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

January 9, 2002

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

Attention: Ms. Evelyn Haskin, Enforcement & Compliance

Dear Ms. Haskin:

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

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

Sincerely,

Diedre B. Nida

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

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

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

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

IE25

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

ATTN: Diedre B. Nida

# DISCHARGE MONITORING REPORT (DMR)

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

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

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

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

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

| PARAMETER (32-37) | | (3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | (4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM | (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | NO. EX (62-63) | FREQUENCY OF ANALYSIS (64-68) | SAMPLE TYPE (69-70) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 17.7 | (04) | 0 | 31 / 31 | MODELD |
| 00010 Z 0 0 INSTREAM MONITORING | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 30.5 DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| TEMPERATURE, WATER DEG. CENTIGRADE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | 30.3 | (04) | 0 | 31 / 31 | RCORDR |
| 00010 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | REPORT DAILY MX | DEG. C. | | SEE PERMIT | CK REQ |
| PH | SAMPLE MEASUREMENT | ******** | ******** | ** | 7.3 | ******** | 7.8 | (12) | 0 | 8 / 31 | GRAB |
| 00400 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 6.0 MINIMUM | ******** | 9.0 MAXIMUM | SU | | WEEKLY | GRAB |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | 5 | 8 | (19) | 0 | 4 / 31 | GRAB |
| 00530 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 30 MO AVG | 100 DAILY MX | MG/L | | WEEKLY | GRAB |
| OIL AND GREASE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | <5 | <5 | (19) | 0 | 4 / 31 | GRAB |
| 00556 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 15 MO AVG | 20 DAILY MX | MG/L | | WEEKLY | GRAB |
| FLOW, IN CONDUIT OR THRU TREATMENT PLANT | SAMPLE MEASUREMENT | ******** | 1622 | (03) | ******** | ******** | ******** | ** | 0 | 31 / 31 | RCORDR |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | REPORT DAILY MX | MGD | ******** | ******** | ******** | **** | | CONTIN UOUS | RCORDR |
| CHLORINE, TOTAL RESIDUAL | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | <0.007 | 0.014 | (19) | 0 | 41 / 31 | GRAB |
| 50060 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | 0.036 | 0.058 INST MAX | MG/L | | WEEK-DAYS | CALCTD |

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

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

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

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

ATTN: Diedre B. Nida

DISCHARGE MONITORING REPORT (DMR)

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

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

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

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

NOTE: Read instructions before completing this form.

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

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

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
CCW data for December 2001 is attached.

CCW Data for December 2001

CCW CHANNEL

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

CCW TRENCH DISCHARGE

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

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

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)*

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

MONITORING PERIOD

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

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

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

NOTE: Read instructions before completing this form.

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

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

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

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

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

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Location HAMILTON COUNTY

ATTN: Diedre B. Nida

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

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

MONITORING PERIOD

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

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

*** NO DISCHARGE [ ] ***

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

NOTE: Read instructions before completing this form.

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

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

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

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

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

ATTN: Diedre B. Nida

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

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

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

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

*** NO DISCHARGE XX ***

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

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

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

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

No phosphate bearing chemicals were employed. No Discharge this Period

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

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

ATTN: Diedre B. Nida

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

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

MONITORING PERIOD

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

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

*** NO DISCHARGE [XX] ***

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

NOTE: Read instructions before completing this form.

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

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

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

No Discharge this Period

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

ATTN: Diedre B. Nida

DISCHARGE MONITORING REPORT (DMR)

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

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

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

*** NO DISCHARGE XX ***

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

NOTE: Read instructions before completing this form.

| PARAMETER (32-37) | | (3 Card Only) QUANTITY OR LOADING (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | (4 Card Only) QUALITY OR CONCENTRATION (38-45) MINIMUM | (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | NO. EX (62-63) | FREQUENCY OF ANALYSIS (64-68) | SAMPLE TYPE (69-70) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OXYGEN, DISSOLVED (DO) | SAMPLE MEASUREMENT | ******** | ******** | ** | | ******** | ******** | (19) | | | |
| 00300 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | 2.0 DAILY MN | ******** | ******** | MG/L | | TWICE/ WEEK | GRAB |
| SOLIDS, TOTAL SUSPENDED | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (19) | | | |
| 00530 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 100 DAILY MX | MG/L | | TWICE/ WEEK | GRAB |
| SOLIDS, SETTLEABLE | SAMPLE MEASUREMENT | ******** | ******** | ** | ******** | ******** | | (25) | | | |
| 00545 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | ******** | ******** | **** | ******** | ******** | 1.0 DAILY MX | ML/L | | ONCE/ MONTH | GRAB |
| FLOW, IN CONDUIT OR THRU TREATMENT PLANT | SAMPLE MEASUREMENT | | | (03) | ******** | ******** | ******** | ** | | | |
| 50050 1 0 0 EFFLUENT GROSS VALUE | PERMIT REQUIREMENT | REPORT MO AVG | REPORT DAILY MX | MGD | ******** | ******** | ******** | * | | ONCE/ BATCH | CALCTD |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |

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

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

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

January 8, 2002

Diedre B. Nida, SB 2A-SQN

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

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

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

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

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

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

Cynthia L. Russell

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

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

# TENNESSEE VALLEY AUTHORITY
# TOXICITY TEST REPORT

INTRODUCTION/EXECUTIVE SUMMARY

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

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

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

5) Design Flow (MGD): 3,266

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

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

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

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

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

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

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

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

17) Test Results (%): Outfall 101

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

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

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

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

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

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

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

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

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

METHODS SUMMARY

Samples

1) Sampling Point: Outfall 101 and Intake

2) Sample Type: Composite

3) Sample Information:

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

*Total residual chlorine upon receipt.

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

Test Organisms

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

Test Method Summary (See Appendix A for additional information)

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

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

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

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

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

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

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

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

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

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

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

PHYSICAL/CHEMICAL SUMMARY

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

See Summary Tables in Appendix B

SUMMARY/CONCLUSIONS

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

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

Appendix A

# ADDITIONAL TOXICITY TEST INFORMATION

## SUMMARY OF METHODS

1) *Pimephales promelas*

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

2) *Ceriodaphnia dubia*

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

## DEVIATIONS/MODIFICATIONS TO TEST PROTOCOL

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

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

1) *Pimephales promelas*

None

2) *Ceriodaphnia dubia*

None

## PHYSICAL AND CHEMICAL METHODS

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

2) Instruments: All identification, service, and calibration information pertaining to S&ME laboratory instruments is recorded in calibration and maintenance log books.

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

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

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

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

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

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

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

## QUALITY ASSURANCE

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

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

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

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

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

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

REFERENCES


1) NPDES Permit No. TN0026450.

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

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

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

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

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

And

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

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

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

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

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

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

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

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

Table B-3. Water Chemistry Mean Values and Ranges for Daphnid Test, Sequoyah Nuclear Plant (SQN), December 10 - 17, 2001

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

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix C

Chain of Custody Records and
Toxicity Bench Sheets

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client
Other (specify):

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

Sample Custody – Fill In From Top Down

| Relinquished By (Signature): | Date/Time | Received By (Signature): | Date/Time |
|---|---|---|---|
| Wanda Allen | 12/10/01 0930 | R. Nunley | 12/10/01 0930 |
| R. Nunley | 12/10/01 1232 | Gene L. Southard | 12/10/01 1232 |

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

oc

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client
Other (specify):

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

Sample Custody – Fill In From Top Down

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

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

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# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client
Other (specify):

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

Sample Custody – Fill In From Top Down

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

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

COC

# *CERIODAPHNIA* TEST INFORMATION SHEET

Test Name: TVA –Sequoyah Nuclear Plant

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

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

Stock (if applicable): _____

**Control Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

**Dilution Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

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

**Age of Test Organisms:**

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

**Record of Minor Test Non-Conformity**

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

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

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

## Ceriodaphnia Daily Test Information Logsheet

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

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

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

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

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

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

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

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

Client: Tennessee Valley Authority-Sequoyah Analysts: BAO YCS AHL

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

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

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

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

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

30
YW

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

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

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

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

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

## Ceriodaphnia Survival and Reproduction Test-Reproduction

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

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

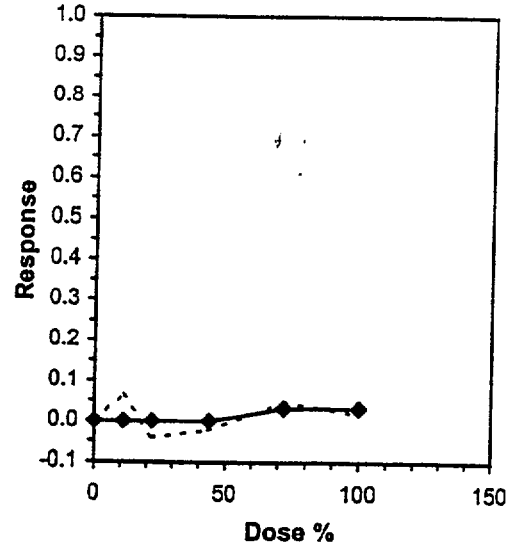
| | | | Transform: Untransformed | | | | | Rank | 1-Tailed | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-% | Mean | N-Mean | Mean | Min | Max | CV% | N | Sum | Critical | Mean | N-Mean |
| D-Control | 25.700 | 1.0000 | 25.700 | 22.000 | 31.000 | 10.384 | 10 | | | 25.725 | 1.0000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

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

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

Linear Interpolation (80 Resamples)

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



## Ceriodaphnia Survival and Reproduction Test-Reproduction

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

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

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

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

**Hypothesis Test (1-tail, 0.05)**

Homoscedastic t Test indicates no significant differences

# Daily Chemistry Data - Ceriodaphnia 7-day Chronic

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

Analysts: LSD, VCS, BAD, DSC
Dates/times: 4/5/01 1430 - 4/12/01 1500
Age of neonates: <24 hrs

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

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

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

Notes:

# Daily Chemistry Data - Ceriodaphnia 7-day Chronic

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

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

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

| 100% Outfall 001 | Day 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Temperature-Initial | 24.6 | ~~24.3~~ | 24.9 | 25.4 | 25.1 | 24.0 | 25.0 | | 24.8 = init. stewed day 2 |
| Final | | 24.1 | 24.4 | 25.0 | 24.0 | 24.5 | 25.0 | 24.4 | |
| D.O. Initial | 7.0 | 7.2 | ~~7.4~~ | 7.2 | 7.2 | 7.5 | 7.2 | | init D.O. day 2 = 7.8 |
| Final | | 7.0 | 7.8 | 6.9 | 7.1 | 7.0 | 7.1 | 7.6 | |
| pH Initial | 7.7 | 7.6 | 7.8 | 7.9 | ~~8.0~~ | 7.8 | 7.8 | | ph day 4 ⇒ 7.8 |
| Final | | 8.1 | 8.3 | 8.2 | 8.1 | 8.2 | 8.2 | 8.2 | |
| Alkalinity | 63 | / | 69 | / | 67 | / | / | | Conductivity day 4 ⇒ 191 |
| Hardness | 70 | / | 80 | / | 80 | / | / | | |
| Conductivity-Initial | 193 | 194 | 201 | 205 | ~~185~~ | 191 | 183 | | |
| Chlorine | 0.07 | / | 0.08 | / | 0.07 | / | / | | |
| Analyst Initials | LSD | BAD | BAD | DSG | VCS | BAD | DSG | VCS | |
| QA Review Initials | LSD | LSD | LSD | LSD | LSD | LSD | LSD | LSD | |
| Sample Date | 12/10 | 12/10 | 12/12 | 12/12 | 12/14 | 12/14 | 12/14 | / | |

Notes:

## Daily Chemistry Data - Ceriodaphnia 7-day Chronic

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

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

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

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

Notes:

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

Initial Chemistry

CERIO

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

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

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

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

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

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

Cerio Water Chemistry

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

Final Chemistry

CERIO

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

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

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

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

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

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

Cerio Water Chemistry

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

| | | |
|---|---|---|
| Test temperature | Mean: | 24.7 |
| | Min: | 24.0 |
| | Max: | 25.5 |

Word Review by: CM

Excel Reviewed by: CM

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

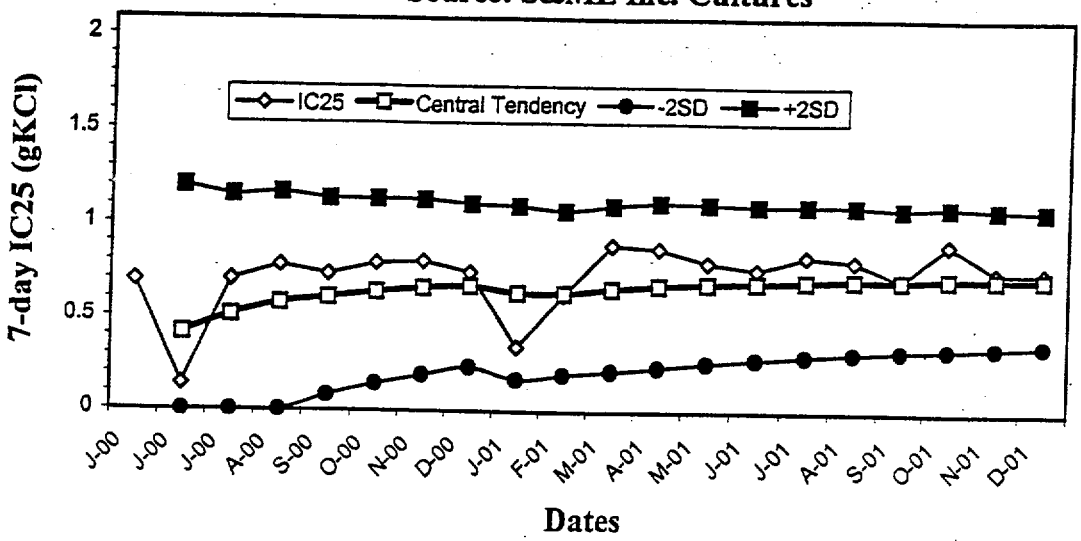
Appendix D

Reference Toxicant Tests and
Control Chart Information

# Fathead Minnow Potassium Chloride Chronic Reference Toxicant Control Chart

CV% = 25.0

Source: S&ME Inc. Cultures




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

## Fathead Minnow Daily Test Information Logsheet

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

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

**Client:** S&ME Chronic Reference

**Location:** S&ME Laboratory

**Analyst:** DSG, LSD, VCS

**Dates:** 12/9/01 – 12/16/01

## CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

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

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

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

** Injured during removal 12/4/01 LSD

# FATHEAD MINNOW SEVEN DAY TEST
## RAW DATA
## SURVIVAL AND GROWTH

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

Test Dates: 12/9/01 - 12/16/01
Oven Temp (°C) 103
Comments:
Drying Time (h) ~~46~~ LSD 9½ hrs
End of drying (date/time) 0900 12/17/01
Start of drying (date/time) 1130 12/16/01

| Exposure & Repl. | Rep. | # Live Fish | # Original Fish | Pan Tare Weight (mg) | Dry Weight Pan + Fish (mg) | Groups Dry Weight (Pan + Fish minus Tare)(mg) | Mean Dry Weight (mg) |
|---|---|---|---|---|---|---|---|
| Control | A | 10 | 10 | 1264.99 | 1270.02 | 5.83 | 0.503 |
| (Mod. Hard) | B | 10 | 10 | 1253.35 | 1257.88 | 4.53 | 0.453 |
| | C | 10 | 10 | 1259.65 | 1264.55 | 4.90 | 0.490 |
| | D | 10 | 10 | 1255.13 | 1260.40 | 5.27 | 0.527 |
| 250 mg/L | A | 10 | 10 | 1264.50 | 1269.51 | 5.01 | 0.501 |
| (KCl) | B | 10 | 10 | 1263.07 | 1268.88 | 5.01 | 0.501 |
| | C | 10 | 10 | 1263.71 | 1267.97 | 4.26 | 0.426 |
| | D | 10 | 10 | 1264.20 | 1269.19 | 4.99 | 0.499 |
| 500 mg/L | A | 6 | ~~7~~ 6 | 1257.10 | 1259.55 | ~~4.45~~ 2.45 4.55 4.00 | 0.408 |
| (KCl) | B | 10 | 10 | 1260.41 | 1264.73 | 4.32 | 0.432 |
| | C | 10 | 10 | 1263.02 | 1267.94 | 4.92 | 0.492 |
| | D | 10 | 10 | 1262.73 | 1267.34 | 4.61 | 0.461 |
| 750 mg/L | A | 9 | 10 | 1258.84 | 1262.39 | 3.55 | 0.355 |
| (KCl) | B | 7 | 10 | 1262.35 | 1266.46 | 4.11 | 0.411 |
| | C | 6 | 10 | 1250.18 | 1253.27 | 3.09 | 0.309 |
| | D | 9 | 10 | 1250.41 | 1254.50 | 4.09 | 0.409 |
| 1000 mg/L | A | 3 | 10 | 1263.15 | 1264.86 | 1.71 | 0.171 |
| (KCl) | B | 2 | 10 | 1262.94 | 1264.28 | 1.34 | 0.134 |
| | C | 2 | 10 | 1259.08 | 1260.38 | 1.30 | 0.130 |
| | D | 4 | 10 | 1250.47 | 1253.35 | 2.88 | 0.288 |

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

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

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

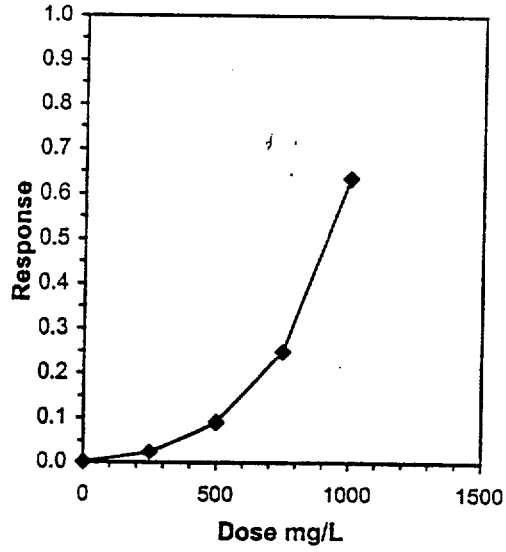
| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 0.4933 | 1.0000 | 0.4933 | 0.4530 | 0.5270 | 6.265 | 4 | | |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

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

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

Linear Interpolation (80 Resamples)

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



# Daily Chemistry Data - Fathead Minnow 7-day Chronic

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

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

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

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

NOTES:

## Daily Chemistry Data - Fathead Minnow 7-day Chronic

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

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

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

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

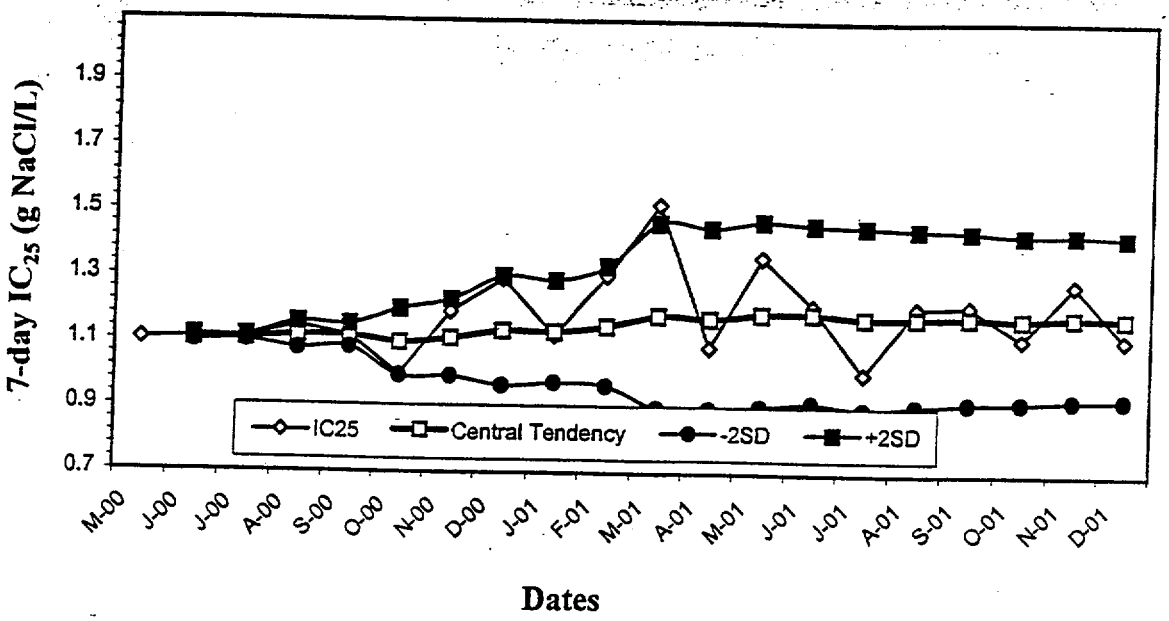
| 1500 mg/L (KCl) | Day 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| Temperature-Initial | 25.6 | 24.0 | 24.4 | 24.8 | 25.3 | | | | |
| Final | | 24.9 | 26.0 | 24.6 | — | / | / | / | |
| D.O. Initial | 7.2 | 7.6 | 7.1 | 7.6 | 7.3 | / | / | | |
| Final | | 6.4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

NOTES:

## *Ceriodaphnia dubia* Sodium Chloride Chronic Reference Toxicant Control Chart

CV% = 10.6

**Source: S&ME Inc. Cultures**




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

# *CERIODAPHNIA* TEST INFORMATION SHEET

Test Name: Chronic Reference Test

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

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

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

**Control Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

**Dilution Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

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

**Age of Test Organisms:**

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

**Record of Minor Test Non-Conformity**

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

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

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

## Ceriodaphnia Daily Test Information Logsheet

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

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

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

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

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

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

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

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

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

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

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

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

## Ceriodaphnia Survival and Reproduction Test-Reproduction

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

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

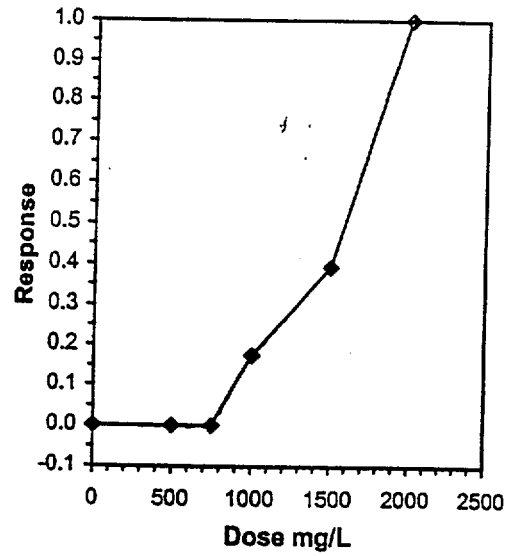
| | | | Transform: Untransformed | | | | | | 1-Tailed | | Isotonic | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc-mg/L | Mean | N-Mean | Mean | Min | Max | CV% | N | t-Stat | Critical | MSD | Mean | N-Mean |
| D-Control | 24.800 | 1.0000 | 24.800 | 22.000 | 27.000 | 6.801 | 10 | | |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

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

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

Linear Interpolation (80 Resamples)

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



## Daily Chemistry Data - Ceriodaphnia 7-day Chronic

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

Analysts: LSD YCS, BAD DSG
Dates/times: 121101 1430 - 121701 1730
Age of Neonates: <24 hrs

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

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

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

## Daily Chemistry Data - Ceriodaphnia 7-day Chronic

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

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

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

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

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

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix E

Invalid Fathead Minnow Toxicity Test
Bench Sheets

TOXICITY TEST RESULTS (See Appendix E for Bench Sheets)

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

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

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

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

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

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

REFERENCE TOXICANT TEST RESULTS

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

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

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

# FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

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

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

Stock (if applicable): _____

**Control Water Type (✓):**

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

**Dilution Water Type (✓):**

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

**Source of Test Larvae (✓):**

S&ME Lot# 01-227 ☐

Other (describe): _____ ☐

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

**Record of Minor Test Non-Conformity**

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

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

REV.01, JANUARY00 (fathead minnow test info)

## Fathead Minnow Daily Test Information Logsheet

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

| Daily Test information | Temperature Information (25±1°C) | | | Feeding Information (feeding interval 6± 1h) | | Test Initiation, Water Change, or Test Termination | | Control Water Carboy No. and Additional comments | |
|---|---|---|---|---|---|---|---|---|---|
| Date and Initials | Incubator Temp. (°C) a.m. | Incubator Temp. (°C) p.m. | Therm. No. | Fed 100 uL Brine Shrimp | Feeding time | Start Time | End Time | Carboy # | Date Prep. |
| Day 0 LSO 12/10/01 | — | 25.1 | 4 | | am: —<br>pm: 1615 | 1400 | 1430 | 2 | 12/9/01 |
| Day 1 BHO 12/11/01 | 25.2 | 25.2 | 4 | ✓ | am: 0930<br>pm: 1600 | 1425 | 1450 | 4 | 12/9/01 |
| Day 2 VCS 12/12/01 | 25.1 | 25.3 | 4 | ✓ | am: 1000<br>pm: 1630 | 1440 | 1505 | 4 | 12/11/01 |
| Day 3 VCS 12/13/01 | 25.1 | 25.1 | 4 | ✓ | am: 0930<br>pm: 1600 | 1335 | 1500 | 2 | 12/11/01 |
| Day 4 VCS 12/14/01 | 25.1 | 25.2 | 4 | ✓ | am: 0830<br>pm: 1600 | 1325 | 1401 | 4 | 12/12/01 |
| Day 5 BHO 12/15/01 | 25.3 | 25.2 | 4 | ✓ | am: 0915<br>pm: 1500 | 1400 | 1435 | LSO ~~4~~ 2 | 12/13/01 |
| Day 6 ALR 12/16/01 | 25.2 | 25.2 | 4 | ✓ | am: 930<br>pm: 1100 | 1300 | 1335 | 4 | 12/14/01 |
| Day 7 LSO 12/17/01 | 25.2 | 25.2 | 4 | | | 1435 | | ~~2~~ 4 | ~~12/14/01~~ |

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

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

## CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

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

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

*injured removed from replicate

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

# FATHEAD MINNOW SEVEN DAY TEST
## RAW DATA
## SURVIVAL AND GROWTH

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

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

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

# FATHEAD MINNOW SEVEN DAY TEST
# RAW DATA
# SURVIVAL AND GROWTH

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

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

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

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

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

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

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

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

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

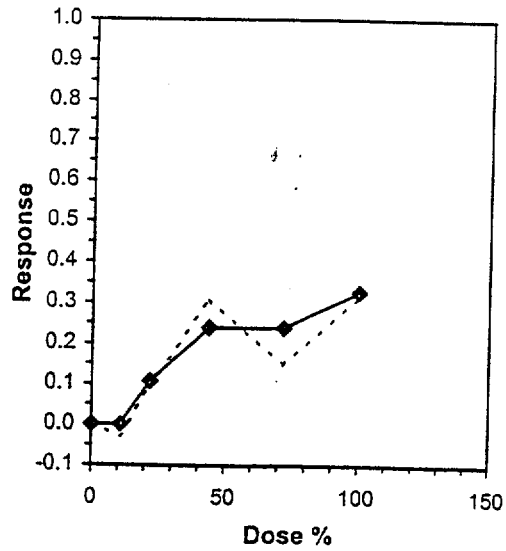
### Linear Interpolation (80 Resamples)

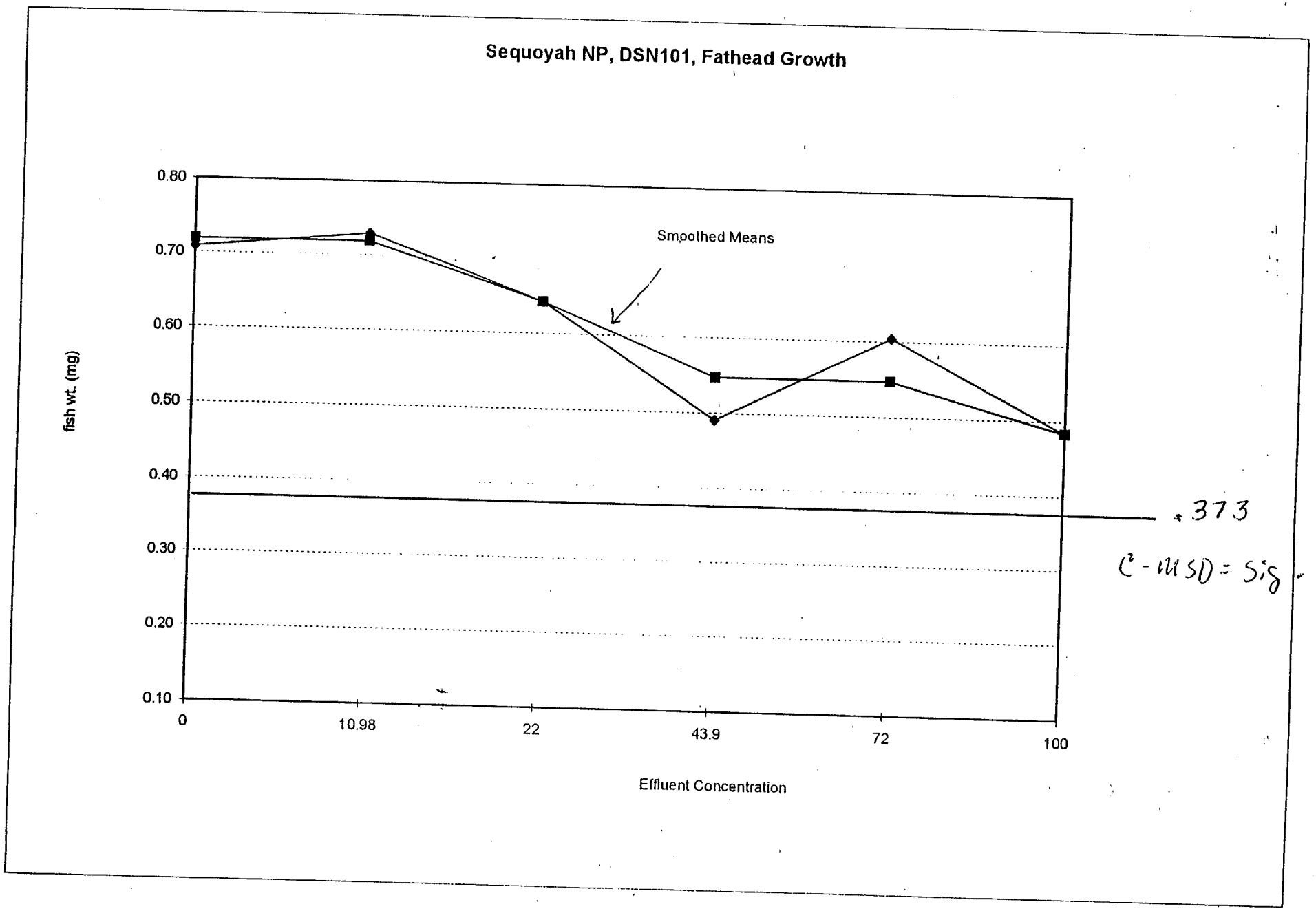
| Point | % | SD | 95% CL(Exp) | | Skew |
|---|---|---|---|---|---|
| IC05 | 16.111 | 7.134 | 0.000 | 34.339 | 0.5410 |
| IC10 | 21.242 | | | | |
| IC15 | 29.084 | | | | |
| IC20 | 37.396 | | | | |
| IC25 | 75.449 | | | | |
| IC40 | >100 | | | | |
| IC50 | >100 | | | | |

PMSD range 9.4% - 35%

MSD = 0.3365

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




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

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

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

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

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

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

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

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

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

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

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

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

**Hypothesis Test (1-tail, 0.05)**

Homoscedastic t Test indicates significant differences

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

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

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

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

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

**Hypothesis Test (1-tail, 0.05)**

Heteroscedastic t Test indicates significant differences

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

Initial Chemistry

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

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

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

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

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

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

Fish Water Chemistry

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

Final Chemistry

FISH

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

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

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

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

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

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

Fish Water Chemistry

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

| | | |
|---|---|---|
| Test Temperature | Mean | 24.9 |
| | Minimum | 24.0 |
| | Maximum | 25.7 |

Word Review by: Cur

Excel Reviewed by: Cur

# Daily Chemistry Data - Fathead Minnow 7-day Chronic

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

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

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

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

Notes:

# Daily Chemistry Data - Fathead Minnow 7-day Chronic

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

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

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

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

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

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

Notes:

## Daily Chemistry Data - Fathead Minnow 7-day Chronic

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

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

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

Notes

Sequoyah Nuclear Plant Biomonitoring
November 27- December 1, 2001

Appendix F

Void Tests
Chain of Custody Records and
Toxicity Bench Sheets

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client
Other (specify):

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

Sample Custody – Fill In From Top Down

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

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

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client

Other (specify):

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

Sample Custody – Fill In From Top Down

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

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

A COC

# BIOMONITORING CHAIN OF CUSTODY RECORD



Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

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

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

FedEx UPS Bus Client
Other (specify):

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

Sample Custody – Fill In From Top Down

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

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

# FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

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

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

Intake 100%.

Stock (if applicable): _____

**Control Water Type (✓):**

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

**Dilution Water Type (✓):**

Moderately Hard Water + Trace Minerals ☑

Other (describe): _____ ☐

**Source of Test Larvae (✓):**

S&ME Lot # 01-221 ☐

Other (describe): _____ ☐

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

**Record of Minor Test Non-Conformity**

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

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

REV.01, JANUARY00 (fathead minnow test info)

## Fathead Minnow Daily Test Information Logsheet

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

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

**Client:** TVA/Sequoyah Nuclear Plant

**Location:** Soddy Daisy, Tennessee

**Analysts:** VCS, BAD, DSG

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

## CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

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

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

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

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

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

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

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

* change D.O. membrane * DSG

* terminated due to lack of sample day 4
BAD

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

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

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

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

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

DSG changed D.O. membrane day #7

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

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

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

DSG changed D.O. meters on day 1

# *CERIODAPHNIA* TEST INFORMATION SHEET

Test Name: TVA –Sequoyah Nuclear Plant

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

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

Stock (if applicable): _____

**Control Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

**Dilution Water Type (✓):**

20% Dilute Mineral Water + Trace Minerals ☑

Other (describe): _____ ☐

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

**Age of Test Organisms:**

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

**Record of Minor Test Non-Conformity**

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

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

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

## Ceriodaphnia Daily Test Information Logsheet

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

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

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

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

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

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

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

* lost animal

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

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

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

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

* dropped animal.

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

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

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

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

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

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

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

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

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



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

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

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

* terminated test early due to lack of sample.
BAD

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

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

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

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

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

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

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

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