | Sample ID | Temperature (°C) | | Dissolved Oxygen (mg/L) | | pH (S.U.) | | Conductance (µmhos/cm) | Alkalinity (mg/L $CaCO_3$) | Hardness (mg/L $CaCO_3$) | Total Residual Chlorine (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | | | | |
| *Pimephales promelas* | Control | 24.5<br>24.3 - 24.7 | 24.9<br>24.5 - 25.2 | 8.1<br>7.8 - 8.3 | 7.6<br>7.3 - 8.1 | 8.05<br>8.02 - 8.07 | 7.73<br>7.61 - 8.02 | 308<br>301 - 317 | 64<br>63 - 66 | 87<br>85 - 89 | |
| | 10.98% | 24.5<br>24.4 - 24.7 | 24.9<br>24.5 - 25.2 | 8.2<br>8.0 - 8.3 | 7.5<br>7.3 - 8.2 | 8.07<br>8.02 - 8.09 | 7.68<br>7.56 - 8.03 | 293<br>285 - 302 | | | |
| | 22% | 24.6<br>24.5 - 25.1 | 24.9<br>24.6 - 25.3 | 8.2<br>8.0 - 8.3 | 7.4<br>6.8 - 8.2 | 8.06<br>8.01 - 8.10 | 7.68<br>7.55 - 8.06 | 282<br>274 - 291 | | | |
| | 43.9% | 24.7<br>24.5 - 25.1 | 24.9<br>24.6 - 25.2 | 8.2<br>8.0 - 8.4 | 7.4<br>6.8 - 8.1 | 8.05<br>8.00 - 8.10 | 7.63<br>7.52 - 7.90 | 260<br>250 - 273 | | | |
| | 72% | 25.0<br>24.5 - 25.3 | 24.9<br>24.4 - 25.2 | 8.2<br>8.0 - 8.4 | 7.3<br>6.7 - 8.2 | 8.04<br>7.97 - 8.10 | 7.64<br>7.53 - 7.94 | 231<br>222 - 237 | | | |
| | 100% | 25.1<br>24.5 - 25.6 | 24.9<br>24.5 - 25.2 | 8.3<br>8.1 - 8.4 | 7.3<br>6.7 - 8.2 | 8.02<br>7.94 - 8.10 | 7.64<br>7.52 - 8.01 | 202<br>193 - 211 | 73<br>69 - 78 | 86<br>83 - 87 | <0.10<br><0.10 - <0.10 |
| | Intake | 24.9<br>24.5 - 25.5 | 24.9<br>24.5 - 25.1 | 8.3<br>8.2 - 8.4 | 7.5<br>7.1 - 8.3 | 8.00<br>7.87 - 8.09 | 7.68<br>7.57 - 8.02 | 205<br>192 - 215 | 71<br>69 - 73 | 84<br>79 - 89 | <0.10<br><0.10 - <0.10 |
| *Ceriodaphnia dubia* | Control | 24.5<br>24.2 - 24.7 | 24.9<br>24.5 - 25.2 | 8.1<br>7.8 - 8.3 | 8.2<br>8.0 - 8.4 | 8.05<br>8.02 - 8.07 | 8.08<br>8.02 - 8.17 | 308<br>301 - 317 | 64<br>63 - 66 | 87<br>85 - 89 | |
| | 10.98% | 24.6<br>24.3 - 24.9 | 24.9<br>24.5 - 25.2 | 8.2<br>8.0 - 8.3 | 8.2<br>8.0 - 8.3 | 8.07<br>8.02 - 8.09 | 8.09<br>8.03 - 8.19 | 293<br>285 - 302 | | | |
| | 22% | 24.6<br>24.4 - 25.0 | 24.9<br>24.5 - 25.2 | 8.2<br>8.0 - 8.3 | 8.2<br>8.0 - 8.2 | 8.06<br>8.01 - 8.10 | 8.08<br>8.02 - 8.18 | 282<br>274 - 291 | | | |
| | 43.9% | 24.8<br>24.6 - 25.3 | 24.8<br>24.4 - 25.2 | 8.2<br>8.0 - 8.4 | 8.2<br>8.1 - 8.2 | 8.05<br>8.00 - 8.10 | 8.10<br>8.05 - 8.19 | 260<br>250 - 273 | | | |
| | 72% | 24.9<br>24.6 - 25.5 | 24.8<br>24.5 - 25.2 | 8.2<br>8.0 - 8.4 | 8.2<br>8.1 - 8.3 | 8.04<br>7.97 - 8.10 | 8.09<br>8.02 - 8.18 | 231<br>222 - 237 | | | |
| | 100% | 25.0<br>24.6 - 25.6 | 24.8<br>24.3 - 25.2 | 8.3<br>8.1 - 8.4 | 8.3<br>8.1 - 8.3 | 8.02<br>7.94 - 8.10 | 8.11<br>8.00 - 8.21 | 202<br>193 - 211 | 71<br>69 - 73 | 84<br>79 - 89 | <0.10<br><0.10 - <0.10 |
| | Intake | 24.9<br>24.4 - 25.2 | 24.7<br>24.3 - 25.2 | 8.3<br>8.2 - 8.4 | 8.2<br>8.1 - 8.4 | 8.00<br>7.87 - 8.09 | 8.07<br>7.99 - 8.15 | 205<br>192 - 215 | 71<br>69 - 73 | 84<br>79 - 89 | <0.10<br><0.10 - <0.10 |

## PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, August 6-13, 2002.

| Test | Sample ID | Temperature (°C) | | Dissolved Oxygen (mg/L) | | pH (S.U.) | | Conductance (µmhos/cm) | Alkalinity (mg/L $CaCO_3$) | Hardness (mg/L $CaCO_3$) | Total Residual Chlorine (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | | | | |
| *Pimephales promelas* | Control | 24.5<br>24.3 - 24.7 | 24.9<br>24.4 - 25.3 | 8.1<br>7.9 - 8.2 | 7.5<br>7.1 - 8.3 | 8.05<br>7.98 - 8.08 | 7.72<br>7.62 - 8.03 | 301<br>296 - 311 | 64<br>63 - 66 | 87<br>85 - 89 | |
| | 10.98% | 24.7<br>24.4 - 24.9 | 24.9<br>24.4 - 25.4 | 8.1<br>7.9 - 8.2 | 7.5<br>7.1 - 8.3 | 8.04<br>7.98 - 8.08 | 7.73<br>7.59 - 8.02 | 293<br>284 - 306 | | | |
| | 22% | 24.8<br>24 6 - 25.1 | 24.9<br>24.4 - 25.2 | 8.1<br>7.9 - 8.3 | 7.5<br>7.2 - 8.3 | 8.04<br>7.98 - 8.08 | 7.70<br>7.60 - 7.99 | 280<br>272 - 294 | | | |
| | 43.9% | 24.9<br>24.7 - 25.3 | 24.8<br>24.4 - 25.2 | 8.1<br>7.9 - 8.3 | 7.4<br>6.8 - 8.3 | 8 04<br>7.98 - 8.08 | 7.68<br>7.54 - 8.02 | 258<br>245 - 269 | | | |
| | 72% | 25.1<br>24.7 - 25.4 | 24.8<br>24.4 - 25.2 | 8.1<br>7.9 - 8.2 | 7.4<br>6.7 - 8.3 | 8.03<br>7.97 - 8.08 | 7.69<br>7.56 - 8.04 | 229<br>220 - 238 | | | |
| | 100% | 25.1<br>24.7 - 25.4 | 24.8<br>24.4 - 25.2 | 8.1<br>7.8 - 8.3 | 7.5<br>7.2 - 8.4 | 8 02<br>7.96 - 8.09 | 7.73<br>7.58 - 8.02 | 201<br>193 - 209 | 73<br>69 - 78 | 86<br>83 - 87 | <0.10<br><0.10 - <0.10 |
| | Intake | 25.0<br>24.6 - 25.5 | 24 8<br>24.4 - 25.1 | 8.2<br>7.9 - 8.3 | 7.5<br>7.2 - 8.3 | 7.97<br>7.75 - 8.07 | 7.70<br>7.56 - 8.04 | 199<br>190 - 212 | 71<br>69 - 73 | 84<br>79 - 89 | <0.10<br><0.10 - <0.10 |

Sequoyah Nuclear Plant Biomonitoring
September 6-13, 2002

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: TVA SQN

P O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_____

General Comments:

| Field Identification / Sample Description | Grab/ Comp | Ship Temp (°C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | --- | --- | Start | End | --- | --- | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 1247 8/4/02 1244 | 8/5/02 1147 1144 | 2(2.5g) | | | | ✓ | | 405 020806.04 | 0.7°C | KEK | 1040 | SAMPLES RECEIVED IN GOOD CONDITION |
| SQN-INT-TOX | comp | 4 | 8/4/02 1256 | 8/5/02 1156 | 1 (2.5g) | | | | ✓ | | 405 020806.05 | 0.5°C | KEK | 1040 | CUSTODY SEALS INTACT. |
| | | | | | | | | | | | | | | | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| Wanda Allen | 8/5/02 1500 | Fed ex | 08-05-02 |
| Fed-ex | 08-06-02 | KEKeeno ETS | 08-06-02 1040 |
| | | | |
| | | | |

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

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: TVA SQN

P.O Number: PO BOX 2000

Facility Sampled SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

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

General Comments:

| Field Identification / Sample Description | Grab/ Comp | Ship Temp. (°C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Start | End | | | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp. (°C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 8/6/02 1257 | 8/7/02 1157 | 2(2.5g) | | | | N | | 405 020808.06 | 1.2°C | KE | 1125 | CUSTODY SEALS INTACT |
| SQN-INT-TOX | comp | 4 | 8/6/02 1245 | 8/7/02 1145 | 1(2.5g) | | | | N | | 405 020808.07 | 0.5°C | KE | 1125 | SAMPLES RECEIVED IN GOOD CONDITION |
| | | | | | | | | | | | | | | | |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature) | Date/Time | Received By (Signature) | Date/Time |
|---|---|---|---|
| Wanda Allen | 8/7/02 1500 | Fedex | 08-07-02 |
| Fedex | 08-08-02 | K Keenan ETS | 08-08-02 1125 |
| | | | |
| | | | |

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

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify):_____

General Comments:

| Field Identification / Sample Description | Grab/ Comp | Ship. Temp ( °C) | Collection Date/Time | | Container Number & Volume Collected | Flow (MGD) | Rain Event? (Mark as Appropriate) | | | | Laboratory Use | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Start | End | | | Y- | If Yes, Inches | No | Trace | EST Log Number | Arrival Temp. ( °C) | By | Time | Appearance |
| SQN-101-TOX | comp | 4 | 1332 8/8/02 1332 | 8/9/02 1232/1232 | 2(2 5g) | | N | | ✓ | | 405 020810.05 | 1.7-C | KEK | 1051 | CUSTODY SEALS INTACT |
| SQN-INT-TOX | comp | 4 | 8/8/02 1303 | 8/9/02 1203 | 1 (2.5g) | | N | | ✓ | | 405 020810.06 | 1.5 C | KEK | 1051 | SAMPLES RECEIVED IN GOOD CONDITION. |

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| [illegible] | 8/9/02 / 1445 | Fed Ex | 08-09-02 |
| Fedex | 08-10-02 | Kelleenan ETS | 08-10-02 1051 |
| | | | |
| | | | |

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

# Sample Receipt Log

| Date Received | Time Received | Received By | Received From | Sample Temperature (°C) | Project Number | Sample Number | Sample Name and Description | State | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 08-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.01 | POND 1, STATION B1 | KY | PAF SPECIAL STUDY - TVA |
| 08-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.02 | POND 2, STATION B1 | KY | |
| 08-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.03 | POND 1, INFLOW | KY | |
| 08-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.04 | POND 2, INFLOW | KY | |
| 8-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.05 | POND 1, STATION B1 & ADIPIC ACID | KY | |
| 8-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.06 | POND 2, STATION B1 & ADIPIC ACID | KY | |
| 8-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.07 | POND 1, STATION B1 & DBA | KY | |
| 8-01-02 | 1058 | Jumper | Fedex | 0.9°C | 399 | 020801.08 | POND 2, STATION B1 & DBA | KY | |
| 8-03-02 | 1141 | Jumper | Fedex | 0.7°C | 402 | 020803.01 | ALCOA OUTFALL 005 | NC | |
| 1-06-02 | 1030 | KEKeenan | UPS | 0.4°C | 403 | 020806.01 | TRITEST, INC. NORTH CARY WRF | NC | |
| -06-02 | 1033 | KEKeenan | Fedex | 3.7°C | 404 | 020806.02 | CORR ERI McQUAY INT. - BEFORE SWALE | AL | |
| -06-02 | 1033 | KEKeenan | Fedex | 3.7°C | 404 | 020806.03 | CORR ERI McQUAY INT. - AFTER SWALE | AL | |
| -06-02 | 1040 | KEKeenan | Fedex | 0.7°C | 405 | 020806.04 | TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | |
| -06-02 | 1040 | KEKeenan | Fedex | 0.5°C | 405 | 020806.05 | TVA SEQUOYAH NUCLEAR PLANT INTAKE | TN | |
| -06-02 | 1044 | KEKeenan | Fedex | 1.7°C | 406 | 020806.06 | CHARLESTON PUBLIC WORKS | SC | |
| -06-02 | 1206 | KEKeenan | L. Coward | 0.8°C | 407 | 020806.07 | BLUE RIDGE PARKWAY MT. PISGAH LODGE | NC | |
| -06-02 | 1545 | KEKeenan | R. Pate | 2.6°C | 408 | 020806.08 | ENVIRONMENTAL INC. HIGHLANDS CAMP & CONF. CENTER | NC | |
| -07-02 | 1037 | KEKeenan | Ash. Courier | 0.7°C | 409 | 020807.01 | Comm-Scope, Inc | NC | |
| -07-02 | 1037 | KEKeenan | Greyhound | 3.7°C | 410 | 020807.02 | ~~Spruce Pine WWTP~~ Waynesville WWTP | NC | |
| 1-07-02 | 1042 | KEKeenan | Test America | 0.4°C | 411 | 020807.03 | Test America Silverline Plastics | NC | |
| -07-02 | 1042 | KEKeenan | Greyhound | 0.7°C | 412 | 020807.04 | Scarlett Acres | NC | |

# Sample Receipt Log

| Date Received | Time Received | Received By | Received From | Sample Temperature (°C) | Project Number | Sample Number | Sample Name and Description | State | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 08-07-02 | 1042 | KEKeenan | Ash. Courier | 3.8°C | 413 | 020807.05 | Spruce Pine WWTP | NC | |
| 08-07-02 | 1044 | KEKeenan | Fed-ex | 0.1°C | 414 | 020807.06 | Georgetown Steel - Scalepit | SC | |
| 08-07-02 | 1044 | KEKeenan | Fed-ex | 3.6°C | 415 | 020807.07 | Duke Energy McGuire Nuclear Station - 002 | NC | |
| 08-07-02 | 1044 | KEKeenan | Fed-ex | 1.8°C | 416 | 020807.08 | Duke Energy Belews Creek Steam Station | NC | |
| 08-07-02 | 1047 | KEKeenan | Fed-ex | 0.3°C | 417 | 020807.09 | Duke Energy Lincoln CT Station | NC | |
| 08-08-02 | 1052 | KEKeenan | UPS | 0.7°C | 403 | 020808.01 | TRITEST INC., NORTH CARY WRF | NC | |
| 08-08-02 | 1122 | KEKeenan | Fedex | 0.9°C | 418 | 020808.02 | PCS PHOSPHATE, OUTFALL 007 | NC | |
| 08-08-02 | 1122 | KEKeenan | Fedex | 1.6°C | 418 | 020808.03 | PCS PHOSPHATE, OUTFALL 100 | NC | |
| 08-08-02 | 1123 | KEKeenan | Fedex | 1.6°C | 404 | 020808.04 | CORR ERI McQUAY INT. - BEFORE SWALE | AL | |
| 08-08-02 | 1123 | KEKeenan | Fedex | 2.8°C | 404 | 020808.05 | CORR ERI McQUAY INT. - AFTER SWALE | AL | |
| 08-08-02 | 1125 | KEKeenan | Fedex | 1.2°C | 405 | 020808.06 | TVA - SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | |
| 08-08-02 | 1125 | KEKeenan | Fedex | 0.5°C | 405 | 020808.07 | TVA - SEQUOYAH NUCLEAR PLANT INTAKE | TN | |
| 08-08-02 | 1127 | KEKeenan | Fedex | 3.3°C | 406 | 020808.08 | CHARLESTON PUBLIC WORKS | SC | |
| 08-09-02 | 1102 | KEKeenan | Asheville Courier | 0.5°C. | 419 | 020809.01 | TEST AMERICA - EARTH ENV. MARSHALL WWTP | NC | |
| 08-09-02 | 1237 | Gumer | P. Parker | 2.0°C | 407 | 020809.02 | BLUE RIDGE PARKWAY MT. PISGAH LODGE | NC | |
| 08-09-02 | 1430 | Gumer | R. Pate | 3.1°C | 408 | 020809.03 | ENVIRONMENTAL INC. HIGHLANDS CAMP & CONF. CENTER | NC | |
| 08-10-02 | 1050 | KEKeenan | Fedex | 1.2°C | 403 | 020810.01 | TRITEST INC. NORTH CARY WRF | NC | |
| 08-10-02 | 1050 | KEKeenan | Fedex | 3.8°C | 404 | 020810.02 | CORR ERI McQUAY INT. - BEFORE SWALE | AL | |
| 08-10-02 | 1050 | KEKeenan | Fedex | 3.8°C | 404 | 020810.03 | CORR ERI McQUAY INT. - AFTER SWALE | AL | |
| 08-10-02 | 1051 | KEKeenan | ~~Fedex~~ Ash Courier | 2.1°C | 409 | 020810.04 | COMM SCOPE, INC. | NC | |
| 08-10-02 | 1051 | KEKeenan | Fedex | 1.7°C | 405 | 020810.05 | TVA - SEQUOYAH NUCLEAR PLANT OUTFALL 101 | TN | |

# Sample Receipt Log

| Date Received | Time Received | Received By | Received From | Sample Temperature (°C) | Project Number | Sample Number | Sample Name and Description | State | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 8-10-02 | 1051 | KEKeenan | Fedex | 1.5°C | 405 | 020810.06 | TVA- Sequoyah Nuclear Plant Intake | TN | |
| 8-10-02 | 1052 | KEKeenan | Greyhound | 1.9°C | 412 | 020810.07 | Scarlet Acres | NC | |
| 08-10-02 | 1052 | KEKeenan | Asheville Courier | 2.7°C | 413 | 020810.08 | Spruce Pine WWTP | NC | |
| 8-10-02 | 1053 | KEKeenan | Greyhound | 1.9°C | 410 | 020810.09 | Waynesville WWTP | NC | |
| 8-10-02 | 1053 | KEKeenan | Fedex | 3.7°C | 416 | 020810.10 | Duke Energy Corp. Belews Creek Steam Station | NC | |
| 8-10-02 | 1054 | KEKeenan | Fedex | 2.4°C | 417 | 020810.11 | Duke Energy Corp. Lincoln CT Station | NC | |
| 8-10-02 | 1056 | KEKeenan | Fedex | 1.4°C | 406 | 020810.12 | Charleston Public Works | SC | |
| 8-13-02 | 1135 ~~1150~~ | KKeena | Fedex | * 14.5°C | 425 ~~418~~ | 020813.01 | International Paper | SC | *Sample exceeded ~~total~~ acceptable temp upon receipt. |
| 8-13-02 | 1142 | KKeena | Fedex | 1.3°C | 426 ~~419~~ | 020813.02 | Hercules, Inc. | GA | |
| 8-13-02 | 1150 | KKeena | UPS | 0.7°C | 420 | 020813.03 | Tritest, Inc - Town of Apex | NC | |
| 8-14-02 | 1042 | KKeena | Fed-ex | 3.7°C | 421 | 020814.01 | Enfield WWTP | NC | |
| 8-14-02 | 1042 | KKeena | Fed-ex | 1.3°C | 422 | 020814.02 | Duke Energy Corp - McGuire CO | NC | |
| 8-14-02 | 1045 | KKeena | Fed-ex | 0.8°C | 423 | 020814.03 | Georgetown Steel - DRI Plant | SC | |
| 8-14-02 | 1045 | KKeena | UPS | 0.9°C | 424 | 020814.04 | Tritest, Inc - Apex | NC | |
| 8-14-02 | 1245 | Hunter | R. Vess | 3.4°C | ~~425~~ 427 | 020814.05 | Baxter Healthcare Corp. | NC | |
| 8-15-02 | 1010 | KEKeenan | UPS | 1.9°C | 420 | 020815.01 | Tritest Inc. - Apex | NC | |
| 8-15-02 | 1115 ~~1145~~ | KEKeenan | Fedex | * 13.5°C | 428 | 020815.02 | BE&K Terranext Madison Mine Outfall 002 | MO | *Samples exceeded acceptable temp upon receipt. |
| 8-15-02 | 1115 ~~1145~~ | KEKeenan | Fedex | * 13.5°C | 428 | 020815.03 | BE&K Terranext Madison Mine Outfall 003 | MO | |
| 8-15-02 | 1115 | KEKeenan | Fedex | * 13.5°C | 428 | 020815.04 | BE&K Terranext Madison Mine Upstream 002 | MO | |
| 8-15-02 | 1115 | KEKeenan | Fedex | * 13.5°C | 428 | 020815.05 | BE&K Terranext Madison Mine Upstream 003 | MO | |
| 8-15-02 | 1125 | Hunter | Fedex | | 429 | 020815.06 | WCF Special Study - TVA FGD | | |

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

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN0026450

NONTREATED

| *Dilution preparation information:* | | | | | | *Comments:* |
|---|---|---|---|---|---|---|
| MHS batch: | | 07-29-02 / 08-05-02 / 08-07-02 | | | | |
| Dilution prep (%) | 10.98 | 22 | 43.9 | 72 | 100 | |
| Effluent volume (mL) | 164.7 | 330 | 658.5 | 1080 | 1500 | |
| Diluent volume (mL) | 1335.3 | 1170 | 841.5 | 420 | 0 | |

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 24-HOURS OLD 23.5 - 26.5 | Randomizing template: | Yellow |
| Date and times organisms were born between: | 08-05-02 1030 TO 1230 - 1530 EST 1330 HST | Incubator number: | 2 |
| Organism source: | ABS BATCH 08-05-02 | *Artemia* lot number: | 86-2204 Q |
| Transfer bowl information: | pH = 7.99 Temperature = 24.8°C | Oven temperature: | 101°C |
| | | Drying time: | 14 HOURS |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|---|---|---|---|---|---|
| 0 | 08-06-02 | —— | 1630 | 1502 | JJ |
| 1 | 08-07-02 | 1030 | 1637 | 1446 | JJ |
| 2 | 08-08-02 | 1022 | 1630 | 1500 | JJ |
| 3 | 08-09-02 | 1032 | 1640 | 1509 | JJ |
| 4 | 08-10-02 | 1141 | 1750 | 1500 | JJ |
| 5 | 08-11-02 | 1000 | 1600 | 1456 | JJ |
| 6 | 08-12-02 | 1034 | 1638 | 1443 | JJ |
| 7 | 08-13-02 | —— | —— | 1422 | JJ |

| *Control information:* | | Acceptance criteria |
|---|---|---|
| % Mortality: | 0% | ≤ 20% |
| Average weight per larvae: | 0.8406 | ≥ 0.25 mg/larvae |

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

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH - NONTREATED **Date:** 08-06-02

*Survival and Growth Data*

| Day | CONTROL | | | | 10.98% | | | | 22% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) Blue | 14.657 | 15.012 | 14.660 | 14.917 | 14.916 | 14.604 | 14.687 | 15.078 | 14.999 | 15.008 | 14.915 | 14.573 |
| B = Pan + Larvae weight (mg) | 22.09 | 22.81 | 23.39 | 24.56 | ~~21.85~~ 20.25 | 20.69 | 21.360 | 22.74 | 22.54 | 22.15 | 23.37 | 20.88 |
| Larvae weight (mg) = A – B | 7.453 | 7.798 | 8.730 | 9.643 | 5.334 | 6.086 | 6.673 | 7.662 | 7.541 | 7.142 | 8.455 | 6.307 |

*Reweighed

Calculations and data reviewed: JH

*Comments:*

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH NONTREATED **Date:** 08-06-02

*Survival and Growth Data*

| Day | 43.9% | | | | 72% | | | | 100% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | N | O | P | Q | R | S | T | U | V | W | X |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 9 id | 10 | 10 | 9 id. | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 9 | 10 | 10 | 8 id | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.998 | 14.648 | 15.057 | 15.016 | 14.958 | 14.575 | 14.801 | 14.705 | 14.713 | 14.567 | 15.030 | 14.799 |
| B = Pan + Larvae weight (mg) | 21.70 | 20.83 | 22.03 | 20.79 | 24.34 | 21.76 | 23.03 | 21.51 | 22.24 | 21.86 | 22.23 | 21.32 |
| Larvae weight (mg) = A – B | 6.832 | 6.182 | 6.973 | 5.774 | 9.372 | 7.185 | 8.229 | 6.805 | 7.527 | 7.253 | 7.200 | 6.521 |

Calculations and data reviewed. JH

*Comments:*

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH- NONTREATED **Date:** 08-06-02

*Survival and Growth Data*

| Day | 100% INTAKE | | | |
|---|---|---|---|---|
| | Y | Z | AA | BB |
| 0 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 14.916 | 14.963 | 15.067 | 14.631 |
| B = Pan + Larvae weight (mg) | 23.11 | 22.83 | 23.00 | 22.32 |
| Larvae weight (mg) = A – B | 8.194 | 7.867 | 7.933 | 7.689 |

Calculations and data reviewed. JH

| *Comments:* |
|---|
| |
| |
| |
| |
| |

# Environmental Testing Solutions, LLC

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

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

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

Reviewed by:

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 14 637 | 22 090 | 7 453 | 0.7453 | 100 0 | 0 8406 | 11.7 | Not applicable |
| | B | 10 | 10 | 15 012 | 22 810 | 7.798 | 0 7798 | | | | |
| | C | 10 | 10 | 14 660 | 23 390 | 8 730 | 0 8730 | | | | |
| | D | 10 | 10 | 14 917 | 24 560 | 9 643 | 0 9643 | | | | |
| 10 98% | E | 10 | 9 | 14 916 | 20 250 | 5 334 | 0 5334 | 97.5 | 0.6439 | 15.3 | 23.4 |
| | F | 10 | 10 | 14 604 | 20 690 | 6 086 | 0 6086 | | | | |
| | G | 10 | 10 | 14 687 | 21 360 | 6 673 | 0 6673 | | | | |
| | H | 10 | 10 | 15 078 | 22 740 | 7 662 | 0 7662 | | | | |
| 22% | I | 10 | 10 | 14 999 | 22 540 | 7 541 | 0 7541 | 100 0 | 0.7361 | 12.1 | 12.4 |
| | J | 10 | 10 | 15 008 | 22 150 | 7 142 | 0 7142 | | | | |
| | K | 10 | 10 | 14 915 | 23 370 | 8 455 | 0 8455 | | | | |
| | L | 10 | 10 | 14 573 | 20 880 | 6 307 | 0 6307 | | | | |
| 43.9% | M | 10 | 9 | 14 948 | 21.780 | 6 832 | 0 6832 | 92.5 | 0.6440 | 8.7 | 23.4 |
| | N | 10 | 10 | 14 648 | 20 830 | 6 182 | 0 6182 | | | | |
| | O | 10 | 10 | 15 057 | 22 030 | 6 973 | 0 6973 | | | | |
| | P | 10 | 8 | 15 016 | 20 790 | 5 774 | 0 5774 | | | | |
| 72% | Q | 10 | 10 | 14 988 | 24 360 | 9 372 | 0 9372 | 100 0 | 0.7898 | 14 6 | 6.0 |
| | R | 10 | 10 | 14 575 | 21 760 | 7 185 | 0 7185 | | | | |
| | S | 10 | 10 | 14 801 | 23 030 | 8 229 | 0 8229 | | | | |
| | T | 10 | 10 | 14 705 | 21 510 | 6 805 | 0 6805 | | | | |
| 100% | U | 10 | 10 | 14 713 | 22 240 | 7 527 | 0 7527 | 100 0 | 0.7135 | 6.1 | 15.1 |
| | V | 10 | 10 | 14 567 | 21 860 | 7 293 | 0 7293 | | | | |
| | W | 10 | 10 | 15 030 | 22.230 | 7 200 | 0 7200 | | | | |
| | X | 10 | 10 | 14 799 | 21 320 | 6 521 | 0 6521 | | | | |
| 100% Intake | Y | 10 | 10 | 14 916 | 23 110 | 8 194 | 0 8194 | 100 0 | 0.7921 | 2.6 | 5.8 |
| | Z | 10 | 10 | 14 963 | 22 830 | 7 867 | 0 7867 | | | | |
| | AA | 10 | 10 | 15 067 | 23 000 | 7 933 | 0 7933 | | | | |
| | BB | 10 | 10 | 14 631 | 22 320 | 7 689 | 0 7689 | | | | |

**Outfall 101:**
**Dunnett's MSD value:** 0.1486
**PMSD:** 17.7

**Intake:**
**Dunnett's MSD value:** 0 0979
**PMSD:** 11 6

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 20.2% from the control (determined
Lower PMSD bound determined by USEPA (10th percentile) = 9 4%
Upper PMSD bound determined by USEPA (90th percentile) = 35%
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests

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

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | FpFRCR | Sample ID: | TVA Sequoyah Nuclear Plant - Outfall 101 |
| End Date: | 8/13/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | Nontreated |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | FP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.7453 | 0.7798 | 0.8730 | 0.9643 |
| 10.98 | 0.5334 | 0.6086 | 0.6673 | 0.7662 |
| 22 | 0.7541 | 0.7142 | 0.8455 | 0.6307 |
| 43.9 | 0.6832 | 0.6182 | 0.6973 | 0.5774 |
| 72 | 0.9372 | 0.7185 | 0.8229 | 0.6805 |
| 100 | 0.7527 | 0.7293 | 0.7200 | 0.6521 |

| | | | Transform: Untransformed | | | | | 1-Tailed | | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.8406 | 1.0000 | 0.8406 | 0.7453 | 0.9643 | 11.723 | 4 | | | | 0.8406 | 1.0000 |
| *10.98 | 0.6439 | 0.7660 | 0.6439 | 0.5334 | 0.7662 | 15.260 | 4 | 3.190 | 2.410 | 0.1486 | 0.7055 | 0.8392 |
| 22 | 0.7361 | 0.8757 | 0.7361 | 0.6307 | 0.8455 | 12.120 | 4 | 1.694 | 2.410 | 0.1486 | 0.7055 | 0.8392 |
| *43.9 | 0.6440 | 0.7661 | 0.6440 | 0.5774 | 0.6973 | 8.728 | 4 | 3.188 | 2.410 | 0.1486 | 0.7055 | 0.8392 |
| 72 | 0.7898 | 0.9395 | 0.7898 | 0.6805 | 0.9372 | 14.594 | 4 | 0.824 | 2.410 | 0.1486 | 0.7055 | 0.8392 |
| 100 | 0.7135 | 0.8488 | 0.7135 | 0.6521 | 0.7527 | 6.054 | 4 | 2.061 | 2.410 | 0.1486 | 0.7055 | 0.8392 |

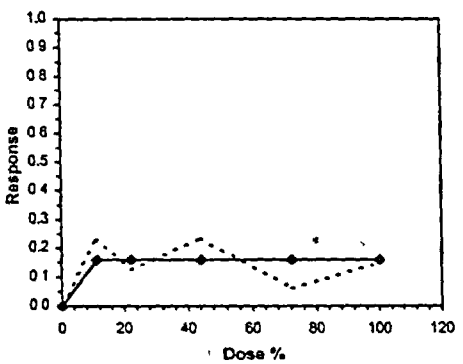
| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.945176542 | 0.884 | 0.281352782 | -0.78585716 |
| Bartlett's Test indicates equal variances (p = 0.67) | 3.180229425 | 15.08631706 | | |

| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 0.148617897 | 0.176799783 | 0.024719414 | 0.007605681 | 0.028946454 | 5, 18 |

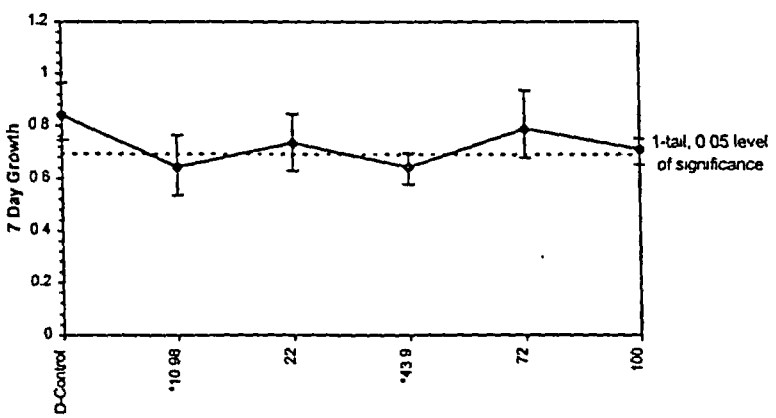
**Linear Interpolation (80 Resamples)**

| Point | % | SD | 95% CL(Exp) | | Skew |
|---|---|---|---|---|---|
| IC05* | 3.415 | 10.190 | 1.513 | 13.497 | 8.6024 |
| IC10* | 6.830 | | | | |
| IC15* | 10.245 | | | | |
| IC20 | >100 | | | | |
| IC25 | >100 | | | | |
| IC40 | >100 | | | | |
| IC50 | >100 | | | | |

* indicates IC estimate less than the lowest concentration




**Dose-Response Plot**



# Environmental Testing Solutions, LLC

## Statistical Analyses

| Larval Fish Growth and Survival Test-7 Day Growth | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID | PpFRCR | Sample ID | TVA Sequoyah Nuclear Plant - Intake |
| End Date: | 8/13/02 | Lab ID: | ETS-Env Testing Solutions | Sample Type | Nontreated |
| Sample Date | | Protocol | EPAF 91-EPA Freshwater | Test Species | PP-Pimephales promelas |
| Comments | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0 7453 | 0 7798 | 0 8730 | 0 9643 |
| 100 | 0.8194 | 0 7867 | 0 7933 | 0 7689 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | |
|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD |
| D-Control | 0 8406 | 1 0000 | 0 8406 | 0 7453 | 0 9643 | 11 723 | 4 | | | |
| 100 | 0 7921 | 0 9423 | 0 7921 | 0 7689 | 0.8194 | 2 642 | 4 | 0 963 | 1 943 | 0 0979 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0 01) | 0 962719679 | 0 749 | 0 560729505 | 1 122114493 |
| F-Test indicates equal variances (p = 0 03) | 22 16693497 | 47 46834564 | | |

| Hypothesis Test (1-tail, 0.05) |
|---|
| Homoscedastic t Test indicates no significant differences |

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

| | Date | Time | Analyst |
|---|---|---|---|
| Test start | 08-06-02 | 1214 | JF |
| Test end | 08-13-02 | 1146 | JF |

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

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | <24-HOURS OLD | Randomizing template: | PURPLE |
| Date and times organisms were born between: | 08-05-02, 1523 TO 1728 | Incubator number: | 2 |
| Organism source: | 07-30-02 A-D | YCT batch: ABS | 08-01-02 |
| Transfer bowl information: | pH = 8.30 Temperature = 24.7 | *Selenastrum* batch: ABS | 08-01-02 |

## CONTROL

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 5 | 0 | 5 | 0 | 3 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 5 | 4 | 0 | 4 | 0 | 4 | 0 | 4 | 5 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 7 | 8 | 10 | 12 | 9 | 8 | 11 | 11 | 9 | 9 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 15 | 13 | 13 | 16 | 14 | 12 | 16 | 17 | 14 | 17 |
| Total young produced | | 27 | 25 | 28 | 32 | 28 | 24 | 30 | 32 | 28 | 30 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |
| X for 3rd Broods | | X | X | X | X | X | X | X | X | X | X |

Calculations and data reviewed: JF

Test Renewal, Feeding, and Incubator Location Information

| | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| Date | 08-12 | 08-06 | 08-07 | 08-08 | 08-09 | 08-10 | 08-11 |
| Time | 1126 | 1214 | 1119 | 1210 | 1209 | 1217 | 1222 |
| Analyst | JF | JF | JF | JF | JF | JF | JF |
| Shelf Location | B2 | B2 | B2 | B2 | B2 | B2 | B2 |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % of Male Adults: | 0% | ≤ 20% | 7-day LC50 | >100% |
| % Adults having 3rd Broods: | 100% | ≥ 80% | NOEC | 100% |
| % Mortality: | 0% | ≤ 20% | LOEC | >100% |
| Mean Offspring/Female: | 28.4 | ≥ 15.0 offspring/female | ChV | >100% |
| % CV: | 9.4% | < 40.0 % | IC25 | >100% |

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH **Date:** 08-06-02

CONCENTRATION: 10.98%

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 4 | 0 | 5 | 0 | 0 | 0 | 0 | 6 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 6 | 0 | 4 | 0 | 5 | 4 | 4 | 4 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 9 | 10 | 12 | 11 | 12 | 8 | 12 | 0 | 10 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 3 | 0 | 0 | 16 | 0 | 0 | 12 | 0 | 15 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 14 | 17 | 18 | 17 | 0 | 18 | 15 | 13 | 17 | 0 |
| Total young produced | | 27 | 36 | 34 | 32 | 33 | 31 | 31 | 29 | 31 | 31 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 31.5 |
| % Reduction from Control: | -10.9% |

Calculations and data reviewed: [illegible]

CONCENTRATION: 22%

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 5 | 0 | 5 | 0 | 6 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 4 | 0 | 5 | 0 | 4 | 0 | 4 | 4 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 8 | 10 | 9 | 10 | 9 | 8 | 10 | 10 | 9 | 11 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 18 | 15 | 0 | 16 | 17 | 16 | 12 | 18 | 14 | 15 |
| Total young produced | | 30 | 29 | 30 | 31 | 31 | 28 | 28 | 32 | 27 | 31 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 29.7 |
| % Reduction from Control: | -4.6% |

Calculations and data reviewed: [illegible]

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH

**Date:** 08-06-02

**CONCENTRATION:** 49%

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 4 | 5 | 4 | 0 | 5 | 3 | 4 | 6 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 8 | 10 | 8 | 12 | 11 | 12 | 12 | 7 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 19 | 14 | 16 | 18 | 0 | 17 | 18 | 16 | 19 | 15 |
| Total young produced | | 34 | 26 | 31 | 30 | 33 | 33 | 33 | 32 | 32 | 30 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 31.4 |
| % Reduction from Control: | -10.6% |

Calculations and data reviewed: JH

**CONCENTRATION:** 72%

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 6 | 0 | 5 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 4 | 0 | 4 | 0 | 5 | 4 | 4 | 5 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 10 | 9 | 13 | 11 | 10 | 0 | 13 | 9 | 11 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 18 | 0 | 15 | 0 | 13 | 0 | 0 | 16 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 17 | 18 | 0 | 20 | 0 | 16 | 19 | 17 | 17 | 0 |
| Total young produced | | 31 | 32 | 33 | 37 | 31 | 31 | 36 | 34 | 31 | 32 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 32.8 |
| % Reduction from Control: | -15.5% |

Calculations and data reviewed: JH

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH

**Date:** 08-06-02

**CONCENTRATION:** 100%

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 4 | 6 | 0 | 6 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 5 | 5 | 4 | 0 | 0 | 6 | 0 | 5 | 4 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 11 | 9 | 10 | 13 | 10 | 12 | 12 | 14 | 11 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 16 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 0 | 2 | 20 | 18 | 15 | 19 | 20 | 16 | 21 | 19 |
| Total young produced | | 32 | 31 | 34 | 35 | 31 | 37 | 38 | 35 | 36 | 33 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 34.2 |
| % Reduction from Control: | -20.4% |

Calculations and data reviewed: JF

**CONCENTRATION:** 100% INTAKE

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 5 | 6 | 4 | 4 | 5 | 4 | 0 | 4 | 4 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 8 | 9 | 7 | 9 | 6 | 7 | 9 | 6 | 11 | 8 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 15 | 0 | 0 | 14 | 0 | 16 | 0 | 0 | 0 | 18 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 0 | 13 | 14 | 3 | 14 | 0 | 12 | 16 | 15 | 0 |
| Total young produced | | 28 | 28 | ~~3~~ 25 | 30 | 25 | 27 | 26 | 26 | 30 | 31 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 27.6 |
| % Reduction from Control: | 2.8% |

Calculations and data reviewed: JF

# Environmental Testing Solutions, LLC

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

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

**Client:** TVA Sequoyah Nuclear Plant, Nontreated

**Test dates:** August 6-13, 2002

**Project number:** 405

**Reviewed by:** [signature]

| Concentration (%) | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Survival (%) | Average reproduction (offspring/female) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 27 | 25 | 28 | 32 | 28 | 24 | 30 | 32 | 28 | 30 | 100 | 28.4 | 9.4 | Not applicable |
| 10.98% | 27 | 36 | 34 | 32 | 33 | 31 | 31 | 29 | 31 | 31 | 100 | 31.5 | 8.0 | -10.9 |
| 22% | 30 | 29 | 30 | 31 | 31 | 28 | 28 | 32 | 27 | 31 | 100 | 29.7 | 5.5 | -4.6 |
| 43.9% | 34 | 26 | 31 | 30 | 33 | 33 | 33 | 32 | 32 | 30 | 100 | 31.4 | 7.4 | -10.6 |
| 72% | 31 | 32 | 33 | 37 | 31 | 31 | 36 | 34 | 31 | 32 | 100 | 32.8 | 6.7 | -15.5 |
| 100% | 32 | 31 | 34 | 35 | 31 | 37 | 38 | 35 | 36 | 33 | 100 | 34.2 | 7.1 | -20.4 |
| 100% Intake | 28 | 28 | 25 | 30 | 25 | 27 | 26 | 26 | 30 | 31 | 100 | 27.6 | 7.9 | 2.8 |

**ffall 101:**

nnett's MSD value: 2.372

SD: 8.4

**ike:**

nnett's MSD value: 1.889

SD: 6.7

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 11.8% from the control.

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

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

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

PA. 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 ction Agency, Cincinnati, OH.

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | CdFRCR | Sample ID: | TVA Sequoyah Nuclear Plant, Outfall 101 |
| End Date: | 8/13/02 | Lab ID | ETS-Env Testing Solutions | Sample Type: | DMR-Discharge Monitoring Report |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species | CD-Ceriodaphnia dubia |
| Comments | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 27.000 | 25.000 | 28.000 | 32.000 | 28.000 | 24.000 | 30.000 | 32.000 | 28.000 | 30.000 |
| 10.98 | 27.000 | 36.000 | 34.000 | 32.000 | 33.000 | 31.000 | 31.000 | 29.000 | 31.000 | 31.000 |
| 22 | 30.000 | 29.000 | 30.000 | 31.000 | 31.000 | 28.000 | 28.000 | 32.000 | 27.000 | 31.000 |
| 43.9 | 34.000 | 26.000 | 31.000 | 30.000 | 33.000 | 33.000 | 33.000 | 32.000 | 32.000 | 30.000 |
| 72 | 31.000 | 32.000 | 33.000 | 37.000 | 31.000 | 31.000 | 36.000 | 34.000 | 31.000 | 32.000 |
| 100 | 32.000 | 31.000 | 34.000 | 35.000 | 31.000 | 37.000 | 38.000 | 35.000 | 36.000 | 33.000 |

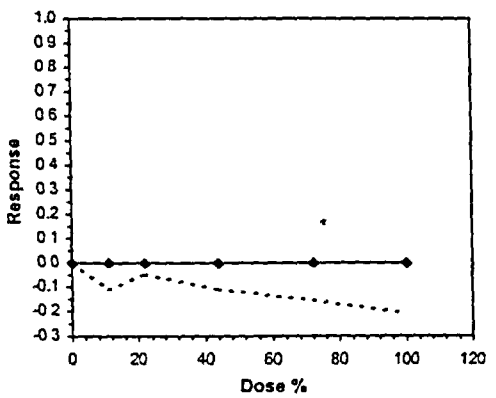
| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 28.400 | 1.0000 | 28.400 | 24.000 | 32.000 | 9.419 | 10 | | | | 31.333 | 1.0000 |
| 10.98 | 31.500 | 1.1092 | 31.500 | 27.000 | 36.000 | 7.954 | 10 | -2.988 | 2.287 | 2.372 | 31.333 | 1.0000 |
| 22 | 29.700 | 1.0458 | 29.700 | 27.000 | 32.000 | 5.510 | 10 | -1.253 | 2.287 | 2.372 | 31.333 | 1.0000 |
| 43.9 | 31.400 | 1.1056 | 31.400 | 26.000 | 34.000 | 7.385 | 10 | -2.892 | 2.287 | 2.372 | 31.333 | 1.0000 |
| 72 | 32.800 | 1.1549 | 32.800 | 31.000 | 37.000 | 6.710 | 10 | -4.241 | 2.287 | 2.372 | 31.333 | 1.0000 |
| 100 | 34.200 | 1.2042 | 34.200 | 31.000 | 38.000 | 7.136 | 10 | -5.591 | 2.287 | 2.372 | 31.333 | 1.0000 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates normal distribution (p > 0.01) | 0.561091602 | 1.035 | -0.12299514 | -0.24073858 |
| Bartlett's Test indicates equal variances (p = 0.81) | 2.272905827 | 15.08631706 | | |

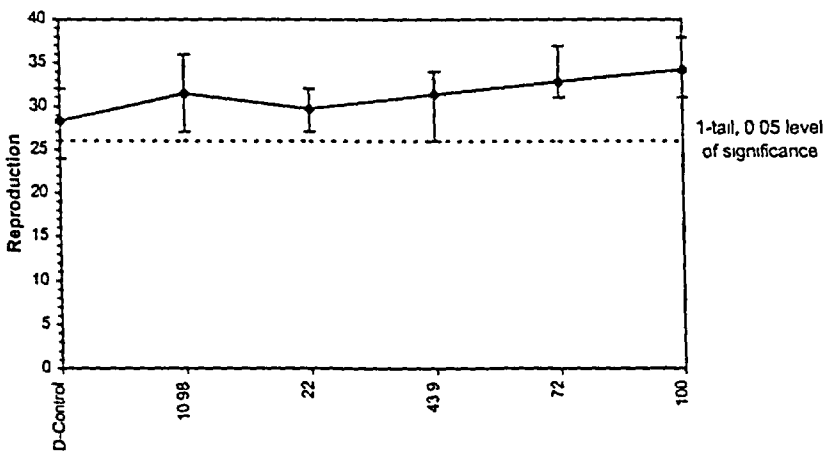
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 2.372295457 | 0.08353153 | 43.34666667 | 5.381481481 | 9.9E-06 | 5, 54 |

**Linear Interpolation (80 Resamples)**

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




**Dose-Response Plot**




*sqn_08-06-02data.xls*

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date | 8/6/02 | Test ID | CdFRCR | Sample ID | TVA Sequoyah Nuclear Plant, Intake |
| End Date | 8/13/02 | Lab ID | ETS-Env Testing Solutions | Sample Type | DMR-Discharge Monitoring Report |
| Sample Date | | Protocol | EPAF 91-EPA Freshwater | Test Species | CD-Ceriodaphnia dubia |
| Comments | | | | | |

| Conc-% | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 27 000 | 25 000 | 28 000 | 32 000 | 28 000 | 24 000 | 30 000 | 32 000 | 28 000 | 30 000 |
| 100 | 28 000 | 28 000 | 25 000 | 30 000 | 25 000 | 27 000 | 26 000 | 26 000 | 30 000 | 31 000 |

| | | | Transform Untransformed | | | | | | 1-Tailed | |
|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD |
| D-Control | 28 400 | 1 0000 | 28 400 | 24 000 | 32 000 | 9 419 | 10 | | | |
| 100 | 27 600 | 0 9718 | 27 600 | 25 000 | 31 000 | 7 864 | 10 | 0 734 | 1 734 | 1 889 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0 01) | 0 960157156 | 0 868 | -0 010531462 | -0 873208308 |
| F-Test indicates equal variances (p = 0 54) | 1 51886797 | 6.54108572 | | |

**Hypothesis Test (1-tail, 0 05)**

Homoscedastic t Test indicates no significant differences

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

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

| *Dilution preparation information:* | | | | | | *Comments:* |
|---|---|---|---|---|---|---|
| MHS batch: | | 07-29-02 | 08-05-02 | 08-07-02 | | |
| Dilution prep (%) | 10.98 | 22 | 43.9 | 72 | 100 | |
| Effluent volume (mL) | 164.7 | 330 | 658.2 | 1080 | 1500 | |
| Diluent volume (mL) | 1335.3 | 1170 | 841.5 | 420 | 0 | |

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 24-HOURS OLD | Randomizing template: | BLUE |
| Date and times organisms were born between: | 08-05-02 1030 TO 1330 1200 to 1530 EST MST | Incubator number: | 2 |
| Organism source: | ABS BATCH 08-05-02 | *Artemia* lot number: | 86-22040 |
| Transfer bowl information: | pH = 7.99 Temperature = 24.8°C | Oven temperature: | 101°C |
| | | Drying time: | 14-HOURS |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|---|---|---|---|---|---|
| 0 | 08-06-02 | — | 1630 | 1529 | JH |
| 1 | 08-07-02 | 1030 | 1631 | 1501 | JH |
| 2 | 08-08-02 | 1022 | 1630 | 1440 | JH |
| 3 | 08-09-02 | 1032 | 1640 | 1443 | JH |
| 4 | 08-10-02 | 1141 | 1750 | 1440 | JH |
| 5 | 08-11-02 | 1000 | 1600 | 1436 | JH |
| 6 | 08-12-02 | 1034 | 1638 | 1458 | JH |
| 7 | 08-13-02 | — | — | 1446 | JH |

| *Control information:* | | Acceptance criteria |
|---|---|---|
| % Mortality: | 2.52 ~~0%~~ | ≤ 20% |
| Average weight per larvae: | 0.7892 | ≥ 0.25 mg/larvae |

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

**Species:** *Pimephales promelas*

**Client:** SEQUOIAH UV-TREATED

**Date:** 08-06-02

*Survival and Growth Data*

| Day | CONTROL | | | | 10.987% | | | | 22% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 9[1d] | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 9[1d] | 10 | 10 | 10 |
| 6 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| 7 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 |
| A = Pan weight (mg) GREEN | 14.811 | 14.974 | 14.833 | 14.806 | 15.127 | 14.626 | 15.028 | 14.950 | 14.631 | 14.727 | 14.998 | 15.284 |
| B = Pan + Larvae weight (mg) | 23.50 | 23.43 | 21.59 | 22.47 | 24.10 | 21.67 | 21.52 | 23.48 | 23.48 | 21.57 | 23.99 | 23.23 |
| Larvae weight (mg) = A – B | 8.689 | 8.456 | 6.757 | 7.664 | 8.973 | 7.044 | 6.492 | 8.530 | 8.849 | 6.843 | 8.992 | 7.946 |

Calculations and data reviewed JL

*Comments:*

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH UV-TREATED **Date:** 08-06-02

*Survival and Growth Data*

| Day | 43.9% | | | | 72% | | | | 100% | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | N | O | P | Q | R | S | T | U | V | W | X |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 10 | 9[d] | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 7 | 10 | 10 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| A = Pan weight (mg) | 15.120 | 14.983 | 15.040 | 15.089 | 14.769 | 15.005 | 14.740 | 15.014 | 14.825 | 15.307 | 15.051 | 14.628 |
| B = Pan + Larvae weight (mg) | 21.91 | 23.20 | 23.82 | 24.08 | 20.58 | 22.30 | 22.14 | 21.91 | 20.90 | 24.66 | 23.64 | 20.80 |
| Larvae weight (mg) = A – B | 6.790 | 8.217 | 8.780 | 8.991 | 5.811 | 7.295 | 7.400 | 6.896 | 6.072 | 9.353 | 8.589 | 6.172 |

Calculations and data reviewed: JP

| *Comments:* |
|---|
| |
| |
| |
| |
| |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH UV-TREATED **Date:** 08-06-02

*Survival and Growth Data*

| Day | 100% INTAKE | | | |
|---|---|---|---|---|
| | Y | Z | AA | BB |
| 0 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 |
| 2 | 10 | 9 rd | 10 | 10 |
| 3 | 10 | 9 | 10 | 10 |
| 4 | 10 | 9 | 10 | 10 |
| 5 | 10 | 9 | 10 | 10 |
| 6 | 10 | 9 | 10 | 10 |
| 7 | 10 | 9 | 10 | 10 |
| A = Pan weight (mg) | 14.750 | 14.634 | 14.706 | 14.972 |
| B = Pan + Larvae weight (mg) | 22.90 | 21.28 | 22.18 | 22.83 |
| Larvae weight (mg) = A – B | 8.150 | 6.646 | 7.474 | 7.858 |

Calculations and data reviewed. JJ

| *Comments:* |
|---|
| |
| |
| |
| |
| |

# Environmental Testing Solutions, LLC

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

## Species: *Pimephales promelas*

### Quality Control

### Verification of Data Entry, Calculations, and Statistical Analyses

**Client:** TVA Sequoyah Nuclear Plant, UV Treated

**Test dates:** August 6-13, 2002

**Project number:** 405

**Reviewed by:**

| Concentration (%) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 14 811 | 23 500 | 8 689 | 0 8689 | 97.5 | 0.7892 | 11.1 | Not applicable |
| | B | 10 | 10 | 14 974 | 23 430 | 8 456 | 0 8456 | | | | |
| | C | 10 | 9 | 14 833 | 21 590 | 6 757 | 0 6757 | | | | |
| | D | 10 | 10 | 14 806 | 22 470 | 7 664 | 0 7664 | | | | |
| 10 98% | E | 10 | 10 | 15 127 | 24 100 | 8 973 | 0 8973 | 100 0 | 0.7760 | 15.2 | 1.7 |
| | F | 10 | 10 | 14 626 | 21 670 | 7 044 | 0 7044 | | | | |
| | G | 10 | 10 | 15 028 | 21 520 | 6 492 | 0 6492 | | | | |
| | H | 10 | 10 | 14 950 | 23 480 | 8 530 | 0 8530 | | | | |
| 22% | I | 10 | 9 | 14 631 | 23 480 | 8 849 | 0 8849 | 97.5 | 0.8158 | 12.2 | -3.4 |
| | J | 10 | 10 | 14 727 | 21 570 | 6 843 | 0 6843 | | | | |
| | K | 10 | 10 | 14 998 | 23 990 | 8 992 | 0 8992 | | | | |
| | L | 10 | 10 | 15 284 | 23 230 | 7.946 | 0 7946 | | | | |
| 43 9% | M | 10 | 10 | 15 120 | 21 910 | 6 790 | 0 6790 | 100 0 | 0 8195 | 12.1 | -3.8 |
| | N | 10 | 10 | 14 983 | 23 200 | 8 217 | 0 8217 | | | | |
| | O | 10 | 10 | 15 040 | 23 820 | 8.780 | 0 8780 | | | | |
| | P | 10 | 10 | 15 089 | 24 080 | 8.991 | 0 8991 | | | | |
| 72% | Q | 10 | 9 | 14 769 | 20 580 | 5 811 | 0 5811 | 97.5 | 0 6851 | 10.6 | 13.2 |
| | R | 10 | 10 | 15 005 | 22 300 | 7.295 | 0 7295 | | | | |
| | S | 10 | 10 | 14 740 | 22 140 | 7 400 | 0 7400 | | | | |
| | T | 10 | 10 | 15 014 | 21 910 | 6 896 | 0 6896 | | | | |
| 100% | U | 10 | 10 | 14 828 | 20 900 | 6 072 | 0 6072 | 100 0 | 0.7547 | 22.2 | 4.4 |
| | V | 10 | 10 | 15 307 | 24 660 | 9 353 | 0 9353 | | | | |
| | W | 10 | 10 | 15 051 | 23 640 | 8 589 | 0 8589 | | | | |
| | X | 10 | 10 | 14 628 | 20 800 | 6 172 | 0 6172 | | | | |
| 100% Intake | Y | 10 | 10 | 14 750 | 22 900 | 8 150 | 0 8150 | 97.5 | 0.7532 | 8.7 | 4 6 |
| | Z | 10 | 9 | 14 634 | 21.280 | 6 646 | 0 6646 | | | | |
| | AA | 10 | 10 | 14 706 | 22.180 | 7 474 | 0 7474 | | | | |
| | BB | 10 | 10 | 14 972 | 22 830 | 7 858 | 0 7858 | | | | |

**Outfall 101:**

**Dunnett's MSD value:** 0.1900

**PMSD:** 24.1

**Intake:**

**Dunnett's MSD value:** 0.106

**PMSD:** 13 4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 20 2% from the control (determined through

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

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

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

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

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | PpFRCR | Sample ID: | TVA Sequoyah Nuclear Plant - Outfall 101 |
| End Date: | 8/13/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | UV Treated |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.8689 | 0.8456 | 0.6757 | 0.7664 |
| 10.98 | 0.8973 | 0.7044 | 0.6492 | 0.8530 |
| 22 | 0.8849 | 0.6843 | 0.8992 | 0.7946 |
| 43.9 | 0.6790 | 0.8217 | 0.8780 | 0.8991 |
| 72 | 0.5811 | 0.7295 | 0.7400 | 0.6896 |
| 100 | 0.6072 | 0.9353 | 0.8589 | 0.6172 |

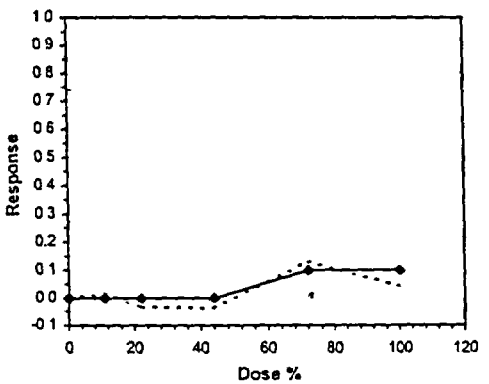
| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.7892 | 1.0000 | 0.7892 | 0.6757 | 0.8689 | 11.080 | 4 | | | | 0.8001 | 1.0000 |
| 10.98 | 0.7760 | 0.9833 | 0.7760 | 0.6492 | 0.8973 | 15.220 | 4 | 0.167 | 2.410 | 0.1900 | 0.8001 | 1.0000 |
| 22 | 0.8158 | 1.0337 | 0.8158 | 0.6843 | 0.8992 | 12.150 | 4 | -0.337 | 2.410 | 0.1900 | 0.8001 | 1.0000 |
| 43.9 | 0.8195 | 1.0384 | 0.8195 | 0.6790 | 0.8991 | 12.102 | 4 | -0.384 | 2.410 | 0.1900 | 0.8001 | 1.0000 |
| 72 | 0.6851 | 0.8681 | 0.6851 | 0.5811 | 0.7400 | 10.601 | 4 | 1.321 | 2.410 | 0.1900 | 0.7199 | 0.8997 |
| 100 | 0.7547 | 0.9563 | 0.7547 | 0.6072 | 0.9353 | 22.191 | 4 | 0.438 | 2.410 | 0.1900 | 0.7199 | 0.8997 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0.912943244 | 0.884 | -0.198924213 | -1.222822762 |
| Bartlett's Test indicates equal variances (p = 0.80) | 2.345666647 | 15.08631706 | | |

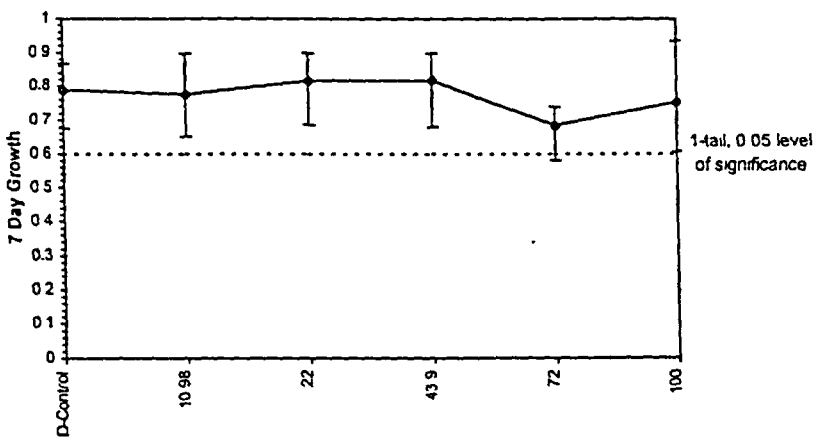
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 100 | >100 | | 1 | 0.18998293 | 0.240743749 | 0.009860864 | 0.012428681 | 0.568297744 | 5, 18 |

**Linear Interpolation (80 Resamples)**

| Point | % | SD | 95% CL(Exp) | Skew |
|---|---|---|---|---|
| IC05 | 57.911 | | | |
| IC10 | 71.922 | | | |
| IC15 | >100 | | | |
| IC20 | >100 | | | |
| IC25 | >100 | | | |
| IC40 | >100 | | | |
| IC50 | >100 | | | |




**Dose-Response Plot**



# Environmental Testing Solutions, LLC

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | PpFRCR | Sample ID | TVA Sequoyah Nuclear Plant - Intake |
| End Date | 8/13/02 | Lab ID | ETS-Env Testing Solutions | Sample Type | UV Treated |
| Sample Date: | | Protocol. | EPAF 91-EPA Freshwater | Test Species | PP-Pimephales promelas |
| Comments | | | | | |

| Conc-% | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0 8689 | 0 8456 | 0 6757 | 0 7664 |
| 100 | 0 8150 | 0 6646 | 0 7474 | 0 7858 |

| Conc-% | Mean | N-Mean | Transform. Untransformed Mean | Min | Max | CV% | N | t-Stat | 1-Tailed Critical | MSD |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 0 7892 | 1 0000 | 0 7892 | 0 6757 | 0 8689 | 11 080 | 4 | | | |
| 100 | 0 7532 | 0 9544 | 0 7532 | 0 6646 | 0 8150 | 8 661 | 4 | 0 659 | 1 943 | 0 1060 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0 01) | 0 912290037 | 0 749 | -0 632737902 | -1 026414614 |
| F-Test indicates equal variances (p = 0 64) | 1 796635509 | 47 46834564 | | |
| Hypothesis Test (1-tail, 0 05) | | | | |
| Homoscedastic t Test indicates no significant differences | | | | |

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Methods 1000.0 and 1002.0)
## Species: *Ceriodaphnia dubia* and *Pimephales promelas*

### Summary of Chemical Analyses

**Client:** Sequoyah Nuclear Plant Non-Treated
**Test dates:** August 06-13, 2002
**Project number:** 405

**Reviewed by:** Cen

| Concentration | Parameter | Initial | | | | *Pimephales promelas* Final | | | | *Ceriodaphnia dubia* Final | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S |
| Control | pH (SU) | 8 02 | 8 07 | 8 05 | 0 02 | 7 61 | 8 02 | 7 73 | 0 14 | 8 02 | 8 17 | 8 08 | 0 06 |
| | DO (mg/L) | 7 8 | 8 3 | 8 1 | 0 2 | 7.3 | 8 1 | 7.6 | 0 3 | 8 0 | 8 4 | 8 2 | 0 1 |
| | Conductivity (µmhos/cm) | 301 | 317 | 308 | 7 | | | | | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 63 | 66 | 64 | 2 | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 85 | 89 | 87 | 2 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 3 | 24 7 | 24 5 | 0 1 | 24 2 | 24 7 | 24 5 | 0 2 |
| | Final Temperature (°C) | | | | | 24 5 | 25 2 | 24 9 | 0 3 | 24 5 | 25 2 | 24 9 | 0 2 |
| 10.98% | pH (SU) | 8 02 | 8 09 | 8 07 | 0 02 | 7 56 | 8 03 ~~8.06~~ | 7 68 | 0 17 | 8 03 | 8 19 | 8 09 | 0 07 |
| | DO (mg/L) | 8 0 | 8 3 | 8 2 | 0 1 | 7 3 | 8.2 | 7 5 | 0 3 | 8 0 | 8 3 | 8 2 | 0 1 |
| | Conductivity (µmhos/cm) | 285 | 302 | 293 | 7 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 4 | 24 7 | 24 5 | 0 1 | 24 3 | 24 9 | 24 6 | 0 2 |
| | Final Temperature (°C) | | | | | 24 5 | 25 2 | 24 9 | 0 3 | 24 5 | 25 2 | 24 9 | 0 2 |
| 22% | pH (SU) | 8 01 | 8 10 | 8 06 | 0 03 | 7 55 | 8 06 | 7.68 | 0 17 | 8 02 | 8 18 | 8 08 | 0 07 |
| | DO (mg/L) | 8 0 | 8 3 | 8 2 | 0 1 | 6 8 | 8 2 | 7.4 | 0 4 | 8 0 | 8 2 | 8 2 | 0 1 |
| | Conductivity (µmhos/cm) | 274 | 291 | 282 | 6 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 5 | 25 1 | 24 6 | 0 2 | 24 4 | 25 0 | 24 6 | 0 2 |
| | Final Temperature (°C) | | | | | 24 6 | 25 3 | 24 9 | 0.3 | 24 5 | 25 2 | 24 9 | 0 3 |
| 43.9% | pH (SU) | 8 00 | 8 10 | 8 05 | 0 04 | 7 52 | 7 90 | 7 63 | 0 12 | 8 05 | 8 19 | 8 10 | 0 06 |
| | DO (mg/L) | 8 0 | 8 4 | 8 2 | 0 3 | 6 8 | 8 1 | 7.4 | 0 4 | 8 1 | 8 2 | 8 2 | 0 0 |
| | Conductivity (µmhos/cm) | 250 | 273 | 260 | 8 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 5 | 25 1 | 24 7 | 0 2 | 24 6 | 25 3 | 24 8 | 0 2 |
| | Final Temperature (°C) | | | | | 24.6 ~~24.7~~ | 25 2 | 24 9 | 0.2 | 24 4 | 25.2 | 24 8 | 0 3 |
| 72% | pH (SU) | 7 97 | 8 10 | 8 04 | 0 05 | 7 53 | 7 94 | 7 64 | 0.14 | 8 02 | 8.18 | 8 09 | 0 06 |
| | DO (mg/L) | 8 0 | 8 4 | 8 2 | 0 1 | 6 7 | 8 2 | 7 3 | 0 5 | 8 1 | 8 3 | 8 2 | 0 1 |
| | Conductivity (µmhos/cm) | 222 | 237 | 231 | 6 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 5 | 25 3 | 25 0 | 0 3 | 24 6 | 25 5 | 24 9 | 0 3 |
| | Final Temperature (°C) | | | | | 24 4 | 25 2 | 24 9 | 0 3 | 24 5 | 25 2 | 24 8 | 0 3 |
| 100% | pH (SU) | 7.94 | 8 10 | 8 02 | 0 07 | 7.52 | 8 01 | 7 64 | 0 17 | 8 00 | 8 21 | 8 11 | 0 08 |
| | DO (mg/L) | 8 1 | 8 4 | 8 3 | 0 1 | 6 7 | 8 2 | 7 3 | 0.5 | 8 1 | 8 3 | 8 3 | 0 1 |
| | Conductivity (µmhos/cm) | 193 | 211 | 202 | 6 | | | | | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 69 | 78 | 73 | 5 | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 83 | 87 | 86 | 2 | | | | | | | | |
| | Total Residual Chlorine (mg/L) | < 0 10 | < 0 10 | < 0 10 | 0 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 5 | 25 6 | 25 1 | 0 4 | 24 6 | 25 6 | 25 0 | 0 3 |
| | Final Temperature (°C) | | | | | 24 5 | 25.2 | 24 9 | 0 3 | 24 3 | 25.2 | 24 8 | 0 3 |
| 100% Intake | pH (SU) | 7.87 | 8 09 | 8 00 | 0 09 | 7 57 | 8 02 | 7 68 | 0 15 | 7.99 | 8.15 | 8 07 | 0 07 |
| | DO (mg/L) | 8 2 | 8 4 | 8.3 | 0 1 | 7 1 | 8 3 | 7 5 | 0 4 | 8 1 | 8 4 | 8 2 | 0 1 |
| | Conductivity (µmhos/cm) | 192 | 215 | 205 | 8 | | | | | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 69 | 73 | 71 | 2 | | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 79 | 89 | 84 | 5 | | | | | | | | |
| | Total Residual Chlorine (mg/L) | < 0 10 | < 0.10 | < 0 10 | 0 | | | | | | | | |
| | Initial Temperature (°C) | | | | | 24 5 | 25 5 | 24 9 | 0 4 | 24 4 | 25 2 | 24 9 | 0 3 |
| | Final Temperature (°C) | | | | | 24 5 | 25 1 | 24 9 | 0 3 | 24 3 | 25 2 | 24.7 | 0 3 |
| **Overall Temperature (°C)** (including all concentrations for initial and final temperatures) | | | | | | 24.3 | 25.6 | 24 8 | 0.3 | 24.2 | 25.6 | 24 8 | 0 3 |

# Environmental Testing Solutions, LLC

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

### Daily Chemical Analyses

**Client:** Sequoyah Nuclear Plant Non-Treated

**Test dates:** August 06-13, 2002

**Project number:** 405

**Reviewed by:** Cur

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Control | pH (SU) | 8.07 | 8 02 | 8 05 | 7 67 | 8 03 | 7.69 | 8 07 | 7 76 | 8 06 | 7.68 | 8 05 | 7.68 | 8 02 | 7.61 |
| | DO (mg/L) | 7 8 | 8 1 | 8 0 | 7 4 | 7.8 | 7.6 | 8 2 | 7.7 | 8.1 | 7.3 | 8.2 | 7.4 | 8 3 | 7.4 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | | 301 | | 303 | | 302 | | 313 | |
| | Alkalinity (mg/L $CaCO_3$) | 66 | | 63 | | | | 63 | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | 85 | | | | 89 | | | | | | | |
| | Temperature (°C) | 24.4 | 25.2 | 24 5 | 25 0 | 24 4 | 24 7 | 24.5 | 24 5 | 24.7 | 25.1 | 24 3 | 24 8 | 24 5 | 25.1 |
| 10.98% | pH (SU) | 8 09 | 8 03 | 8 07 | 7 61 | 8 09 | 7.56 | 8 07 | 7 66 | 8.06 | 7 60 | 8 06 | 7.72 | 8 02 | 7 56 |
| | DO (mg/L) | 8 0 | 8 2 | 8 2 | 7.4 | 8 0 | 7 4 | 8 3 | 7.6 | 8.1 | 7.3 | 8.2 | 7.5 | 8.3 | 7.3 |
| | Conductivity (µmhos/cm) | 299 | | 288 | | 302 | | 289 | | 285 | | 292 | | 299 | |
| | Temperature (°C) | 24 4 | 25 2 | 24 7 | 25 0 | 24 4 | 24.7 | 24 5 | 24.5 | 24 6 | 25.1 | 24 6 | 24.8 | 24 5 | 25.1 |
| 22% | pH (SU) | 8.10 | 8 06 | 8 07 | 7 60 | 8 10 | 7 55 | 8 06 | 7.66 | 8 04 | 7.59 | 8 06 | 7.67 | 8 01 | 7.64 |
| | DO (mg/L) | 8.1 | 8.2 | 8 2 | 7 4 | 8 0 | 7.1 | 8.2 | 7 5 | 8 2 | 6.8 | 8 2 | 7.5 | 8.3 | 7.4 |
| | Conductivity (µmhos/cm) | 287 | | 278 | | 291 | | 277 | | 274 | | 280 | | 286 | |
| | Temperature (°C) | 24.5 | 25.3 | 25.1 | 25 0 | 24 6 | 24 7 | 24.6 | 24 6 | 24 5 | 25.1 | 24 6 | 24.7 | 24 5 | 25 0 |
| 43.9% | pH (SU) | 8.10 | 7 90 | 8 06 | 7.59 | 8.09 | 7.52 | 8 07 | 7 62 | 8 02 | 7.57 | 8 03 | 7.61 | 8 00 | 7.60 |
| | DO (mg/L) | 8.1 | 8 1 | 8 3 | 7.3 | 8 0 | 7.1 | 8 2 | 7.4 | 8 3 | 6 8 | 8 2 | 7.4 | 8 4 | 7.6 |
| | Conductivity (µmhos/cm) | 273 | | 253 | | 264 | | 258 | | 250 | | 260 | | 265 | |
| | Temperature (°C) | 24 5 | 25.2 | 25.1 | 25.0 | 24 8 | 24 7 | 24 8 | 24.6 | 24 6 | 25 1 | 24.8 | 24.7 | 24 6 | 25 0 |
| 72% | pH (SU) | 8.10 | 7.94 | 8 06 | 7 60 | 8 09 | 7.55 | 8 06 | 7 61 | 7.97 | 7.57 | 7.99 | 7.65 | 7.98 | 7 53 |
| | DO (mg/L) | 8.1 | 8 2 | 8 2 | 7.4 | 8 0 | 6 9 | 8 2 | 7.2 | 8 3 | 6.7 | 8 2 | 7.2 | 8 4 | 7 6 |
| | Conductivity (µmhos/cm) | 237 | | 234 | | 237 | | 230 | | 222 | | 224 | | 230 | |
| | Temperature (°C) | 24.7 | 25.2 | 25.3 | 25 0 | 25 0 | 24 7 | 24.9 | 24 4 | 24 5 | 25.1 | 25.1 | 24 9 | 25.2 | 25.1 |
| 100% | pH (SU) | 8.10 | 8 01 | 8 06 | 7.56 | 8.07 | 7.52 | 8 06 | 7.66 | 7.94 | 7.57 | 7.94 | 7.61 | 7.97 | 7.58 |
| | DO (mg/L) | 8 1 | 8.2 | 8.3 | 7.4 | 8 1 | 7.0 | 8.3 | 7.3 | 8.3 | 6.7 | 8.3 | 7.3 | 8.4 | 7.5 |
| | Conductivity (µmhos/cm) | 211 | | 202 | | 209 | | 204 | | 193 | | 196 | | 201 | |
| | Alkalinity (mg/L $CaCO_3$) | 78 | | | | 71 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | | | 87 | | | | 83 | | | | | |
| | Total Residual Chlorine (mg/L) | <0 10 | | | | <0.10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 24 7 | 25.2 | 25 5 | 25.0 | 25.4 | 24 5 | 24.9 | 24.5 | 24.5 | 25.1 | 25.3 | 24.8 | 25 6 | 25.1 |
| 100% Intake | pH (SU) | 8 09 | 8 02 | 8 04 | 7 67 | 8 07 | 7 62 | 8 05 | 7 65 | 7.87 | 7.59 | 7.90 | 7.66 | 7.95 | 7.57 |
| | DO (mg/L) | 8 2 | 8 3 | 8 2 | 7 6 | 8 3 | 7.4 | 8.3 | 7.4 | 8 4 | 7.1 | 8.4 | 7.4 | 8 4 | 7.4 |
| | Conductivity (µmhos/cm) | 209 | | 203 | | 211 | | 202 | | 192 | | 215 | | 200 | |
| | Alkalinity (mg/L $CaCO_3$) | 73 | | | | 72 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 83 | | | | 79 | | | | 89 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0.10 | | | | <0 10 | | | | | |
| | Temperature (°C) | 24 5 | 25.1 | 24.7 | 25.0 | 25 0 | 24 6 | 24.5 | 24.5 | 24 8 | 25.1 | 25.5 | 24.8 | 25 0 | 25.1 |

# Environmental Testing Solutions, LLC

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

### Daily Chemical Analyses

**Client:** Sequoyah Nuclear Plant Non-Treated
**Test dates:** August 06-13, 2002
**Project number:** 405

**Reviewed by:** Cen

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Control | pH (SU) | 8 07 | 8 06 | 8 05 | 8 09 | 8 03 | 8 02 | 8 07 | 8.17 | 8.06 | 8 17 | 8 05 | 8 05 | 8 02 | 8 03 |
| | DO (mg/L) | 7 8 | 8 3 | 8 0 | 8.2 | 7 8 | 8 4 | 8 2 | 8 2 | 8 1 | 8.2 | 8.2 | 8 3 | 8 3 | 8 0 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | | 301 | | 303 | | 302 | | 313 | |
| | Alkalinity (mg/L $CaCO_3$) | 66 | | 63 | | | | 63 | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | 85 | | | | 89 | | | | | | | |
| | Temperature (°C) | 24 6 | 24 8 | 24 4 | 24 7 | 24 3 | 25.1 | 24.7 | 24.9 | 24.7 | 25 2 | 24 2 | 24 5 | 24 6 | 24 8 |
| 10.98% | pH (SU) | 8 09 | 8 06 | 8 07 | 8 08 | 8 09 | 8 04 | 8 07 | 8.19 | 8 06 | 8.18 | 8 06 | 8 03 | 8 02 | 8 07 |
| | DO (mg/L) | 8 0 | 8 2 | 8 2 | 8.1 | 8 0 | 8 3 | 8 3 | 8 2 | 8.1 | 8.2 | 8.2 | 8.3 | 8 3 | 8 0 |
| | Conductivity (µmhos/cm) | 299 | | 288 | | 302 | | 289 | | 285 | | 292 | | 299 | |
| | Temperature (°C) | 24 6 | 24 8 | 24 6 | 24.7 | 24 3 | 25 1 | 24 9 | 24 9 | 24.7 | 25.2 | 24 4 | 24.5 | 24 6 | 24 9 |
| 22% | pH (SU) | 8.10 | 8 04 | 8 07 | 8 08 | 8.10 | 8 05 | 8 06 | 8 18 | 8 04 | 8 16 | 8 06 | 8 02 | 8 01 | 8 02 |
| | DO (mg/L) | 8.1 | 8 2 | 8 2 | 8 1 | 8 0 | 8 2 | 8 2 | 8 2 | 8 2 | 8 2 | 8 2 | 8 2 | 8 3 | 8 0 |
| | Conductivity (µmhos/cm) | 287 | | 278 | | 291 | | 277 | | 274 | | 280 | | 286 | |
| | Temperature (°C) | 24 7 | 24.8 | 24 6 | 24 6 | 24 4 | 25.1 | 25 0 | 24.9 | 24 6 | 25 2 | 24 4 | 24 5 | 24 8 | 24.9 |
| 43.9% | pH (SU) | 8 10 | 8 07 | 8 06 | 8 08 | 8 09 | 8 06 | 8 07 | 8 19 | 8 02 | 8.18 | 8 03 | 8 05 | 8 00 | 8 06 |
| | DO (mg/L) | 8.1 | 8.2 | 8 3 | 8 1 | 8 0 | 8 2 | 8 2 | 8 2 | 8 3 | 8 2 | 8 2 | 8 2 | 8 4 | 8 2 |
| | Conductivity (µmhos/cm) | 273 | | 253 | | 264 | | 258 | | 250 | | 260 | | 265 | |
| | Temperature (°C) | 24 7 | 24.8 | 24.7 | 24 6 | 24 7 | 25 1 | 25.3 | 24 8 | 24 6 | 25 2 | 24 7 | 24.4 | 24 8 | 24 7 |
| 72% | pH (SU) | 8 10 | 8 12 | 8 06 | 8 08 | 8 09 | 8 05 | 8 06 | 8 18 | 7.97 | 8.14 | 7.99 | 8 02 | 7.98 | 8 05 |
| | DO (mg/L) | 8 1 | 8.3 | 8 2 | 8 1 | 8 0 | 8.2 | 8 2 | 8 2 | 8.3 | 8 2 | 8 2 | 8 2 | 8 4 | 8 2 |
| | Conductivity (µmhos/cm) | 237 | | 234 | | 237 | | 230 | | 222 | | 224 | | 230 | |
| | Temperature (°C) | 24.9 | 24 8 | 24 6 | 24 6 | 24 8 | 25.1 | 25 5 | 24 8 | 24 6 | 25 2 | 24 8 | 24.5 | 25.1 | 24.7 |
| 100% | pH (SU) | 8 10 | 8 12 | 8.06 | 8.10 | 8 07 | 8 05 | 8 06 | 8 21 | 7.94 | 8.20 | 7.94 | 8 00 | 7.97 | 8 06 |
| | DO (mg/L) | 8.1 | 8 3 | 8 3 | 8 1 | 8.1 | 8.2 | 8 3 | 8 3 | 8 3 | 8.3 | 8.3 | 8.3 | 8 4 | 8.3 |
| | Conductivity (µmhos/cm) | 211 | | 202 | | 209 | | 204 | | 193 | | 196 | | 201 | |
| | Alkalinity (mg/L $CaCO_3$) | 78 | | | | 71 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | | | 87 | | | | 83 | | | | | |
| | Total Residual Chlorine (mg/L) | <0 10 | | | | <0 10 | | | | <0 10 | | | | | |
| | Temperature (°C) | 24 8 | 24.8 | 24 8 | 24 6 | 25 0 | 25.1 | 25 6 | 24.9 | 24.6 | 25.2 | 25.1 | 24.3 | 25 3 | 24.7 |
| 100% Intake | pH (SU) | 8 09 | 8 13 | 8 04 | 8 09 | 8 07 | 8 04 | 8 05 | 8.13 | 7.87 | 8.15 | 7.90 | 7.99 | 7.95 | 7.99 |
| | DO (mg/L) | 8 2 | 8 4 | 8 2 | 8.2 | 8 3 | 8.3 | 8 3 | 8 2 | 8 4 | 8.1 | 8.4 | 8.1 | 8.4 | 8 3 |
| | Conductivity (µmhos/cm) | 209 | | 203 | | 211 | | 202 | | 192 | | 215 | | 200 | |
| | Alkalinity (mg/L $CaCO_3$) | 73 | | | | 72 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 83 | | | | 79 | | | | 89 | | | | | |
| | Total Residual Chlorine (mg/L) | <0 10 | | | | <0 10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 25.1 | 24 8 | 24.5 | 24.5 | 25 0 | 25.1 | 24 4 | 24 6 | 24 8 | 25.2 | 25 0 | 24.3 | 25 2 | 24 7 |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH - NONTREATED **Date:** 08-06-02

***Full-strength Chemistry:*** OUTFALL 101

| Parameter | Sample Number: | | | Control Batch: | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.10 | 8.07 | 7.94 | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 8.1 | 8.1 | 8.3 | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 211 | 209 | 193 | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 78 | 71 | 69 | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 87 | 87 | 83 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-01-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1147 | 1157 | 1232 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.7°C | 1.2°C | 1.7°C | | | |
| Physical characteristics | pale tan, clear, particles | PALE YELLOW CLEAR | Tan Slightly Cloudy | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.04 | 020808.06 | 020810.05 | | | |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH-NONTREATED **Date:** 08-06-02

***Full-strength Chemistry:*** INTAKE

| Parameter | Sample Number: | | | Control Batch: | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.09 | 8.07 | 7.87 | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 8.2 | 8.3 | 8.4 | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 209 | 211 | 192 | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 73 | 72 | 69 | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 83 | 79 | 89 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-04-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1156 | 1145 | 1203 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.5°C | 0.5°C | 1.5°C | | | |
| Physical characteristics | NO COLOR Clear | CLEAR NO COLOR | pale tan. Clear | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.05 | 020808.07 | 10 020808.06 | | | |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH - NONTREATED

**Date:** 08-06-02

*Daily Chemistry:*

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final |
| CONTROL | pH (S.U.) | 8.07 | 8.02 | 8.05 | 7.67 | 8.03 | 7.69 |
| | DO (mg/L) | 7.8 | 8.1 | 8.0 | 7.4 | 7.8 | 7.6 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | |
| | Temperature (°C) | 24.4 | 25.2 | 24.5 | 25.0 | 24.4 | 24.7 |
| 10.98% | pH (S.U.) | 8.09 | 8.03 | 8.07 | 7.61 | 8.09 | 7.56 |
| | DO (mg/L) | 8.0 | 8.2 | 8.2 | 7.4 | 8.0 | 7.4 |
| | Conductivity (µmhos/cm) | 299 | | 288 | | 302 | |
| | Temperature (°C) | 24.4 | 25.2 | 24.7 | 25.0 | 24.4 | 24.7 |
| 22% | pH (S.U.) | 8.10 | 8.06 | 8.07 | 7.60 | 8.10 | 7.55 |
| | DO (mg/L) | 8.1 | 8.2 | 8.2 | 7.4 | 8.0 | 7.1 |
| | Conductivity (µmhos/cm) | 287 | | 278 | | 291 | |
| | Temperature (°C) | 24.5 | 25.3 | 25.1 | 25.0 | 24.6 | 24.7 |
| 43.9% | pH (S.U.) | 8.10 | 7.90 | 8.06 | 7.59 | 8.09 | 7.52 |
| | DO (mg/L) | 8.1 | 8.1 | 8.3 | 7.3 | 8.0 | 7.1 |
| | Conductivity (µmhos/cm) | 273 | | 253 | | 264 | |
| | Temperature (°C) | 24.5 | 25.2 | 25.1 | 25.0 | 24.8 | 24.7 |
| 72% | pH (S.U.) | 8.10 | 7.94 | 8.06 | 7.60 | 8.09. | 7.55 |
| | DO (mg/L) | 8.1 | 8.2 | 8.2 | 7.4 | 8.0 | 6.9 |
| | Conductivity (µmhos/cm) | 237 | | 234 | | 237 | |
| | Temperature (°C) | 24.7 | 25.2 | 25.3 | 25.0 | 25.0 | 24.7 |
| 100% | pH (S.U.) | 8.10 | 8.01 | 8.06 | 7.56 | 8.07 | 7.52 |
| | DO (mg/L) | 8.1 | 8.2 | 8.3 | 7.4 | 8.1 | 7.0 |
| | Conductivity (µmhos/cm) | 211 | | 202 | | 209 | |
| | Temperature (°C) | 24.7 | 25.2 | 25.5 | 25.0 | 25.4 | 24.5 |
| 100% INTAKE | pH (S.U.) | 8.09 | 8.02 | 8.04 | 7.67 | 8.07 | 7.62 |
| | DO (mg/L) | 8.2 | 8.3 | 8.2 | 7.6 | 8.3 | 7.4 |
| | Conductivity (µmhos/cm) | 209 | | 203 | | 211 | |
| | Temperature (°C) | 24.5 | 25.1 | 24.7 | 25.0 | 25.0 | 24.6 |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH- NONTREATED

**Date:** 08-06-02

| Concentration | Parameter | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 7.76 | 8.06 | 7.68 | 8.05 | 7.68 | 8.02 | 7.61 |
| | DO (mg/L) | 8.2 | 7.7 | 8.1 | 7.3 | 8.2 | 7.4 | 8.3 | 7.4 |
| | Conductivity (µmhos/cm) | 301 | | 303 | | 302 | | 313 | |
| | Temperature (°C) | 24.5 | 24.5 | 24.7 | 25.1 | 24.3 | 24.8 | 24.5 | 25.1 |
| 10.98% | pH (S.U.) | 8.07 | 7.66 | 8.06 | 7.60 | 8.06 | 7.72 | 8.02 | 7.56 |
| | DO (mg/L) | 8.3 | 7.6 | 8.1 | 7.3 | 8.2 | 7.5 | 8.3 | 7.3 |
| | Conductivity (µmhos/cm) | 289 | | 285 | | 292 | | 299 | |
| | Temperature (°C) | 24.5 | 24.5 | 24.6 | 25.1 | 24.6 | 24.8 | 24.5 | 25.1 |
| 22% | pH (S.U.) | 8.06 | 7.66 | 8.04 | 7.59 | 8.06 | 7.67 | 8.01 | 7.64 |
| | DO (mg/L) | 8.2 | 7.5 | 8.2 | 6.8 | 8.2 | 7.5 | 8.3 | 7.4 |
| | Conductivity (µmhos/cm) | 277 | | 274 | | 280 | | 286 | |
| | Temperature (°C) | 24.6 | 24.6 | 24.5 | 25.1 | 24.6 | 24.7 | 24.5 | 25.0 |
| 43.9% | pH (S.U.) | 8.07 | 7.62 | 8.02 | 7.57 | 8.03 | 7.61 | 8.00 | 7.60 |
| | DO (mg/L) | 8.2 | 7.4 | 8.3 | 6.8 | 8.2 | 7.4 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 258 | | 250 | | 260 | | 265 | |
| | Temperature (°C) | 24.8 | 24.6 | 24.6 | 25.1 | 24.8 | 24.7 | 24.6 | 25.0 |
| 72% | pH (S.U.) | 8.06 | 7.61 | 7.97 | 7.57 | 7.99 | 7.65 | 7.98 | 7.53 |
| | DO (mg/L) | 8.2 | 7.2 | 8.3 | 6.7 | 8.2 | 7.2 | 8.4 | 7.6 |
| | Conductivity (µmhos/cm) | 230 | | 222 | | 224 | | 230 | |
| | Temperature (°C) | 24.9 | 24.4 | 24.5 | 25.1 | 25.1 | 24.9 | 25.2 | 25.1 |
| 100% | pH (S.U.) | 8.06 | 7.66 | 7.94 | 7.57 | 7.94 | 7.61 | 7.97 | 7.58 |
| | DO (mg/L) | 8.3 | 7.3 | 8.3 | 6.7 | 8.3 | 7.3 | 8.4 | 7.5 |
| | Conductivity (µmhos/cm) | 204 | | 193 | | 196 | | 201 | |
| | Temperature (°C) | 24.9 | 24.5 | 24.5 | 25.1 | 25.3 | 24.8 | 25.6 | 25.1 |
| 100% INTAKE | pH (S.U.) | 8.05 | 7.65 | 7.87 | 7.59 | 7.90 | 7.66 | 7.95 | 7.57 |
| | DO (mg/L) | 8.3 | 7.4 | 8.4 | 7.1 | 8.4 | 7.4 | 8.4 | 7.4 |
| | Conductivity (µmhos/cm) | 202 | | 192 | | 215 | | 200 | |
| | Temperature (°C) | 24.5 | 24.5 | 24.8 | 25.1 | 25.5 | 24.8 | 25.0 | 25.1 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH

**Date:** 08-06-02

***Full-strength Chemistry:*** OUTFALL 101

| Parameter | Sample Number: | | | Control Batch: | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.10 | 8.07 | 7.94 | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 8.1 | 8.1 | 8.3 | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 211 | 209 | 193 | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 78 | 71 | 69 | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 87 | 87 | 83 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-04-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1147 | 1157 | 1232 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.7°C | 1.2°C | 1.7°C | | | |
| Physical characteristics | PALE TAN CLEAR PARTICLES | PALE YELLOW CLEAR | tan slightly cloudy | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.04 | 020808.06 | 020810.05 | | | |

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH **Date:** 08-06-02

***Full-strength Chemistry:*** INTAKE

| Parameter | Sample Number: | | | Control Batch: | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.09 | 8.07 | 7.87 | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 8.2 | 8.3 | 8.4 | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 209 | 211 | 192 | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 73 | 72 | 69 | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 83 | 79 | 89 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-04-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1156 | 1145 | 1203 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.5°C | 0.5°C | 1.5°C | | | |
| Physical characteristics | CLEAR NO COLOR | CLEAR NO COLOR | pale tan CLEAR | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.05 | 020808.07 | 020810.06 | | | |

Species: *Ceriodaphnia dubia*

Client: SEQUOYAH

Date: 08-06-02

*Daily Chemistry:*

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final |
| CONTROL | pH (S.U.) | 8.07 | 8.06 | 8.05 | 8.09 | 8.03 | 8.02 |
| | DO (mg/L) | 7.8 | 8.3 | 8.0 | 8.2 | 7.8 | 8.4 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | |
| | Temperature (°C) | 24.6 | 24.8 | 24.4 | 24.7 | 24.3 | 25.1 |
| 10.98% | pH (S.U.) | 8.09 | 8.06 | 8.07 | 8.08 | 8.09 | 8.04 |
| | DO (mg/L) | 8.0 | 8.2 | 8.2 | 8.1 | 8.0 | 8.3 |
| | Conductivity (µmhos/cm) | 299 | | 288 | | 302 | |
| | Temperature (°C) | 24.6 | 24.8 | 24.6 | 24.7 | 24.3 | 25.1 |
| 22% | pH (S.U.) | 8.10 | 8.04 | 8.07 | 8.08 | 8.10 | 8.05 |
| | DO (mg/L) | 8.1 | 8.2 | 8.2 | 8.1 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 287 | | 278 | | 291 | |
| | Temperature (°C) | 24.7 | 24.8 | 24.6 | 24.6 | 24.4 | 25.1 |
| 43.9% | pH (S.U.) | 8.10 | 8.07 | 8.06 | 8.08 | 8.09 | 8.06 |
| | DO (mg/L) | 8.1 | 8.2 | 8.3 | 8.1 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 273 | | 253 | | 264 | |
| | Temperature (°C) | 24.7 | 24.8 | 24.7 | 24.6 | 24.7 | 25.1 |
| 72% | pH (S.U.) | 8.10 | 8.12 | 8.06 | 8.08 | 8.09 | 8.05 |
| | DO (mg/L) | 8.1 | 8.3 | 8.2 | 8.1 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 237 | | 234 | | 237 | |
| | Temperature (°C) | 24.9 | 24.8 | 24.6 | 24.6 | 24.8 | 25.1 |
| 100% | pH (S.U.) | 8.10 | 8.12 | 8.06 | 8.10 | 8.07 | 8.05 |
| | DO (mg/L) | 8.1 | 8.3 | 8.3 | 8.1 | 8.1 | 8.2 |
| | Conductivity (µmhos/cm) | 211 | | 202 | | 209 | |
| | Temperature (°C) | 24.8 | 24.8 | 24.8 | 24.6 | 25.0 | 25.1 |
| 100% INTAKE | pH (S.U.) | 8.09 | 8.13 | 8.04 | 8.09 | 8.07 | 8.04 |
| | DO (mg/L) | 8.2 | 8.4 | 8.2 | 8.2 | 8.3 | 8.3 |
| | Conductivity (µmhos/cm) | 209 | | 203 | | 211 | |
| | Temperature (°C) | 25.1 | 24.8 | 24.5 | 24.5 | 25.0 | 25.1 |

**Species:** *Ceriodaphnia dubia*

**Client:** SEQUOYAH

**Date:** 08·06·02

| Concentration | Parameter | Day 3 Initial | Day 3 Final | Day 4 Initial | Day 4 Final | Day 5 Initial | Day 5 Final | Day 6 Initial | Day 6 Final |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 8.17 | 8.06 | 8.17 | 8.05 | 8.05 | 8.02 | 8.03 |
| | DO (mg/L) | 8.2 | 8.2 | 8.1 | 8.2 | 8.2 | 8.3 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 301 | | 303 | | 302 | | 313 | |
| | Temperature (°C) | 24.7 | 24.9 | 24.7 | 25.2 | 24.2 | 24.5 | 24.6 | 24.8 |
| 10.98% | pH (S.U.) | 8.07 | 8.19 | 8.06 | 8.18 | 8.06 | 8.03 | 8.02 | 8.07 |
| | DO (mg/L) | 8.3 | 8.2 | 8.1 | 8.2 | 8.2 | 8.3 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 289 | | 285 | | 292 | | 299 | |
| | Temperature (°C) | 24.9 | 24.9 | 24.7 | 25.2 | 24.4 | 24.5 | 24.6 | 24.9 |
| 22% | pH (S.U.) | 8.06 | 8.18 | 8.04 | 8.16 | 8.06 | 8.02 | 8.01 | 8.02 |
| | DO (mg/L) | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 277 | | 274 | | 280 | | 286 | |
| | Temperature (°C) | 25.0 | 24.9 | 24.6 | 25.2 | 24.4 | 24.5 | 24.8 | 24.9 |
| 43.9% | pH (S.U.) | 8.07 | 8.19 | 8.02 | 8.18 | 8.03 | 8.05 | 8.00 | 8.06 |
| | DO (mg/L) | 8.2 | 8.2 | 8.3 | 8.2 | 8.2 | 8.2 | 8.4 | 8.2 |
| | Conductivity (µmhos/cm) | 258 | | 250 | | 260 | | 265 | |
| | Temperature (°C) | 25.3 | 24.8 | 24.6 | 25.2 | 24.7 | 24.4 | 24.8 | 24.7 |
| 72% | pH (S.U.) | 8.06 | 8.18 | 7.97 | 8.14 | 7.99 | 8.02 | 7.98 | 8.05 |
| | DO (mg/L) | 8.2 | 8.2 | 8.3 | 8.2 | 8.2 | 8.2 | 8.4 | 8.2 |
| | Conductivity (µmhos/cm) | 230 | | 222 | | 224 | | 230 | |
| | Temperature (°C) | 25.5 | 24.8 | 24.6 | 25.2 | 24.8 | 24.5 | 25.1 | 24.7 |
| 100% | pH (S.U.) | 8.06 | 8.21 | 7.94 | 8.20 | 7.94 | 8.00 | 7.97 | 8.06 |
| | DO (mg/L) | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.4 | 8.3 |
| | Conductivity (µmhos/cm) | 204 | | 193 | | 196 | | 201 | |
| | Temperature (°C) | 25.6 | 24.9 | 24.6 | 25.2 | 25.1 | 24.3 | 25.3 | 24.7 |
| 100% INTAKE | pH (S.U.) | 8.05 | 8.13 | 7.87 | 8.15 | 7.90 | 7.99 | 7.95 | 7.99 |
| | DO (mg/L) | 8.3 | 8.2 | 8.4 | 8.1 | 8.4 | 8.1 | 8.4 | 8.3 |
| | Conductivity (µmhos/cm) | 202 | | 192 | | 215 | | 200 | |
| | Temperature (°C) | 24.4 | 24.6 | 24.8 | 25.2 | 25.0 | 24.3 | 25.2 | 24.7 |

# Environmental Testing Solutions, LLC

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

### Summary of Chemical Analyses

**Client:** Sequoyah Nuclear Plant UV-Treated
**Test dates:** August 06-13, 2002
**Project number:** 405

Reviewed by: CM

*Pimephales promelas*

| Concentration | Parameter | Initial | | | | Final | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Mean | S | Minimum | Maximum | Mean | S |
| Control | pH (SU) | 7.98 | 8.08 | 8.05 | 0.04 | 7.62 | 8.03 | 7.72 | 0.14 |
| | DO (mg/L) | 7.9 | 8.2 | 8.1 | 0.1 | 7.1 | 8.3 | 7.5 | 0.4 |
| | Conductivity (µmhos/cm) | 296 | 311 | 301 | 6 | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 63 | 66 | 64 | 2 | | | | |
| | Hardness (mg/L $CaCO_3$) | 85 | 89 | 87 | 2 | | | | |
| | Initial Temperature (°C) | | | | | 24.3 | 24.7 | 24.5 | 0.1 |
| | Final Temperature (°C) | | | | | 24.4 | 25.3 | 24.9 | 0.3 |
| 10.98% | pH (SU) | 7.98 | 8.08 | 8.04 | 0.04 | 7.59 | 8.02 | 7.73 | 0.14 |
| | DO (mg/L) | 7.9 | 8.2 | 8.1 | 0.1 | 7.1 | 8.3 | 7.5 | 0.4 |
| | Conductivity (µmhos/cm) | 284 | 306 | 293 | 7 | | | | |
| | Initial Temperature (°C) | | | | | 24.4 | 24.9 | 24.7 | 0.2 |
| | Final Temperature (°C) | | | | | 24.4 | 25.4 | 24.9 | 0.4 |
| 22% | pH (SU) | 7.98 | 8.08 | 8.04 | 0.04 | 7.60 | 7.99 | 7.70 | 0.13 |
| | DO (mg/L) | 7.9 | 8.3 | 8.1 | 0.1 | 7.2 | 8.3 | 7.5 | 0.4 |
| | Conductivity (µmhos/cm) | 272 | 294 | 280 | 7 | | | | |
| | Initial Temperature (°C) | | | | | 24.6 | 25.1 | 24.8 | 0.2 |
| | Final Temperature (°C) | | | | | 24.4 | 25.2 | 24.9 | 0.3 |
| 43.9% | pH (SU) | 7.98 | 8.08 | 8.04 | 0.03 | 7.54 | 8.02 | 7.68 | 0.16 |
| | DO (mg/L) | 7.9 | 8.3 | 8.1 | 0.1 | 6.8 | 8.3 | 7.4 | 0.5 |
| | Conductivity (µmhos/cm) | 245 | 269 | 258 | 8 | | | | |
| | Initial Temperature (°C) | | | | | 24.7 | 25.3 | 24.9 | 0.3 |
| | Final Temperature (°C) | | | | | 24.4 | 25.2 | 24.8 | 0.3 |
| 72% | pH (SU) | 7.97 | 8.08 | 8.03 | 0.04 | 7.56 | 8.04 | 7.69 | 0.16 |
| | DO (mg/L) | 7.9 | 8.2 | 8.1 | 0.1 | 6.7 | 8.3 | 7.4 | 0.5 |
| | Conductivity (µmhos/cm) | 220 | 238 | 229 | 6 | | | | |
| | Initial Temperature (°C) | | | | | 24.7 | 25.4 | 25.1 | 0.3 |
| | Final Temperature (°C) | | | | | 24.4 | 25.2 | 24.8 | 0.3 |
| 100% | pH (SU) | 7.96 | 8.09 | 8.02 | 0.05 | 7.58 | 8.02 | 7.73 | 0.14 |
| | DO (mg/L) | 7.8 | 8.3 | 8.1 | 0.2 | 7.2 | 8.4 | 7.5 | 0.4 |
| | Conductivity (µmhos/cm) | 193 | 209 | 201 | 6 | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 69 | 78 | 73 | 5 | | | | |
| | Hardness (mg/L $CaCO_3$) | 83 | 87 | 86 | 2 | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | 0 | | | | |
| | Initial Temperature (°C) | | | | | 24.7 | 25.4 | 25.1 | 0.3 |
| | Final Temperature (°C) | | | | | 24.4 | 25.2 | 24.8 | 0.3 |
| 100% Intake | pH (SU) | 7.75 | 8.07 | 7.97 | 0.11 | 7.56 | 8.04 | 7.70 | 0.16 |
| | DO (mg/L) | 7.9 | 8.3 | 8.2 | 0.1 | 7.2 | 8.3 | 7.5 | 0.4 |
| | Conductivity (µmhos/cm) | 190 | 212 | 199 | 7 | | | | |
| | Alkalinity (mg/L $CaCO_3$) | 69 | 73 | 71 | 2 | | | | |
| | Hardness (mg/L $CaCO_3$) | 79 | 89 | 84 | 5 | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | 0 | | | | |
| | Initial Temperature (°C) | | | | | 24.6 | 25.5 | 25.0 | 0.3 |
| | Final Temperature (°C) | | | | | 24.4 | 25.1 | 24.8 | 0.3 |

| | | | | |
|---|---|---|---|---|
| Overall Temperature (°C) (including all concentrations for initial and final temperatures) | 24.3 | 25.5 | 24.9 | 0.3 |

# Environmental Testing Solutions, LLC

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

### Daily Chemical Analyses

**Client:** Sequoyah Nuclear Plant UV-Treated

**Test dates:** August 06-13, 2002

**Project number:** 405

**Reviewed by:** CW

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Control | pH (SU) | 8 08 | 8 03 | 8 08 | 7 70 | 8 06 | 7 65 | 8 02 | 7.70 | 8 06 | 7.62 | 8.04 | 7.70 | 7.98 | 7 62 |
| | DO (mg/L) | 8 0 | 8 3 | 8.1 | 7.5 | 7 9 | 7 5 | 8 2 | 7 6 | 8 0 | 7.1 | 8.1 | 7.3 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 305 | | 298 | | 311 | | 297 | | 296 | | 297 | | 303 | |
| | Alkalinity (mg/L $CaCO_3$) | 66 | | 63 | | | | 63 | | | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | 85 | | | | 89 | | | | | | | |
| | Temperature (°C) | 24 5 | 25.1 | 24 6 | 25 0 | 24 4 | 24 8 | 24 5 | 24 4 | 24.7 | 25.1 | 24.3 | 25.3 | 24 6 | 24.6 |
| 10.98% | pH (SU) | 8 07 | 8 02 | 8 08 | 7 74 | 8 07 | 7 68 | 8 02 | 7.74 | 8 05 | 7.65 | 8.04 | 7.72 | 7.98 | 7.59 |
| | DO (mg/L) | 8.1 | 8 3 | 8 0 | 7 4 | 7 9 | 7 5 | 8 2 | 7 6 | 8 0 | 7.1 | 8.2 | 7.3 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 295 | | 290 | | 306 | | 288 | | 284 | | 294 | | 296 | |
| | Temperature (°C) | 24.5 | 25.1 | 24 9 | 25 0 | 24 4 | 24 6 | 24.7 | 24 4 | 24 8 | 25.1 | 24.7 | 25 4 | 24 8 | 24 6 |
| 22% | pH (SU) | 8 07 | 7 99 | 8 08 | 7 70 | 8 07 | 7.66 | 8 02 | 7 66 | 8 05 | 7 64 | 8 04 | 7.62 | 7.98 | 7 60 |
| | DO (mg/L) | 8 1 | 8 3 | 8 2 | 7 4 | 7.9 | 7.6 | 8 3 | 7 6 | 8 2 | 7 2 | 8.2 | 7.4 | 8 1 | 7.3 |
| | Conductivity (µmhos/cm) | 282 | | 276 | | 294 | | 275 | | 272 | | 280 | | 281 | |
| | Temperature (°C) | 24 6 | 25.1 | 25 1 | 25 0 | 24.7 | 24 6 | 24 8 | 24 4 | 24 8 | 25.1 | 24 9 | 25 2 | 25 0 | 24 6 |
| 43.9% | pH (SU) | 8 07 | 8 02 | 8 08 | 7 69 | 8 06 | 7 65 | 8 02 | 7 66 | 8 03 | 7.57 | 8 03 | 7 61 | 7.98 | 7 54 |
| | DO (mg/L) | 8 2 | 8 3 | 8 0 | 7 4 | 7.9 | 7.6 | 8 3 | 7 2 | 8 2 | 6 8 | 8 2 | 7 0 | 8 1 | 7.3 |
| | Conductivity (µmhos/cm) | 269 | | 251 | | 266 | | 256 | | 245 | | 260 | | 260 | |
| | Temperature (°C) | 24.8 | 25.1 | 25 3 | 25 0 | 24.7 | 24 6 | 24 8 | 24 4 | 24.7 | 25.1 | 25.2 | 25.2 | 25.1 | 24 4 |
| 72% | pH (SU) | 8 07 | 8 04 | 8 08 | 7 70 | 8 05 | 7 63 | 8 01 | 7 66 | 8 01 | 7.56 | 8 01 | 7.63 | 7.97 | 7.59 |
| | DO (mg/L) | 8 1 | 8 3 | 8.2 | 7.4 | 7 9 | 7.5 | 8 2 | 7.3 | 8 1 | 6.7 | 8 2 | 7.1 | 8 1 | 7.3 |
| | Conductivity (µmhos/cm) | 234 | | 231 | | 238 | | 226 | | 220 | | 226 | | 226 | |
| | Temperature (°C) | 24 7 | 25.1 | 25 4 | 25.0 | 24.8 | 24 6 | 25.1 | 24 4 | 24 9 | 25 1 | 25 4 | 25 2 | 25.1 | 24 5 |
| 100% | pH (SU) | 8 09 | 8 02 | 8 07 | 7.73 | 8 05 | 7 68 | 8 02 | 7.75 | 7.99 | 7.64 | 7.99 | 7 69 | 7.96 | 7 58 |
| | DO (mg/L) | 8.2 | 8 4 | 8 3 | 7.4 | 7 8 | 7 4 | 8.2 | 7.2 | 8.2 | 7.2 | 8.1 | 7.5 | 8.2 | 7.3 |
| | Conductivity (µmhos/cm) | 208 | | 201 | | 209 | | 200 | | 193 | | 196 | | 197 | |
| | Alkalinity (mg/L $CaCO_3$) | 78 | | | | 71 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 87 | | | | 87 | | | | 83 | | | | | |
| | Total Residual Chlorine (mg/L) | <0 1 | | | | <0.10 | | | | <0 10 | | | | | |
| | Temperature (°C) | 24 7 | 25 1 | 25 4 | 25 0 | 24 9 | 24.5 | 25.4 | 24.4 | 24.9 | 25.1 | 25.4 | 25.2 | 25.3 | 24.6 |
| 100% Intake | pH (SU) | 8 05 | 8 04 | 8 07 | 7.76 | 8 03 | 7 64 | 7.75 | 7 68 | 7 96 | 7.63 | 7.96 | 7 62 | 7.94 | 7.56 |
| | DO (mg/L) | 8 1 | 8 3 | 8 3 | 7.5 | 7.9 | 7.2 | 8.2 | 7.6 | 8.2 | 7.2 | 8 2 | 7.5 | 8.2 | 7.4 |
| | Conductivity (µmhos/cm) | 203 | | 198 | | 204 | | 212 | | 190 | | 195 | | 194 | |
| | Alkalinity (mg/L $CaCO_3$) | 73 | | | | 72 | | | | 69 | | | | | |
| | Hardness (mg/L $CaCO_3$) | 83 | | | | 79 | | | | 89 | | | | | |
| | Total Residual Chlorine (mg/L) | <0.10 | | | | <0 10 | | | | <0.10 | | | | | |
| | Temperature (°C) | 24 6 | 25.1 | 25 0 | 25 0 | 24 9 | 24 5 | 25 0 | 24 4 | 24 6 | 25.1 | 25.5 | 25.1 | 25.2 | 24 6 |

**Species:** ***Pimephales promelas***

**Client:** SEQUOYAH - UV-TREATED

**Date:** 08-06-02

***Full-strength Chemistry:*** OUTFALL 101

| Parameter | Sample Number: 1 | 2 | 3 | Control Batch: 07-29-02 | 08-05-02 | 08-07-02 |
|---|---|---|---|---|---|---|
| pH (S.U.) | 8.09 | 8.05 | 7.99 | 8.08 | 8.08 | 8.02 ~~8.07~~ |
| DO (mg/L) | 8.2 | 7.8 | 8.2 | 8.0 | 8.1 | 8.2 |
| Conductivity (µmhos/cm) | 208 | 209 | 193 | 305 | 298 | 297 |
| Alkalinity (mg $CaCO_3$/L) | 78 | 71 | 69 | 64 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 87 | 87 | 83 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-04-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1147 | 1157 | 1232 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.7°C | 1.2°C | 1.7°C | | | |
| Physical characteristics | pale tan, Clear, particles | PALE YELLOW CLEAR | Tan Slightly Cloudy | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.04 | 020808.06 | 020810.05 | | | |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH UV-TREATED

**Date:** 08-06-02

***Full-strength Chemistry:*** INTAKE

| Parameter | Sample Number: 1 | 2 | 3 | Control Batch: 07-29-02 | 08-05-02 | 08-07-02 |
|---|---|---|---|---|---|---|
| pH (S.U.) | 8.05 | 8.03 | 7.96 | 8.08 | 8.08 | 8.02 |
| DO (mg/L) | 8.1 | 7.9 | 8.2 | 8.0 | 8.1 | 8.2 |
| Conductivity (µmhos/cm) | 203 | 204 | 190 | 305 | 298 | 297 |
| Alkalinity (mg $CaCO_3$/L) | 73 | 72 | 69 | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 83 | 79 | 89 | 87 | 85 | 89 |
| Chlorine (mg/L) | <0.10 | <0.10 | <0.10 | | | |
| Collection start date | 08-04-02 | 08-06-02 | 08-08-02 | | | |
| Collection end time | 1156 | 1145 | 1203 | | | |
| Grab or Composite (duration) | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | 23-HOUR COMPOSITE | | | |
| Temperature (°C) upon receipt | 0.5°C | 0.5°C | 1.5°C | | | |
| Physical characteristics | NO COLOR, Clear | CLEAR NO COLOR | pale tan Clear | | | |
| Dates sample used | 08-06-02 08-07-02 | 08-08-02 08-09-02 | 08-10-02 08-11-02 08-12-02 | | | |
| ETS Project and Sample numbers | 405 020806.05 | 020808.07 | 020810.06 | | | |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH UV-TREATED **Date:** 08-06-02

***Daily Chemistry:***

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.08 | 8.03 | 8.08 | 7.70 | 8.06 | 7.65 |
| | DO (mg/L) | 8.0 | 8.3 | 8.1 | 7.5 | 7.9 | 7.5 |
| | Conductivity (µmhos/cm) | 305 | | 298 | | 311 | |
| | Temperature (°C) | 24.5 | 25.1 | 24.6 | 25.0 | 24.4 | 24.8 |
| 10.98% | pH (S.U.) | 8.07 | 8.02 | 8.08 | 7.74 | 8.07 | 7.68 |
| | DO (mg/L) | 8.1 | 8.3 | 8.0 | 7.4 | 7.9 | 7.5 |
| | Conductivity (µmhos/cm) | 295 | | 290 | | 306 | |
| | Temperature (°C) | 24.5 | 25.1 | 24.9 | 25.0 | 24.4 | 24.6 |
| 22% | pH (S.U.) | 8.07 | 7.99 | 8.08 | 7.70 | 8.07 | 7.66 |
| | DO (mg/L) | 8.1 | 8.3 | 8.2 | 7.4 | 7.9 | 7.6 |
| | Conductivity (µmhos/cm) | 282 | | 276 | | 294 | |
| | Temperature (°C) | 24.6 | 25.1 | 25.1 | 25.0 | 24.7 | 24.6 |
| 43.9% | pH (S.U.) | 8.07 | 8.02 | 8.08 | 7.69 | 8.06 | 7.65 |
| | DO (mg/L) | 8.2 | 8.3 | 8.0 | 7.4 | 7.9 | 7.6 |
| | Conductivity (µmhos/cm) | 269 | | 251 | | 266 | |
| | Temperature (°C) | 24.8 | 25.1 | 25.3 | 25.0 | 24.7 | 24.6 |
| 72% | pH (S.U.) | 8.07 | 8.04 | 8.08 | 7.70 | 8.05 | 7.63 |
| | DO (mg/L) | 8.1 | 8.3 | 8.2 | 7.4 | 7.9 | 7.5 |
| | Conductivity (µmhos/cm) | 234 | | 231 | | 238 | |
| | Temperature (°C) | 24.7 | 25.1 | 25.4 | 25.0 | 24.8 | 24.6 |
| 100% | pH (S.U.) | 8.09 | 8.02 | 8.07 | 7.73 | 8.05 | 7.68 |
| | DO (mg/L) | 8.2 | 8.4 | 8.3 | 7.4 | 7.8 | 7.4 |
| | Conductivity (µmhos/cm) | 208 | | 201 | | 209 | |
| | Temperature (°C) | 24.7 | 25.1 | 25.4 | 25.0 | 24.9 | 24.5 |
| 100% INTAKE | pH (S.U.) | 8.05 | 8.04 | 8.07 | 7.76 | 8.03 | 7.64 |
| | DO (mg/L) | 8.1 | 8.3 | 8.3 | 7.5 | 7.9 | 7.2 |
| | Conductivity (µmhos/cm) | 203 | | 198 | | 204 | |
| | Temperature (°C) | 24.6 | 25.1 | 25.0 | 25.0 | 24.9 | 24.5 |
| | | Initial | Final | Initial | Final | Initial | Final |

**Species:** *Pimephales promelas*

**Client:** SEQUOYAH - UV-TREATED

**Date:** 08-06-02

| Concentration | Parameter | Day 3 Initial | Day 3 Final | Day 4 Initial | Day 4 Final | Day 5 Initial | Day 5 Final | Day 6 Initial | Day 6 Final |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.02 | 7.70 | 8.06 | 7.62 | 8.04 | 7.70 | 7.98 | 7.62 |
| | DO (mg/L) | 8.2 | 7.6 | 8.0 | 7.1 | 8.1 | 7.3 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 297 | | 296 | | 297 | | 303 | |
| | Temperature (°C) | 24.5 | 24.4" | 24.7 | 25.1 | 24.3 | 25.3 | 24.6 | 24.6 |
| 10.98% | pH (S.U.) | 8.02 | 7.74 | 8.05 | 7.65 | 8.04 | 7.72 | 7.98 | 7.59 |
| | DO (mg/L) | 8.2 | 7.6 | 8.0 | 7.1 | 8.2 | 7.3 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 288 | | 284 | | 294 | | 296 | |
| | Temperature (°C) | 24.7 | 24.4 | 24.8 | 25.1 | 24.7 | 25.4 | 24.8 | 24.6 |
| 22% | pH (S.U.) | 8.02 | 7.66 | 8.05 | 7.64 | 8.04 | 7.62 | 7.98 | 7.60 |
| | DO (mg/L) | 8.3 | 7.6 | 8.2 | 7.2 | 8.2 | 7.4 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 275 | | 272 | | 280 | | 281 | |
| | Temperature (°C) | 24.8 | 24.4 | 24.8 | 25.1 | 24.9 | 25.2 | 25.0 | 24.6 |
| 43.9% | pH (S.U.) | 8.02 | 7.66 | 8.03 | 7.57 | 8.03 | 7.61 | 7.98 | 7.54 |
| | DO (mg/L) | 8.3 | 7.2 | 8.2 | 6.8 | 8.2 | 7.0 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 256 | | 245 | | 260 | | 260 | |
| | Temperature (°C) | 24.8 | 24.4 | 24.7 | 25.1 | 25.2 | 25.2 | 25.1 | 24.4 |
| 72% | pH (S.U.) | 8.01 | 7.66 | 8.01 | 7.56 | 8.01 | 7.63 | 7.97 | 7.59 |
| | DO (mg/L) | 8.2 | 7.3 | 8.1 | 6.7 | 8.2 | 7.1 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 226 | | 220 | | 226 | | 226 | |
| | Temperature (°C) | 25.1 | 24.4 | 24.9 | 25.1 | 25.4 | 25.2 | 25.1 | 24.5 |
| 100% | pH (S.U.) | 8.02 | 7.75 | 7.99 | 7.64 | 7.99 | 7.69 | 7.96 | 7.58 |
| | DO (mg/L) | 8.2 | 7.2 | 8.2 | 7.2 | 8.1 | 7.5 | 8.2 | 7.3 |
| | Conductivity (µmhos/cm) | 200 | | 193 | | 196 | | 197 | |
| | Temperature (°C) | 25.4 | 24.4 | 24.9 | 25.1 | 25.4 | 25.2 | 25.3 | 24.6 |
| 100% INTAKE | pH (S.U.) | 7.75 | 7.68 | 7.96 | 7.63 | 7.96 | 7.62 | 7.94 | 7.56 |
| | DO (mg/L) | 8.2 | 7.6 | 8.2 | 7.2 | 8.2 | 7.5 | 8.2 | 7.4 |
| | Conductivity (µmhos/cm) | 212 | | 190 | | 195 | | 194 | |
| | Temperature (°C) | 25.0 | 24.4 | 24.6 | 25.1 | 25.5 | 25.1 | 25.2 | 24.6 |

# Alkalinity
## (EPA Method 310.1)

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

Analyst: KEL

Date analyzed: 08.13.02

**Titrate samples to pH = 4.50 S.U.**

*Titrant normality and multiplier determination:*

| pH of Deionized water = 4.5 S.U. | Titrant reference number | Normality check standard number | Begin ml | End ml | Total ml (E) | Normality (N) of $H_2SO_4$ = (5 ml $Na_2CO_3$ x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500 |
|---|---|---|---|---|---|---|---|
| 5.9 | IN8058 | IN5510 | 0.7 | 13.2 | 12.5 | 0.020 | 10 |

B/L - 0.6 - 0.7 = 0.1ml

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| IN55099 | 100 | 100 | 13.2 | 23.2 | 10 | 10 | 100 | 100% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 08.05.02 | SSWH2O | ~~30~~ 100 | 23.2 | 26.2 | 3.0 | 10 | S 30 | |
| 08.06.02 | Duplicate | 100 | 26.2 | 29.3 | 3.1 | 10 | D 31 | 3.3% |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| IN55099 | 50 | 100 | 26.2 | 34.2 | 8.0 | 10 | 80 |

| Sample alkalinity (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 31 | 51 | 102% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 07.30.02 | ~~08~~ SSW | 100 | 34.2 | 37.3 | 3.1 | 10 | 31 |
| 07.23.02 | MHSH2O | | 37.3 | 43.5 | 6.2 | | 62 |
| 07.29.02 | | | 1.0 | 7.6 | 6.6 | | 66 |
| 07.31.02A | | | 7.6 | 13.9 | 6.3 | | 63 |
| 07.31.02B | | | 13.9 | 20.2 | 6.3 | | 63 |
| 08.05.02 | | | 20.2 | 26.5 | 6.3 | | 63 |
| 08.06.02 | | | 26.5 | 33.0 | 6.5 | | 65 |
| 08.07.02 | | | 33.0 | 39.3 | 6.3 | | 63 |
| 08.09.02 | | | 39.3 | 45.8 | 6.5 | | 65 |

Reviewed by: [illegible]

Date reviewed: 08.15.02

# Alkalinity
## (EPA Method 310.1)

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

Analyst: [illegible]

Date analyzed: 08.13.02

**Titrate samples to pH = 4.50 S.U.**

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INS5099 | 100 | 100 | 0.9 | 10.9 | 10 | 10 | 100 | 100 |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 08.10.02 | MHS $H_2O$ | 100 | 10.9 | 17.4 | 6.5 | 10 | S 65 | |
| 08.10.02 | Duplicate | 100 | 17.4 | 23.7 | 6.3 | 10 | D 63 | 3.1% |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INS5099 | 50 | 100 | ~~23.7~~ 17.4 | 28.5 | 11.1 | 10 | 110 |

| Sample alkalinity (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 63 | 47 | 94% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 08.12-02 | MHS $H_2O$ | 100 | 28.6 | 35.3 | 6.7 | 10 | 67 |
| 08.05-02 | Salt $H_2O$ | | 35.3 | 44.1 | 8.8 | | 88 |
| 08.05-02 | | | 0.8 | 10.1 | 9.3 | | 93 |
| 08.06.02 | | | 10.5 | 19.0 | 8.5 | | 85 |
| 08.09.02 | | | 19.2 | 27.2 | 8.0 | | 80 |
| 08.12-02 A | | | 27.2 | 38.4 | 11.2 | | 110 |
| 08.12-02 B | | | 38.6 | 49.5 | 10.9 | | 110 |
| 020731.01 | AIQA BW005 1 | | 0.3 | 3.1 | 2.8 | | 28 |
| 020803.01 | 2 | | 3.3 | 6.1 | 2.8 | | 28 |

Reviewed by: [illegible]

Date reviewed: 08-18-02

# Alkalinity
## (EPA Method 310.1)

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

| | |
|---|---|
| Analyst | KEL |
| Date analyzed | 08.13-02 |

**Titrate samples to pH = 4.50 S.U.**

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INS5099 | 100 | 100 | 6.3 | 16.3 | 10 | 10 | 100 | 100% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 020809.06 | Guwa_Scale | 100 | 16.4 | 24.3 | 7.9 | 10 | S 79 | |
| 020807.06 | Duplicate | 100 | 24.3 | 32.2 | 7.9 | 10 | D 79 | — |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INS5099 | 50 | 100 | 24.3 | 37.2 | 12.9 | 10 | 130 |

| Sample alkalinity (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 79 | 51 | 102% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 020806.01 | N Cary 1 | 100 | 37.2 | 46.5 | 9.3 | 10 | 93 |
| 020808.01 | 2 | | 1.2 | 10.5 | 9.3 | | 93 |
| 020810.01 | 3 | | 10.5 | 19.8 | 9.3 | | 93 |
| — | DMEQA22 Cd 5ml | | 20.0 | 26.5 | 6.5 | | 65 |
| — | DMEQA22 AP 100% | | 26.5 | 32.8 | 6.3 | | 63 |
| 020806.03 | Core A1 cd 1 | 50 | 37.8 | 39.5 | 6.7 | (2) | 130 |
| 020808.05 | 2 | | 39.5 | 46.9 | 7.4 | | 150 |
| 020810.03 | 3 | | 0.7 | 10.0 | 8.3 | | 170 |
| 020806.02 | Core A1 AP 1 | | 10.0 | 17.5 | 7.5 | | 150 |

Reviewed by: [illegible]

Date reviewed: 08-18-02

# Alkalinity
## (EPA Method 310.1)

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

Analyst: KEN

Date analyzed: 08.18.02

**Titrate samples to pH = 4.50 S.U.**

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INS5099 | 100 | 100 | 17.7 | 27.7 | 10 | 10 | 100 | 100% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 02 080B.04 | Core A1 PP 2 | 50 | 27.7 | 35.7 | 8.0 | (2) 10 | S ~~80~~ 160 | |
| 020808.04 | Duplicate | 50 | 35.7 | 44.0 | 8.3 | (2) 10 | D 170 | 6.1% |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike alkalinity (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INS5099 | 100 | 50 | 35.7 | 49.0 | 13.3 | (2) 10 | 270 |

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

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Alkalinity (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| 020810.02 | Core A1 PP 3 | 50 | 2.4 | 11.2 | 8.8 | (2) 10 | 180 |
| 020806.04 | TVA SQN 101 1 | 100 | 11.2 | 19.0 | 7.8 | | 78 |
| 020808.06 | 2 | | 19.5 | 26.6 | 7.1 | | 71 |
| 020810.05 | 3 | | 26.6 | 33.5 | 6.9 | | 69 |
| 020806.05 | TVA INT 1 | | 33.5 | 40.8 | 7.3 | | 73 |
| 020808.07 | 2 | | 3.3 | 10.5 | 7.2 | | 72 |
| 020810.06 | 3 | | 10.5 | 17.4 | 6.9 | | 69 |
| 020806.06 | Charleston PW 1 | 50 | 17.5 | 20.5 | 3.0 | (2) | 60 |
| 020808.08 | 2 | 100 | 20.5 | 26.9 | 6.4 | | 64 |
| 020810.12 | 3 | | 26.9 | 32.3 | 5.4 | | 54 |

Reviewed by: JJ

Date reviewed: 08.18.02

# Total Hardness
## (EPA Method 130.2)

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

| | |
|---|---|
| Analyst | [illegible] |
| Date analyzed | 08-13-02 |

*Titrant normality and multiplier determination:*

| Titrant reference number | Normality check standard number | Begin ml | End ml | Total ml (E) | Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022) | pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000 |
|---|---|---|---|---|---|---|
| WR050 | INS5092 | 0.1 | 10.0 | 9.9 | 0.0202 | 20.2 |

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS101 | 40 | 50 | 10.0 | 12.0 | 2.0 | 20.2 | 40.4 | 101% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 07-30-02 | SSW $H_2O$ | 50 | 12.2 | 14.5 | 2.3 | 20.2 | S 46 | |
| 07-30-02 | Duplicate | 50 | 14.5 | 17.0 | 2.5 | 20.2 | D 50 | 8.32 |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS101 | 40 | 50 | 14.5 | 19.0 | 4.5 | 20.2 | 91 |

| Sample hardness (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 50 | 41 | 102.5% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| TV=ND | Blank (should be = 0 mg $CaCO_3$/L) | 50 | 0.1 | 0.1 | 0.0 | 20.2 | ND |
| 08-05-02 | SSW $H_2O$ | | 19.0 | 21.3 | 2.3 | | 46 |
| 07-23-02 | MHS $H_2O$ | | 21.5 | 25.6 | 4.1 | | 83 |
| 07-29-02 | | | 25.6 | 29.9 | 4.3 | | 87 |
| 07-31-02A | | | 29.9 | 34.2 | 4.3 | | 87 |
| 07-31-02B | | | 34.2 | 38.5 | 4.3 | | 87 |
| 08-05-02 | | | 38.5 | 42.7 | 4.2 | | 85 |
| 08-06-02 | | | 42.7 | 47.1 | 4.4 | | 89 |
| 08-07-02 | | | 4.0 | 8.4 | 4.4 | | 89 |
| 08-09-02 | | | 8.4 | 12.6 | 4.2 | | 85 |

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

Reviewed by: [illegible]

Date reviewed 08-18-02

# Total Hardness
## (EPA Method 130.2)

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

| | |
|---|---|
| Analyst | KCL |
| Date analyzed | 08.13.02 |

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INSS101 | 40 | 50 | 12.6 | 14.6 | 2.0 | 20.2 | 40.4 | 101% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 08.10.02 | MHS $H_2O$ | 50 | 11.0 | 15.4 | 4.4 | 20.2 | S 89 | |
| 08.10.02 | Duplicate | 50 | 15.5 | 19.8 | 4.3 | 20.2 | D 87 | 2.3% |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INSS101 | | | 15.5 | 21.9 | 6.4 | 20.2 | 130 |

| Sample hardness (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 87 | 43 | 107.5% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| | Blank (should be = 0 mg $CaCO_3$/L) | | | | | | 0 |
| 08.12.02 | MHS | 50 | 21.9 | 26.3 | 4.4 | 20.2 | 89 |
| 020731.01 | ALCOA BW005 1 | | 26.3 | 28.7 | 2.4 | | ~~49~~ 48 |
| 020803.01 | ↓ 2 | | 28.7 | 31.0 | 2.3 | | 46 |
| 020807.06 | Georgetown - Scale | | 31.0 | 32.6 | 1.6 | | 32 |
| 020806.01 | N. Carry 1 | | 32.6 | 36.0 | 3.4 | | 69 |
| 020808.01 | ↓ 2 | | 36.0 | 39.3 | 3.3 | | 67 |
| 020810.01 | ↓ 3 | | 39.3 | 42.6 | 3.3 | | 67 |
| — | DMR QA-22 Cd 50% | | 42.6 | ~~48.~~ 46.8 | 4.2 | | 85 |
| — | DMR QA-22 AP 100% | ↓ | 1.5 | 5.9 | 4.4 | ↓ | 89 |

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

Reviewed by: [signature]

Date reviewed 08-18-02

# Total Hardness
## (EPA Method 130.2)

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

Analyst: KYL

Date analyzed: 08-13-02

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| INS5101 | 40 | 50 | 5.9 | 8.0 | 2.1 | 20.2 | 42 | 105% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| 020806.03 | Corr-A1 cd1 | 25 | 8.0 | 12.1 | 4.1 | (2) 20.2 | S 170 | |
| 020806.03 | Duplicate | 25 | 12.1 | 16.7 | 4.6 | (2) 20.2 | D 190 | 11.1 |

*Matrix spike recovery:* NOT enough to recheck

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| INS5101 | | 25 | 21.5 | 23.4 | 1.9 | 20.2 | 38 |

| Sample hardness (B) (mg $CaCO_3$/L) | Measured spike value (MV) MV = A - B (mg $CaCO_3$/L) | % R = MV / SV x 100 (acceptable range = 75 to 125%) |
|---|---|---|
| 190 | 38 | 96% |

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| | Blank (should be = 0 mg $CaCO_3$/L) | | | | | | |
| 020808.05 | Corr A1 cd 2 | 25 | 16.7 | 21.5 | 4.8 | (2) 20.2 | 190 |
| 020810.03 | ↓ 3 | ↓ | 23.4 | 27.9 | 4.5 | (2) | 180 |
| 020806.02 | Corr A1 PP 1 | | 27.9 | 32.9 | 5.0 | (2) | 200 |
| 020808.04 | ↓ 2 | | 32.9 | 38.1 | 5.2 | (2) | 210 |
| 020810.02 | ↓ 3 | ↓ | 38.1 | 43.3 | 5.2 | (2) | 210 |
| 020806.04 | IVA SAN 101 1 | 50 | 43.3 | 47.6 | 4.3 | | 87 |
| 020808.06 | ↓ 2 | ↓ | 13.0 | 17.3 | 4.3 | | 87 |
| 020810.05 | ↓ 3 | | 17.3 | 21.4 | 4.1 | | 83 |
| 020806.05 | IVA SAN INT 1 | ↓ | 21.4 | 25.5 | 4.1 | ↓ | 83 |

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

Reviewed by: [illegible]

Date reviewed: 08-16-02

# Total Hardness
## (EPA Method 130.2)

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

Analyst: KEK

Date analyzed: 08-13-02

*Titrant normality and multiplier determination:*

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (MV) (mg $CaCO_3$/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|---|---|---|---|---|
| | 40 | 50 | | | | | | |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | S | |
| | Duplicate | | | | | | D | |

*Matrix spike recovery:*

| Reference standard number | Spike value (SV) (mg $CaCO_3$/L) | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Spike hardness (A) (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

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

*Sample measurements:*

| Sample number | Sample ID | Sample volume (ml) | Begin ml | End ml | Total ml | Multiplier | Hardness (mg $CaCO_3$/L) |
|---|---|---|---|---|---|---|---|
| | Blank (should be = 0 mg $CaCO_3$/L) | | | | | | N |
| 020808.07 | SQN INT 2 | 50 | 25.5 | 29.4 | 3.9 | 20.2 | 79 |
| 020810.04 | 1 3 | | 29.4 | 33.8 | 4.4 | | 89 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

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

Reviewed by: JJ

Date reviewed: 08-15-02

# Total Residual Chlorine
## (EPA Method 330.5)

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

| | |
|---|---|
| Analyst | KHL |
| Date analyzed | 08-06-02 |

| | |
|---|---|
| Iodide reagent: | INR051 |
| Acid reagent: | INR054 |
| Slope: | 27.4 |

*Calibration:*

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

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| INSS091 | 0.50 | 0.473 | 94.6% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 020806.06 | Charleston PW | pale tan, clear | S <0.00490 | |
| 020806.06 | Duplicate | | D <0.00446 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00602 |
| 020806.02 | Core-AL - PP | pale tan, slightly cloudy | <0.00142 |
| 020806.03 | Core-AL - Cd | pale tan, clear | <0.00106 |
| 020806.01 | Tritest - North Cary | no color, clear | <0.00715 |
| 020806.04 | SDN - 101 | pale tan, clear, roots, dirt | <0.00312 |
| 020806.05 | SDN - INT | no color, clear | <0.00306 |
| | | | |
| | | | |
| | | | |
| | | | |

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| INSS091 | 0.50 | 0.456 | 91.2% |

| | |
|---|---|
| Reviewed by | |
| Date reviewed | 08-18-02 |

# Total Residual Chlorine
## (EPA Method 330.5)

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

| | |
|---|---|
| Analyst | KJL |
| Date analyzed | 08-08-02 |

| | |
|---|---|
| Iodide reagent: | INR054 |
| Acid reagent: | INR054 |
| Slope: | 26.8 |

*Calibration:*

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

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| INSS091 | 0.50 | 0.498 | 99.6% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 020808.08 | Charleston PW | pale tan, clear | S <0.00477 | |
| ↓ | Duplicate | | D <0.00361 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00806 |
| 020808.04 | CORR-AL PP | pale tan, slightly cloudy | <0.00252 |
| 020808.05 | CORR-AL CD | pale yellow, clear | <0.00170 |
| 020808.01 | Treated - N.Cary | pale yellow clear | <0.00104 |
| 020808.02 | PC Phosphate 007 | pale yellow, clear | <0.00220 |
| 020808.03 | ↓ 100 | no color, clear | <0.00113 |
| 020808.06 | TVA - SQN 101 | pale yellow, clear | 0.0106 |
| 020808.07 | TVA - SQN INT | no color, clear | <0.00407 |
| | | | |
| | | | |

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| INSS091 | 0.50 | 0.476 | 95.2% |

| | |
|---|---|
| Reviewed by | |
| Date reviewed | 08-18-02 |

# Total Residual Chlorine
## (EPA Method 330.5)

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

| | |
|---|---|
| Analyst | KO |
| Date analyzed | 08-20-02. |

| | |
|---|---|
| Iodide reagent: | IN R051 |
| Acid reagent: | IN R054 |
| Slope: | 26.5 |

*Calibration:*

| | 0.10 mg/L | 1.00 mg/L |
|---|---|---|
| Reference standard number | IN SS091 | IN SS091 |

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| IN SS091 | 0.50 | 0.534 | 106.8% |

*Duplicate sample precision:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) | %RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%) |
|---|---|---|---|---|
| 020810.12 | Charleston PW | yellow clear | S <0.00544 | |
| ↓ | Duplicate | | D <0.00426 | — |

*Sample measurements:*

| Sample number | Sample ID | Sample characteristics | Residual chlorine (mg/L) |
|---|---|---|---|
| | Blank (should be = < 0.10 mg/L) | | <0.00903 |
| 020810.02 | Corr-AL PP | pale yellow, clear | <0.00181 |
| 020810.03 | Corr-AL CD | no color, clear | <0.00103 |
| 020810.01 | Treated Inc-North Corr | pale tan, clear | <0.00751 |
| 020810.05 | TVA-SQN 101 | tan, slightly cloudy | <0.00926 |
| 020810.06 | TVA SQN INT | pale tan, clear | <0.00593 |
| | | | |
| | | | |
| | | | |
| | | | |

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

*Laboratory control standard:*

| Reference standard number | True value (TV) (mg/L) | Measured value (MV) (mg/L) | % RS = MV / TV x 100 (acceptable range = 90 to 110%) |
|---|---|---|---|
| IN SS091 | 0.50 | 0.537 | 107.4% |

| | |
|---|---|
| Reviewed by | |
| Date reviewed | 08-18-02 |

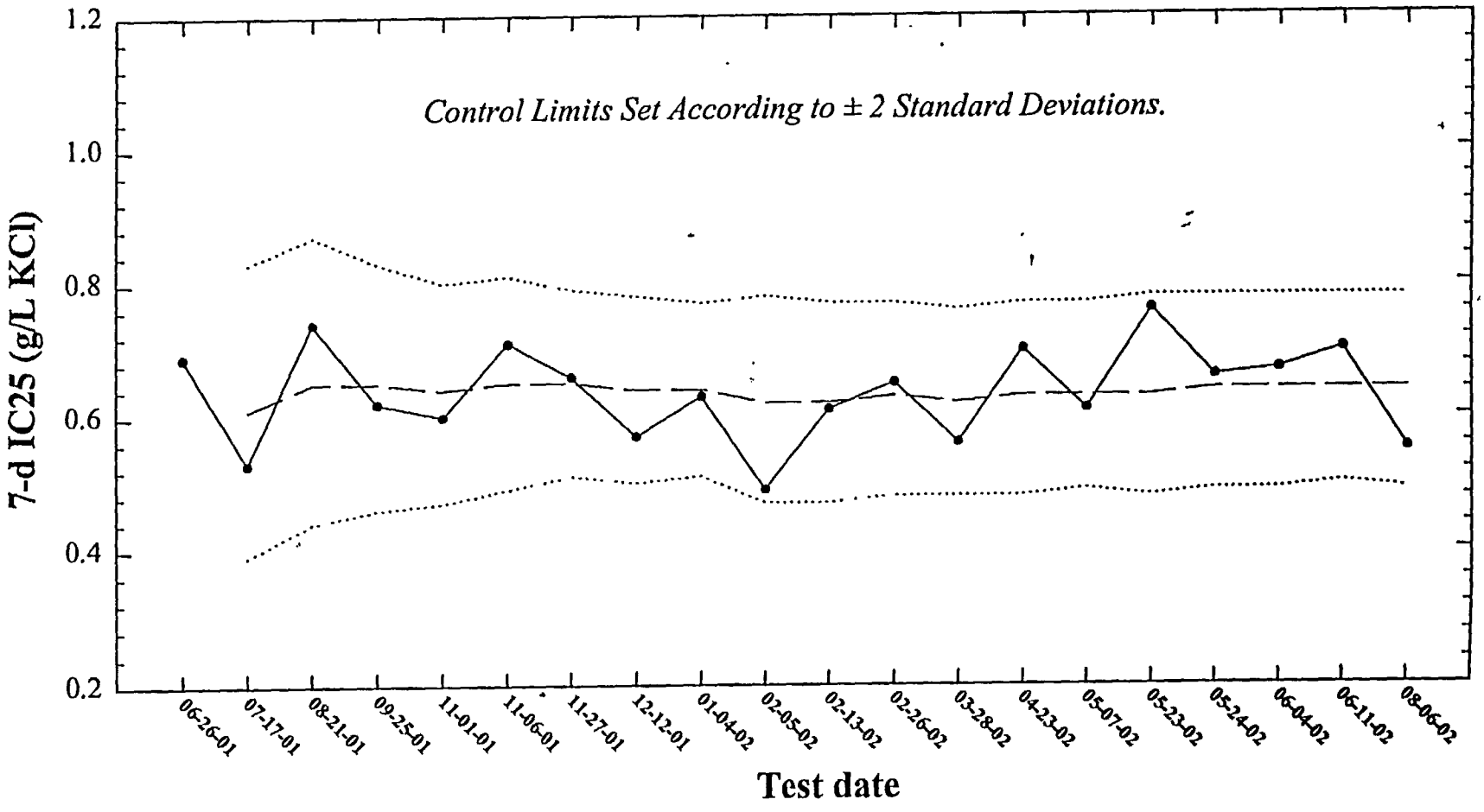
Sequoyah Nuclear Plant Biomonitoring
September 6-13, 2002

Appendix D

Reference Toxicant Test and
Control Chart

# Environmental Testing Solutions, LLC

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



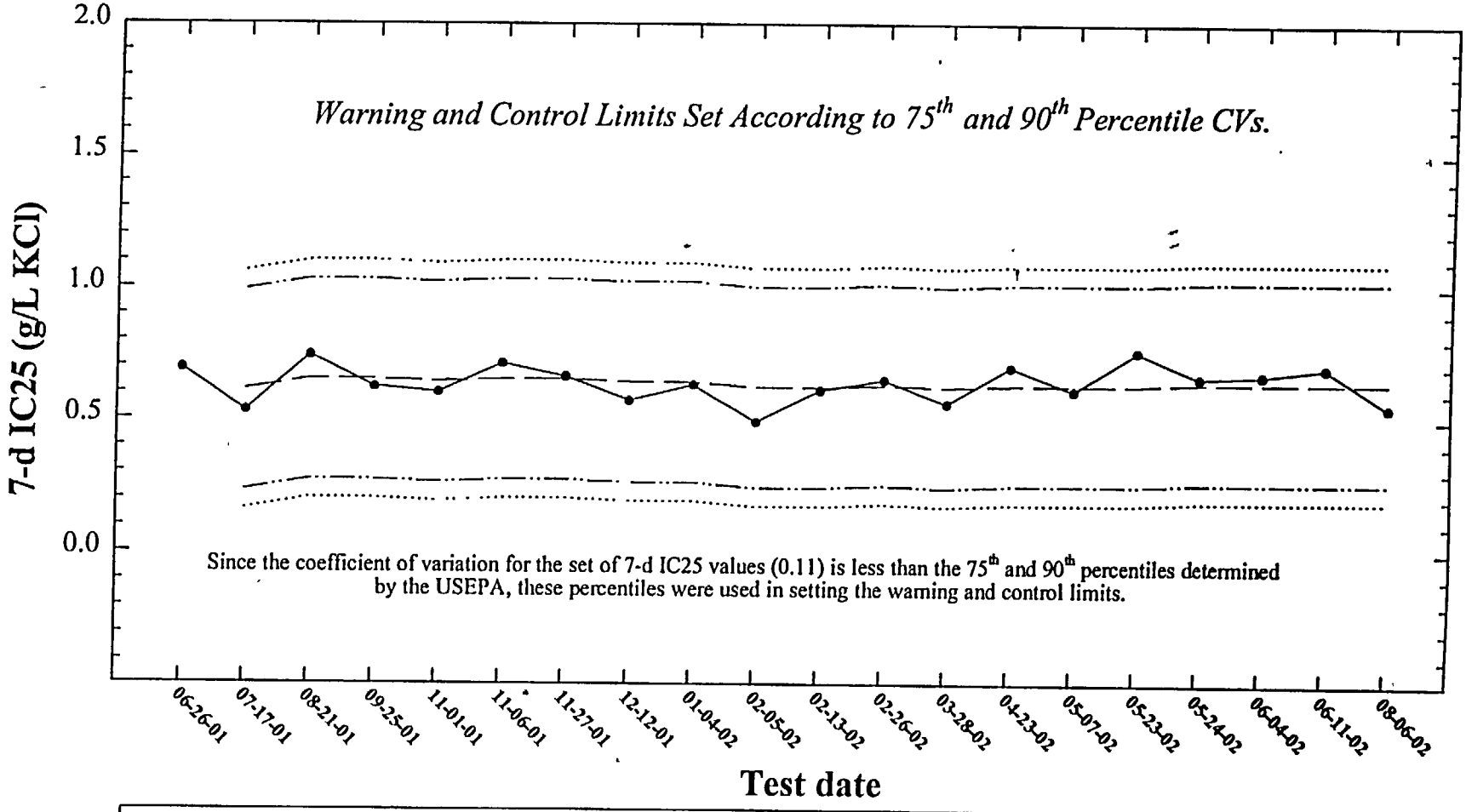

—•— **7-day IC25** = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

— – **Central Tendency** (mean IC25)

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

# Environmental Testing Solutions, LLC

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




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

— — **Central Tendency** (mean IC25)

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

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

# Environmental Testing Solutions, LLC

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

| Test number | Test date | 7-day IC25 (g KCl/L) | CT (g/L KCl) | S | CT - 2S | CT + 2S | $S_{A.75}$ | CT - $S_{A.75}$ | CT + $S_{A.75}$ | $S_{A.90}$ | CT - $S_{A.90}$ | CT + $S_{A.90}$ | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 06-26-01 | 0.69 | | | | | | | | | | | |
| 2 | 07-17-01 | 0.53 | 0.61 | 0.11 | 0.39 | 0.83 | 0.23 | 0.23 | 0.99 | 0.27 | 0.16 | 1.06 | 0.18 |
| 3 | 08-21-01 | 0.74 | 0.65 | 0.11 | 0.44 | 0.87 | 0.25 | 0.27 | 1.03 | 0.29 | 0.20 | 1.10 | 0.17 |
| 4 | 09-25-01 | 0.62 | 0.65 | 0.09 | 0.46 | 0.83 | 0.25 | 0.27 | 1.03 | 0.29 | 0.20 | 1.10 | 0.14 |
| 5 | 11-01-01 | 0.60 | 0 64 | 0.08 | 0.47 | 0.80 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.13 |
| 6 | 11-06-01 | 0.71 | 0.65 | 0 08 | 0.49 | 0.81 | 0.25 | 0.27 | 1.03 | 0.29 | 0.20 | 1.10 | 0.12 |
| 7 | 11-27-01 | 0.66 | 0 65 | 0 07 | 0.51 | 0.79 | 0.25 | 0.27 | 1.03 | 0.29 | 0.20 | 1.10 | 0.11 |
| 8 | 12-12-01 | 0.57 | 0.64 | 0.07 | 0.50 | 0.78 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.11 |
| 9 | 01-04-02 | 0.63 | 0.64 | 0.07 | 0.51 | 0.77 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.10 |
| 10 | 02-05-02 | 0.49 | 0.62 | 0.08 | 0.47 | 0.78 | 0.24 | 0.24 | 1.00 | 0.28 | 0.17 | 1.07 | 0.13 |
| 11 | 02-13-02 | 0.61 | 0.62 | 0.08 | 0.47 | 0.77 | 0.24 | 0.24 | 1.00 | 0.28 | 0.17 | 1.07 | 0.12 |
| 12 | 02-26-02 | 0.65 | 0.63 | 0.07 | 0.48 | 0.77 | 0.24 | 0.25 | 1.01 | 0.28 | 0.18 | 1.08 | 0.12 |
| 13 | 03-28-02 | 0.56 | 0.62 | 0.07 | 0.48 | 0.76 | 0.24 | 0.24 | 1.00 | 0.28 | 0.17 | 1.07 | 0.12 |
| 14 | 04-23-02 | 0.70 | 0.63 | 0.07 | 0.48 | 0.77 | 0.24 | 0.25 | 1.01 | 0.28 | 0.18 | 1.08 | 0.12 |
| 15 | 05-07-02 | 0.61 | 0.63 | 0.07 | 0.49 | 0.77 | 0.24 | 0.25 | 1.01 | 0.28 | 0.18 | 1.08 | 0.11 |
| 16 | 05-23-02 | 0.76 | 0.63 | 0 08 | 0.48 | 0.78 | 0.24 | 0.25 | 1.01 | 0.29 | 0.18 | 1.08 | 0.12 |
| 17 | 05-24-02 | 0.66 | 0 64 | 0 07 | 0.49 | 0.78 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.12 |
| 18 | 06-04-02 | 0.67 | 0.64 | 0.07 | 0.49 | 0.78 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.11 |
| 19 | 06-11-02 | 0.70 | 0.64 | 0.07 | 0.50 | 0.78 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.11 |
| 20 | 08-06-02 | 0.55 | 0.64 | 0.07 | 0.49 | 0.78 | 0.24 | 0.26 | 1.02 | 0.29 | 0.19 | 1.09 | 0.11 |

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

CT = Central tendency (mean IC25).

S = Standard deviation of the IC25 values.

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

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

CV = Coefficient of variation of the IC25 values.

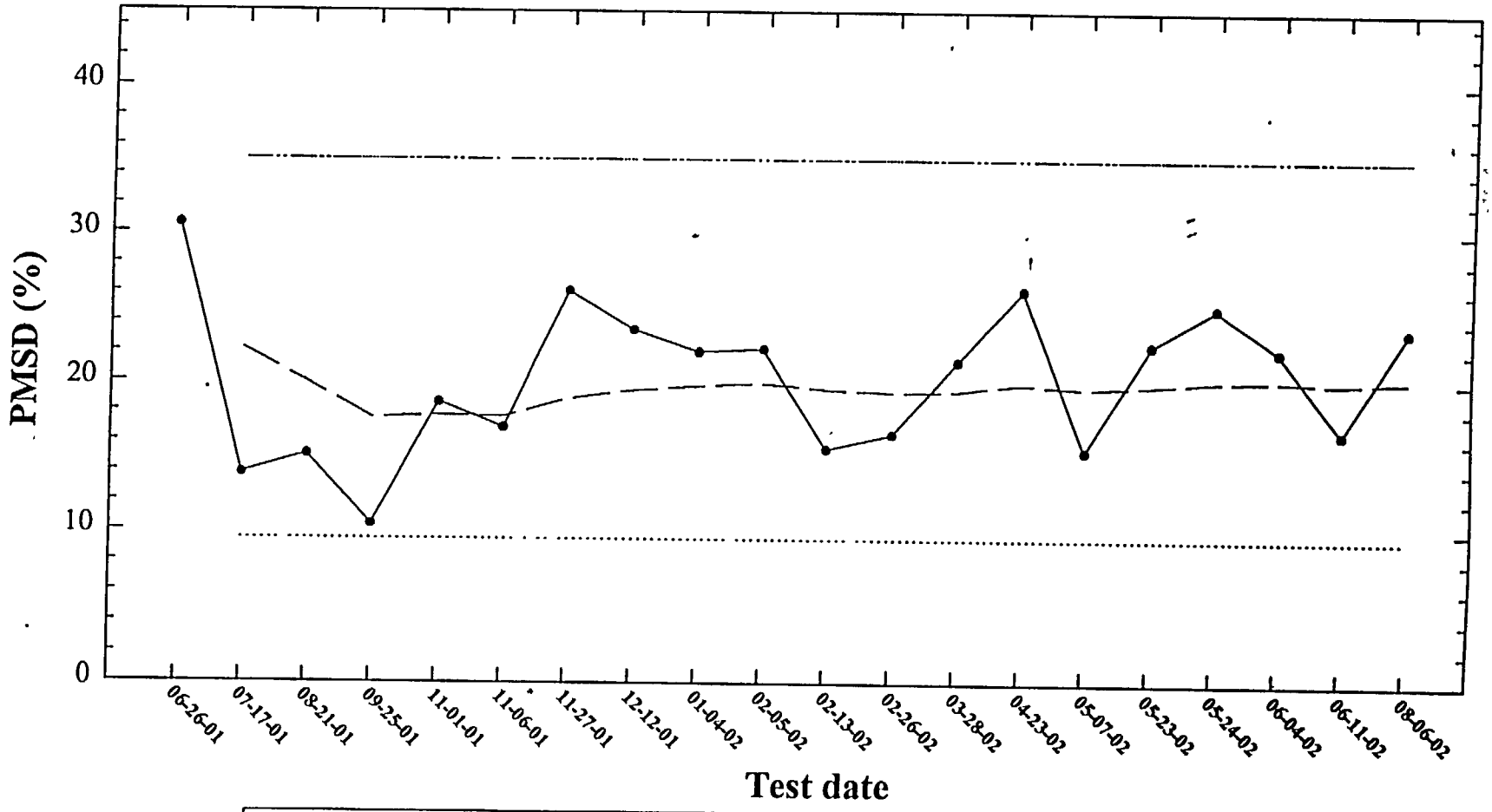
USEPA 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH

*Organisms obtained from Aquatic BioSystems, Inc*

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

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




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

— - Central Tendency (mean PMSD)

····· Lower and Upper PMSD Bounds

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

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

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

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

| Test number | Test date | Control Survival (%) | Control Mean Growth (mg/larvae) | CV (%) | CT for Control Growth CV (%) | MSD | PMSD (%) | CT for PMSD (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | 06-26-01 | 100 | 0.63 | 9.8 | | 0.19 | 30.6 | |
| 2 | 07-17-01 | 100 | 0.52 | 9.1 | 9.4 | 0.07 | 13.8 | 22.2 |
| 3 | 08-21-01 | 100 | 0.89 | 8.3 | 9.1 | 0.13 | 15.1 | 19.9 |
| 4 | 09-25-01 | 100 | 0.85 | 4.9 | 8.0 | 0.09 | 10.4 | 17.5 |
| 5 | 11-01-01 | 100 | 0.54 | 2.5 | 6.9 | 0.10 | 18.6 | 17.7 |
| 6 | 11-06-01 | 100 | 1.00 | 7.4 | 7.0 | 0.17 | 16.9 | 17.6 |
| 7 | 11-27-01 | 97.5 | 0.70 | 22.8 | 9.3 | 0.18 | 26.1 | 18.8 |
| 8 | 12-12-01 | 95 | 0.82 | 16.6 | 10.2 | 0.19 | 23.5 | 19.4 |
| 9 | 01-04-02 | 95 | 0.80 | 10.1 | 10.2 | 0.18 | 22.0 | 19.7 |
| 10 | 02-05-02 | 97.5 | 0.95 | 6.9 | 9.8 | 0.21 | 22.2 | 19.9 |
| 11 | 02-13-02 | 100 | 0.65 | 8.0 | 9.7 | 0.10 | 15.5 | 19.5 |
| 12 | 02-26-02 | 100 | 0.64 | 3.3 | 9.1 | 0.11 | 16.5 | 19.3 |
| 13 | 03-28-02 | 100 | 0.63 | 11.2 | 9.3 | 0.13 | 21.4 | 19.4 |
| 14 | 04-23-02 | 100 | 0.71 | 12.8 | 9.5 | 0.19 | 26.2 | 19.9 |
| 15 | 05-07-02 | 97.5 | 0.46 | 12.3 | 9.7 | 0.07 | 15.4 | 19.6 |
| 16 | 05-23-02 | 100 | 0.38 | 9.9 | 9.7 | 0.09 | 22.5 | 19.8 |
| 17 | 05-24-02 | 97.5 | 0.44 | 21.3 | 10.4 | 0.11 | 25.0 | 20.1 |
| 18 | 06-04-02 | 100 | 0.68 | 14 0 | 10.6 | 0.15 | 22.1 | 20.2 |
| 19 | 06-11-02 | 100 | 0.65 | 3.7 | 10.3 | 0.11 | 16.6 | 20.0 |
| 20 | 08-06-02 | 97.5 | 0.69 | 22.2 | 10.8 | 0.16 | 23.5 | 20.2 |

*Note*

CV = Coefficient of variation for control survival.
On average, the CV for control growth is **10.8%** in Environmental Testing Solutions, LLC *Pimephales* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 3 5%
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by **20.2%** from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9 4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

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

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

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

*Organisms obtained from Aquatic BioSystems, Inc.*

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

PpKClCR Test Number: 29

| *Dilution preparation information:* | | | | | | *Comments:* |
|---|---|---|---|---|---|---|
| KCl CHM number: | | CHM 067. | | | | |
| Stock preparation: | | 50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water | | | | |
| Dilution prep (mg/L) | 300 | 450 | 600 | 750 | 900 | |
| Stock volume (mL) | 6 | 9 | 12 | 15 | 18 | |
| Diluent volume (mL) | 994 | 991 | 988 | 985 | 982 | |

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | 24-HOURS OLD | Randomizing template: | Yellow |
| Date and times organisms were born between: | 08-05-02 1030 TO 1330 MST | Incubator number: | 2 |
| Organism source: | ABS BATCH 08-05-02 | *Artemia* lot number: | BG22OHQ |
| Transfer bowl information: | pH = 7.99 Temperature = 24.8°C | Oven temperature: | 101°C |
| | | Drying time: | 14-HOURS |

*Daily feeding and renewal information:*

| Day | Date | Morning feeding time | Afternoon feeding time | Test initiation, renewal, or termination time | Analyst |
|---|---|---|---|---|---|
| 0 | 08-06-02 | —— | 1630 | 1627 | JL |
| 1 | 08-07-02 | 1030 | 1637 | 1600 | JL |
| 2 | 08-08-02 | 1022 | 1630 | 1623 | JL |
| 3 | 08-09-02 | 1032 | 1640 | 1638 | JL |
| 4 | 08-10-02 | 1141 | 1750 | 1630 | JL |
| 5 | 08-11-02 | 1000 | 1600 | 1557 | JL |
| 6 | 08-12-02 | 1034 | 1638 | 1635 | JL |
| 7 | 08-13-02 | —— | —— | 1621 | JL |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints:* | |
|---|---|---|---|---|
| % Mortality: | 2.5% | ≤ 20% | 7-day LC50 | 750.3 |
| Average weight per larvae: | 0.694 | ≥ 0.25 mg/larvae | NOEC | 450 |
| | | | LOEC | 600 |
| | | | ChV | 519.6 |
| | | | IC25 | 552.6 |

PpKClCR Test Number: 29

*Survival and Growth Data*

| Day | CONTROL | | | | 300 mg KCl/L | | | | 450 mg KCl/L | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | J | K | L |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 4 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 5 | 10 | 10 | 10 | 9 id | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 6 | 10 | 10 | 10 | 9 | 9 id | 10 | 10 | 10 | 10 | 9 id | 10 | 10 |
| 7 | 10 | 10 | 10 | 9 | 9 | 10 | 10 | 10 | 10 | 9 | 10 | 10 |
| A = Pan weight (mg) RED | 15.040 | 15.063 | 14.958 | 14.685 | 15.004 | 14.953 | 14.805 | 15.054 | 14.730 | 14.870 | 14.659 | 15.063 |
| B = Pan + Larvae weight (mg) | 22.68 | 19.93 | 21.77 | 23.15 | 23.06 | 22.58 | 22.42 | 22.81 | 22.90 | 20.81 | 21.84 | 22.42 |
| Larvae weight (mg) = A – B | 7.640 | 4.867 | 6.812 | 8.455 | 8.056 | 7.627 | 7.615 | 7.756 | 8.170 | 5.940 | 7.181 | 7.357 |

Calculations and data reviewed. JH

| Comments: |
|---|
| |
| |
| |
| |
| |

PpKClCR Test Number: 29

*Survival and Growth Data*

| Day | 600 mg KCl/L | | | | 750 mg KCl/L | | | | 900 mg KCl/L | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | N | O | P | Q | R | S | T | U | V | W | X |
| 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 1 | 10 | 10 | 10 | 10 | 9 1d | 9 1d | 10 1d | 9 1d | 3 2d | 2 8d | 4 6d | 2 8d |
| 2 | 9 1d | 10 | 10 | 9 1d | 7 2d | 7 2d | 9 1d | 6 3d | 3 | 1 1d | 2 2d | 1 1d |
| 3 | 9 | 10 | 10 | 9 | 6 1d | 7 | 9 | 6 | 1 2d | 0 1d | 2 | 1 |
| 4 | 9 | 10 | 10 | 8 1d | 5 1d | 7 | 9 | 6 | 1 | 0 | 1 1d | 1 |
| 5 | 9 | 10 | 10 | 8 | 4 1d | 7 | 9 | 5 1d | 1 | 0 | 1 | 1 |
| 6 | 9 | 10 | 9 1d | 6 2d | 4 | 7 | 9 | 5 | 1 | 0 | 1 | 1 |
| 7 | 9 | 10 | 9 | 6 | 4 | 7 | 8 1d | 4 1d | 1 | 0 | 1 | 1 |
| A = Pan weight (mg) | 14.972 | 15.014 | 14.851 | 14.673 | 14.635 | 14.653 | 14.630 | 14.994 | 14.620 | — | 14.762 | 14.643 |
| B = Pan + Larvae weight (mg) | 20.26 | 20.71 | 19.17 | 18.39 | 17.44 | 18.19 | 18.79 | 17.70 | 15.29 | — | 15.24 | 15.64 |
| Larvae weight (mg) = A – B | 5.288 | 5.696 | 4.319 | 3.717 | 2.805 | 3.537 | 4.160 | 2.706 | 0.670 | — | 0.478 | 0.997 |

Calculations and data reviewed: DI

*Comments:*

# Environmental Testing Solutions, LLC

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

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

**Test number:** PpKClCR # 29

**Test dates:** August 6-13, 2002

**Reviewed by:** [signature]

| Concentration (mg/L KCl) | Replicate | Initial number of larvae | Final number of larvae | A = Pan weight (mg) | B = Pan + Larvae weight (mg) | Larvae weight (mg) = A - B | Weight / Initial number of larvae (mg) | Mean survival (%) | Mean weight (mg) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 15 040 | 22 680 | 7 640 | 0 7640 | 97.5 | 0 6944 | 22.2 | Not applicable |
| | B | 10 | 10 | 15 063 | 19 930 | 4 867 | 0 4867 | | | | |
| | C | 10 | 10 | 14 958 | 21 770 | 6 812 | 0 6812 | | | | |
| | D | 10 | 9 | 14 695 | 23 150 | 8 455 | 0 8455 | | | | |
| 300 | E | 10 | 9 | 15 004 | 23 060 | 8 056 | 0 8056 | 97.5 | 0.7764 | 2.6 | -11.8 |
| | F | 10 | 10 | 14 953 | 22 580 | 7 627 | 0 7627 | | | | |
| | G | 10 | 10 | 14 805 | 22 420 | 7 615 | 0 7615 | | | | |
| | H | 10 | 10 | 15 054 | 22 810 | 7.756 | 0 7756 | | | | |
| 450 | I | 10 | 10 | 14 730 | 22 900 | 8 170 | 0 8170 | 97.5 | 0.7162 | 12.9 | -3.1 |
| | J | 10 | 9 | 14 870 | 20 810 | 5 940 | 0 5940 | | | | |
| | K | 10 | 10 | 14 659 | 21 840 | 7.181 | 0 7181 | | | | |
| | L | 10 | 10 | 15 063 | 22 420 | 7.357 | 0 7357 | | | | |
| 600 | M | 10 | 9 | 14 972 | 20 260 | 5 288 | 0 5288 | 85 0 | 0 4755 | 19.0 | 31.5 |
| | N | 10 | 10 | 15 014 | 20 710 | 5 696 | 0 5696 | | | | |
| | O | 10 | 9 | 14 851 | 19 170 | 4 319 | 0 4319 | | | | |
| | P | 10 | 6 | 14 673 | 18 390 | 3 717 | 0 3717 | | | | |
| 750 | Q | 10 | 4 | 14 635 | 17 440 | 2 805 | 0 2805 | 57.5 | 0.3302 | 20 6 | 52.4 |
| | R | 10 | 7 | 14 653 | 18 190 | 3 537 | 0 3537 | | | | |
| | S | 10 | 8 | 14 630 | 18 790 | 4 160 | 0 4160 | | | | |
| | T | 10 | 4 | 14 994 | 17 700 | 2.706 | 0 2706 | | | | |
| 900 | U | 10 | 1 | 14 620 | 15 290 | 0 670 | 0 0670 | 7.5 | 0 0536 | 77.7 | 92.3 |
| | V | 10 | 0 | 0 000 | 0 000 | 0 000 | 0 0000 | | | | |
| | W | 10 | 1 | 14 762 | 15 240 | 0 478 | 0 0478 | | | | |
| | X | 10 | 1 | 14 643 | 15 640 | 0 997 | 0 0997 | | | | |

**Dunnett's MSD value:** 0.1633

**PMSD:** 23.5

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 20 2% from the control (determined

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

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

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

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

*Organisms obtained from Aquatic BioSystems, Inc*

# Environmental Testing Solutions, LLC
## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Growth**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | PpKCICR | Sample ID: | REF-Ref Toxicant |
| End Date: | 8/13/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | KCL-Potassium chloride |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 0.7640 | 0.4867 | 0.6812 | 0.8455 |
| 300 | 0.8056 | 0.7627 | 0.7615 | 0.7756 |
| 450 | 0.8170 | 0.5940 | 0.7181 | 0.7357 |
| 600 | 0.5288 | 0.5696 | 0.4319 | 0.3717 |
| 750 | 0.2805 | 0.3537 | 0.4160 | 0.2706 |
| 900 | 0.0670 | 0.0000 | 0.0478 | 0.0997 |

| Conc-mg/L | Mean | N-Mean | Transform. Untransformed Mean | Min | Max | CV% | N | t-Stat | 1-Tailed Critical | MSD | Isotonic Mean | N-Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 0 6944 | 1.0000 | 0.6944 | 0.4867 | 0.8455 | 22.154 | 4 | | | | 0.7354 | 1 0000 |
| 300 | 0.7764 | 1 1181 | 0.7764 | 0.7615 | 0.8056 | 2.643 | 4 | -1 150 | 2.290 | 0.1633 | 0.7354 | 1 0000 |
| 450 | 0.7162 | 1 0315 | 0.7162 | 0.5940 | 0.8170 | 12.867 | 4 | -0.306 | 2.290 | 0.1633 | 0.7162 | 0.9740 |
| *600 | 0.4755 | 0.6848 | 0.4755 | 0.3717 | 0.5696 | 18 955 | 4 | 3 068 | 2.290 | 0 1633 | 0 4755 | 0.6466 |
| 750 | 0.3302 | 0.4756 | 0.3302 | 0.2706 | 0 4160 | 20 641 | 4 | | | | 0.3302 | 0.4490 |
| 900 | 0.0536 | 0 0772 | 0.0536 | 0.0000 | 0 0997 | 77.723 | 4 | | | | 0 0536 | 0.0729 |

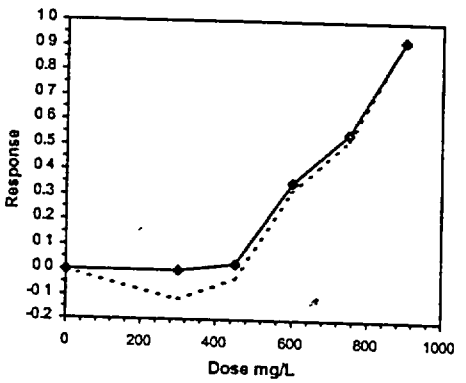
**Auxiliary Tests**

| | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates normal distribution (p > 0.01) | 0 962346911 | 0.844 | -0.638576412 | 0.709160105 |
| Bartlett's Test indicates equal variances (p = 0.06) | 7.236044884 | 11.34488201 | | |

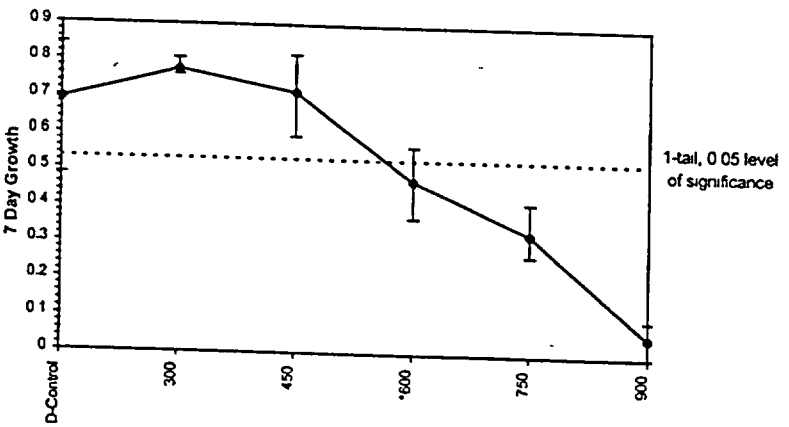
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 450 | 600 | 519 6152423 | | 0.163338371 | 0.235239247 | 0 069053993 | 0 010175025 | 0 006295148 | 3, 12 |

**Linear Interpolation (80 Resamples)**

| Point | mg/L | SD | 95% CL(Exp) | | Skew |
|---|---|---|---|---|---|
| IC05 | 460 98 | 59 64 | 158 17 | 492.12 | -1.3621 |
| IC10 | 483.89 | 35 10 | 308 99 | 527 08 | -1.5212 |
| IC15 | 506.80 | 28.29 | 374.27 | 567.34 | -1 0268 |
| IC20 | 529 72 | 27 05 | 433.28 | 606 72 | -0.3757 |
| IC25 | 552 63 | 27.25 | 464 11 | 639 77 | 0 0988 |
| IC40 | 635 40 | 34.31 | 534 13 | 723 98 | 0.0431 |
| IC50 | 711.31 | 31 08 | 590.57 | 794 73 | -0 4304 |




**Dose-Response Plot**




*Organisms obtained from Aquatic BioSystems, Inc.*

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Larval Fish Growth and Survival Test-7 Day Survival**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | PpKCICR | Sample ID: | REF-Ref Toxicant |
| End Date: | 8/13/02 | Lab ID: | ETS-Env Testing Solutions | Sample Type: | KCL-Potassium chloride |
| Sample Date: | | Protocol: | EPAF 91-EPA Freshwater | Test Species: | PP-Pimephales promelas |
| Comments: | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| D-Control | 1.0000 | 1.0000 | 1.0000 | 0.9000 |
| 300 | 0.9000 | 1.0000 | 1.0000 | 1.0000 |
| 450 | 1.0000 | 0.9000 | 1.0000 | 1.0000 |
| 600 | 0.9000 | 1.0000 | 0.9000 | 0.6000 |
| 750 | 0.4000 | 0.7000 | 0.8000 | 0.4000 |
| 900 | 0.1000 | 0.0000 | 0.1000 | 0.1000 |

| | | | Transform: Arcsin Square Root | | | | | Rank | 1-Tailed | Number | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical | Resp | Number |
| D-Control | 0.9750 | 1.0000 | 1.3713 | 1.2490 | 1.4120 | 5.942 | 4 | | | 1 | 40 |
| 300 | 0.9750 | 1.0000 | 1.3713 | 1.2490 | 1.4120 | 5.942 | 4 | 18.00 | 10.00 | 1 | 40 |
| 450 | 0.9750 | 1.0000 | 1.3713 | 1.2490 | 1.4120 | 5.942 | 4 | 18.00 | 10.00 | 1 | 40 |
| 600 | 0.8500 | 0.8718 | 1.1990 | 0.8861 | 1.4120 | 18.543 | 4 | 13.50 | 10.00 | 6 | 40 |
| *750 | 0.5750 | 0.5897 | 0.8669 | 0.6847 | 1.1071 | 24.877 | 4 | 10.00 | 10.00 | 17 | 40 |
| *900 | 0.0750 | 0.0769 | 0.2810 | 0.1588 | 0.3218 | 28.997 | 4 | 10.00 | 10.00 | 37 | 40 |

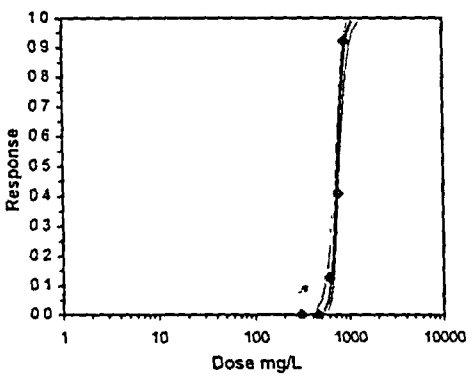
| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01) | 0.860098541 | 0.884 | -0.553246613 | 0.625562269 |
| Bartlett's Test indicates equal variances (p = 0.19) | 7.398184776 | 15.08631706 | | |

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

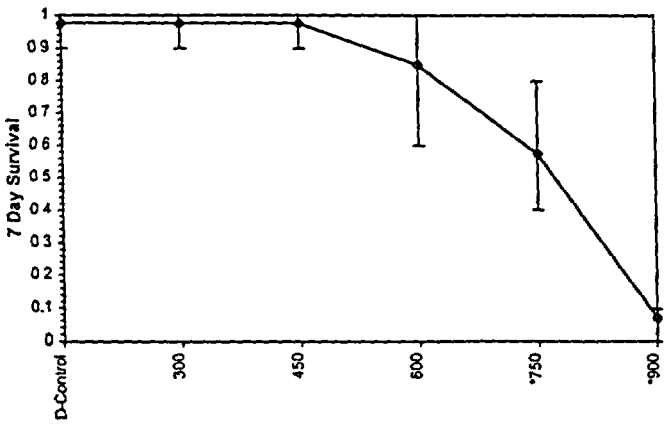
**Maximum Likelihood-Probit**

| Parameter | Value | SE | 95% Fiducial Limits | | Control | Chi-Sq | Critical | P-value | Mu | Sigma | Iter |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Slope | 14.86246231 | 2.552758691 | 9.859055178 | 19.86586944 | 0.025 | 2.81270589 | 7.814724922 | 0.42 | 2.875220573 | 0.067283602 | 14 |
| Intercept | -37.7328574 | 7.362665248 | -52.16368157 | -23.30203324 | | | | | | | |
| TSCR | 0.0339899 | 0.016532024 | 0.001587133 | 0.066392667 | | | | | | | |

| Point | Probits | mg/L | 95% Fiducial Limits | |
|---|---|---|---|---|
| EC01 | 2.674 | 523.2334589 | 426.6393284 | 581.2978711 |
| EC05 | 3.355 | 581.4988979 | 498.8924525 | 630.7847028 |
| EC10 | 3.718 | 615.167196 | 541.8106861 | 659.4439001 |
| EC15 | 3.964 | 638.9775564 | 572.4799029 | 679.9329331 |
| EC20 | 4.158 | 658.5568426 | 597.7636903 | 697.0483148 |
| EC25 | 4.326 | 675.8315673 | 620.0069934 | 712.460673 |
| EC40 | 4.747 | 721.3972266 | 677.3533936 | 755.5406079 |
| EC50 | 5.000 | 750.2751705 | 711.5482693 | 785.8117776 |
| EC60 | 5.253 | 780.3091207 | 744.3231942 | 820.7504566 |
| EC75 | 5.674 | 832.918816 | 794.6955439 | 890.6099305 |
| EC80 | 5.842 | 854.7672686 | 813.6038403 | 922.2324542 |
| EC85 | 6.036 | 880.9587041 | 835.2417557 | 961.6284323 |
| EC90 | 6.282 | 915.0566243 | 862.216557 | 1014.855002 |
| EC95 | 6.645 | 968.0376377 | 902.3614912 | 1100.974195 |
| EC99 | 7.326 | 1075.834983 | 980.1448071 | 1286.162925 |




**Dose-Response Plot**




*Organisms obtained from Aquatic BioSystems, Inc.*

PpKClCR Test Number: 29

*MHS Control Chemistry:*

| Parameter | Control Batch: | | |
|---|---|---|---|
| | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 87 | 85 | 89 |

*Acceptance Criteria for Daily Chemistry:*

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

PpKClCR Test Number: 29

*Daily Chemistry:*

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 8.02 | 8.05 | 8.03 | 8.03 | 7.98 |
| | DO (mg/L) | 7.8 | 8.3 | 8.0 | 7.8 | 7.8 | 8.3 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.3 | 25.2 | 24.1 | 24.9 |
| 300 mg KCl/L | pH (S.U.) | 8.12 | 8.03 | 8.12 | 8.03 | 8.13 | 7.96 |
| | DO (mg/L) | 7.9 | 8.1 | 8.2 | 7.7 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 886 | | 835 | | 889 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.3 | 25.2 | 24.2 | 24.9 |
| 450 mg KCl/L | pH (S.U.) | 8.13 | 8.06 | 8.13 | 8.05 | 8.14 | 7.96 |
| | DO (mg/L) | 7.9 | 8.2 | 8.2 | 7.7 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 1144 | | 1086 | | 1150 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.3 | 25.2 | 24.2 | 24.9 |
| 600 mg KCl/L | pH (S.U.) | 8.13 | 8.06 | 8.14 | 8.06 | 8.15 | 8.01 |
| | DO (mg/L) | 7.9 | 8.2 | 8.2 | 7.8 | 8.0 | 8.2 |
| | Conductivity (µmhos/cm) | 1426 | | 1352 | | 1439 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.3 | 25.2 | 24.2 | 24.8 |
| 750 mg KCl/L | pH (S.U.) | 8.14 | 8.05 | 8.14 | 8.06 | 8.16 | 8.05 |
| | DO (mg/L) | 8.0 | 8.3 | 8.2 | 7.9 | 8.1 | 8.2 |
| | Conductivity (µmhos/cm) | 1677 | | 1598 | | 1690 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.2 | 25.2 | 24.2 | 24.8 |
| 900 mg KCl/L | pH (S.U.) | 8.15 | 8.07 | 8.15 | 8.07 | 8.16 | 8.06 |
| | DO (mg/L) | 8.0 | 8.3 | 8.3 | 8.0 | 8.1 | 8.3 |
| | Conductivity (µmhos/cm) | 1897 | | 1816 | | 1918 | |
| | Temperature (°C) | 24.3 | 24.7 | 24.3 | 25.2 | 24.2 | 24.8 |
| | | Initial | Final | Initial | Final | Initial | Final |

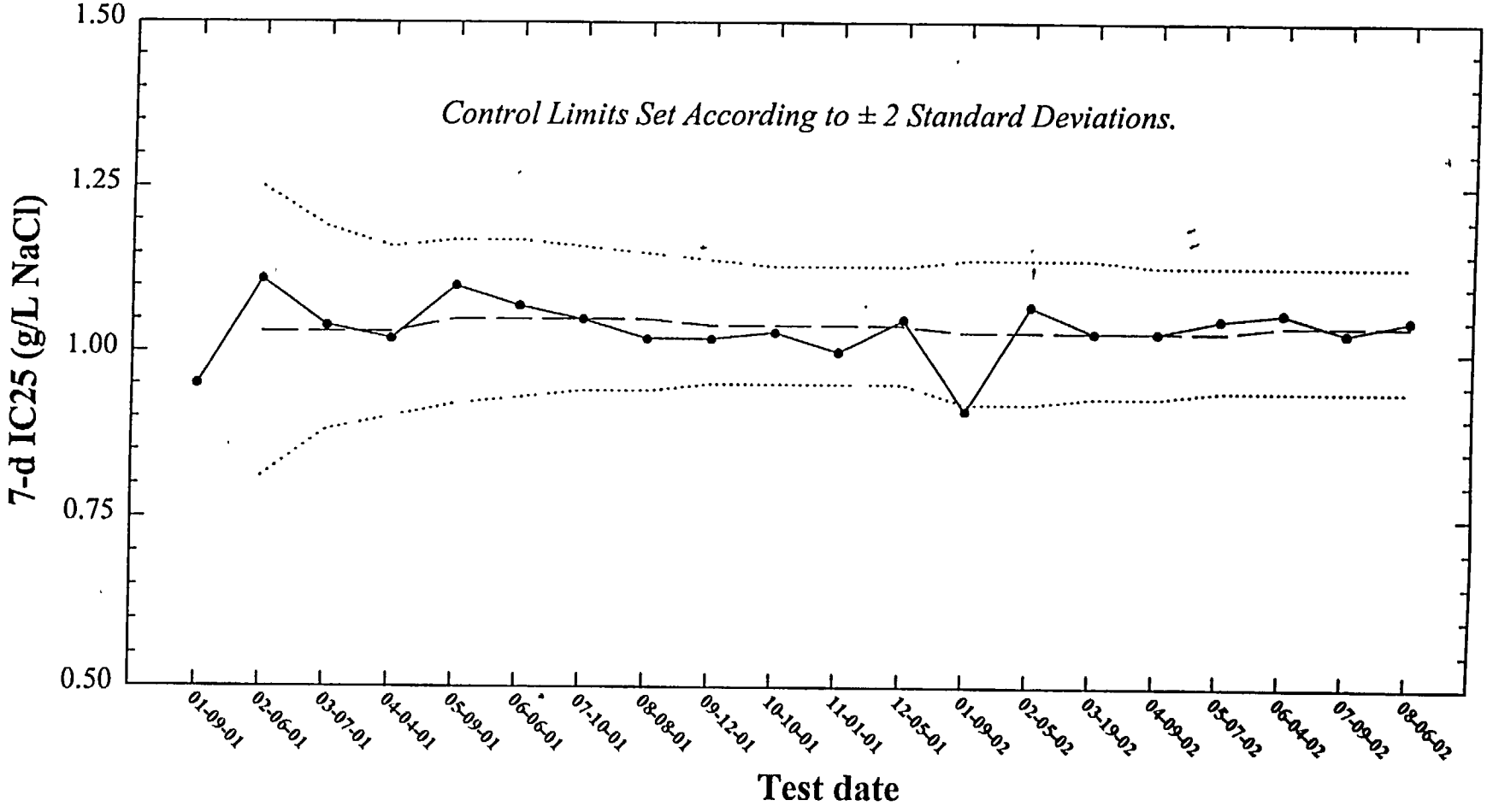
Stock 69900 68200 70300

PpKClCR Test Number: 29

| Concentration | Parameter | Day 3 | | Day 4 | | Day 5 | | Day 6 | |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 7.80 | 8.06 | 7.75 | 8.05 | 7.78 | 8.02 | 7.62 |
| | DO (mg/L) | 8.2 | 7.9 | 8.1 | 7.8 | 8.2 | 7.6 | 8.3 | 7.5 |
| | Conductivity (µmhos/cm) | 301 | | 303 | | 302 | | 313 | |
| | Temperature (°C) | 24.5 | 24.8 | 24.4 | 24.9 | 24.1 | 25.3 | 24.2 | 24.3 |
| 300 mg KCl/L | pH (S.U.) | 8.13 | 7.89 | 8.16 | 7.76 | 8.13 | 7.78 | 8.12 | 7.54 |
| | DO (mg/L) | 8.3 | 7.8 | 8.3 | 7.5 | 8.3 | 7.3 | 8.1 | 7.5 |
| | Conductivity (µmhos/cm) | 844 | | 832 | | 828 | | 852 | |
| | Temperature (°C) | 24.5 | 24.6 | 24.4 | 24.9 | 24.1 | 25.2 | 24.2 | 24.4 |
| 450 mg KCl/L | pH (S.U.) | 8.13 | 7.92 | 8.16 | 7.74 | 8.16 | 7.79 | 8.12 | 7.54 |
| | DO (mg/L) | 8.3 | 7.8 | 8.3 | 7.5 | 8.3 | 7.4 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 1091 | | 1093 | | 1113 | | 1123 | |
| | Temperature (°C) | 24.5 | 24.6 | 24.4 | 24.9 | 24.2 | 25.2 | 24.3 | 24.4 |
| 600 mg KCl/L | pH (S.U.) | 8.13 | 7.89 | 8.15 | 7.79 | 8.16 | 7.89 | 8.13 | 7.61 |
| | DO (mg/L) | 8.3 | 7.9 | 8.2 | 7.5 | 8.4 | 7.5 | 8.2 | 7.2 |
| | Conductivity (µmhos/cm) | 1368 | | 1356 | | 1382 | | 1390 | |
| | Temperature (°C) | 24.5 | 24.6 | 24.4 | 24.9 | 24.1 | 25.2 | 24.3 | 24.2 |
| 750 mg KCl/L | pH (S.U.) | 8.14 | 7.93 | 8.15 | 7.80 | 8.16 | 7.87 | 8.14 | 7.56 |
| | DO (mg/L) | 8.4 | 7.9 | 8.3 | 7.4 | 8.4 | 7.6 | 8.2 | 7.2 |
| | Conductivity (µmhos/cm) | 1605 | | 1603 | | 1631 | | 1642 | |
| | Temperature (°C) | 24.5 | 24.6 | 24.4 | 24.9 | 24.1 | 25.2 | 24.3 | 24.4 |
| 900 mg KCl/L | pH (S.U.) | 8.15 | 7.97 | 8.15 | 7.87 | 8.16 | 7.93 | 8.15 | 7.67 |
| | DO (mg/L) | 8.3 | 7.9 | 8.3 | 7.4 | 8.3 | 7.7 | 8.1 | 7.3 |
| | Conductivity (µmhos/cm) | 1832 | | 1795 | | 1819 | | 1833 | |
| | Temperature (°C) | 24.5 | 24.6 | 24.4 | 24.9 | 24.1 | 25.3 | 24.3 | 24.4 |
| | | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Stock | | 69100 | | 68900 | | 68906 | | 69~~900~~ | |

# Environmental Testing Solutions, LLC

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



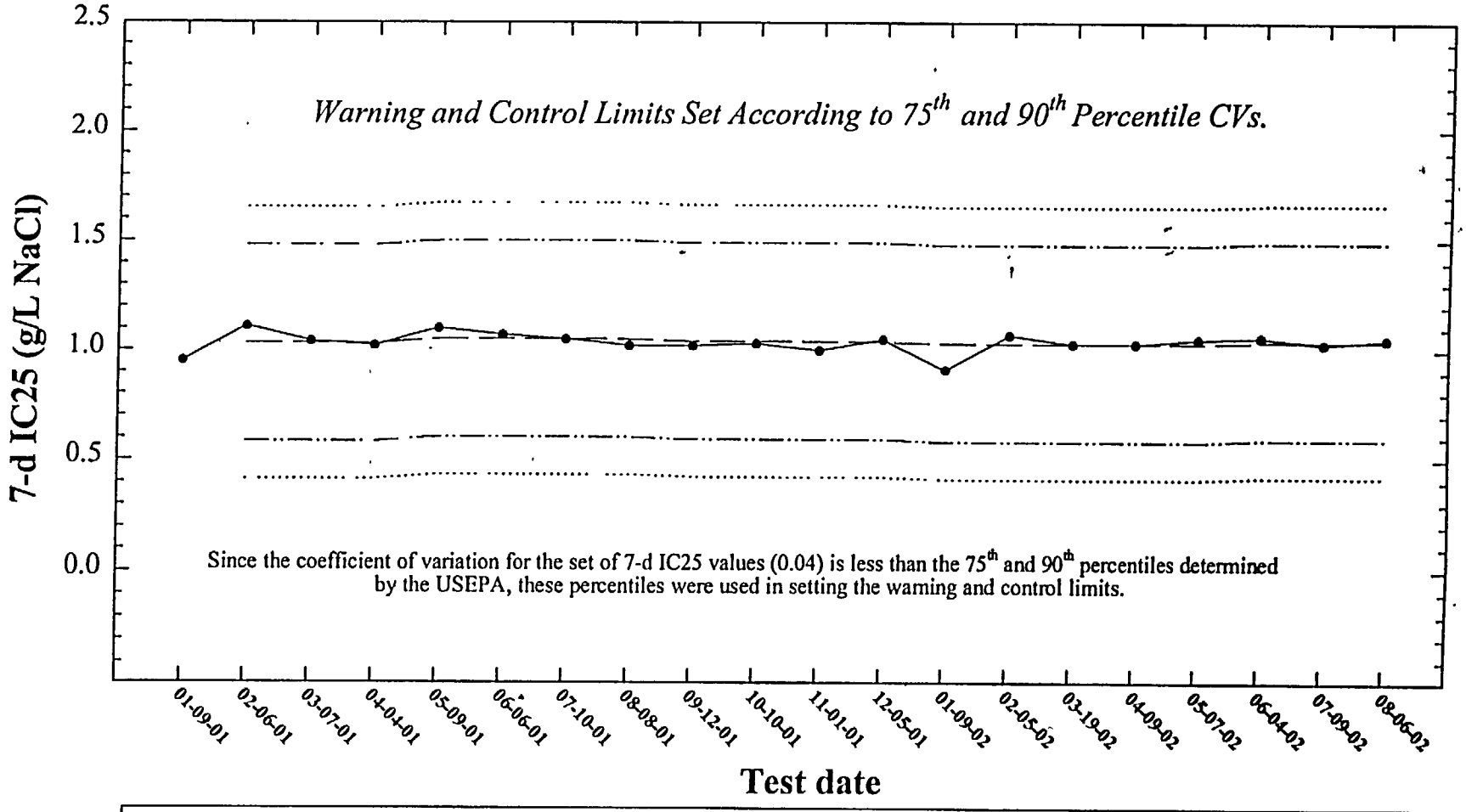

—•— **7-day IC25** = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— — **Central Tendency** (mean IC25)

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

# Environmental Testing Solutions, LLC

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




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

— – **Central Tendency** (mean IC25)

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

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

# Environmental Testing Solutions, LLC

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

| Test number | Test date | 7-d IC25 (g/L NaCl) | CT (g/L NaCl) | S | CT - 2S | CT + 2S | $S_{A.75}$ | CT - $S_{A.75}$ | CT + $S_{A.75}$ | $S_{A.90}$ | CT - $S_{A.90}$ | CT + $S_{A.90}$ | CV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01-09-01 | 0 95 | | | | | | | | | | | |
| 2 | 02-06-01 | 1.11 | 1 03 | 0.11 | 0 81 | 1.25 | 0.46 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.11 |
| 3 | 03-07-01 | 1.04 | 1 03 | 0 08 | 0 88 | 1.19 | 0.47 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0 08 |
| 4 | 04-04-01 | 1 02 | 1 03 | 0 07 | 0 90 | 1.16 | 0.46 | 0 58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.06 |
| 5 | 05-09-01 | 1.10 | 1 05 | 0 06 | 0.92 | 1.17 | 0.47 | 0.60 | 1.50 | 0.65 | 0.43 | 1.67 | 0.06 |
| 6 | 06-06-01 | 1.07 | 1 05 | 0 06 | 0 93 | 1.17 | 0 47 | 0.60 | 1.50 | 0.65 | 0.43 | 1.67 | 0.06 |
| 7 | 07-10-01 | 1.05 | 1.05 | 0 05 | 0 94 | 1.16 | 0.47 | 0 60 | 1.50 | 0.65 | 0.43 | 1.67 | 0.05 |
| 8 | 08-08-01 | 1.02 | 1.05 | 0.05 | 0 94 | 1.15 | 0 47 | 0 60 | 1.50 | 0 65 | 0.43 | 1.67 | 0.05 |
| 9 | 09-12-01 | 1 02 | 1.04 | 0.05 | 0.95 | 1.14 | 0 47 | 0.59 | 1.49 | 0.65 | 0.42 | 1.66 | 0.05 |
| 10 | 10-10-01 | 1.03 | 1.04 | 0.05 | 0.95 | 1.13 | 0 47 | 0.59 | 1.49 | 0.65 | 0.42 | 1.66 | 0.04 |
| 11 | 11-01-01 | 1.00 | 1.04 | 0.05 | 0.95 | 1.13 | 0.47 | 0.59 | 1.49 | 0.64 | 0.42 | 1.66 | 0.04 |
| 12 | 12-05-01 | 1.05 | 1.04 | 0 04 | 0 95 | 1.13 | 0.47 | 0.59 | 1.49 | 0.64 | 0.42 | 1.66 | 0.04 |
| 13 | 01-09-02 | 0.91 | 1.03 | 0 05 | 0.92 | 1.14 | 0 46 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.05 |
| 14 | 02-05-02 | 1.07 | 1.03 | 0.05 | 0 92 | 1.14 | 0.46 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.05 |
| 15 | 03-19-02 | 1.03 | 1.03 | 0 05 | 0 93 | 1.14 | 0.46 | 0.58 | 1.48 | 0 64 | 0.41 | 1.65 | 0.05 |
| 16 | 04-09-02 | 1.03 | 1.03 | 0.05 | 0.93 | 1.13 | 0 46 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.05 |
| 17 | 05-07-02 | 1.05 | 1.03 | 0 05 | 0 94 | 1.13 | 0.47 | 0.58 | 1.48 | 0.64 | 0.41 | 1.65 | 0.05 |
| 18 | 06-04-02 | 1.06 | 1.04 | 0 05 | 0.94 | 1.13 | 0 47 | 0.59 | 1.49 | 0.64 | 0.42 | 1.66 | 0.05 |
| 19 | 07-09-02 | 1.03 | 1.04 | 0 05 | 0.94 | 1.13 | 0.47 | 0.59 | 1.49 | 0.64 | 0.42 | 1.66 | 0 04 |
| 20 | 08-06-02 | 1.05 | 1.04 | 0.05 | 0.94 | 1.13 | 0.47 | 0.59 | 1.49 | 0.64 | 0.42 | 1.66 | 0.04 |

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

**CT** = Central tendency (mean IC25).

**S** = Standard deviation of the IC25 values.

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

$S_{A.90}$ = Standard deviation corresponding to the the 90th percentile CV. $S_{A.90}$ = 0 62, as determined by the USEPA for the method and endpoint.

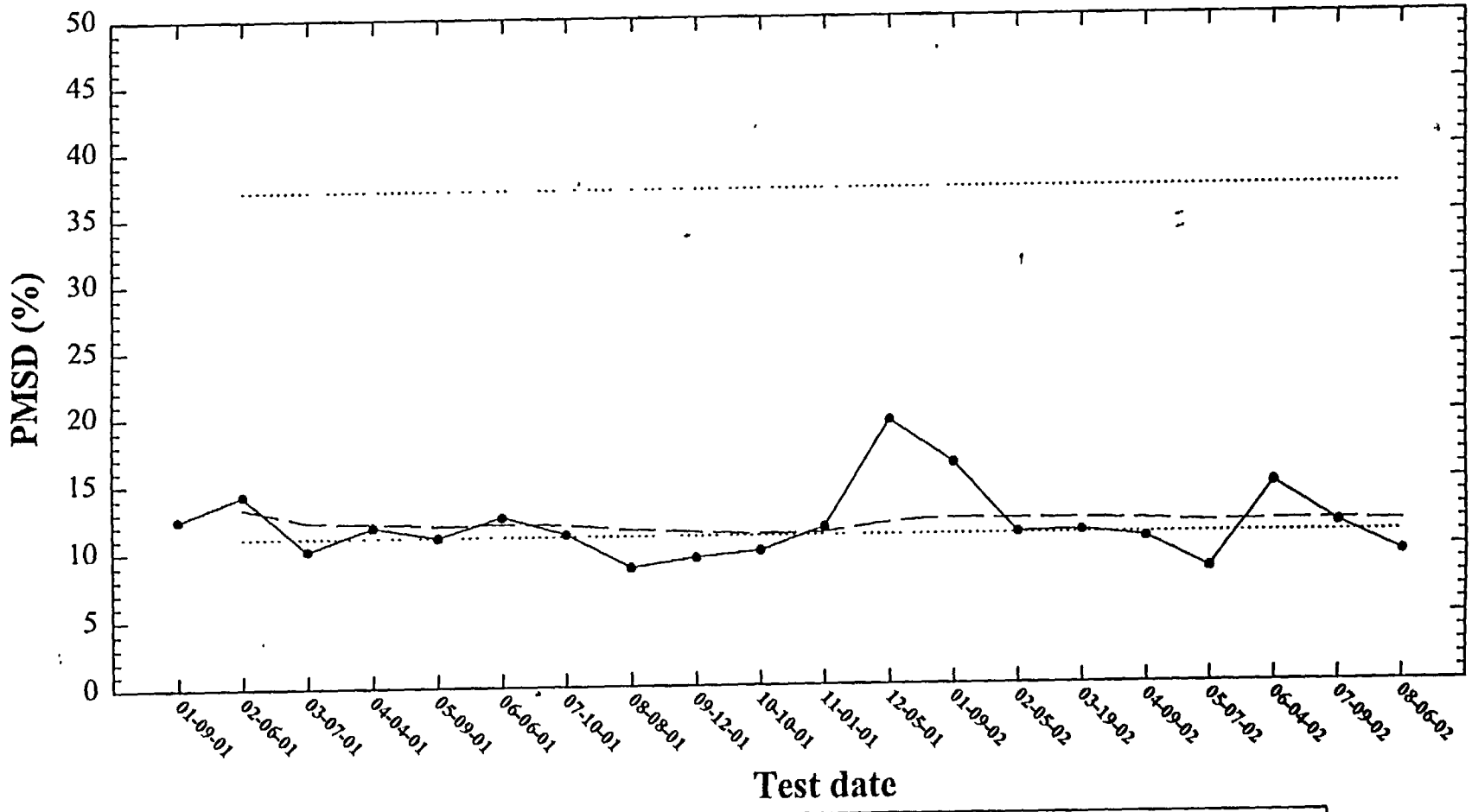
**CV** = Coefficient of variation of the IC25 values

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

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

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




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

— - Central Tendency (mean PMSD)

····· Lower and Upper PMSD Bounds

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

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

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

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

| Test number | Test date | Control Survival (%) | Control Mean Reproduction (offspring/female) | CV (%) | CT for Control Reproduction CV (%) | MSD | PMSD (%) | CT for PMSD (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | 01-09-01 | 100 | 28.0 | 8.4 | | 3.5 | 12.4 | |
| 2 | 02-06-01 | 100 | 22.1 | 10.1 | 9.3 | 3.1 | 14.2 | 13.3 |
| 3 | 03-07-01 | 100 | 24.0 | 8.3 | 8.9 | 2.4 | 10.1 | 12.2 |
| 4 | 04-04-01 | 100 | 25.0 | 10.0 | 9.2 | 2.9 | 11.8 | 12.1 |
| 5 | 05-09-01 | 100 | 27.9 | 8.9 | 9.1 | 3.1 | 11.0 | 11.9 |
| 6 | 06-06-01 | 100 | 27.8 | 5.8 | 8.6 | 3.5 | 12.5 | 12.0 |
| 7 | 07-10-01 | 100 | 25.0 | 9.4 | 8.7 | 2.8 | 11.2 | 11.9 |
| 8 | 08-08-01 | 100 | 30.9 | 2.4 | 7.9 | 2.7 | 8.7 | 11.5 |
| 9 | 09-12-01 | 100 | 28.6 | 6.6 | 7.8 | 2.7 | 9.4 | 11.3 |
| 10 | 10-10-01 | 100 | 24.9 | 8.8 | 7.9 | 2.5 | 9.9 | 11.1 |
| 11 | 11-01-01 | 100 | 27.0 | 6.5 | 7.7 | 3.1 | 11.6 | 11.2 |
| 12 | 12-05-01 | 100 | 24.8 | 9.1 | 7.8 | 4.8 | 19.5 | 11.9 |
| 13 | 01-09-02 | 100 | 27.5 | 7.5 | 7.8 | 4.5 | 16 3 | 12.2 |
| 14 | 02-05-02 | 100 | 23.1 | 10.1 | 8.0 | 2.6 | 11.1 | 12.1 |
| 15 | 03-19-02 | 100 | 26.3 | 8 6 | 8.0 | 3.0 | 11.2 | 12.1 |
| 16 | 04-09-02 | 100 | 26.2 | 12.3 | 8.3 | 2.8 | 10.7 | 12.0 |
| 17 | 05-07-02 | 100 | 27.3 | 8.1 | 8.3 | 2.3 | 8.4 | 11.8 |
| 18 | 06-04-02 | 100 | 26.0 | 9.9 | 8.4 | 3.8 | 14.7 | 11.9 |
| 19 | 07-09-02 | 100 | 29.5 | 8.0 | 8.4 | 3.5 | 11.7 | 11.9 |
| 20 | 08-06-02 | 100 | 28.4 | 10 4 | 8.5 | 2.7 | 9.5 | 11.8 |

*Note*

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is **8.5%** in Environmental Testing Solutions, LLC
Lower CV bound determined by USEPA (10th percentile) = 8 9%
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by **11.8%** from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

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

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

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

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

CdNaClCR Test Number: 25

| | Date | Time | Analyst |
|---|---|---|---|
| Test start | 08-06-02 | 1159 | JJ |
| Test end | 08-13-02 | 1123 | JJ |

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

| *Test organism information:* | | *Test information:* | |
|---|---|---|---|
| Organism age: | <24-HOURS OLD | Randomizing template: | GREEN |
| Date and times organisms were born between: | ~~07-30~~ 08-05-02 1528 TO 1738 | Incubator number: | 2 |
| Organism source: | 07-30-02 A-D | YCT batch: ABS | 08-01-02 |
| Transfer bowl information: | pH = 8.30 Temperature (°C) = 24.7 | *Selenastrum* batch: ABS | 08-01-02 |

**CONTROL** *Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 4 | 4 | 5 | 4 | 4 | 6 | 4 | 4 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 8 | 12 | 10 | 11 | 8 | 8 | 10 | 9 | 11 | 8 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 15 | 13 | 15 | 14 | 10 | 14 | 16 | 16 | 17 | 2 |
| Total young produced | | 27 | 29 | 29 | 30 | 22 | 26 | 32 | 29 | 32 | 28 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |
| X for 3rd Broods | | X | X | X | X | X | X | X | X | X | X |

Calculations and data reviewed: JJ

Test Renewal, Feeding, and Randomization Record Label

| | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|---|---|---|---|---|---|---|---|
| Date | 08-12 | 08-06 | 08-07 | 08-08 | 08-09 | 08-10 | 08-11 |
| Time | 1106 | 1159 | 1102 | 1114 | 1106 | 1230 | 1234 |
| Analyst | JJ | JJ | JJ | JJ | JJ | JJ | JJ |
| Shelf Location | B1 | B1 | B1 | B1 | B1 | B1 | B1 |

| *Control information:* | | Acceptance criteria | *Summary of test endpoints (mg NaCl/L):* | |
|---|---|---|---|---|
| % of Male Adults: | 0% | ≤ 20% | 7-day LC50 | >1400 |
| % Adults having 3rd Broods: | 100% | ≥ 80% | NOEC | 1000 |
| % Mortality: | 0% | ≤ 20% | LOEC | 1200 |
| Mean Offspring/Female: | 28.4 | ≥ 15.0 offspring/female | ChV | 1095.4 |
| % CV: | 10.4% | < 40.0 % | IC25 | 1054.5 |

CdNaClCR Test Number: 25

## 600 mg NaCl/L

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 5 | 4 | 4 | 4 | 4 | 3 | 5 | 4 | 4 | 5 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 10 | 12 | 9 | 8 | 8 | 11 | 10 | 10 | 7 | 8 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 14 | 16 | 18 - | 15 | 13 | 16 | 15 | 12 | 17 | 14 |
| Total young produced | | 29 | 32 | 31 | 27 | 25 | 30 | 30 | 26 | 28 | 27 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 28.5 |
| % Reduction from Control: | -0.4% |

Calculations and data reviewed: [illegible]

## 800 mg NaCl/L

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 5 | 4 | 4 | 0 | 5 | 3 | 5 | 5 | 4 | 3 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 9 | 10 | 8 | 12 | 9 | 9 | 11 | 8 | 10 | 10 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 14 | 14 | 16 | 3 | 14 | 16 | 13 | 15 | 18 | 12 |
| Total young produced | | 28 | 28 | 28 | 33 | 28 | 28 | 29 | 28 | 32 | 25 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 28.7 |
| % Reduction from Control: | -1.1% |

Calculations and data reviewed: [illegible]

CdNaClCR Test Number: 25

## 1000 mg NaCl/L

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 4 | 3 | 6 | 0 | 4 | 4 | 4 | 3 | 5 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 9 | 8 | 8 | 11 | 8 | 8 | 8 | 10 | 9 | 6 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 4 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 13 | 11 | 16 | 2 | 14 | 12 | 16 | 15 | 11 | 12 |
| Total young produced | | 26 | 22 | 30 | 31 | 26 | 24 | 28 | 28 | 25 | 26 |
| Final Adult Mortality | | L | L | L | L | L | L | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 0% |
| Mean Offspring/Female: | 26.6 |
| % Reduction from Control: | 6.3% |

Calculations and data reviewed: JL

## 1200 mg NaCl/L

*Survival and Reproduction Data*

| Day | | Replicate number 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 2 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 3 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 4 | Young produced | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 2 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 5 | Young produced | 5 | 0 | 4 | 0 | 4 | 0 | 2 | 0 | 0 | 6 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 6 | Young produced | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 |
| | Adult mortality | L | L | L | L | L | L | L | L | L | L |
| 7 | Young produced | 0 | 4 | 6 | 6 | 0 | 0 | 14 | 0 | 7 | 3 |
| Total young produced | | 5 | 4 | 10 | 7 | 4 | 3 | 16 | 8 | 9 | 9 |
| Final Adult Mortality | | L | L | L | L | L | D | L | L | L | L |

| *Concentration:* | |
|---|---|
| % Mortality: | 10% |
| Mean Offspring/Female: | 7.5 |
| % Reduction from Control: | 73.6% |

Calculations and data reviewed: JL

CdNaClCR Test Number: 25

**1400 mg NaCl/L** *Survival and Reproduction Data*

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

| *Concentration:* | |
|---|---|
| % Mortality: | 20% |
| Mean Offspring/Female: | 6.1 |
| % Reduction from Control: | 99.67% |

Calculations and data reviewed: JL

# Environmental Testing Solutions, LLC

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

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

**Test number:** CdNaClCR #25

**Test dates:** August 6-13, 2002

**Reviewed by:** [signature]

| Concentration (mg/L NaCl) | Replicate number | | | | | | | | | | Survival (%) | Average reproduction (offspring/female) | Coefficient of variation (%) | Percent reduction from control (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | |
| Control | 27 | 29 | 29 | 30 | 22 | 26 | 32 | 29 | 32 | 28 | 100 | 28.4 | 10.4 | Not applicable |
| 600 | 29 | 32 | 31 | 27 | 25 | 30 | 30 | 26 | 28 | 27 | 100 | 28.5 | 8.0 | -0.4 |
| 800 | 28 | 28 | 28 | 33 | 28 | 28 | 29 | 28 | 32 | 25 | 100 | 28.7 | 7.9 | -1.1 |
| 1000 | 26 | 22 | 30 | 31 | 26 | 24 | 28 | 28 | 25 | 26 | 100 | 26.6 | 10.2 | 6.3 |
| 1200 | 5 | 4 | 10 | 7 | 4 | 3 | 16 | 8 | 9 | 9 | 90 | 7.5 | 51.5 | 73.6 |
| 1400 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 80 | 0.1 | 316.2 | 99.6 |

**Dunnett's MSD value:** 2.687

**PMSD:** 9.5

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 11.8% from the control.

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

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

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

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

# Environmental Testing Solutions, LLC

## Statistical Analyses

**Ceriodaphnia Survival and Reproduction Test-Reproduction**

| | | | | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | CdNaClCR | Sample ID: | REF-Ref Toxicant |
| End Date: | 8/13/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | NACL-Sodium chloride |
| Sample Date: | | Protocol | EPAF 91-EPA Freshwater | Test Species | CD-Ceriodaphnia dubia |
| Comments | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 27.000 | 29.000 | 29.000 | 30.000 | 22.000 | 26.000 | 32.000 | 29.000 | 32.000 | 28.000 |
| 600 | 29.000 | 32.000 | 31.000 | 27.000 | 25.000 | 30.000 | 30.000 | 26.000 | 28.000 | 27.000 |
| 800 | 28.000 | 28.000 | 28.000 | 33.000 | 28.000 | 28.000 | 29.000 | 28.000 | 32.000 | 25.000 |
| 1000 | 26.000 | 22.000 | 30.000 | 31.000 | 26.000 | 24.000 | 28.000 | 28.000 | 25.000 | 26.000 |
| 1200 | 5.000 | 4.000 | 10.000 | 7.000 | 4.000 | 3.000 | 16.000 | 8.000 | 9.000 | 9.000 |
| 1400 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

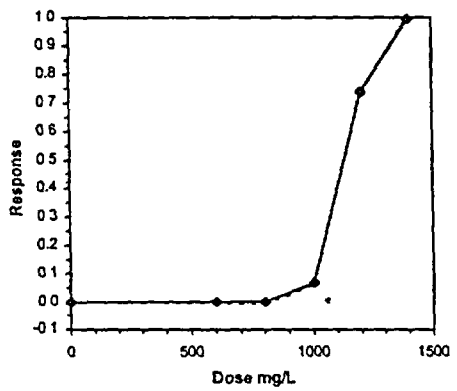
| | | | Transform: Untransformed | | | | | Rank | 1-Tailed | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical | Mean | N-Mean |
| D-Control | 28.400 | 1.0000 | 28.400 | 22.000 | 32.000 | 10.392 | 10 | | | 28.533 | 1.0000 |
| 600 | 28.500 | 1.0035 | 28.500 | 25.000 | 32.000 | 7.976 | 10 | 103.50 | 75.00 | 28.533 | 1.0000 |
| 800 | 28.700 | 1.0106 | 28.700 | 25.000 | 33.000 | 7.886 | 10 | 101.50 | 75.00 | 28.533 | 1.0000 |
| 1000 | 26.600 | 0.9366 | 26.600 | 22.000 | 31.000 | 10.211 | 10 | 84.50 | 75.00 | 26.600 | 0.9322 |
| *1200 | 7.500 | 0.2641 | 7.500 | 3.000 | 16.000 | 51.544 | 10 | 55.00 | 75.00 | 7.500 | 0.2629 |
| *1400 | 0.100 | 0.0035 | 0.100 | 0.000 | 1.000 | 316.228 | 10 | 55.00 | 75.00 | 0.100 | 0.0035 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates non-normal distribution (p <= 0.01) | 1.10093987 | 1.035 | 0.37210747 | 1.60743708 |
| Bartlett's Test indicates unequal variances (p = 5.03E-06) | 32.366787 | 15.0863171 | | |

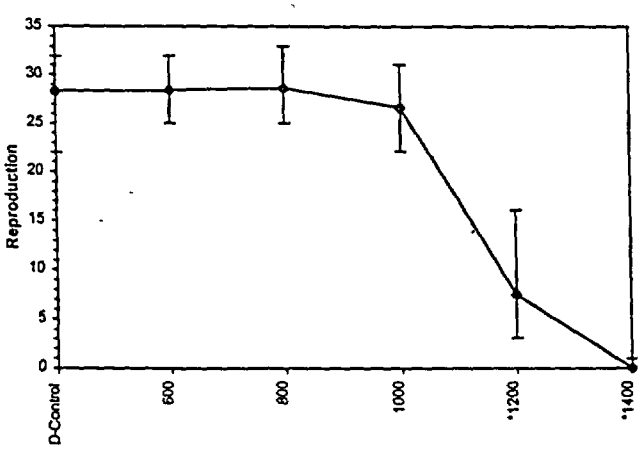
| Hypothesis Test (1-tail, 0.05) | NOEC | LOEC | ChV | TU |
|---|---|---|---|---|
| Steel's Many-One Rank Test | 1000 | 1200 | 1095.44512 | |

**Linear Interpolation (80 Resamples)**

| Point | mg/L | SD | 95% CL | | Skew |
|---|---|---|---|---|---|
| IC05 | 947.586207 | 137.069434 | 475.633205 | 1012.93162 | -2.3107 |
| IC10 | 1009.63351 | 33.701626 | 932.916667 | 1025.97968 | -3.0218 |
| IC15 | 1024.57243 | 9.34834907 | 1005.6456 | 1038.96952 | -0.2116 |
| IC20 | 1039.51134 | 8.5033028 | 1022.8989 | 1052.59962 | -0.0138 |
| IC25 | 1054.45026 | 8.02436167 | 1040.1522 | 1065.83573 | 0.0784 |
| IC40 | 1099.26702 | 8.0011814 | 1085.69236 | 1117.16361 | 0.4499 |
| IC50 | 1129.14485 | 9.12420599 | 1114.31148 | 1152.92427 | 0.6101 |




**Dose-Response Plot**



# Environmental Testing Solutions, LLC

## Statistical Analyses

| Used for PMSD calculation only. | | | Ceriodaphnia Survival and Reproduction Test-Reproduction | | |
|---|---|---|---|---|---|
| Start Date: | 8/6/02 | Test ID: | CdNaClCR | Sample ID: | REF-Ref Toxicant |
| End Date: | 8/13/02 | Lab ID: | ETS-Env. Testing Solutions | Sample Type: | NACL-Sodium chloride |
| Sample Date | | Protocol. | EPAF 91-EPA Freshwater | Test Species | CD-Ceriodaphnia dubia |
| Comments | | | | | |

| Conc-mg/L | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| D-Control | 27 000 | 29.000 | 29 000 | 30 000 | 22 000 | 26 000 | 32 000 | 29 000 | 32 000 | 28 000 |
| 600 | 29 000 | 32 000 | 31.000 | 27 000 | 25 000 | 30 000 | 30 000 | 26.000 | 28 000 | 27 000 |
| 800 | 28 000 | 28 000 | 28 000 | 33 000 | 28 000 | 28 000 | 29.000 | 28.000 | 32.000 | 25 000 |
| 1000 | 26 000 | 22.000 | 30 000 | 31.000 | 26 000 | 24 000 | 28.000 | 28 000 | 25 000 | 26 000 |
| 1200 | 5 000 | 4 000 | 10 000 | 7.000 | 4 000 | 3 000 | 16 000 | 8 000 | 9.000 | 9 000 |
| 1400 | 1 000 | 0 000 | 0 000 | 0.000 | 0 000 | 0 000 | 0 000 | 0 000 | 0 000 | 0 000 |

| | | | Transform: Untransformed | | | | | | 1-Tailed | |
|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD |
| D-Control | 28 400 | 1 0000 | 28 400 | 22.000 | 32 000 | 10 392 | 10 | | | |
| 600 | 28 500 | 1 0035 | 28 500 | 25.000 | 32 000 | 7 976 | 10 | -0 085 | 2.287 | 2 687 |
| 800 | 28 700 | 1 0106 | 28 700 | 25 000 | 33 000 | 7 886 | 10 | -0 255 | 2.287 | 2.687 |
| 1000 | 26 600 | 0 9366 | 26 600 | 22 000 | 31.000 | 10.211 | 10 | 1 532 | 2.287 | 2 687 |
| *1200 | 7.500 | 0 2641 | 7 500 | 3 000 | 16 000 | 51.544 | 10 | 17 786 | 2 287 | 2.687 |
| *1400 | 0.100 | 0 0035 | 0 100 | 0 000 | 1.000 | 316 228 | 10 | 24 084 | 2.287 | 2.687 |

| Auxiliary Tests | Statistic | Critical | Skew | Kurt |
|---|---|---|---|---|
| Kolmogorov D Test indicates non-normal distribution (p <= 0 01) | 1.10093987 | 1 035 | 0 37210747 | 1 60743708 |
| Bartlett's Test indicates unequal variances (p = 5 03E-06) | 32 366787 | 15 0863171 | | |

| Hypothesis Test (1-tail, 0 05) | NOEC | LOEC | ChV | TU | MSDu | MSDp | MSB | MSE | F-Prob | df |
|---|---|---|---|---|---|---|---|---|---|---|
| Dunnett's Test | 1000 | 1200 | 1095.44512 | | 2 68694591 | 0 09461077 | 1628 62667 | 6 9037037 | 2.2E-35 | 5, 54 |

CdNaClCR Test Number: 25

*MHS Control Chemistry:*

| Parameter * | Control Batch: | | |
|---|---|---|---|
| | 07-29-02 | 08-05-02 | 08-07-02 |
| pH (S.U.) | 8.07 | 8.05 | 8.07 |
| DO (mg/L) | 7.8 | 8.0 | 8.2 |
| Conductivity (µmhos/cm) | 317 | 303 | 301 |
| Alkalinity (mg $CaCO_3$/L) | 66 | 63 | 63 |
| Hardness (mg $CaCO_3$/L) | 87 | 85 | 89 |

* One batch used to make dilutions. separate batches indicated for control. gl

*Acceptance Criteria for Daily Chemistry:*

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

CdNaClCR Test Number: 25

*Daily Chemistry:*

| Concentration | Parameter | Day 0 | | Day 1 | | Day 2 | |
|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 8.12 | 8.05 | 8.10 | 8.03 | 8.09 |
| | DO (mg/L) | 7.8 | 8.1 | 8.0 | 8.1 | 7.8 | 8.0 |
| | Conductivity (µmhos/cm) | 317 | | 303 | | 317 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.3 | 24.7 | 24.2 | 25.3 |
| 600 mg NaCl/L | pH (S.U.) | 8.13 | 8.13 | 8.17 | 8.13 | 8.17 | 8.09 |
| | DO (mg/L) | 8.0 | 8.2 | 8.3 | 8.1 | 8.0 | 7.9 |
| | Conductivity (µmhos/cm) | 1454 | | 1453 | | 1481 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.2 | 24.7 | 24.4 | 25.2 |
| 800 mg NaCl/L | pH (S.U.) | 8.13 | 8.12 | 8.15 | 8.12 | 8.16 | 8.09 |
| | DO (mg/L) | 8.0 | 8.2 | 8.2 | 8.1 | 8.0 | 7.9 |
| | Conductivity (µmhos/cm) | 1823 | | 1800 | | 1839 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.3 | 24.7 | 24.2 | 25.2 |
| 1000 mg NaCl/L | pH (S.U.) | 8.13 | 8.12 | 8.15 | 8.12 | 8.15 | 8.09 |
| | DO (mg/L) | 8.0 | 8.2 | 8.2 | 8.1 | 8.0 | 8.0 |
| | Conductivity (µmhos/cm) | 2224 | | 2200 | | 2244 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.3 | 24.7 | 24.2 | 25.2 |
| 1200 mg NaCl/L | pH (S.U.) | 8.13 | 8.14 | 8.14 | 8.12 | 8.14 | 8.09 |
| | DO (mg/L) | 8.0 | 8.2 | 8.3 | 8.1 | 8.0 | 8.0 |
| | Conductivity (µmhos/cm) | 2581 | | 2550 | | 2611 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.3 | 24.7 | 24.2 | 25.2 |
| 1400 mg NaCl/L | pH (S.U.) | 8.12 | 8.13 | 8.14 | 8.12 | 8.13 | 8.10 |
| | DO (mg/L) | 8.0 | 8.3 | 8.3 | 8.1 | 8.0 | 8.1 |
| | Conductivity (µmhos/cm) | 2938 | | 2910 | | 2968 | |
| | Temperature (°C) | 24.2 | 24.9 | 24.3 | 24.7 | 24.2 | 25.2 |
| | | Initial | Final | Initial | Final | Initial | Final |
| Stock | | 109100 | | 110500 | | 110600 | |

CdNaClCR Test Number: 25

| Concentration | Parameter | Day 3 Initial | Day 3 Final | Day 4 Initial | Day 4 Final | Day 5 Initial | Day 5 Final | Day 6 Initial | Day 6 Final |
|---|---|---|---|---|---|---|---|---|---|
| CONTROL | pH (S.U.) | 8.07 | 8.28 | 8.06 | 8.22 | 8.05 | 8.10 | 8.02 | 8.00 |
| | DO (mg/L) | 8.2 | 8.4 | 8.1 | 8.4 | 8.2 | 8.3 | 8.3 | 8.0 |
| | Conductivity (µmhos/cm) | 301 | | 303 | | 302 | | 313 | |
| | Temperature (°C) | 24.6 | 24.9 | 24.3 | 24.7 | 24.2 | 24.8 | 24.3 | 24.6 |
| 600 mg NaCl/L | pH (S.U.) | 8.10 | 8.25 | 8.15 | 8.22 | 8.15 | 8.06 | 8.10 | 8.08 |
| | DO (mg/L) | 8.4 | 8.4 | 8.4 | 8.4 | 8.2 | 8.2 | 8.2 | 8.0 |
| | Conductivity (µmhos/cm) | 1413 | | 1404 | | 1420 | | 1435 | |
| | Temperature (°C) | 24.6 | 25.0 | 24.3 | 25.0 | 24.2 | 24.8 | 24.2 | 24.8 |
| 800 mg NaCl/L | pH (S.U.) | 8.10 | 8.28 | 8.15 | 8.25 | 8.16 | 8.03 | 8.10 | 8.10 |
| | DO (mg/L) | 8.4 | 8.4 | 8.4 | 8.4 | 8.2 | 8.2 | 8.2 | 8.1 |
| | Conductivity (µmhos/cm) | 1761 | | 1758 | | 1775 | | 1789 | |
| | Temperature (°C) | 24.5 | 25.0 | 24.4 | 24.9 | 24.2 | 24.8 | 24.2 | 24.8 |
| 1000 mg NaCl/L | pH (S.U.) | 8.10 | 8.26 | 8.15 | 8.20 | 8.16 | 8.04 | 8.10 | 8.07 |
| | DO (mg/L) | 8.5 | 8.4 | 8.4 | 8.4 | 8.2 | 8.3 | 8.2 | 8.2 |
| | Conductivity (µmhos/cm) | 2138 | | 2166 | | 2180 | | 2200 | |
| | Temperature (°C) | 24.5 | 25.0 | 24.4 | 24.9 | 24.2 | 24.8 | 24.2 | 24.8 |
| 1200 mg NaCl/L | pH (S.U.) | 8.10 | 8.26 | 8.14 | 8.25 | 8.16 | 8.06 | 8.10 | 8.10 |
| | DO (mg/L) | 8.5 | 8.3 | 8.4 | 8.4 | 8.3 | 8.3 | 8.3 | 8.2 |
| | Conductivity (µmhos/cm) | 2485 | | 2489 | | 2520 | | 2550 | |
| | Temperature (°C) | 24.6 | 25.0 | 24.4 | 24.8 | 24.2 | 24.8 | 24.3 | 25.0 |
| 1400 mg NaCl/L | pH (S.U.) | 8.11 | 8.25 | 8.14 | 8.20 | 8.16 | 8.07 | 8.10 | 8.10 |
| | DO (mg/L) | 8.5 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.2 |
| | Conductivity (µmhos/cm) | 2822 | | 2852 | | 2890 | | 2920 | |
| | Temperature (°C) | 24.6 | 25.0 | 24.4 | 24.8 | 24.2 | 24.8 | 24.2 | 24.9 |

| | Day 3 | Day 4 | Day 5 | Day 6 |
|---|---|---|---|---|
| Stock | 109400 | 109400 | 109800 | 109800 |