Report

of

Test No. 806-3

Assessment of Freshwater Sediments as part of the Downtown Portland Sediment Characterization Project, using a 28-day Amphipod, *Hyalella azteca*, Sediment Bioassay.

Submitted to

Hart Crowser, Inc.,
8910 SW Gemini Drive
Beaverton, OR 97008

Submitted by

Northwestern Aquatic Sciences
3814 Yaquina Bay Road
P.O. Box 1437
Newport, OR 97365

May 18, 2010

TOXICITY TEST REPORT

TEST IDENTIFICATION

Test No.: 806-3

Title: Toxicity of freshwater sediments using a 28-day Amphipod, *Hyalella azteca*, sediment bioassay as part of the Downtown Portland Sediment Characterization Project.

Protocol No.: NAS-XXX-HA4c, February 11, 2000. Revision 3 (4-26-05). Based on ASTM 2001 (Standard test methods for measuring the toxicity of sediment-associated contaminants with fresh water invertebrates, E1706-00), Am. Soc. Test. Mat., Phila., PA, and EPA Method 100.1 (Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates, EPA/600/R-99/064).

STUDY MANAGEMENT

Study Sponsor: Hart Crowser, Inc., 8910 SW Gemini Drive, Beaverton, OR 97008
Sponsor's Study Monitor: Mr. Rick Ernst
Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365
Test Location: Newport laboratory
Laboratory's Study Personnel: G.J. Irissarri, B.S., Proj. Man./Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; R.S. Caldwell, PhD, Sr. Toxicologist; G.A. Buhler, B.S., Aq. Toxicologist; S.J. Gage, B.A., Sr. Tech.; L.P. Sandoval, B.S., Tech.; Y. Nakahama, Tech.
Study Schedule:
Test Beginning: 4-2-10, 0950 hrs.
Test Ending: 4-30-10, 1000 hrs.
Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.
Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).
Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Test Sediments: Freshwater test sediments collected as part the Downtown Portland Sediment Characterization project. Details are as follows:

NAS Sample No.	3160G	3161G
Description	DPSC-G093	DPSC-G094
Collection Date	3/25/10	3/25/10
Receipt Date	3/27/10	3/27/10

Control Sediment: The negative control sediment (NAS#3136G) was collected on 3-10-10 from an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.
Treatments: Homogenized at test set up by mixing using stainless steel implements.
Storage: All test, reference, and control sediments were stored at 4°C in the dark in sealed containers until used.

TEST WATER

Source: Dechlorinated municipal tap water.
Date of Preparation: 3-30-10, 4-9-10

Water Quality:
pH: 7.0, 7.1
conductivity: 137, 150 µmhos/cm
hardness: 43, 43 mg/L as $CaCO_3$
alkalinity: 30, 30 mg/L as $CaCO_3$.
total chlorine: < 0.02, <0.02 mg/L
Pretreatment: Dechlorinated and aerated ≥24 hr.

TEST ORGANISMS

Species: *Hyalella azteca,* amphipod.
Age/Size: 7-8 days old
Source: Chesapeake Cultures, Hayes, VA; received 3-31-10
Acclimation: Holding conditions for the five days prior to testing averaged: Temperature, 19.3 ± 3.6 °C; dissolved oxygen, 10.7 ± 3.7 mg/L; pH, 7.6 ± 0.6; conductivity, 347 ± 79 µmhos/cm; hardness, 145 ± 56 mg/L as $CaCO_3$; and alkalinity, 143 ± 57 mg/L as $CaCO_3$. Photoperiod, 16:8, L:D. Half of the water was replaced daily with dechlorinated municipal tap water during holding. Animals were fed YTC daily during holding.

TEST PROCEDURES AND CONDITIONS

The following is an abbreviated statement of the test procedures and a statement of the test conditions actually employed. See the test protocol (Appendix I) for a more detailed description of the test procedures used in this study.

Test Chambers: 300 ml high-form glass beakers
Test Volumes: 100 ml sediment layer; 175 ml test water.
Replicates/Treatment: 8 (plus two additional WQ beakers)
Organisms/Treatment: 80
Water Volume Changes: 2 water volumes per day
Aeration: None.
Feeding: Animals are fed 1.0 ml of YTC suspension per beaker daily.
Effects Criteria: 1) survival after 28 days, and 2) average individual dry weight after 28 days. Death is defined as no visible movement or response to tactile stimulation. Missing organisms were considered to be dead.
Water Quality and Other Test Conditions: The temperature, dissolved oxygen, conductivity, pH, hardness, alkalinity, and ammonia-nitrogen were measured in the overlying water of one replicate test container per treatment on days 0 and 28 of the test. Temperature was measured daily, pH and dissolved oxygen three times per week, and conductivity weekly, in the overlying water of one replicate test container per treatment. Hardness and alkalinity were measured with titrimetric methods. Ammonia-N was measured using Hach reagents based on the salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric method; samples were not distilled prior to analysis. The photoperiod was 16:8, L:D.

DATA ANALYSIS METHODS

Survival, mortality and average individual dry weight were calculated for each replicate as follows:

percent survival = 100 x (number surviving/initial number tested)
percent mortality = 100 x (number dead/initial number tested)

average individual dry weight = (final wt. - tare wt.)/number weighed,
where:
final wt. = tare wt. + dry weight of organisms recovered on day 28, in mg

Means and standard deviations for the biological endpoints described above, and for water quality data, were computed using Microsoft Excel 2000.

PROTOCOL DEVIATIONS

Test beakers were not changed as scheduled for the afternoon on day 21.

REFERENCE TOXICANT TEST

The reference toxicant test is a multi-concentration toxicity test using potassium chloride, to evaluate the performance of the test organisms used in the sediment toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2712
Reference Toxicant and Source: Potassium Chloride (KCl), Fisher Lot #073280.
Test Date: 4-2-10.
Dilution Water Used: Moderately hard synthetic water prepared from Milli-Q® deionized water.
Result: 96-hr LC50, 0.36 g/L. This result is within the laboratory's control chart warning limits (0.32 – 0.47 g/L).

TEST RESULTS

Observations of water quality in the overlying water throughout the test are summarized in Table 1. A detailed tabulation of the water quality results by sample and test day can be found in Appendix II. Interstitial ammonia and pH measurements of bulk sediments are listed in Table 2. The means and standard deviations of percent mortality and average dry weight of *Hyalella* exposed for 28 days to sediments are summarized in Table 3. Detailed data organized by sample and replicate, and summary statistics for these observations, are given in Appendix II.

All water quality observations of overlying water temperature and dissolved oxygen were within the protocol specified ranges. Ammonia-N in the overlying water ranged between <0.1 and 0.3 mg/L for all day 0 and day 28 measurements. Interstitial bulk sediment values for ammonia-N ranged from <0.5 to 2.5 mg/L.

The test met the survival acceptability criteria specified in the test protocol with 5.0 % mean control mortality (≤20% required). The reference toxicant (positive control) EC50 result was within the laboratory's control chart limits (0.36 g/L; control chart mean ± 2 S.D. = 0.39 ± 0.08). It is concluded, therefore, that the test has developed fully acceptable data for use in making management decisions.

STUDY APPROVAL

Project Manager/Study Director — Date: 5-11-10

Quality Assurance Unit — Date: 5-11-10

Assistant Laboratory Director — Date: 5/7/10

Table 1. Summary of water quality conditions during tests of the amphipod, *Hyalella azteca*, exposed to freshwater sediments.

Water Quality Parameter	Mean ± S.D.	Minimum	Maximum	N
Temperature (°C)	22.7 ± 0.2	22.1	23.2	87
Dissolved oxygen (mg/L)	6.7 ± 0.4	6.1	7.5	39
Conductivity (µmhos/cm)	157 ± 17	133	215	18
pH	6.5 ± 0.1	6.3	6.8	39
Hardness (mg/L as $CaCO_3$)	43 ± 8	34	51	6
Alkalinity (mg/L as $CaCO_3$)	30 ± 0	30	30	6
Total ammonia (mg/L)	---	<0.1	0.3	6

Table 2. Interstitial ammonia-N and pH in test sediments porewater on day 0 and at test termination.

NAS Sample No.	Sample Description	Day 0		Day 10	
		pH	Ammonia (mg/L)	pH	Ammonia (mg/L)
3136G	Control	6.4	2.0	6.5	2.5
3160G	DPSC-G093	6.7	0.8	6.1	1.2
3161G	DPSC-G094	6.6	<0.5	6.3	1.1

Table 3. Mortality and growth results of *Hyalella azteca* 28-day sediment toxicity test.

NAS Sample No.	Sample Description	Percent mortality (Mean ± SD)	Average dry wt/amphipod (mg) (Mean ± SD)
3136G	Control	5.0 ± 5.3	0.53 ± 0.09
3160G	DPSC-G093	15.0 ± 20.0	0.39 ± 0.07
3161G	DPSC-G094	5.0 ± 7.6	0.43 ± 0.05

APPENDIX I

PROTOCOL

TEST PROTOCOL

FRESHWATER AMPHIPOD, *HYALELLA AZTECA*, 28-DAY SEDIMENT SURVIVAL AND GROWTH TEST

1. INTRODUCTION

1.1 Purpose of Study: The purpose of this study is to characterize the chronic toxicity of freshwater sediments using a 28-day exposure and survival and growth endpoints with the amphipod, *Hyalella azteca*.

1.2 Referenced Method: This protocol is based on ASTM Method E 1706-00 (ASTM 2001) and EPA Method 100.1 (EPA/600/R-99/064)

1.3 Summary of Method: A summary of test conditions for the amphipod 28-day sediment survival and growth test is tabulated below. The test with *Hyalella azteca* is conducted at 23 ± 1°C with a 16L:8D photoperiod at an illuminance of about 100-1000 lux. Test chambers are 300-mL high-form lipless beakers containing 100 mL of sediment and 175 mL of overlying water. Ten 7-8day old amphipods are used in each replicate. The number of replicates/treatment depends on the objective of the test. Eight replicates are recommended for routine testing. Amphipods in each test chamber are fed 1.0 mL of YCT food daily. Each chamber receives two volume additions per day of overlying water. Test endpoints include survival and growth.

2. STUDY MANAGEMENT

2.1 Sponsor's Name and Address:

_____
_____
_____
_____

2.2 Sponsor's Study Monitor:

_____

2.3 Name of Testing Laboratory:
Northwestern Aquatic Sciences
3814 Yaquina Bay Road, P.O. Box 1437
Newport, OR 97365.

2.4 Test Location:

_____

2.5 Laboratory's Personnel to be Assigned to the Study:
Study Director: _____
Quality Assurance Unit: _____
Aquatic Toxicologist: _____
Aquatic Toxicologist: _____

2.6 Proposed Testing Schedule: Tests are normally begun within 14 days of sample collection. Reference toxicant test to be run concurrently.

2.7 Good Laboratory Practices: The test is conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

3. TEST MATERIAL

The test materials are freshwater sediments. The control, reference, and test sediments are placed in solvent cleaned 1 L glass jars fitted with PTFE-lined screw caps. At the laboratory the samples are stored at 4°C in the dark. The original sealed containers may be stored for up to 8 weeks prior to testing, depending on the testing requirements. If jars are not not full when received or if sediment is removed for testing, headspaces should be filled with nitrogen to retard deterioration. A negative control sediment is collected from a clean site. In addition, a reference sediment, a clean sediment with physical characteristics similar to the test sediments, may be employed as a comparison station.

4. TEST WATER

Test water (overlying water) at NAS is normally dechlorinated tap water or moderately hard synthetic water. Synthetic dilution water is prepared from Milli-Q reagent grade water and reagent grade chemicals. Test water may also be well water, surface water, site water, or other water depending on the study design. The hardness or other water quality parameters of the dilution water may need to be adjusted to meet the study design.

5. TEST ORGANISMS

5.1 Species: amphipod, *Hyalella azteca.*

5.2 Source: Cultured at NAS. Alternatively, animals may be purchased from a reputable commercial supplier.

5.3 Age: 7-8 days old at start of test

5.4 Acclimation and Pretest Observation: Cultures are maintained at 23 ± 1°C under a 16:8 L:D photoperiod. Cultured amphipods are fed dried maple leaves with YTC. Rabbit chow, Tetramin® or TetraFin® flakes may also be used. Acclimation of test organisms to the test water may be desirable, depending on culture water, but it is not required. If test organisms are to be acclimated, fifty percent of the holding water is changed daily with the addition of test water.

6. DESCRIPTION OF TEST SYSTEM

6.1 Test Chambers and Environmental Control: Test chambers used in the toxicity test are 300-mL high-form lipless glass beakers. Test chambers are maintained at constant temperature by partial immersion in a temperature-controlled water bath or by placement in a temperature-controlled room. Aeration is not empolyed unless dissolved oxygen drops below 2.5 mg/L. The test is conducted under an illuminance of 100-1000 lux with a 16L:8D photoperiod.

6.2 Cleaning: All laboratory glassware, including test chambers, is cleaned as described in EPA/600/4-90/027F. New glassware and test systems are soaked 15 minutes in tap water and scrubbed with detergent (or cleaned in automatic dishwasher); rinsed twice with tap water; carefully rinsed once with fresh, dilute (10%, V:V) hydrochloric or nitric acid to remove scale, metals, and bases; rinsed twice with deionized water; rinsed once with acetone to remove organic compounds (using a fume hood or canopy); and rinsed three times with deionized water. Test systems and chambers are rinsed again with dilution water just before use.

7. EXPERIMENTAL DESIGN AND TEST PROCEDURES

7.1 Experimental Design: The test involves exposure of amphipods to test, control, and reference sediments. The sediments are placed on the bottom of the test containers and are overlain with test water. The test exposure is for 28 days. The renewal of overlying water consists of two volume additions per day, either continuous or intermittent. Each treatment consists of eight replicate test containers, each containing 10 organisms. Test chamber positions are completely randomized. Test organisms are randomly distributed to the test chambers. Blind testing is normally used.

7.2 Setup of Test Containers: Sediments are homogenized and placed in test chambers on the day before addition of test organisms. Sediment (100 ml) is placed into each of eight replicate beakers. After addition of the sediment, 175 ml of test water is gently added to each beaker in a manner to prevent resuspension. The overlying water is replaced twice daily. The test begins when amphipods are introduced to the test chambers. Initial water quality measurements are taken prior to the addition of test organisms.

7.3 Effect Criterion: The effect criteria used in the 28-day amphipod bioassay are mortality and growth. Death is defined as the lack of movement of body or appendages on response to tactile stimulation. Growth is measured as change in dry weight.

7.4 Test Conditions: No aeration is employed unless dissoved oxygen falls below 2.5 mg/L. The test temperature employed is 23 ± 1°C. A 16:8, L:D photoperiod is used. Illumination is supplied by daylight fluorescent lamps at 100-1000lux. The overlying water is replaced twice daily.

7.5 Beginning the Test: On the day the test begins, amphipods are impartially counted into small containers of test water (10/container). The test is begun by rinsing test organisms into the equilibrated test containers. For the growth endpoint, time-zero weight data should be collected.

7.6 Feeding: Amphipods are fed 1.0 mL of YCT daily per test chamber. A feeding may be skipped if there is a build up of excess food. However, all beakers must be treated similarly.

7.7 Test Duration, Type and Frequency of Observations, and Methods: The duration of the toxicity test is 28 days. The type and frequency of observations to be made are summarized as follows:

TYPE OF OBSERVATION	TIMES OF OBSERVATION
BIOLOGICAL DATA	
Survival, growth	Day 28
PHYSICAL AND CHEMICAL DATA	
Hardness, alkalinity, conductivity, and ammonia-N	Beginning and end of test in overlying water of one replicate beaker from each treatment.
Temperature	Daily in overlying water of one replicate beaker from each treatment.
Conductivity	Weekly
Dissolved oxygen and pH	3X/week
Optional pore water ammonia and/or sulfide	In test sediments prior to initiating the tests. Optionally in sediments from sacrificial test chambers at test beginning and/or end.

Dissolved oxygen is measured using a polarographic oxygen probe calibrated according to the manufacturer's recommendations. The pH is measured using a pH probe and a properly calibrated meter with scale divisions of 0.1 pH units. Temperature is measured with a calibrated mercury thermometer or telethermometer. Conductivity is measured with a conductivity meter. Hardness and alkalinity are measured using titrometric methods. Total soluble sulfide and total ammonia-N were

measured using Hach test kits based on the methylene blue (EPA Method 376.2) and salicylate (Clin. Chim. Acta 14:403, 1996) colorimetric methods, respectively; samples were not distilled prior to analysis.

Overlying water should be sampled just before water renewal from about 1 to 2 cm above the sediment surface using a pipet. It may be necessay to pool water samples from individual replicates. The pipet should be checked to make sure no organisms are removed during sampling of overlying water.

7.8 Test Termination: At test termination, the contents of each test container are sieved through a #35 (500 µm mesh) sieve to recover the amphipods. Amphipods from each replicate are put into a 30 mL plastic cup, rinsed with DI water, gently blotted and place into the appropriate tared aluminum weighing pan. The number of survivors for each container is recorded on the datasheet.

7.9 Growth Measurement: Growth is measured as average dry weight of animals in a test replicate at the end of the test on day 28. Pooled animals from each test replicate are gently blotted and placed into tared aluminum weigh pans. The pans are dried at 60-90°C to constant weight. The dried amphipods are placed into a dessicator and weighed as soon as possible to the nearest 0.01 mg (desirable to use 0.001 mg). The total weight of the dried amphipods in each pan is divided by the number of amphipods weighed to obtain an average dry weight per surviving amphipod per replicate.

8. CRITERIA OF TEST ACCEPTANCE

The test results are acceptable if the minimum survival of organisms in the control treatment at the end of the test is at least 80%.

9. DATA ANALYSIS

The endpoints of the toxicity test are survival and growth. Survival is obtained as a direct count of living organisms in each test container at the end of the test. Average amphipod dry weight, also measured at the end of the test, may be used to compare growth between treatment sediments and the control or reference sediment. Ordinarily the following data analysis is performed. Due to special requirements, alternative methods may be used. The means and standard deviations are calculated for each treatment level. Identification of toxic sediments is established by statistical comparison of test endpoints between test and control or reference sediments. Between treatment comparisons may be made using a Student's t-test or Wilcoxon's Two-Sample test, where each treatment is compared to the control or the reference sediment. An arcsine-square root transformation of proportional data, and tests for normality and heterogeneity of variances, are performed prior to statistical comparisons.

10. REPORTING

The final report of the test results must include all of the following standard information at a minimum: name and identification of the test; the investigator and laboratory; date and time of test beginning and end; information on the test material; information on the source and quality of the overlying/test water; detailed information about the test organisms including acclimation conditions; a description of the experimental design and test chambers and other test conditions including feeding, if any, and water quality; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses and a summary table of endpoints; a description of the statistical methods used; any unusual information about the test or deviations from procedures; reference toxicant testing information.

11. STUDY DESIGN ALTERATION

Amendments made to the protocol must be approved by the sponsor and study director and should include a description of the change, the reason for the change, the date the change took effect and the dated signatures of the study director and sponsor. Any deviations in the protocol must be described and recorded in the study raw data.

12. REFERENCE TOXICANT

The reference toxicant test is a standard multi-concentration toxicity test using a specified chemical toxicant to evaluate the performance of test organisms used in the study. Reference toxicant tests are 96-hour, water only exposures, not 28-day sediment exposures. The reference toxicant test is run concurrently. Performance is evaluated by comparing the results of the reference toxicant test with historical results (e.g., control charts) obtained at the laboratory.

13. REFERENCED GUIDELINES

ASTM. 2001. Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates. ASTM Standard Method No. E 1706-00. Am. Soc. Test. Mat., Philadelphia, PA.

U.S. EPA. 2000. Section 11, Test Method 100.1, *Hyalella azteca* 10-d Survival and Growth Test for Sediments, pp. 47-54 In: Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (Second Edition). EPA/600/R-99/064.

Weber, C.I. (Ed.) 1993. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (Fourth Edition). EPA/600/4-90/027F.

14. APPROVALS

_____ for _____
Name Date

_____ for **Northwestern Aquatic Sciences**
Name Date

Appendix A
Test Conditions Summary

1. Test type	whole sediment toxicity test with renewal of overlying water
2. Test duration	28 days
3. Temperature	23 ± 1°C
4. Light quality	daylight fluorescent light
5. Illuminance	100-1000 lux
6. Photoperiod	16L:8D
7. Test chamber size	300-mL high-form lipless beakers, (Pyrex® 1040 or equivalent)
8. Sediment volume	100 mL
9. Overlying water volume	175 mL
10. Renewal overlying water	2 volume additions/day (continuous or intermittent)
11. Age of test organisms	7-8 days old at test initiation
12. Organisms per test chamber	10
13. Replicates per treatment	8 recommended for routine testing (depends on design)
14. Organisms per treatment	80
15. Feeding regime	YCT food, fed 1.0 mL daily/chamber
16. Cleaning	if screens are used, clean as needed
17. Aeration	None, unless DO falls below 2.5 mg/L
18. Overlying (test) water	Dechlorinated tap water, culture water, well water, surface water, site water or reconstituted water, depending on study design.
19. Water quality	Hardness, alkalinity, conductivity, ammonia-N beginning and end; temperature daily; conductivity weekly; DO & pH 3X/wk
20. Endpoints	Survival & growth (based on weight)
21. Test acceptability criteria	Minimum control survival of 80%
22. Sample holding	14 days at 4°C in the dark (recommended)
23. Sample volume required	1L (800 mL per sediment)
24. Reference toxicant	Concurrent testing required

APPENDIX II

RAW DATA

TEST DESCRIPTION, MONITORING, AND RESULTS BENCHSHEETS

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-XXX-HA4c

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

REVIEWED PAGES 1-35 -GJI

Test No. 806-3 Client Hart Crowser Investigator

STUDY MANAGEMENT

Client: Hart Crowser, Inc., 8910 SW Gemini Drive, Beaverton, OR 97008

Client's Study Monitor: Mr. Rick Ernst

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri GJI

QA Officer L.K. Nemeth

1. GABrissarri GJI 2. Susan Gale
3. Ives Apolcalahua 4. D.S. Caldwell
5. Lidia P. Sandoval 6.
7. 8.

Study Schedule:

Test Beginning: 4-2-10 0950 Test Ending: 4-30-10 1000

TEST MATERIAL

General description (see sample logbook/chain-of-custody for details):

NAS Sample No.:	3136G	3160G	3161G		
Description:	Control	DPSC-G093	DPSC-G094		
Collection Date:	3/10/10	3/25/10	3/25/10		
Receipt Date:	3/10/10	3/27/10	3/27/10		
:					
NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					
NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					
NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					
NAS Sample No.:					
Description:					
Collection Date:					
Receipt Date:					
:					

Error codes: 1) correction of handwriting error
2) written in wrong location; entry deleted
3) wrong date deleted, replaced with correct date
4) error found in measurement; measurement repeated

Test No. 806-3 Client Hart Crowser Investigator

SEDIMENT DESCRIPTIONS -- SUPPLEMENTAL NOTES

Sample No.	Description
3136G	FINE BLACK MUD
3160G	BROWN SAND w/ LARGE ROCKS AND CLAMS
3161G	BROWN FINE SAND w/ ROCKS AND PLANT MATERIAL

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No. 806-3 Client Hart Crowser Investigator

TEST WATER

Source: Dechlorinated Newport, OR tap water

Date of Collection/Preparation: 3-30-10, 4-9-10

pH 7.0, 7.1

Cond (umhos/cm2) 137, 150

Hardness (mg/La0 43, 43

Alkalinity (mg/L) 30, 30

Total Chlorine (mg/l) <0.02, <0.02

Treatments: Aerated ≥ 24 hrs

TEST ORGANISMS

Species: *Hyalella azteca* Age: 7-8 DAYS Date received: 3-31-10

Source: Chesapeake Cultures, Hayes, VA

Acclimation Data:

Date	Temp. (deg.C)	pH	DO (mg/L)	Cond umhos/cm	Feeding amount	Feeding description	Water changes	Hardness	Alkalinity (mg/L)
3-31-10	15.1	7.0	>15.0	403	10 mL	YTC	YES	196	190
4-1-10	21.2	8.1	8.4	332	10 mL	YTC	YES	154	160
4-2-10	21.5	7.6	8.7	257	—	—	—	86	80
Mean	19.3	7.6	10.7	347				145	143
S.D.	3.6	0.6	3.7	79				56	57
(N)	3	3	3	3				3	3

Photoperiod during acclimation: 16:8, L:D

TEST PROCEDURES AND CONDITIONS

Test chambers: 300 ml glass beakers

Test volumes: 100 ml of test sediment; 275 ml total volume

Replicates/treatment: (8) 8 + 2 WQ BEAKERS Organisms/treatment: (80) 80 (10/REP)

Test water changes: Twice daily

Aeration: only if DO falls below 2.5 mg/L Beaker placement: Total randomization

Feeding: everyday beginning with day zero Photoperiod: 16:8, L:D

Test temperature (deg.C): 23

Control Sediment:

Source: From an area approximately one mile east of the Hwy. 101 bridge at Beaver Creek, approx. 8 miles south of Newport, OR.

Date collected: 3/10/10

Sieved through 0.5 -mm screen

Storage: 4°C in the dark in closed containers. NAS# 3136G

MISCELLANEOUS NOTES

Light Intensity:

Date	Location	Light Intensity (ft-candles*)	Initials
4-5-10	BEAKER #14	87	GJL

*To convert ft-candles to lux multipy by 10.76

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No. 806-3 Client Hart Crowser Investigator _____

Test conducted in (circle one): room 1 room 2 trailer water bath other: Room #3

Randomization chart: TOP SHELF

5	10	15	20	25	30				
4	9	14	19	24	29				
3	8	13	18	23	28				
2	7	12	17	22	27				
1	6	11	16	21	26				

Randomization chart:

Randomization chart:

Randomization chart:

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 0 (4 / 2 /10) / YM / GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
18	22.2	7.3	133	6.7	51	30		Each beaker fed 1.0 ml
21	22.1	7.5	139	6.7	51	30		YTC suspension
23	22.2	7.4	215	6.8	34	30		Initials: GJL
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1645
								Initials: YM

*Water quality measurements to be taken.

Day 1 (4 / 3 /10) GJL

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8							Each beaker fed 1.0 ml
21	22.9							YTC suspension
23	23.0							Initials: GJL
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1645
								Initials: YM

*Water quality measurements to be taken.

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 2 (4 / 4 /10) GJL

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.9							Each beaker fed 1.0 ml
21	~~22.5~~ 23.0 GJL 4-4-10							YTC suspension
23	23.0							Initials: GJL
								Water changed in all
								beakers.
								Time: 0615
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1645
								Initials: AJ

*Water quality measurements to be taken.

Day 3 (4 / 5 /10) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.5	6.9		6.5				Each beaker fed 1.0 ml
21	22.6	6.8		6.5				YTC suspension
23	22.7	6.7		6.5				Initials: GJL
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1640
								Initials: YP

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 4 (4/6/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.3							Each beaker fed 1.0 ml
21	22.6							YTC suspension
23	22.6							Initials: GJ
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1650
								Initials: LPS

*Water quality measurements to be taken.

Day 5 (4/7/10) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.4	7.0	146	6.4				Each beaker fed 1.0 ml
21	22.5	6.9	161	6.4				YTC suspension
23	22.7	6.8	159	6.4				Initials: GJ
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1650
								Initials: LPS

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 6 (4/8/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.4							Each beaker fed 1.0 ml
21	22.4							YTC suspension
23	22.5							Initials: GJ
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1645
								Initials: YN

*Water quality measurements to be taken.

Day 7 (4/9/10) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.5	6.9		6.4				Each beaker fed 1.0 ml
21	22.6	6.7		6.4				YTC suspension
23	22.7	6.7		6.4				Initials: GB
								Water changed in all
								beakers.
								Time: 0610
								Initials: GB
								Water changed in all
								beakers.
								Time: 1645
								Initials: GB

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 8 (4/10/19 GB

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.2							Each beaker fed 1.0 ml
21	22.3							YTC suspension
23	22.4							Initials: GB
								Water changed in all
								beakers.
								Time: 0610
								Initials: GB
								Water changed in all
								beakers.
								Time: 1715
								Initials: [illegible]

*Water quality measurements to be taken.

Day 9 (4/11/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8							Each beaker fed 1.0 ml
21	22.9							YTC suspension
23	23.0							Initials: GJ
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1720
								Initials: [illegible]

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 10 (4/12/10) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8	6.5		6.5				Each beaker fed 1.0 ml
21	22.8	6.4		6.4				YTC suspension
23	22.9	6.3		6.5				Initials: GJ
								Water changed in all
								beakers.
								Time: 0610
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1640
								Initials: YN

*Water quality measurements to be taken.

Day 11 (4/13/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.6							Each beaker fed 1.0 ml
21	22.7							YTC suspension
23	22.7							Initials: GJ
								Water changed in all
								beakers.
								Time: 0605
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1640
								Initials: YN

*Water quality measurements to be taken.

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 12 (4/14/10) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8	6.2	151	6.5				Each beaker fed 1.0 ml
21	22.5	6.2	155	6.5				YTC suspension
23	22.6	6.1	164	6.5				Initials: GB
								Water changed in all
								beakers.
								Time: 0605
								Initials: GB
								Water changed in all
								beakers.
								Time: 1645
								Initials: GB

*Water quality measurements to be taken.

Day 13 (4/15/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.6							Each beaker fed 1.0 ml
21	22.4							YTC suspension
23	22.5							Initials: GJ
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1640
								Initials: YN

*Water quality measurements to be taken.

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 14 (4/16/10) GJI

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.7	6.4		6.4				Each beaker fed 1.0 ml
21	22.4	6.4		6.3				YTC suspension
23	22.5	6.5		6.4				Initials: GB
								Water changed in all
								beakers.
								Time: 0600
								Initials: GB
								Water changed in all
								beakers.
								Time: 1715
								Initials: YN

*Water quality measurements to be taken.

Day 15 (4/17/10) GJI

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8							Each beaker fed 1.0 ml
21	22.6							YTC suspension
23	22.8							Initials: GJI
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJI
								Water changed in all
								beakers.
								Time: 1730
								Initials:

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 16 (4 /18 /10) GSL

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8							Each beaker fed 1.0 ml
21	22.7							YTC suspension
23	22.7							Initials: GSL
								Water changed in all
								beakers.
								Time: 0600
								Initials: GSL
								Water changed in all
								beakers.
								Time: 1720
								Initials: [illegible]

*Water quality measurements to be taken.

Day 17 (4 /19 /10) GSL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.9	6.5		6.8				Each beaker fed 1.0 ml
21	22.6	6.7		6.7				YTC suspension
23	22.7	6.5		6.7				Initials: GB
								Water changed in all
								beakers.
								Time: 0605
								Initials: GB
								Water changed in all
								beakers.
								Time: 1640
								Initials: [illegible]

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 18 (4/20/10) GJL

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.7							Each beaker fed 1.0 ml
21	22.6							YTC suspension
23	22.6							Initials: GJL
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJL
								Water changed in all
								beakers.
								Time: 1730
								Initials: LPS

*Water quality measurements to be taken.

Day 19 (4/21/10) GJL

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.9	6.4	151	6.7				Each beaker fed 1.0 ml
21	22.4	6.6	158	6.7				YTC suspension
23	22.6	6.4	162	6.6				Initials: GJB
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJB
								Water changed in all
								beakers.
								Time: 1640
								Initials: LPS

*Water quality measurements to be taken.

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 20 (4/22/10) GJ

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.8							Each beaker fed 1.0 ml
21	22.8							YTC suspension
23	22.7							Initials: GJ
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJ
								Water changed in all
								beakers.
								Time: 1630
								Initials: [illegible]

*Water quality measurements to be taken.

Day 21 (4/23/10) GJ

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.6	6.9		6.6				Each beaker fed 1.0 ml
21	22.3	7.0		6.6				YTC suspension
23	22.5	7.0		6.6				Initials: GJ
								Water changed in all
								beakers.
								Time: 0600
								Initials: GJ
								Water changed in all
								beakers.
								Time:
								Initials:

AFTERNOON CHANGE INADVERTANTLY NOT DONE - GJ

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 22 (4/24/10) GD

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	23.0							Each beaker fed 1.0 ml
21	22.9							YTC suspension
23	23.1							Initials: GD
								Water changed in all
								beakers.
								Time: 0600
								Initials: GD
								Water changed in all
								beakers.
								Time: 1740
								Initials: GD

*Water quality measurements to be taken.

Day 23 (4/25/10) GD

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.3							Each beaker fed 1.0 ml
21	22.4							YTC suspension
23	22.5							Initials: GD
								Water changed in all
								beakers.
								Time: 0605
								Initials: GD
								Water changed in all
								beakers.
								Time: 1730
								Initials: GD

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 24 (4/26/10) OB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond. (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.4	6.4		6.5				Each beaker fed 1.0 ml
21	22.4	6.3		6.4				YTC suspension
23	22.5	6.3		6.4				Initials: OB
								Water changed in all
								beakers.
								Time: 0600
								Initials: OB
								Water changed in all
								beakers.
								Time: 1645
								Initials: UB

*Water quality measurements to be taken.

Day 25 (4/27/10) OB

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.9							Each beaker fed 1.0 ml
21	22.8							YTC suspension
23	22.9							Initials: OB
								Water changed in all
								beakers.
								Time: 0600
								Initials: OB
								Water changed in all
								beakers.
								Time: 1640
								Initials: UB

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 26 (4/28/10) GB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	23.1	6.8	153	6.5				Each beaker fed 1.0 ml
21	23.0	6.9	151	6.4				YTC suspension
23	23.1	6.7	155	6.4				Initials: GB
								Water changed in all
								beakers.
								Time: 0600
								Initials: GB
								Water changed in all
								beakers.
								Time: 1640
								Initials: YM

*Water quality measurements to be taken.

Day 27 (4/29/10) GB

Beaker No.	Temp.* (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
18	22.7							Each beaker fed 1.0 ml
21	22.7							YTC suspension
23	22.8							Initials: GB
								Water changed in all
								beakers.
								Time: 0600
								Initials: GB
								Water changed in all
								beakers.
								Time: 1645
								Initials: YM

*Water quality measurements to be taken.

Test No 806-3 Client Hart Crowser Investigator

DAILY RECORD SHEET

Day 28 (4/30/10) OB

Beaker No.	Temp.* (deg.C)	DO* (ppm)	Cond.* (umhos/cm)	pH*	Hardness* (mg/L)	Alkalinity* (mg/L)	NH3* (ppm)	Comments
18	23.2	7.4	156	6.6	43	30		Each beaker fed 1.0 ml
21	22.7	7.3	158	6.6	34	30		YTC suspension
23	22.9	7.5	165	6.6	43	30		Initials: —
								Water changed in all
								beakers.
								Time: 0600
								Initials: OB
								Water changed in all
								beakers.
								Time: —
								Initials: —

*Water quality measurements to be taken.

Day _____(/ /)

Beaker No.	Temp. (deg.C)	DO (ppm)	Cond. (umhos/cm)	pH	Hardness (mg/L)	Alkalinity (mg/L)	NH3 (ppm)	Comments
								Each beaker fed 1.0 ml
								YTC suspension
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:
								Water changed in all
								beakers.
								Time:
								Initials:

*Water quality measurements to be taken.

HYALELLA AZTECA 28-DAY SOLID PHASE SEDIMENT TEST

Test No. 806-3 Client Hart Crowser Investigator

DAY 28 TEST TERMINATION SHEET

Beaker No.	Number of survivors	Initials
1	9	GBB
2	10	GBB
3	9	GBB
4	9	GBB
5	10	GBB
6	10	GBB
7	9	GBB
8	10	GBB
9	—	—
10	10	GBB
11	10	GBB
12	8	GBB
13	10	GBB
14	8	GBB
15	10	GBB
16	4	GBB
17	—	—
18	—	—
19	10	GBB
20	9	GBB
21	—	—
22	9	GBB
23	—	—
24	8	GBB
25	10	GBB
26	10	GBB
27	9	GBB
28	9	GBB
29	—	—
30	10	GBB
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Beaker No.	Number of survivors	Initials
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		

Test No. 806-3 Client Hart Crowser Investigator

ZERO-TIME WEIGHING DATA SHEET

Tare: Date 4-1-10 Oven temp (C.) 62 Drying time (hr.) 24 Initials GJL
Standard Weights: 10 mg: 10.010 100mg: 100.016

Final: Date 4-5-10 Oven temp (C.) 63 Drying time (hr.) 24 Initials GJL
Standard Weights: 10 mg: 10.010 100mg: 100.015

Equip. used: Oven: BLUE M #1 Balance: SARTORIUS M3P

(Dry overnight at 60-90 degrees C)

Pan #	Tare wt. (mg)	Total wt. (mg)	#weighed	Comments
1	38.510	39.108	10	
2	37.719	38.262	10	
3	37.692	38.259	10	
4	36.863	37.398	10	
5	37.759	38.261	10	

Test No. 806-3 Client Hart Crowser Investigator

WEIGHING DATA SHEET

Tare: Date 4-7-10 Oven temp (C.) 62 Drying time (hr.) 24 Initials GJL
Standard Weights: 10 mg: 10.012 100mg: 100.016

Final #1: Date 5-3-10 Oven temp (C.) 63 Drying time (hr.) 24 Initials GJL
Standard Weights: 10 mg: 10.010 100mg: 100.014

Final #2: Date 5-4-10 Oven temp (C.) 62 Drying time (hr.) 24 Initials GJL
Standard Weights: 10 mg: 10.009 100mg: 100.012

Equip. used: Oven BLUE M #1 Balance SARTORIUS M3P
(Dry overnight at 60-90 degrees C)

Bkr. #	Pan #	Tare wt. (mg)	Total wt. (mg) 1	Total wt. (mg) 2	no. weighed	put into pans-initials	Comments
1	1	36.934	40.078	40.022	9	LPS	
2	2	36.347	40.377	40.307	10	LPS	
3	3	38.509	43.119	43.037	9	LPS	
4	4	37.226	41.873	41.786	9	LPS	
5	5	38.852	43.754	43.665	10	LPS	
6	6	35.479	40.039	39.965	10	LPS	
7	7	38.124	41.291	41.245	9	LPS	
8	8	36.900	40.824	40.763	10	LPS	
9	9	—	—	—	—	—	
10	10	39.760	43.945	43.878	10	LPS	
11	11	36.501	40.624	40.559	10	LPS	
12	12	36.779	40.532	40.470	8	LPS	
13	13	37.057	41.030	40.966	10	LPS	
14	14	39.797	42.692	42.638	8	LPS	
15	15	31.827	37.409	37.319	10	LPS	
16	16	38.547	40.797	40.763	4	LPS	
17	17	—	—	—	—	—	
18	18	—	—	—	—	—	
19	19	36.219	40.206	40.157	10	LPS	
20	20	36.163	41.550	41.482	9	LPS	
21	21	—	—	—	—	—	
22	22	38.708	44.974	44.902	9	LPS	
23	23	—	—	—	—	—	
24	24	38.733	41.572	41.545	8	LPS	
25	25	29.757	33.612	33.519	10	LPS	
26	26	30.481	35.201	35.095	10	LPS	
27	27	38.682	43.957	43.844	9	LPS	
28	28	39.800	43.040	42.975	9	LPS	
29	29	—	—	—	—	—	
30	30	35.549	40.078	39.987	10	LPS	
31	31						
32	32						
33	33						

Chesapeake Cultures

P.O. Box 507 Hayes, VA 23072 (804)693-4046 (804)694-4704 fax
www.c-cultures.com
growfish@c-cultures.com

NAS

Shipment Information

Species Hyalella azteca Date 3/30/10

Age 4-5 days on shipment ~1.5mm P.O. No.

Quantity 490+ Invoice No. 6793

Temperature 24°C Salinity — pH 7.96

Notes RECEIVED 3-31-10 ~~631~~

Biologist S

Please inspect shipment and report any problem immediately

TEST DATA ANALYSIS RECORDS

Endpoints Data Entry and Calculations File

BKR=beaker number
INIT=initial number
SURV=number survivors
MORT=number dead=INIT-SURV
PSURV=%survival=100(SURV/INIT)
PMORT=%mortality=100(MORT/INIT)

TARE WT= ashed weight of pan used for that replicate at test termination (mg), or dry weight of pan if ash-free dry weight is not an endpoint
WT COUNT= number of test organisms weighed at test end
DRY WT= TARE WT + dry weight of test organisms recovered at test termination (mg)
TWT=total biomass=DRY WT-TARE WT
WT=average individual biomass=TWT/WT COUNT

INITIAL WEIGHT				
pan #	tare wt (mg)	final wt (mg)	wt count	avg. wt/ organism
1	38.510	39.108	10	0.060
2	37.719	38.262	10	0.054
3	37.692	38.259	10	0.057
4	36.863	37.398	10	0.054
5	37.759	38.261	10	0.050
			avg.	0.055

INDEX	BKR	NAS SMPL	CLIENT DESCRIP	REPL		INIT	SURV	MORT	PSURV	PMORT	TARE WT (mg)	WT COUNT	DRY WT (mg)	TWT (mg)	WT (mg)		SURV	MORT	PSURV	PMORT	WT
1	4	3136G	Control	1		10	9	1	90.0	10.0	37.226	9	41.786	4.560	0.507						
2	30	3136G	Control	2		10	10	0	100.0	0.0	35.549	10	39.987	4.438	0.444						
3	22	3136G	Control	3		10	9	1	90.0	10.0	38.708	9	44.902	6.194	0.688						
4	19	3136G	Control	4		10	10	0	100.0	0.0	36.219	10	40.157	3.938	0.394						
5	27	3136G	Control	5		10	9	1	90.0	10.0	38.682	9	43.844	5.162	0.574	Mean	9.5	0.5	95.0	5.0	0.53
6	15	3136G	Control	6		10	10	0	100.0	0.0	31.827	10	37.319	5.492	0.549	SD	0.5	0.5	5.3	5.3	0.09
7	5	3136G	Control	7		10	10	0	100.0	0.0	38.852	10	43.665	4.813	0.481	n	8	8	8	8	8
8	20	3136G	Control	8		10	9	1	90.0	10.0	36.163	9	41.482	5.319	0.591						
9	23	3136G	Control	9	wq replicate																
10	9	3136G	Control	10	day 0 replicate																
11	7	3160G	DPSC-G093	1		10	9	1	90.0	10.0	38.124	9	41.245	3.121	0.347						
12	13	3160G	DPSC-G093	2		10	10	0	100.0	0.0	37.057	10	40.966	3.909	0.391						
13	14	3160G	DPSC-G093	3		10	8	2	80.0	20.0	39.797	8	42.638	2.841	0.355						
14	2	3160G	DPSC-G093	4		10	10	0	100.0	0.0	36.347	10	40.307	3.960	0.396						
15	28	3160G	DPSC-G093	5		10	9	1	90.0	10.0	39.800	9	42.975	3.175	0.353	Mean	8.5	1.5	85.0	15.0	0.39
16	25	3160G	DPSC-G093	6		10	10	0	100.0	0.0	29.757	10	33.519	3.762	0.376	SD	2.0	2.0	20.0	20.0	0.07
17	16	3160G	DPSC-G093	7		10	4	6	40.0	60.0	38.547	4	40.763	2.216	0.554	n	8	8	8	8	8
18	24	3160G	DPSC-G093	8		10	8	2	80.0	20.0	38.733	8	41.545	2.812	0.352						
19	18	3160G	DPSC-G093	9	wq replicate																
20	29	3160G	DPSC-G093	10	day 0 replicate																
21	3	3161G	DPSC-G094	1		10	9	1	90.0	10.0	38.509	9	43.037	4.528	0.503						
22	11	3161G	DPSC-G094	2		10	10	0	100.0	0.0	36.501	10	40.559	4.058	0.406						
23	12	3161G	DPSC-G094	3		10	8	2	80.0	20.0	36.779	8	40.470	3.691	0.461						
24	6	3161G	DPSC-G094	4		10	10	0	100.0	0.0	35.479	10	39.965	4.486	0.449						
25	10	3161G	DPSC-G094	5		10	10	0	100.0	0.0	39.760	10	43.878	4.118	0.412	Mean	9.5	0.5	95.0	5.0	0.43
26	8	3161G	DPSC-G094	6		10	10	0	100.0	0.0	36.900	10	40.763	3.863	0.386	SD	0.8	0.8	7.6	7.6	0.05
27	1	3161G	DPSC-G094	7		10	9	1	90.0	10.0	36.934	9	40.022	3.088	0.343	n	8	8	8	8	8
28	26	3161G	DPSC-G094	8		10	10	0	100.0	0.0	30.481	10	35.095	4.614	0.461						
29	21	3161G	DPSC-G094	9	wq replicate																
30	17	3161G	DPSC-G094	10	day 0 replicate																

PAGE 24 OF 35

data entry verified against laboratory bench sheets 5-6-10 JMF

Water Quality Data

BKR	NAS SMPL	CLIENT DESCRIP	DAY	Interstitial water pH	Interstitial water NH3
9	3136G	Control	0	6.4	2.0
17	3161G	DPSC-G094	0	6.6	<0.5
29	3160G	DPSC-G093	0	6.7	0.8
18	3160G	DPSC-G093	28	6.1	1.2
21	3161G	DPSC-G094	28	6.3	1.1
23	3136G	Control	28	6.5	2.5

BKR	NAS SMPL	CLIENT DESCRIP	REPL	DAY	Overlying water TEMP	DO	COND	pH	NH3	HARD	ALK
18	3160G	DPSC-G093	9	0	22.2	7.3	133	6.7	<0.1	51	30
21	3161G	DPSC-G094	9	0	22.1	7.5	139	6.7	0.2	51	30
23	3136G	Control	9	0	22.2	7.4	215	6.8	0.3	34	30
18	3160G	DPSC-G093	9	1	22.8						
21	3161G	DPSC-G094	9	1	22.9						
23	3136G	Control	9	1	23.0						
18	3160G	DPSC-G093	9	2	22.9						
21	3161G	DPSC-G094	9	2	23.0						
23	3136G	Control	9	2	23.0						
18	3160G	DPSC-G093	9	3	22.5	6.9		6.5			
21	3161G	DPSC-G094	9	3	22.6	6.8		6.5			
23	3136G	Control	9	3	22.7	6.7		6.5			
18	3160G	DPSC-G093	9	4	22.3						
21	3161G	DPSC-G094	9	4	22.6						
23	3136G	Control	9	4	22.6						
18	3160G	DPSC-G093	9	5	22.4	7.0	146	6.4			
21	3161G	DPSC-G094	9	5	22.5	6.9	161	6.4			
23	3136G	Control	9	5	22.7	6.8	159	6.4			
18	3160G	DPSC-G093	9	6	22.4						
21	3161G	DPSC-G094	9	6	22.4						
23	3136G	Control	9	6	22.5						
18	3160G	DPSC-G093	9	7	22.5	6.9		6.4			
21	3161G	DPSC-G094	9	7	22.6	6.7		6.4			
23	3136G	Control	9	7	22.7	6.7		6.4			
18	3160G	DPSC-G093	9	8	22.2						
21	3161G	DPSC-G094	9	8	22.3						
23	3136G	Control	9	8	22.4						
18	3160G	DPSC-G093	9	9	22.8						
21	3161G	DPSC-G094	9	9	22.9						
23	3136G	Control	9	9	23.0						
18	3160G	DPSC-G093	9	10	22.8	6.5		6.5			
21	3161G	DPSC-G094	9	10	22.8	6.4		6.4			
23	3136G	Control	9	10	22.9	6.3		6.5			
18	3160G	DPSC-G093	9	11	22.6						
21	3161G	DPSC-G094	9	11	22.7						
23	3136G	Control	9	11	22.7						
18	3160G	DPSC-G093	9	12	22.8	6.2	151	6.5			
21	3161G	DPSC-G094	9	12	22.5	6.2	155	6.5			
23	3136G	Control	9	12	22.6	6.1	164	6.5			
18	3160G	DPSC-G093	9	13	22.6						
21	3161G	DPSC-G094	9	13	22.4						
23	3136G	Control	9	13	22.5						
18	3160G	DPSC-G093	9	14	22.7	6.4		6.4			
21	3161G	DPSC-G094	9	14	22.4	6.4		6.3			

23	3136G	Control	9	14	22.5	6.5		6.4					
18	3160G	DPSC-G093	9	15	22.8								
21	3161G	DPSC-G094	9	15	22.6								
23	3136G	Control	9	15	22.8								
18	3160G	DPSC-G093	9	16	22.8								
21	3161G	DPSC-G094	9	16	22.7								
23	3136G	Control	9	16	22.7								
18	3160G	DPSC-G093	9	17	22.9	6.5		6.8					
21	3161G	DPSC-G094	9	17	22.6	6.7		6.7					
23	3136G	Control	9	17	22.7	6.5		6.7					
18	3160G	DPSC-G093	9	18	22.7								
21	3161G	DPSC-G094	9	18	22.6								
23	3136G	Control	9	18	22.6								
18	3160G	DPSC-G093	9	19	22.9	6.4	151	6.7					
21	3161G	DPSC-G094	9	19	22.4	6.6	158	6.7					
23	3136G	Control	9	19	22.6	6.4	162	6.6					
18	3160G	DPSC-G093	9	20	22.8								
21	3161G	DPSC-G094	9	20	22.8								
23	3136G	Control	9	20	22.7								
18	3160G	DPSC-G093	9	21	22.6	6.9		6.6					
21	3161G	DPSC-G094	9	21	22.3	7.0		6.6					
23	3136G	Control	9	21	22.5	7.0		6.6					
18	3160G	DPSC-G093	9	22	23.0								
21	3161G	DPSC-G094	9	22	22.9								
23	3136G	Control	9	22	23.1								
18	3160G	DPSC-G093	9	23	22.3								
21	3161G	DPSC-G094	9	23	22.4								
23	3136G	Control	9	23	22.5								
18	3160G	DPSC-G093	9	24	22.4	6.4		6.5					
21	3161G	DPSC-G094	9	24	22.4	6.3		6.4					
23	3136G	Control	9	24	22.5	6.3		6.4					
18	3160G	DPSC-G093	9	25	22.9								
21	3161G	DPSC-G094	9	25	22.8								
23	3136G	Control	9	25	22.9								
18	3160G	DPSC-G093	9	26	23.1	6.8	153	6.5					
21	3161G	DPSC-G094	9	26	23.0	6.9	151	6.4					
23	3136G	Control	9	26	23.1	6.7	155	6.4					
18	3160G	DPSC-G093	9	27	22.7								
21	3161G	DPSC-G094	9	27	22.7								
23	3136G	Control	9	27	22.8								
18	3160G	DPSC-G093	9	28	23.2	7.4	156	6.6	0.2	43	30		
21	3161G	DPSC-G094	9	28	22.7	7.3	158	6.6	0.2	34	30		
23	3136G	Control	9	28	22.9	7.5	165	6.6	0.1	43	30		
				Mean	22.7	6.7	157	6.5	—	43	30	6.4	—
				SD	0.2	0.4	17	0.1	—	8	0	0.2	—
				n	87	39	18	39	6	6	6	6	6
				Min	22.1	6.1	133	6.3	<0.1	34	30	6.1	<0.5
				Max	23.2	7.5	215	6.8	0.3	51	30	6.7	2.5

Test Number: P806-3

Freshwater Sediment Test
28-day Hyalella azteca

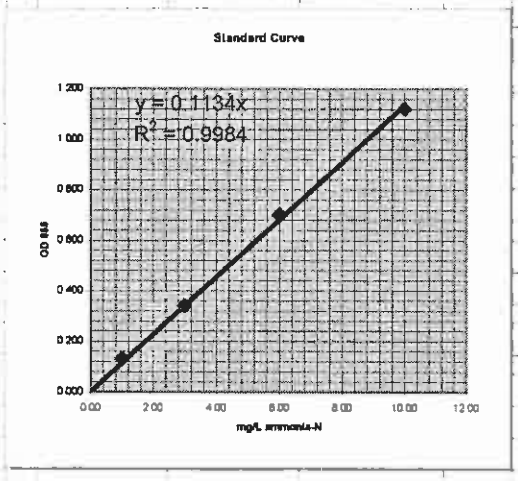
BKR	NAS SMPL	CLIENT DESCRIP	REPL	
4	3136G	Control	1	
30	3136G	Control	2	
22	3136G	Control	3	
19	3136G	Control	4	
27	3136G	Control	5	
15	3136G	Control	6	
5	3136G	Control	7	
20	3136G	Control	8	
23	3136G	Control	9	wq replicate
9	3136G	Control	10	day 0 replicate
7	3160G	DPSC-G093	1	
13	3160G	DPSC-G093	2	
14	3160G	DPSC-G093	3	
2	3160G	DPSC-G093	4	
28	3160G	DPSC-G093	5	
25	3160G	DPSC-G093	6	
16	3160G	DPSC-G093	7	
24	3160G	DPSC-G093	8	
18	3160G	DPSC-G093	9	wq replicate
29	3160G	DPSC-G093	10	day 0 replicate
3	3161G	DPSC-G094	1	
11	3161G	DPSC-G094	2	
12	3161G	DPSC-G094	3	
6	3161G	DPSC-G094	4	
10	3161G	DPSC-G094	5	
8	3161G	DPSC-G094	6	
1	3161G	DPSC-G094	7	
26	3161G	DPSC-G094	8	
21	3161G	DPSC-G094	9	wq replicate
17	3161G	DPSC-G094	10	day 0 replicate

AMMONIA EXPOSURE BENCHSHEETS AND ANALYSIS

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)	pH	Salinity (ppt)
	Blank	—	-----	-----		
	1.0 mg/L NH_3-N Std.	-----	0.132	1.00		
	3.0 mg/L NH_3-N Std.	-----	0.340	3.00		
	6.0 mg/L NH_3-N Std.	-----	0.700	6.00		
	10.0 mg/L NH_3-N Std.	-----	1.120	10.00		
	3.0 mg/L spike	-----	0.341	3.01		
	3.0 mg/L spike dupl.	-----	0.357	3.15		
	5.0 mg/L 2nd source		0.572	5.04		
1.	9	5	0.046	2.03		
2.	17	5	0.010	ND		
3.	29	5	0.017	0.75		
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33						
34						
35						
36						



Reporting limit (mg/L) =	0.5
Recovery (%) =	102.6
Precision (RPD) =	-4.58
2nd source (%) =	100.9
Sample volume (ml):	0.10
Dilution factor	5

Sample Set Description:

Test No.: 806-3
Test Day: 0
Species: *Hyalella*

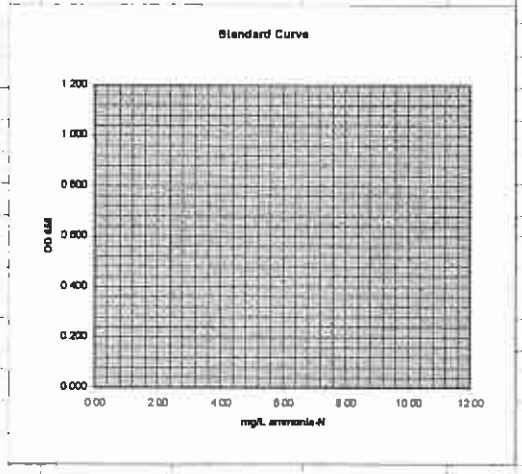
Sediment porewaters

Analyst: RSC
Date analysed: 4/2/2010

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	-----	-----		
	1.0 mg/L NH3-N Std.	-----	.132	1.00		
	3.0 mg/L NH3-N Std.	-----	.340	3.00		
	6.0 mg/L NH3-N Std.	-----	.700	6.00		
	10.0 mg/L NH3-N Std.	-----	1.12	10.00		
	3.0 mg/L spike	-----	.341			
	3.0 mg/L spike dupl.	-----	.357			
	5.0 mg/L 2nd source		.572			
1.	9	5	.046		6.4	
2.	17	5	.010		6.6	
3.	29	5	.017		6.7	
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33						
34						
35						
36						



Reporting limit (mg/L) =	0.5
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.10
Dilution factor	5

Sample Set Description:

Test No.: 806-3
Test Day: 0
Species: *Hyalella*

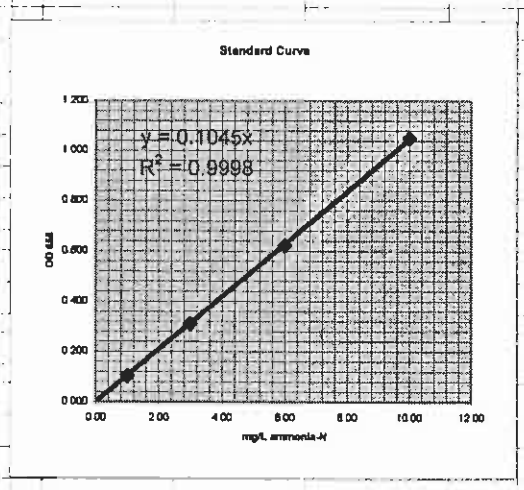
Sediment porewaters

Analyst:	RSC
Date analysed:	4/2/2010

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	-----	----		
	1.0 mg/L NH_3-N Std.	-----	0.103	1.00		
	3.0 mg/L NH_3-N Std.	-----	0.310	3.00		
	6.0 mg/L NH_3-N Std.	-----	0.620	6.00		
	10.0 mg/L NH_3-N Std.	-----	1.050	10.00		
	3.0 mg/L spike	-----	0.300	2.87		
	3.0 mg/L spike dupl.	-----	0.310	2.97		
	5.0 mg/L 2nd source		0.520	4.98		
1.	18	5	0.024	1.15		
2.	21	5	0.023	1.10		
3.	23	5	0.053	2.54		
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33						
34						
35						
36						



Reporting limit (mg/L) =	0.5
Recovery (%) =	97.3
Precision (RPD) =	-3.28
2nd source (%) =	99.5
Sample volume (ml):	0.10
Dilution factor	5

Sample Set Description:

Test No.: 806-3
Test Day: 10
Species: *Hyalella*

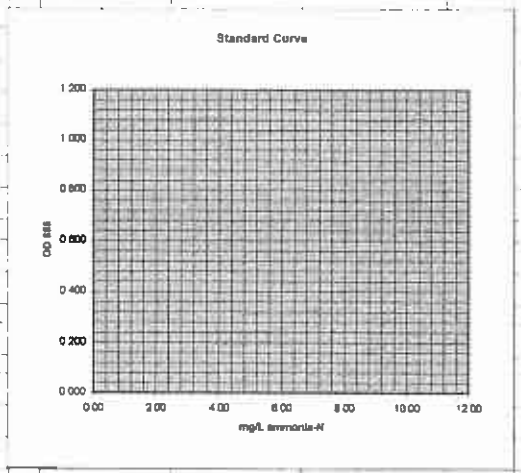
Sediment porewaters

Analyst: RSC
Date analysed: 4/30/2010

Total Ammonia-N in Sediment Pore Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH3-N (mg/L)	pH	Salinity (ppt)
	Blank	-----	-----	-----		
	1.0 mg/L NH3-N Std.	-----	.103	1.00		
	3.0 mg/L NH3-N Std.	-----	.310	3.00		
	6.0 mg/L NH3-N Std.	-----	.620	6.00		
	10.0 mg/L NH3-N Std.	-----	1.05	10.00		
	3.0 mg/L spike	-----	.300			
	3.0 mg/L spike dupl.	-----	.310			
	5.0 mg/L 2nd source		.520			
1.	18	5	.024		6.1	
2.	21	5	.023		6.3	
3.	23	5	.057		6.5	
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						
29.						
30.						
31.						
32.						
33						
34						
35						
36						



Reporting limit (mg/L) =	0.5
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.10
Dilution factor	5

Sample Set Description:

Test No.: 806-3
Test Day: 10
Species: *Hyalella*

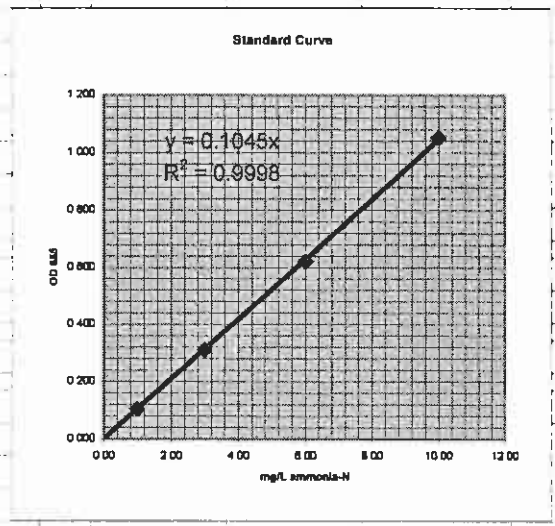
Sediment porewaters

Analyst:	RSC
Date analysed:	4/30/2010

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD_{655}	NH_3-N (mg/L)
	Blank	-----	----	----
	1.0 mg/L NH_3-N Std.	-----	0.103	1.00
	3.0 mg/L NH_3-N Std.	-----	0.310	3.00
	6.0 mg/L NH_3-N Std.	-----	0.620	6.00
	10.0 mg/L NH_3-N Std.	-----	1.050	10.00
	3.0 mg/L spike	-----	0.300	2.87
	3.0 mg/L spike dupl.	-----	0.310	2.97
	5.0 mg/L 2nd source	-----	0.520	4.98
1.	Day 0 (4-2-10)	######		
2.	18	1	0.010	ND
3.	21	1	0.016	0.15
4.	23	1	0.026	0.25
5.	Day 28 (4-30-10)	######		
6.	18	1	0.018	0.17
7.	21	1	0.018	0.17
8.	23	1	0.014	0.13



Reporting limit (mg/L) =	0.1
Recovery (%) =	97.3
Precision (RPD) =	-3.28
2nd source (%) =	99.5
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:
Test No.: 806-3
Test Day: Days 0 & 28
Species: *Hyalella*

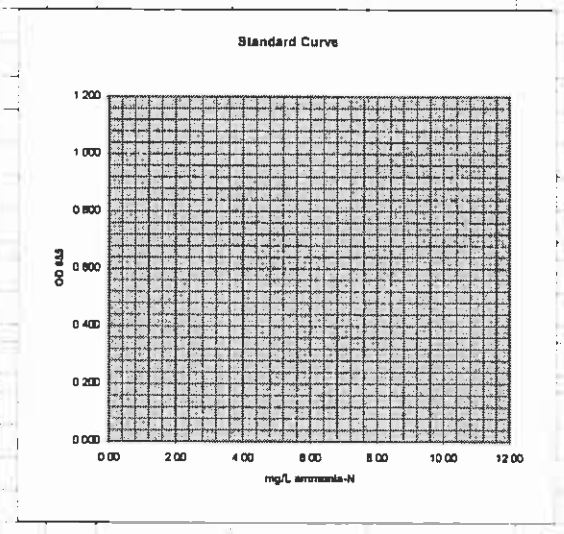
Overlying water

Analyst: RSC RSC
Date analysed: 4/30/2010

Total Ammonia-N in Water: Computation Worksheet
Salicylate Method (SOP #5492)

Result

	Sample description	Dilution factor	OD655	NH_3-N (mg/L)
	Blank	-----	-----	-----
	1.0 mg/L NH_3-N Std.	-----	.103	1.00
	3.0 mg/L NH_3-N Std.	-----	.310	3.00
	6.0 mg/L NH_3-N Std.	-----	.620	6.00
	10.0 mg/L NH_3-N Std.	-----	1.05	10.00
	3.0 mg/L spike	-----	.300	
	3.0 mg/L spike dupl.	-----	.310	
	5.0 mg/L 2nd source	-----	.520	
1.	Day 0 (4-2-10)	######		
2.	18	1	.010	
3.	21	1	.016	
4.	23	1	.026	
5.	Day 28 (4-30-10)	######		
6.	18	1	.018	
7.	21	1	.018	
8.	23	1	.014	
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				
31.				
32.				
33.				
34.				
35.				
36.				



Reporting limit (mg/L) =	0.1
Recovery (%) =	#VALUE!
Precision (RPD) =	#VALUE!
2nd source (%) =	#VALUE!
Sample volume (ml):	0.50
Dilution factor	1

Sample Set Description:

Test No.: 806-3
Test Day: Days 0 & 28
Species: *Hyalella*

Overlying water

Analyst: RSC
Date analysed: 4/30/2010

CHAIN-OF-CUSTODY RECORDS

GSI Water Solutions, Inc.

Lab submittal: Columbia Analytical Services, 1317 South 13th Ave., Kelso, WA 98626

CHAIN OF CUSTODY / LABORATORY ANALYSIS REQUEST FORM

Date: March 25, 2010 Page 1 of 1

Project Name: DPSC Phase II
Project Number: 0205.008
Project Manager: Kevin Parrett
Company/Address:
GSI Water Solutions
55 SW Yamhill Street
Portland, OR
Phone: (503) 239-8799
Fax: (503) 239-8940

Sampler's Signature: Erin Carroll for JN

Analysis Requested: Bioassay

NAS #	Sample I.D.	Date	Time	LAB I.D.	Sample Matrix	Number of Containers	Bioassay	REMARKS
31606	DPSC-G093	3/25/2010	11 41		Sediment	3		
31616	DPSC-G094	3/25/2010	12 33		Sediment	3		2.5 L provided. Insufficient volume for 3 L

Relinquished By	Received By
Signature: Erin Carroll	Signature: Gary Bilek
Printed Name: GSI Water Solutions	Printed Name: NAS
Firm: 3-26-10 10:30	Firm: 3-27-10 0910
Date/Time	Date/Time
Relinquished By	Received By
Signature	Signature
Printed Name	Printed Name
Firm	Firm
Date/Time	Date/Time

TURNAROUND REQUIREMENTS: 24 hr ____ 3 day ____ Standard (10 working days) ____

Send Reports to: Attn: Erin Carroll, GSI Water Solutions, 55 SW Yamhill St, Suite 400, Portland, OR 97201

Send Reports to: [illegible]

REPORT REQUIREMENTS: I. Routine Report ____ II. Standard (Includes DQP Summary) X ____ III. Data Validation Report (includes All Raw Data) ____ EDD(s) ____ (MDL/PQL/TRACE)

INVOICE INFORMATION: Attn: Rick Trout, BPA, The Greater Inc, 8410 SW Hunzen Drive, Hillsboro, OR 97123

SAMPLE RECEIPT: Temperature VIA ____ Temperature ____ Condition: Temp=1.8°C ____ Lab No. ____

Special Instructions/Comments:
Per Final Sampling and Analysis Plan (February 2010)

Next Day Air® Early A.M.®

Shipping Document

See instructions on back. Visit UPS.com® or call 1-800-PICK-UPS® (800-742-5877) for additional information and UPS Tariff/Terms and Conditions.

TRACKING NUMBER A561 448 929 2

1 SHIPMENT FROM

SHIPPER'S ACCOUNT NO. 71WDE1-G61 Water Solutions

REFERENCE NUMBER 0205.008.004

NAME Erin Carroll TELEPHONE 503-239-8796

COMPANY 55 SW Yamhill, suite 400

STREET ADDRESS Portland, OR 97204

CITY AND STATE ZIP CODE

2 EXTREMELY URGENT DELIVERY TO

NAME Gerald Irassarri TELEPHONE 541-265-7225

COMPANY Northwestern Aquatic Sciences

STREET ADDRESS 3814 Yaquina Bay Rd. DEPT/FLR Residential Delivery ☐

CITY AND STATE Newport, OR ZIP CODE 97365

3 WEIGHT: WEIGHT Enter "LTR" if Letter 052 | DIMENSIONAL WEIGHT If Applicable | LARGE PACKAGE ☐ | 4 SHIPPER RELEASE ☐ | CHARGES

5 FIRST DAY AIR EARLY A.M. CHARGE $

6 ADDITIONAL SERVICES

- ☐ SATURDAY PICKUP See instructions | ☒ SATURDAY DELIVERY See instructions $
- ☐ DECLARED VALUE FOR CARRIAGE Customers are automatically protected up to $100. For declared value over $100, see instructions $ AMOUNT $
- ☐ C.O.D. If C.O.D., enter amount to be collected and attach completed UPS C.O.D. tag to package $ AMOUNT $
- ☐ VERBAL CONFIRMATION OF DELIVERY See instructions $

7 ADDITIONAL HANDLING CHARGE ☒ An Additional Handling Charge applies for certain items. See instructions $

TOTAL CHARGES $

8 METHOD OF PAYMENT: BILL SHIPPER'S ACCOUNT NUMBER ☐ (IN SECTION 1) | BILL RECEIVER ☐ | BILL THIRD PARTY ☐ | CREDIT CARD ☐ (American Express, Diner's Club, MasterCard, Visa) (RECORD ACCOUNT NO. IN SECTION 9) | CHECK ☐

9 RECEIVER'S/THIRD PARTY'S UPS ACCT. NO. OR MAJOR CREDIT CARD NO. EXPIRATION DATE /

THIRD PARTY'S COMPANY NAME

STREET ADDRESS

CITY AND STATE ZIP CODE

All shipments are subject to the terms contained in the UPS Tariff/Terms and Conditions of Service available at UPS.com and local UPS offices.

10 SHIPPER'S SIGNATURE X Erin Carroll DATE OF SHIPMENT 3/26/10

020191126 1/07 S

UPS COPY

This form not needed with UPS Internet Shipping at UPS.com

13473 053888_P1 11046537 29 of 100

DPSC Phase II 3-25-2010
Custody Seal
Erin Carroll

1 of 1

DPSC Phase II 3-25-10
Custody Seal
Erin Carroll

1 of 1

APPENDIX III

RAW DATA – REFERENCE TOXICANT TEST

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS- _____

ACUTE TOXICITY TEST (ALL SPECIES)

REVIEWED PAGES 1-7 -GJI

Test No. 999-2712 Client: QC Test Investigator _____

Test Type (rangefinding/definitive) _____ Test Length (hr) 96

Species *Hyalella azteca*

STUDY MANAGEMENT

Client: QC test

Client's Study Monitor: QC test

Testing Laboratory: Northwestern Aquatic Sciences

Test Location: Newport Laboratory

Laboratory's Study Personnel:

Proj. Man./Study Dir. G.J. Irissarri GJI

QA Officer L. K. Nemeth

1. GABilla GJI 2. M.S. Redmond MSR

3. _____ 4. _____

Test Beginning: 4-2-10 0945 Test Ending: 4-6-10 1040

TEST MATERIAL

Description: Potassium Chloride Crystals - Lot No.: FISHER 073280

NAS Sample No.				
Date of Collection:				
Date of Receipt:				
Temperature (deg C):				
Dissolved oxygen (mg/L):				
pH:				
Conductivity (umhos/cm):				
Hardness (mg/L):				
Alkalinity (mg/L):				
Salinity (ppt):				
Total chlorine (mg/L):				
Total ammonia-N (mg/L):				
_____:				

DILUTION WATER

Description: Moderately hard synthetic water

Date of Preparation/Collection: 3-30-10

Water Quality: Cond. (umhos/cm): 268 Salinity (ppt) [redacted] pH 7.8

Hardness (mg/L as $CaCO_3$): 94 Alkalinity (mg/L as $CaCO_3$): 70

Treatments: Aerated ≥ 24 hrs

TEST LOCATION

Test conducted in (circle one): room 1 room 2 trailer water bath other: Room #3

Randomization chart:

REP B	∅	0.125	0.063	0.5	0.25	1				
A	0.063	0.5	0.25	1	∅	0.125				

Error codes: 1) Correction of handwriting error
2) Written in wrong location; entry deleted
3) Wrong date deleted; replaced with correct date
4) Error found in measurement; measurement repeated

Revised 12-5-01

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-_____

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-2712 Client QC Test Investigator _____

TEST ORGANISMS

Species: *Hyalella azteca* Age: 7-8 DAYS Size: _____

Source: Chesapeake Cultures, Hayes, VA Date received: 3-31-10

Acclimation Data:

Date	Temp. (deg.C)	pH	Cond. umhos/cm	DO (mg/L)	Hardness (mg/L)	Alkalinity (mg/L)	Feeding Amount	Feeding description	Water changes
3-31-10	15.1	7.0	403	>15.0	196	190	10 mL	YTC	YES RECEIVING
4-1-10	21.2	8.1	382	8.4	154	160	"	"	YES
4-2-10	21.5	7.6	257	8.7	86	80	–	–	–
Mean	19.3	7.6	347	10.7	145	143			
S.D.	3.6	0.6	79	3.7	56	57			
(N)	3	3	3	3	3	3			

Photoperiod during acclimation: 16:8, L:D

TEST PROCEDURES AND CONDITIONS

Test concentrations (50% series recommended): 1, 0.5, 0.25, 0.125, 0.063 0 g/L

Test chamber: 250 ml glass beakers Test volume: 100 ml

Replicates/treatment: 2 Organisms/treatment: 20 (10/rep)

Test water changes: None Aeration during test: None

Feeding: 0.5 ml YTC suspension per beaker on days 0 and 2

Duration: 24-hr, 48-hr, 96-hr Test temperature (deg.C): 23 ± 1 or 20 ± 1

Beaker placement: Stratified randomization Photoperiod: 16:8, L:D

MISCELLANEOUS NOTES

Test solution preparation:

Working stock: Dissolve 0.5g KCl crystals in dilution water and dilute to 500 mL.
Final conc.: 1.0 g/L.

Test concentration (g/L)	KCl working stock (ml/200ml)	Dilution water
1	200	Brought up to final volume of 200 ml with dilution water and distributed evenly between two replicates
0.5	100	
0.25	50	
0.125	25	
0.063	12.5	
0	0	

4-2-10

NORTHWESTERN AQUATIC SCIENCES PROTOCOL NO. NAS-_____

ACUTE TOXICITY TEST (ALL SPECIES)

Test No. 999-2712 Client QC Test

DAILY RECORD SHEET

Day 0 (4 /12 /10) GJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	22.2	7.9	1910	9.0	94	70	10	10
2. 0.5	22.1	7.8	1098	8.9			10	10
3. 0.25	22.1	7.8	689	9.0			10	10
4. 0.125	22.2	7.8	478	9.0			10	10
5. 0.063	22.2	7.8	368	8.9			10	10
6. 0	22.1	7.7	265	9.0	94	70	10	10
All animals fed 0.5 ml YTC suspension. Initials: GB								

Day 1 (4 /13 /10) GJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	23.2	7.5	1928	7.5			3(7D)	6(4D)
2. 0.5	23.3	7.5	1121	7.4			8(2D)	10
3. 0.25	23.3	7.4	703	7.4			10	10
4. 0.125	23.3	7.3	497	7.5			10	10
5. 0.063	23.3	7.2	386	7.3			10	10
6. 0	23.2	7.2	274	7.4			10	10

Day 2 (4 /14 /10) GJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	23.6	7.4	1941	7.6			Ø(3D)	Ø(6D)
2. 0.5	23.7	7.4	1126	7.6			6(2D)	5(5D)
3. 0.25	23.6	7.3	710	7.6			9(1D)	9(1D)
4. 0.125	23.6	7.3	501	7.7			10	10
5. 0.063	23.6	7.2	391	7.6			10	10
6. 0	23.5	7.1	282	7.6			10	10
All animals fed 0.5 ml YTC suspension. Initials: GJ								

Day 3 (4 /15 /10) GJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	—	—	—	—			Ø	Ø
2. 0.5	23.8	7.3	1134	7.3			5(1D)	Ø(5D)
3. 0.25	23.9	7.3	726	7.4			8(1D)	9
4. 0.125	23.8	7.2	511	7.5			9(1D)	10
5. 0.063	23.9	7.1	395	7.2			10	10
6. 0	23.8	7.1	299	7.6			10	10

Day 4 (4 / 6 /10) GJ

Conc. (g/L)	Temp. (deg.C)	pH	Cond. (umhos/cm)	DO (ppm)	Hardness (mg/L)	Alkalinity (mg/L)	Survivors A	Survivors B
1. 1	—	—	—	—	—	—	Ø	Ø
2. 0.5	23.6	7.7	1119	7.7			3(2D)	Ø
3. 0.25	23.6	7.5	721	7.7			8	9
4. 0.125	23.5	7.4	511	7.8			9	10
5. 0.063	23.4	7.3	391	7.6			10	10
6. 0	23.2	7.2	291	7.6	94	80	10	9(1D)
Mean	23.2	7.4		7.8	94	73		
SD	0.6	0.3		0.6	Ø	6		
n	28	28		28	3	3		

Revised 12-5-01

Chesapeake Cultures

P.O. Box 507 Hayes, VA 23072 (804)693-4046 (804)694-4704 fax
www.c-cultures.com
growfish@c-cultures.com

NAS

Shipment Information

Species Hyalella azteca Date 3/30/10

Age 4-5 days on shipment ~1.5mm P.O. No.

Quantity 490+ Invoice No. 6793

Temperature 24°C Salinity — pH 7.96

Notes RECEIVED 3-31-10 GJ

Biologist

Please inspect shipment and report any problem immediately

Acute 96-hr Toxicity Test-96 Hr Survival

Start Date:	4/2/2010 09:45	Test ID:	999-2712	Sample ID:	REF-Ref Toxicant
End Date:	4/6/2010 10:40	Lab ID:	ORNAS-Northwestern Aquati	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	HA-Hyalella azteca
Comments:					

Conc-gm/L	1	2
D-Control	1.0000	0.9000
0.063	1.0000	1.0000
0.125	0.9000	1.0000
0.25	0.8000	0.9000
0.5	0.3000	0.0000
1	0.0000	0.0000

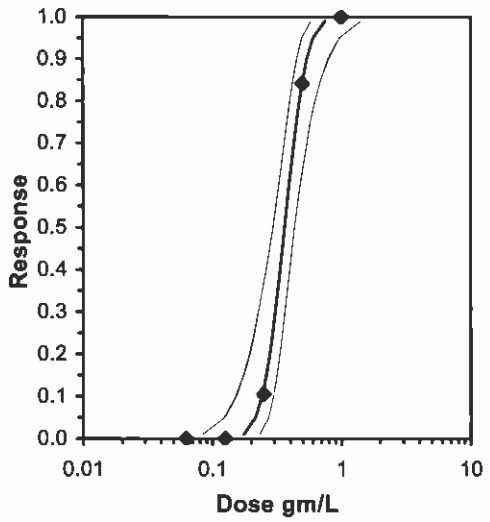
			Transform: Arcsin Square Root					Number	Total
Conc-gm/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Resp	Number
D-Control	0.9500	1.0000	1.3305	1.2490	1.4120	8.661	2	1	20
0.063	1.0000	1.0526	1.4120	1.4120	1.4120	0.000	2	0	20
0.125	0.9500	1.0000	1.3305	1.2490	1.4120	8.661	2	1	20
0.25	0.8500	0.8947	1.1781	1.1071	1.2490	8.517	2	3	20
0.5	0.1500	0.1579	0.3692	0.1588	0.5796	80.603	2	17	20
1	0.0000	0.0000	0.1588	0.1588	0.1588	0.000	2	20	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Normality of the data set cannot be confirmed				
Equality of variance cannot be confirmed				

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.29827	1.74362	3.88079	10.7158	0.05	0.86656	7.81472	0.83	-0.4413	0.13702	3
Intercept	8.22039	0.78343	6.68486	9.75591							
TSCR	0.03317	0.02324	-0.0124	0.07872							

Point	Probits	gm/L	95% Fiducial Limits	
EC01	2.674	0.17378	0.08351	0.23187
EC05	3.355	0.21546	0.12363	0.27168
EC10	3.718	0.24163	0.15184	0.2967
EC15	3.964	0.26106	0.17401	0.31563
EC20	4.158	0.27761	0.19351	0.33221
EC25	4.326	0.29264	0.21157	0.3478
EC40	4.747	0.33422	0.2618	0.39503
EC50	5.000	0.36203	0.29413	0.4315
EC60	5.253	0.39216	0.32669	0.47677
EC75	5.674	0.44788	0.37913	0.57741
EC80	5.842	0.47213	0.39926	0.6276
EC85	6.036	0.50206	0.42244	0.6943
EC90	6.282	0.54243	0.45155	0.79186
EC95	6.645	0.60831	0.49539	0.9681
EC99	7.326	0.75422	0.58302	1.4269

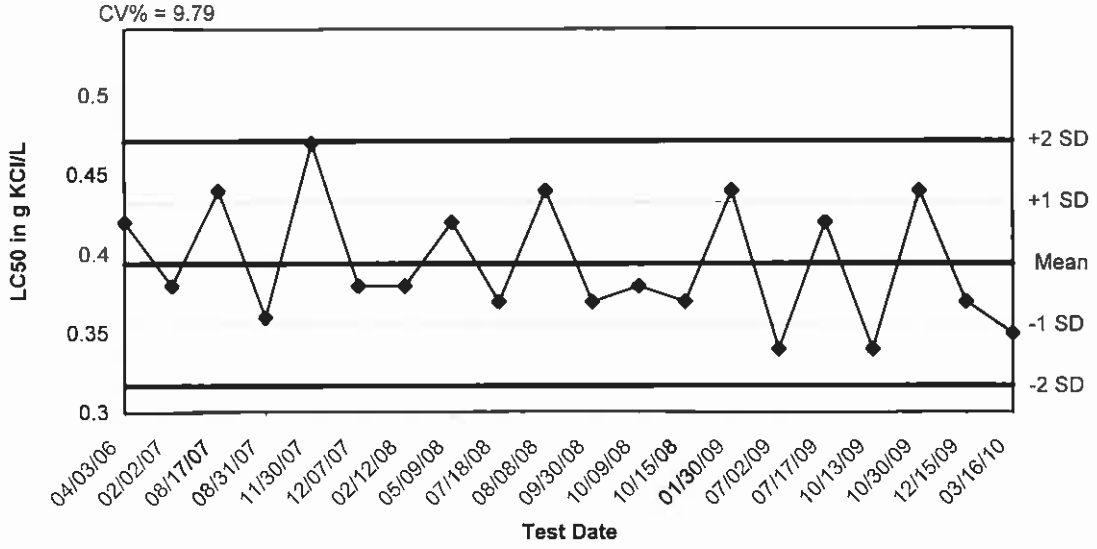


Test: AT-Acute 96-hr Toxicity Test	Test ID: 999-2712
Species: HA-Hyalella azteca	Protocol: EPAF 91-EPA Freshwater
Sample ID: REF-Ref Toxicant	Sample Type: KCL-Potassium chloride
Start Date: 4/2/2010 09:45 End Date: 4/6/2010 10:40	Lab ID: ORNAS-Northwestern Aquatic Sciences

Pos	ID	Rep	Group	Start	24 Hr	48 Hr	72 Hr	96 Hr	Notes
	1	1	D-Control	10				10	
	2	2	D-Control	10				9	
	3	1	0.063	10				10	
	4	2	0.063	10				10	
	5	1	0.125	10				9	
	6	2	0.125	10				10	
	7	1	0.250	10				8	
	8	2	0.250	10				9	
	9	1	0.500	10				3	
	10	2	0.500	10				0	
	11	1	1.000	10				0	
	12	2	1.000	10				0	

Comments: data entry verified against laboratory bench sheets 5-6-10 MF

Amphipod, Hyalella azteca, acute reference toxicant test



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
04/03/06	0.4200	0.3940	0.3554	0.3168	0.4326	0.4712
02/02/07	0.3800	0.3940	0.3554	0.3168	0.4326	0.4712
08/17/07	0.4400	0.3940	0.3554	0.3168	0.4326	0.4712
08/31/07	0.3600	0.3940	0.3554	0.3168	0.4326	0.4712
11/30/07	0.4700	0.3940	0.3554	0.3168	0.4326	0.4712
12/07/07	0.3800	0.3940	0.3554	0.3168	0.4326	0.4712
02/12/08	0.3800	0.3940	0.3554	0.3168	0.4326	0.4712
05/09/08	0.4200	0.3940	0.3554	0.3168	0.4326	0.4712
07/18/08	0.3700	0.3940	0.3554	0.3168	0.4326	0.4712
08/08/08	0.4400	0.3940	0.3554	0.3168	0.4326	0.4712
09/30/08	0.3700	0.3940	0.3554	0.3168	0.4326	0.4712
10/09/08	0.3800	0.3940	0.3554	0.3168	0.4326	0.4712
10/15/08	0.3700	0.3940	0.3554	0.3168	0.4326	0.4712
01/30/09	0.4400	0.3940	0.3554	0.3168	0.4326	0.4712
07/02/09	0.3400	0.3940	0.3554	0.3168	0.4326	0.4712
07/17/09	0.4200	0.3940	0.3554	0.3168	0.4326	0.4712
10/13/09	0.3400	0.3940	0.3554	0.3168	0.4326	0.4712
10/30/09	0.4400	0.3940	0.3554	0.3168	0.4326	0.4712
12/15/09	0.3700	0.3940	0.3554	0.3168	0.4326	0.4712
03/16/10	0.3500	0.3940	0.3554	0.3168	0.4326	0.4712

MSR
4-7-10