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Evaluation of the Toxicity of Los Alamos National Laboratory Sediments to the Larval Insect *Chironomus tentans*

(Samples Collected December 6, 2002)

Prepared For

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March 2003

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(Samples Collected December 6, 2002)

Table of Contents

	Page
1.0 INTRODUCTION	1
2.0 TEST PROCEDURES	1
2.1 Receipt and Handling of the Surface Water and Sediment Samples	1
2.2 Test Organisms	2
2.3 Sediment Toxicity Testing with *Chironomus tentans*	2
2.3.1 Reference Toxicant Test Procedures with *Chironomus tentans*	3
3.0 RESULTS	4
3.1 Sediment Toxicity to *Chironomus tentans*	4
3.1.1 Toxicity of Sediment RE16-03-49883	4
3.1.2 Toxicity of Sediment RE16-03-49884	5
3.1.3 Toxicity of Sediment RE16-03-49885	6
3.1.4 Toxicity of Sediment RE16-03-49886	7
3.2 Results of the Reference Toxicant Evaluation of *Chironomus tentans*	8
4.0 SUMMARY AND CONCLUSIONS	9
4.1 QA/QC Summary	9

Appendix A Chain-of-Custody Record for the Los Alamos National Laboratory Surface Water and Sediment Samples

Appendix B Test Data & Summary of Statistics for the Evaluation of Sediment RE16-03-49883 Toxicity to *Chironomus tentans*

Appendix C Test Data & Summary of Statistics for the Evaluation of Sediment RE16-03-49884 Toxicity to *Chironomus tentans*

Appendix D Test Data & Summary of Statistics for the Evaluation of Sediment RE16-03-49885 Toxicity to *Chironomus tentans*

Appendix E Test Data & Summary of Statistics for the Evaluation of Sediment RE16-03-49886 Toxicity to *Chironomus tentans*

Appendix F Test Data & Summary of Statistics for the Reference Toxicant Evaluation of the *Chironomus tentans*

Appendix G Water Quality Characteristics of the Test Replicate Overlying Water at the Initiation (Day 0) and Termination (Day 10) of the Tests

Evaluation of the Toxicity of Los Alamos National Laboratory Sediments to the Larval Insect *Chironomus tentans*

1.0 INTRODUCTION

The Los Alamos National Laboratory (LANL) has contracted Pacific EcoRisk (PER) to perform toxicity evaluations of several freshwater sediments. These evaluations consist of performing the U.S. EPA 10-day survival and growth sediment toxicity test with the larval insect *Chironomus tentans*. These tests were conducted for four sediment samples that were collected on December 6 2002. This report describes the performance and results of these tests.

2.0 TEST PROCEDURES

The methods used in conducting these tests followed the US EPA guidelines, "Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates" (EPA/600/R-99/064).

2.1 Receipt and Handling of the Surface Water and Sediment Samples

On December 6, 2002, grab samples of ~4L of sediment were collected from three sites by LANL staff into appropriately-cleaned sample containers; at one of these sites, an additional grab sample of ~4L of sediment was collected. At each of these sites, grab samples of overlying surface water were also collected (Table 1). These samples were stored "on ice" in ice-chest coolers, until being shipped, via overnight delivery and under chain of custody, to the PER testing laboratory in Martinez, CA (Chain-of-Custody documentation is provided in Appendix A). Upon receipt at the laboratory, an aliquot of each surface water sample was removed for analysis of initial water quality characteristics (Table 2), with the remainder of the surface water and sediment samples being stored at 4°C until needed.

Table 1. Los Alamos National Laboratory sediment and accompanying site water sample ID codes.

Sediment Sample	Site-Specific Water Sample
RE16-03-49884	RE16-03-49880
RE16-03-49886	RE16-03-49882
RE16-03-49883*	RE16-03-49879**
RE16-03-49885*	

* - These two samples were collected from the same site.

** - Water sample RE16-03-49879 was used in the toxicity test of sediment sample RE16-03-49883; sediment sample RE16-03-49885 was tested using Lab Control Water.

Table 2. Water quality characteristics of the Los Alamos National Laboratory surface water samples

Sample ID	Temp. (°C)	pH	D.O. (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	Conductivity (μS/cm)	Total Ammonia (mg/L N)
RE16-03-49879	10.8	7.91	10.9	85	101	268	<0.01
RE16-03-49880	10.7	8.14	11.1	63	72	221	<0.01
RE16-03-49882	10.1	8.33	10.2	63	83	274	<0.01

Upon instructions from Neptune and Company staff, and immediately prior to the start of the tests, the two sediment samples that were collected from the same site (see Table 1) were composited and homogenized within a stainless steel bowl after which the resulting homogenized sediment was split back into two aliquots which were placed back into the original sample containers. Each of the remaining two sediment samples was also homogenized at this time. An aliquot of each homogenized sediment was centrifuged at 2500 g for 15 minutes for collection of sediment porewater and determination of the initial porewater chemistries (Table 3).

Table 3. Water quality characteristics of the Los Alamos National Laboratory sediment sample porewaters

Sample ID	pH	D.O. (mg/L)	Total Ammonia (mg/L N)	Sulfide (mg/L)
RE16-03-49884	7.14	4.1	2.21	0.08
RE16-03-49886*	7.10	4.8	1.44	0.02
RE16-03-49883* RE16-03-49885	7.12	5.5	4.62	0.15

* - These two samples were collected from the same site, and were composited and homogenized immediately prior to porewater analyses.

2.2 Test Organisms

At approximately three weeks prior to the start of these tests, *Chironomus tentans* egg cases were obtained from a commercial supplier (Aquatic Biosystems, Ft. Collins, CO). These eggs were incubated in EPA synthetic moderately hard water at 23°C. Upon hatching, the larvae were maintained in the same water at 23°C, and were provided shredded paper towel substrate and fed YCT and *Selenastrum capricornutum*, as per EPA guidelines. Immediately prior to the start of the tests, healthy third-instar larvae were collected from these cultures.

2.3 Sediment Toxicity Testing with *Chironomus tentans*

The freshwater sediment toxicity test with *Chironomus tentans* consists of exposing the larval insects to the sediment for 10 days, after which effects on survival and growth are evaluated. The specific procedures used in this test are described below.

Each of the four site sediments was tested at the 100% concentration only. The Control treatment sediment consisted of the same reference soil that is used as the routine control sediment by the National Biological Survey (Columbia, MO) in their freshwater sediment toxicity tests; this soil has been continuously incubated in a tank of freshwater at 23°C for over nine months. There were eight replicates for each of the test treatments. Each replicate container consisted of a 300 mL tall-form glass beaker with a 3 cm ribbon of 540 μm mesh NITEX attached to the top of the beaker with silicone sealant. Each of the sediment samples was homogenized immediately prior to introduction of the sediments into the test replicates. Approximately 100 mL of sediment was loaded into each of the test replicate containers. Each of the test replicates was then carefully filled with overlying water. For the Control treatment, this consisted of EPA synthetic moderately hard water, modified for use with *Chironomus* as per the EPA test guidelines. The site waters that were collected concurrently with the site sediments were used as the overlying test water for those sediments (see Table 1), except for sediment RE16-03-49885, which used EPA synthetic moderately hard water as the overlying water. The replicates with sediments and clean overlying water were established 24 hrs prior to the introduction of the larval insects.

After this initial 24 hrs period, the overlying water in each replicate was flushed with two volumes of the corresponding treatment-specific water using a modified Zumwalt delivery system (Zumwalt et al. 1994). A small aliquot of the renewed overlying water in each of the eight replicates per treatment was then collected and composited for measurement of "initial" water quality characteristics (pH, D.O., conductivity, alkalinity, hardness, and total ammonia); these data are provided in Appendix G. Based upon the observation of significant hypoxia in the test sediment overlying waters, each of the test replicates was gently aerated for the duration of these tests. Then 10 third-instar *Chironomus* were randomly allocated into each replicate, followed by the addition of 1.0 mL of YCT food. The test replicates were then returned to the water baths.

Each day, for the following nine days, the test replicates were pulled from the water bath, and each replicate was examined for the presence of any dead *Chironomus* or the presence of pupal exuvia. A small aliquot of the overlying water in each of the eight replicates was then collected and composited as before for measurement of "old" D.O., after which each replicate was flushed with two volumes of fresh treatment water. Another small aliquot of the overlying water in each of the eight replicates was then collected and composited as before for measurement of "new" D.O., after which each replicate was fed 1.0 mL of YCT, and then replaced within the water bath.

After 10 days exposure, the replicate containers were pulled from the water bath, and each was examined for the presence of pupal exuvia. Then, an aliquot of overlying water was collected from each replicate and composited for analysis of the "final" water quality characteristics (Appendix G). The sediments in each replicate container were then carefully washed out and sieved using a #40 (425 μm mesh) stainless steel sieve, and the number of surviving *Chironomus* determined; animals were identified as either larvae, pupae, or adult (each pupal exuvia was counted as a surviving adult). The surviving larval *Chironomus* from each replicate were then rinsed with de-ionized water, and transferred to a pre-dried and pre-tared drying pan. These were then dried at 100°C for 24 hrs and re-weighed to determine the mean "dry" weight per individual *Chironomus*.

Each replicate pan was then placed into a muffle furnace and ashed at 550°C for two hrs, after which the pans were placed within a desiccator. After the pans had cooled, they were each re-weighed to determine the mean ash-free dry wt (= final ashed weight minus "dry" weight divided by the number of organisms in the pan). The data for each sediment treatment were analyzed and compared to the Control treatment to determine whether or not any statistically significant reductions in survival and/or growth were observed. All statistical analyses were performed using the CETIS® statistical package (Version 1.023, TidePool Scientific, McKinleyville, CA).

2.3.1 Reference Toxicant Test Procedures with *Chironomus tentans*

In order to validate that the *Chironomus* used in these tests were responding in a typical fashion to chemical stress, a reference toxicant test was run. The reference toxicant test consists of an acute 48 hour static toxicity test with copper (as $CuSO_4$), at concentrations of 0, 25, 50, 100, 200, and 400 μg/L. There were two replicates at each treatment level, each replicate consisting of 400 mL of test media in a 600 mL glass beaker. The test was initiated by randomly allocating 10 chironomids into each of the replicate beakers. The beakers were placed in a temperature-controlled water bath at 23°C under continual darkness.

Each replicate container was examined daily, and the number of live chironomids in each was recorded at this time. Routine water quality characteristics (D.O., pH, and temperature) of the treatment waters were measured and recorded for one randomly selected replicate per treatment each day. After 48 hrs, the number of live organisms in each replicate beaker was determined. The test response data were then compared to the ongoing database of response data from previous reference toxicant tests performed in this lab.

3.0 RESULTS

The results of the toxicity evaluations of the Los Alamos National Laboratory sediments are presented below.

3.1 Sediment Toxicity to *Chironomus tentans*

3.1.1 Toxicity of Sediment RE16-03-49883

The survival results of this test are summarized below in Table 4. Briefly, there was 93.75% survival in the Control sediment, and 90% survival in the Sediment RE16-03-49883 treatment, which was not significantly less than the Control.

The growth results of this test are also summarized below in Table 4. Briefly, the mean ash-free dry weight was 1.14 mg at the Control treatment, and was 1.28 mg at the Sediment RE16-03-49883 treatment, which was not significantly less than the Control.

The test data & summary of statistical analyses for this test are presented in Appendix B.

Table 4. Toxicity of Sediment RE16-03-49883 to *Chironomus tentans* survival and growth.

Treatment	Rep A	Rep B	Rep C	Rep D	Rep E	Rep F	Rep G	Rep H	Mean
	% Survival								
Control	100	80	100	100	100	80	100	90	93.75
RE16-03-49883	90	90	90	80	100	90	90	90	90
	Mean *Chironomus* Weight (ash-free dry wt, mg)								
Control	0.90	1.27	1.26	1.33	1.08	0.92	1.24	1.10	1.14
RE16-03-49883	1.30	1.48	1.27	1.14	1.36	1.24	1.36	1.10	1.28

3.1.2 Toxicity of Sediment RE16-03-49884

The survival results of this test are summarized below in Table 5. Briefly, there was 93.75% survival in the Control sediment, and 88.75% survival in the Sediment RE16-03-49884 treatment, which was not significantly less than the Control.

The growth results of this test are also summarized below in Table 5. Briefly, the mean ash-free dry weight was 1.14 mg at the Control treatment, and was 1.26 mg at the Sediment RE16-03-49884 treatment, which was not significantly less than the Control.

The test data & summary of statistical analyses for this test are presented in Appendix C.

Table 5. Toxicity of Sediment RE16-03-49884 to *Chironomus tentans* survival and growth.

Treatment	Rep A	Rep B	Rep C	Rep D	Rep E	Rep F	Rep G	Rep H	Mean
	% Survival								
Control	100	80	100	100	100	80	100	90	93.75
RE16-03-49884	90	100	90	90	80	90	80	90	88.75
	Mean *Chironomus* Weight (ash-free dry wt, mg)								
Control	0.90	1.27	1.26	1.33	1.08	0.92	1.24	1.10	1.14
RE16-03-49884	1.23	1.40	1.12	1.40	1.26	1.27	1.23	1.20	1.26

3.1.3 Toxicity of Sediment RE16-03-49885

The survival results of this test are summarized below in Table 6. Briefly, there was 93.75% survival in the Control sediment, and 91.25% survival in the Sediment RE16-03-49885 treatment, which was not significantly less than the Control.

The growth results of this test are also summarized below in Table 6. Briefly, the mean ash-free dry weight was 1.14 mg at the Control treatment, and was 0.89 mg at the Sediment RE16-03-49885 treatment, which was significantly less than the Control.

The test data & summary of statistical analyses for this test are presented in Appendix D.

Table 6. Toxicity of Sediment RE16-03-49885 to *Chironomus tentans* survival and growth.

Treatment	Rep A	Rep B	Rep C	Rep D	Rep E	Rep F	Rep G	Rep H	Mean
	% Survival								
Control	100	80	100	100	100	80	100	90	93.75
RE16-03-49885	100	90	100	90	100	80	90	80	91.25
	Mean *Chironomus* Weight (ash-free dry wt, mg)								
Control	0.90	1.27	1.26	1.33	1.08	0.92	1.24	1.10	1.14
RE16-03-49885	0.77	0.90	0.64	0.95	0.88	0.84	0.92	1.19	0.89 *

* - Significantly less than the Control treatment response at $p < 0.05$.

3.1.4 Toxicity of Sediment RE16-03-49886

The survival results of this test are summarized below in Table 7. Briefly, there was 93.75% survival in the Control sediment, and 96.25% survival in the Sediment RE16-03-49886 treatment, which was not significantly less than the Control.

The growth results of this test are also summarized below in Table 7. Briefly, the mean ash-free dry weight was 1.14 mg at the Control treatment, and was 1.21 mg at the Sediment RE16-03-49886 treatment, which was not significantly less than the Control.

The test data & summary of statistical analyses for this test are presented in Appendix E.

Table 7. Toxicity of Sediment RE16-03-49886 to *Chironomus tentans* survival and growth.

Treatment	Rep A	Rep B	Rep C	Rep D	Rep E	Rep F	Rep G	Rep H	Mean
	% Survival								
Control	100	80	100	100	100	80	100	90	93.75
RE16-03-49886	100	100	100	100	80	100	90	100	96.25
	Mean *Chironomus* Weight (ash-free dry wt, mg)								
Control	0.90	1.27	1.26	1.33	1.08	0.92	1.24	1.10	1.14
RE16-03-49886	1.17	1.16	1.21	1.33	1.20	1.27	1.25	1.12	1.21

3.2 Results of the Reference Toxicant Evaluation of *Chironomus tentans*

The results of the reference toxicant evaluation of the *Chironomus* used in these tests are presented in Table 8. There was 100% survival at the Control treatment. The NOEC was 25 μg/L Cu and the LOEC was 50 μg/L Cu. The EC50 was 51.0 μg/L Cu.

This EC50 value is consistent with previous performance of this test in our laboratory, indicating that these test organisms were responding to toxic stress in a typical fashion. The test data sheets and the summary of statistical analyses for this test are presented in Appendix F.

Table 8. Reference toxicant testing: Effects of copper on survival of *Chironomus tentans.*

Copper Treatment (μg/L)	% Survival in Test Replicates		Overall Mean % Survival
	Rep A	Rep B	
Control	100	100	100
25	100	80	90
50 *	**60**	**60**	**60 ***
100 *	**0**	**10**	**5 ***
200 *	**0**	**0**	**0 ***
400 *	**0**	**0**	**0 ***
EC50 =	51.0 μg/L Cu		

* - Survival at this treatment level was significantly less than the Control at $p < 0.05$.

4.0 SUMMARY AND CONCLUSIONS

The results of these sediment toxicity evaluations of the Los Alamos freshwater sediment (and overlying site water) samples (Table 9) indicate that none of the four sediment samples resulted in statistically significant reductions in *Chironomus* survival; sediment sample RE16-03-49885, which was tested with Lab Water instead of Site water, resulted in a statistically significant reduction in *Chironomus* growth.

Table 9. Effects of Los Alamos sediment samples on *Chironomus tentans* survival and growth.

Sample ID	Mean % Survival	Mean Weight (mg, ash-free dry wt)
Control	93.75	1.14
RE16-03-49883 SW SC SITE H_2O	90	1.28
RE16-03-49884 ↓ BG	88.75	1.26
RE16-03-49885 SW SC LAB H_2O	91.25	0.89 *
RE16-03-49886 ST ARROYO	96.25	1.21

* - Significantly less than the Control treatment response at $p < 0.05$.

4.1 QA/QC SUMMARY

Test Conditions - Test conditions (pH, D.O., temperature, etc.) were within acceptable limits for these test organisms. All such analyses were performed according the laboratory Standard Operating Procedures.

Negative Control - The biological responses for the test organisms at the Control treatment were within acceptable limits.

Positive Control - The results for the concurrent reference toxicant test were consistent with the reference toxicant test database, indicating that these test organisms were responding to toxic stress in a typical fashion.

APPENDIX A

Chain-of-Custody Record for the Los Alamos National Laboratory Surface Water and Sediment Samples

Monday, December 9, 2002

REQUEST NUMBER: 1447S

ANALYSIS TYPE: OTHER

Los Alamos
NATIONAL LABORATORY

ATTN: Scott Olge
Pacific Ecorisk Laboratories
835 Arnold Dr., Suite 104
Martinez, CA 94553

Please analyze the enclosed samples according to the schedule indicated:

SHIP DATE: 12/09/2002
REPORT DUE: 01/08/2003
TURN AROUND REQ'D: 30

RAD SCREENING: NOT REQ
COMMENTS:

These samples are on:

LANL Request Number: 1447S
Per Agreement Number:
Project Cost Code: MR3A0331TNH0

LANL ER SMO CONTACT:
Signature:

METHOD CODE	SAMPLE ID	CONT ID	SAMPLE MATRIX	DATE SAMPLED	COMMENTS
EPA:100.2	RE16-03-49879	2	W	12/06/2002	
EPA:100.2	RE16-03-49880	2	W	12/06/2002	
EPA:100.2	RE16-03-49882	2	W	12/06/2002	
EPA:100.2	RE16-03-49883	2	S	12/06/2002	
EPA:100.2	RE16-03-49884	2	S	12/06/2002	
EPA:100.2	RE16-03-49885	2	S	12/06/2002	
EPA:100.2	RE16-03-49886	2	S	12/06/2002	

Final Page of REQUEST NUMBER 1447S

CHAIN OF CUSTODY DOCUMENT NUMBER: 1447SC

Los Alamos
NATIONAL LABORATORY

REQUEST NUMBER: 1447S

ANALYSIS TYPE: OTHER

ATTN: Scott Olge
Pacific Ecorisk Laboratories
835 Arnold Dr., Suite 104
Martinez, CA 94553

SAMPLE ID	CONT ID	CONTAINER DESCRIPTION	ORDER TEMPLATE CODE	PRESERVATIVE	MATRIX
RE16-03-49879	2	1 GAL POLY	Bioassay	NONE	W
RE16-03-49880	2	1 GAL POLY	Bioassay	NONE	W
RE16-03-49882	2	1 GAL POLY	Bioassay	NONE	W
RE16-03-49883	2	1 GAL POLY	Bioassay	NONE	S
RE16-03-49884	2	1 GAL POLY	Bioassay	NONE	S
RE16-03-49885	2	1 GAL POLY	Bioassay	NONE	S
RE16-03-49886	2	1 GAL POLY	Bioassay	NONE	S

Final Page of CHAIN OF CUSTODY DOCUMENT FOR REQUEST NUMBER 1447S

Relinquished By:	Date	Time	Received By:	Date	Time
PRINTED NAME SIGNATURE	12/9/02	14:30	K. Kirchner K. Kirchner	12/10/02	10:30
PRINTED NAME SIGNATURE			PRINTED NAME SIGNATURE		
PRINTED NAME SIGNATURE			PRINTED NAME SIGNATURE		

Received for DISPOSAL By:	Date	Time	Remarks:
PRINTED NAME SIGNATURE			

Subject: Sample pairs
Date: Monday, January 13, 2003 11:42 AM
From: Mark Tardiff <mtardiff@neptuneinc.org>
To: "R. Scott Ogle" <scottogle@pacificecorisk.com>

Scott the water and sediment sample pairings are as follows:

RE16-03-49879, RE16-03-49883, RE16-03-49885

The sediment samples, RE16-03-49883 and RE16-03-49885 were homogenized by you in the lab. One set of replicates from that combined sample will be run with water from sample ID RE16-03-49879. The other set of replicates will be run with Lab water.

The other four samples are paired as follows:

RE16-03-49880, RE16-03-49884

RE16-03-49882, RE16-03-49886

Call with any questions.

Mark Tardiff
Neptune and Company, Inc.
1505 15 th Street Suite B
Los Alamos, NM 87544
Phone: 505-662-0707, ext 28
Fax: 505-662-0500
mtardiff@neptuneinc.org

APPENDIX B

Test Data and Summary of Statistics for the Evaluation of Sediment RE16-03-49883 Toxicity to *Chironomus tentans*

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Test:	11-7728-6930	**Test Type:**	Survival (10day)-Growth	**Species:**	Chironomus tentans
Start Date:	15 Jan-03 10:30 AM	**Protocol:**	USEPA Freshwater Sediment (2000)	**Source:**	Aquatic Biosystems, CA
End Date:	25 Jan-03 01:50 PM	**Dil Water:**	Ambient Water		
Setup Date:	15 Jan-03 10:30 AM	**Brine:**			

Sample:	08-4461-9191	**Material:**	Freshwater Sediment	**Client:**	Los Alamos National Laboratory
Sampled:	06 Dec-02 12:00 PM	**Code:**	8158	**Project:**	
Received:	10 Dec-02 10:30 AM	**Source:**	Los Alamos National Laboratory	**Latitude:**	
Temp °C:		**Station:**	RE16-03-49883	**Longitude:**	

Comparison Summary

Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
10-3072-8973	Mean Weight	100	>100	N/A	11.28%	Equal Variance t
08-0425-9521	Proportion Survived	100	>100	N/A	6.18%	Equal Variance t

Mean Weight Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	1.1384931	0.8989998	1.3300003	0.0578479	0.1636186	14.37%
100		8	1.2820833	1.0955558	1.4844445	0.044401	0.1255849	9.80%

Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	0.9375	0.8	1	0.0323899	0.0916125	9.77%
100		8	0.9	0.8	1	0.0188982	0.0534522	5.94%

Mean Weight Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	0.899	1.2725	1.263	1.3300	1.0780	0.9250	1.2360	1.1044
100		1.3044	1.4844	1.2667	1.1400	1.36	1.2444	1.3611	1.0956

Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9
100		0.9	0.9	0.9	0.8	1	0.9	0.9	0.9

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Proportion Survived	Comparison	05-2284-1693	05-2284-1693	19 Mar-03 10:13 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)		100	>100	1.00	N/A	6.18%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.954922	8.885389	0.1761799	Equal Variances
Distribution	Shapiro-Wilk W	0.8821942	0.8441989	0.04150799	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.01625525	0.01625525	1	1.233781	0.2853862	Non-Significant Effect
Error	0.184452	0.01317514	14			
Total	0.2007073	0.02943039	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	1.110757	1.76131	0.1426931	0.1010843	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	0.9375	0.8	1	0.0916126	1.3154280	1.107149	1.412016	0.1403127
100		8	0.9	0.8	1	0.0534522	1.2516799	1.107149	1.412016	0.0816250

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9		
100		0.9	0.9	0.9	0.8	1	0.9	0.9	0.9		

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Mean Weight	Comparison	05-2284-1693	05-2284-1693	19 Mar-03 10:13 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed		100	>100	1.00	N/A	11.28%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.697426	8.885389	0.5017482	Equal Variances
Distribution	Shapiro-Wilk W	0.9472207	0.8441989	0.4307563	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.08247264	0.08247264	1	3.877179	0.06906722	Non-Significant Effect
Error	0.2977982	0.0212713	14			
Total	0.3802709	0.1037439	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	-1.969055	1.76131	0.9654664	0.1284408	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	1.1384931	0.8989998	1.33	0.1636186				
100		8	1.2820833	1.095556	1.484444	0.1255848				

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	0.899	1.2725	1.263	1.33	1.078	0.9250	1.236	1.1044		
100		1.3044	1.4844	1.2667	1.14	1.36	1.2444	1.3611	1.0956		

Chironomus tentans 10-Day Freshwater Sediment Toxicity Test Data

Client: Los Alamos (Neptune) Test ID#: 8158 Date (Day 0): January 15, 2003

DAY	Date	Temp. (°C)	CONTROL D.O. (OLD)	CONTROL D.O. (NEW)	49883 D.O. (OLD)	49883 D.O. (NEW)	SIGN-OFF
0	1/15/03	22.8	4.9	8.2	2.0	7.5	nc 1030
			A – B – C – D –		A – B – C – D –		
			E – F – G – H –		E – F – G – H –		
1	1/16/03	22.6	7.6	8.1	7.7	8.0	nc 1130
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
2	1/17/03	22.3	7.6	7.7	7.8	7.9	1550 nc
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
3	1/18/03	22.5	8.2	8.8	8.3	8.8	1210
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 1 G 0 H 0		
4	1/19/03	22.6	8.6	8.9	8.5	8.8	3:10 pm
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		KK
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
5	1/20/03	22.7	8.6	8.9	8.4	8.4	1605
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		KK
6	1/21/03	22.5	8.3	8.4	6.5	8.2	1600
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		al
7	1/22/03	22.4	7.8	8.0	6.9	8.1	
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		TA
8	1/23/03	22.9	8.1	8.3	6.4	7.7	1610
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		al
9	1/24/03	22.7	NM	8.2	NM	8.2	nc 1200
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
10	1/25/03	22.7	8.0		7.1		1:50 pm
			# Live Organisms/replicate		# Live Organisms/replicate		
			A 10 B 8 C 10 D 10		A 9 B 9 C 9 D 8		
			E 10 F 8 G 10 H 9		E 10 F 9 G 9 H 9		

Chironomus tentans Sediment Toxicity Test Weight Data

Client: Los Alamos / Neptune and Company
Sample ID: 49883
Test ID#: 8158 Test Date: Jan 15, 2003

Pan Wt Date: 1-24-03 Sign-Off: [illegible]
Dry Wt. Date: 1-26-03 Sign-Off: [illegible]
Ashed Wt. Date: 1-30-03 Sign-Off: [illegible]

Dry Weight Calculations

Pan ID	Concentration/ Replicate		Initial Ashed Pan Wt. (mg)	Dry Pan + Larvae Wt. (mg)	# of Live Organisms			Mean Dry Larvae Weight (mg)
					Larvae	Pupae	Adult	
1	Control	A	30.15	44.30	10	—	—	1.415
2		B	30.51	43.91	8	—	—	1.675
3		C	29.35	46.26	10	—	—	1.701
4		D	31.11	50.06	10	—	—	1.895
5		E	30.89	48.08	10	—	—	1.719
6		F	28.65	39.57	8	—	—	1.365
7		G	28.73	46.47	10	—	—	1.774
8		H	28.38	41.23	9	—	—	1.428
17	49883	A	32.19	50.17	9	—	—	1.998
18		B	30.03	50.77	9	—	—	2.304
19		C	29.00	47.19	9	—	—	2.021
20		D	28.56	41.58	8	—	—	1.628
21		E	30.51	50.01	10	—	—	1.950
22		F	31.11	46.81	9	—	—	1.744
23		G	28.69	47.76	9	—	—	2.119
24		H	28.85	41.58	9	—	—	1.415
QA 2			29.60	29.60 pb	pb			

Ash Free Dry Weight Calculations

Pan ID	Concentration/ Replicate		Dry Pan + Larvae Wt. (mg)	Ashed Pan + Larvae Wt. (mg)	Total Ash Free Dry Wt. of Larvae (mg)	# of Larvae	Mean Ash Free Dry Wt. of Larvae (mg)
1	Control	A	44.30	35.31	8.99	10	0.899
2		B	43.91	33.73	10.18	8	1.273
3		C	46.26	33.63	12.63	10	1.263
4		D	50.06	36.76	13.30	10	1.330
5		E	48.08	37.30	10.78	10	1.078
6		F	39.57	32.17	7.40	8	0.925
7		G	46.47	34.11	12.36	10	1.236
8		H	41.23	31.29	9.94	9	1.104
17	49883	A	50.17	38.43	11.74	9	~~1.484~~ 1.304
18		B	50.77	37.41	13.36	9	~~1.307~~ 1.484
19		C	47.19	35.79	11.40	9	1.267
20		D	41.58	32.46	9.12	8	1.140
21		E	50.01	36.41	13.60	10	1.360
22		F	46.81	35.61	11.20	9	1.244
23		G	47.76	35.51	12.25	9	1.361
24		H	41.58	31.72	9.86	9	1.095
QA 2			29.60 pb	29.60		pb	

APPENDIX C

Test Data and Summary of Statistics for the Evaluation of Sediment RE16-03-49884 Toxicity to *Chironomus tentans*

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Test:	00-5624-5504	**Test Type:**	Survival (10day)-Growth	**Species:**	Chironomus tentans
Start Date:	15 Jan-03 10:30 AM	**Protocol:**	USEPA Freshwater Sediment (2000)	**Source:**	Aquatic Biosystems, CO
End Date:	25 Jan-03 01:50 PM	**Dil Water:**	Ambient Water		
Setup Date:	15 Jan-03 10:30 AM	**Brine:**			

Sample:	03-2375-4839	**Material:**	Freshwater Sediment	**Client:**	Los Alamos National Laboratory
Sampled:	06 Dec-02 12:00 PM	**Code:**	8159	**Project:**	
Received:	10 Dec-02 10:30 AM	**Source:**	Los Alamos National Laboratory	**Latitude:**	
Temp °C:		**Station:**	RE16-03-49884	**Longitude:**	

Comparison Summary

Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
05-2110-8496	Mean Weight	100	>100	N/A	10.39%	Equal Variance t
14-7922-1055	Proportion Survived	100	>100	N/A	6.53%	Equal Variance t

Mean Weight Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	1.1384931	0.8989998	1.3300003	0.0578479	0.1636186	14.37%
100		8	1.2627743	1.1177779	1.4022222	0.0341435	0.0965724	7.65%

Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	0.9375	0.8	1	0.0323899	0.0916125	9.77%
100		8	0.8875	0.8	1	0.0226582	0.064087	7.22%

Mean Weight Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	0.899	1.2725	1.263	1.3300	1.0780	0.9250	1.2360	1.1044
100		1.2311	1.3990	1.1178	1.4022	1.2575	1.2656	1.2312	1.1978

Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9
100		0.9	1	0.9	0.9	0.8	0.9	0.8	0.9

Reviewed By:

CETIS Report

ronomus Survival and Growth Test — Pacific EcoRisk

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Mean Weight	Comparison	09-5180-6584	09-5180-6584	19 Mar-03 10:19 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed		100	>100	1.00	N/A	10.39%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.870512	8.885389	0.1875336	Equal Variances
Distribution	Shapiro-Wilk W	0.9349988	0.8441989	0.2860158	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.06178331	0.06178331	1	3.423156	0.08550468	Non-Significant Effect
Error	0.2526809	0.01804864	14			
Total	0.3144642	0.07983195	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	-1.850177	1.76131	0.9572477	0.1183118	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	1.1384931	0.8989998	1.33	0.1636186				
100		8	1.2627743	1.117778	1.402222	0.0965724				

ata Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	0.899	1.2725	1.263	1.33	1.078	0.9250	1.236	1.1044		
100		1.2311	1.399	1.1178	1.4022	1.2575	1.2656	1.2313	1.1978		

CETIS Report

Chironomus Survival and Growth Test — Pacific EcoRisk

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Proportion Survived	Comparison	09-5180-6584	09-5180-6584	19 Mar-03 10:19 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)		100	>100	1.00	N/A	6.53%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	2.120074	8.885389	0.3427292	Equal Variances
Distribution	Shapiro-Wilk W	0.8991522	0.8441989	0.07806857	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.02655933	0.02655933	1	1.833326	0.1971893	Non-Significant Effect
Error	0.2028175	0.01448697	14			
Total	0.2293769	0.0410463	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	1.354004	1.76131	0.09859466	0.1059972	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	0.9375	0.8	1	0.0916126	1.3154280	1.107149	1.412016	0.1403127
100		8	0.8875	0.8	1	0.064087	1.2339428	1.107149	1.412016	0.0963653

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9		
100		0.9	1	0.9	0.9	0.8	0.9	0.8	0.9		

Approved By:

Chironomus tentans 10-Day Freshwater Sediment Toxicity Test Data

Client: Los Alamos (Neptune) Test ID#: 8159 Date (Day 0): January 15, 2003

DAY	Date	Temp. (°C)	CONTROL D.O. (OLD)	CONTROL D.O. (NEW)	49884 D.O. (OLD)	49884 D.O. (NEW)	SIGN-OFF
0	1/15/03	22.8	4.9	8.2	3.3	7.7	1030 mc cu
			A – B – C – D –		A – B – C – D –		
			E – F – G – H –		E – F – G – H –		
1	1/16/03	22.6	7.6	8.1	7.9	8.9	1130 cl
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
2	1/17/03	22.3	7.6	7.7	7.8	8.2	1550 mc
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
3	1/18/03	22.5	8.2	8.8	7.8	9.3	1220 cl
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
4	1/19/03	22.6	8.6	8.9	8.5	9.0	3:10 pm KK
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
5	1/20/03	22.7	8.6	8.9	8.4	8.8	1605 KK
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
6	1/21/03	22.5	8.3	8.4	7.9	8.1	1600 cl.
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
7	1/22/03	22.4	7.8	8.0	8.0	9.3	TA
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
8	1/23/03	22.9	8.1	8.3	8.0	8.4	1610 cl
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
9	1/24/03	22.7	NM	8.2	NM	8.2	1200 mc cu
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
10	1/25/03	22.7	8.0		8.1		12:30 pm
			# Live Organisms/replicate		# Live Organisms/replicate		
			A 10 B 8 C 10 D 10		A 9 B 10 C 9 D 9		
			E 10 F 8 G 10 H 9		E 8 F 9 G 8 H 9		

Chironomus tentans Sediment Toxicity Test Weight Data

Client: Los Alamos / Neptune and Company
Sample ID: 49884
Test ID#: 8159 Test Date: Jan 15 2003

Pan Wt Date: 1-24-03 Sign-Off: [illegible]
Dry Wt. Date: 1-26-03 Sign-Off: [illegible]
Ashed Wt. Date: 1-30-03 Sign-Off: [illegible]

Dry Weight Calculations

Pan ID	Concentration/ Replicate		Initial Ashed Pan Wt. (mg)	Dry Pan + Larvae Wt. (mg)	# of Live Organisms			Mean Dry Larvae Weight (mg)
					Larvae	Pupae	Adult	
1	Control	A	30.15	44.30	10	—	—	1.415
2		B	30.51	43.91	8	—	—	1.675
3		C	29.25	46.26	10	—	—	1.701
4		D	31.11	50.06	10	—	—	1.895
5		E	30.89	48.08	10	—	—	1.719
6		F	28.65	39.57	8	—	—	1.365
7		G	28.73	46.47	10	—	—	1.774
8		H	28.38	41.23	9	—	—	1.428
9	49884	A	28.45	44.31	9	—	—	1.762
10		B	28.46	48.68	10	—	—	~~1.546~~ 2.022 [illegible]
11		C	29.49	44.59	9	—	—	1.678
12		D	31.70	49.66	9	—	—	1.995
13		E	28.43	42.40	8	—	—	1.746
14		F	31.56	47.79	9	—	—	1.803
15		G	28.51	42.51	8	—	—	~~1.760~~ 1.750 [illegible]
16		H	29.06	45.35	9	—	—	1.810
QA 1			29.54	29.54 [illegible]	[illegible]	—	—	

Ash Free Dry Weight Calculations

Pan ID	Concentration/ Replicate		Dry Pan + Larvae Wt. (mg)	Ashed Pan + Larvae Wt. (mg)	Total Ash Free Dry Wt. of Larvae (mg)	# of Larvae	Mean Ash Free Dry Wt. of Larvae (mg)
1	Control	A	44.30	35.31	8.99	10	0.899
2		B	43.91	33.73	10.18	8	1.273
3		C	46.26	33.63	12.63	10	1.263
4		D	50.06	36.76	13.30	10	1.330
5		E	48.08	37.30	10.78	10	1.078
6		F	39.57	32.17	7.40	8	0.925
7		G	46.47	34.11	12.36	10	1.236
8		H	41.23	31.29	9.94	9	1.104
9	49884	A	44.31	33.23	11.08	9	1.231
10		B	48.68	34.69	13.99	10	1.399
11		C	44.59	34.53	10.06	9	1.118
12		D	49.66	37.04	12.62	9	1.402
13		E	42.40	32.34	10.06	8	1.258
14		F	47.79	36.40	11.39	9	1.266
15		G	42.51	32.66	9.85	8	1.231
16		H	45.35	34.57	10.78	9	1.198
QA 1			29.54 [illegible]	29.52		[illegible]	

APPENDIX D

Test Data and Summary of Statistics for the Evaluation of Sediment RE16-03-49885 Toxicity to *Chironomus tentans*

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Test:	00-5624-5504	**Test Type:**	Survival (10day)-Growth	**Species:**	Chironomus tentans
Start Date:	15 Jan-03 10:30 AM	**Protocol:**	USEPA Freshwater Sediment (2000)	**Source:**	Aquatic Biosystems, CO
End Date:	25 Jan-03 01:15 PM	**Dil Water:**	Ambient Water		
Setup Date:	15 Jan-03 10:30 AM	**Brine:**			

Sample:	04-6874-4600	**Material:**	Freshwater Sediment	**Client:**	Los Alamos National Laboratory
Sampled:	06 Dec-02 12:00 PM	**Code:**	8161	**Project:**	
Received:	10 Dec-02 10:30 AM	**Source:**	Los Alamos National Laboratory	**Latitude:**	
Temp °C:		**Station:**	RE16-03-49885	**Longitude:**	

Comparison Summary

Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
16-2914-1712	Mean Weight	<100	100	N/A	12.39%	Equal Variance t
11-2180-6254	Proportion Survived	100	>100	N/A	7.40%	Equal Variance t

Mean Weight Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	1.1384931	0.8989998	1.3300003	0.0578479	0.1636186	14.37%
100		8	0.8876182	0.6450001	1.1900001	0.0553471	0.1565452	17.64%

Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	0.9375	0.8	1	0.0323899	0.0916125	9.77%
100		8	0.9125	0.8	1	0.0295048	0.0834523	9.15%

Mean Weight Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	0.899	1.2725	1.263	1.3300	1.0780	0.9250	1.2360	1.1044
100		0.7690	0.9033	0.6450	0.9511	0.8833	0.8425	0.9167	1.1900

Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9
100		1	0.9	1	0.9	1	0.8	0.9	0.8

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Proportion Survived	Comparison	02-7109-5819	02-7109-5819	19 Mar-03 11:59 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Angular (Corrected)		100	>100	1.00	N/A	7.40%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.201633	8.885389	0.8147267	Equal Variances
Distribution	Shapiro-Wilk W	0.8454132	0.8441989	0.01046627	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.006639833	0.006639833	1	0.3681464	0.5537292	Non-Significant Effect
Error	0.2525019	0.01803585	14			
Total	0.2591417	0.02467568	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	0.6067507	1.76131	0.2768646	0.1182699	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	0.9375	0.8	1	0.0916126	1.3154280	1.107149	1.412016	0.1403127
100		8	0.9125	0.8	1	0.0834523	1.2746854	1.107149	1.412016	0.1280003

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9		
100		1	0.9	1	0.9	1	0.8	0.9	0.8		

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Mean Weight	Comparison	02-7109-5819	02-7109-5819	19 Mar-03 11:59 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed		<100	100		N/A	12.39%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.092411	8.885389	0.9101741	Equal Variances
Distribution	Shapiro-Wilk W	0.9698251	0.8441989	0.8013034	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.2517529	0.2517529	1	9.819247	0.00732707	Significant Effect
Error	0.358942	0.02563872	14			
Total	0.6106949	0.2773916	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	3.133568	1.76131	0.00366354	0.1410113	Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	1.1384931	0.8989998	1.33	0.1636186				
100		8	0.8876182	0.6450001	1.19	0.1565451				

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	0.899	1.2725	1.263	1.33	1.078	0.9250	1.236	1.1044		
100		0.7690	0.9033	0.6450	0.9511	0.8833	0.8425	0.9167	1.19		

Chironomus tentans 10-Day Freshwater Sediment Toxicity Test Data

Client: Los Alamos (Neptune) Test ID#: 8161 Date (Day 0): January 15, 2003

DAY	Date	Temp. (°C)	CONTROL D.O. (OLD)	CONTROL D.O. (NEW)	49885 D.O. (OLD)	49885 D.O. (NEW)	SIGN-OFF
0	1/15/03	22.8	4.9	8.2	6.2	7.9	mc 1030 ae
1	1/16/03	22.6	7.6	8.1	7.6	9.2	1130 ae
2	1/17/03	22.3	7.6	7.7	7.4	8.2	mc
3	1/18/03	22.5	8.2	8.8	8.1	9.2	1210 ae
4	1/19/03	22.6	8.6	8.9	8.7	8.7	3:10 pm KK
5	1/20/03	22.7	8.6	8.9	8.3	8.5	1605 KK
6	1/21/03	22.5	8.3	8.4	8.2	8.6	1600 ae
7	1/22/03	22.4	7.8	8.0	8.0	9.2	TA
8	1/23/03	22.9	8.1	8.3	8.0	8.3	1600 ae
9	1/24/03	22.7	NM	8.2	NM	8.4	mc 1200 ae
10	1/25/03	22.7	8.0		8.2		1:15 pm

	# Live Organisms/replicate				# Live Organisms/replicate			
A	10	B	8	C	10	D	10	A 10 B 9 C 10 D 9
E	10	F	8	G	10	H	9	E 10 F 8 G 9 H 8

Chironomus tentans Sediment Toxicity Test Weight Data

Client: Los Alamos / Neptune and Company
Sample ID: 49885
Test ID#: 8161 Test Date: Jan 15, 2003

Pan Wt Date: 1-24-03 Sign-Off: [illegible]
Dry Wt. Date: 1-26-03 Sign-Off: [illegible]
Ashed Wt. Date: 1-30-03 Sign-Off: [illegible]

Dry Weight Calculations

Pan ID	Concentration/ Replicate		Initial Ashed Pan Wt. (mg)	Dry Pan + Larvae Wt. (mg)	# of Live Organisms			Mean Dry Larvae Weight (mg)
					Larvae	Pupae	Adult	
1	Control	A	30.15	44.30	10	—	—	1.415
2		B	30.51	43.91	8	—	—	1.675
3		C	29.25	46.26	10	—	—	1.701
4		D	31.11	50.06	10	—	—	1.895
5		E	30.89	48.08	10	—	—	1.719
6		F	28.65	39.57	8	—	—	1.365
7		G	28.73	46.47	10	—	—	1.774
8		H	28.38	41.23	9	—	—	1.428
25	49885	A	29.19	40.86	10	—	—	1.167
26		B	30.06	43.47	9	—	—	1.490
27		C	29.13	39.18	10	—	—	1.005
28		D	30.36	43.77	9	—	—	1.490
29		E	30.02	41.79	9	1	—	1.308
30		F	28.67	38.49	8	—	—	1.228
31		G	29.99	41.66	9	—	—	1.297
32		H	30.24	42.84	8	—	—	1.575
QA 3			28.13	28.15 RG	[illegible]	[illegible]	—	

Ash Free Dry Weight Calculations

Pan ID	Concentration/ Replicate		Dry Pan + Larvae Wt. (mg)	Ashed Pan + Larvae Wt. (mg)	Total Ash Free Dry Wt. of Larvae (mg)	# of Larvae	Mean Ash Free Dry Wt. of Larvae (mg)
1	Control	A	44.30	35.31	8.99	10	0.899
2		B	43.91	33.73	10.18	8	1.273
3		C	46.26	33.63	12.63	10	1.263
4		D	50.06	36.76	13.30	10	1.330
5		E	48.08	37.30	10.78	10	1.078
6		F	39.57	32.17	7.40	8	0.925
7		G	46.47	34.11	12.36	10	1.236
8		H	41.23	31.29	9.94	9	1.104
25	49885	A	40.86	33.17	7.69	10	0.769
26		B	43.47	35.34	8.13	9	0.903
27		C	39.18	32.73	6.45	10	0.645
28		D	43.77	35.21	8.56	9	0.951
29		E	41.79	33.84	7.95	9	0.883
30		F	38.49	31.75	6.74	8	0.843
31		G	41.66	33.41	8.25	9	0.917
32		H	42.84	33.32	9.52	8	1.190
QA 3			28.15 RG	28.14		RG	

APPENDIX E

Test Data and Summary of Statistics for the Evaluation of Sediment RE16-03-49886 Toxicity to *Chironomus tentans*

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Test:	09-5610-3245	**Test Type:**	Survival (10day)-Growth	**Species:**	Chironomus tentans
Start Date:	15 Jan-03 10:30 AM	**Protocol:**	USEPA Freshwater Sediment (2000)	**Source:**	Aquatic Biosystems, CO
End Date:	25 Jan-03 02:40 PM	**Dil Water:**	Ambient Water		
Setup Date:	15 Jan-03 10:30 AM	**Brine:**			

Sample:	08-6714-3770	**Material:**	Freshwater Sediment	**Client:**	Los Alamos National Laboratory
Sampled:	06 Dec-02 12:00 PM	**Code:**	8160	**Project:**	
Received:	10 Dec-02 10:30 AM	**Source:**	Los Alamos National Laboratory	**Latitude:**	
Temp °C:		**Station:**	RE16-03-49886	**Longitude:**	

Comparison Summary

Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
09-9081-5498	Mean Weight	100	>100	N/A	9.72%	Equal Variance t
06-6345-5726	Proportion Survived	100	>100	N/A	7.02%	Mann-Whitney U

Mean Weight Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	1.1384931	0.8989998	1.3300003	0.0578479	0.1636186	14.37%
100		8	1.2139063	1.1150001	1.3320000	0.0244396	0.0691256	5.69%

Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Control Sed	8	0.9375	0.8	1	0.0323899	0.0916125	9.77%
100		8	0.9625	0.8	1	0.0263052	0.0744024	7.73%

Mean Weight Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	0.899	1.2725	1.263	1.3300	1.0780	0.9250	1.2360	1.1044
100		1.168	1.1640	1.2070	1.3320	1.2013	1.2740	1.25	1.1150

Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9
100		1	1	1	1	0.8	1	0.9	1

Approved By:

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Proportion Survived	Comparison	16-7061-6242	16-7061-6242	19 Mar-03 12:07 PM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Mann-Whitney U	C > T	Angular (Corrected)		100	>100	1.00	N/A	7.02%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	1.495624	8.885389	0.6084836	Equal Variances
Distribution	Shapiro-Wilk W	0.7422359	0.8441989	0.000205345	Non-normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.005809008	0.005809008	1	0.3536566	0.5615394	Non-Significant Effect
Error	0.2299579	0.01642556	14			
Total	0.2357669	0.02223457	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)
Control Sed		100	27.5		0.6395493	3	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	0.9375	0.8	1	0.0916126	1.3154280	1.107149	1.412016	0.1403127
100		8	0.9625	0.8	1	0.0744024	1.3535364	1.107149	1.412016	0.1147324

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	1	0.8	1	1	1	0.8	1	0.9		
100		1	1	1	1	0.8	1	0.9	1		

CETIS Report

Chironomus Survival and Growth Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
Mean Weight	Comparison	16-7061-6242	16-7061-6242	19 Mar-03 12:07 PM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Equal Variance t	C > T	Untransformed		100	>100	1.00	N/A	9.72%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Variance Ratio	5.602568	8.885389	0.03688271	Equal Variances
Distribution	Shapiro-Wilk W	0.955834	0.8441989	0.5614241	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.02274862	0.02274862	1	1.442095	0.2497247	Non-Significant Effect
Error	0.2208458	0.0157747	14			
Total	0.2435944	0.03852332	15			

Group Comparisons

Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)
Control Sed		100	-1.200873	1.76131	0.8751376	0.110608	Non-Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Control Sed	8	1.1384931	0.8989998	1.33	0.1636186				
100		8	1.2139063	1.115	1.332	0.0691257				

Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Control Sed	0.899	1.2725	1.263	1.33	1.078	0.9250	1.236	1.1044		
100		1.168	1.164	1.207	1.332	1.2013	1.274	1.25	1.115		

Chironomus tentans 10-Day Freshwater Sediment Toxicity Test Data

Client: Los Alamos (Neptune) Test ID#: 8160 Date (Day 0): January 15, 2003

DAY	Date	Temp. (°C)	CONTROL D.O. (OLD)	CONTROL D.O. (NEW)	49886 D.O. (OLD)	49886 D.O. (NEW)	SIGN-OFF
0	1/15/03	22.8	4.9	8.2	2.1	7.8	1030 CR
			A – B – C – D –		A – B – C – D –		
			E – F – G – H –		E – F – G – H –		
1	1/16/03	22.6	7.6	8.1	6.9	9.1	mc 1130 CR
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
2	1/17/03	22.3	7.6	7.7	7.1	NM	1550 mc
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
3	1/18/03	22.5	8.82 cr	8.8	7.8	9.0	1210 CR
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
4	1/19/03	22.6	8.6	8.9	8.6	8.3	3:18 pm KC RSO
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
5	1/20/03	22.7	8.6	8.9	8.1	8.5	1605 KK
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
6	1/21/03	22.5	8.3	8.4	7.8	8.6	1600 CR
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
7	1/22/03	22.4	7.8	8.0	6.8	9.0	TA
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
8	1/23/03	22.9	8.1	8.3	7.5	8.3	1600 CR
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
9	1/24/03	22.7	NM	8.2	NM	8.0	mc 1200 CR
			A 0 B 0 C 0 D 0		A 0 B 0 C 0 D 0		
			E 0 F 0 G 0 H 0		E 0 F 0 G 0 H 0		
10	1/25/03	22.7	8.0		8.0		2:40pm RJS
			# Live Organisms/replicate		# Live Organisms/replicate		
			A 10 B 8 C 10 D 10		A 10 B 10 C 10 D 10		
			E 10 F 8 G 10 H 9		E 8 F 10 G 9 H 10		

Chironomus tentans Sediment Toxicity Test Weight Data

Client: Los Alamos / Neptune and Company
Sample ID: 49886
Test ID#: 8160 Test Date: Jan 15, 2003

Pan Wt Date: 1-24-03 Sign-Off: [illegible]
Dry Wt. Date: 1-26-03 Sign-Off: [illegible]
Ashed Wt. Date: 1-30-03 Sign-Off: [illegible]

Dry Weight Calculations

Pan ID	Concentration/ Replicate		Initial Ashed Pan Wt. (mg)	Dry Pan + Larvae Wt. (mg)	# of Live Organisms			Mean Dry Larvae Weight (mg)
					Larvae	Pupae	Adult	
1	Control	A	30.15	44.30	10	—	—	1.415
2		B	30.51	43.91	8	—	—	1.675
3		C	29.25	46.26	10	—	—	1.701
4		D	31.11	50.06	10	—	—	1.895
5		E	30.89	48.08	10	—	—	1.719
6		F	28.65	39.57	8	—	—	1.365
7		G	28.73	46.47	10	—	—	1.774
8		H	28.38	41.23	9	—	—	1.428
33	49886	A	29.38	47.00	10	—	—	1.762
34		B	28.06	43.52	10	—	—	1.546
35		C	30.10	46.88	10	—	—	1.678
36		D	29.32	49.27	10	—	—	1.995
37		E	29.96	43.93	8	—	—	1.746
38		F	30.08	48.11	10	—	—	1.803
39		G	28.47	44.31	9	—	—	1.760
40		H	28.26	46.36	10	—	—	1.810
QA 4			30.27	[illegible] 30.26	[illegible]			

Ash Free Dry Weight Calculations

Pan ID	Concentration/ Replicate		Dry Pan + Larvae Wt. (mg)	Ashed Pan + Larvae Wt. (mg)	Total Ash Free Dry Wt. of Larvae (mg)	# of Larvae	Mean Ash Free Dry Wt. of Larvae (mg)
1	Control	A	44.30	35.31	8.99	10	0.899
2		B	43.91	33.73	10.18	8	1.273
3		C	46.26	33.63	12.63	10	1.263
4		D	50.06	36.76	13.30	10	1.330
5		E	48.08	37.30	10.78	10	1.078
6		F	39.57	32.17	7.40	~~10~~ 8 AG	0.925
7		G	46.47	34.11	12.36	10	1.236
8		H	41.23	31.29	9.94	9	1.104
33	49886	A	47.00	35.32	11.68	10	1.168
34		B	43.52	31.88	11.64	10	1.164
35		C	46.88	34.81	12.07	10	1.207
36		D	49.27	35.95	13.32	10	1.332
37		E	43.93	34.32	9.61	8	1.201
38		F	48.11	35.37	12.74	10	1.274
39		G	44.31	33.06	11.25	9	1.250
40		H	46.36	35.21	11.15	10	1.115
QA4			[illegible] 30.26	30.25			

APPENDIX F

Test Data and Summary of Statistics for the Reference Toxicant Evaluation of the *Chironomus tentans*

CETIS Report

Acute Chironomus Test — **Pacific EcoRisk**

Test:	17-5956-8896	**Test Type:**	Survival (48h)	**Species:**	Chironomus tentans
Start Date:	16 Jan-03 11:30 AM	**Protocol:**	USEPA Freshwater Sediment (2000)	**Source:**	Environmental Consult & Test
End Date:	18 Jan-03 12:45 PM	**Dil Water:**	Mod-Hard Synthetic Water		
Setup Date:	23 Aug-02 12:00 AM	**Brine:**			

Sample:	06-5899-8711	**Material:**	Copper sulfate	**Client:**	
Sampled:	16 Jan-03 11:30 AM	**Code:**	8237	**Project:**	
Received:		**Source:**	Reference Toxicant	**Latitude:**	
Temp °C:		**Station:**		**Longitude:**	

Comparison Summary

Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
06-2321-9981	48h Proportion Survived	25	50	35.35534	20.93%	Dunnett's Multiple Comparison

Point Estimate Summary

Analysis	Endpoint	% Effect	Conc-µg/L	95% LCL	95% UCL	Method
10-4360-5447	48h Proportion Survived	1	16.90798	8.288918	23.90853	Linear Regression
		5	23.36521	13.70358	30.6909	
		10	27.76247	17.83225	35.22486	
		15	31.18781	21.23146	38.78071	
		20	34.20913	24.3232	41.97513	
		25	37.03337	27.26099	45.04169	
		40	45.22768	35.77038	54.64882	
		50	51.00672	41.49873	62.30968	

48h Proportion Survived Summary

Conc-µg/L	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Dilution Water	2	1	1	1	0	0	0.00%
25		2	0.9	0.8	1	0.1	0.1414214	15.71%
50		2	0.6	0.6	0.6	0	0	0.00%
100		2	0.05	0	0.1	0.05	0.0707107	141.42%
200		2	0	0	0	0	0	0.00%
400		2	0	0	0	0	0	0.00%

48h Proportion Survived Detail

Conc-µg/L	Control Type	Rep 1	Rep 2
0	Dilution Water	1	1
25		1	0.8
50		0.6	0.6
100		0	0.1
200		0	0
400		0	0

CETIS Report

Report Date: 19 Mar-03 10:37 AM
Analysis: 06-2321-9981

Acute Chironomus Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
48h Proportion Survived	Comparison	04-4374-1735	04-4374-1735	19 Mar-03 10:37 AM	CETISv1.023

Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Dunnett's Multiple Comparison	C > T	Angular (Corrected)		25	50	4.00	35.35534	20.93%

ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Modified Levene	65535	16.69437	7.76089E-10	Unequal Variances
Distribution	Shapiro-Wilk W	0.9326732	0.7493504	0.505478	Normal Distribution

ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	1.634217	0.5447389	3	36.46682	0.002305262	Significant Effect
Error	0.05975173	0.01493793	4			
Total	1.693969	0.5596769	7			

Group Comparisons

Control	vs	Conc-µg/L	Statistic	Critical	P Level	MSD	Decision(0.05)
Dilution Water		25	1.247199	2.835078	>0.05	0.3465056	Non-Significant Effect
		50	4.303186	2.835078	<=0.05	0.3465056	Significant Effect
		100	9.58716	2.835078	<=0.05	0.3465056	Significant Effect

Data Summary

			Original Data				Transformed Data			
Conc-µg/L	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Dilution Water	2	1	1	1	0	1.4120162	1.412016	1.412016	0.0003334
		2	0.9000000	0.8	1	0.1414214	1.2595825	1.107149	1.412016	0.2155738
50		2	0.6000000	0.6	0.6	0.0001691	0.8860771	0.8860771	0.8860771	0.0001326
100		2	0.0500000	0	0.1	0.0707107	0.2402654	0.1587802	0.3217506	0.1152374

Data Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1								
25		1	0.8								
50		0.6	0.6								
100		0	0.1								

CETIS Report

Acute Chironomus Test — **Pacific EcoRisk**

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version
48h Proportion Survived	Linear Regression	04-4374-1735	04-4374-1735	19 Mar-03 10:37 AM	CETISv1.023

Linear Regression Options

Model	Threshold Option	Lower Threshold	Threshold Optimized	Reweighted	Pooled Groups	Heterogeneity Corr.
Log-Normal	Control Threshold	0	Yes	Yes	No	No

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Statistic	P Level	Decision(0.05)
Slope	4.85125	0.9269751	3.034379	6.668121	5.23342	0.0135764	Significant
Intercept	-3.284128	1.603323	-6.426641	-0.1416139	-2.048325	0.1329778	Not Significant

Regression Summary

Iters	Log Likelihood	Mu	Sigma	G Stat	Chi-Sq	Critical	P Level	Decision(0.05)
6	-12.82281	-0.67697	0.2061324	0.1402623	5.091976	15.50731	0.7477019	Non-Significant Heterogeneity

Residual Analysis

Attribute	Method	Statistic	Critical	P Level	Decision(0.05)
Variances	Modified Levene	-3.1264E+15	6.256057	2.86468E-31	Unequal Variances
Distribution	Shapiro-Wilk W	0.8334793	0.8415879	0.04061602	Non-normal Distribution

Point Estimates

% Effect	Conc-µg/L	95% LCL	95% UCL
1	16.90798	8.288918	23.90853
5	23.36521	13.70358	30.6909
10	27.76247	17.83225	35.22486
15	31.18781	21.23146	38.78071
20	34.20913	24.3232	41.97513
25	37.03337	27.26099	45.04169
40	45.22768	35.77038	54.64882
50	51.00672	41.49873	62.30968

Data Summary

			Calculated Variate(A/B)						
Conc-µg/L	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Dilution Water	2	1	1	1	0	0	20	20
25		2	0.9000000	0.8	1	0.028868	0.141421	18	20
50		2	0.6000000	0.6	0.6	3.45E-05	0.000169	12	20
100		2	0.0500000	0	0.1	0.014434	0.070711	1	20
200		2	0	0	0	0	0	0	20
400		2	0	0	0	0	0	0	20

48 Hour Acute *Chironomus* Toxicity Test Data

Client: Los Alamos
Test ID #: 8327
Date: 1/16/03

Test Species: *Chironomus tentans*
Test Material: Copper sulfate
Control/Dilution Water: EPAMH

Treatment (µgCu/L)	Temp	pH Old	pH New	D.O. Old	D.O. New	Conductivity (µS/cm)	# Live Animals A	# Live Animals B	Sign-Off
Control	22.4		7.90		9.0	272	10	10	Time: 1130
25	22.4		7.98		8.9	271	10	10	Date:
50	22.4		7.96		9.0	271	10	10	1.16.03
100	22.4		7.99		8.9	273	10	10	
200	22.4		8.00		8.9	271	10	10	ID: ae
400	22.4		8.00		9.0	271	10	10	mc
Control	22.5	8.05		7.7			10	10	Time: 1145
25	22.5	8.07		7.5			10	10	Date:
50	22.5	8.04		7.3			7	9 ~~10~~	1.17.03
100	22.5	7.99		7.5			2	4	
200	22.5	7.97		7.2			1	0	ID: ae mc
400	22.5	NM		NM			0	0	
Control	22.5	7.88		7.5		285	10	10	Time: 1245
25	22.5	7.87		7.4		283	10	8	Date:
50	22.5	7.92		7.5		281	6	6	1.18.03
100	22.5	7.93		7.6		286	0	1	
200	22.5	7.93		7.5		285	0	—	ID: ae
400	22.5	—		—		—	—	—	

APPENDIX G

Water Quality Characteristics of the Test Replicate Overlying Water at the Initiation (Day 0) and Termination (Day 10) of the Tests

Chironomus tentans Sediment Test Water Quality Characteristics

Client: Los Alamos (Neptune) Test ID #: 8158 8159 8160/8161 Date (Day 0): Jan 15, 2003

Initial (Day 0) Water Quality Characteristics for Overlying Water

Date: Jan 15, 2003 Temperature (°C): 22.8 RS Sign-Off: ag

Treatment ID	pH	D.O. (mg/L)	Conductivity (µS/cm)	Alkalinity	Hardness	Total Ammonia
Control	8.12	8.2	308	78	138	~~0.78~~ 0.00
49883	7.69	7.5	269	91	100	1.60
49884	8.09	7.7	248	72	69	0.02
49885	7.68	7.9	300	~~61~~ 107	106	1.83
49886	8.26	7.8	312	61	88	0.00

Final (Day 10) Water Quality Characteristics for Overlying Water

Date: Jan 25, 2003 Temperature (°C): 22.7 Sign-Off: ag

Treatment ID	pH	D.O. (mg/L)	Conductivity (µS/cm)	Alkalinity	Hardness	Total Ammonia
Control	7.80	8.0	337	79	103	0.00
49883	7.84	7.1	284	71	71	3.48
49884	8.07	8.1	275	73	75	0.32
49885	7.67	8.2	312	84	85	3.95
49886	8.13	8.0	328	61	92	0.00