DOE/OR/22012--T13

STANDARD REPORT FORM

STATIC RENEWAL TESTS USING ANODONTA IMBECILLIS
(FRESHWATER MUSSELS)

Test Title: Anodonta imbecillis Copper Sulfate Reference Toxicant/Food Test, Clinch River - Environmental Restoration Program (CR-ERP)

Principle Investigator: Damien J. Simbeck

Starting Date: July 6, 1993

Ending Date: July 15, 1993

1.0 EXECUTIVE SUMMARY

Reference toxicant testing using juvenile freshwater mussels was conducted as part of the CR-ERP biomonitoring study of Clinch River sediments to assess the sensitivity of test organisms and the overall performance of the test. [1] Tests were conducted using moderately hard synthetic water spiked with known concentrations of copper as copper sulfate. Two different foods, phytoplankton and YCT-Selenastrum (YCT-S), were tested in side by side tests to compare food quality.

Toxicity testing of copper sulfate reference toxicant was conducted from July 6-15, 1993. The organisms used for testing were juvenile fresh-water mussels (Anodonta imbecillis). Results from this test showed LC_{50} values of 0.97 and 0.84 mg Cu/L for phytoplankton and YCT-S, respectively. Previously obtained values for phytoplankton tests are 2.02 and 1.12 mg Cu/L. Too few tests have been conducted with copper as the toxicant to determine a normal range of values. Although significant reduction in growth, compared to the phytoplankton control, was seen in all treatments, including the YCT-S Control, the consequence of this observation has not been established. Ninety-day testing of juvenile mussels exhibited large variations in growth within treatment and replicate groups. [2]

2.0 SAMPLE COLLECTION/TREATMENTS

2.1 Test Sample Identification (Chemical/Effluent/Elutriate, etc.): The samples used were serial dilutions of preserved copper stock solutions diluted in moderately hard synthetic water. Stock solutions were prepared on June 28, 1993, from EPA Reference Toxicant copper sulfate (50 mg Cu/mL), lot #188, and were used daily during the test.

DISCLAIMER

2.2 Control and/or Dilution Water: Moderately hard synthetic water.

2.3 Sample Dates and Times: Not applicable.

2.4 Sampling Method: Not applicable

2.5 Sample Storage/Handling: All samples were renewed daily. Moderately hard synthetic water was prepared as needed and stored in 20-L carboys under aeration until used. Copper stock solutions were preserved using 1:1 HNO_3 following procedures for preservation of metals samples. [3]

2.6 Sample Transport: Not applicable

2.7 Sample Pretreatment: Sample temperature was raised to 24°C in a warm water bath. Food (phytoplankton or YCT-S) and non-toxic, filtered (100 µm Nytex® screen) sediment were added daily prior to initial chemical measurements.

2.8 Test Treatments: Nominal test concentrations were Control (0 mg Cu/L), 0.31 mg Cu/L, 0.63 mg Cu/L, 1.25 mg Cu/L, 2.5 mg Cu/L, and 5.0 mg Cu/L. Actual total copper concentrations verified by laboratory analysis of the prepared test series were Control (0 mg Cu/L), 0.30 mg Cu/L, 0.60 mg Cu/L, 1.40 mg Cu/L, 2.70 mg Cu/L, and 5.40 mg Cu/L for the phytoplankton series and Control (0 mg Cu/L), 0.30 mg Cu/L, 0.62 mg Cu/L, 1.30 mg Cu/L, 2.50 mg Cu/L, and 5.10 mg Cu/L for the YCT-S series.

3.0 TEST ORGANISMS/CULTURING CONDITIONS

3.1 Species: Anodonta imbecillis, freshwater mussel

3.2 Source: In vitro culture, June 21-June 28, 1993, TVA Aquatic Research Laboratory. The gravid adult from which glochidia were extracted was obtained from Taylor's Catfish ponds, Town Creek, Alabama, on April 13, 1993. Adults were maintained in a 40-L aquarium with approximately 5 L non-toxic sediment from Taylor's ponds and 20 L Tennessee River water. Water was changed at least once per week with bloomed phytoplankton water and sediment was changed monthly.

3.3 Culture medium: Mussel culture medium used to transform larvae (glochidia) into juveniles consisted of a 2:1 mixture of cell culture medium (MEM) and 0.22 µm filtered catfish plasma. Antibiotics and antimycotics were added in small concentrations to prevent bacterial and fungal contamination. [4]

3.4 Temperature of Culture: 24°C ± 1°C

3.5 Culture water: After transformation of larval mussels, the free-living juveniles were placed in 100 µm filtered TR water with bloomed indigenous algae (phytoplankton). Non-toxic sediment (100 µm filtered) was added to provide additional food and substrate for healthy growth of the juvenile mussels. [5]

3.6 Temperature of Culture: 24°C ± 1°C

3.7 General Maintenance: Cultures were maintained in 1000-mL Nalgene® trays in 24-h dark incubators for 6-10 days after transformation. Cultures were fed bloomed phytoplankton daily. Water and sediment were changed a minimum of once every two days. Health and survival of the cultures were checked by microscopic examination of animals when culture water was changed.

3.8 Food Preparation:

3.8.1 Phytoplankton preparation: Phytoplankton was bloomed in 20-L glass aquaria 4-7 days (until dark green). Blooms were initiated by adding concentrated solids from ARL channel water to filtered (100 µm) TR water. Algal nutrients used for Selenastrum cultures were added (1 mL/L) to boost algal blooms. [6] Blooms were centrifuged to concentrate the algal cells into a dark green suspension, obtaining about 0.5 L per aquarium. Prepared phytoplankton concentrate was refrigerated until used.

3.8.2 YCT and Selenastrum preparation: YCT was made according to methods modified from EPA/600/4-89/001 with tropical fish food substituted for trout chow and alfalfa substituted for Cerophyll. [7] The alga Selenastrum capricornutum concentrated to 30 x 10^6 cells/mL was also fed as part of the test diet.

3.9 Sediment preparation: Whole, non-toxic sediment from Taylor's Catfish ponds, Town Creek, Alabama, was filtered through a 100-µm nylon mesh filter. Filtered sediment was stored at 4°C until used.

4.0 TEST METHODS

4.1 Mussels, Anodonta imbecillis, Survival Test, TVA Test Method, SOP-22, liquid media protocol. [6]

4.2 Modification/Deviations to SOP-22: None

4.3 Date/Time Test Initiated: July 6, 1993/0930 CDT

4.4 Date/Time Test Terminated: July 15, 1993/0930 CDT

4.5 Age of test organisms: 8 days old

4.6 Test Chamber: 50 mm-diameter glass cylinder (75 mm tall) with 100-µm nylon mesh bottom, placed in 250-mL crystallizing dish

4.7 Volume per Chamber: 150 mL

4.8 Number of organisms per replicate: 10

4.9 Number of Replicates per Treatment: 4

4.10 Dilution Water: Moderately hard synthetic water

4.11 Test Controls: Moderately hard synthetic water was spiked with pH adjusted reagent water to exclude pH as a variable since copper stock solutions were acid preserved. This water augmented with either phytoplankton or YCT-S served as controls for respective food-source comparisons.

4.12 Food and Feeding: One series was fed 6 mL/L phytoplankton and the other was fed 3 mL/L YCT and 3 mL/L Selenastrum, added to test water daily.

4.13 Test Temperature: 24°C ± 1

4.14 Photoperiod: 24-h dark

4.15 Renewal Period: 24-h

4.16 Physical and Chemical Parameters Measured: Parameters measured daily ("initial") on fresh test solutions and control waters (following addition of silt and algae) were temperature (temperature adjusted to equal "final" temperature before renewal), DO, pH, and conductivity. Alkalinity, and hardness were measured daily on the control and highest concentration.

"Final" measurements of temperature, DO, and pH were measured daily in one replicate per treatment before renewal. Conductivity was measured in a combination of two or more replicates per treatment following renewal. Mean values and ranges are reported in Section 6.3.2. One day during the study samples were collected for total copper determination by combining test water from the replicates for each treatment (following renewal) in 500 mL bottles and adding 1:1 HNO_3 for preservation. The test copper series were sent to TVA's Environmental Chemistry Laboratory in Chattanooga, Tennessee, for analysis using inductively coupled plasma (ICP) methodology.

4.17 Test Endpoint Determination:

4.17.1 Survival: Test animals were counted as dead when microscopic examination revealed valves gaped open and no observable internal movement or an empty shell.

4.17.2 Growth: Reported growth was the length along the longest axis measured at ≅ mid-shell using an ocular micrometer. Results are reported in microns.

4.18 Statistics: Revised statistical procedures contained in the fourth edition of EPA's acute toxicity methods require a decision process for testing statistical assumptions before selecting a specific program to determine LC_{50} values. [8] Decision processes followed for testing mussel survival response are shown in Sections 6.2.1.1 and 6.2.2.1. The program used for LC_{50} determination for this test was the Spearman-Karber Method for the phytoplankton series and the Probit Analysis for the YCT-S series. Statistical analysis of growth data was conducted using the phytoplankton control and included only those treatments which did not show significant survival effects based on hypothesis testing of treatments within each food test. The decision process used for selection of the appropriate test for mussel growth is shown in Section 6.3.1. Dunnett's Test was used for endpoint determination.

5.0 QUALITY ASSURANCE

5.1 Toxicity Test Methods: All phases of the study including, but not limited to, sample preparation, 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, the ARL Quality Assurance Plan and SOP Manual, and EPA/600/4-89/001. [6][8] Any known deviations were noted during the study and are reported herein.

5.2 Physical and Chemical Methods

5.2.1 Reagents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable). All ARL chemicals are recorded in a bound Laboratory Chemical Logbook and specific chemicals used were documented on a chemical record sheet contained in the study notebook.

5.2.2 Instruments: All identification, service, and calibration information pertaining to ARL laboratory instruments is contained in bound Laboratory Instrument Logbooks and specific instruments used were documented on an instrument record sheet, along with daily calibration record sheets, contained in the study notebook.

5.2.3 Temperature was measured using mercury thermometers. The instrument was standardized and inspected with readings made according to TVA procedure DS-42.11. [3]

5.2.4 Dissolved oxygen was measured using a YSI Model 57 oxygen meter. The instrument was standardized (using the Winkler method) and readings were taken according to TVA procedures DS-43.6 and DS-42.4, respectively. [3]

5.2.5 The pH was measured using an Orion Model SA250 meter equipped with an Orion Ross combination electrode. The instrument was standardized and readings were made according to TVA procedures DS-43.7 and DS-42.8, respectively. [3]

5.2.6 Conductance was measured using a YSI Model 32 SCT meter. The instrument was standardized and readings were taken according to TVA procedures DS-43.3 and DS-42.3, respectively. [3]

5.2.7 Alkalinity was measured by titration of 100 mL samples with 0.02 N H_2SO_4 to an end point of 4.5 according to TVA procedure DS-42.1. [3]

5.2.8 Hardness was determined by titration of 50 mL samples with EDTA to a colorimetric endpoint using an indicator (Instructions provided by Reagent Manufacturer [Calgon]), Schwarzenbach Method.

5.2.9 Total residual chlorine was determined using the DPD Titrimetric Method according to TVA procedure DS-42.9, Rev. 0. [3]

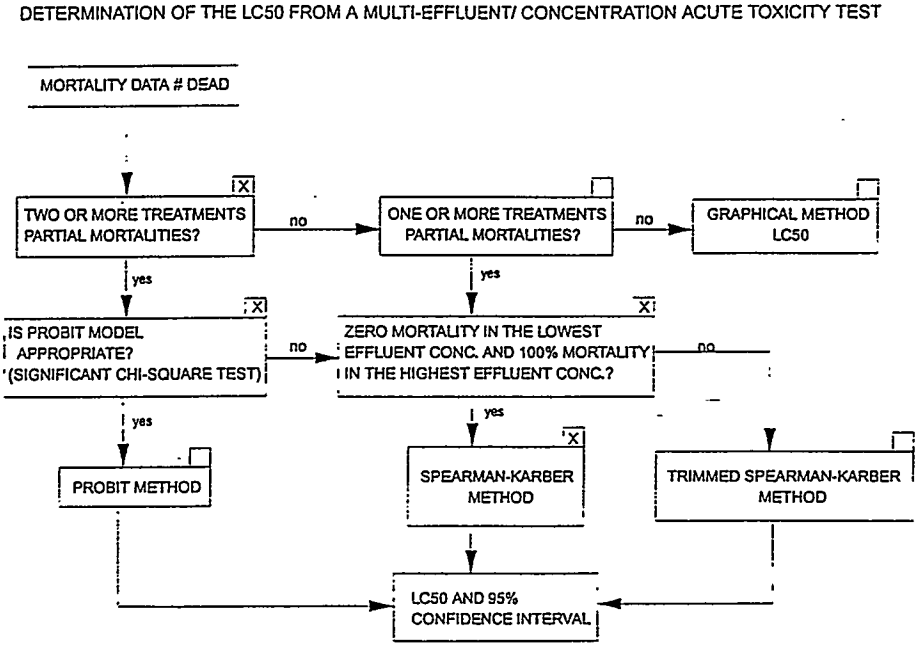
6.0 RESULTS

6.1 Summary of Results: Nine day exposure of juvenile freshwater mussels, Anodonta imbecillis, to copper reference toxicant resulted in LC_{50} values of 0.97 and 0.84 mg Cu/L for phytoplankton and YCT-S, respectively, based on the measured copper concentrations. A significant reduction in growth, compared to the phytoplankton control, was seen in all treatments, including the YCT-S Control.

6.2 Results, Survival Data:

6.2.1 Phytoplankton Study:

6.2.1.1 Statistical Decision Process for Determining Toxicity Endpoints for 9-Day Exposure of the Juvenile Mussel-Phytoplankton Series, Anodonta imbecillis, to Copper, July 6-15, 1993.



6.2.1.2 Daily Percent Survival Summary for Anodonta imbecillis, Copper Sulfate Reference Toxicant-Phytoplankton Study, CR-ERP, July 6-15, 1993.

	Total Daily % Survival								
Treatment	1	2	3	4	5	6	7	8	9
Control	95	95	95	95	95	93	93	93	93
0.30 mg Cu/L	100	100	100	100	100	100	100	100	100
0.60 mg Cu/L	100	100	100	100	100	100	100	100	98
1.40 mg Cu/L	100	100	100	95	90	85	58	35	10
2.70 mg Cu/L	95	83	75	65	60	33	23	0	0
5.40 mg Cu/L	50	18	0	0	0	0	0	0	0

6.2.1.3 Nine-day Percent Survival Summary for Anodonta imbecillis, Copper Sulfate Reference Toxicant-Phytoplankton Study, CR-ERP, July 6-15, 1993.

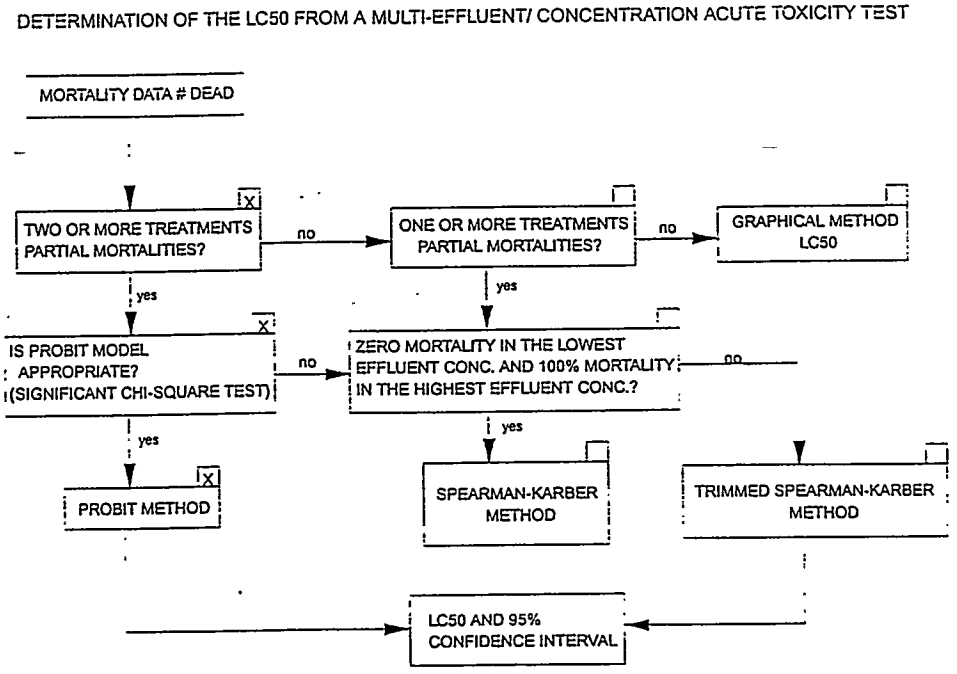
Mussel Survival Data (% Survival)												
	Replicate											
Treatment	1	2	3	4	5	6	7	8	9	10	Mean	S*
Control	90	90	90	100							93	
0.30 mg Cu/L	100	100	100	100							100	
0.60 mg Cu/L	100	100	90	100							98	
1.40 mg Cu/L	0	10	20	10							10	*
2.70 mg Cu/L	0	0	0	0							0	*
5.40 mg Cu/L	0	0	0	0							0	*

*Significantly less than control based on Steel's Many-one Rank Test.

6.2.1.4 Test Endpoint: 9-day LC_{50} = 0.97 (0.92-1.01, 95% C L) mg Cu/L.

6.2.2 YCT-S Study:

6.2.2.1 Statistical Decision Process for Determining Toxicity Endpoints for 9-Day Exposure of the Juvenile Mussel-YCT-S Series, Anodonta imbecillis, to Copper, July 6-15, 1993.



6.2.2.2 Daily Percent Survival Summary for Anodonta imbecillis, Copper Sulfate Reference Toxicant-YCT-S Study, CR-ERP, July 6-15, 1993.

	Total Daily % Survival								
Treatment	1	2	3	4	5	6	7	8	9
Control	100	100	100	100	100	100	100	100	100
0.30 mg Cu/L	100	98	98	98	98	98	98	98	98
0.62 mg Cu/L	100	100	93	93	90	90	90	88	80
1.30 mg Cu/L	98	98	95	85	75	63	43	23	15
2.50 mg Cu/L	88	70	68	68	43	30	13	13	0
5.10 mg Cu/L	43	18	0	0	0	0	0	0	0

6.2.2.3 Nine-day Percent Survival Summary for Anodonta imbecillis, Copper Sulfate Reference Toxicant-YCT-S Study, CR-ERP, July 6-15, 1993.

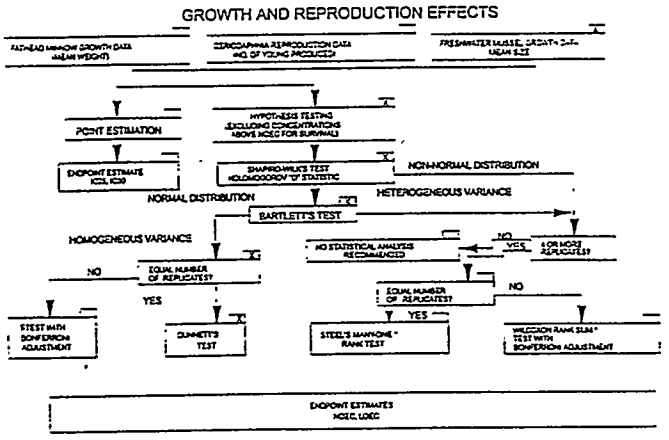
	Mussel Survival Data (% Survival)											
	Replicate											
Treatment	1	2	3	4	5	6	7	8	9	10	Mean	S*
Control	100	100	100	100							100	
0.30 mg Cu/L	100	100	100	90							98	
0.62 mg Cu/L	80	100	70	70							80	
1.30 mg Cu/L	50	10	0	0							15	*
2.50 mg Cu/L	0	0	0	0							0	*
5.10 mg Cu/L	0	0	0	0							0	*

*Significantly less than control based on Steel's Many-one Rank Test.

6.2.2.4 Test Endpoint: 9-day LC_{50} = 0.84 (0.73-0.96, 95% C L) mg Cu/L.

6.3 Results, Growth Data:

6.3.1 Statistical Decision Process for Determining Toxicity Endpoints for 9-Day Exposure of the Juvenile Mussel Anodonta imbecillis, to Copper, July 6-15, 1993.



6.3.2 Analysis of Growth (length, µm) Data Using Dunnett's Test for Juvenile Mussels 9-Day Test,

No transformation applied before data analysis. For this set of data, the minimum significant difference is 34.76.

This represents a 5.18% reduction in Growth (length, µm).
T = 2.41 Alpha = 0.05 (one-tailed test)

Growth (length, µm) Data

Group	Replicate 1	2	3	4	5	6	7	8	9	10	Mean	S*
Control-Phyto	696.9	670.8	683.8	631.1							670.65	
0.30 mg/L-P	411.6	446.9	439.0	435.1							433.15	*
0.60 mg/L-P	439.0	446.9	435.6	439.0							440.12	*
Control-YCT-S	635.0	654.6	642.9	576.2							627.17	*
0.30 mg/L-Y	462.6	446.9	466.5	453.0							457.25	*
0.62 mg/L-Y	431.2	443.0	459.2	448.0							445.35	*

*Indicates values significantly less than control (Control-Phyto).
EMS = 416.1.

6.4 Results: Water chemistry summary for Anodonta imbecillis, Copper Sulfate Reference Toxicant/Food Study, CR-ERP, July 6-15, 1993.

6.4.1 Overall Test Temperature:

6.4.1.1 Phytoplankton Study: 23.9°C (23.3°-24.4°C)

6.4.1.2 YCT-S Study: 23.8°C (23.0°-24.4°C)

6.4.2 See: Appendix A Water Chemistry Mean Values and Ranges for Anodonta imbecillis, Copper Sulfate Reference Toxicant/Phytoplankton Study, CR-ERP, July 6-15, 1993.

Appendix B Water Chemistry Mean Values and Ranges for Anodonta imbecillis, Copper Sulfate Reference Toxicant/YCT-Selenastrum Study, CR-ERP, July 6-15, 1993.

7.0 CONCLUSION

Toxicity testing of copper sulfate reference toxicant was conducted from July 6-15, 1993. The organisms used for testing were juvenile fresh-water mussels (Anodonta imbecillis). Results from this test showed LC_{50} values of 0.97 and 0.84 mg Cu/L for phytoplankton and YCT-S, respectively. Previously obtained values for phytoplankton tests are 2.02 and 1.12 mg Cu/L. Too few tests have been conducted with copper as the

toxicant to determine a normal range of values. Although significant reduction in growth, compared to the phytoplankton control, was seen in all treatments, including the YCT-S Control, the consequence of this observation has not been established. Ninety-day testing of juvenile mussels exhibited large variations in growth within treatment and replicate groups. [2]

8.0 REFERENCES

1. Phipps, T. L., and L. A. Kszos, Statement of Work to Provide Assistance to Staff of the Clinch River-Environmental Restoration Program (CR-ERP) and to Evaluate Toxicity Tests of Water and Sediment Conducted by CR-ERP Staff, Environmental Sciences Division, Biomonitoring Group, Oak Ridge National Laboratory (April 1993).
2. Schweinforth, R. L., and D. C. Wade, Effects from Subchronic 90-Day Exposure of In Vitro Transformed Juvenile Freshwater Mussels (Anodonta imbecillis) to Manganese, Abstract, 11th Annual Meeting, SETAC, Arlington, VA, 11-15 November, 1990.
3. Field Operations Natural Resource Engineering Procedures Manual, Vol. 1, Division of Natural Resource Operations, Tennessee Valley Authority.
4. Isom, B. G., and R. G. Hudson, "In Vitro Culture of Parasitic Freshwater Mussel Glochidia," The Nautilus, Vol. 96, No. 4, 1982, pp. 147-151.
5. Hudson, R. G., and B. G. Isom, "Rearing Juveniles of the Freshwater Mussels (Unionidae) in a Laboratory Setting," The Nautilus, Vol. 98, No. 4, 1984, pp. 129-135.
6. Aquatic Research Laboratory Quality Assurance Program and Standard Operating Procedures Manual, Division of Water Resources, Tennessee Valley Authority (October 1992).
7. Weber, C. I., W. H. Peltier, T. J. Norberg-King, W. B. Horning, F. A. Kessler, J. R. Menkdick, T. W. Neiheisel, P. A. Lewis, D. J. Klemm, Q. H. Pickering, F. L. Robinson, J. M. Lazorchak, L. J. Wymer, and R. W. Freyberg. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-89/001 (March 1989) and EPA/600/4-89/001a (September 1989).
8. Weber, C. I. (ed.), Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA/600/4-90/027 (September 1991).

PLARC501-1709

Appendix A

Water Chemistry Mean Values and Ranges for Anadonta imbecillis,
Copper Sulfate Reference Toxicant-Phytoplankton Study, CR-ERP, July 6-15, 1993

Source	Temperature	Dissolved Oxygen		pH		Conductivity		Alk	Hardness
	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Initial
	(°C)	(mg/L)	(mg/L)	(S.U.)	(S.U.)	(µmhos)	(µmhos)	*	*
CONTROL	23.7 (23.4-24.2)	7.7 (7.4-8.1)	7.9 (7.7-8.3)	6.8 (6.7-6.9)	7.8 (7.7-7.9)	356 (346-369)	373 (359-384)	39 (37-48)	95.8 (90.6-102.6)
0.312 mg/L	23.9 (23.6-24.4)	7.7 (7.4-8.1)	8.0 (7.8-8.3)	6.8 (6.7-6.9)	7.8 (7.7-8.0)	357 (345-373)	376 (360-403)	-	-
0.625 mg/L	24.0 (23.3-24.2)	7.8 (7.5-8.1)	8.0 (7.8-8.3)	6.8 (6.7-6.9)	7.8 (7.7-7.9)	356 (346-371)	371 (355-392)	-	-
1.250 mg/L	24.0 (23.5-24.3)	7.9 (7.6-8.1)	8.0 (7.9-8.2)	6.8 (6.7-6.9)	7.8 (7.7-8.0)	357 (348-372)	373 (356-397)	-	-
2.500 mg/L	23.9 (23.3-24.2)	7.9 (7.5-8.2)	8.0 (7.9-8.3)	6.6 (6.5-6.8)	7.8 (7.7-7.9)	360 (351-375)	371 (358-386)	40 (36-47)	95.4 (94.1-99.2)
5.000 mg/L	24.0 (23.9-24.1)	7.8 (7.6-8.0)	8.0 (8.0-8.1)	6.5 (6.4-6.5)	7.7 (7.6-7.8)	358 (355-360)	372 (368-375)	33 (31-33)	95.8 (94.1-97.5)

* mg/L as $CaCO_3$

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Appendix B

Water Chemistry Mean Values and Ranges for Anadonta imbecillis,
Copper Sulfate Reference Toxicant-YCT-Selenastrum Study, CR-ERP, July 6-15, 1993

Source	Temperature	Dissolved Oxygen		pH		Conductivity		Alk	Hardness
	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Initial
	(°C)	(mg/L)	(mg/L)	(S.U.)	(S.U.)	(µmhos)	(µmhos)	*	*
CONTROL	23.6 (23.0-24.2)	7.7 (7.3-8.1)	7.9 (7.7-8.1)	6.7 (6.2-7.2)	7.7 (7.3-7.9)	357 (345-380)	374 (359-391)	37 (11-48)	95.0 (92.3-102.6)
0.312 mg/L	23.9 (23.0-24.4)	7.7 (7.3-8.1)	8.0 (7.8-8.2)	6.8 (6.7-7.1)	7.8 (7.5-7.9)	355 (343-370)	370 (360-381)	-	-
0.625 mg/L	23.9 (23.4-24.4)	7.7 (7.4-8.1)	8.0 (7.8-8.3)	6.7 (6.7-7.0)	7.8 (7.5-7.9)	355 (345-370)	370 (354-385)	-	-
1.250 mg/L	23.9 (23.5-24.4)	7.8 (7.5-8.1)	8.0 (7.8-8.3)	6.7 (6.7-7.0)	7.8 (7.7-7.9)	356 (347-371)	371 (352-385)	-	-
2.500 mg/L	23.9 (23.5-24.4)	7.8 (7.5-8.1)	8.0 (7.8-8.3)	6.6 (6.6-6.8)	7.8 (7.7-7.9)	359 (350-374)	372 (357-394)	41 (37-48)	95.4 (94.1-100.9)
5.000 mg/L	23.7 (23.4-23.9)	7.7 (7.5-7.9)	8.1 (7.9-8.3)	6.4 (6.4-6.5)	7.7 (7.6-7.8)	357 (354-360)	374 (363-384)	33 (32-33)	96.2 (95.8-97.5)

* mg/L as $CaCO_3$

PLARC501-1710(2)

ATTACHMENT I

TOXICITY TEST BENCH SHEETS AND STATISTICAL ANALYSES

RL ACUTE TOXICITY TEST (MUSSEL) MASTER CHECKLIST Study: Cd-EDTA Mussel Ref Tox July 1993

Date Issued: _____ To: DJS From: JM

1. Test organism availability: T.L.* DJS C.U.† DJS Date 6-27-93
2. Sample Collection Coordination: Date NA By NA With NA
3. Glassware availability: T.L. DJS Tech _____ Date 6-30-93
4. Silt/Phytoplankton availabilty: Silt- By DJS Date 6-26-93
   Phytoplankton- By DJS Date 6-26-93
5. Glassware prep. complete: Date 7-2-93 By JPP
6. Data Sheet prep. complete: Date 7-5-93 By DJS
7. Test organism availability verification: T.L. DJS
8. Test Initiation: Date/Time 7/6/93; 0930
9. Test Renewal:

	Day#:	0	1	2	3	4	5	6	7	8	9
Meter Calib.	T.L.	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS
	T.M.‡	NA	JPP	JPP	NA	NA	JPP	NA	JPP	—	—
Log Samples	T.L.	NA	NA	NA	NA	NA	NA	NA	NA	NA	N/A
	T.M.	NA	NA	NA	NA	NA	NA	NA	NA	NA	N/A
Initial Chem.	T.L.	DJS	DJS	DJS	JPP	DJS	DJS	DJS	DJS	DJS	N/A
	T.M.	NA	JPP	JPP	JPP	JPP	JPP	JPP	JPP	—	N/A
Renewal/Counts	T.L.	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS
	T.M.	JPP	JPP	JPP	JPP	JPP	JPP	JPP	JPP	—	—
Final Chem.	T.L.	N/A	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS
	T.M.	N/A	JPP	JPP	JPP	JPP	JPP	JPP	JPP	—	—
Meter Recal.	T.L.	DJS	JPP	JPP	JPP	DJS	DJS	DJS	DJS	DJS	DJS
	T.M.	NA	NA	NA	NA	NA	JPP	JPP	—	—	—
Paperwork reviewed	T.L.	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS	DJS
	T.M.	NA	NA	NA	JPP	JPP	N/A	N/A	—	—	—

10. Test Termination: Date/Time 7/15/93; 0930
12. Run Stats: Date 7/22/93 By DJS
13. Report Prep.: Date 7/22/93 By DJS
14. Report Final: Date 8-16-93 By JM Approved: DCW

*Team Leader †Culture Unit ‡Team Member

PLARC501-1513

ce: 06-28-93

Copper stocks prepared as follows by D. Simbeck using EPA Copper Sulfate reference toxicant, Lot #188, Ampules #2025, Ampules #2026, 50 mg/mL Cu:

1. Combine contents of 2 ampules (7.0 mL) in 100 mL beaker.

2. Add 5 mL $CuSO_4$ to a 100 mL vol. flask and fill to line to obtain Stock #I = 2,500 mg/L. Pour into 100 mL beaker to mix.

NOTE: Steps 1 and 2 completed on 05-06-93 by DJS.

3. Add 2.5 mL $CuSo_4$ (ampule #2144) to a 100 mL vol. flask and fill to line to obtain Stock #II = 1,250 mg/L. Pour into 100 mL beaker to mix.

4. Prepare diluted stock series:

Cu Conc. Stock	mL Stock	#	mL 50:50 HNO_3	Dilute to 100 mL
Control	0.00		1	100
46.75 mg/L	1.87	I	1	100
93.75 mg/L	3.75	I	1	100
187.50 mg/L	7.50	I	1	100
375.00 mg/L	30.00	II	1	100
750.00 mg/L	60.00	II	1	100

5. Prepare test solutions:

Cu Conc. Stock	mL	Dilute to 1000 mL	Cu Conc. Test
Control	6.67	993.33	0.000
46.75 mg/L	6.67	993.33	0.312
93.75 mg/L	6.67	993.33	0.625
187.50 mg/L	6.67	993.33	1.250
375.00 mg/L	6.67	993.33	2.500
750.00 mg/L	6.67	993.33	5.000

Damien J. Simbeck

PLARC501-1504

MUSSEL TEST RECORD SHEET
Anodonta imbecillis

Project CR-ERP Reference Toxicant

Beginning Date/Time 7-6-93 /0930 Ending Date/Time /

Personnel Simbeck, Posey

Mussels placed in test vessels: Date 07-05-93 Time 0930-1100

Mussels per test vessel: 10

Test Teatments:

1	Control (phyto)	11	2.500 mg/L Cu (YCT-S)
2	0.312 mg/L Cu (phyto)	12	5.000 mg/L Cu (YCT-S)
3	0.625 mg/L Cu (phyto)	13	
4	1.250 mg/L Cu (phyto)	14	
5	2.500 mg/L Cu (phyto)	15	
6	5.000 mg/L Cu (phyto)	16	
7	Control (YCT-S)	17	
8	0.312 mg/L Cu (YCT-S)	18	
9	0.625 mg/L Cu (YCT-S)	19	
10	1.250 mg/L Cu (YCT-S)	20	

Control/Dilution Water: Moderately Hard Syntetic Water (F-Med)

Source _____ Date Collected/Prepared _____

CULTURE HISTORY:

Culture ID	Date Started	Date Transformed
93-Q	06/21/93	06/28/93

FOOD/SUBSTRATE PREPARATION:

Phytoplankton Started	Phytoplankton Concentrated
06/21/93	06/26/93
06/25/93	06/29//93

Silt Collected: Date/Location 06/23/93 / Taylor's Lower Pond

Silt Filtered (Date) 06/24/93 Silt Weighed (Date) 06/30/93

Volume Weighed 5 mL

	Wt. of pan	Wt. of pan and silt	Wt. of silt
Replicate 1	1.03831 mg	1.78540 mg	0.74704 mg
Replicate 2	1.00116 mg	1.74436 mg	0.74320 mg $\bar{x} = 0.75060$
Replicate 3	1.03139 mg	1.79344 mg	0.76205 mg

Average dry weight 150.1 mg/mL PLARC501-130(5)

5.33 mL = 800 mg dry weight

TREATMENT: Control Phytoplankton

	DAY:	0	1 sp	2 days	3 days	4 days	5 days	6 days	7 days	8 days	9 days
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10	10	10	10	10	9	9	9	9
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	1	1	1	1
Rep 2:	# Alive	10	9	9	9	9	9	9	9	9	9
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	1	1	1	1	1	1	1	1	1
Rep 3:	# Alive	10	9	9	9	9	9	9	9	9	9
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	1	1	1	1	1	1	1	1	1
Rep 4:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	0	0	0	0

TREATMENT: 0.312 mg/L Cu phytoplankton

	DAY:	0	1 sp	2 days	3 days	4 days	5 days	6 days	7 days	8 days	9 days
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	0	0	0	0
Rep 2:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	0	0	0	0
Rep 3:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	0	0	0	0
Rep 4:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	0	0	0	0	0	0	0	0	0
	# Dead	0	0	0	0	0	0	0	0	0	0

TREATMENT: 0.625 mg/L CU Phytoplankton

DAY:		0	1st	2nd	3rd	4th	5th	6th	7th	8th	9
DATE:		7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	*10	10	10	10	10	10	10	10	8
	# Stressed	Ø	0	0	0	0	0	0	0	0	2
	# Dead	Ø	0	0	0	0	0	0	0	0	0
Rep 2:	# Alive	10	*10	10	10	10	10	10	10	10	10
	# Stressed	Ø	0	0	0	0	0	0	0	0	0
	# Dead	Ø	0	0	0	0	0	0	0	0	0
Rep 3:	# Alive	10	*10	Inactive 10	10	10	10	10	10	10	9
	# Stressed	Ø	0	0	0	0	0	0	0	0	0
	# Dead	Ø	0	0	0	0	0	0	0	0	1
Rep 4:	# Alive	10	*10	10	10	10	9	10	10	10	9
	# Stressed	Ø	0	0	0	0	1	0	0	0	1
	# Dead	Ø	0	0	0	0	0	0	0	0	0

* very slow moving, inactive by day 2

TREATMENT: 1.250 mg/L Cu Phytoplankton

DAY:		0	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
DATE:		7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10	10	10	9	9	7	2	1	0
	# Stressed	Ø	0	0	0	0	0	2	3	0	0
	# Dead	Ø	0	0	0	1	1	1	5	9	10
Rep 2:	# Alive	10	10	10	10	9	9	9	4	1	1
	# Stressed	Ø	0	0	0	1	0	0	3	3	0
	# Dead	Ø	0	0	0	0	1	1	3	6	9
Rep 3:	# Alive	10	10	10	10	9	7	6	4	3	2
	# Stressed	Ø	0	0	0	0	2	1	3	2	0
	# Dead	Ø	0	0	0	1	1	3	3	5	8
Rep 4:	# Alive	10	10	10	10	10	9	7	3	3	1
	# Stressed	Ø	0	0	0	0	0	2	1	1	0
	# Dead	Ø	0	0	0	0	1	1	6	6	9

Inactive on Day 2

TREATMENT: 2.500 mg/L CU Phytoplankton

DAY:		0	1	2	3	4	5	6	7	8	9
DATE:		7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	~~10~~ 7	7	7	4	3**	2	1	0	
	# Stressed	Ø	1	0	0	2	1	1	0	0	
	# Dead	Ø	2	3	3	4	5	7	9	10	
Rep 2:	# Alive	10	10	8	8	6	2	0	0	0	
	# Stressed	Ø	0	2	0	2	6	4	~~3~~ 4	0	
	# Dead	Ø	0	0	2	2	2	6	6	10	
Rep 3:	# Alive	10	10	7	6	4	5	0	~~1~~ 0	0	
	# Stressed	Ø	0	0	0	2	1	3	3	0	
	# Dead	Ø	0	3	4	4	4	7	7	10	
Rep 4:	# Alive	10	10	8	8	4	3	3	1	0	
	# Stressed	Ø	0	1	1	2	2	0	0	0	
	# Dead	Ø	0	1	1	4	5	7	9	10	

7 mussels are allowing out to collect at muscle flaps

** only found 9

TREATMENT: 5.000 mg/L Cu Phytoplankton

DAY:		0	1	2	3	4	5	6	7	8	9
DATE:		7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	5	0	0						
	# Stressed	Ø	1	3	0						
	# Dead	Ø	4	7	10						
Rep 2:	# Alive	10	0	0	–						
	# Stressed	Ø	1	0	–						
	# Dead	Ø	9	10	–						
Rep 3:	# Alive	10	4	1	0						
	# Stressed	Ø	4	3	0						
	# Dead	Ø	2	6	10						
Rep 4:	# Alive	10	2	0	–						
	# Stressed	Ø	3	0	–						
	# Dead	Ø	5	10	–						

SPEARMAN-KARBER METHOD LC50 ESTIMATION

TEST: Mussel Ref Tox July 1993 (phyto)
DATE: 15 July 1993

TREATMENT	log10 CONC.		# DEAD	ADJ. PROP DEAD		# EXPOSED
0.300	-0.52288	[1]	0	-0.081	A	40
0.600	-0.22185	[2]	1	-0.054	B	40
1.400	0.14613	[3]	36	0.892	C	40
2.700	0.43136	[4]	40	1.000	D	40
5.400	0.73239	[5]	40	1.000	E	40
Control			3	0		

M=Log(Estimated LC50)

(B-A)(log[1]+log[2])/2 +	-0.01005	+
(C-B)(log[2]+log[3])/2 +	-0.03581	+
(D-C)(log[3]+log[4])/2 +	0.031184	+
(E-D)(log[4]+log[5])/2 = M	0	= M
	-0.01468	= M

Estimated LC50 = antilog M

V(m)=Estimated Varience in M

B(1-B)(log[3]-log[1])e2/4(n-1)+	-0.00016	+
C(1-C)(log[4]-log[2])e2/4(n-1)+	0.000263	+
D(1-D)(log[5]-log[3])e2/4(n-1)+	0	= V(m)
	0.000100	= V(m)

$CL = M +/- 2\sqrt{V(m)}$

LCL= antilog-0.03470
UCL= antilog0.005334

Est. LC50 = 0.966751

95% LCL = 0.923197

95% UCL = 1.012359

Reviewed By: DJS

---------- STUDY=JULY#03 REFTOX ST_DATE=070693 PARM=MINS TEST=STEEL ----------

OBS	TREATMENT	N CONTROL	N EFFLUENT	RANK SUM	CRITICAL RANK SUM	SIGNIFICANT DIFFERENCE
1	0.30	4	4	24	10	
2	0.60	4	4	22	10	
3	1.4	4	4	10	10	*
4	2.7	4	4	10	10	*
5	5.4	4	4	10	10	*

TREATMENT: Control YCT-S

	DAY:	0	1	2	3	4	5	6	7	8	9
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 2:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 3:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 4:	# Alive	10	10	10	10	10	10	10	10	10	10
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	0	0	0	0	0	0	0	0
			BJS	JPP	BJS	JPP	BJS	JPP	BJS	JPP	JPP

TREATMENT: 0.312 mg/L Cu YCT-S

	DAY:	0	1	2	3	4	5	6	7	8	9
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10*	10	10	10	10	10	10	10	10 ~~9~~
	# Stressed	0	Ø	0	0	0	0	0	0	0	0 ~~1~~
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 2:	# Alive	10	10*	10	10	10	10	10	10	10	9
	# Stressed	0	Ø	0	0	0	0	0	0	0	Ø 1
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 3:	# Alive	10	10*	10	10	10	10	10	10	10	10
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	0	0	0	0	0	0	0	0
Rep 4:	# Alive	10	10*	9	9	9	9	9	9	9	9
	# Stressed	0	Ø	0	0	0	0	0	0	0	0
	# Dead	0	Ø	1	1	1	1	1	1	1	1
			BJS	JPP	BJS	JPP	BJS	JPP	BJS	JPP	JPP

* Day 1 - Slow but active

TREATMENT: 0.625 mg/L CU YCT-S

		DAY:	0	1	2	3	4	5	6	7	8	9
		DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive		10	10*	10*	10	10	10	10	10	10	8 7
	# Stressed		0	Ø	0	0	0	0	0	0	0	0 1
	# Dead		0	Ø	0	0	0	0	0	0	0	2
Rep 2:	# Alive		10	10*	10*	10	10	10	10	10	10	10
	# Stressed		0	Ø	10	0	0	0	0	0	0	0
	# Dead		0	Ø	0	0	0	0	0	0	0	0
Rep 3:	# Alive		10	10*	10*	9	9	8	8	8	*7	7
	# Stressed		0	Ø	0	0	0	0	0	0	0	0
	# Dead		0	Ø	0	1	1	2	2	2	2	3
Rep 4:	# Alive		10	10*	10*	8	8	8	8	8	7	7
	# Stressed		0	Ø	0	0	0	0	0	0	0	0
	# Dead		0	Ø	0	2	2	2	2	2	3	3
*extremely slow but active				DJS	JPP	DJS	JPP	DJS	JPP	DJS	JPP	JPP

* found 9

TREATMENT: 1.250 mg/L Cu YCT-S

		DAY:	0	1	2	3	4	5	6	7	8	9
		DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive		10	10*	10*	10	9	9	8	7	5	3
	# Stressed		0	Ø	0	0	0	0	1	0	2	2
	# Dead		0	Ø	0	0	1	1	1	3	3	5
Rep 2:	# Alive		10	10*	10*	9	6	6	3	2	1	0
	# Stressed		0	Ø	0	0	3	1	2	1	1	1
	# Dead		0	Ø	0	1	1	3	5	7	8	9
Rep 3:	# Alive		10	9*	9*	9	7	3	1 5	0	0	
	# Stressed		0	Ø	0	0	0	2	3	1	0	
	# Dead		0	1	1	1	3	5	6	9	10	
Rep 4:	# Alive		10	10*	10*	10	9	8	6	1	0	
	# Stressed		0	Ø	Ø	0	0	1	1	5	0	
	# Dead		0	Ø	Ø	0	1	1	3	4	10	
& Practically inactive very little movement				DJS	JPP	DJS	JPP	DJS	JPP	JPP	JPP	

TREATMENT: 2.500 mg/L CU YCT-S

	DAY:	0	1	2	3	4	5	6	7	8	9
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	10*	10*	8	4	4	3	0	0	0
	# Stressed	0	0	0	1	5	1	2	3	3	0
	# Dead	0	0	0	1	1	5	5	7	7	10
Rep 2:	# Alive	10	6*	6	5	5	2	2	0		
	# Stressed	0	3	0	1	1	3	0	0		
	# Dead	0	1	4	4	4	5	8	10		
Rep 3:	# Alive	10	6*	5	5	5	1	2	1	2	0
	# Stressed	0	1	0	0	0	2	1	1	0	0
	# Dead	0	3	5	5	5	7	7	8	8	10
Rep 4:	# Alive	10	8*	7	5	4	4	1	0		
	# Stressed	0	1	0	2	3	0	1	0		
	# Dead	0	1	3	3	3	6	8	10		
* Inactive closed			DJS	JPP	DJS	JPP	DJS	JPP	DJS	JPP	JPP

TREATMENT: 5.000 mg/L Cu YCT-S

	DAY:	0	1	2	3	4	5	6	7	8	9
	DATE:	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Rep 1:	# Alive	10	2*	0	0						
	# Stressed	0	1	3	0						
	# Dead	0	7	7	10						
Rep 2:	# Alive	10	2*	0	0						
	# Stressed	0	2	2	0						
	# Dead	0	6	8	10						
Rep 3:	# Alive	10	0	0							
	# Stressed	0	4	0							
	# Dead	0	6	10							
Rep 4:	# Alive	10	2*	2*	0						
	# Stressed	0	4	0	0						
	# Dead	0	4	8	10						
* inactive, closed			DJS	JPP	DJS						

EPA PROBIT ANALYSIS PROGRAM
USED FOR CALCULATING EC VALUES
Version 1.4

Y-Death

Conc.	Number Exposed	Number Resp.	Observed Proportion Responding	Adjusted Proportion Responding	Predicted Proportion Responding
0.3000	40	1	0.0250	0.0250	0.0088
0.6200	40	8	0.2000	0.2000	0.2426
1.3000	40	34	0.8500	0.8500	0.8437
2.5000	40	40	1.0000	1.0000	0.9941
5.1000	40	40	1.0000	1.0000	1.0000

Chi - Square Heterogeneity = 1.840

Mu = -0.076189
Sigma = 0.188271

Parameter	Estimate	Std. Err.	95% Confidence Limits	
Intercept	5.404674	0.160099	(5.090879,	5.718469)
Slope	5.311483	0.715271	(3.909553,	6.713413)

Theoretical Spontaneous Response Rate = 0.0000

Death

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
C 1.00	0.3061	0.2060	0.3903
C 5.00	0.4113	0.3045	0.4981
C10.00	0.4814	0.3739	0.5691
C15.00	0.5354	0.4286	0.6239
C50.00	0.8391	0.7331	0.9584
C85.00	1.3150	1.1323	1.6300
C90.00	1.4625	1.2422	1.8673
C95.00	1.7120	1.4201	2.2916
C99.00	2.3003	1.8135	3.3863

---------- STUDY=JULY#03 musref ST_DATE=070693 PARM=MINS TEST=STEEL ----------

OBS	TREATMENT	N CONTROL	N EFFLUENT	RANK SUM	CRITICAL RANK SUM	SIGNIFICANT DIFFERENCE
1	0.30	4	4	16	10	
2	0.62	4	4	12	10	
3	1.3	4	4	10	10	*
4	2.5	4	4	10	10	*
5	5.1	4	4	10	10	*

Mussel Reference Toxicant: Growth 07/15/93

Treatment: Control P

Replicate	1	2	3	4
1	1.8	2.0	1.8	1.4
2	2.1	2.0	1.5	1.6
3	1.2	2.0	1.8	2.1
4	1.3	1.5	1.6	1.4
5	2.0	1.8	1.8	1.3
6	2.0	1.7	1.5	1.8
7	1.3	1.7	2.0	1.3
8	1.8	1.2	1.9	2.1
9	2.5	1.5	1.8	1.7
10	D	D	D	1.4

Treatment: Control Y

Replicate	1	2	3	4
1	1.8	1.9	1.6	1.3
2	1.8	1.6	1.6	1.8
3	1.0	1.3	1.6	1.5
4	1.3	1.8	1.9	1.7
5	1.8	2.0	1.5	1.4
6	1.9	1.6	1.9	1.6
7	1.6	1.8	2.1	1.8
8	1.7	1.5	1.2	1.3
9	1.8	1.5	1.1	1.3
10	1.5	1.7	1.9	1.1

Treatment: 0.312 P

Replicate	1	2	3	4
1	1.2	1.1	1.1	1.0
2	0.9	1.1	1.1	1.1
3	0.8	1.1	1.0	1.0
4	1.2	1.2	1.1	1.1
5	1.1	1.2	1.2	1.3
6	1.1	1.1	1.1	1.1
7	1.0	1.1	1.2	1.1
8	1.0	1.2	1.3	1.2
9	1.1	1.3	1.0	1.0
10	1.1	1.0	1.1	1.2

Treatment: 0.312 Y

Replicate	1	2	3	4
1	1.0	1.2	1.0	1.0
2	1.1	1.2	1.1	1.1
3	1.2	1.2	1.2	1.2
4	1.3	1.1	1.3	1.2
5	1.3	1.3	1.1	1.1
6	1.2	1.2	1.3	1.3
7	1.2	1.1	1.1	1.0
8	1.3	1.1	1.5	1.3
9	1.1	0.9	1.2	1.2
10	1.1	1.1	1.3	D

Treatment: 0.625 P

Replicate	1	2	3	4
1	1.2	1.2	1.0	1.1
2	1.2	1.1	1.3	1.1
3	1.0	1.1	1.2	1.3
4	1.1	1.1	1.1	1.2
5	1.1	1.1	1.2	1.0
6	1.1	1.2	1.2	1.1
7	1.2	1.2	0.9	1.0
8	1.1	1.2	1.0	1.1
9	1.2	1.1	1.1	1.1
10	1.0	1.1	D	1.2

Treatment: 0.625 Y

Replicate	1	2	3	4
1	1.0	1.1	1.2	1.1
2	1.1	1.2	1.1	1.1
3	1.4	1.3	1.0	1.3
4	1.2	1.1	1.1	1.2
5	1.1	1.2	1.2	1.1
6	0.9	1.0	1.3	1.2
7	1.0	1.2	1.3	1.0
8	1.1	0.9	D	D
9	D	1.2	D	D
10	D	1.1	D	D

1 unit= 392 microns

Mussel Reference Toxicant: Growth 07/15/93

Treatment: 1.250 P

Replicate	1	2	3	4
1	P	1.5	1.2	1.2
2	D	D	1.1	D
3	D	D	D	D
4	D	D	D	D
5	D	D	D	D
6	D	D	D	D
7	D	D	D	D
8	D	D	D	D
9	D	D	D	D
10	D	D	D	D

Treatment: 1.250 Y

Replicate	1	2	3	4
1	1.3	1.3	D	D
2	1.1	D	D	D
3	1.2	D	D	D
4	1.1	D	D	D
5	1.2	D	D	D
6	D	D	D	D
7	D	D	D	D
8	D	D	D	D
9	D	D	D	D
10	D	D	D	D

Treatment: 2.500 P

Replicate	1	2	3	4
1	D	D	D	D
2	D	D	D	D
3	D	D	D	D
4	D	D	D	D
5	D	D	D	D
6	D	D	D	D
7	D	D	D	D
8	D	D	D	D
9	D	D	D	D
10	D	D	D	D

Treatment: 2.500 Y

Replicate	1	2	3	4
1	D	D	D	D
2	D	D	D	D
3	D	D	D	D
4	D	D	D	D
5	D	D	D	D
6	D	D	D	D
7	D	D	D	D
8	D	D	D	D
9	D	D	D	D
10	D	D	D	D

Mussel Reference Toxicant: Growth 07/15/93

Treatment: Control P
Micrometer units

Replicate	1	2	3	4
1	1.8	2.0	1.8	1.4
2	2.1	2.0	1.5	1.6
3	1.2	2.0	1.8	2.1
4	1.3	1.5	1.6	1.4
5	2.0	1.8	1.8	1.3
6	2.0	1.7	1.5	1.8
7	1.3	1.7	2.0	1.3
8	1.8	1.2	1.9	2.1
9	2.5	1.5	1.8	1.7
10	DEAD	DEAD	DEAD	1.4

Treatment: Control P
Micrometers

Replicate	1	2	3	4
1	705.6	784.0	705.6	548.8
2	823.2	784.0	588.0	627.2
3	470.4	784.0	705.6	823.2
4	509.6	588.0	627.2	548.8
5	784.0	705.6	705.6	509.6
6	784.0	666.4	588.0	705.6
7	509.6	666.4	784.0	509.6
8	705.6	470.4	744.8	823.2
9	980.0	588.0	705.6	666.4
10	0.0	0.0	0.0	548.8
AVERAGE	696.9	670.8	683.8	631.1
			AVERAGE=	669.6

Treatment: 0.312 P
Micrometer units

Replicate	1	2	3	4
1	1.2	1.1	1.1	1.0
2	0.9	1.1	1.1	1.1
3	0.8	1.1	1.0	1.0
4	1.2	1.2	1.1	1.1
5	1.1	1.2	1.2	1.3
6	1.1	1.1	1.1	1.1
7	1.0	1.1	1.2	1.1
8	1.0	1.2	1.3	1.2
9	1.1	1.3	1.0	1.0
10	1.1	1.0	1.1	1.2

Treatment: 0.312 P
Micrometers

Replicate	1	2	3	4
1	470.4	431.2	431.2	392.0
2	352.8	431.2	431.2	431.2
3	313.6	431.2	392.0	392.0
4	470.4	470.4	431.2	431.2
5	431.2	470.4	470.4	509.6
6	431.2	431.2	431.2	431.2
7	392.0	431.2	470.4	431.2
8	392.0	470.4	509.6	470.4
9	431.2	509.6	392.0	392.0
10	431.2	392.0	431.2	470.4
AVERAGE	411.6	446.9	439.0	435.1
			AVERAGE=	433.2

Treatment: 0.625 P
Micrometer units

Replicate	1	2	3	4
1	1.2	1.2	1.0	1.1
2	1.2	1.1	1.3	1.1
3	1.0	1.1	1.2	1.3
4	1.1	1.1	1.1	1.2
5	1.1	1.1	1.2	1.0
6	1.1	1.2	1.2	1.1
7	1.2	1.2	0.9	1.0
8	1.1	1.2	1.0	1.1
9	1.2	1.1	1.1	1.1
10	1.0	1.1	DEAD	1.2

Treatment: 0.625 P
Micrometers

Replicate	1	2	3	4
1	470.4	470.4	392.0	431.2
2	470.4	431.2	509.6	431.2
3	392.0	431.2	470.4	509.6
4	431.2	431.2	431.2	470.4
5	431.2	431.2	470.4	392.0
6	431.2	470.4	470.4	431.2
7	470.4	470.4	352.8	392.0
8	431.2	470.4	392.0	431.2
9	470.4	431.2	431.2	431.2
10	392.0	431.2	0.0	470.4
AVERAGE	439.0	446.9	435.6	439.0
			AVERAGE=	440.2

Mussel Reference Toxicant: Growth 07/15/93

Treatment: 1.250 P

Micrometer units

Replicate	1	2	3	4
1	DEAD	1.5	1.2	1.2
2	DEAD	DEAD	1.1	DEAD
3	DEAD	DEAD	DEAD	DEAD
4	DEAD	DEAD	DEAD	DEAD
5	DEAD	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 1.250 P

Micrometers

Replicate	1	2	3	4
1	0.0	588.0	470.4	470.4
2	0.0	0.0	431.2	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	0.0	588.0	450.8	470.4

AVERAGE= 490.0

Treatment: 2.500 P

Micrometer units

Replicate	1	2	3	4
1	DEAD	DEAD	DEAD	DEAD
2	DEAD	DEAD	DEAD	DEAD
3	DEAD	DEAD	DEAD	DEAD
4	DEAD	DEAD	DEAD	DEAD
5	DEAD	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 2.500 P

Micrometers

Replicate	1	2	3	4
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0

AVERAGE= 0.0

Treatment: 5.000 P

Micrometer units

Replicate	1	2	3	4
1	DEAD	DEAD	DEAD	DEAD
2	DEAD	DEAD	DEAD	DEAD
3	DEAD	DEAD	DEAD	DEAD
4	DEAD	DEAD	DEAD	DEAD
5	DEAD	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 5.000 P

Micrometers

Replicate	1	2	3	4
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0

AVERAGE= 0.0

Mussel Reference Toxicant: Growth 07/15/93

Treatment: Control Y

Micrometer units

Replicate	1	2	3	4
1	1.8	1.9	1.6	1.3
2	1.8	1.6	1.6	1.8
3	1.0	1.3	1.6	1.5
4	1.3	1.8	1.9	1.7
5	1.8	2.0	1.5	1.4
6	1.9	1.6	1.9	1.6
7	1.6	1.8	2.1	1.8
8	1.7	1.5	1.2	1.3
9	1.8	1.5	1.1	1.2
10	1.5	1.7	1.9	1.1

Treatment: Control Y

Micrometers

Replicate	1	2	3	4
1	705.6	744.8	627.2	509.6
2	705.6	627.2	627.2	705.6
3	392.0	509.6	627.2	588.0
4	509.6	705.6	744.8	666.4
5	705.6	784.0	588.0	548.8
6	744.8	627.2	744.8	627.2
7	627.2	705.6	823.2	705.6
8	666.4	588.0	470.4	509.6
9	705.6	588.0	431.2	470.4
10	588.0	666.4	744.8	431.2
AVERAGE	635.0	654.6	642.9	576.2
		AVERAGE=		627.2

Treatment: 0.312 Y

Micrometer units

Replicate	1	2	3	4
1	1.0	1.2	1.0	1.0
2	1.1	1.2	1.1	1.1
3	1.2	1.2	1.2	1.2
4	1.3	1.1	1.3	1.2
5	1.3	1.3	1.1	1.1
6	1.2	1.2	1.3	1.3
7	1.2	1.1	1.1	1.0
8	1.3	1.1	1.3	1.3
9	1.1	0.9	1.2	1.2
10	1.1	1.1	1.3	DEAD

Treatment: 0.312 Y

Micrometers

Replicate	1	2	3	4
1	392.0	470.4	392.0	392.0
2	431.2	470.4	431.2	431.2
3	470.4	470.4	470.4	470.4
4	509.6	431.2	509.6	470.4
5	509.6	509.6	431.2	431.2
6	470.4	470.4	509.6	509.6
7	470.4	431.2	431.2	392.0
8	509.6	431.2	509.6	509.6
9	431.2	352.8	470.4	470.4
10	431.2	431.2	509.6	0.0
AVERAGE	462.6	446.9	466.5	453.0
		AVERAGE=		457.3

Treatment: 0.625 Y

Micrometer units

Replicate	1	2	3	4
1	1.0	1.1	1.2	1.1
2	1.1	1.2	1.1	1.1
3	1.4	1.3	1.0	1.3
4	1.2	1.1	1.1	1.2
5	1.1	1.2	1.2	1.1
6	0.9	1.0	1.3	1.2
7	1.0	1.2	1.3	1.0
8	1.1	0.9	DEAD	DEAD
9	DEAD	1.2	DEAD	DEAD
10	DEAD	1.1	DEAD	DEAD

Treatment: 0.625 Y

Micrometers

Replicate	1	2	3	4
1	392.0	431.2	470.4	431.2
2	431.2	470.4	431.2	431.2
3	548.8	509.6	392.0	509.6
4	470.4	431.2	431.2	470.4
5	431.2	470.4	470.4	431.2
6	352.8	392.0	509.6	470.4
7	392.0	470.4	509.6	392.0
8	431.2	352.8	0.0	0.0
9	0.0	470.4	0.0	0.0
10	0.0	431.2	0.0	0.0
AVERAGE	431.2	443.0	454.2	448.0
		AVERAGE=		444.7

Mussel Reference Toxicant: Growth 07/15/93

Treatment: 1.250 Y
Micrometer units

Replicate	1	2	3	4
1	1.2	1.2	DEAD	DEAD
2	1.1	DEAD	DEAD	DEAD
3	1.2	DEAD	DEAD	DEAD
4	1.1	DEAD	DEAD	DEAD
5	1.2	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 1.250 Y
Micrometers

Replicate	1	2	3	4
1	470.4	470.4	0.0	0.0
2	431.2	0.0	0.0	0.0
3	470.4	0.0	0.0	0.0
4	431.2	0.0	0.0	0.0
5	470.4	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	454.7	470.4	0.0	0.0

AVERAGE= 457.3

Treatment: 2.500 Y
Micrometer units

Replicate	1	2	3	4
1	DEAD	DEAD	DEAD	DEAD
2	DEAD	DEAD	DEAD	DEAD
3	DEAD	DEAD	DEAD	DEAD
4	DEAD	DEAD	DEAD	DEAD
5	DEAD	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 2.500 Y
Micrometers

Replicate	1	2	3	4
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0

AVERAGE= 0.0

Treatment: 5.000 Y
Micrometer units

Replicate	1	2	3	4
1	DEAD	DEAD	DEAD	DEAD
2	DEAD	DEAD	DEAD	DEAD
3	DEAD	DEAD	DEAD	DEAD
4	DEAD	DEAD	DEAD	DEAD
5	DEAD	DEAD	DEAD	DEAD
6	DEAD	DEAD	DEAD	DEAD
7	DEAD	DEAD	DEAD	DEAD
8	DEAD	DEAD	DEAD	DEAD
9	DEAD	DEAD	DEAD	DEAD
10	DEAD	DEAD	DEAD	DEAD

Treatment: 5.000 Y
Micrometers

Replicate	1	2	3	4
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0

AVERAGE= 0.0

Page 1 of 1

COULTER COUNTER DATA SHEET

MUSSEL FOOD FOR DS

Study: PULEX FOOD — Study Dates: Beginning: 7-2 End: 7-2

Analysis Date: 7-2-93 — Counter Calibration Date: 6-29-93

Personnel: COOPER — Calibration Constant: 7,823

SAMPLE ID	REP.	ml SAMPLE	ml ISOTON	HANOH.	TL	CORRECTED COUNT	CELLS/ ml
ED STILL	1	19	100	1103		204	
						144	$\bar{X}$ = 161
						137	
ALGAE	1					3285	
	2a					3223	$\bar{X}$ = 3166.3 - 161
						3179	x200x50 =
						3097	30053000
	2b					3158	$\bar{X}$ = 3183.3 - 161
						3192	x200x50 =
						3200	30223000
	2c					3127	$\bar{X}$ = 3120 - 161
						3171	x200x50 =
						3062	29590000

Comments: $\bar{X}$ = 29,955,333

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-6-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	24.1	24.4	24.4	24.4	24.3	24.3		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.8	7.8	7.8	7.8	7.9	7.9		
pH (before air)								
(after air)								
(w/silt/algae)	7.2	7.1	7.0	7.0	6.8	6.5		
(Aeration time)								
Conductivity	380	356	352	353	355	360		
Hardness	5.6					5.7		
x 17.1	95.8					97.5		
Alkalinity	3.7					3.2		
x 10	37					32		
Chlorine								
Ammonia								

NOTES: F-Med # 1372

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-6-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	24.1	24.4	24.4	24.5	24.4	24.5		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.8	7.9	7.9	8.0	8.0	8.0		
pH (before air)								
(after air)								
(w/silt/algae)	6.9	6.9	6.9	6.8	6.7	6.5		
(Aeration time)								
Conductivity	362	356	353	354	356	360		
Hardness	5.7					5.7		
x 17.1	97.5					97.5		
Alkalinity	3.7					3.1		
x 10	37					31		
Chlorine								
Ammonia								

NOTES: F-MED #1372

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-7-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	23.4	23.7	23.9	24.0	24.1	23.8		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.4	7.5	7.5	7.7	7.7	7.7		
pH (before air)								
(after air)								
(w/silt/algae)	6.7	6.7	6.7	6.7	6.6	6.4		
(Aeration time)								
Conductivity	352	353	353	354	358	358		
Hardness	5.4					5.6		
x 17.1	92.3					95.8		
Alkalinity	3.7					3.3		
x 10	37					33		
Chlorine								
Ammonia								

NOTES: F-MED A1376

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-7-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.7	23.9	24.0	23.9	23.9	23.8		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.4	7.4	7.6	7.7	7.7	7.7		
pH (before air)								
(after air)								
(w/silt/algae)	6.7	6.7	6.7	6.7	6.5	6.4		
(Aeration time)								
Conductivity	352	352	353	353	357	360		
Hardness	6.5					5.6		
x 17.1	94.1					95.8		
Alkalinity	3.8					3.3		
x 10	38					33		
Chlorine								
Ammonia								

NOTES: F MEO # 1376

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-8-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	24.3	24.4	24.4	24.5	24.6	24.5		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.5	7.6	7.6	7.7	7.8	7.8		
pH (before air)								
(after air)								
(w/silt/algae)	6.8	6.8	6.7	6.7	6.6	6.4		
(Aeration time)								
Conductivity	345	346	347	348	351	354		
Hardness	JSP 65.6					5.6		
x 17.1	95.8					95.8		
Alkalinity	3.6					3.2		
x 10	36					32		
Chlorine								
Ammonia								

NOTES: f mod H

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993

Personnel: Simbeck

Posey

Beginning Date: 7-6-93

Ending Date: 7-15-93

Date: 7-8-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	24.4	24.4	24.4	24.4	24.4	24.4		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.4	7.5	7.5	7.6	7.7	7.8		
pH (before air)								
(after air)								
(w/silt/algae)	6.8	6.7	6.7	6.7	6.6	6.5		
(Aeration time)								
Conductivity	346	346	348	348	351	355		
Hardness	6.0					5.5		
x 17.1	102.6					94.1		
Alkalinity	3.7					3.3		
x 10	37					33		
Chlorine								
Ammonia								

NOTES: F-MED H

(PLARC501-130

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-9-93

TREATMENT	Cntrl	0.312	0.625	1.250	2,500	5,000		
	YCT-S							
Temperature	24.6	23.9	23.8	23.8	23.9	24.0		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.3	7.3	7.4	7.5	7.5	7.5		
pH (before air)								
(after air)								
(w/silt/algae)	*6.7	6.7	6.7	6.7 6.6	6.6	6.4		
(Aeration time)								
Conductivity	346	343	345	347	350	354		
Hardness	5.4					5.6		
x 17.1	92.3					95.8		
Alkalinity	*1.1					3.3		
x 10	11					33		
Chlorine								
Ammonia								

NOTES: * may be low due to excessive silt / checked twice JA

dropped original sample. Had to make new and added too much spike sample (13.53 mL in one liter) pH = 6.2, DO and Conductivity unchanged

F-mco 11/1/81

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-9-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	24.6	23.8	23.8	23.8	23.8	24.0		
D.O. (before air)								
(after air)								
(w/silt/algae)	7.4	7.4	7.5	7.6	7.5	7.6		
pH (before air)	—							
(after air)								
(w/silt/algae)	6.8	6.8	6.8	6.7	6.6	6.5		
(Aeration time)								
Conductivity	347	345	346	348	352	355		
Hardness	5.3					5.6		
x 17.1	90.6					95.8		
Alkalinity	3.7					3.3		
x 10	37					33		
Chlorine								
Ammonia								

NOTES: Lumped #1381

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-10-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	YCT-S					
Temperature	23.4	23.5	23.6	23.5	23.8	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.6	7.7	7.6	7.7	7.7	
pH (before air)						
(after air)						
(w/silt/algae)	6.8	6.7 (7 pp)	6.7	6.7	6.6	
(Aeration time)						
Conductivity	356	357	358	358	361	
Hardness	5.7				~~5.9~~ 5.5	
x 17.1	97.5				~~92.5~~ 94.1	
Alkalinity	4.0				4.0	
x 10	40				40	
Chlorine						
Ammonia						

NOTES: 1 mcg # 1393

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-10-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000			
	PHYTOPLANKTON								
Temperature	23.5	23.5	23.5	23.5	23.5				
D.O. (before air)									
(after air)									
(w/silt/algae)	7.7	7.7	7.8	7.8	7.8				
pH (before air)									
(after air)									
(w/silt/algae)	6.8	6.7	6.7	6.7	6.6				
(Aeration time)									
Conductivity	358	357	359	360	362				
Hardness	5.9				5.5				
x 17.1	100.9				94.1				
Alkalinity	4.0				3.8				
x 10	40				38				
Chlorine									
Ammonia									

NOTES: 1 mod #1383

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: _____ Posey

Ending Date: _____ _____

Date: 7-11-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	23.1	23.2	23.2	23.2	23.4	—		
D.O. (before air)								
(after air)								
(w/silt/algae)	8.1	8.1	8.1	8.1	8.1	—		
pH (before air)								
(after air)								
(w/silt/algae)	6.7	6.7	6.7	6.7	6.6	-		
(Aeration time)								
Conductivity	351	352	352	353	356	—		
Hardness	5.4		-		5.5			
x 17.1	92.3				94.1			
Alkalinity	4.0				3.8			
x 10	40				38			
Chlorine								
Ammonia								

NOTES: F Mem #1384

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-11-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.2	23.2	23.2	23.2	23.4	—		
D.O. (before air)								
(after air)								
(w/silt/algae)	8.1	8.1	8.1	8.1	8.1	—		
pH (before air)								
(after air)								
(w/silt/algae)	6.9	6.8	6.8	6.7	6.6	—		
(Aeration time)								
Conductivity	351	352	353	354	357	—		
Hardness	5.5				5.6			
x 17.1	94.1				95.8			
Alkalinity	4.0				4.0			
x 10	40				40			
Chlorine								
Ammonia								

NOTES: F- MEO 1384

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-12-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	YCT S					
Temperature	23.7	23.4	23.4	23.6	23.4	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.9	8.0	8.0	8.1	8.0	
pH (before air)						
(after air)						
(w/silt/algae)	6.7	6.7	6.7	6.7	6.6	
(Aeration time)						
Conductivity	354	356	356	357	359	
Hardness	6.0				5.9	
x 17.1	102.6				100.9	
Alkalinity	4.0				3.7	
x 10	40				37	
Chlorine						
Ammonia						

NOTES: EMCF

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-12-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000			
	PHYTOPLANKTON								
Temperature	23.6	23.5	23.6	23.5	23.5				
D.O. (before air)									
(after air)									
(w/silt/algae)	8.0	8.0	8.0	8.1	8.2				
pH (before air)									
(after air)									
(w/silt/algae)	6.9	6.8	6.8	6.8	6.7				
(Aeration time)									
Conductivity	355	373	356	358	361				
Hardness	5.5				5.8				
x 17.1	94.1				99.2				
Alkalinity	3.8				3.6				
x 10	38				36				
Chlorine									
Ammonia									

NOTES: F-MED #

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-13-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	YCT-S					
Temperature	23.9	23.8	23.8	23.9	23.9	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.9	7.8	7.9	7.9	7.9	
pH (before air)						
(after air)						
(w/silt/algae)	6.8	6.8	6.8	6.8	6.7	
(Aeration time)						
Conductivity	369	370	370 ~~369~~ SP	371	374	
Hardness	5.4				5.5	
x 17.1	92.3				94.1	
Alkalinity	4.8				4.8	
x 10	48				48	
Chlorine						
Ammonia						

NOTES: F THEO #1388

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-13-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	PHYTOPLANKTON					
Temperature	23.7	23.7	23.7	23.9	24.0	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.8	7.8	7.8	8.0	7.9	
pH (before air)						
(after air)						
(w/silt/algae)	6.9	6.9	6.9	6.9	6.8	
(Aeration time)						
Conductivity	369	370	371 ~~372~~ JP	372 ~~375~~ JP	373 ~~369~~ JP	
Hardness	5.5				5.5	
x 17.1	94.1				94.1	
Alkalinity	4.8				4.7	
x 10	48				47	
Chlorine						
Ammonia						

NOTES: F. MEM #1388

(PLARC501-130)

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-14-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	PHYTOPLANKTON					
Temperature	23.8	23.9	24.1	24.1	24.1	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.8	7.8	7.8	7.8	7.8	
pH (before air)						
(after air)						
(w/silt/algae)	6.8	6.8	6.8	6.8	6.7	
(Aeration time)						
Conductivity	364	364	365	366	368	
Hardness	5.5				5.5	
x 17.1	94.1				94.1	
Alkalinity	4.0				4.0	
x 10	40				40	
Chlorine						
Ammonia						

NOTES: F-MED #11391

INITIAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-14-93

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	YCT-S					
Temperature	24.1	24.1	24.1	24.2	24.1	
D.O. (before air)						
(after air)						
(w/silt/algae)	7.8	7.8	7.8	7.8	7.8	
pH (before air)						
(after air)						
(w/silt/algae)	6.7	6.7	6.7	6.7	6.6	
(Aeration time)						
Conductivity	364	364	364	365	368	
Hardness	5.5	-			9.5	
x 17.1	94.1				94.1	
Alkalinity	4.0				4.0	
x 10	40				40	
Chlorine						
Ammonia						

NOTES: F-MED #1391

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-7-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
		YCT-S						
Temperature	24.1	24.2 1/2	24.2	23.6	24.0	23.9		
D.O.	8.1	8.1	8.0	8.3	8.3	8.3		
pH	7.2 6.4	7.5	7.5	7.7	7.7	7.6		
Conductivity	391	369	370	375	368	375 360		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-7-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.5	23.7	23.8	23.8	24.0	23.4		
D.O.	8.0	8.1	8.2	8.1	8.2	8.1		
pH	7.7	7.7	7.7	7.7	7.7	7.6		
Conductivity	376	380	368	363	365	374		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-8-93 Replicate: 2

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	24.2	24.4	24.0	24.2	23.7	23.1		
D.O.	7.9	8.0	8.0	7.9	8.0	8.2		
pH	7.8	7.8	7.8	7.8	7.8	7.8		
Conductivity	368	363	368	368	365	384		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-8-93 Replicate: 2

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	24.2	24.2	24.1	24.1	23.3	24.1		
D.O.	8.0	8.0	8.0	8.0	8.2	8.0		
pH	7.8	7.8	7.8	7.8	7.9	7.8		
Conductivity	359	363	362	371	379	375		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-9-93 Replicate: 3

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S					R-4		
Temperature	23.0	23.0	23.8	23.8	23.5	23.9		
D.O.	8.0	8.1	8.0	7.8	8.0	7.9		
pH	7.8	7.8	7.8	7.8	7.8	7.8		
Conductivity	362	372	359	356	363	363		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-9-93 Replicate: 3

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON					A224		
Temperature	23.7	23.9	24.1	24.0	24.2	24.1		
D.O.	7.7	7.8	7.8	8.0	7.9	8.0		
pH	7.8	7.8	7.8	7.8	7.8	7.9		
Conductivity	360	360	370	358	358	368		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-10-93 Replicate: 4

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	23.5	24.0	24.2	24.4	24.4			
D.O.	7.8	7.9	7.9	7.8	7.8			
pH	7.3	7.6	7.7	7.7	7.7			
Conductivity	385	360	354	352	357			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-10-93 Replicate: 2/

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.8	24.0	24.2	24.3	24.2			
D.O.	7.8	7.8	7.8	7.9	7.9			
pH	7.8	7.8	7.7	7.7	7.7			
Conductivity	384	364	355	356	359			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-11-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
			YCT-S					
Temperature	23.6	23.7	23.6	23.5	23.8			
D.O.	8.1	8.2	8.3	8.3	8.3			
pH	7.8	7.8	7.9	7.9	7.8			
Conductivity	371	370	373	374	380			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-11-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000			
	PHYTOPLANKTON								
Temperature	23.4	24.0	24.2	24.0	24.0				
D.O.	8.3	8.3	8.3	8.2	8.3				
pH	7.9	7.8	7.8	7.8	7.8				
Conductivity	378	368	370	394	374				
Hardness									
x 17.1									
Alkalinity									
x 10									
Chlorine									
Ammonia									

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-12-93 Replicate: 2

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	24.0	24.0	23.4	24.0	23.9			
D.O.	7.8	7.8	8.0	8.0	8.0			
pH	7.8	7.8	7.9	7.8	7.8			
Conductivity	359	365	373	369	367			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-12-93 Replicate: 2

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
	PHYTOPLANKTON					
Temperature	24.0	24.4	23.3	23.5	24.1	
D.O.	7.9	7.8	8.0	8.0	8.0	
pH	7.9	7.9	7.9	7.9	7.9	
Conductivity	366	364	375	370	366	
Hardness						
x 17.1						
Alkalinity						
x 10						
Chlorine						
Ammonia						

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-13-93 Replicate: 3

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	23.6	23.8	24.0	24.0	23.8			
D.O.	~~7.8~~ 7	7.8	~~8.0~~ 7.8	7.8	7.8			
pH	7.8	7.8	7.8	7.8	7.8			
Conductivity	364	370	371	379	375			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-13-93 Replicate: 3

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.8	23.6	24.0	24.0	24.0			
D.O.	7.8	7.9	8.0	7.9	7.9			
pH	7.9	7.8	7.9	7.9	7.8			
Conductivity	379	403	370	368	376			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-14-93 Replicate: 4

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000
		YCT-S				
Temperature	23.2	23.6	23.8	23.5	23.7	
D.O.	8.0	7.9	7.9	8.0	8.0	
pH	7.9	7.9	7.9	7.9	7.9	
Conductivity	384	381	385	385	383	
Hardness						
x 17.1						
Alkalinity						
x 10						
Chlorine						
Ammonia						

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-14-93

Date: 7-14-93 Replicate: 4

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.7	23.8	24.1	23.6	23.7			
D.O.	7.8	7.9	7.9	8.0	7.9			
pH	7.8	7.9	7.9	8.0	7.9			
Conductivity	380	382	392	397	396			
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-15-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	YCT-S							
Temperature	23.6	24.2	24.4	24.2	24.0	-		
D.O.	7.8	7.9	7.8	7.8	7.9	-	-	
pH- ——	7.8	7.8	7.8	7.9	7.9	-		
Conductivity	378	379	379	380	394	-		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES:

(PLARC501-130)

FINAL CHEMISTRY

Project: Mussel Ref Tox July 1993 Personnel: Simbeck

Beginning Date: 7-6-93 Posey

Ending Date: 7-15-93

Date: 7-15-93 Replicate: 1

TREATMENT	Cntrl	0.312	0.625	1.250	2.500	5.000		
	PHYTOPLANKTON							
Temperature	23.5	23.6	24.1	24.3	–	–		
D.O.	7.9	8.0	8.0	8.0	–	–		
pH	7.8	8.0	7.9	7.9	–	–		
Conductivity	378	401	375	382	–	–		
Hardness								
x 17.1								
Alkalinity								
x 10								
Chlorine								
Ammonia								

NOTES: 4 checked twice

(PLARC501-130)

C.R - E R P 2 -- July 06-15, 1993 -- I N I T I A L A N D F I N A L C H E M I S T R Y

I N I T I A L C H E M I S T R Y

CONTROL PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.1	7.8	6.9	362	97.5	37	--
1	23.7	7.4	6.7	352	94.1	38	--
2	24.4	7.4	6.8	346	102.6	37	--
3	24.6	7.4	6.8	347	90.6	37	--
4	23.5	7.7	6.8	358	100.9	40	--
5	23.2	8.1	6.9	351	94.1	40	--
6	23.6	8.0	6.9	355	94.1	38	--
7	23.7	7.8	6.9	369	94.1	48	--
8	23.8	7.8	6.8	364	94.1	40	--
MEAN	23.8	7.7	6.8	356	95.8	39	--
MIN	23.2	7.4	6.7	346	90.6	37	--
MAX	24.6	8.1	6.9	369	102.6	48	--

1.250 mg/L-PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.5	8.0	6.8	354	-	-	-
1	23.9	7.7	6.7	353	-	-	-
2	24.4	7.6	6.7	348	-	-	-
3	23.8	7.6	6.7	348	-	-	-
4	23.5	7.8	6.7	360	-	-	-
5	23.2	8.1	6.7	354	-	-	-
6	23.5	8.1	6.8	358	-	-	-
7	23.9	8.0	6.9	372	-	-	-
8	24.1	7.8	6.8	366	-	-	-
MEAN	23.9	7.9	6.8	357	0.0	0	--
MIN	23.2	7.6	6.7	348	0.0	0	--
MAX	24.5	8.1	6.9	372	0.0	0	--

0.312 mg/L-PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.4	7.9	6.9	356	-	-	-
1	23.9	7.4	6.7	352	-	-	-
2	24.4	7.5	6.7	346	-	-	-
3	23.8	7.4	6.8	345	-	-	-
4	23.5	7.7	6.7	357	-	-	-
5	23.2	8.1	6.8	352	-	-	-
6	23.5	8.0	6.8	373	-	-	-
7	23.7	7.8	6.9	370	-	-	-
8	23.9	7.8	6.8	364	-	-	-
MEAN	23.8	7.7	6.8	357	0.0	0	--
MIN	23.2	7.4	6.7	345	0.0	0	--
MAX	24.4	8.1	6.9	373	0.0	0	--

2.500 mg/L-PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.4	8.0	6.7	356	-	-	-
1	23.9	7.7	6.5	357	-	-	-
2	24.4	7.7	6.6	351	-	-	-
3	23.8	7.5	6.6	352	-	-	-
4	23.5	7.8	6.6	362	94.1	38	-
5	23.4	8.1	6.6	357	95.8	40	-
6	23.5	8.2	6.7	361	99.2	36	-
7	24.0	7.9	6.8	375	94.1	47	-
8	24.1	7.8	6.7	368	94.1	40	-
MEAN	23.9	7.9	6.6	360	95.4	40	--
MIN	23.4	7.5	6.5	351	94.1	36	--
MAX	24.4	8.2	6.8	375	99.2	47	--

0.625 mg/L PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.4	7.9	6.9	353	-	-	-
1	24.0	7.6	6.7	353	-	-	-
2	24.4	7.5	6.7	348	-	-	-
3	23.8	7.5	6.8	346	-	-	-
4	23.5	7.8	6.7	359	-	-	-
5	23.2	8.1	6.8	353	-	-	-
6	23.6	8.0	6.8	356	-	-	-
7	23.7	7.8	6.9	371	-	-	-
8	24.1	7.8	6.8	365	-	-	-
MEAN	23.9	7.8	6.8	356	0.0	0	--
MIN	23.2	7.5	6.7	346	0.0	0	--
MAX	24.4	8.1	6.9	371	0.0	0	--

5.000 mg/L-PHYTO

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.5	8.0	6.5	360	97.5	31	-
1	23.8	7.7	6.4	360	95.8	33	-
2	24.4	7.8	6.5	355	94.1	33	-
3	24.0	7.6	6.5	355	95.8	33	-
4	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
MEAN	24.2	7.8	6.5	358	95.8	33	-
MIN	23.8	7.6	6.4	355	94.1	31	-
MAX	24.5	8.0	6.5	360	97.5	33	-

FINAL CHEMISTRY

CONTROL-PHYTO

DAY	TEMP	DO	pH	COND
1	23.5	8.0	7.7	376
2	24.2	8.0	7.8	359
3	23.7	7.7	7.8	360
4	23.8	7.8	7.8	384
5	23.4	8.3	7.9	378
6	24.0	7.9	7.9	366
7	23.8	7.8	7.9	379
8	23.7	7.9	7.8	380
9	23.5	7.9	7.8	378
MEAN	23.7	7.9	7.8	373
MIN	23.4	7.7	7.7	359
MAX	24.2	8.3	7.9	384

0.312 mg/L-PHYTO

DAY	TEMP	DO	pH	COND
1	23.7	8.1	7.7	380
2	24.2	8.0	7.8	363
3	23.9	7.8	7.8	360
4	24.0	7.8	7.8	364
5	24.0	8.3	7.8	368
6	24.4	7.8	7.9	364
7	23.6	7.9	7.8	403
8	23.8	7.9	7.9	382
9	23.6	8.0	8.0	401
MEAN	23.9	8.0	7.8	376
MIN	23.6	7.8	7.7	360
MAX	24.4	8.3	8.0	403

0.625 mg/L-PHYTO

DAY	TEMP	DO	pH	COND
1	23.8	8.2	7.7	368
2	24.1	8.0	7.8	362
3	24.1	7.8	7.8	370
4	24.2	7.8	7.7	355
5	24.2	8.3	7.8	370
6	23.3	8.0	7.9	375
7	24.0	8.0	7.9	370
8	24.1	7.9	7.9	392
9	24.1	8.0	7.9	375
MEAN	24.0	8.0	7.8	371
MIN	23.3	7.8	7.7	355
MAX	24.2	8.3	7.9	392

1.250 mg/L PHYTO

DAY	TEMP	DO	pH	COND
1	23.8	8.1	7.7	363
2	24.1	8.0	7.8	371
3	24.0	8.0	7.8	358
4	24.3	7.9	7.7	356
5	24.0	8.2	7.8	394
6	23.5	8.0	7.9	370
7	24.0	7.9	7.9	368
8	23.6	8.0	8.0	397
9	24.3	8.0	7.9	382
MEAN	24.0	8.0	7.8	373
MIN	23.5	7.9	7.7	356
MAX	24.3	8.2	8.0	397

2.500 mg/L-PHYTO

DAY	TEMP	DO	pH	COND
1	24.0	8.2	7.7	365
2	23.3	8.2	7.9	379
3	24.2	7.9	7.8	358
4	24.2	7.9	7.7	359
5	24.0	8.3	7.8	379
6	24.1	8.0	7.9	366
7	24.0	7.9	7.8	376
8	23.7	7.9	7.9	386
9	-	-	-	-
MEAN	23.9	8.0	7.8	371
MIN	23.3	7.9	7.7	358
MAX	24.2	8.3	7.9	386

5.000 mg/L-PHYTO

DAY	TEMP	DO	pH	COND
1	23.9	8.1	7.6	374
2	24.1	8.0	7.8	375
3	24.1	8.0	7.8	368
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-
MEAN	24.0	8.0	7.7	372
MIN	23.9	8.0	7.6	368
MAX	24.1	8.1	7.8	375

TEMPERATURE: MEAN: 23.9

MIN: 23.3

MAX: 24.4

Reviewed By/Date: DJS 8/2/93

(CR-ERP-2)

INITIAL CHEMISTRY

CONTROL-YCT-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.1	7.8	7.2	380	95.8	37	--
1	23.4	7.4	6.7	352	92.3	37	--
2	24.3	7.5	6.8	345	95.8	36	--
3	24.6	7.3	6.2	346	92.3	11	--
4	23.4	7.6	6.8	356	97.5	40	--
5	23.1	8.1	6.7	351	92.3	40	--
6	23.7	7.9	6.7	354	102.6	40	--
7	23.9	7.9	6.8	369	92.3	48	--
8	24.1	7.8	6.7	364	94.1	40	--
MEAN	23.8	7.7	6.7	357	95.0	37	--
MIN	23.1	7.3	6.2	345	92.3	11	--
MAX	24.6	8.1	7.2	380	102.6	48	--

1.250 mg/L-YCY-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.4	7.8	7.0	353	-	-	-
1	24.0	7.7	6.7	354	-	-	-
2	24.5	7.7	6.7	348	-	-	-
3	23.8	7.5	6.7	347	-	-	-
4	23.5	7.7	6.7	358	-	-	-
5	23.2	8.1	6.7	353	-	-	-
6	23.6	8.1	6.7	357	-	-	-
7	23.9	7.9	6.8	371	-	-	-
8	24.2	7.8	6.7	365	-	-	-
MEAN	23.9	7.8	6.7	356	0.0	0	--
MIN	23.2	7.5	6.7	347	0.0	0	--
MAX	24.5	8.1	7.0	371	0.0	0	--

0.312 mg/L-YCT-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.4	7.8	7.1	356	-	-	-
1	23.7	7.5	6.7	353	-	-	-
2	24.4	7.6	6.8	346	-	-	-
3	23.9	7.3	6.7	343	-	-	-
4	23.5	7.7	6.7	357	-	-	-
5	23.2	8.1	6.7	352	-	-	-
6	23.4	8.0	6.7	356	-	-	-
7	23.8	7.8	6.8	370	-	-	-
8	24.1	7.8	6.7	364	-	-	-
MEAN	23.8	7.7	6.8	355	0.0	0	--
MIN	23.2	7.3	6.7	343	0.0	0	--
MAX	24.4	8.1	7.1	370	0.0	0	--

2.500 mg/L-YCT-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.3	7.9	6.8	355	-	-	-
1	24.1	7.7	6.6	358	-	-	-
2	24.6	7.8	6.6	351	-	-	-
3	23.9	7.5	6.6	350	-	-	-
4	23.8	7.7	6.6	361	94.1	40	-
5	23.4	8.1	6.6	356	94.1	38	-
6	23.4	8.0	6.6	359	100.9	37	-
7	23.9	7.9	6.7	374	94.1	48	-
8	24.1	7.8	6.6	368	94.1	40	-
MEAN	23.9	7.8	6.6	359	95.4	41	--
MIN	23.4	7.5	6.6	350	94.1	37	--
MAX	24.6	8.1	6.8	374	100.9	48	--

0.625 mg/L-YCT-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORINE
0	24.4	7.8	7.0	352	-	-	-
1	23.9	7.5	6.7	353	-	-	-
2	24.4	7.6	6.7	347	-	-	-
3	23.8	7.4	6.7	345	-	-	-
4	23.6	7.6	6.7	358	-	-	-
5	23.2	8.1	6.7	352	-	-	-
6	23.4	8.0	6.7	356	-	-	-
7	23.8	7.9	6.8	370	-	-	-
8	24.1	7.8	6.7	364	-	-	-
MEAN	23.8	7.7	6.7	355	0.0	0	--
MIN	23.2	7.4	6.7	345	0.0	0	--
MAX	24.4	8.1	7.0	370	0.0	0	--

5.000 mg/L-YCT-S

DAY	TEMP	DO	pH	COND	HARD	ALK	CHLORI
0	24.3	7.9	6.5	360	97.5	32	-
1	23.8	7.7	6.4	358	95.8	33	-
2	24.5	7.8	6.4	354	95.8	32	-
3	24.0	7.5	6.4	354	95.8	33	-
4	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-
MEAN	24.2	7.7	6.4	357	96.2	33	-
MIN	23.8	7.5	6.4	354	95.8	32	-
MAX	24.5	7.9	6.5	360	97.5	33	-

FINAL CHEMISTRY

CONTROL-YCT-S

DAY	TEMP	DO	pH	COND
1	24.1	8.1	7.6	391
2	24.2	7.9	7.8	368
3	23.0	8.0	7.8	362
4	23.5	7.8	7.3	385
5	23.6	8.1	7.8	371
6	24.0	7.8	7.8	359
7	23.6	7.7	7.8	364
8	23.2	8.0	7.9	384
9	23.6	7.8	7.8	378
MEAN	23.6	7.9	7.7	374
MIN	23.0	7.7	7.3	359
MAX	24.2	8.1	7.9	391

0.312 mg/L-YCT-S

DAY	TEMP	DO	pH	COND
1	24.1	8.1	7.5	369
2	24.4	8.0	7.8	363
3	23.0	8.1	7.8	372
4	24.0	7.9	7.6	360
5	23.7	8.2	7.8	370
6	24.0	7.9	7.8	365
7	23.8	7.8	7.8	370
8	23.6	7.9	7.9	381
9	24.2	7.9	7.8	379
MEAN	23.9	8.0	7.8	370
MIN	23.0	7.8	7.5	360
MAX	24.4	8.2	7.9	381

0.625 mg/L-YCT-S

DAY	TEMP	DO	pH	COND
1	24.2	8.0	7.5	370
2	24.0	8.0	7.8	368
3	23.8	8.0	7.8	359
4	24.2	7.9	7.7	354
5	23.6	8.3	7.9	373
6	23.4	8.0	7.9	373
7	24.0	7.8	7.8	371
8	23.8	7.9	7.9	385
9	24.4	7.8	7.8	379
MEAN	23.9	8.0	7.8	370
MIN	23.4	7.8	7.5	354
MAX	24.4	8.3	7.9	385

1.250 mg/L-YCT-S

DAY	TEMP	DO	pH	COND
1	23.6	8.3	7.7	375
2	24.2	7.9	7.8	368
3	23.8	7.8	7.8	356
4	24.4	7.8	7.7	352
5	23.5	8.3	7.9	374
6	24.0	8.0	7.8	369
7	24.0	7.8	7.8	379
8	23.5	8.0	7.9	385
9	24.2	7.8	7.9	380
MEAN	23.9	8.0	7.8	371
MIN	23.5	7.8	7.7	352
MAX	24.4	8.3	7.9	385

2.500 mg/L-YCT-S

DAY	TEMP	DO	pH	COND
1	24.0	8.3	7.7	368
2	23.7	8.0	7.8	365
3	23.5	8.0	7.8	363
4	24.4	7.8	7.7	357
5	23.8	8.3	7.8	380
6	23.9	8.0	7.8	367
7	23.8	7.8	7.8	375
8	23.7	8.0	7.9	383
9	24.0	7.9	7.9	394
MEAN	23.9	8.0	7.8	372
MIN	23.5	7.8	7.7	357
MAX	24.4	8.3	7.9	394

5.000 mg/L-YCT-S

DAY	TEMP	DO	pH	COND
1	23.9	8.3	7.6	375
2	23.4	8.2	7.8	384
3	23.9	7.9	7.8	363
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-
MEAN	23.7	8.1	7.7	374
MIN	23.4	7.9	7.6	363
MAX	23.9	8.3	7.8	384

TEMPERATURE: MEAN: 23.8
MIN: 23.0
MAX: 24.4

Reviewed By/Date: 0/S 8/2/93

(CR-ERP-2)

Project Instrument Record Sheet

Project Study CR-ERP Mussel Ref Tox July 93

Beginning Date 7-6-93

Ending Date 7-15-93

DO Meter

Model YSI Model 57
TVA Tag 557673
Calibration Date 4-28-93

pH Meter(s)

Model SA 250 Orion Research
TVA Tag SW-8147
Calibration Date 4-30-93

Model Orion Model 407A
TVA Tag 557674
Calibration Date 4-14-93

Conductivity Meter

Model YSI Model 32
TVA Tag 543389
Calibration Date 2-8-93

Thermometer(s)

Model SAMA CT-40
TVA Tag A-20
Calibration Date

Model
TVA Tag
Calibration Date

PROJECT REAGENT RECORD SHEET

Project/Study: CR-ERP Mussel Ref Tox 93 Beginning Date: 7-9-93
Personnel: Sunbeck, Posey Ending Date: 7-16-93

WINKLER TITRATION METHOD

Alkaline-Iodide-Azide:
Brand Fisher
Lot # 910062-24
Exp. 2-93

Manganous Sulfate:
Brand Fisher
Lot # 910067-26
Exp. 4-93

Sodium Thiosulfate:
Brand Ricca
Lot # 11267
Exp. 4-94

Sulfuric Acid:
Brand Fisher
Lot # 854507
Exp. NA

Thyodene:
Brand Fisher
Lot # 912254
Exp. NA

pH BUFFER SOLUTIONS

pH 4:
Brand RiccA
Lot # F267
Exp. 3-94

pH 7:
Brand Mallinckrodt
Lot # 0098KCX
Exp. 9-94

pH 10:
Brand Mall.-Baker
Lot # 0099KJVJ
Exp. 12-93

pH ____:
Brand
Lot #
Exp.

CONDUCTIVITY STANDARD SOLUTIONS

200 µmhos:
Brand Biopharm
Lot # I302C
Exp. 11-94

720 µmhos:
Brand Biopharm
Lot # E052A
Exp. 5-94

____ µmhos:
Brand
Lot #
Exp.

ALKALINITY TITRATION

Sulfuric Acid Solution N/50:
Brand Mallinckrodt
Lot # H364
Exp. NA

HARDNESS TITRATION

Hardness Titrating Solution:
Brand Calgon
Lot # R20337700
Exp. N/A

Hardness Indicator:
Brand Calgon
Lot # 01E98
Exp. NA

Hardness Buffer Solution:
Brand Calgon
Lot # 21C68
Exp. NA

CHLORINE TITRATION

DPD Powder Pillows:
Brand Hach
Lot # 03cm
Exp. NA

Potassium Iodide:
Brand Fisher
Lot # 863484A
Exp. NA

FAS:
Brand RiccA
Lot # C278
Exp. 7-27-93

PLARC501-632

ATTACHMENT II

COPPER ANALYSIS REQUEST AND RESULTS

TVA 11064 (WR-1-80)

SAMPLE CUSTODY RECORD

ACCT. #4210-011200-85555

SURVEY Mussel Ref Tox DATE 7-12-93

SHIPPED FROM ARL-IA TBFN VIA TVA Mail

SHIPPED BY Damien Simbeck AT 0800 (TIME)

RECEIVED BY _____ AT _____ (TIME) ON _____ (DATE)

CHECK AS INDICATED:

SHIPPING ☒

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BOTTLE REQUIREMENT*

TAG NO.	BOD	COD	FERROUS	METALS	DISS. METALS	SPEC. METALS	MINERAL	DISS. MINERAL	NUTRIENT	OIL & GREASE	PHENOLS	Total Copper	CHLOROPHYLLS	SEDIMENT
BLANK											/			
CON-P											/			
0.312-P											/			
0.625-P											/			
1.250-P											/			
2.50-P											/			
5.0-P											/			
CON-Y											/			
0.312-Y											/			
0.625-Y											/			
1.250-Y											/			
2.50-Y											/			
5.0-Y											/			

NO. OF ICE CHESTS SHIPPED _____ RECEIVED _____

NO. OF SHIPPING CHESTS SHIPPED 1 RECEIVED _____

NO. OF RACKS SHIPPED _____ RECEIVED _____

NO. OF FIELD SHEETS SHIPPED 3 RECEIVED _____

SIGNATURE OF SHIPPER Damien Simbeck DATE 7-12-93

*IF THE NUMBER OF SAMPLES OF EACH TYPE RECEIVED IS DIFFERENT FROM THE NUMBER SHIPPED, NOTIFY THE WATER QUALITY AND ECOLOGY BRANCH IMMEDIATELY.

TVA 991 (ACD 1-82)

REQUEST FOR AND REPORT OF ANALYSIS

Date submitted 7-12-93 Laboratory No.

Date wanted 7-26 93

Date reported Charge to account No. 4210-011200-85555

GENERAL DESCRIPTION:

Consignor's Number	Specific Description for Each Sample
1	Blank
2	Con-P (Control-P)
3	0.312-P (0.312 mg/L Cu-P)
4	0.625-P (0.625 mg/L Cu-P)
5	1.250-P (1.250 mg/L Cu-P)
6	2.50-P (2.50 mg/L Cu-P)
7	5.0-P (5.0 mg/L Cu-P
8	Con-Y (Control Y)

Remarks, method, etc.: Total Copper * mix well before analysis

ANALYZE FOR

Lab. No.	Consignor's Number									

Requested by Danica Simbeck Notebook page

Address ARL-1A BEN Analyzed by

Request approved by Laboratory

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TVA 991 (ACD-4-82)

REQUEST FOR AND REPORT OF ANALYSIS

Date submitted 7-12-93 Laboratory No.

Date wanted 7-26-93

Date reported Charge to account No. 4210 011200-65555

GENERAL DESCRIPTION:

Consignor's Number	Specific Description for Each Sample
9	0.312-Y (0.312 mg/L Cu-Y)
10	0.625-Y (0.625 mg/L Cu-Y)
11	1.250-Y (1.250 mg/L Cu-Y)
12	2.50-Y (2.50 mg/L Cu-Y)
13	5.0-Y (5.0 mg/L Cu-Y)

Remarks, method, etc.: Total Copper * mix well before analysis

ANALYZE FOR

Lab. No.	Consignor's Number									

Requested by Damien Simbeck Notebook page

Address APL 1A BFN Analyzed by

Request approved by Laboratory

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3

STANDARD SAMPLE LOGIN SHEET FOR LABSAH # Labels : 1 of 3

LABSAH SAMPLE KEY NO. : 9# 16781 (Filled in at sample login.)

Requesting Organization : STD (Enter for standard sample login.)

Sample ID/Location : BLANK (A. Biology) ICP (25)

Sample Comments : Mussel Reference toxicity study (25)

Sample Type/Matrix : Water (25)

Date Sample Collected : 930712 YYMMDD format (6)

Time Sample Collected : _____ 24 Hour Time format (4)

Date Sample Received by Lab : 930713 YYMMDD format (6)

Sample was collected by : Damien Simbeck (30)

Send sample results to : Damien Simbeck (30)

Address for results - 1 : ARL IA-BFN (30)

Address for results - 2 : _____ (30)

Sample Account Number : 4210-011200-85555, F, WRS (50)

Sample Project Leader : LHH LOH DHV CVS CFP BWS (WRS) ALP RIG GQ CLK JAT

Days until sample results are due : 14 default is 0 (3)

Method of Analysis : _____ (46)

Laboratory comments : _____ (25)

Test or Group IDC entry : 01042

STANDARD SAMPLE LOGIN SUPPLEMENTAL DATA SHEET Page 1 of

LABSAM SAMPLE KEY NO. : 93/ 6782 (Filled in at sample login.)		
Sample ID/Location : CON-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6783 (Filled in at sample login.)		
Sample ID/Location : 0.312-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6784 (Filled in at sample login.)		
Sample ID/Location : 0.625-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6785 (Filled in at sample login.)		
Sample ID/Location : 1.250-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6786 (Filled in at sample login.)		
Sample ID/Location : 2.50-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6787 (Filled in at sample login.)		
Sample ID/Location : 5.0-P (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6788 (Filled in at sample login.)		
Sample ID/Location : CON-Y (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6789 (Filled in at sample login.)		
Sample ID/Location : 0.312-Y (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6790 (Filled in at sample login.)		
Sample ID/Location : 0.625-Y (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	
LABSAM SAMPLE KEY NO. : 93/ 6791 (Filled in at sample login.)		
Sample ID/Location : 1.250-Y (ICP)	(25)	
Sample Comments :	(25)	
Date Sample Collected : YYMMDD format	(6)	

STANDARD SAMPLE LOGIN SUPPLEMENTAL DATA SHEET

LABSAM SAMPLE KEY NO. : 93/ 6792 (Filled in at sample login.)
Sample ID/Location : 1.250-Y (ICP) Precision (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ 6793 (Filled in at sample login.)
Sample ID/Location : 2.50-Y (ICP) (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ 6794 (Filled in at sample login.)
Sample ID/Location : 5.0-Y (ICP) (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

LABSAM SAMPLE KEY NO. : 93/ (Filled in at sample login.)
Sample ID/Location : (25)
Sample Comments : (25)
Date Sample Collected : YYMMDD format (6)

TVA 11064 (WR-1-80)

SAMPLE CUSTODY RECORD

ACCT. # 4210-011208-85555

SURVEY Mussel Ref Tox DATE 7-12-93

SHIPPED FROM ARL-1A BFN VIA TVA Mail

SHIPPED BY Damien Simbeck AT 0800 TIME

RECEIVED BY _____ AT _____ TIME ON _____ DATE

CHECK AS INDICATED:

SHIPPING ☒

RECEIVING ☒

BOTTLE REQUIREMENT*

TAG NO.	BOD	COD	FERROUS	METALS	DISS. METALS	SPEC. METALS	MINERAL	DISS. MINERAL	NUTRIENT	OIL & GREASE	PHENOLS	Total Copper	CHLOROPHYLLS	SEDIMENT
BLANK											X			
CON - P											X			
0.312 - P											X			
0.625 - P											X			
1.25 - P											X			
2.5 - P											X			
5.0 - P											X			
CON - Y											X			
0.312 - Y											X			
0.625 - Y											X			
1.25 - Y											X			
2.5 - Y											X			
5.0 - Y											X			

RECEIVED 93 JUL 13 AM 11:03 WATER QUALITY BRANCH

NO. OF ICE CHESTS SHIPPED _____ RECEIVED _____

NO. OF SHIPPING CHESTS SHIPPED 1 RECEIVED _____

NO. OF RACKS SHIPPED _____ RECEIVED _____

NO. OF FIELD SHEETS SHIPPED 3 RECEIVED _____

SIGNATURE OF SHIPPER [signature] DATE 7-12-93

*IF THE NUMBER OF SAMPLES OF EACH TYPE RECEIVED IS DIFFERENT FROM THE NUMBER SHIPPED, NOTIFY THE WATER QUALITY AND ECOLOGY BRANCH IMMEDIATELY

TVA 991 (ACID-4 82)

REQUEST FOR AND REPORT OF ANALYSIS

Date submitted 7-12-93 Laboratory No.

Date wanted 7-26-93

Date reported Charge to account No. 4210-011200-85555

GENERAL DESCRIPTION:

Consignor's Number	Specific Description for Each Sample
1	Blank
2	Cu-P (Control-P)
3	0.312-P (0.312 mg/L Cu-P)
4	0.625-P (0.625 mg/L Cu-P)
5	1.250-P (1.250 mg/L Cu-P)
6	2.50-P (2.50 mg/L Cu-P)
7	5.0-P (5.0 mg/L Cu-P
8	Cu-Y (Control-Y)

Remarks, method, etc.: Total Copper * mix well before analysis

ANALYZE FOR

Lab. No.	Consignor's Number									

RECEIVED
93 JUL 13 AM 10 03
LAB BRANCH

Requested by: Donna Simbeck

Address: NL-1A BFN

Request approved by: D. J. Simbeck

Notebook page

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Laboratory

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TVA 991 (ACD-4-82)

REQUEST FOR AND REPORT OF ANALYSIS

Date submitted 7-12-93 Laboratory No.

Date wanted 7-21-93

Date reported Charge to account No. 4210-011200-85555

GENERAL DESCRIPTION:

Consignor's Number	Specific Description for Each Sample
9	1:312-Y (0.312 mg/L Cu-Y)
10	1:625-Y (0.625 mg/L Cu-Y)
11	1.250-Y (1.250 mg/L Cu-Y)
12	2.50-Y (2.50 mg/L Cu-Y)
13	5.0-Y (5.0 mg/L Cu-Y)

Remarks, method, etc.: Total Copper * mix well before analysis

ANALYZE FOR

Lab. No.	Consignor's Number									

RECEIVED
93 JUL 13 AM 8:03
LABORATORY BRANCH

Requested by Warren Simbeck Notebook page

Address AP1 1A BFN Analyzed by

Request approved by Laboratory

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TVA Environmental Chemistry	Chattanooga, Tennessee
07/21/93	FINAL DATA REPORT 07:39

S'INFO	BLANK (A.BIOLOGY) ICP	SAMPLE	: 93/06781
S'CMT	MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	WATER	DUEDATE	: 07/27/93
ACT'NUMB	4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06781 Project Leader :William R. Scott

Sample ID Information :BLANK (A.BIOLOGY) ICP
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	< 10.	ug/L

TVA Environmental Chemistry	Chattanooga, Tennessee
07/21/93 FINAL DATA REPORT	07:39
	Page 1

S'INFO	: CON-P (ICP)	SAMPLE	: 93/06782
S'CMT	: MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	: WATER	DUEDATE	: 07/27/93
ACT'NUMB	: 4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06782 Project Leader :William R. Scott

Sample ID Information :CON-P (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	< 10.	ug/L

S'INFO : 0.312-P (ICP)
S'CMT : MUSSEL REFERENCE TOXICITY
S'TYPE : WATER
ACT'NUMB : 4210-011200-85555,F,WRS
SAMPLE : 93/06783
LOGDATE : 930713
DUEDATE : 07/27/93
P'LEAD : @WRS

Lab Sample Number :93/06783 Project Leader :William R. Scott

Sample ID Information :0.312-P (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. ID	Analysis Performed	result	units
01042	Copper, Total in Water	300.	ug/L

TVA Environmental Chemistry	Chattanooga, Tennessee
07/21/93	FINAL DATA REPORT 07:39
	Page 1

S'INFO 00.625-P(ICP) SAMPLE : 93/06784
S'CMT MUSSEL REFERENCE TOXICITY LOGDATE : 930713
S'TYPE WATER DUEDATE : 07/27/93
ACT'NUMB 4210-011200-85555,F,WRS P'LEAD : @WRS

Lab Sample Number :93/06784 Project Leader :William R. Scott

Sample ID Information :00.625-P(ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. ID	Analysis Performed	result	units
01042	Copper, Total in Water	600.	ug/L

S'INFO : 1.250-P (ICP)
S'CMT : MUSSEL REFERENCE TOXICITY
S'TYPE : WATER
ACT'NUMB : 4210-011200-85555,F,WRS

SAMPLE : 93/06785
LOGDATE : 930713
DUEDATE : 07/27/93
P'LEAD : @WRS

Lab Sample Number :93/06785 Project Leader :William R. Scott

Sample ID information :1.250-P (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result		units
01042	Copper, Total in Water	1400.		ug/L

S'INFO . 2.50-P (ICP) SAMPLE : 93/06786
S'CMT . MUSSEL REFERENCE TOXICITY LOGDATE : 930713
S'TYPE . WATER DUEDATE : 07/27/93
ACT'NUMB . 4210-011200-85555,F,WRS P'LEAD : @WRS

Lab Sample Number :93/06786 Project Leader :William R. Scott

Sample ID information :2.50-P (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	2700.	ug/L

S'INFO	5.0-P (ICP)	SAMPLE	: 93/06787
S'CMT	MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	WATER	DUEDATE	: 07/27/93
ACT'NUM	4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06787 Project Leader :William R. Scott

Sample ID Information :5.0-P (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix .WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	5400.	ug/L

TVA Environmental Chemistry	Chattanooga, Tennessee
07/21/93	FINAL DATA REPORT 07:39

S'INFO	CON-Y (ICP)	SAMPLE	: 93/06788
S'CMT	MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	WATER	DUEDATE	: 07/27/93
ACT'NUMB	4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06788 Project Leader :William R. Scott

Sample ID information :CON-Y (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. ID:	Analysis Performed	result	units
01042	Copper, Total in Water	< 10.	ug/L

TVA Environmental Chemistry	Chattanooga, Tennessee
07/21/93	FINAL DATA REPORT 07:39

S'INFO	: 0.312-Y (ICP)	SAMPLE	: 93/06789
S'CMT	: MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	: WATER	DUEDATE	: 07/27/93
ACT'NUMb	: 4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06789 Project Leader :William R. Scott

Sample ID Information :0.312-Y (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	300.	ug/L

S'INFO	0.625-Y (ICP)	SAMPLE	: 93/06790
S'CNT	MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	WATER	DUEDATE	: 07/27/93
ACT'NUMB	4210-011200-85555,F,URS	P'LEAD	: @URS

Lab Sample Number :93/06790 Project Leader :William R. Scott

Sample ID information :0.625-Y (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,URS

Alt IDC	Analysis Performed	result	units
01042	Copper, Total in Water	620.	ug/L

S'INFO	1 250-Y (ICP)	SAMPLE	: 93/06791
S'CMT	MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	WATER	DUEDATE	: 07/27/93
ACT'NUMB	4210-011200-85555,F,WRS	P'LEAD	: @WRS

Lab Sample Number :93/06791 Project Leader :William R. Scott

Sample ID Information :1.250-Y (ICP)
Sample Comments :MUSSEL REFERENCE TOXICITY
Sample type-matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	1300.	ug/L

S'INFO : 1.250-Y (ICP) PRECISION
S'CMT : MUSSEL REFERENCE TOXICITY
S'TYPE : WATER
ACT'NUMb : 4210-011200-85555,F,WRS
SAMPLE : 93/06792
LOGDATE : 930713
DUEDATE : 07/27/93
P'LEAD : @WRS

Lab Sample Number :93/06792 Project Leader :William R. Scott

Sample ID information :1.250-Y (ICP) PRECISION
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	1300.	ug/L

S'INFO . 2.50-Y (ICP) SAMPLE : 93/06793
S'CMT . MUSSEL REFERENCE TOXICITY LOGDATE : 930713
S'TYPE . WATER DUEDATE : 07/27/93
ACT'NUMB . 4210-011200-85555,F,WRS P'LEAD : @WRS

Lab Sample Number :93/06793 Project Leader :William R. Scott

Sample ID information :2.50-Y (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,WRS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	2500.	ug/L

S'INFO	. 5.0-Y (ICP)	SAMPLE	: 93/06794
S'CMT	. MUSSEL REFERENCE TOXICITY	LOGDATE	: 930713
S'TYPE	. WATER	DUEDATE	: 07/27/93
ACT'NUMB	. 4210-011200-85555,F,URS	P'LEAD	: @URS

Lab Sample Number :93/06794 Project Leader :William R. Scott

Sample ID Information :5.0-Y (ICP)
Sample comments :MUSSEL REFERENCE TOXICITY
Sample type/matrix :WATER
Sample collected by :DAMIEN SIMBECK
Sample collection date :930712
Sample login date :930713 Sample received by lab :930713
Sample account number :4210-011200-85555,F,URS

Alt. IDC	Analysis Performed	result	units
01042	Copper, Total in Water	5100.	ug/L